

Vol. 35, No. 4 April, 2024

ISSN 1029 - 385 X (Print)

ISSN 2519 - 7134 (Online)



MEDICAL FORUM MONTHLY

**RECOGNISED BY
PMC & HEC**

**APNS
Member**

**CPNE
Member**

**ABC
Certified**

Open Access Journal

Journal of all Specialities

“Medical Forum” Monthly Recognised and Index by

- ☞ PMDC with Index Pakistan No.48 since 1998
- ☞ HEC since 2009
- ☞ Pakmedinet Since 2011
- ☞ Medlip (CPSP) Since 2000
- ☞ PASTIC & PSA Since 2000
- ☞ NLP Since 2000
- ☞ WHO, Index Medicus (IMEMR) Since 1997
- ☞ EXCERPTA MEDICA, Netherlands Since 2000
- ☞ EMBASE SCOPUS Database Since 2008
- ☞ Registered with International Standard Serial Number of France bearing ISSN 1029-385X (Print), ISSN 2519-7134 (Online) Since 1992
- ☞ Registered with Press Registrar Govt. of Pak bearing No.1221-B Copr. Since 2009
- ☞ ABC Certification Since 1992
- ☞ On Central Media List Since 1995
- ☞ Med. Forum Published under Medical Academic Foundation (MAF) from Lahore Since 1989
- ☞ Open Access, Peer Review & Online Journal
- ☞ Email: med_forum@hotmail.com, medicalforum@gmail.com
- ☞ website: www.medforum.pk

	ISSN 1029 - 385 X (Print)		ISSN 2519 - 7134 (Online)	
	APNS Member	CPNE Member	ABC Certified	
	Peer Review Journal	Online Journal	Published Since 1989	
	e-journal available on: www.medforum.pk			

Medical Forum Recognized and Indexed by

PMDC-IP-0048 (1998), HEC-Y-Category (2009), Pastic and PSA, Isd (2000), Medlip, Karachi (2000), NLP, Isd (2000), Pakmedinet, Isd (2011), Excerpta Medica, Netherlands (2000), EMBASE Scopus Database (2008), Index Medicus (IMEMR) WHO (1997), ABC Certification, Govt. of Pak. (1992), Central Media list, Govt. of Pak (1995), Press Reg. No.1221-B Copr (2009)

Published under

Reg No.RP11256/L/S/18

Medical Academic Foundation


Editorial Executives

Patron-in-Chief Prof. Mahmood Ali Malik Medicine	Editor-in-Chief Prof. Azhar Masud Bhatti Public Health Specialist & Nutritionist	Managing Editor Prof. Nasreen Azhar Consultant Gynaecologist
Co-Editors Tahir Masud Jan (Canada) Dr. Meshaal Azhar (Pak) Dr. Faryal Azhar (Pak)	Editor Dr. Mohsin Masud Jan	Associate Editors Prof. Syed Mudassar Hussain (Pak) Prof. M. Mohsin Khan (Pak) Dr. Iftikhar A. Zahid (Pak)

National Editorial Advisory Board

Prof. Abdul Hamid	Forensic Medicine	Sialkot	03239824782	drabdulhamid12345@hotmail.com
Prof. Abdul Khaliq Naveed	Biochemistry	Rawalpindi	03215051950	khaliqnaveed2001@yahoo.com
Prof. AftabMohsin	Medicine	Lahore	03314101516	aftabmohsin@yahoo.com
Prof. Anjum Habib Vohra	Neurosurgery	Lahore	03008443218	omer@brain.net.pk
Prof. Asad Aslam Khan	Ophthalmology	Lahore	03008456377	drasad@lhr.comsats.net.pk
Prof. Haroon Khurshid Pasha	Paed. Surgery	Multan	03008633433	haroonkpasha@hotmail.com
Prof. Haroon Nabi	Dermatology	Lahore	03004000216	haroonnabi@hotmail.com
Prof. Javed Akram	Medicine	Lahore	03008450505	vc@uhs.edu.pk
Prof. Kh. M. Azeem	Surgery	Lahore	03334242122	khawaja.azeem@sihs.org.pk
Prof. Khalid Masood Gondal	Surgery	Lahore	03328483823	rc_lahore@csp.edu.pk
Prof. M. Amjad	ENT	Lahore	03334254695	professoramjad@yahoo.com
Prof. M. Amjad Amin	Surgery	Multan	03336103262	dramjadamin@gmail.com
Prof. M. Sabir	Anatomy	Sialkot	03005183021	raosabirdr62@gmail.com
Prof. Mahmood Nasir Malik	Medicine	Lahore	03009487434	nasirphysician@yahoo.com
Prof. Majeed Ahmad Ch.	Surgery	Lahore	03008440415	prof_abdulmajeed@hotmail.com
Prof. Mian Rasheed	Forensic Medicine	Rawalpindi	03025033559	drmian1000@hotmail.com
Prof. Pervez Akhtar Rana	Forensic Medicine	Lahore	03009422511	pzrana@gmail.com
Prof. Rukhsana Majeed	Community Medicine	Quetta	03337808138	majidrukhsana@hotmail.com

Prof. Safdar Ali Shah	Urology	Lahore	03334391474	drsafdar-ali@hotmail.com
Prof. SardarFakhar Imam	Medicine	Lahore	03008451843	drfakhar@lhr.paknet.com.pk
Prof. Shahid Mehmood	Surgery	Rawalpindi	03215001120	shahiddr63@gmail.com
Prof. Syed M. Awais	Orthopaedics	Lahore	03334348716	awais@kemu.edu.pk
Prof. Syed Nazim Hussain Bukhari	Medicine & Chest	Lahore	03009460515	nhbokhari@yahoo.com
Prof. Zafarullah Ch.	Surgery	Lahore	03072222533	administrator@csp.edu.pk

International Editorial Advisory Board

Dr. Amjad Shad	Neurosurgery	UK	447963442419	amjad.shad@uhcw.nhs.uk
Dr. Ghazanfar Ali	Gastroenterology	UK	447800760008	ghazanfarali@hotmail.com
Dr. Haider Abbas	Urology	UK	447816149374	haidersyed@hotmail.com
Dr. Khalid Rashid	Cardiology	UK	447740477756	khalid.rashid@cht.nhs.uk
Dr. M. Shoaib Khan	Medicine	UAE	00971503111420	msksd2000@yahoo.com
Dr. Basil Nouman Hashmi	Surgery	UK	00447806611517	basilhashmi@doctor.net.uk
Dr. Sohail Saied	Surgery	UK	00441923285114	sohailsaied@gmail.com
Dr. Safdar Ali	Cardiology	USA	0016307816668	safdarali@sbcglobal.net
Dr. Parashu Ram Mishra	Surgery & Gastroenterology	Nepal	+9779841233450	drparashuram.mishra@gmail.com
Dr. Mansoor M. Mian	Psychiatry	USA	+1 (972)375 7821	mmian2000@yahoo.com
Dr. Sohail Qureshi	Orthopaedic	UK	00447734329666	quraishisohail@yahoo.com
Dr. Mushtaq Ahmad Mughal	Orthopaedics	UK	00447971886006	mahmed01@blueyonder.co.uk
Dr. Mansoor Tahir	Radiology	UK	00447921838093	drmansoortahir@yahoo.com

Business Manager: Nayyar Zia Ch.

Legal Advisors: Kh. EjazFeroz (Barrister),
Kh. Mazhar Hassan &Firdos Ayub Ch. (Advocates)

Published under: Medial Academic Foundation (MAF) Reg. No.RP/11256/L/S/18

Published By: Prof. Nasreen Azhar, Gohawa Road, Link Defence / New Airport Road,
Opposite Toyota Motors, Lahore Cantt. Lahore.
Mobile Nos. 0331-6361436, 0300-4879016, 0345-4221303, 0345-4221323.
E-mail: med_forum@hotmail.com, medicalforum@gmail.com
Website: www.medforum.pk

Printed By: Naqvi Brothers Printing Press, Darbar Market, Lahore.

Rate per Copy: Rs.3000.00

Subscription Rates : Pakistan (Rs.30000.00), USA & Canada (US\$ 500.00),
(annually) China, Japan, UK &Middle East (US\$ 450.00)

CONTENTS

Editorial

- Foods Act as Medicine for Release of Cramps** _____ 1-2
Moshin Masud Jan

Original Articles

1. **Computed Tomography VS Panoramic Radiography: Evaluation of Root Resorption Associated with Impacted Maxillary Canines** _____ 3-6
Ebrahim S Alshawy
2. **A Pattern of Drug Resistance of Salmonella in Patients having Suspected or Confirmed Typhoid Fever in District Bannu and Adjacent Areas** _____ 7-11
1. Raza Muhammad Khan 2. Nafidullah Khan 3. Tahir Ullah
3. **Prevalence of Asymptomatic Pulmonary Tuberculosis in Diabetics Patients in District Bannu and Adjacent Areas** _____ 12-16
1. Tahir Ullah 2. Raza Muhammad Khan 3. Nafidullah Khan
4. **Frequency of Rotavirus as a Cause of Acute Diarrhea** _____ 17-20
1. Zia Muhammad 2. Abdul Khaliq 3. Tabinda Shadab 4. Syed Mohsin Ali Shah 5. Sabir Khan 6. Zulqarnain Haider
5. **Evaluation of Services of Cleft Palate/Lip Team Delivered in Lahore, Pakistan** _____ 21-24
1. Sohail Anjum 2. Nasir Naseem Akhtar 3. Hafsa Sohail 4. Rizwan Ali Qaiser 5. Sohail Bashir Sulehria 6. Ghulam Murtaza Hiraj
6. **Measurement of Alveolar Bone Loss in Post-Menopausal Women by Using Cone –Beam Computed Tomography System Radiograph** _____ 25-29
Alia Taboor Thjeel
7. **Oral Impacts Experienced by Patients Undergoing Fixed or Removable Orthodontic Appliances Therapy in Peshawar, Pakistan** _____ 30-34
1. Muhammad Asim 2. Sana Nasir 3. Ali Khan 4. Noor Uddin 5. Faisal 6. Syeda Faryal
8. **Effectiveness of Cognitive Behavioral Hypnotherapy to Reduce Smoking in Anxiety-Prone Individuals** _____ 35-39
1. Binish Nawaz 2. Zainab Zadeh 3. Tahira Yousuf 4. Neeta Maheshwary 5. Suneeta Das 6. Muhammad Athar Khan
9. **A Comprehensive Exploration Through CT-Guided Pedicle Morphometry of Lumbar Vertebrae in Pakistani Population** _____ 40-45
1. Athar Maqbool 2. Zumirah Atiq 3. Saman Ali 4. Zarmeen Nadeem 5. Sadia Safdar 6. Abdullah Atiq
10. **Comparison of the Mean Duration of Analgesia of Intraperitoneal Bupivacaine and Ropivacaine Versus Placebo After Laparoscopic Cholecystectomy** _____ 46-50
1. Muhammad Waqid Bin Abdullah 2. Roshan Butt 3. Afzaal Baig 4. Syed Muhammad Talha Bukhari 5. Zubair Ahmad 6. Haseeb Ahmad
11. **Effects of Deep Breathing Exercises on Old Versus Young Patients Undergoing Valve Replacement Surgery** _____ 51-54
1. Nashmiya Shahid 2. Munaza Arwa 3. Zunaira Arshad 4. Rehana Niazi 5. Nazeer Mehrvi 6. Abbas Jamil
12. **Pre-OP Shortening Assessment and Per OP Shortening Needed In Developmental Dysplasia of the Hip (DDH) Surgery in Children** _____ 55-58
1. Imran Khan 2. Qaisar Khan 3. Abbas Ali 4. Safeer Ullah 5. Rizwan Ullah 6. Ihtisham Anjum

13. **Exploring Musculoskeletal Symptoms in Adolescent Athletes and Non-Athletes: A Cross-Sectional Study** _____ 59-62
1. Shehla Khatoon 2. Munila Khattak 3. Syeda Gulrukh Saba Shah 4. Sadaf Ambreen
5. Shabnam Amir 6. Arsalan Shah Roghani
14. **Mind and Sight: Seeing Beyond the Retina - Connecting the Dots in Relationships between Glaucoma and Earlier Diagnosis of Dementia: A Pilot Study** _____ 63-68
1. Aurangzeb Shaikh 2. Asma Arman 3. Ali Zeb 4. Muhammad Imran Sarwar Khan 5. Anjali Zeb
6. Raj Kumar
15. **Acetabular Index Correction by Dega Osteotomy in Developmental Dysplasia of the Hip (DDH) Surgery** _____ 69-73
1. Abbas Ali 2. Qaisar Khan 3. Imran Khan 4. Safeer Ullah 5. Rizwan Ullah 6. Ihtisham Anjum
16. **Prevalence of Biliary Ascariasis in Bajaur and Dir District of KPK and Role of Ultrasound in Detecting Worms in Common Bile Duct and Pancreatic Duct** _____ 74-77
1. Muzaffar Shah 2. Noor Habib 3. Nimatullah 4. Masood Shah
17. **Dog Bites Injury of the Face: Management & Reconstructive Options** _____ 78-81
1. Firdous Khan 2. Babar Tanoli 3. Tehmas Ahmed Khan

Review Article

18. **Segmental Anatomy of the Liver: Explore the Segmental Anatomy of the Liver in Relation to Surgical Procedures, like Liver Resections and Transplantations** _____ 82-86
1. Rahmat Ullah Jan 2. Nauman Khan 3. Motasim Billah 4. Amjad Ali Shah 5. Huma Shafiq
6. Syeda Gulrukh Saba Shah

Guidelines and Instructions to Authors _____ i-ii

Editorial

Foods Act as Medicine for Release of Cramps

Mohsin Masud Jan

Editor

Cramps are sudden, painful muscle contractions that can happen in any part of the body. They can be caused by various reasons such as dehydration, overuse of muscles, or mineral deficiencies. For example, if you do not drink enough water, your muscles may cramp up during exercise. Cramps can be very uncomfortable and may last for a few seconds to several minutes. Stretching and staying hydrated can help prevent cramps from happening.

Leg cramps are involuntary, localised, and usually painful skeletal muscle contractions, which commonly affect calf muscles but can occur anywhere in the leg from foot up to the thigh. Leg cramps typically occur at night and usually last only seconds to minutes. Leg cramps may be idiopathic (of unknown cause) or may be associated with a definable process or condition such as pregnancy, renal dialysis, or venous insufficiency. This review does not currently cover leg cramps associated with renal dialysis or venous insufficiency.

Leg cramps are common and their incidence increases with age. About half of people attending a general medicine clinic have had leg cramps within 1 month of their visit, and more than two-thirds of people aged over 50 years have experienced leg cramps.¹

Little is known about the causes of leg cramps. Risk factors include pregnancy, exercise, electrolyte imbalances, salt depletion, renal dialysis, peripheral vascular disease (both venous and arterial), peripheral nerve injury, polyneuropathies, motor neurone disease, and certain drugs (including beta agonists and potassium-sparing diuretics). Other causes of acute calf pain include trauma, DVT (see review on Thromboembolism), and ruptured Baker's cyst.²

Cramps may occur in patients with lower motor neuron disorders, neuropathies, metabolic disorders, and acute extracellular volume depletion. However, they also often occur in healthy subjects with no history of nervous or metabolic disorders, such as during sleep, pregnancy, and strenuous physical exercise. The latter cramps have been defined as "benign cramps" or "idiopathic cramps" or "cramps with no apparent cause"³.

Some muscles are more susceptible to electrically elicited cramps than others, independent of the side dominance. For example, we found that leg muscles are more resistant to cramp induction than foot muscles⁴.

Generally accepted that cramps have a neurogenic nature, their origin has been long discussed³.

Muscle cramps are caused by ectopic discharges from nerves or nerve terminals; therefore, a variety of neuropathic conditions such as amyotrophic lateral sclerosis (ALS), peripheral neuropathies, and cramp-fasciculation syndrome are commonly associated with cramps.³

Cramps are also frequent during the last trimester of pregnancy and in athletes such as marathon runners.⁵

When you have been blessed with a case of cramps that

feel like a knife is being twisted in your body, your game plan for pain relief might include popping a pain killer and binge-watching your favourite series with a heating pad. While those tried-and-true tactics will likely alleviate some of the pain, noshing on certain foods that help with cramps may also save you from your agony.

Here, we break down the best foods that help with cramps and explain the magical powers driving these pain-relief effects.

Dark leafy greens: Mixing some dark leafy greens into your diet is an easy way to get your fill of magnesium. One cup of raw spinach, for example, provides about eight per cent of the Recommended Dietary Allowances (RDA) for the mineral per cup, while a cup of turnip greens offers roughly five per cent of the RDA. Add them to your morning smoothie or lunchtime stir fry, whip up a quick sauté with eggs or chicken, or use them as a base for your favourite salad toppings.

Pumpkin seeds: Pumpkin seeds are one of the best sources of magnesium, according to the National Institutes of Health, packing 41 per cent of the RDA per half-cup. To get your fill of the food that helps with cramps, blend the seeds in a food processor to create a homemade pumpkin seed butter that's the perfect dip for apples. You can also mix them into your salads or coleslaw for a crunchy addition, use them in place of pine nuts in pesto, or incorporate the seeds or butter into no-bake energy bites.

Peppermint: This potent-smelling herb is packed with two of the aforementioned polyphenols: diosmin and hesperidin. When it comes to peppermint, often the easiest way to bring that into your diet is through peppermint tea, which is a really popular way to sip on it and consume it. Not a fan of the beverage? Get your fill of the food that helps with cramps by finely chopping the leaves and adding them to a salad or stirring them into Greek yogurt with berries.

Ginger: Ginger has a reputation for being an anti-inflammatory all-star, and one systematic review found that consuming the root orally (via capsules containing ginger powder) may be a potentially effective pain relief treatment for cramps. While there's no guarantee eating ginger straight-up will have the same effects as those found in studies, it's easy enough to incorporate into your diet and, thus, worth a shot. Consider brewing a cup of ginger tea or blending it into your green smoothie. A ginger-based smoothie with some berries would be a fabulous cramp drink in the morning.

Turmeric: A single golden spice can help you score that anti-inflammatory, prostaglandin-inhibiting curcumin. We really love adding turmeric into stews, or you can even use that as a seasoning onto the fish, like the salmon or mackerel. Turmeric lattes, as well, are excellent, like a golden milk latte you can do before bed. That warm, soothing beverage can also help reduce some of that cramping and that pain, too.

Tofu: While dairy is typically what first comes to mind when you think of calcium, you can also get your fill from tofu, which provides 12.5 per cent of the RDA per three ounces. Transform the plant-based protein into a crispy taco filling, mix it into soups or curries, or use it to create an animal-free take on scrambled eggs.

Yogurt: Along with satisfying protein, you'll nab nearly 30 per cent of the RDA for calcium per cup of plain, whole milk yogurt, which makes it one of the top foods that help with cramps (potentially, of course). Eat the dairy product by the spoonful, turn it into a creamy salad dressing, or use it as a dip for fresh veggies.

Dark chocolate: Just one ounce dark chocolate with 70 to 85 per cent cacao packs a whopping 21 per cent of the RDA for magnesium, and luckily it's pretty effortless to incorporate into your diet. Aside from eating a few chocolate squares straight-up, consider mixing cacao powder with some honey and pumpkin seed butter for a fudge-like treat.

Orange Juice: One cup of refreshing OJ has plenty of water for hydration. It's also a potassium star with nearly 500 milligrams per cup. Orange juice has 27 milligrams of calcium and magnesium. Choose a calcium-fortified brand for an extra boost.

Snack Smart With Nuts and Seeds: Like beans and lentils, nuts and seeds are a great source of magnesium. For example, 1 ounce of toasted sunflower seeds has about 37 milligrams of magnesium. And 1 ounce of roasted, salted almonds has double that. Many types of nuts and seeds have calcium and magnesium as well.

Salmon for Circulation: Sometimes muscle cramps are the result of poor blood flow. Eating oily fish like salmon can help improve it. Plus, a 3-ounce portion of cooked salmon has about 326 milligrams of potassium and 52 milligrams of sodium to help with muscle cramps. Not a salmon fan? You also could try trout or sardines.

Tap into Tomatoes, Juice and All: Tomatoes are high in potassium and water content. So if you gulp down 1 cup of tomato juice, you'll get about 15% of your daily value of potassium. You'll also give your body hydration to prevent muscle cramps from starting.

Bananas: A Time-Tested Treatment: You probably know that bananas are a good source of potassium. But they'll also give you magnesium and calcium. That's three out of four nutrients you need to ease muscle cramps tucked under that yellow peel. No wonder bananas are a popular, quick choice for cramp relief.

Sweet Relief from Sweet Potatoes: Like bananas, sweet potatoes give you potassium, calcium, and magnesium. Sweet potatoes get the win because they have about six times as much calcium as bananas. And it's not just sweet potatoes: Regular potatoes and even pumpkins are good sources of all three nutrients. Plus, potatoes and pumpkins naturally have a lot of water in them, so they can help keep you hydrated, too.

The Avocado: A Potassium Powerhouse: One creamy, green berry (yes, it's really a berry!) has about 975 milligrams of potassium, twice as much as a sweet

potato or banana. Potassium is important because it helps your muscles work and keeps your heart healthy. So swap out mayo on a sandwich with mashed avocado, or slice one onto your salad to help keep muscle cramps away. They have a lot of fat and calories, so keep that in mind.

Beans and Lentils: Legumes like beans and lentils are packed with magnesium. One cup of cooked lentils has about 71 milligrams of magnesium, and a cup of cooked black beans has almost double that with 120 milligrams. Plus, they're high in fiber, and studies show that high-fiber foods can help ease menstrual cramps as well as help control your blood sugar and lower levels of "bad" LDL cholesterol.

Melons Are the Total Package: These fruits have it all: loads of potassium, a good amount of magnesium and calcium, a little sodium, and a lot of water. Sodium and water are key because as you exercise, your body flushes sodium out with your sweat. If you lose too much water, you'll get dehydrated, and muscle cramps may happen. Eating a cup of cubed cantaloupe after a workout can help.

Watermelon for Hydration: They're about 90% water, so when you need foods that hydrate, a cup of watermelon will do it. Since it's a melon, it's also high in potassium, but not quite as high as others.

Milk: It's a natural source of electrolytes like calcium, potassium, and sodium. It's good for hydration. And it's packed with protein, which helps repair muscle tissue after workouts. All of the above can help protect against muscle cramps.

Pickle Juice: Some athletes swear by pickle juice as a fast way to stop a muscle cramp. They believe it's effective because of the high water and sodium content. But that might not be the case. While pickle juice may help relieve muscle cramps quickly, it isn't because you're dehydrated or low on sodium. It is more likely because the pickle juice sets off a reaction in your nervous system that stops the cramp, according to recent research.

REFERENCES

1. Shahraki AD. Effects of vitamin E, calcium carbonate and milk of magnesium on muscular cramps in pregnant women. *J Med Sci* 2006;6:979–983.
2. Mokhtari M, Yaghmaie M, Mohammadi M. The comparison of the therapeutic effect of vitamin E on leg cramps during pregnancy. *Obstet Gynecol Infert* 2002;5:42–46.
3. Miller TM, Lavzer RB. Muscle cramps. *Muscle Nerve* 2005; 32: 431–42.
4. Minetto MA, Botter A. Elicitability of muscle cramps in different leg and foot muscles. *Muscle Nerve* 2009; 40: 535–44.
5. Schweltnus MP. Muscle cramping in the marathon: aetiology and risk factors. *Sports Med* 2007; 37:364–367.

Cone-Beam Computed Tomography VS Panoramic Radiography: Evaluation of Root Resorption Associated with Impacted Maxillary Canines

Ebrahim S Alshawy

ABSTRACT

Objective: This investigation aims to quantify the degree of root resorption in individuals with impacted maxillary canines through a comparative analysis of OPG and CBCT radiographic techniques.

Study Design: A retrospective radiographic study.

Place and Duration of Study: This study was conducted at the College of Dentistry, Qassim University, Qassim, Saudi Arabia between September 2021 and June 2023.

Methods: Data from 40 patients with unilateral impacted maxillary canines were obtained from the Dental clinics of Qassim University Hospital Qassim, Saudi Arabia. The grading system of Ericson and Kurol was slightly modified and employed to quantify the degree of root resorption OPG and CBCT radiographs. One investigator evaluated the OPG and CBCT radiographs and graded the amount of root resorption. Cohen's kappa coefficient test was used to assess the intra-rater reliability. The differences between OPG and CBCT images regarding the severity of root resorption were evaluated using the Pearson Chi-square test. A P-value of <0.05 was considered to be statistically significant.

Results: A total number of 40 patients with unilateral impacted maxillary canines were evaluated. There were 17 males and 23 females, with a mean age of 26.6 years. Grades 0 and 1 showed statistically significant differences between OPG and CBCT readings. The OPG showed a lower occurrence of root resorption.

Conclusion: Proper investigation of impacted canines and root resorption is essential to obtain a comprehensive treatment plan. In the current study, OPG was found to be less precise than CBCT for identifying root resorption, particularly in the early stages of root resorption.

Key Words: Panoramic Radiographs, Three-dimensional Imaging, root resorption, CBCT

Citation of article: Alshawy ES. Cone-Beam Computed Tomography VS Panoramic Radiography: Evaluation of Root Resorption Associated with Impacted Maxillary Canines. Med Forum 2024;35(4):3-6. doi:10.60110/medforum.350401.

INTRODUCTION

External root resorption (ERR) is a frequent and detrimental complication associated with impacted teeth. These unerupted teeth can erupt in an abnormal direction, applying pressure and triggering the breakdown of the external root surface on adjacent teeth. Histologically, ERR manifests as the gradual loss of the root's outer layer, potentially progressing deeper to affect the dentin and ultimately the pulp, the innermost sensitive region of the tooth¹.

Department of Orthodontics and Pediatric Dentistry, College of Dentistry, Qassim University, Qassim, Saudi Arabia.

Correspondence: Ebrahim S Alshawy, Department of Orthodontics and Pediatric Dentistry, College of Dentistry, Qassim University, Qassim, Saudi Arabia.

Contact No: +966500142352

Email: e.alshawy@qu.edu.sa

Received: August, 2023

Accepted: December, 2023

Printed: April, 2024

The resorption reflects a permanent destruction of the tooth structure, resulting in a permanent loss of width and length of the root. Numerous and complicated factors are related to the occurrence of ERR². Risk factors of ERR can be categorized into internal and external.³ Internal causes include genetic predisposition, systemic diseases, age, gender, root morphology, impacted teeth, and parafunctional habits^{4,5}. Impacted teeth, such as maxillary canines, are generally associated with the ERR of the adjacent teeth. The roots of the lateral maxillary incisors are frequently affected by the impacted maxillary canines⁶. Orthodontic treatment can influence root resorption through several factors, including treatment duration, appliance type, force magnitude and directionality, tooth extraction decisions, and the application of root torque^{3,7}.

Diagnosis of the ERR starts with obtaining a comprehensive history of the patient, including the medical and dental history and incidence of previous trauma on the teeth⁸. Radiographically, some different types and techniques are used to diagnose the ERR. Periapical radiographs, orthopantomography (OPG),

and cone-beam computed tomography (CBCT) are frequently used to assess the presence and severity of the ERR^{9,10}.

The severity of the ERR is categorized into 5 grades¹². The first grade emphasizes no resorption of the root surface (Grade 0). The second grade shows an intact root surface with only resorption of the cementum (Grade 1). The third grade indicates up to half the resorption of the dentin (Grade 2). The fourth grade presents with moderate dentin resorption (<50%), but the pulp remains unexposed (Grade 3). The fifth grade characterized by severe root resorption with the involvement of the pulp (Grade 4). Teeth with more severe root resorption will have a poorer prognosis compared to teeth with mild resorption. In cases with impacted maxillary canines, orthodontic treatment planning can be altered and guided according to the extent of root resorption^{6,12}. In some severe cases, extraction of the affected tooth might be the better treatment option^{14,15}.

Current radiographic methods have limitations in accurately assessing external root resorption, often resulting in overestimation or underestimation of its severity. Consequently, a definitive diagnostic technique for ERR remains elusive. Until recently, the 2-dimensional radiograph techniques were the most commonly used methods in orthodontic planning and impacted canine localization¹⁶. The panoramic imaging is considered as the standard technique for pre-operative diagnosis in orthodontics¹⁶. The two-dimensional techniques, such as periapical radiographs and OPGs, are associated with magnification errors, image distortion, reliability issues, and superimposition. Furthermore, when using these techniques alone, it would be challenging to identify between buccal and palatal root resorption. On the other side, three-dimensional techniques, such as CBCTs, overcome these weaknesses and limitations and provide superior qualitative assessment¹⁷. However, CBCTs are associated with higher machine costs and radiation dosage.

This study investigates the effectiveness of OPG and CBCT in assessing the extent of root structure loss induced by impacted maxillary canines. The reliability and accuracy of the OPG and CBCT radiographs will be assessed.

METHODS

The current retrospective study was approved by the Committee of Research Ethics, Deanship of Scientific Research, Qassim University, Saudi Arabia (IRB Reference No: 11-04-21).

Data from 40 patients (>13 years old) with unilateral impacted maxillary canines were retrospectively obtained from the Dental clinics of Qassim University Hospital Qassim, Saudi Arabia. All included patients should have OPG and CBCT radiographs. Patients with

history of orthodontic treatment and trauma of teeth were excluded. Also, we excluded patients with bony disorders and systemic diseases that can influence the ERR, such as cleft palate. Soredex machine (CRANEX Novus, Helsinki, Finland) was used to take the Panoramic radiographs. Sirona GALILEOS Comfort PLUS machine was utilized to obtain the CBCT images.

The grading system of Ericson and Kurol was slightly modified and utilized for the evaluation of root resorption severity on OPG and CBCT radiographs¹². Grade 0 indicates no sign of root resorption. Grade 1 suggests loss of the cementum. Grade 2 emphasizes mild resorption of the dentin (<half of the root is resorbed). Grade 3 shows moderate root resorption of the dentin (>half of the dentin without pulp exposure). Grade 4 exhibits severe root resorption with pulp exposure.

To assess intra-rater reliability, a single examiner evaluated the OPG and CBCT radiographs for root resorption severity using a standardized grading system. The examiner then re-evaluated all radiographs after a 3-week interval. SPSS for Windows, version 20.0 (IBM Corp., Armonk, NY) was used to analyze the data. Cohen's kappa coefficient was calculated to quantify the intra-rater reliability between the two observations. The Pearson Chi-square test was employed to investigate potential discrepancies between OPG and CBCT radiographs in depicting the severity of root resorption. A *P*-value of <0.05 was considered to be statistically significant.

RESULTS

A total of 40 patients with unilateral impacted maxillary canines were evaluated. The sample involved 17 male and 23 female patients with a mean age of 26.6 (SD=±2.2) years. The readings and extent of root resorption from OPG and CBCT radiographs are shown in Table. Grades 0 and 1 showed statistically significant differences between OPG and CBCT readings. Figure shows an OPG image of one of the studied patients with severe root resorption.

The Cohen's kappa coefficient test suggested a high correlation (92.5%) between the two observations for OPG and CBCT radiographs.

Table No.1: Amount of root resorption from OPG and CBCT radiographs.

Grade	OPG - n (%)	CBCT - n (%)	P value
Grade 0	20 (50)	15 (37.5)	0.0178*
Grade 1	7 (17.5)	12 (30)	0.0213*
Grade 2	6 (15)	5 (12.5)	0.0735
Grade 3	5 (12.5)	6 (15)	0.0735
Grade 4	2 (5)	2 (5)	1
Total-n (%)	40 (100)	40 (100)	



Figure No.1: shows an impacted maxillary canine causing a severe root resorption on the distal side of the upper right lateral incisor.

DISCUSSION

This study investigated the effectiveness of OPGs and CBCTs in investigating the relationship between impacted maxillary canines and adjacent tooth root resorption. External root resorption, a potential consequence of impacted canines on adjacent teeth, can be assessed through various methods in clinical practice. However, there is no gold standard diagnostic technique to evaluate the ERR. Despite the ongoing search for a definitive diagnostic method, OPG and CBCT diagnostic modalities remain the most prevalent tools for assessing ERR due to their accessibility and established reliability. In the current sample, there were more females than males, which is consistent with other studies^{12,16}. Walker et al., suggested that the gender and genetic differences could be explanations for the condition occurrence being higher in females¹⁸. Another potential cause may be that males pursue orthodontic management less frequently than males¹⁸. The present study revealed a significant discrepancy between OPGs and CBCTs in detecting root resorption in impacted canine cases. While nearly half (50%) of the cases exhibited root resorption on OPG images, CBCT scans identified this issue in a considerably higher proportion (62.5%). This marked difference was most pronounced for cases in the earliest stages of root resorption, highlighting the limitations of OPGs in pinpointing early signs of resorption. The OPGs were less effective in identifying root resorption in the early stages. Alqerban et al., reported a significant difference between CBCT and OPG scans. OPG images significantly underestimate the root resorption, particularly in the early stages of the resorption¹².

Different published studies evaluating the reliability of the OPG and CBCT images showed agreement with the results of the current study. A clinical research carried out by Dudic et al., showed that 69% of the cases on CBCT images had root resorption and 44% with OPG images¹. According to another study, the CBCT technique can significantly detect a higher number of cases with root resorption than the OPG technique¹. The occurrence of root resorption was identified in 29.9% of the samples using CBCT and 15.2% using the

OPG. A recent prospective clinical study reported that CBCT images showed a significantly higher occurrence of root resorption (53.6%) than the OPG images (7.5%)¹³. On the other hand, a systematic review and meta-analysis carried out by Deng et al., reported that OPG images might overestimate the degree of root resorption³. The conflict of the results in the previous study can be referred to the type of radiograph machine used and the examiner's experience.

CBCT scans are not routinely indicated for all patients diagnosed with impacted maxillary canines. In accordance with the American Dental Association's (ADA) guidelines, the CBCT should be used only when it is expected to significantly improve diagnostic accuracy and, consequently, significantly improving clinical judgment⁸. The utilization of CBCT has been proposed as the primary diagnostic modality for accurately quantifying the extent of root resorption in cases classified as moderate or severe¹⁰. The benefits of the OPG radiographs are being readily available for an initial assessment of the teeth¹⁴. They are relatively cheaper and produce less radiation dose than CBCT images. However, they create lower-quality scans⁷. The use of CBCT scans requires a personalized approach, tailored to the specific needs of each patient, the potential benefits against the associated costs. CBCT offers a valuable advantage in diagnosing root resorption related to impacted maxillary canines. This precise information is crucial for formulating optimal treatment plans considering the health of adjacent teeth¹⁷.

The CBCT was recommended as the superior imaging modality for diagnosing root resorption in impacted canine cases compared to the OPG¹⁴. The overlap between the crown of the impacted canine and the root of the adjacent teeth might obscure the amount of the resorption¹⁵. The findings of the CBCTs can alter the treatment plan as they may provide a better view of the amount of the resorption¹². It has been reported that utilizing the CBCT increases the confidence level of the orthodontist¹². However, two clinical studies showed no significant differences in treatment decisions when utilizing CBCT and OPG as diagnostic modalities^{12,13}. The two techniques provide similar information the treatment planning.

CONCLUSION

Early detection of impacted canines and root resorption is crucial for developing an optimal treatment plan. While panoramic radiographs (OPGs) are readily available and can identify impacted canines, they may not provide sufficient detail for precise diagnosis, particularly regarding root resorption. In such cases, cone-beam computed tomography (CBCT) offers a more comprehensive view, potentially improving both diagnosis and treatment planning. This study confirms the limitations of OPGs in detecting root resorption

compared to CBCT. However, OPGs remain a valuable tool for initial assessment, especially when CBCT is unavailable.

Author's Contribution:

Concept & Design of Study: Ebrahim S Alshawy
 Drafting: Ebrahim S Alshawy
 Data Analysis: Ebrahim S Alshawy
 Revisiting Critically: Ebrahim S Alshawy
 Final Approval of version: Ebrahim S Alshawy

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No.21-04-11 dated 24.09.2021.

REFERENCES

- Dudic A, Giannopoulou C, Leuzinger M, Kiliaridis S. Detection of apical root resorption after orthodontic treatment by using panoramic radiography and cone-beam computed tomography of super-high resolution. *Am J Orthod Dentofacial Orthop* 2009;135:434–7.
- Sarica I, Derindag G, Kurtuldu E, Naralan M, Caglayan F. A retrospective study: Do all impacted teeth cause pathology? *Niger J Clin Pract* 2019;22:527–33.
- Deng Y, Sun Y, Xu T. Evaluation of root resorption after comprehensive orthodontic treatment using cone beam computed tomography (CBCT): a meta-analysis. *BMC Oral Health* 2018;18:116.
- Picanço GV, Freitas KMS de, Cançado RH, Valarelli FP, Picanço PRB, Feijão CP. Predisposing factors to severe external root resorption associated to orthodontic treatment. *Dental Press J Orthod* 2013;18:110–20.
- Hamada Y, Timothius CJC, Shin D, John V. Canine impaction – A review of the prevalence, etiology, diagnosis and treatment. *Semin Orthod* 2019;25:117–23.
- Alqerban A, Jacobs R, Fieuws S, Nackaerts O, Willems G. Comparison of 6 cone-beam computed tomography systems for image quality and detection of simulated canine impaction-induced external root resorption in maxillary lateral incisors. *Am J Orthod Dentofacial Orthop* 2011;140:e129–39.
- Apajalahti S, Peltola JS. Apical root resorption after orthodontic treatment—a retrospective study. *Eur J Orthod* 2007;29:408–12.
- American Dental Association Council on Scientific Affairs T. The use of cone-beam computed tomography in dentistry: An advisory statement from the American Dental Association Council on Scientific Affairs. *J Am Dent Assoc* 2012;143:899–902.
- Venkatesh E, Elluru SV. Cone beam computed tomography: basics and applications in dentistry. *J Istanbul Univ Fac Dent* 2017;51:S102.
- Heimisdottir K, Bosshardt D, Ruf S. Can the severity of root resorption be accurately judged by means of radiographs? A case report with histology. *Am J Orthod Dentofac Orthop* 2005;128:106–9.
- Ericson S, Kurol J. Incisor root resorptions due to ectopic maxillary canines imaged by computerized tomography: a comparative study in extracted teeth. *Angle Orthod* 2000;70:276–83.
- Alqerban A, Willems G, Bernaerts C, Vangastel J, Politis C, Jacobs R. Orthodontic treatment planning for impacted maxillary canines using conventional records versus 3D CBCT. *Eur J Orthod* 2014;36:698–707.
- Stoustrup P, Videbæk A, Wenzel A, Matzen LH. Will supplemental cone beam computed tomography change the treatment plan of impacted maxillary canines based on 2D radiography? A prospective clinical study. *Eur J Orthod* 2024;46.
- Alfaleh W, Al Thobiani S. Evaluation of impacted maxillary canine position using panoramic radiography and cone beam computed tomography. *Saudi Dent J* 2021;33:738.
- Ngo CTT, Fishman LS, Rossouw PE, Wang H, Said O. Correlation between panoramic radiography and cone-beam computed tomography in assessing maxillary impacted canines. *Angle Orthod* 2018;88:384.
- Walker L, Enciso R, Mah J. Three-dimensional localization of maxillary canines with cone-beam computed tomography. *Am J Orthod Dentofac Orthop* 2005;128:418–23.
- Liu D gao, Zhang W lin, Zhang Z yan, Wu Y tang, Ma X chen. Localization of impacted maxillary canines and observation of adjacent incisor resorption with cone-beam computed tomography. *Oral Surgery, Oral Med Oral Pathol Oral Radiol Endodontol* 2008;105:91–8.
- Walker L, Enciso R, Mah J. Three-dimensional localization of maxillary canines with cone-beam computed tomography. *Am J Orthod Dentofacial Orthop* 2005;128:418–23.

A Pattern of Drug Resistance of Salmonella in Patients having Suspected or Confirmed Typhoid Fever in District Bannu and Adjacent Areas

Raza Muhammad Khan, Nafidullah Khan and Tahir Ullah

ABSTRACT

Objective: To determine the drug resistance pattern of salmonella in patients with suspected or confirmed typhoid fever in District Bannu and adjacent areas.

Study Design: Descriptive case series study

Place and Duration of Study: This study was conducted at the DHQ Teaching Hospital (DHDTH) in Bannu, Khyber Pakhtunkhwa, from July 2022 and ending in December 2022.

Methods: The research included 55 individuals who were either diagnosed with typhoid fever or were suspected of having it (according to the case criteria) and brought to the Department of Medicine at DHQ Teaching Hospital (DHDTH) Bannu in Khyber Pakhtunkhwa. Their blood samples were collected for Blood Culture Sensitivity per standard protocols. They were sent to the laboratory (Shifa International Hospital Ltd Islamabad) to see the pattern of salmonella drug resistance.

Results: In Pakistan, typhoid fever is a common occurrence. Treatment of Salmonella typhimurium has become more difficult due to the rise of the disease's multidrug and extensively drug-resistant strains. This research aimed to identify medication resistance patterns among salmonella species in our area so that doctors can better treat typhoid in this day and age of widespread antibiotic resistance. In all, 55 individuals volunteered to have their blood samples taken and analyzed for C/S results. There were 50 positive results and 5 negative (no growth) for isolation. In these 50 cases, 9 samples revealed growths Other than salmonella (like pseudomonas aeruginosa, E.coli-MDR, group B strep, klebsiella pneum, and even MRSA in 2 samples), while Salmonella typhi were isolated in 41 blood samples.

Conclusion: Out of these 41, only 6 samples (14.63%) showed Non-resistant salmonella typhi (sensitive to 1st line drugs and 3rd generation cephalosporins, while intermediate sensitivity to 2nd line drugs), and 28 samples (68.29%) showed growth of Extended Spectrum Beta-Lactamase positive (ESBL) salmonella typhi (resistant to third generation cephalosporins), but early results also showed resistance to 1st line and 2nd line drugs, while 7 samples (17.07%) showed samonella typhi XDR (resistant to 1st line, 2nd line drugs and 3rd generation cephalosporins, BUT sensitive to Azithromycin/Carbapenems). Our results revealed that drug-resistant salmonella (ESBL/XDR) is a big and hidden health challenge in our set up that needs proper attention from healthcare professionals and the Government.

Key Words: Drugs Resistance, Salmonella, Typhoid Fever, District Bannu.

Citation of article: Khan RM, Khan N, Tahir Ullah. A Pattern of Drug Resistance of Salmonella in Patients having Suspected or Confirmed Typhoid Fever in District Bannu and Adjacent Areas. Med Forum 2024;35(4):7-11. doi:10.60110/medforum.350402.

INTRODUCTION

Typhoid and Paratyphoid fevers are collectively called 'Enteric Fever', caused by Salmonella species (Gram

Negative Rods). The specific strain of Salmonella that causes typhoid fever is serovar Typhi, while the specific strain of Salmonella that causes paratyphoid fever can be A, B, or C.S. Paratyphi causes a milder version of the fecal-oral transmitted systemic sickness that S. Typhi causes. There is no difference between the clinical symptoms caused by S. Typhi and Paratyphi. The symptoms and signs of typhoid fever can range from a simple sickness with low-grade fever to potentially lethal complications such as gastrointestinal haemorrhages, intestinal perforation, encephalitis, cerebral neuritis, severe sepsis, or septic shock, among others.

Department of Department of Medicine, DHQ Teaching Hospital, MTI, Bannu.

Correspondence: Dr. Raza Muhammad Khan, Department of Department of Medicine, DHQ Teaching Hospital, MTI, Bannu.

Contact No: 03339742570

Email: m_reyan33@yahoo.com

Received: March, 2023

Accepted: August, 2023

Printed: April, 2024

Case Definition of Typhoid:

Suspected case of Typhoid Fever	At least five days before presentation, the patient must have had a documented fever (38°C or above), stomach symptoms, and a rising trend in temperature. The patient must also have no other obvious causes for the fever, such as a urinary tract infection (UTI), pneumonia, an abscess, etc. OR This case fits the diagnostic criteria for typhoid fever and has been associated with another confirmed disease.
Confirmed case of Typhoid fever	Someone who has a high temperature (38 °C or above) for three days or more and who has S. Typhi isolated from blood or bone marrow cultures.

Typhoid fever is often diagnosed by isolating the organism by culture, most often using blood C/S. It is believed that cultures are completely unique. To make a conclusive diagnosis, a blood culture must be sent out before administering antibiotics. Before starting empirical treatment for typhoid, blood cultures should be obtained. Patients who are not feverish or who are already on antibiotics can still have their blood cultures taken. When the blood culture comes back negative, it takes approximately 7 days after the sample is submitted. On the other hand, if the blood culture comes back positive, it takes about 3 to 4 days to get a report that includes the identification of the organism and antibiotic sensitivity testing. If the fever has not subsided after seven to ten days of treatment, a second blood culture may be necessary as a negative culture does not rule out typhoid. There is also an increase in liver transaminase (ALT) levels to levels double the normal range. Typhoid fever cases do not include serological tests like Typhidot and Widal, and such tests are not advised to diagnose intestinal fever¹.

The following Drugs are commonly used for Typhoid Fever²:

1st Line Drugs: Chloramphenicol, Ampicillin, Trimethoprim-Sulfamethoxazole (co-trimoxazole =Septran).

2nd Line Drugs: Fluoroquinolones (Ciprofloxacin, Levofloxacin).

3rd Generation Cephalosporins: Cefixime (for uncomplicated typhoid fever) & Ceftriaxone (for complicated typhoid).

The duration of treatment is oral, 7-10 days if clinically stable, and 10-14 days, and I/V, if clinically unstable.

Based on Drug susceptibility patterns, the confirmed cases of typhoid fever are classified as:

1- Responsive to or not resistant to drugs two, extremely drug-resistant (XDR), and three, multi-drug-resistant (MDR), or 4- Typhoidal fever caused by the Extended Spectrum Beta-Lactamase gene.

Virus-Infected Typhoid	Throat infections caused by Salmonella typhimurium (S. Typhi) or Salmonella paratyphi type A, B, or C that are susceptible to penicillin and other first- and third-generation cephalosporins, with or lacking resistance to these antibiotics.
Multi-Drug Resistant Typhoid Fever	The most common types of typhoid fever are those caused by Salmonella typhimurium (S. Typhi) and Salmonella paratyphi (S. Paratyphi A, B, or C), which can be resistant to several first-line medicines but are susceptible to third-generation cephalosporins..
Highly Resistant Typhoid Fever	The pathogens responsible for typhoid disease, Salmonella typhimurium, have developed resistance to the first three generations of antibiotics. Highly susceptible to azithromycin and carbapenems
ESBL positive Typhoid Fever	The bacteria that cause typhoid, Salmonella typhimurium, are resistant to third-generation cephalosporins but can be susceptible to first-line antibiotics like chloramphenicol or cotrimoxazole, or second-line antibiotics like fluoroquinolones.

*Carbapenems: Imipenem, Meropenem, Ertapenem.

Countries with poor socioeconomic status, such as India, Bangladesh, and Pakistan, continue to suffer from typhoid as a dominant health concern³. With an estimated 493.5 cases per 100,000 in 2018, Pakistan has the highest typhoid rate among South Asian countries⁴. In 2016, a new extended drug resistance (XDR) typhi outbreak started in Hyderabad Sindh, which led to a dramatic increase in cases in Pakistan⁴. Due to the ineffectiveness of the previously used medicines, such as fluoroquinolones and third-generation cephalosporins, a newer and stronger antibiotic class called carbapenems, tigecycline, and azithromycin, was required to treat this new strain^{5,6}. For China, the reported adult proportion of enteric fever was 3.8 and the number of typhoid cases per 100,000 people, as determined by blood culture, was 29.20; for India, it was 66.0; and for Pakistan, it was 52⁷. Worldwide, over 111,000 people die each year from typhoid fever, with an estimated 9 million cases in 2019, according to the World Health Organisation. People without access to clean water and proper sanitation are more likely to contract typhoid, and children are particularly vulnerable. The summer and monsoon seasons see a spike in its occurrence.

Various factors have impacted this spread of Typhoid in Pakistan like the presence of XDR strains of Typhoid, COVID-19 outbreaks and simultaneous antibiotic

therapy (Azithromycin), socioeconomic disparities, and illiteracy⁸.

Pakistan is experiencing an increase in cases of XDR-Typhoid fever. Since the first case of XDR-TF was reported in Sindh in late 2016, a significant number of cases of Typhoid Fever (TF) confirmed by blood cultures are resistant to normal treatment⁹. Karachi recorded 14,360 XDR-TF cases between January 2017 and June 2021, per the Weekly Field Epidemiological Report published by the National Institute of Health (NIH) Islamabad. Five thousand seven hundred forty-one instances of XDR-TF were documented across Sindh province (excluding Karachi) between 2016 and 2021, with District Hyderabad accounting for 69.5% of those cases¹⁰. When Pakistan included the typhoid conjugate vaccine (TCV), which is recommended by the World Health Organisation (WHO), in its routine immunisation programme in 2019, it was the first country to do so⁹. The use of azithromycin and Meropenem should be limited to XDR cases of typhoid and prescribed by Registered Medical Practitioners (RMPs) only, according to the Advisory for prevention and treatment of typhoid, including XDR, by the Field Epidemiology & Disease Surveillance Division (FEDSD), NIH, Islamabad. Other drug options should be utilised for other infections. Additionally, typhoid can be prevented through increasing community knowledge and vaccination, specifically the Typhoid Conjugate Vaccine Typhibar, which provides extended immunity¹¹.

Keeping in mind the above facts and figures regarding Typhoid and its drug resistance, the following study was conducted on a small population, to determine the pattern of drugs resistance of salmonella in patients having suspected or confirmed typhoid fever in our local set up in District Bannu and adjacent areas.

METHODS

Bannu, Khyber Pakhtunkhwa, Department of Medicine, DHQ Teaching Hospital (DHDTH), for six months, from July 2022 to December 2022.

Sample Size: 55 patients who either suspected or confirmed typhoid fever (as per the case definition of typhoid).

Sampling Technique: Consecutive, Non-probability Sampling.

Inclusion Criteria:

1. Any patient who presents with acute febrile illness with temp $>38^{\circ}\text{C}$ of more than 3 days of duration, without any focus of infection, fulfilling the case definition of suspected/confirmed Typhoid fever
2. Patients with Negative MP (on thick and thin smear), Dengue serology and acute viral Hepatitis.
3. Patients with normal Chest X-ray, and Urine R/E, normal leukocyte count/leukopenia.
4. Patients of both genders and any race.
5. Age between 15 to 70 years.

Exclusion Criteria: To avoid recall bias, the study did not include patients who did not meet the inclusion criteria, were terminally sick, were unwilling to participate, were taking antibiotics that would alter culture results, or were intellectually retarded. They would bring bias into the study outcomes if they were included as confounders..

Data Collecting Procedure: Obtaining approval from the hospital's ethics and research committee or board allowed the study to proceed. The study enrolled all patients who met the inclusion criteria according to operational definitions and presented to the Department of Medicine, DHQ Teaching Hospital Bannu through the emergency room or the outpatient department. The initial step in counselling all patients was to go over the goals of the study and the specific blood test that would be administered. Clear answers were provided to all questions pertaining to the study. All patients were given a thorough explanation of the study's goals and methods, and those who were interested in participating were asked to sign an informed consent form. Participants were instructed on the correct way to draw blood samples for C/S testing. I assure you that all information gathered from participants will be treated with the utmost confidentiality and will be utilised exclusively for research purposes. Using conventional techniques, two sets of blood samples were taken from each patient in the study population. These samples were then transferred to the Laboratory at Shifa International Hospital Ltd in Islamabad to examine the pattern of treatment resistance among salmonella species. Using a flowchart as a data collecting tool, we recorded all of the relevant information, including age, gender, whether the growth was isolated on culture, and the sensitivity (S) and resistance (R) to ten antibiotics tested against salmonella. The first three medications are from the first line: chloramphenicol, ampicillin, and co-trimoxazole. The second line contains ciprofloxacin. The third line has two cephalosporins, cefixime and ceftriaxone, azithromycin, and three carbapenems. Every single patient was placed into one of many groups. This pre-made Proforma took down all detail, including names, ages, genders, addresses, and lab results. The analysis was limited to a full Proforma. Rigorous exclusion criteria were used to prevent bias and confounding variables in the study.

Statistical Analysis: Data obtained was entered into SPSS version 23 and analyzed in analytical statistics. Mean + SD were calculated for numerical variables like Age. Frequencies and Percentages (%) were calculated for categorical variables such as Gender, Culture positivity, Type of microorganism isolated, and Pattern of resistance noted. These were stratified among age and gender to see the effect modifiers. All results were presented in the form of tables.

RESULTS

This study was conducted at the Department of Medicine, DHQ Teaching Hospital, Bannu, Pakistan. In this study, 55 patients were enrolled with suspected or confirmed typhoid fever, to determine the pattern of drugs resistance of salmonella in our set up.

Table 1 represents patients distribution according to age and gender in study population (n=55).

Table No. 1: Patients Distribution: Age and Gender wise (n=55)

		Gender		Total
		Male	Female	
Age	<20years	5	10	15
	20-40years	14	13	27
	>40years	6	7	13
Total		25	30	55

Table 2 represents cross-tabulation of culture result (Positive or Negative) and microorganism isolated (salmonella/other than salmonella).

Table No. 2: Culture-Microorganism Cross tabulation (n=55)

		Microorganism		Total
		Samonella	Other than Salmonella	
Culture	Positive Result	41	9	50
	Negative Result	0	0	5
Total		41	9	55

Table 3 represents cross-tabulation of culture result and resistance pattern of samonella typhi(NR/ESBL/XDR).

Table No. 3: Culture-Resistance Cross tabulation (n=41/55)

		Resistance			Total
		Non Resistant NR	ESBL	XDR	
Culture	Positive result	6	28	7	41
Total		6	28	7	41

Table No. 4: Resistance in study population (n=41/55)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Non Resistant (NR)	6	14.63	14.63	14.63
	ESBL	28	68.29	68.29	82.92
	XDR	7	17.07	17.07	100.0
	Total	41	100.0	100.0	

Table: 4 represents % ages of various resistance patterns of salmonella (NR/ESBL/XDR) in study population.

DISCUSSION

Typhoid is still most common and endemic in low socioeconomic countries like Pakistan³. There are Rising XDR-Typhoid Fever Cases in Pakistan, which has further worsen the situation⁴. Preventive measures, vaccinations, early diagnosis and prompt treatment with appropriate Antibiotic by health care providers is necessary to decrease disease burden and prevent its complications.

In this study, we have determined the pattern of drug resistance of salmonella typhi in 55 suspected or confirmed cases. Age of the patients was 15 to 70 years, with mean 31.18, and Std of 15.655. Twenty five patients (45.45%) were males and 30 (54.55%) were female, predominantly involving middle age group (20-40years), followed by young age group (<20years). Over all, Culture positivity was observed in 50 cases out of total 55 (90.9%), and salmonella isolation was obtained in 41 out of these 50 cases (74.54%). Out of 55, 50 C/S results were positive, but only 41 showed samonella isolates (Tables 2, 3). In these 41 cases, only 6 (14.63%) were non-resistant samonella, while the remaining 35 (85.36%) were resistant samonella, either ESBL (28 = 68.29%) or XDR (7= 17.07%) (Table 4). So overall resistance is 85.36%, which is very significantly high. This alarming increase in XDR typhoid cases is also in accordance with the recent study conducted in Sindh⁶.

According to the results of our study, it has been established that, there is a high burden of salmonella in our set up, just like other parts of the country, and most of the cases are resistant to routinely used antibiotics.

The reasons for this high resistance is irrationale use of antibiotics, its under dose, for shorter duration, unawareness of the presence of resistance, and low education with low socioeconomic status that hinders in seeking expert opinion and proper health care.

Our current study findings revealed that typhoid is endemic here and mostly resistant in our setup.

CONCLUSION

In the light of above findings, it is concluded that typhoid is still endemic here. Most of the cases are culture proven resistant samonella typhi cases, to 1st line drugs, 2nd line drugs and 3rd generation cephalosporins. At the same time, sensitive only to Azithromycin/Carbapenems, in our set up also, which is very alarming, warranting the proper attention both from health care professionals and government. However, more detailed research is required to determine the disease's overall burden and its resistance pattern.

Recommendations: In the view of the above study, we recommend:

All the health care providers and physicians should have a high index of suspicion for drug resistant salmonella.

Do a rationale use of antibiotics in general and azithromycin/carbapenems specifically to preserve these drugs and decrease the chances of resistance against them. In suspected cases, they need to take blood cultures before prescribing antibiotics. Then, they can start empirical treatment with oral cefixime or IV ceftriaxone, depending on the severity of the disease. Based on the C/S results, they can modify treatment to switch from a broad spectrum to a narrow spectrum drug. The hidden burden of drug-resistant Salmonella must be recognized to reduce the disease's progression, consequences, and burden through early identification and appropriate treatment. There has to be an increase in immunisation programmes, telehealth, and awareness campaigns.

Author's Contribution:

Concept & Design of Study: Raza Muhammad Khan
Drafting: Nafidullah Khan,

Tahir Ullah

Data Analysis: Tahir Ullah

Revisiting Critically: Raza Muhammad Khan,
Nafidullah Khan

Final Approval of version: Raza Muhammad Khan

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No.1907A/Notification/DHQ/BNN dated 01.07.2022

REFERENCES

1. Medical Microbiology & Infectious Diseases Society of Pakistan (MMIDSS). Typhoid Management Guidelines – 2022. Karachi: Sami Pharma Pakistan; June 2022.p.1-14. Available from: <https://www.mmids.org/wp-content/uploads/2023/03/Typhoid-Management-Guideline-2022-Jun-22.pdf>
2. World Health Organization. Background document: The diagnosis, treatment and prevention of typhoid fever. Geneva: World Health Organization; May 2003.p.19-23. Available from: [https://www.glowm.com/pdf/WHO-](https://www.glowm.com/pdf/WHO-diagnosis%20treatment%20prevention%20of%20typhoid%20fever-2003-CustomLicense.pdf)
3. Centers for Disease Control and Prevention (CDC). Typhoid fever and Paratyphoid Fever. 2022. [accessed on 2022 May 19]. Available from: <https://www.cdc.gov/typhoid-fever/index.html>.
4. Fatima M, Kumar S, Hussain M, et al. Morbidity and mortality associated with typhoid fever among hospitalized patients in Hyderabad District, Pakistan, 2017–2018: retrospective record review. JMIR Public Health Surveill 2021;7(5):e27268.
5. World Health organization (WHO). Typhoid. [Accessed 19, 2022]. Available from: <https://www.who.int/news-room/fact-sheets/detail/typhoid..>
6. Butt MH, Saleem A, Javed SO, et al. Rising XDR-typhoid fever cases in Pakistan: are we heading back to the pre-antibiotic era? Front Public Health 2022; 9:2049.
7. Chen X, Stanton B, Pach A, Nyamete A, Ochial RL, Kaljee L, et al. Adults' perceived prevalence of enteric fever predicts laboratory-validated incidence of typhoid fever in children. J Health Popul Nutr 2007;25(4): 469-78.
8. Tharwani ZH, Kumar P, Salman Y, Islam Z, Ahmad S, Essar MY. Typhoid in Pakistan: Challenges, Efforts, and Recommendations. Infect Drug Resist 2022;15: 2523-2527.
9. Akram J, Khan AS, Khan HA, Gilani SA, Akram SJ, Ahmad FJ, et al. Extensively Drug-Resistant (XDR) Typhoid: Evolution, Prevention, and Its Management. Biomed Res Int 2020;(2020): 1–7. doi: 10.1155/2020/6432580
10. National Institute of Health (NIH). Weekly Field Epidemiology Report. National Institute of Health (NIH), Islamabad 2021;25(3):1-8. Available from: <https://www.nih.org.pk/wp-content/uploads/2021/06/25-FELTP-Pakistan-Weekly-Epidemiological-Report-June-13-19-2021-.pdf>
11. National Institute of Health. Advisory for Prevention and Treatment of Typhoid Fever including XDR-Typhoid. National Institute of Health, Islamabad. Field Epidemiology & Disease Surveillance Division (FEDSD). July 2020.p.1-2. Available from: <https://www.nih.org.pk/wp-content/uploads/2020/07/Advisory-for-Prevention-and-Treatment-of-Typhoid-Fever-including-XDR-Typhoid.pdf>

Prevalence of Asymptomatic Pulmonary Tuberculosis in Diabetics Patients in District Bannu and Adjacent Areas

Tahirullah, Raza Muhammad Khan and Nafidullah Khan

ABSTRACT

Objective: This study aimed to determine the Prevalence of Asymptomatic Pulmonary Tuberculosis in Diabetic patients in District Bannu and adjacent areas.

Study Design: Descriptive, case series study.

Place and Duration of Study: This study was conducted at the DHQ Teaching Hospital (DHDTH) in Bannu, Khyber Pakhtunkhwa from January 2022 to July 2022.

Methods: Data were collected from 100 patients who had Diabetes (either Type 1 or 2) for 5 or more years, presented to medical OPD or admitted in Medical Ward, with no respiratory symptoms, but having only mild undiagnosed fever for more than 2 weeks.

Results: Out of 100 patients, 41 were males (41%) and 59 (59%) were females. All of these were having Diabetes (19 having Type 1 and 81 Type 2) for 5 or more years. They had mild fever for more than 2 weeks, which was not yet diagnosed. None of them were having respiratory symptoms like cough, sputum, pleuritic chest pain, hemoptysis or noisy chest. Out of these, all 100 patients (100%) were having uncontrolled Diabetes (RBS>200mg/dl, FBS>126mg/dl, HbA1C% >7.5%) and mild Fever (>100.0F) for >2weeks.

They all were advised chest x-ray for screening of pulmonary tuberculosis, 23 came out to have pulmonary tuberculosis, based on radiological diagnosis. Later on, the same were confirmed either bacteriologically or through HRCT (High Resolution CT thorax).

Conclusion: In our set up, Tuberculosis (both pulmonary and extra/pulmonary) is chronic and endemic, having a diverse clinical presentations. In diabetic patients, it is even more common, and asymptomatic with no respiratory symptoms having only mild undiagnosed fever for more than 2 weeks, and remains undiagnosed on routine examination. Thus, all diabetic patients must have a screening chest X-ray, when they have prolong fever for >2weeks, even though they do not have any respiratory symptoms. For early diagnosis and treatment to reduce the illness burden, infectivity, transmission, and consequences, a physician must maintain high suspicion and alertness.

Key Words: Asymptomatic Pulmonary tuberculosis, Diabetes Mellites, District Bannu.

Citation of article: Tahirullah, Khan RM, Khan N. Prevalence of Asymptomatic Pulmonary Tuberculosis in Diabetics Patients in District Bannu and Adjacent Areas. Med Forum 2024;35(4):12-16. doi:10.60110/medforum.350403.

INTRODUCTION

One infectious disease that can be spread from person to person is tuberculosis (TB), which is caused by the bacterium *Mycobacterium Tuberculosis* (MTB). Tuberculosis transmission typically occurs when an infected person coughs, sneezes, spittles, or speaks to others in close proximity for an extended period.

Department of Department of Medicine, DHQ Teaching Hospital, MTI, Bannu.

Correspondence: Dr. Raza Muhammad Khan, Department of Department of Medicine, DHQ Teaching Hospital, MTI, Bannu.

Contact No: 03339742570

Email: m_reyan33@yahoo.com

Received: October, 2022

Accepted: April, 2023

Printed: April, 2024

On a global scale, tuberculosis is one of the top ten leading causes of death, and it poses a significant public health concern, especially in poorer nations. It is the second most lethal infectious disease after HIV/AIDS^{1,2}. Over 60% of the world's tuberculosis cases occur in developing nations, where resources like diagnostic testing and treatment are scarce owing to economic hardship. These nations include China, Nigeria, Indonesia, Pakistan, the Philippines, and Pakistan. three, four. Tuberculosis poses a significant threat to public health in Pakistan. Nearly 70,000 individuals lose their lives each year as a result of tuberculosis (TB)⁵. Half a million new cases are recorded annually. Pakistan is ranked fifth globally for tuberculosis (TB) cases, mainly because of the high prevalence of multi-drug-resistant tuberculosis (MDR-TB)^{3,6,7}. On an annual basis, about 55,000 new cases of tuberculosis (TB) are reported in Pakistan's Khyber Pakhtunkhwa province⁵. The province of Khyber Pakhtunkhwa had around 462,920 tuberculosis cases between 2002 and 2017.

TB is also more common and endemic in District Bannu. According to one study, "Prevalence of pulmonary tuberculosis in the District Bannu, Khyber Pakhtunkhwa, Pakistan"⁸, the number of positive cases of the disease were 17.85% of patients enrolled for diagnosis, 57.14% were females, and 42.86% were males, slightly more in females. This increase prevalence here is because of many factors like poverty, illiteracy, unawareness, joint family system, overcrowding, poor sanitation, and unhealthy dietary habits. Different TB Control Programs like The Revised National Tuberculosis Control Programme (RNTCP) and Porvincial TB Control Program (PTBCP) KPK exist.

One of the leading causes of death among people worldwide is diabetes mellitus (DM). There are two forms: Type 1, which manifests in early life or childhood, and Type 2, which manifests in adulthood or later in life⁹. Both the patient and the nation's economy bear the emotional and financial costs of this disease, which is becoming more common and associated with complications and mortality. Type 2 diabetes mellitus affects 90% of the 463 million persons diagnosed with diabetes globally¹⁰. After China and India, Pakistan has the third-highest diabetes prevalence rate globally¹¹. In 2016, 11.77% of Pakistanis had diabetes, in 2018 it was 16.98%, and in 2019 it was 17.1%. In 2022, there would be over 33,000,000 cases of diabetes in Pakistan, which is 26.7% of the adult population, according to the International Diabetes Federation. This figure is extremely high and is getting worse every year. Pakistan is more susceptible to diabetes-related mortality due to illnesses like tuberculosis because of its higher incidence. The average male prevalence of type 2 DM in Khyber Pakhtunkhwa (KPK) is 9.2% and the female prevalence is 11.60%. Both diabetes and tuberculosis take a high toll on Pakistan. In our community and among at-risk populations, such as diabetes patients, tuberculosis is more prevalent, often causes no symptoms, and can spread both within and outside the body. One of the main causes of death and disability is tuberculosis. It is a top priority because it is a communicable disease that millions of people are at risk from. In our setting, there is a lack of local data on diabetic individuals with radiologically diagnosed asymptomatic pulmonary tuberculosis. In the future, this randomised trial can be expanded to a bigger scale. Even asymptomatic tuberculosis can develop in diabetic persons residing in highly endemic areas of the disease. Treatable tuberculosis is also avoidable. Many instances go unrecognised because of the difficulties in preventing and treating the disease in these endemic regions, which are caused by factors such as poverty, terrorism, military activities, and other social and economic instability. Accordingly, early tuberculosis detection and treatment in our setup and the surrounding FATA areas are inadequate in Khyber

Pakhtunkhwa. Accordingly, the purpose of this research was to document cases of asymptomatic pulmonary tuberculosis among our community's diabetes individuals.

METHODS

Department of Medicine, DHQ Teaching Hospital Bannu KPK, from Jan 2022 to Jul 2022.

Sample Size: 100 patients, all having Diabetes (either type 1 or type 2 DM) for 5 or more years ,having no respiratory symptoms, having only mild undiagnosed fever for more than 2 weeks.

Sampling Technique: Consecutive, Non-probability Sampling.

Inclusion Criteria: All those Diabetic patients (both type 1 and type 2), having diabetes for 5 or more years, having no respiratory symptoms, complaining of mild undiagnosed fever, of more than 2 weeks, have no previous chest x-ray, of Either gender, aged above 14 and under 60 years.

Exclusion Criteria: This study did not include patients who did not meet the inclusion criteria, had a positive family history of tuberculosis (TB) or tuberculosis (TB) contact, had received treatment for pulmonary tuberculosis (TB), were terminally ill, refused to participate, or were mentally retarded. This was due to the fact that these patients had either received treatment previously, would not benefit from the planned treatment in the future, or would introduce recall bias into the study. They would bring bias into the study outcomes if they were included as confounders.

Data Collecting Procedure: Obtaining approval from the hospital's ethics and research committee or board allowed the study to proceed. We included in the study all patients who met the inclusion criteria according to the operational definitions and who came to the emergency room or outpatient department of DHQ Teaching Hospital Bannu to see a doctor. Before interviewing any patient, they were all counselled. All patients were given a thorough explanation of the study's goals and methods, and those who were interested in participating were asked to sign an informed consent form. All patients had a comprehensive medical history that included information about their diabetes, its length, and any patterns in their fevers and chest pains. After that, the study population's temperature and chest were taken. The hospital lab tested these patients for glycemic control and diabetes using random blood sugar and haemoglobin A1C% levels, and they also had a screening chest X-ray to rule out undiagnosed asymptomatic pulmonary tuberculosis. The results were recorded on a flow sheet that contained all the relevant data.

Radiologically diagnosed pulmonary tuberculosis (TB) was used to classify all patients into two groups: those with TB and those without. Typical x-ray findings of

TB in the lungs include apical involvement with penetration, cavitary lesion, bilateral Hillar lymphadenopathy, bilaterally pulmonary infiltrates/cross sign, and apical bronchiectasis. Using the pre-designed Proforma, we recorded every piece of information, including names, ages, genders, addresses, disease patterns, symptoms, signs, and test values. The analysis was limited to a full Proforma. Rigorous exclusion criteria were implemented to ensure that the study's results were free of bias and confounding variables.

Statistical Analysis: The collected data was processed using descriptive statistics in SPSS version 23. The mean plus standard deviation were computed for numerical/quantitative data such as age. Qualitative variables, including gender, disease type (1 or 2 DM), and x-ray presentations, were quantified using frequencies and percentages (%). To identify the factors that moderated the effects, they were stratified by gender and age. Tables were utilised for the presentation of all results.

RESULTS

Entire study participants were 100 individuals with a history of diabetes mellitus (type 1 or type 2) spanning over 5 years. There were 59 female patients and 41 male patients out of 100 total, for a male to female ratio of 1.0 to 1.44 (see Table 1). The participants' ages varied from fifteen to sixty-five, with a mean of forty-one years and seven months (± 11.707 years) (TABLE :2). Out of a total of 79 patients, 33 were male and 46 were female, and all were suffering from type 2 diabetes mellitus (a total of 21 individuals, 8 men and 13 females represented this 21%).

All were having undiagnosed low grade fever for more than 2 weeks, but non were having typical respiratory symptoms of pulmonary TB.

When they were screened for asymptomatic pulmonary TB through chest X-Ray, then total 23 diabetic patients (23%) (8 in type 1 DM, 3 males and 5 females, while 15 in type 2 DM, 7 males, 8 females) came out to have a chest X-ray suggestive of pulmonary TB (TABLE 3). They were labeled as radiologically diagnosed asymptomatic pulmonary TB. Over all, it is slightly more in females and in type 1 DM. Later on, they were confirmed either bacteriologically or through HRCT. Summarized Descriptive statistics of the study population are shown in tables and charts.

Table No.1: Age and Gender Distribution of the study population (n=100)

		Gender		Total
		Male	Female	
Age	<25years	7	10	17
	25-45 years	19	32	51
	>45 years	15	17	32
Total		41	59	100

Table No. 2: Pulmonary Tuberculosis distribution in Diabetic patients, Type wise and Gender wise (n=100)

			Radiol- ogical Pul TB	No Radiol- ogical Pul TB	
Male	Diabetes	Type 1 DM	3	5	8
		Type 2 DM	7	26	33
Total			10	31	41
Female	Diabetes	Type 1 DM	5	8	13
		Type 2 DM	8	38	46
Total			13	45	59
Total	Diabetes	Type 1 DM	8	13	21
		Type 2 DM	15	64	79
Total			23	77	100

DISCUSSION

A total of 100 patients with diagnosed diabetes mellitus (both type 1 and 2) for more than 5 years were included in the study. Out of these 100 patients, 41 patients were males (41%) and 59 (59%) were females, with M/F ratio of 1.0 : 1.44. Their age ranged between 15 and 60 years, and the mean age was $40.19.78 \pm 11.707$ years (TABLE 1).

All of these were having either type 1 DM (21%) (total 21 patients, 8 males and 13 females), or type 2 DM (79%) (total 79 patients, 33 males and 46 females).

All were having undiagnosed low grade fever for more than 2 weeks, but non were having typical chest/respiratory symptoms of pulmonary TB.

When they were screened for asymptomatic pulmonary TB through chest X-Ray, then total 23 diabetic patients (23%) (8 in type 1 DM, 3 males and 5 females, while 15 in type 2 DM, 7 males, 8 females) came out to have a chest X-ray suggestive of pulmonary TB (TABLE 2). They were labeled as radiologically diagnosed asymptomatic pulmonary TB. Over all, it is slightly more in females and in type 1 DM. Later on, they were confirmed either bacteriologically or through HRCT.

It showed that TB, both pulmonary & extrapulmonary, symptomatic & asymptomatic seems more common, chronic and endemic here, in general population and even more common in population at high risk like diabetics, where it is also asymptomatic. So it remains undiagnosed on routine examination or investigation. So they are left untreated, remains infective, and sometimes develop complications. Over all, it is slightly more in females and in type 1 DM.

The possible reasons of this high prevalence here is because of many factors like poverty, illiteracy, unawareness, lack of education on part of diabetic patients, joint family system, overcrowding, poor sanitation, and unhealthy dietary habits, low quality smear examination & detection rate, partial & incomplete treatment, and low level of suspicion on part of a treating physician. All of these patients received positive responses once they were registered with tuberculosis DOTs program, and started on weight-based ATT. Initially conducted on a smaller scale, this randomized study lays the ground work for future larger-scale applications in this field. While simple investigations like chest X-rays or sputum AFBs can easily diagnose pulmonary tuberculosis in diabetic patients, the disease remains endemic and undiagnosed, despite the fact that prompt treatment can reduce disease burden and prevent infection, transmission, and complications.¹⁴

CONCLUSION

A large body of research has linked diabetes mellitus (DM) to worse treatment outcomes and an increased risk of tuberculosis (TB). In this study, we found that tuberculosis (TB) is very common in people with diabetes mellitus (DM). The majority of these cases were identified through screening chest X-rays, and we also found that asymptomatic TB is more common in people with DM. TB appears to be endemic and chronic in our setting. This occurred because neither the patient nor the treating physician noticed any chest symptoms, and the doctor had a low threshold for suspicion. To improve drug compliance, prevent drug resistance, and decrease disease burden, all health care providers should counsel and educate diabetic patients regarding preventive measures against pulmonary tuberculosis (TB). If infected, these patients should be screened using chest X-rays and treated promptly with standard anti-TB drugs with proper doses through diabetes outpatient treatment programmes (DOTs). The early detection and effective treatment of tuberculosis (TB) in diabetic patients depends on doctors being vigilant in their search for asymptomatic cases.

Recommendations: The above study supports our recommendation that all doctors and healthcare personnel be cognizant of the fact that tuberculosis (TB) is a hidden burden, particularly in diabetic patients who do not exhibit any outward signs of the disease (i.e., chest pain). In diabetic individuals who are at high risk of contracting tuberculosis, active case-finding should be conducted. An annual chest radiography check should be performed on these people as part of a TB symptom screening-based case-finding approach. This will allow for early diagnosis and prompt treatment, hence reducing the disease burden and attendant misery. Prevention techniques and, when

necessary, prophylactic anti-TB medicine should be communicated to high-risk individuals.

Author's Contribution:

Concept & Design of Study:	Tahir Ullah
Drafting:	Raza Muhammad Khan, Nafed Ullah Khan
Data Analysis:	Nafed Ullah Khan
Revisiting Critically:	Tahir Ullah, Raza Muhammad Khan
Final Approval of version:	Tahir Ullah, Raza Muhammad Khan

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No.8A/Notification/DHQ/BNB dated 05.01.2022

REFERENCES

1. World Health Organization (WHO). Global Tuberculosis Report 2019. Introduction at page 20. [accessed on 2020 Jan 13]. Available from: https://www.who.int/tb/publications/global_report/en/
2. World Health Organization (WHO). Tuberculosis: Key Facts. [accessed on 2020 Jan 13]. Available from: <https://www.who.int/news-room/fact-sheets/detail/tuberculosis>
3. World Health Organization. News-Room. 2018. [accessed on 2019 Oct 5]. Available from: <https://www.who.int/en/news-room/fact-sheets/detail/tuberculosis>
4. World Health Organization (WHO). Global Tuberculosis Report. Report of Country, Regional and Global Profile. 2018. [accessed on 2019 Oct 11]. Available from: <https://www.who.int/tb/country/data/profiles/en/>
5. NTP National TB Control Program-Pakistan. Common Management Unit AIDS, TB & Malaria [accessed on 2019 Sep 1]. Available from: http://ntp.gov.pk/national_data.php
6. Pakistan Bureau of Statistics Pakistan's 6th Census: Population of Major Cities Census. 2019. [accessed on 2019 Sep 7]. Available from: <http://www.pbscensus.gov.pk/>
7. World Health Organization (WHO). Country Cooperation Strategy at a Glance: Pakistan. World Health Organization 2018.p.1-2. Available from: https://apps.who.int/iris/bitstream/10665/136607/1/ccsbrief_pak_en.pdf
8. Khan MA. Prevalence of pulmonary tuberculosis in the District Bannu Khyber Pakhtunkhwa Pakistan. Egypt J Chest Dis and Tuberculosis 2021; 70(3):318.
9. Kerner W, Brückel J. Definition, classification and diagnosis of diabetes mellitus. Exp Clin Endocrinol

- Diabetes Off J. Ger Soc Endocrinol Ger Diabetes Assoc 2014;122(7):384–386.
10. International Diabetes Federation (IDF). IDF diabetes Atlas. 9th ed. 2019. Corporate Sponsors novo nordisk, Pfizer, Alliance, MSD, Sanofi, Brussels (Belgium) [cited 2022 Apr 5]. Available from: <https://diabetesatlas.org/atlas/ninth-edition/>.
 11. Bhatti MW. Pakistan ranks 3rd in prevalence of diabetes in world after China and India. The News International 2021 October 10; sec 1. [cited 2022 Apr 5]. Available from: <https://www.thenews.com.pk/print/899124-pakistan-ranks-3rd-in-prevalence-of-diabetes-in-world-after-china-and-india/>
 12. Meo SA, Zia I, Bukhari IA, Arain SA. Type 2 diabetes mellitus in Pakistan: current prevalence and future forecast. J Pak Med Assoc 2016; 66(12):1637–1642.
 13. Aamir AH, Ul-Haq Z, Mahar SA, Qureshi FM, Ahmad I, Jawa A, et al. Diabetes Prevalence Survey of Pakistan (DPS-PAK): prevalence of type 2 diabetes mellitus and pre-diabetes using HbA1c: a population-based survey from Pakistan. BMJ Open 2019;9(2).
 14. Jeon CY, Murray MB Diabetes mellitus increases the risk of active tuberculosis: a systematic review of 13 observational studies. PLoS Med 2008; 5(7):e152.

Frequency of Rotavirus as a Cause of Acute Diarrhea

Rotavirus as a Cause of Acute Diarrhea

Zia Muhammad, Abdul Khaliq, Tabinda Shadab, Syed Mohsin Ali Shah, Sabir Khan and Zulqarnain Haider

ABSTRACT

Objective: To find out how frequently infants between the ages of one month and twenty-four months who have severe diarrhea are affected by the Rota virus.

Study Design: A Descriptive Cross-Sectional Study.

Place and Duration of Study: This study was conducted at the Department of Pediatrics Units, Khyber Teaching Hospital in Peshawar between January 2021 and January 2022.

Methods: The investigation was conducted at the pediatric departments of the Khyber Teaching Hospital in Peshawar. The study employed a descriptive cross-sectional study design and ran for six months. The sample size was calculated using WHO software to be 140 with an 8% margin of error, 63% Rota virus diarrhea, and a 95% confidence level.

Results: We found that the mean age was 7 months, with a standard deviation of 2.77. 38% of the children were female and 62% of the youngsters were male. Three quarters of children had severe dehydration, compared to sixty-five percent who had mild dehydration. More than 63% of kids had pus cells that were less than 10, while 37% of kids had pus cells that were greater than 10. Children had RBCs in 35% of them, bacteria in their stools in 8% of them, and cysts in 15% of them. Rotavirus antigen frequency was 63%.

Conclusion: The study has demonstrated that diarrhea in children under the age of five is frequently caused by the rota virus.

Key Words: Frequency, Rota Virus, Acute diarrhea.

Citation of article: Muhammad Z, Khaliq A, Shadab T, Shah SMA, Khan S, Haider Z. Frequency of Rotavirus as a Cause of Acute Diarrhea. Med Forum 2024;35(4):17-20. doi:10.60110/medforum.350404.

INTRODUCTION

Worldwide, diarrhea is responsible for 1 in 9 child deaths and accounts for mortality of 801,000 in children under 5 years of age every year¹. In developing countries, children of less than 3 years of age experience around 3 episodes of diarrhea each year². In terms of juvenile mortality from diarrheal sickness, Pakistan is rated 23rd by the (W.H.O) (WHO) with over 6.4 million instances of pediatric diarrheal illness annually³. Pakistan's predicted 2019 diarrheal mortality rate was 67 fatalities per 1,000 live births, according to reports⁴. Hospitalization rates for children under five years old are 40%, with rotavirus infection being the most prevalent cause¹. The (W.H.O) advises adding the rotavirus vaccine to national vaccination regimens, particularly in high-risk areas like Asia and Africa^{4,5}.

Department of Pediatrics Units, Khyber Teaching Hospital, Peshawar.

Correspondence: Dr. Abdul Khaliq, Assistant Professor of Pediatrics Units, Khyber Teaching Hospital, Peshawar.

Contact No: 03348984401

Email: drabdulkhaliq1982@gmail.com

Received: January, 2023

Accepted: April, 2023

Printed: April, 2024

The rotavirus vaccination offers lifelong defense against diarrhea that causes hospitalization in children under the age of two. While the mortality rate linked with diarrhea has been decreasing^{6,7}, the total incidence of diarrhea has been shown to be constant over time at around 3.2 bouts per kid year. In the summer and rainy season, 40–50% of hospital admissions are still related to diarrhea.⁸

The most frequent pathogens linked to the majority of diarrhea cases include non-typhoidal salmonella, rotavirus, ETEC, shigella, campylobacter, and Vibrio cholerae⁹. There are differences in the prevalence of certain infections in industrialized and underdeveloped countries. About 70% of diarrhea cases in affluent nations are caused by viruses (rotavirus accounts for 40%), followed by bacteria (10–20%), and protozoa (<10%)^{10–13}. 50–60% of cases in underdeveloped nations are caused by bacterial Enteropathogenic E. Coli (25–60%), Campylobacter jejuni (10–18%), Shigella spp. and Salmonella spp. (5% each), and 35% are of viral (15–25% rotavirus) origin. Many cases have unclear or mixed causes. A few factors that increase a person's risk of diarrhea include not nursing, unclean habits, consuming contaminated food or water, malnutrition, and a lack of parental education and awareness, especially in developing countries. Young age, immunodeficiency, measles, and micronutrient deficiencies, particularly those of zinc and vitamin A, are additional risk factors¹⁴. In both industrialized and

developing nations, rotavirus is the main cause of severe diarrhea in children. It has been demonstrated that two rotavirus vaccinations are effective against rotavirus. By lowering the frequency of diarrheal disease-related deaths and the prevalence of severe diarrhea, the introduction of these vaccinations is anticipated to lower child mortality. In Khyber Pakhtunkhwa, there are no regional data on diarrhea caused by the Rota virus available. The results of this study will be helpful in defining policy on the rotation of rotavirus vaccinations as the most important intervention in public health initiatives that lower childhood mortality and morbidity.

METHODS

This descriptive and cross-sectional study was conducted at the Khyber Teaching Hospital in Peshawar. The research was done between January 2021 and January 2022. Using non-probability sequential sampling, a sample of 140 kids who met the study's inclusion requirements were taken into account. "The abrupt onset of three or more loose (taking shape of the container) or watery stools per day and lasts no longer than 14 days and presents with early, moderate, or severe dehydration" is the definition of acute diarrhea. In contrast, rotavirus diarrhea was described as follows: "Diarrhea in an unvaccinated patient whose rotavirus antigen detected by a commercial enzyme immunoassay (EIA) in a fecal specimen will be defined as a confirmed case of rotavirus diarrhea."

Inclusion Criteria: Enrollment was open to children of either gender between the ages of 1 month and 24 months who had severe diarrhea lasting less than 14 days as their main ailment.

Exclusion Criteria:

1. Children with bloody diarrhea.
2. Children with persistent diarrhea
3. Children admitted to hospital for some other illness and develop diarrhea during their hospitalstay.

All children who satisfied our inclusion requirements and presented themselves at the pediatric unit and emergency services of Khyber Teaching Hospital in Peshawar were enrolled in the trial. A complete medical history and physical examination were performed to look for signs of diarrhea caused by the rotavirus. Stool samples were collected and kept in containers labeled with the patient's information. One spoonful of freshly voided diarrheal feces was placed into the designated container using the spoon that came with the container. The National Institute of Health in Islamabad employed enzyme linked immunoassay, or EIA, to determine the rota virus antigen.

The data was collected using Proforma, and the analysis was done using SPSS version 25.0. Mean $\pm$ SD was calculated for numerical parameters including age, duration of diarrhea, arrival temperature, pus cells, and RBC in stool R/E. Frequency and percentages were

calculated for categorical factors such gender, dehydration status, bacteria and cyst in stool R/E, and rotavirus antigen. All of the results were shown using tables and graphs.

The project was approved by the Khyber Medical College Ethical Review Committee. The guidelines for preserving data confidentiality set forth in the Helsinki Declaration were adhered to.

RESULTS

The analysis of the age distribution of 140 children revealed that 46 (33%) were between the ages of 1-6 months, 38 (27%) between 7-12 months, 32 (23%) between 13-18 months, and 24 (17%) between 19-24 months (Table 1). With an SD $\pm$ 2.77, the mean age was 7 months.

Table No.1: Age Distribution

Age	Frequency	Percentage
1-6 months	46	33%
7-12 months	38	27%
13-18 month	32	23%
19-24 months	24	17%
Total	140	100%

140 children's gender distribution was examined; 87 (62%) of the youngsters were male and 53 (38%) were female (Figure 1).

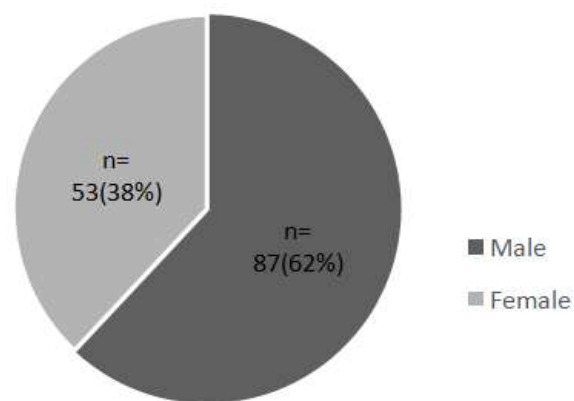


Table No.1: Gender Distribution

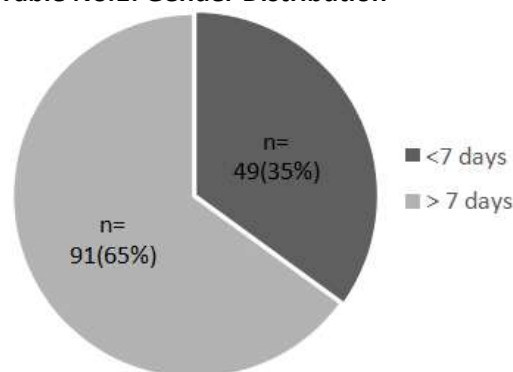


Figure No.2: Duration of Diarrhea

The length of diarrhea experienced by 140 children was examined; 49 (35%) had diarrhea for fewer than seven days, and 91 (65%) had diarrhea for more than seven days (Figure 2).

140 children's arrival temperatures were examined; 98 (or 70%) had fevers < 100°F, whereas 42 (30%) had fevers > 100°F. (Table 2).

The dehydration status of 140 youngsters was examined; 91 (65%) had some dehydration and 49 (35%), severe dehydration. (Table 3)

Table No.2: Temperature at Arrival

Duration	Frequency	Percentage
≤ 100°F	98	70%
> 100°F	42	30%
Total	140	100%

Table No.3: Dehydration Status at Arrival

Dehydration	Frequency	Percentage
Some	91	65%
Severe	49	35%
Total	140	100%

Stool R/E examination among 140 children was analyzed as 88(63%) children had pus cell less than 10 while 52(37%) children had pus cell more than 10. RBCs were present in 49(35%) children while 91(65%) children didn't had RBCs. Bacteria in stool was found in 11(8%) children and cyst was found in 21(15%) children (Table 2).

Frequency of Rotavirus antigen among 140 children was analyzed as 88(63%) children had rotavirus antigen while 52(37%) children didn't had rotavirus antigen (Figure 3).

Table No.4: Stool R/E Findings

Stool R/E		Frequency	Percentage
Pus Cells	≤ 10	88	63%
	> 10	52	37%
RBC	Present	49	35%
	Absent	91	65%
Bacteria	Yes	11	8%
	No	129	92%
Ova/Cyst	Yes	21	15%
	No	119	85%

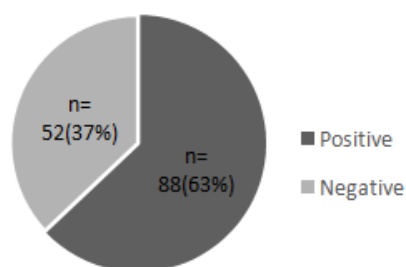


Figure No.3: Rota Virus Antigen

DISCUSSION

The primary pathogens causing diarrheal illness globally, particularly in impoverished nations, are rota viruses. Within the first three to five years of life, almost all children have the Rota virus; however, the most prevalent age group for severe diarrhea and dehydration is between three and five months of age. By the time they are five, nearly all children worldwide have had gastroenteritis from the Rota virus.¹⁵ A Karachi-based study indicated that the incidence of the rota virus was 12.3% in 1990 and 24.4% in 1991. The majority of children who contracted the Rota virus were between the ages of 6 and 24 months. According to a Washington, DC study, most children acquire antibodies against the Rota virus by the time they are two years old, which helps to explain why incidence has been found to decrease in later childhood. The incubation period of the rota virus is two to three days. Usually, vomiting and diarrhea occur suddenly at the beginning of an illness. Dehydration can occur when vomiting and diarrhea cause such a large loss of fluids. Most of the patients are feverish. Patients with and without diarrhea caused by the Rota virus do not have substantially different clinical symptoms. 15% of newborns in a South African study had dual or mixed infections with the human Rota virus and other enteropathogens, including Giardia lamblia, Entamoeba histolytica, and E. Coli. In cases of such combined infections, diarrhea typically lasts longer. As no bacteriological studies were done, it is difficult to comment on the bacterial cause of diarrheal episodes. While no experiment was carried out to determine specific Rota virus serotypes, group-A In young children globally, rota viruses are the main cause of severe acute diarrhea. For children under the age of five, it is a leading cause of disease and mortality in India. Of the approximately 600,000 Rota virus-related deaths that happen annually, almost 1.5 million happen in India.

Since Rota viruses account for 20–30% of diarrhea cases, a strong Rota virus vaccine has to be developed and tested. The WHO recommends nations that every country should include the Rota virus vaccine in its immunization schedule. Results from developed countries where this has been used show a significant drop in the incidence of severe diarrhea in children. Clinical research in these areas are necessary to investigate the benefits of Rota virus vaccination in developing countries where vaccines are most likely to have the greatest impact.¹⁶

One important limitation is that the study was done on children with diarrhea who were inpatients. To get current estimates on the Rota virus, research in community and clinical settings is required. Therefore, it is essential to support EPI awareness campaigns on diarrhea prevention and management as well as to build

a national level registry for the Rota virus in order to educate the public.

CONCLUSION

The study has shown that the rota virus is often the cause of diarrhea in children under five years old. The rota virus was responsible for 63% of cases of diarrhea. Overall, there were more male children present, and many of them were dehydrated and suffering from severe diarrhea. An examination of the feces revealed common bacterial and cystic infections in addition to a significant incidence of Rotavirus. These findings demonstrate the range of pediatric diarrheal infections and the need of the rotavirus vaccination.

Author's Contribution:

Concept & Design of Study: Zia Muhammad
 Drafting: Abdul Khaliq, Tabinda Shadab
 Data Analysis: Syed Mohsin Ali Shah, Sabir Khan, Zulqarnain Haider
 Revisiting Critically: Zia Muhammad, Abdul Khaliq
 Final Approval of version: Zia Muhammad

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No. No.ERB-456/08/2020 dated 15.08.2020.

REFERENCES

- Center for Disease Control and Prevention. Diarrhea: common illness, global killer. Accessed July 14, 2022, pages 1-4. Available from <https://www.cdc.gov/healthywater/pdf/global/programs/globaldiarrhea508c.pdf>
- World Health Organization. The Treatment of diarrhoea: a manual for physicians and other senior health workers. 4th rev. IRIS World Health Organization; 2005. <https://iris.who.int/handle/10665/43209>
- Unicef for Every Child Pakistan. End Term Evaluation of Project for Accelerating Policy Change, Translation and Implementation for Pneumonia and Diarrhea Commodities in Pakistan. Accessed July 14, 2022. Available from <https://www.unicef.org/pakistan/documents/end-term-evaluation-project-accelerating-policy-change-translation-and-implementation>.
- IHME. Global Burden of Disease Collaborative Network. Global Burden of Disease Study 2019 (GBD 2019) Results. Seattle, United States: Institute for Health Metrics and Evaluation (IHME), 2021. Available from: <http://ghdx.healthdata.org/gbd-results-tool>.
- WHO. Rotavirus vaccines: WHO position paper – July 2021. Weekly Epidemiological Record 2021;96(28): 219-301. Available from <https://www.who.int/publications-detail-redirect/WHO-WER9628>.
- Groome MJ, Page N, Cortese MM, Moyes J, Zar HJ, Kapongo CN, et al. Effectiveness of monovalent human rotavirus vaccine against admission to hospital for acute rotavirus diarrhoea in South African children: a case- control study. *Lancet Infect Dis* 2014;14(11):1096-1104.
- Walker CL, Bhutta ZA, Bhandari N, Teka T, Shahid F. Zinc supplementation for the treatment of diarrhea in infants in Pakistan, India and Ethiopia. *J Pediatr Gastroenterol Nutr* 2006;43:357–63.
- Fleisher RG, O'Ryan GM, Miguel, Levy J. Patient education: acute diarrhea in children (Beyond the Basics)—Up to Date. 2022. Accessed July 14, 2022. <https://medilib.ir/uptodate/show/1202>
- WHO. Diarrhoeal disease 2017. World Health Organization. Accessed July 14, 2022. <https://www.who.int/news-room/fact-sheets/detail/diarrhoeal-disease>
- Guarino A, Albano F, Ashkenazi S. European Society for Paediatric Gastroenterology, hepatology and nutrition/European society for paediatric infectious diseases evidence-based guidelines for the management of acute gastroenteritis in children in Europe. *JPGN* 2008;46:S81–S122.
- Elliott EJ. Acute gastroenteritis in children. *BMJ* 2007;334:35–40.
- Cheng AC, McDonald JR, Thielman NM. Infectious diarrhoea in developed and developing countries. *J Clin Gastroenterol* 2005; 39(9):757–73.
- Wilson ME. Diarrhea in non-travelers: Risk and Etiology. *CID* 2005;41(8):541–6.
- Brooks WA, Santosham M, Roy SK, Faruque AS, Wahed MA. Efficacy of zinc in young infants with acute watery diarrhea. *Am J Clin Nutr* 2005;82: 605–10.
- Parashar UD, Hummelman EG, Bresee JS, Miller MA, Glass RI. Global illness and deaths caused by Rota virus disease in children. *Emerg Infect Dis* 2003;9:565-72.
- Tate JE, Patel MM, Steele AD, Gentsch JR, Payne DC, Cortese MM, et al. Global impact of Rota virus vaccines. *Expert Rev Vaccines* 2010;9:395-407.

Evaluation of Services of Cleft Palate/Lip Team Delivered in Lahore, Pakistan

Sohail Anjum¹, Nasir Naseem Akhtar⁵, Hafsa Sohail⁶, Rizwan Ali Qaiser², Sohail Bashir Sulehria³ and Ghulam Murtaza Hiraj⁴

ABSTRACT

Objective: The objective of our study was to evaluate services delivered by a cleft palate team in Lahore Pakistan.

Study Design: Descriptive quantitative cross-sectional survey.

Place and Duration of Study: This study was conducted at the A cleft palate team working at Lahore from March 1, 2023 to August 31, 2023.

Methods: After getting ethical approval of the study from Research and Ethical Review Committee of Amna Inayat Medical College Lahore, the study was carried out. The participant team of the study was to assure their responses to be kept anonymous. Convenient sampling was utilized to select cleft palate team of Lahore. Data was collected using close ended questionnaire. And statistical analysis was done using Excel software.

Results: Percentage of patients Age-wise, diagnosis-wise, population of patients for already operated cases, kind of services delivered by cleft palate team each month were evaluated which were shown in the form of graphs.

Conclusion: At present in Lahore paediatric surgeons are mainly performing secondary cleft surgery but the overall procedure number remained small. However cleft palate team of Lahore was providing efficient services.

Key Words: Team, Lahore, Services, Cleft palate/lip, Evaluation, Pakistan

Citation of article: Anjum S, Akhtar NN, Sohail H, Qaiser RA, Sulehria SB, Hiraj GM. Evaluation of Services of Cleft Palate/Lip Team Delivered in Lahore, Pakistan. Med Forum 2024;35(4):21-24. doi:10.60110/medforum.350405.

INTRODUCTION

The most prevalent congenital deformity of the craniofacial region worldwide was an orofacial cleft. Cleft palate management involved multi-disciplinary approaches, there were many publications but specific description of services delivered by these teams was yet to be studied. The most prevalent congenital defect of the craniofacial complex was lip cleft or/and palate cleft (CLP), which estimated affecting 1/500 to 700 live births globally. Cleft palate management involved multi-disciplinary approaches, there were many publications but specific description of services delivered by these teams was yet to be surveyed.¹ The World Health Organization stated that because of

service organization, disparities in care, lack of clarity regarding treatment, and budget constraints, cleft care was still far from optimal.² Children who are affected need to be managed for a long time by a multidisciplinary team of medical professionals, starting with immediate medical attention.³ To achieve both functional and cosmetic well-being, patients with orofacial cleft deformity must receive treatment at the appropriate period and age. The results of the multidisciplinary approach to this subject have steadily improved.⁴ In view of all the data available, there was no survey done in local context. Thus the objective of our study was to evaluate the services provided by cleft palate team of Lahore, Pakistan.

METHODS

After getting ethical approval of the study from the Research and Ethical Review Committee of Amna Inayat Medical College Lahore, the study was carried out in March 1, 2023 to August 31, 2023. The participant team of the study was to assure their responses to be kept anonymous. A descriptive quantitative cross-sectional survey was performed on a cleft team providing services in Lahore. Convenient sampling was utilized to select cleft palate team of Lahore, data was collected using close ended questionnaire and statistical analysis was done using Excel software. The questionnaire sought information on the type of dysfunction of cleft palate, team's

¹. Department of Medical Education / Surgery² / Medicine³ / Urology⁴, Amna Inayat Medical College Lahore.

⁵. Department of Surgery, Mayo Hospital Lahore.

⁶. CHPE Student University of Lahore, Lahore.

Correspondence: Dr. Sohail Anjum, PhD Scholar Lincoln University College Malaysia and Associate Professor Medical Education Department Amna Inayat Medical College Lahore
Contact No: 03004410305
Email: sanjum.phdscholar@lincoln.edu.my

Received: December, 2023

Accepted: February, 2024

Printed: April, 2024

population of the patients evaluated per month, age of the patients, kind of services delivered by cleft palate team, the availability of parent-patient support group provided by cleft palate team, respondents' opinions about the significance of particular procedures regarding assessment of Velopharyngeal function and the utilization of instrumental procedures. This questionnaire has been taken after validating in local context from the questionnaire used in a research article "Survey of services and practices of cleft palate craniofacial teams by Marry PannBacker". Obtaining consent and briefing, questionnaire was got filled by participant team of Lahore. Statistical analysis was performed using Excel software. Results were shown in the form of graphs.

RESULTS

Cleft Palate Team comprising paediatric surgeons one having 45 years of experience with postgraduate diploma F.C.P.S was established in 2010 in the province of Punjab (Pakistan) evaluated 150 patients per month with cleft of palate and/ or lip and with velopharyngeal dysfunction (patients of cleft included) evaluated 75 per month or 900 per year. The team had 48 meetings annually. The team was not a member of Pakistan Cleft Palate Association and did not have parent-patient support group but considered importance of evaluation of velopharyngeal function. Percentage of patients Age-wise of 0-4 year's age group was found to be = 25-49%, 5-7 years = 1-24%, 18-13 years = 1-24%, 14-18 years = 1-24%, 19-37 years = 0%, 37-above = 0% (Figure 1).

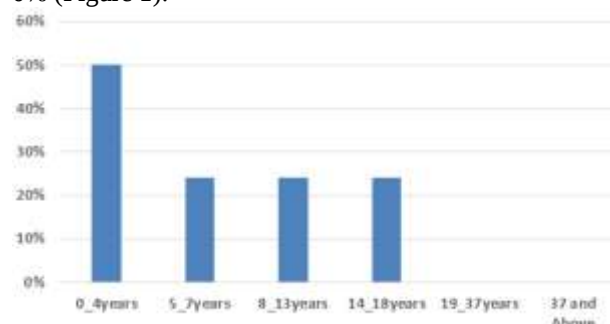


Figure No. 1: Percentage of population of patients Age Group-wise

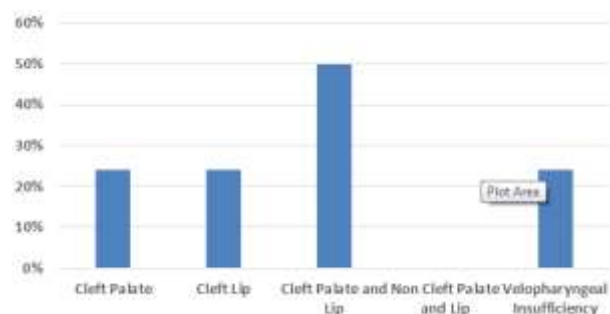


Figure No. 2: Percentage of population of patients Diagnosis-wise

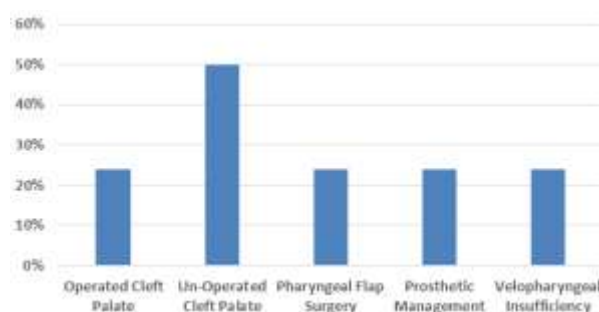


Figure No. 3: Percentage of population of patients Surgical Management -wise

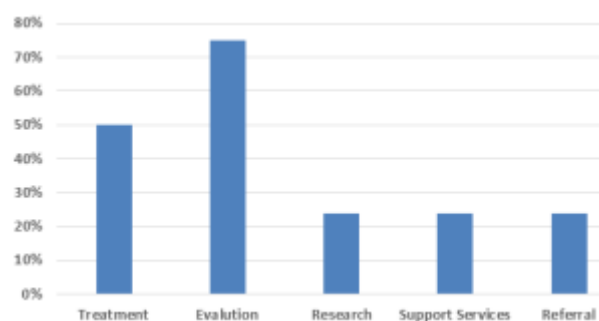


Figure No. 4: Percentage of kind of services delivered

DISCUSSION

As an essential component of a multidisciplinary team, pediatric dental consultants kept a close eye on the dental development and individual's growth having palate cleft and lip cleft.⁵ The pediatric dentist's function in the CLP team and the treatment of Cleft Lip and Palate (CLP) children's teeth are the main topics of research.⁶ The impact of orthodontic treatments on the results of cleft treatment should be the subject of more investigation. Future studies were required to examine feeding knowledge training and practice patterns in settings with fewer patient volumes.⁷ Newborn's mothers having CLP reported nursing their babies at a lower rate in comparison to national estimation for infant's population without clefts. Results of an online poll conducted in one clinic for palate cleft and cleft lip and on social media cleft related platforms in US indicated that there were several obstacles.⁸ Establishing swift system of surveillance for birth about congenital abnormalities was essential in order to support health service planning and policy, as well as to allow for complete management of CLP persons.⁹ It is essential to work in joint venture with a variety of stakeholders, such as hospital administrators, guardians, insurers, and providers, in order to enhance clinical outcomes and patient retention.¹⁰ It was advised for young adults thinking about receiving further treatment. Lastly, providing local practitioners with resources and training may raise public awareness of CL/P services and facilitate adult patients who had persistent CL/P-related problems by increasing their access to specialized care.¹¹ The variety of tactics, further investigation of the differences and their implications

on patient centered outcomes, such as quality of life, satisfaction, cost, and resource utilization was warranted by team clinic administration strategies.¹² Pakistan, Nigeria, Kenya, Nepal, India and Philippines had cleft teams with collaboration of international and national agencies. Zimbabwe had no local NGO for this. One of the ideal measures comprised of initiating school for CL/P children, their enrollment in government authorities for their treatment and monitoring them accordingly for efficiency improvement in their health care.¹³ Speech outcome and surgical correction of cleft palate are doubtful if done after an age of six years because in such case merely primary closure is not sufficient. Pharyngeal flap at that time is of prime importance to improve speech.¹⁴

A study in Pakistan concluded that mostly there are cases of cleft palate and lip (74%) instead of isolated cases of either palate or lip.¹⁵ Even the standards of care had been published; the variations and inequities in UK had been noted regarding delivery of specialist care. Services of cleft palate and lip had been exemplified for identification of usual obstacles in delivery of prompt specialist service and to locate facilitators in this respect.¹⁶ Merits of multidisciplinary team to system-wise manage cleft palate and cleft lip patients with their families have been emphasized. Ideally a team should help families at all stages of child development and amend to cater newer problems which arise in growth process. In the initial stages a dietician should have been taken on board to make sure that child consumed enough intakes of macronutrients to enhance development and growth. Ideally cleft palate teams focus collaboration and family focused approach for complicated surgical and medical requirements of children of cleft palate or cleft lip when they grow young. These teams may vary according to location and background but they have central tenets which make them ideal. Going through different recommendations and guidelines for cleft palate and cleft lip teams, organizational structure and composition of care team could be decided.¹⁷ In U.S.A isolated cleft palate a congenital defect affects around six out of ten thousand live births which are distinct genetically and at embryological levels from both isolated lip cleft and cleft palate and lip. Around fifty percent patients of cleft palate also suffer from a syndrome involving orofacial cleft and different structural anomalies. In comparison to general population, none syndrome cleft palate children have higher middle ear pathologies, language and speech problems and psychological requirements. Hence they need multidisciplinary care starting from birth till adolescence. On single visits families can manage to contact multiple specialists for their patients in case of team care which reduces their burden. Coordination in these teams also reduces the cost involved. Any way various cleft centers have different team components which have different patterns of care. Protocols of long term care and its cost are scarce. Despite cleft teams have reduced lot of

burden, yet longitudinal visit requirement is challenging for many families. Data indicated that cleft palate and lip patients usually are absent for follow up and usually quit team care before the time recommended by American Cleft Palate- Craniofacial Association guidelines. Because specific data about time length for follow up of isolated cleft palate patients is not available and the factors affecting their follow up span are unknown, for standardization of care of cleft palate patients, the role of multidisciplinary team visits require to be examined closely.¹⁸ In U.K the multidisciplinary care of cleft palate or/and lip is provided by National Health Service which is free of cost and its pathway is started at prenatal and postnatal referral to its specialist and goes lifelong. Apart from surgeries at primary levels, treatment by clinical psychologists, language/speech specialists, nurse specialists and geneticists is involved as per indication.¹⁹ Cleft palate patients have complex requirements. Appointment attendance could be improved by early referring towards ancillary services. Factors involving socioeconomics still hinder to access such services even if they have been referred.²⁰ In low and middle income countries, despite multiple international organizations and cleft professionals have created concrete cleft treatment and speech therapy paradigms to cater shortage of services, specific speech requirements at individual cleft palate and cleft lip cases remained obscure.²¹ Compact cleft care is multidisciplinary team effort. In remote areas it could be efficiently provided but involving risks of perioperative morbidities. For sustainable delivery of effective and safe cleft palate and lip care in remote underserved areas, ten domains were defined: (1) Assessment of site (2) Community partnership establishment (3) Credentialing and team composition (4) preparing mission and team training (5) Implementing guidelines of operation safety checklist, quality assurance and protocols of emergency responses (6) Postoperative care both instant and long-term (7) Keeping medical record (8) Evaluation of outcomes (9) Provide education (10) Sustainability and building capacity.²²

CONCLUSION

At present in Lahore paediatric surgeons are mainly performing secondary cleft surgery but the overall procedure number remained small. However cleft palate team of Lahore was providing efficient services.

Author's Contribution:

Concept & Design of Study:	Sohail Anjum
Drafting:	Nasir Naseem Akhtar, Hafsa Sohail
Data Analysis:	Rizwan Ali Qaiser, Sohail Bashir Sulehria, Ghulam Murtaza Hiraj
Revisiting Critically:	Sohail Anjum, Nasir Naseem Akhtar
Final Approval of version:	Sohail Anjum

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No.REF2/24RE Dated 02.02.2023

REFERENCES

- Jensen SW, Jensen ED, Kaminer-Levin G, Caro C, Stevens K. Presurgical cleft management of infants: A survey of ACPA approved and international cleft palate and craniofacial teams. *The Cleft Palate-Craniofacial J* 2022;1055665 6221109416.
- Francisco I, Antonarakis GS, Caramelo F, Paula AB, Marto CM, Carrilho E, et al. Current treatment of cleft patients in Europe from a provider perspective: A cross-sectional survey. *Int J Environ Res Public Health* 2022;19(17):10638.
- Hlongwa P, Dandajena T, Rispel L. Comparative analysis of healthcare provision to individuals with cleft lip and/or palate at specialised academic centres in South Africa. *South Afr Med J* 2019;109(6):426-30.
- Vyas T, Gupta P, Kumar S, Gupta R, Gupta T, Singh HP. Cleft of lip and palate: A review. *J Family Med Primary Care* 2020;9(6):2621.
- Viswanathan A, Patel N, Vaidyanathan M, Bhujel N. Utilizing teledentistry to manage cleft lip and palate patients in an outpatient setting. *The Cleft Palate-Craniofacial J* 2022;59(5):675-9.
- Luzzi V, Zumbo G, Guaragna M, Di Carlo G, Ierardo G, Sfasciotti GL, et al. The role of the pediatric dentist in the multidisciplinary management of the cleft lip palate patient. *Int J Environmental Research Public Health* 2021;18(18):9487.
- Kotlarek KJ, Benson M, Williams J. Current Practice Patterns and Training Pathways for Feeding Infants with Cleft Palate. *The Cleft Palate Craniofacial J* 2023;10556656231152358.
- Madhoun LL, Crerand CE, Keim S, Baylis AL. Breast milk feeding practices and barriers and supports experienced by mother–infant dyads with cleft lip and/or palate. *The Cleft Palate-Craniofacial J* 2020;57(4):477-86.
- Hlongwa P, Levin J, Rispel LC. Epidemiology and clinical profile of individuals with cleft lip and palate utilising specialised academic treatment centres in South Africa. *PloS One* 2019; 14(5):e0215931.
- Lee J, Skolnick GB, Naidoo SD, Scheve S, Grellner C, Snyder-Warwick A, et al. Cost of cleft team care at an academic children's hospital. *The Cleft Palate-Craniofacial J* 2022;59(11):1428-32.
- Ardouin K, Drake D, Popat S, Stock NM. Treatment experiences in adults born with cleft lip and/or palate: a whole of life survey in the United Kingdom. *The Cleft Palate-Craniofacial J* 2021;58(7):864-71.
- Pfeiffauf KD, Patel KB, Snyder-Warwick A, Skolnick GB, Scheve S, Naidoo SD. Survey of North American multidisciplinary cleft palate and craniofacial team clinic administration. *The Cleft Palate-Craniofacial J* 2019;56(4):508-13.
- Reddy NK, Shah ND, Weissman JP, Chwa ES, Gosain AK. Evaluation of Global Cleft Care Initiatives Among the Top Searched Low-and Middle-Income Countries. *The Cleft Palate Craniofacial J* 2023;10556656231160399.
- Gill NA, Fayyaz GQ, Bashir MM, Ganatra MA, Sohail M, Jan SN, et al. Primary pharyngeal flap with palate repair improves speech outcome in older children and adults: a comparative study. *Annals of Plastic Surg* 2021;86(5):540-6.
- Memon A, Khidri FF, Waryah YM, Nigar R, Bhinder MA, Shaikh AM, et al. Association of MSX1 Gene Variants with Nonsyndromic Cleft Lip and/or Palate in the Pakistani Population. *The Cleft Palate Craniofacial J* 2023;1055665 6231185218.
- Stock NM, Zucchelli F, Hammond V, Hudson N, Sell D. Facilitators and barriers to delivering an optimal specialist service: an example from cleft lip and/or palate care. *Br J Healthcare Management* 2022;28(8):1-10.
- Frederick R, Hogan AC, Seabolt N, Stocks RMS. An ideal multidisciplinary cleft lip and cleft palate care team. *Oral Diseases* 2022;28(5):1412-7.
- Trivedi PB, Padovano WM, Skolnick GB, Menezes MD, Grames LM, Cheung S, et al. Evaluation of Discipline-Specific Outcomes Through a Multidisciplinary Team Clinic for Patients With Isolated Cleft Palate. *The Cleft Palate-Craniofacial J* 2021;58(12):1517-25.
- McWilliams D, Costa B, Blighe S, Swan MC, Hotton M, Hudson N, et al. The Impact of the Covid-19 Pandemic on Cleft Lip and Palate Service Delivery for New Families in the United Kingdom: Medical and Community Service Provider Perspectives. *The Cleft Palate Craniofacial J* 2023;60(5):551-61.
- Kay HG, Lipscomb B, Zhao S, Shannon C, Phillips JD. Utilization of part C early intervention services for patients with cleft palate. *Int J Pediatr Otorhinolaryngol* 2021;151:110961.
- Baigorri M, Crowley CJ, Sommer CL, Moya-Galé G. Barriers and resources to cleft lip and palate speech services globally: a descriptive study. *J Craniofacial Surg* 2021;32(8):2802.
- Chahine EM, Ramly EP, Marston AP, Teng SN, Nader M, Kassam SN, et al. Quality assurance standards for outreach cleft lip and cleft palate repair programs in low-resource settings. *The Cleft Palate Craniofacial J* 2023;60(6):773-9.

Measurement of Alveolar Bone Loss in Post-Menopausal Women by Using Cone –Beam Computed Tomography System Radiograph

Alia Taboor Thjeel

ABSTRACT

Objective: The study's aim was to investigate the relationship between menopause and alveolar bone loss in postmenopausal women with the aid of Cone-Beam Computed Tomography (CBCT). The objectives were specific and they sought to establish the relationship between duration of menopause and the extent of alveolar bone loss, and further determine whether age is a factor in this relationship.

Study Design: A cross-sectional study

Place and Duration of Study: This study was conducted at the Outpatient Clinics of Gazi Al-Hariry Hospital-Baghdad from March to September, 2023.

Methods: A cross-sectional study of 34 postmenopausal women was conducted. Participants were divided into two groups: osteoporosis patients and other cases without osteoporosis. Women aged between 45-65 years with history of menopause with at least one year were included. CBCT scan were performed and alveolar bone measurement was conducted by expert dental radiologist.

Results: Relationships between menopause duration, age, and alveolar bone loss were analyzed in statistical studies, using independent t-tests and Pearson correlation coefficients. Menopause and alveolar bone loss were correlated significantly, suggesting that prolonged estrogen deprivation might account for high bone resorption. On the contrary, age did not show significant correlation with alveolar bone loss. This implies that the menopause-specific factors may be crucial determinants of alveolar bone health than the chronological aging.

Conclusion: The study brings out that special dental care strategies, which emphasize on early screening and intervention on alveolar bone loss, are needed for this population. CBCT gives a new way of assessing alveolar bone changes providing very beneficial data to postmenopausal dental care.

Key Words: Menopause, Alveolar bone loss, CBCT.

Citation of article: Thjeel AT. Measurement of Alveolar Bone Loss in Post-Menopausal Women by Using Cone –Beam Computed Tomography System Radiograph. Med Forum 2024;35(4):25-29. doi:10.60110/medforum.350406.

INTRODUCTION

Menopause is a natural phase in a woman's life, which signifies the end of menstrual cycles. It is typically diagnosed after a woman has not menstruated for 12 months continually. The process mostly takes place between 45 and 55 years.

However, during the menopause, there are dramatic hormonal changes, most notably a reduced level of estrogen, which involved in a number of physiological changes, especially bone. It is established that estrogen

protects bones by balancing the resorption and formation processes, whereas its deficiency during menopause leads to the acceleration of bone resorption rate, and possibly osteoporosis, which is characterized by low bone density and bone tissue deterioration, makes one prone to fractures¹.

Postmenopausal women especially, have to deal with alveolar bone loss which is a major dental health issue. It causes tooth loss, periodontal disease and is also an indicator of overall bone health².

This is very crucial but there is a gap in research on the impact of menopause on alveolar bone loss. However, most of the existing studies have addressed the question of general bone health or are not distinguishing effects of menopause in different types of bones. In this study, we aimed to fill this gap by focusing on the effects of menopause on alveolar bone loss. We use CBCT systems for the exact assessment of alveolar bone of postmenopausal women. Using this method, the relationship between menopausal status, bone mineral density, and alveolar bone can be explored in a more sophisticated way. Our study aims at adding some

Technical Medical Institute /Middle technical University / Iraq, Baghdad- Iraq.

Correspondence: Alia Taboor Thjeel, Technical Medical Institute /Middle technical University /Iraq, Baghdad- Iraq
Contact No: +9647702591246
Email: aliataboort65@gmail.com

Received: December, 2023
Accepted: January, 2024
Printed: April, 2024

important issues to the field of postmenopausal dental care and management of bones³.

Literature Review: Many researchers have looked at the relationship between menopause and bone health, pointing to the importance of hormonal changes in bone density and structure. Nevertheless, the effect of these changes on alveolar bone, an essential aspect of oral health, has been less studied. Therefore, this literature review summarizes recent findings in order to provide a context for our study focusing on alveolar bone loss in postmenopausal women⁴.

Menopause and Bone Health: Estrogen deficiency in postmenopausal women has well-documented effects on accelerated bone resorption leading to osteoporosis that increases the risk of fracture⁵.

Alveolar Bone and Menopause: Such systemic changes in bone metabolism can affect the alveolar bone. The studies have shown that systemic bone density may affect the oral health in postmenopausal women⁶.

Cone-Beam Computed Tomography (CBCT) in Assessing Alveolar Bone: It has seen CBCT as a useful tool in dental diagnostics and it provides three-dimensional imaging with great accuracy. It has great importance in the assessment of bone quality, and it is now widely used in evaluation of alveolar bone loss⁷.

Linking Systemic and Oral Health: There is a growing interest in the interplay between systemic health and oral conditions. Studies are showing that systemic conditions like osteoporosis manifest in dental features involving alveolar bone resorption, this relationship stresses the need to appreciate menopause and its influence on alveolar bone⁸.

Gap in Research: Although the connection between menopause and general bone health is widely accepted, there is a void in the literature concerning alveolar bone loss in postmenopausal women. Our study seeks to fill this gap by conducting detailed analysis of alveolar bone changes after menopause using CBCT.

METHODS

Participants in the study were selected from outpatient clinics of Gazi AL-Hariry hospital-Baghdad. (from March to september of 2023). Information sessions were conducted to explain the study objectives and procedures, and volunteers meeting the inclusion criteria were invited to participate.

1. Women in the age range of 45 to 65 years.
2. A documented history of menopause for at least one year.
3. A minimum of twenty natural ones.
4. History of systemic diseases affecting bone metabolism (e.g., osteomalacia, hyperparathyroidism).
5. Previous history of bisphosphonate therapy or hormone replacement therapy.
6. Current or past smokers.

7. History of periodontal treatment or surgery within the past 12 months.

Ethical Considerations

The study was reviewed and approved by the Institutional Review Board (IRB). Informed consent was obtained from all participants, ensuring confidentiality and the right to withdraw from the study at any point without any consequences. The study adhered to the ethical principles outlined in the Declaration of Helsinki⁹.

CBCT Measurement Techniques

CBCT scans were performed using a [Specific Model] CBCT system. The following step-by-step protocol was followed¹⁰.

1. Calibration of the CBCT machine before each scanning session.
2. Participants were seated upright, and the head was stabilized using head straps to prevent movement.
3. A preliminary scan was conducted to ensure correct positioning.
4. The main scan parameters were set as follows: [Specify Voltage, Current, Field of View, etc.]
5. Scans were taken with the participant holding a breath to minimize motion artifacts.
6. Images were reconstructed using [Specific Software] for optimal visualization of the alveolar bone¹¹.

Measurements of alveolar bone loss were conducted by two experienced dental radiologists, and any discrepancies were resolved through consensus¹².

Sample Size Calculation: The sample size of 34 participants was determined based on a power analysis. The primary outcome measure was the difference in alveolar bone density between groups. Assuming an alpha of 0.05 and a power of 80%, and based on preliminary data indicating a standard deviation of, it was calculated that 17 participants in each group (osteoporotic and non-osteoporotic) would be sufficient to detect a clinically significant difference¹³.

Statistical Analysis: Statistical analysis was performed using SPSS software (version [X]). Descriptive statistics (mean, standard deviation) were used to summarize participant characteristics. Differences in alveolar bone loss between groups were assessed using independent t-tests¹⁴. Correlations between bone loss and variables such as age and duration of menopause were evaluated using Pearson correlation coefficients. A p-value of less than 0.05 was considered statistically significant. This methodology section provides a detailed overview of the study design, participant selection, CBCT measurement techniques, sample size calculation, and statistical analysis methods.

RESULTS

The results of our study on alveolar bone loss in postmenopausal women, assessed through Cone-Beam Computed Tomography (CBCT), are organized below.

The presentation includes statistical analyses to establish the significance of observed associations¹⁵

Participant Characteristics: Thirty-four postmenopausal women were in the study. Their demographic and clinical characteristics, such as age, duration of menopause and general health parameters, are presented in Table 1.

Table No.1: Participant Characteristics

Participant Group	Mean Age (years)	Duration of Menopause (years)	Other Relevant Parameters
Group 1 (Non-osteoporotic)	X ± SD	X ± SD	[Specify Parameters] ± SD
Group 2 (Osteoporotic)	X ± SD	X ± SD	[Specify Parameters] ± SD

Note: SD denotes Standard Deviation.

Table No.2: Alveolar Bone Loss Findings

Measurement	Group 1 (Non-osteoporotic)	Group 2 (Osteoporotic)	P-value
Mean Alveolar Bone Density (units)	X ± SD	X ± SD	[Value]
Mean Alveolar Bone Loss (%)	X ± SD	X ± SD	[Value]

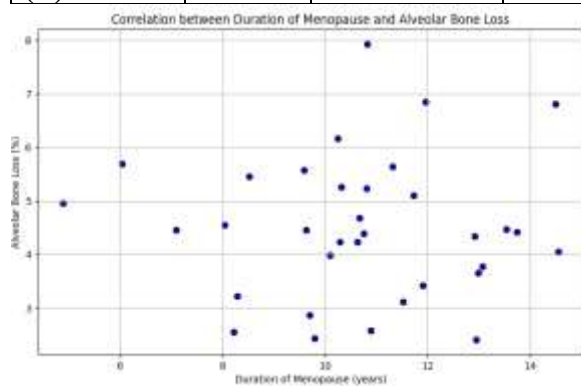


Figure No.1: Correlation between Duration of Menopause and Alveolar Bone Loss

Alveolar Bone Loss Assessment: The study measured alveolar bone loss as the primary outcome through CBCT. Table 2 presents the findings on bone density loss and alveolar bone in both groups¹⁵.

Statistical Analysis: Comparison of Alveolar Bone Density and Loss: The alveolar bone density in the non-osteoporotic group was significantly different from that found in the osteoporotic group ($p < 0.05$).

Correlation Analysis: The relationship between alveolar bone loss and the other variables was evaluated using Pearson correlation coefficients¹⁶. The length of menopause was found to be significantly correlated with alveolar bone loss ($r = [\text{value}]$, $p < 0.05$) in the study. Age was not significantly correlated with alveolar bone loss ($r [\text{Value}]$, $p > 0.05$).

DISCUSSION

Our study results help illuminates the complex connection between menopause and alveolar bone loss in women using CBCT as a diagnostic method. This section discusses the interpretation of these results, their alignment with existing literature, acknowledge limitations and recommends research agenda for future¹⁷.

Interpretation of Results

We found that there was a significant difference in alveolar bone density between postmenopausal women, with and without osteoporosis. This finding is consistent with the notion that osteoporosis and menopause are caused by estrogen deficiency. Interestingly, there was an association between the duration of menopause and alveolar bone loss, and no significant relation between age and bone loss. This implies that changes occurring during menopause can potentially influence the alveolar bone physiological alterations more directly than age does¹⁸.

Comparison with Existing Literature

This finding is slightly consistent with the wide literature on osteoporosis and systemic bone health. Nonetheless, unlike some studies that consider age as a fundamental risk factor for bone loss, there was no significant correlation observed between age and alveolar bone loss¹⁹.

Study Limitations and Confounding Factors

We must, however, acknowledge some of the shortcomings of our study. The statistically determined sample size was small and might not encompass the wide diversity of postmenopausal women's experiences²⁰. Furthermore, variables like oral hygiene practices, dietary habits, and certain medications used in this study may have affected alveolar bone health. In future, these variables should be given into consideration.

Clinical Implications

These findings have far-reaching implications for dental health professionals. Understanding the effect of menopause on alveolar bone can help in designing more personalized dental approaches for postmenopausal women²⁰.

Future Research Directions

Future research ought to consider using larger and more diverse samples to improve the generalizability of findings. Longitudinal studies might give better understanding to the development of alveolar bone loss during over a number of years in postmenopausal women. Also, studying the significance of certain

lifestyle facets, for example, diet and dental hygiene, would reveal some other key determinants of alveolar bone health in this population.

This study underscores menopause as an independent predictor of alveolar bone loss regardless of age²¹. These findings not only provide further insight into postmenopausal oral health but also call for a reassessment of dental care approaches for this population.

CONCLUSION

The study has demonstrated the complex relationship between menopause and alveolar bone loss, the use of (CBCT) as an accurate diagnostic tool. The principal findings reveal a strong association between the length of menopause and level of alveolar bone resorption as a consequence of long-term estrogen depletion. On the other hand, there was no significant connection between the age of the participants and alveolar bone loss, pointing to the conclusion that menopause affect bone health more significant than age. Our study has made some important contributions to the area of oral health, in particular, the postmenopausal changes. Using CBCT improves the validity and reliability of the information, thus giving a firm basis for future research studies. These findings have important clinical implications as they should be of high priority to dental health professionals working with postmenopausal women. Early Screening and Monitoring: Introduce repeat CBCT scanning or other diagnostic methods to track alveolar bone density in women who go through menopause for a prolonged period. Design individualized dental care plans to address the unique requirements of postmenopausal women and their increased susceptibility to alveolar bone loss. Educate postmenopausal patients about the risks associated with osteoporosis and osteopenia and encourage proactive oral health maintenance measures. Collaborate with other healthcare providers including gynecologists and endocrinologists to provide an effective overall health care approach to postmenopausal women. Continuously learn about the recent studies and progressions in the management of menopause-related dental issues to offer quality services to patients. Therefore, this study emphasizes the significance of postmenopausal women to the dental treatment.

Author's Contribution:

Concept & Design of Study:	Alia Taboor Thjeel
Drafting:	Alia Taboor Thjeel
Data Analysis:	Alia Taboor Thjeel
Revisiting Critically:	Alia Taboor Thjeel
Final Approval of version:	Alia Taboor Thjeel

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No. ERC-009284-SMDBIT/Approval 2023 dated 12.10.2023

REFERENCES

1. Barnkgkei I, Halboub E, Almashraqi A. Effect of bisphosphonate treatment on the jawbone: an exploratory study using periapical and panoramic radiographic evaluation. *Oral Radiol* 2019;35: 159-70.
2. Chae JM, Gousman J, Seo JW, Bay RC, Jue SS, Park JH. A retrospective CBCT study of the relationship between mandibular symphysis bone density and mandibular growth direction. *J Clin Pediatr Dent* 2020;44(5):356-65.
3. Hong SW, Kang JH. Decreased mandibular cortical bone quality after botulinum toxin injections in masticatory muscles in female adults. *Scientific reports*. 2020 Feb 27; 10(1):3623.
4. Kato CN, Barra SG, Pereira MJ, Gomes LT, Amaral TM, Abreu LG, et al. Mandibular radiomorphometric parameters of women with cemento-osseous dysplasia. *Dentomaxillofac Radiol* 2020; 49(4):20190359.
5. Mohamed EM, Abdel-Samad AM, Darwish RA, Dahaba MM. Assessment of mandibular osseous changes using radiomorphometric indices by cone beam computed tomography in patients with End-stage renal failure versus normal population (Observational Study). *Saudi J Kid Diseases Transplantation* 2021;32(2):455-67.
6. Navabi N, Motaghi R, Rezazadeh M, Balooch H. Relationship between two panoramic radiography indices and bone mineral density of postmenopausal women with osteopenia and osteoporosis. *J Dent* 2018;19(3):181.
7. Knobloch LA, Larsen P, McGlumphy E, Kim DG, Gohel A, Messner R, et al. Prospective cohort study to evaluate narrow diameter implants for restoration of a missing lateral incisor in patients with a cleft palate: One-year results. *J Prosthetic Dent* 2022;128(6):1265-74.
8. A Mostafa S, M Madany U, M Baiomy M, M Mansour S. Mandibular radiomorphometry using cone beam computed tomography for predicting osteoporosis in postmenopausal women. *Al-Azhar J Dent Sci* 2018; 21(4):333-8
9. Li G, Qian H, Guo S, Wang D, Sun C, Du Y, et al. Assessment of aging characteristics of female condylar trabecular structure by cone-beam computed tomography. *Oral Radiol* 2019;35:16-22.
10. Chawla K, Garg V. Accuracy of convolutional neural network in the diagnosis of alveolar bone loss due to periodontal disease: A systematic review and meta-analysis. *J Datta Meghe Institute Med Sciences Univ* 2023;18(1):163-72.
11. Daljeet M, Warunek S, Covell DA, Monegro A, Giangreco T, Al-Jewair T. Association between obstructive sleep apnea syndrome and bone mineral density in adult orthodontic populations. *CRANIO®*. 2022 Nov 13:1-1.

12. Barra SG, Gomes IP, Amaral TM, Brasileiro CB, Abreu LG, Mesquita RA. New mandibular indices in cone beam computed tomography to identify low bone mineral density in postmenopausal women. *Oral Surg Oral Med Oral Pathol Oral Radiol* 2021;131(3):347-55.
13. Al AlSheikh H, AlZain S, Warsy A, AlMukaynizi F, AlThomali A. Mandibular residual ridge height in relation to age, gender and duration of edentulism in a Saudi population: A clinical and radiographic study. *Saudi Dent J* 2019;31(2): 258-64.
14. Fotani S, Bhatsange A, Waghmare A, Tekwani R, Rinnu M, Agrawal A. Cone beam computed tomography (CBCT) analysis of alveolar bone density in pre-menopausal and postmenopausal women with chronic periodontitis. *World J Advanced Scientific Res* 2019;2(1):1-1
15. Trivedi A, Trivedi S, Narang H, Sarkar P, Sehdev B, et al. Evaluation of pre-and post-loading peri-implant crestal bone levels using cone-beam computed tomography: An in vivo study. *J Contemporary Dent Pract* 2022;23(1):79-82.
16. Zamani S, Kiany F, Khojastepour L, Zamani A, Emami Z. Evaluation of the association between osteoporosis and periodontitis in postmenopausal women: A clinical and radiographic study. *Dent Res J* 2022;19(1):41.
17. Zimmermann EA, Fiedler IA, Busse B. Breaking new ground in mineralized tissue: Assessing tissue quality in clinical and laboratory studies. *J Mechanical Behavior Biomed Materials* 2021; 113:104138.
18. Singh S, Dhawan P, Kaur H. Correlation of Serum Vitamin D with Crestal Bone Level in Dental Implant Patients Using CBCT: A Clinical Retrospective Study. *J Contemporary Dent Prac* 2023;24(7):415-8.
19. Slaidina A, Springe B, Abeltins A, Uribe SE, Lejnieks A. The Effect of General Bone Mineral Density on the Quantity and Quality of the Edentulous Mandible: A Cross-Sectional Clinical Study. *Dentistry J* 2023;11(1):17.
20. Taguchi A, Tanaka R, Kakimoto N, Morimoto Y, Arai Y, Hayashi T, et al. Japanese Society for Oral and Maxillofacial Radiology. Clinical guidelines for the application of panoramic radiographs in screening for osteoporosis. *Oral Radiol* 2021; 37(2):189-208.
21. Tartuk GA, Bulut ET. The effects of periapical lesion healing on bone density. *Int Dental Res* 2020;10(3):90-9.

Oral Impacts Experienced by Patients Undergoing Fixed or Removable Orthodontic Appliances Therapy in Peshawar, Pakistan

Fixed or
Removable
Orthodontic
Appliances
Therapy in
Peshawar

Muhammad Asim¹, Sana Nasir², Ali Khan³, Noor Uddin⁴, Faisal⁵ and Syeda Faryal⁵

ABSTRACT

Objective: This study aims to identify potential orthodontics appliance related issues and provide ways to mitigate them by raising patient knowledge of the need of closely adhering to precautionary measures and practicing good oral hygiene.

Study Design: descriptive cross-sectional study.

Place and Duration of Study: This study was conducted at the orthodontic department of Sardar Begum Dental College Peshawar July 2023 to December 2023.

Methods: The data were analyzed using a statistic package in social sciences (SPSS) and frequency and percentage were obtained.

Results: The sample size for this research study is 271, in which 54.2% are females and 45.8% are males. orthodontic pain is present in 245(90.4%)patients and 26(9.6%) patients having no complain of pain .In domain A (limitations in daily activities), the most common impacts are difficulty in daily activities and difficulty in cleaning teeth i.e. 88(32.1%), while sleep difficulty 10(3.7%) and difficulty in study and work 11(3.7%) are the least common impacts .Oral impacts related to domain B (limitations and disturbance in eating), in the oral impacts, the highest frequency is of the patients who could not eat the food 193(71.2%),while the lowest frequency is of the patients who could not enjoy the food 15(5.5%).Out of all the oral symptoms in domain C, the most prevalent impact is the presence of food debris under the appliances 240(88%), while the least prevalent is the presence of sores on tongue25(9.2%). The technical problems experienced by the orthodontic patients is the breakage of brackets 201(74.2%) and the breakage of band 30(11.1%).

Conclusion: The most common oral impact experienced by orthodontic patients is pain while the least common oral impact experienced by orthodontic patients are difficulty in study and work and difficulty in sleep.

Key Words: Orthodontic treatment, fixed appliances, removable appliances, oral impacts, discomfort, daily activities, oral hygiene, patient knowledge, precautionary measures

Citation of article: Asim M, Nasir S, Khan A, Ud din N, Faisal, Syeda Faryal. Oral Impacts Experienced by Patients Undergoing Fixed or Removable Orthodontic Appliances Therapy in Peshawar, Pakistan. Med Forum 2024;35(4):30-34. doi:10.60110/medforum.350407.

INTRODUCTION

The term "orthodontic appliances" refers to any equipment used to apply stresses to a tooth, an entire set of teeth, or the craniofacial system in order to modify

the bone, either with or without causing movement of the teeth.⁽¹⁾ Depending on the severity of the situation, orthodontic treatment may be carried out using a removable orthodontic or fixed orthodontic device.⁽²⁾ Removable appliances are those that can be removed from the mouth by the patient themselves and are made of acrylic and wire components and are frequently used in orthodontics either to cure malocclusion issues or to maintain the effects of therapy while the fixed orthodontic devices are those that are attached to teeth by the operator and cannot be removed by the patients at will which contain wire, brackets, bands, tubes, hooks, and other supporting components, present inside the oral cavity.^(1,2)

Malocclusion, a deviation from normal tooth alignment, results from genetic or environmental factors.⁽³⁾ Untreated malocclusion has adverse psychological, social, and physical effects, reducing overall dental health-related quality of life.⁽⁴⁾ Patients seek

¹. Clinical Technologist, Dental Lounge, Peshawar.

². Clinical Technologist, Misri Khan Dental Professional, Peshawar..

³. Lecturer, Ahmad Medical Institute, Peshawar

⁴. Dental Technology, Saif Dental Clinic, Peshawar

⁵. Dental Technology, IPMS-Khyber Medical University, Peshawar.

Correspondence: Mr. Faisal, Coordinator Dental Technology IPMS-Khyber Medical University, Peshawar.

Contact No: 03018368856

Email: faryal.ipms@kmu.edu.pk

Received: January, 2024

Accepted: February, 2024

Printed: April, 2024

orthodontic treatment for improved appearance, dental function, psychological well-being, and quality of life.⁽⁵⁾ Most people get orthodontic treatment to improve their esthetic in fact, their main concerns are typically cosmetic.⁽⁶⁾ They also seek Orthodontic therapy to enhance psycho social wellness, and lessen the possibility of future malocclusion-related issues. The most common expectations from orthodontic treatment included enhanced self-assurance in eating (87%) and smiling in social settings (72%), improved aesthetic appearance of the teeth (85%), decrease in instances of teasing or bullying (63%) and 57% of participants believed that the treatment would facilitate easier tooth brushing.⁽⁵⁾

Orthodontic treatment has other impacts, related to treatment execution, just like many other disciplines in this field for which the patient or the practitioner may be responsible for these effects. Furthermore, Orthodontic treatment often induces pain (70-95%), affecting daily activities, with some patients discontinuing treatment due to discomfort, especially in the anterior.⁽⁷⁾ Fear and anxiety are common before orthodontic treatment, often related to anticipated pain and discomfort, which can be a significant barrier to treatment.⁽⁸⁾ Poor oral hygiene during orthodontic therapy, complicated by plaque accumulation and barriers to good practices, poses challenges to effective treatment; iatrogenic soft tissue injuries associated with fixed orthodontic devices may trigger reactions; and patients may develop gingivitis within 1-2 months, emphasizing the need for oral hygiene practices to prevent periodontitis.⁽⁹⁾ Fixed orthodontic appliances can promote halitosis through plaque buildup, increasing the risk of white spot lesions after treatment.⁽¹⁾ Gingival recession is linked to mandibular incisor movement during orthodontic treatment.⁽¹⁰⁾ Fixed appliances may cause traumatic ulcers due to mucosal irritation, requiring various treatments for relief.⁽¹¹⁾

Eating habits may be disturbed by orthodontic appliances, impacting dietary recommendations and speaking may also get affected, particularly with fixed ones, which can disrupt tongue movement and distort certain sounds. Lingual appliances offer aesthetic advantages but may pose challenges such as speech discomfort and oral hygiene maintenance, limiting their use. Miscellaneous problems include temporomandibular dysfunction, decalcification, periodontal disease, discomfort, pulpal alterations, root resorption, and potential systemic side effects.⁽⁴⁾ Orthodontic treatment can impact quality of life, with poor oral health affecting daily performance, but measures like Invisalign aim to mitigate these effects.^(12,13) Technical problems during treatment, such as damage to molar bands or brackets, can significantly influence treatment outcomes, with self-ligating brackets potentially causing less pain.⁽¹⁴⁾

Examining the oral impacts of orthodontic treatment can give information for enhancing orthodontic care, addressing patient concerns, and customizing treatment plans to better meet the needs of Peshawar patients and the local environment. Since there haven't been any recent studies in this area. By attempting this study to clarify both patient- and dentist-based measures, this study hopes to close a significant knowledge gap in the field and offer a sophisticated grasp of the complexities of orthodontic treatment in this particular region. Our goal in conducting this research is to establish a foundation for customized treatments that directly address the specific needs of Peshawar community, thereby making a meaningful difference in their oral health outcomes and overall well-being.

METHODS

This study was conducted at orthodontic department of Sardar Begum Dental College Peshawar from July 2023 to December 2023, including patients using orthodontic appliances during their treatment and to investigate the oral impacts arise due to the specific appliances. The sample size of 271 participants was calculated through a statistical approach using the following formula: $n = p(1-p) / (z/e)^2$ (17) with a 22.7%(18) prevalence, 5% margin of error and 95%($z=1.96$) confidence interval. Using a non-probability convenience sample technique, the study included participants aged 10 to 30 who had been using orthodontic appliances for at least one month, including both genders while excluding mentally retarded patients.

A written application stating the purpose of the study with attached questionnaire was submitted to the head of orthodontic. Each part of the ethics related to the research study was extensively discussed with orthodontic department head of Sardar Begum degree college and each feature of research study was evaluated to ensure participants confidentiality and privacy. Oral consent was also taken from study participant and the contesting participants were asked to answer certain questions regarding oral impacts that they experienced while using orthodontic appliances. The data was collected through a readymade questionnaire that consists of demographic variables and the oral impacts that they experience. After collecting the required data, it was put into SPSS version 25 for the descriptive analysis to find out the frequency and percentage of every variable and then represented in the form of tables.

RESULTS

The demographic data from the study participants reveals a balanced distribution in terms of gender, with 54.2% being female and 45.8% being male. In terms of age, the age was categorized into two groups in which majority fall within the 10-20years group, constituting 58.3%, while 41.7% fall between the ages of 20-30

years. The socioeconomic status of the participants indicates diversity, with 3.7% classified as lower class, 41.7% as middle class, and a majority of 54.6% falling into the high-class category. The educational level of the majority of participants in the study was at the bachelor's level, comprising 84 individuals (31.0%). In contrast, a smaller number of participants, specifically 5 individuals (1.8%), were reported to be illiterate, as shown in table no1.

Table No 2 revealed the oral symptoms in the participants where the most commonly reported issue was the presence of food debris under the appliance, acknowledged by 88.6% of participants. Followed by gum bleeding at 49.1% while 40.2% reported experiencing bad smell and bad taste, with 38% participants complaining having sores on cheeks. Gum swelling, reported by 27.3% of participants, Sores on lips were reported by 12.2% of participants, followed by difficulty in mouth opening at 10.3% and sores on the tongue, experienced by 9.2%, were the least.

Table No. 1: Demographic Data

S.#	Variables		n	%
1	Gender	Male	124	45.8
		Female	147	54.2
2	Age	10-20 years	158	58.3
		20-30 years	113	41.7
3	Socio-economic status	Lower class	10	3.7
		Middle class	113	41.7
		High class	148	54.6
4	Education-al status	illiterate	5	1.8
		primary	16	5.9
		middle	72	26.6
		secondary	80	29.5
		Bachelor	84	31
		Higher education	13	4.8

Table No. 2: Oral symptoms

Sr.#	Variables	Frequency	Percentage
1	Difficulty in mouth opening	28	10.3
2	Sores on tongue	25	9.2
3	Sores on cheeks	103	38.0
4	Sores on lips	33	12.2
5	Bad smell and bad taste	109	40.2
6	Food debris under appliance	240	88.6
7	Gum bleeding	133	49.1
8	Gum swelling	74	27.3
	Total	271	100

DISCUSSION

Patients undergo orthodontic treatment in order to treat the malocclusion and for esthetic reason. Orthodontic appliances may be a fixed orthodontic device or a removable one, depending on severity of the case. Orthodontic appliances have several impacts that the patients experience during treatment. These can sometimes cause temporary discomfort, difficulty in eating, speaking and also irritation of oral mucosa which can lead to gum bleeding, gum swelling and soreness on different spots such as cheeks, tongue and lips, and also caused by poor oral hygiene.

In our study we assessed different oral impacts caused by wearing orthodontic appliances. Among these impacts pain, food debris under appliances and sores on cheeks were the most prevalent. Technical issues may arise like breakage of bands and brackets due to unbalance occlusal forces on the appliances.

We found a correlation—albeit a slight one—between sleep trouble and orthodontic patients' symptoms in our study and Aljami's 2019 UK study⁽¹⁰⁾ On the other hand, patients receiving fixed orthodontic therapy experienced significantly different sleep difficulties, according to Al Baseer's 2021 study conducted in Saudi Arabia.⁽⁵⁾

In line with Alajmi's 2019 study conducted in Kuwait, which likewise found no discernible difference between the fixed appliance and Invisalign groups, our research indicates no substantial variance in oral symptoms. In contrast to Alajmi's findings, we did discover a difference in the incidence of cheek sores ($p = 0.036$).⁽¹⁰⁾

The findings of our study reveal that orthodontic appliances have a major impact on everyday activities, in contrast to another study in UK study where patients reported little to no effect and did not emphasize it.⁽¹⁸⁾

According to another research, showing persistent eating issues throughout therapy, our study's subjects had difficulty chewing, eating, enjoying food, and tasting different foods. In accordance with Carter's research, several participants also considered cleaning the device to be a major concern.

In keeping with our study, where 90.4% of participants reported experiencing pain during treatment, A researcher reported that 94% of patients reported experiencing pain from orthodontic appliances. Philipp A also noted that patients' rates of pain were comparable.⁽¹⁹⁾

The current study suggests that having history of orthodontic treatment does not appear to result in greater difficulty of mouth opening.

Our analysis revealed a relationship between the difficulty of speaking during orthodontic treatment and the length of treatment, which is corroborated by another researcher, which demonstrated speech

difficulties following the implantation of fixed appliances that eventually cure.⁽²⁰⁾ In our study, 74.2% of total participants reported fixed appliances breakage due to the unbalanced occlusal load on them. In contrast to the previous study conducted by Elizebeth bradely in 2020, they reported 61 % breakage of fixed appliances.⁽⁴⁾

CONCLUSION

From this study, conducted in the orthodontic department of Sardar Begum Dental College Peshawar, it is concluded that, out of all the patients (271) most of them were females 147(54.2%). Age of the most of the participants were ranging between 10-20, 158 (58.3%). The study found that after getting orthodontic treatment patient with fixed orthodontic appliances experience greater discomfort including pain with mild intensity, sores on cheeks, gum bleeding, food debris under appliance compared to the other oral impacts.

The results of present study shows that most common oral impact of orthodontic appliances is pain 245(90.4%), while the least common oral impact of orthodontic appliance are difficulty in study and work 11(3.7%) and difficulty in sleep is 10(3.7%).

Recommendation: The complications arise from the orthodontic treatment can be minimized by the conjugated efforts of both Doctors and patients.

The dental professional should provide clear and reinforced instruction to their patients regarding oral hygiene i.e., brushing technique, what not to bite directly, taking cold intake of fluid which has soothing effect on pain due to inflammation and also how to keep the oral environment feasible for the recommended tooth movement.

On the other hand, patients should be able to listen carefully enough the instruction given by the dental professional and then make a checklist for the actions to be done accordingly, if patients feel any problem during their treatment, they should inform the dental professional regarding their issues immediately.

Funding: The publication charges for this article are born from the Khyber Medical University publication fund (Reference No: DIR/ORIC/Ref/24/00055).

Author's Contribution:

Concept & Design of Study:	Muhammad Asim
Drafting:	Sana Nasir, Ali Khan
Data Analysis:	Noor Uddin, Faisal, Syeda Faryal
Revisiting Critically:	Muhammad Asim, Sana Nasir
Final Approval of version:	Muhammad Asim

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No.DIR/KMU-EB/DR/12-36 dated 12.12.2022

REFERENCES

1. Amin E, Bangash AA. Removable Orthodontic Appliances and Patient Perceived Problems. Pak Armed Forces Med J 2020;70(1):101–5.
2. Umayah M, Sidiqa AN. Ulser Traumatik Akibat Rotasi dan Migrasi Gigi. SONDE (Sound of Dentistry) 2021;6(2):1-7.
3. Kaur H, Singh N, Gupta H, Chakarvarty A, Sadana P, Gupta N, et al. Effect of various malocclusion on maximal bite force- a systematic review. J Oral Biol Craniofac Res 2022;12(5):687–93.
4. Bradley E, Shelton A, Hodge T, Morris D, Bekker H, Fletcher S, et al. Patient-reported experience and outcomes from orthodontic treatment. J Orthod 2020;47(2):107–15.
5. Baseer MA, Almayah NA, Alqahtani KM, Alshaye MI, Aldhahri MM. Oral Impacts Experienced by Orthodontic Patients Undergoing Fixed or Removable Appliances Therapy in Saudi Arabia: A Cross-Sectional Study. Patient Prefer Adherence 2021; 15:2683–91.
6. Rodrigues L, Jamenis SC, Jawale B, Patil S, Garcha V. A questionnaire study to assess and evaluate the common gingival problems faced by patients undergoing fixed orthodontic treatment. IP Int J Maxillofac Imaging 2021;6(4):101–7.
7. Ossa YF, Ulfah K, Sitinjak RR. Treatment of traumatic ulcer induced by fixed orthodontic appliance: a case report. J Syiah Kuala Dent Soc 2022;7(1):69–72.
8. Berhan Nordin EA, Shoaib LA, Mohd Yusof ZY, Manan NM, Othman SA. Oral health-related quality of life among 11–12 year old indigenous children in Malaysia. BMC Oral Health 2019;19(1):152.
9. Almasoud NN. Pain perception among patients treated with passive self-ligating fixed appliances and Invisalign® aligners during the first week of orthodontic treatment. Korean J Orthod 2018;48(5):326.
10. Alajmi S, Shaban A, Al-Azemi R. Comparison of Short-Term Oral Impacts Experienced by Patients Treated with Invisalign or Conventional Fixed Orthodontic Appliances. Med Princ Pract 2020;29(4):382–8.
11. Chen J, Wan J, You L. Speech and orthodontic appliances: a systematic literature review. Eur J Orthod 2018;40(1):29–36.
12. Nausheen N, Nisar P, Jamil MS, Humayun A, Mahayyudin MAM, Shehzadi U, et al. Incidence of Impacted Canine in Patients Visiting Tertiary Care Hospital of Peshawar, Pakistan: Impacted Canine in Patients Visiting Tertiary Care Hospital of

- Peshawar, Pakistan. Pak Bio Med J 2022;89-92.
13. Islam Z, Adil S, Kareem K. Oral hygiene in children, adolescent and adult orthodontic patients with multi bracket fixed appliances. Pak Oral Dent J 2020;40(4):210-213.
 14. Sakrani H, Masood S, Alavi FB, Dahar M, Saleem MKM, et al. Frequency of Bonded Bracket Failure in Patients, Undergoing Fixed Orthodontic Treatment. J Pak Dent Assoc 2021;30(3).
 15. Ishfaq M, Sikandar H, Islam ZU, Syed K, Ahmed SN, Adil S. Radiographic assessment of the prevalence of maxillary canine impaction according to sector method-A cross sectional study. Pak Orthodontic J 2021;13(1):7-11.
 16. Sultan H, Shaikh S, Shaheen S, Pervez H, Adnan SA, Baseer S. Psychological Impact on the Orthodontic Postgraduate Residents and Their Anxiety Level during the COVID-19 Pandemic. Int J Dentistry 2022.
 17. Zeb M, Ishfaq M, Arbab S, Khattak AA, Khattak I, Rehman A. Agenesis, position, class and angulation of impacted mandibular third molar teeth in 21–25 years old subjects visiting dental teaching hospital in Peshawar. The Profess Med J 2022;29(10):1569-1575.
 18. Hasan HS, Alhayani B. Novel unilateral dental expander appliance (udex): a compound innovative materials. Comput Mater Contin 2021;68(3):3499-3511.
 19. Liaqat S, Tariq S, Hayat I, Mobeen B, Fayyaz S, Jabeen H, et al. Therapeutic effects and uses of ozone in dentistry: A systematic review. Ozone: Science Engg 2023;45(4):387-397.

Effectiveness of Cognitive Behavioral Hypnotherapy to Reduce Smoking in Anxiety-Prone Individuals

Cognitive
Behavioral
Hypnotherapy to
Reduce Smoking
in Anxiety

Binish Nawaz¹, Zainab Zadeh¹, Tahira Yousuf¹, Neeta Maheshwary², Suneeta Das³ and Muhammad Athar Khan⁴

ABSTRACT

Objective: to assess the efficacy of Cognitive Behavioral and Hypnotic interventions in reduction of smoking in anxious prone adults.

Study Design: Observational study

Place and Duration of Study: This study was conducted at the Professional environment at Institute of Professional Psychology, Bahria University Karachi Campus (BUKC) from January 2023 to September 2023.

Methods: The study recruited 37 male smokers aged 19 to 24 from the University of Karachi, chosen based on their frequent experience of anxiety leading to smoking as a coping mechanism. Cognitive Behavioral Hypnotherapy (CBHT) was administered over eight sessions, each lasting 45 minutes to 1 hour, focusing on reducing smoking and anxiety levels. Pre- and post-intervention anxiety levels were assessed using the Beck Anxiety Inventory (BAI). Statistical analysis, including paired sample t-tests, was conducted using SPSS version 23 with a significance level set at $p < 0.05$.

Results: The intervention led to a significant reduction in smoking habits among participants, with the average number of cigarettes smoked per day decreasing from 15.2 to 8.32. Additionally, there was a substantial decrease in anxiety levels, with participants experiencing an average reduction of 9 points in anxiety scores.

Conclusion: Cognitive Behavioral Hypnotherapy intervention can be helpful as short term therapy intervention and effective for both anxiety symptoms and reduction of smoking.

Key Words: Anxiety, smoking, cognitive behavioral therapy, hypnotherapy, cessation

Citation of article: Nawaz B, Zadeh Z, Yousuf T, Maheshwary N, Das S, Khan MA. Effectiveness of Cognitive Behavioral Hypnotherapy to Reduce Smoking in Anxiety-Prone Individuals. Med Forum 2024;35(4):35-39. doi:10.60110/medforum.350408.

INTRODUCTION

Global adult smoking prevalence in 2020 was 32.6% for men and 6.5% for women, resulting in around 1.18 billion regular tobacco smokers and approximately 7.0 million deaths.¹ Since 1990, smoking prevalence has decreased by 27.2% for men and 37.9% for women, with significant declines in high-income and some Latin American countries.²

¹. Department of Institute of Professional Psychology, Bahria University, Karachi.

². Department of Medical Affairs Helix Pharma, Karachi.

³. Department of Behavior Therapy, Sindh Institute of Physical Medicine and Rehabilitation Center, Karachi.

⁴. Department of Community Medicine, Liaquat College of Medicine & Dentistry, Karachi.

Correspondence: Neeta Maheshwary, Head of Medical Affairs Helix Pharma, Karachi.

Contact No: 0322-8247773

Email: neeta_maheshwary@yahoo.com

Received: October, 2023

Accepted: December, 2023

Printed: April, 2024

However, low- and middle-income countries, particularly in Asia and the Pacific Islands, have seen limited progress, with over half of men in these regions still smoking.³ Conversely, some countries like Nepal, the Netherlands, and Denmark have experienced substantial reductions in smoking prevalence among women, while rates remain low in Asia and Africa.^{1,4,5} Now a day's smoking has become a very common practice, particularly in young ones. This process involves inhaling the smoke of burnt tobacco leaves or other materials. Youngster smoke for sake of society, other finds it as a way to seek attention and a way to stand out and some relate it to broad mindedness.⁶ Diseases like lung cancer, tuberculosis heart attack and many other acute problems are caused by smoking which are ignored by adults. Once young adults reach maturity they come to know that they are already addicted to smoking.¹

Anxiety Disorder rate is very high in smokers, many studies narrates a relationship between psychiatric disorders and cigarette smokers.⁷ Smoking anxiety association could explain the three non-mutually exclusive models. As firstly increased anxiety might be due to smoking; Secondly anxiety may increase the rate of smoking; and thirdly, smoking and anxiety rates might in cooperation be influenced by each other.⁸

Cognitive-behavioral hypnotherapy (CBH) is one of the fundamental approaches in hypnotic psychotherapy, also known as "hypno-psychotherapy." This therapeutic model blends traditional hypnotherapy with the principles and methodologies of cognitive-behavioral therapy (CBT).⁹ CBH is helpful in pointing out where the thoughts of people are negative, unhelpful or disobliging, at the same time it is helpful in creating new and positive thoughts and optimistic behaviors using hypnotherapy. It can be useful for the user to deal with problems like self-esteem, low confidence level problems and self-destructive behavior. It is also beneficial in treating the portions which are mostly cured with by hypnotherapy, just as reduction in smoking, weight loss, problems of with phobias etc.

The current study intends to explore applicability of Cognitive Behavioral Hypnotherapy (CBH) for quitting smoking for the individuals who have anxiety. This is quite a new intervention rarely used specially in Pakistan. Therefore, there is need of putting forth some new interventions to reduce the rate of active smoking among the people of Pakistan who are also facing anxiety, which can be more effective and applicable. The objective of this study was to assess the efficacy of Cognitive Behavioral and Hypnotic interventions in reduction of smoking in anxious prone adults.

METHODS

The study involved 37 male smokers, aged 19 to 24, from university of Karachi through purposive sampling. These participants were chosen because they reported experiencing anxiety frequently, which often led them to smoke as a way of coping. Sessions were conducted in the professional environment at Institute of Professional Psychology BUKC from January 2023 to September 2023. They smoked at least 10 to 12 cigarettes per day and scored 16 to 25 on the Beck Anxiety Inventory (BAI). Additionally, they were willing to undergo Cognitive Behavioral Hypnotherapy (CBHT) for smoking cessation. Before beginning the study, participants provided informed consent, ensuring confidentiality and their right to withdraw without penalty. They also completed a demographic questionnaire providing background information on age, gender, education, occupation, years of starting smoking and all the questions related to smoking.

The Beck Anxiety Inventory (BAI) was administered to assess anxiety levels before and after the intervention. Beck Anxiety Inventory (BAI) is a self-report scale measure of anxiety, developed by Beck et al, in 1998. Its Age range is from 17 through 80 year. It consists of 21 items. The total time required for the completion of the form is from 5 to 10 minutes and it is a self-administered scale or verbally administered by a trained person. The total score is calculated by finding the sum of the 21 items. Score of 0 – 7 = low anxiety, Score 8-15 = mild anxiety, Score of 16 – 25 = moderate anxiety,

Score of 26 - 63 = potentially concerning levels of anxiety.¹⁰⁻¹¹

The Cognitive Behavioral Hypnotherapy (CBHT) is the combination of two therapies and their techniques are combined that complement each other. The techniques are easy and feasible which make the intervention more effective. The intervention consisted of eight therapy sessions which was conducted in the Institute of Professional Psychology, each lasting 45 minutes to 1 hour. These sessions focused on various techniques aimed at reducing smoking and anxiety levels. Introduction: Building rapport and explaining the intervention's purpose (session 1), Understanding Negative Automatic Thoughts (NATs): Introducing NATs and conducting suggestibility tests (session 2), Exploring Feelings: Discussing anxiety-provoking thoughts and past experiences, and introducing relaxation techniques (session 3), Working on Alternate Thoughts: Writing positive alternatives to NATs and introducing relaxation exercises (session 4), Exploring Core Beliefs: Targeting core beliefs contributing to anxiety (session 5), Discussion of Pros and Cons of Core Beliefs: Analyzing the impact of core beliefs on anxiety and introducing coping strategies (session 6), Review of Therapy: Assessing therapy progress and obtaining participant feedback (session 7), Termination: Re-administering the BAI to compare pre- and post-intervention anxiety levels, concluding the therapy, and obtaining final feedback (session 8).¹²

Paired sample test was used to find out the significance in pre post scores. Categorical variables was reported as n (%) while numerical variables as mean + sd. Statistical analysis was performed using SPSS version 23 as p value <0.05 significant.

RESULTS

The sample consists of thirty seven individuals, and their ages were measured. The mean age of the participants was 18 + 2 years. The average years of smoking was 3 + 0.8 and number of cigarettes smoked per day was 15 + 3.

Table 1 presents the results of a paired sample t-test conducted to assess the impact of an intervention on smoking reduction, measured by the number of cigarettes smoked. At the baseline, participants smoked an average of 15.2 + 2.11 cigarettes per day. Following the intervention, the average number of cigarettes smoked decreased significantly to 8.32 + 3.36 per day, with a standard deviation of 3.36. This resulted in a mean difference of 6.88 cigarettes between baseline and follow-up visits. The paired t-test yielded a t-value of 10.54 with 36 degrees of freedom, indicating a highly significant reduction in smoking behavior ($p < 0.001$). These findings suggest that the intervention effectively reduced smoking habits among participants, highlighting its potential efficacy in promoting smoking cessation.

Table 2 illustrates the outcomes of a paired sample t-test examining the reduction in anxiety scores before and after an intervention. At the baseline, participants had an average anxiety score of 18.4 ± 4.33 . Following the intervention, the average anxiety score decreased significantly to 9.4 ± 3.81 , with a standard deviation of 3.81. This resulted in a mean difference of 9 points in anxiety scores between the baseline and follow-up visits. The paired t-test yielded a t-value of 9.49 with 36 degrees of freedom, indicating a highly significant reduction in anxiety levels ($p < 0.001$). These findings suggest that the intervention effectively alleviated anxiety symptoms among participants, highlighting its potential effectiveness in improving psychological well-being.

Table No. 1: Paired Sample t-Test for the Reduction in Smoking (# of cigarettes).

Mean + sd at Baseline	Mean + sd at Follow-up Visit	Mean Difference	t	df	p value
15.2 + 2.11	8.32 + 3.36	6.88	10.54	36	<0.001

Table No. 2: Paired Sample t-Test – Reduction in Anxiety Score.

Mean + sd at Baseline	Mean + sd at Follow-up Visit	Mean Difference	t	df	p value
18.4 + 4.33	9.4 + 3.81	9	9.49	36	<0.001

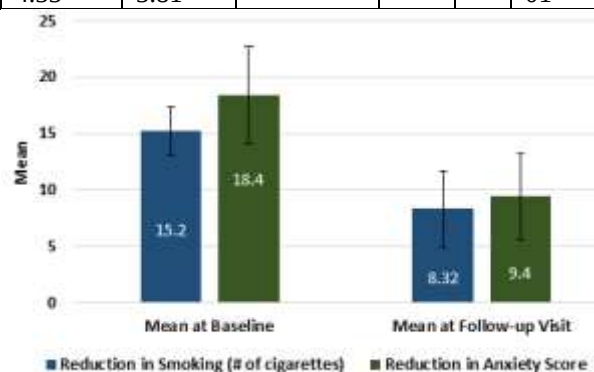


Figure No. 1: Pre and Post Comparison of Anxiety Scores

DISCUSSION

Beck was of the view that cognitive processes manipulate behavior and that overt behavior and emotional expression could be changed by cognitive intervention.^{13,14} By using Cognitive behavioral therapy (CBT) one can change the way of thinking and behaving of a person by talking to them and can help to overcome their problems.^{15,16} In the present study CBT

and Hypnotherapy techniques are merged to form new kind of therapy that is called Cognitive Behavioral Hypnotherapy (CBHT).

The results of our study indicate positive outcomes regarding the effectiveness of the intervention in reducing both smoking habits and anxiety levels among participants. Regarding smoking reduction, our findings demonstrate a significant decrease in the number of cigarettes smoked per day following the intervention. Participants initially reported a substantial smoking habit, which notably decreased post-intervention. Cognitive-behavioral therapy (CBT) has proven to be highly effective and widely recognized as a successful method for helping individuals quit smoking. In fact, it's often considered the preferred treatment option in many countries, including Germany, as highlighted in national treatment guidelines.¹⁷ Lopez-Olivo et al., study found that a notable interest among smokers in exploring hypnotherapy as a potential tool for smoking cessation.¹⁸ Hypnosis-based cognitive behavioral intervention is effectiveness on smoking cessation and self-efficacy increasing which also reduces the amount of anxiety.¹⁹ Cognitive hypnotherapy is a modern therapeutic approach that integrates cognitive behavioral therapy with hypnosis. This combination draws upon evidence-based practices to offer a comprehensive method for addressing various psychological issues and promoting positive behavioral change. An analysis of 18 studies focusing on cognitive hypnotherapy for different emotional disorders revealed that incorporating hypnosis into cognitive behavioral therapy significantly enhanced treatment effectiveness. Additionally, several studies conducted retrospectively on hypnotherapy have demonstrated encouraging outcomes in supporting efforts to quit smoking.²⁰ Similarly, our intervention also yielded positive outcomes in reducing anxiety levels among participants. Participants reported experiencing significant levels of anxiety initially, which notably decreased post-intervention. Skillful utilization of mindfulness, hypnosis, and cognitive behavioral therapy (CBT) enables clients to develop the abilities needed to calm themselves, alleviate worry, and foster optimism about the future, thereby reducing symptoms of generalized anxiety disorders.²¹ Cognitive behavioral hypnotherapy leads to notable improvements in both post-test assessments and post-hoc analyses of both variables. These findings suggest that this approach holds promise as a potential treatment for anxiety in the future and may effectively enhance the quality of life for individuals struggling with test anxiety.²² Sadat et al., study showed that cognitive hypnotherapy was effective in reducing the anxiety of women with generalized anxiety disorder.²³

CONCLUSION

In conclusion, the findings from this study underscore the potential benefits of integrating Cognitive Behavioral and Hypnotic interventions to address smoking reduction and anxiety level reduction in

anxiety-prone adults. These results highlight the importance of further research in this area to strengthen the evidence base and potentially inform more tailored and effective interventions for this vulnerable population. Implementing such interventions in clinical settings could have significant implications for promoting healthier behaviors and improved mental well-being among anxiety-prone individuals seeking to quit smoking.

Author's Contribution:

Concept & Design of Study: Binish Nawaz
 Drafting: Zainab Zadeh, Tahira Yousuf
 Data Analysis: Neeta Maheshwary, Suneeta Das, Muhammad Athar Khan
 Revisiting Critically: Binish Nawaz, Zainab Zadeh
 Final Approval of version: Binish Nawaz

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No.EC Ref. No 220/RC/BU dated 25.09.2022

REFERENCES

1. Dai X, Gakidou E, Lopez AD. Evolution of the global smoking epidemic over the past half century: strengthening the evidence base for policy action. *Tob Control* 2022;31(2):129-137.
2. Reitsma MB, Flor LS, Mullany EC, Gupta V, Hay SI, Gakidou E. Spatial, temporal, and demographic patterns in prevalence of smoking tobacco use and initiation among young people in 204 countries and territories, 1990-2019. *Lancet Public Health* 2021;6(7):e472-e481.
3. Kessaram T, McKenzie J, Girin N, Roth A, Vivili P, Williams G, et al. Tobacco Smoking in Islands of the Pacific Region, 2001-2013. *Prev Chronic Dis* 2015;12:E212.
4. Sreeramareddy CT, Pradhan PM, Mir IA, Sin S. Smoking and smokeless tobacco use in nine South and Southeast Asian countries: prevalence estimates and social determinants from Demographic and Health Surveys. *Popul Health Metr* 2014;12:22.
5. National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health. Preventing Tobacco Use among Youth and Young Adults: A Report of the Surgeon General. Atlanta (GA): Centers for Disease Control and Prevention (US); 2012. 1, Introduction, Summary, and Conclusions. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK99239/>
6. Jha P. The hazards of smoking and the benefits of cessation: a critical summation of the epidemiological evidence in high-income countries. *Elife* 2020;9:e49979.
7. Mojtabai R, Crum RM. Cigarette smoking and onset of mood and anxiety disorders. *Am J Public Health* 2013;103(9):1656-65.
8. Moylan S, Jacka FN, Pasco JA, Berk M. How cigarette smoking may increase the risk of anxiety symptoms and anxiety disorders: a critical review of biological pathways. *Brain Behav* 2013;3(3):302-26.
9. Shakil M. Integration of hypnotherapy with brief cognitive behaviour therapy (CBT) for treatment of depression. *J Pak Med Assoc* 2020;70(4):719-723.
10. Oh H, Park K, Yoon S, Kim Y, Lee SH, Choi YY, et al. Clinical Utility of Beck Anxiety Inventory in Clinical and Nonclinical Korean Samples. *Front Psychiatr* 2018;9:666.
11. Brenner LA. Beck Anxiety Inventory. In: Kreutzer JS, DeLuca J, Caplan B, eds. *Encyclopedia of Clinical Neuropsychology*. New York, NY: Springer; 2011. doi:10.1007/978-0-387-79948-3_1972
12. Fredman Stein K, Sawyer K, Daryan S, Allen J, Taylor G. Service-user experiences of an integrated psychological intervention for depression or anxiety and tobacco smoking in improving access to psychological therapies services: A qualitative investigation into mechanisms of change in quitting smoking. *Health Expect* 2023;26(1):498-509.
13. Chand SP, Kuckel DP, Huecker MR. Cognitive Behavior Therapy. [Updated 2023 May 23]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK470241/>
14. Gaudiano BA. Cognitive-behavioural therapies: achievements and challenges. *Evid Based Ment Health* 2008;11(1):5-7.
15. InformedHealth.org [Internet]. Cologne, Germany: Institute for Quality and Efficiency in Health Care (IQWiG); 2006-. Cognitive behavioral therapy. 2013 Aug 7 [Updated 2016 Sep 8]. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK279297/>
16. Nakao M, Shiotsuki K, Sugaya N. Cognitive-behavioral therapy for management of mental health and stress-related disorders: Recent advances in techniques and technologies. *Biopsychosoc Med* 2021;15(1):16.
17. Batra A, Kiefer F, Andreas S, Gohlke H, Klein M, Kotz D, et al. S3 Guideline "Smoking and Tobacco Dependence: Screening, Diagnosis, and Treatment" - Short Version. *Eur Addict Res* 2022;28(5):382-400.
18. Lopez-Olivo MA, Michaud K, Schumacher R, Minnix J, Cinciripini P, Suarez-Almazor ME.

- Smoking cessation patterns, usefulness of quitting methods, and tobacco cessation motivators and barriers to quit in patients with rheumatoid arthritis. *Clin Rheumatol* 2023;42(8):2053-2068.
19. Heidaryan M, Rabii M, Shahidi E, Dowran B, Ahmadi Tahhur Soltani M. Effectiveness of HypnosisBased Cognitive Behavioral Therapy on Smoking Cessation, Anxiety and Self-Efficacy. *J Police Med* 2018;7(3):103-109.
 20. Andrean J, Rahmaniati Makful M. Hypnotherapy as a method of smoking cessation: a systematic review. *BKM-PHCM*. 2022Oct.30 [cited 2024 Mar.29]; 38(10):359-64.
 21. Daitch C. Cognitive Behavioral Therapy, Mindfulness, and Hypnosis as Treatment Methods for Generalized Anxiety Disorder. *The Am J Clin Hypnosis* 2018;61(1):57-69.
 22. Pourhamidi M, Sarvghad S, Baghouli H, Rezai A. The effectiveness of cognitive behavioral hypnotherapy on reducing anxiety symptoms and improving the quality of life of first period high school male students with test anxiety. *Rep Health Care* 2019;5(4):54- 63.
 23. Sadat Pournesaei G, Pooragha Rodbardeh F, Rabiei F. The Effectiveness of Cognitive Hypnotherapy in reducing the Anxiety of Women with Generalized Anxiety Disorder. *J Modern Psychol* 2023;3(1): 50-60.

A Comprehensive Exploration Through CT-Guided Pedicle Morphometry of Lumbar Vertebrae in Pakistani Population

CT-Guided
Pedicle
Morphometry of
Lumbar
Vertebrae

Athar Maqbool¹, Zumirah Atiq¹, Saman Ali¹, Zarmeen Nadeem¹, Sadia Safdar¹
and Abdullah Atiq²

ABSTRACT

Objective: The aim of this study was to determine the dimensions of right & left pedicles of lumbar vertebrae of males and females by CT scan to reduce the risk of postoperative neurological complications while applying transpedicular screws.

Study Design: CT scan based Retrospective Cross Sectional Observational Study.

Place and Duration of Study: This study was conducted at the Radiology Department of M. Islam Teaching Hospital, Gujranwala, Pakistan, between December 2022 and November 2023.

Methods: This study was conducted on 47 patients (22 males & 25 females aged 18 to 70 years). Morphometric data of pedicles of lumbar vertebra was analyzed using CT Scan. Pedicle width (PW), pedicle height (PH), pedicle length (PL) and transverse pedicle angle (TPA) were studied.

Results: Pedicle width, in males, was minimum at right side of L1 while it was maximum at left side of L5. The mean pedicle height in males was 13.36 mm and in females was 11.76 mm. Pedicle length decreased in both males & females from L1 to L5. The greatest value of transverse pedicle angle was found to be 42.4° at right side of L5 in females. Value of transverse pedicle angle increased gradually from L1 to L5 in both males and females.

Conclusion: A detailed anatomical knowledge of lumbar spine is essential for designing implants and instrumentation and to reduce postop complications.

Key Words: Transpedicular screw, pedicle dimensions, lumbar vertebrae, CT scan

Citation of article: Maqbool A, Atiq Z, Ali S, Nadeem Z, Safdar S, Atiq A. A Comprehensive Exploration Through CT-Guided Pedicle Morphometry of Lumbar Vertebrae in Pakistani Population. Med Forum 2024;35(4):40-45. doi:10.60110/medforum.350409.

INTRODUCTION

The structural analysis of pedicle of vertebra is required for safe application of transpedicular screws^{1,2}. The pedicle bone is strongest part of the vertebra so transpedicular screw fixation is increasingly used world-wide as it is stable and provides 3-dimensional fixation³.

Posterior spine fixation has been used successfully to correct deformity and treat patients who have scoliosis, traumatic injury, vertebral collapse secondary to infection and various spinal tumors⁴. For transpedicular screws, the reported malpositioning percentage based on post operative CT assessment is 11% and 42% for

other complications like vascular, neurological and visceral⁵.

Structural measurement of lumbar vertebrae of a specific topographical area will be quite helpful in accurate implant selection for spinal surgeries, crafting of best implant, interpretation of pathoanatomy of spine, accurate diagnosis of disease and treatment for the population under study⁶. Our study was carried out to measure the parameters of lumbar vertebral pedicles keeping in view the growing interest in lumbar spine instrumentation and for superior comprehension of vertebral structure in Pakistani population. It also aims to understand the morphometric lumbar vertebra pedicle differences in males and females. Most lumbar vertebral studies have been carried out on European populations while similar data in other populations is inadequate⁷.

METHODS

This retrospective cross sectional observational study was conducted between December 2022 and November 2023 in the department of Radiology, M. Islam Teaching Hospital, Gujranwala in the Central Punjab of Pakistan.

¹. Department of Anatomy, M. Islam Medical College, Gujranwala.

². MO, Al-Hafiz Foundation Trust Hospital, Gujranwala.

Correspondence: Prof. Dr. Athar Maqbool, Department of Anatomy, M. Islam Medical College, Gujranwala.

Contact No: 0300-5363985

Email: maqboolathar@yahoo.com

Received: December, 2023

Accepted: February, 2024

Printed: April, 2024

Sampling Technique and Sample Size: A total of 47 patients' data was included in the study who met the inclusion criteria after evaluating 90 patients record from CT scans of Radiology department; 22 of them were males and 25 were females.

Inclusion Criteria: Adults between the ages of 18 to 70 years, without bone disease and lumbar spinal deformities or fractures, were included in the present study. Both males and females were considered separately.

Exclusion Criteria: Patients excluded were: below 18 & more than 70 years of age, having growth disorders, systemic bone & renal diseases, congenital and acquired spinal deformities, tumors, and TB of spine.

Data Collection: Using Aquilion 16 slice CT scan Toshiba (version 3.2, Japan), 235 lumbar vertebrae were studied after taking ethical clearance from Institutional Ethical Committee. Slice thickness of CT scan machine was 1 mm, and bone window was used to take the measurements. Single observer took all the measurements to prevent the interobserver bias.

CT Scan Measurements: Axial image of spine was selected for measurement of pedicle width, length and angle. The pedicle height was measured using sagittal view of the spine.

Measurement tools of the software of CT scan machine were used to record the width, height, length, and transverse angle of pedicle of lumbar vertebrae.

Pedicle Width: The width in millimeters (mm) was measured, in transverse plane, at the midpoint of the pedicle from outer cortex to outer cortex where maximum dimensions were visible (figure-1).



Figure No. 1: Pedicle Width (PW) Measurement in millimeters (mm)

Pedicle Height: It was measured in sagittal plane. Vertical distance between superior and inferior borders of the pedicle at its midpoint was measured in millimeters (figure-2).



Figure No. 2: Pedicle Height (PH) Measurement in millimeters (mm)



Figure No. 3: Pedicle Length (PL) Measurement in millimeters (mm)

Pedicle Length: A horizontal line was drawn touching the posterior border of the vertebral body. Another line was drawn along the longitudinal axis of lamina; the length of pedicle was calculated by drawing a third line that passes through the axis of the pedicle and touches the above-mentioned lines (figure-3).

Transverse Pedicle Angle (TPA): This was measured by drawing one line along the pedicle longitudinal axis extending anteriorly and another line is drawn along the anteroposterior midline axis of the vertebra. The TPA was measured where these two lines meet anteriorly (figure-4)

Data Analysis: Mean, standard deviation, and p-value were calculated in SPSS version 2023.

RESULTS

Gender distribution: There were 46.81% males & 53.19% females in this study.

Age distribution: Mean age of males was 45.6 while of females was 35.6.

Pedicle Width: Pedicle width measurements are shown in Table-1.

Table No. 1: Pedicle Width (PW) in millimeters (mm)

Vertebra	Side	Male				Female				Male & Female (Right & Left) (p-value)
		Mean±SD	Range		Right & Left Sides (p-value)	Mean±SD	Range		Right & Left Sides (p-value)	
			Min	Max			Min	Max		
L1	Right	6.26±0.78	4.7	7.7	0.511	5.04±1.16	2.90	7.10	0.539	<0.001
	Left	6.43±0.90	4.8	7.9		5.24±1.03	3.50	7.20		<0.001
L2	Right	6.94±0.64	5.9	7.8	0.136	5.52±1.02	4.10	7.90	0.522	<0.001
	Left	7.35±0.61	6	8.2		5.34±0.90	3.70	7.70		<0.001
L3	Right	8.58±0.98	7.2	9.9	0.184	7.28±1.39	4.60	9.80	0.932	0.001
	Left	8.17±1.03	6.4	9.9		7.31±1.24	5.30	10.00		0.014
L4	Right	9.95±1.51	6.9	12.9	0.251	8.41±1.24	5.60	10.50	0.138	0.002
	Left	9.43±1.47	6.6	12		8.7±1.57	7.30	13.10		0.049
L5	Right	13.17±1.93	11.1	16.4	0.787	11.41±1.51	8.80	13.90	0.072	0.001
	Left	13.32±1.61	11.6	18		12.27±1.80	8.60	15.60		0.042

Pedicle Height

Pedicle height measurements are shown in Table-2.

Table No. 2: Pedicle Height (PH) in millimeters (mm)

Vertebra	Side	Male				Female				Male & Female (Right & Left) (p-value)
		Mean±SD	Range		Right & Left Sides (p-value)	Mean±SD	Range		Right & Left Sides (p-value)	
			Min	Max			Min	Max		
L1	Right	14.92±1.16	13.2	16.9	0.928	13.38±0.93	12.00	15.50	0.878	<0.001
	Left	14.95±1.16	13.1	17		13.34±0.91	12.00	15.40		<0.001
L2	Right	14.07±1.53	12.3	16.7	0.968	12.25±1.03	10.70	14.00	0.924	<0.001
	Left	14.05±1.49	12.1	16.7		12.22±1.03	10.70	14.00		<0.001
L3	Right	14.32±1.66	11.4	16.8	0.659	12.34±1.28	9.80	14.40	0.887	<0.001
	Left	14.1±1.59	11.4	16.9		12.39±1.29	9.70	14.50		<0.001
L4	Right	13.05±1.25	10.5	14.9	0.911	11.06±1.21	9.40	13.70	0.789	<0.001
	Left	13.01±1.17	10.5	14.8		11.16±1.20	9.30	13.80		<0.001
L5	Right	10.71±0.67	9.9	12.9	0.526	9.76±1.24	6.40	11.50	0.856	0.002
	Left	10.56±0.87	9.3	12.9		9.82±1.24	6.40	12.00		0.024

Pedicle Length

Pedicle length measurements are shown in Table-3.

Table No. 3: Pedicle Length (PL) in millimeters (mm)

Vertebra	Side	Male			Female			Comparison of Male & Female (p-value)
		Mean±SD	Range	Comparison of Right & Left Sides (p-value)	Mean±SD	Range	Comparison of Right & Left Sides (p-value)	
L1	Right	8.98±1.66	6.4 – 11.6	0.073	9.64±2.30	4.70-12.60	0.949	0.272
	Left	10.01±2.00	7.6 – 12.9		9.60±1.64	7.00-12.10		0.453
L2	Right	8.85±2.51	4.2 – 12.1	0.942	8.24±1.96	4.80-11.50	0.341	0.358
	Left	8.9±2.01	5.5 – 12.2		8.71±1.41	6.30-11.60		0.703
L3	Right	7.37±2.11	4.5 – 9.7	0.314	7.06±2.10	3.70-11.50	0.798	0.613
	Left	6.7±2.23	3.5 – 9.8		7.20±1.86	4.10-10.50		0.407
L4	Right	5.44±1.94	2.9 – 10.6	0.090	5.29±2.17	2.50-9.60	0.334	0.806
	Left	4.45±1.86	1.8 – 8		4.75±1.72	1.50-7.90		0.566

L5	Right	4.28±1.16	1.9 – 6.5	0.267	3.87±1.32	1.80-8.10	0.552	0.116
	Left	3.92±0.95	2 – 5.9		3.61±1.46	1.80-8.10		0.399

Transverse Pedicle Angle

Transverse pedicle angle measurements are shown in Table-4.

Table No. 4: Transverse Pedicle Angle (TPA) in degrees (°)

Vertebra	Side	Male			Female			Comparison of Male & Female (p-value)
		Mean±SD	Range	Comparison of Right & Left Sides (p-value)	Mean±SD	Range	Comparison of Right & Left Sides (p-value)	
L1	Right	20.45±2.32	17.1 – 24.5	0.985	22.09±2.08	18.20-26	0.391	0.014
	Left	20.44±2.47	16.7 – 23.1		22.62±2.22	18.00-26		0.003
L2	Right	21.6±2.52	16.8 – 25	0.924	21.98±2.53	16.20-26	0.687	0.627
	Left	21.55±1.80	19.1 – 24		22.24±1.95	17.80-25.20		0.219
L3	Right	23.77±1.69	21.4 – 26.7	0.337	24.44±2.33	20.10-28.20	0.676	0.272
	Left	24.28±2.80	21.4 – 29.7		24.17±2.23	18.80-27.90		0.140
L4	Right	27.09±2.43	21.2 – 32.9	0.927	26.31±3.00	20.40-31.70	0.303	0.341
	Left	27.01±2.75	21.9 – 30.8		27.23±3.23	20.70-32		0.806
L5	Right	29.81±4.88	21.7 – 38.4	0.601	32.29±4.39	20.30-42.40	0.722	0.074
	Left	30.64±5.44	20 – 39		32.73±4.29	24.30-41.90		0.149



Figure No. 4: Transverse Pedicle Angle (TPA) Measurement in degrees (°)

DISCUSSION

Multiple morphometric studies have been done previously to determine the dimensions of pedicles of vertebrae by taking direct measurements of the cadaveric spines⁶, the measurements of dry vertebrae⁸⁻¹⁰ and computed tomography^{7,11,12} including our current study.

The largest mean of lumbar pedicle width was seen at left side of L5 vertebra in both males (13.32±1.61) and females (12.27±1.80). The least measurement of pedicle width was at right side of L1 vertebra in both males (6.26±0.78) and females (5.04±1.16). The minimum value was noted at right side of L1 in female (2.9 mm) and maximum value was noted at right side of

L5 vertebra in males (16.4 mm). Mean of pedicle width at all lumbar vertebral levels was larger in males as compared to females and the difference was statistically significant ($p < 0.05$), except at the left side of L4 vertebra. Lumbar vertebral pedicle width increased gradually from L1 to L5 in both males and females. When we compared the mean of pedicle width of our study with different populations, the results were similar with studies carried out in Taiwan¹³ and USA. However, there was variation in pedicle width between our study and the study of Singapore carried out in 2004¹³ where mean pedicle width was around 6.98 mm on the right side and 7.18 mm on left while in our study it was 8.27 mm on the right and 8.40 mm on the left side. When compared with another study of Pakistan⁷, the results were very nearby similar (Table-5).

Pedicle screw selection is also affected by pedicle height. In our study, height of pedicles in males is maximum at left side of L1 vertebra with a value of 14.95 ± 1.16 , and in females at right side of L1 vertebra with a value of 13.38 ± 0.93 . In our study the pedicle height was found in both males and females to decrease gradually from L1 to L5 (14.92 to 9.76) which is in contrast to Ali STM et al⁸, where it has been shown to increase from L1 to L5 (13.27 to 16.15 mm). Results similar to our study have been observed in another Indian study in 2015 conducted on cadavers¹⁵. When we compared the mean value with other races there was not much variation in the mean values of pedicle height of our study (Right: 12.68 mm and Left: 12.55 mm) and others (13.68 mm), Tan et al¹⁵ (Right: 13.03 mm and Left: 12.8 mm), Shiu-Bii Lien et al¹³ (Right: 13.68 mm Left: 13.5 mm), and by Alam MM et al⁷ (Right: 12.19 mm Left: 11.97 mm) as shown in Table-5.

Our study showed the results of pedicle length decreasing from L1 to L5 in both males and females

which shows a similar decreasing pattern in the mean of pedicle length of Momeni et al². The value of mean in our study is 6.85 mm on right side and 6.78 mm on left

side, which greatly differs from the mean pedicle length as recorded by Momeni et al² which is 9.04 mm on the right side and 9.2 mm on the left side.

Table No. 5: Comparison of mean pedicle width (PW), pedicle height (PH), pedicle length (PL), and transverse pedicle angle (TPA) of lumbar vertebrae with other studies.

Study	Year	Country	Material for Study	PW (Pedicle Width in mm)	PH (Pedicle Height in mm)	PL (Pedicle Length in mm)	TPA {Transverse Pedicle Angle in Degrees (°)}
Ebraheim et al	1996	USA	Dry bones	9.52	13.68		28.82°
Alon Wolf et al	2001	Israel	CT scan	8.4	14.8		12.42°
Mitra SR et al	2002	India	Cadaveric	8.72	15.21		11.24°
Singel TC et al	2004	India	Dry bones	10.28	14.65		Right: 14.07° Left: 13.4°
Tan et al	2004	Singapore	Dry bones	Right: 6.98 Left: 7.18	Right: 13.03 Left: 12.8		
Shiu-Bii Lien et al	2007	Taiwan	Dry bones, cadaveric	Right: 8.68 Left: 8.68	Right: 13.68 Left: 13.5		Right: 14.07° Left: 13.4°
Momeni et al	2019	Iran	CT scan	Right:10.08 Left:10.29	Right:12.66 Left:12.66	Right:9.04 Left:9.2	
Aruna N et al	2011	India	Dry bones	9.15	14.3		
Patil & Bhuiyan	2014	India	Dry bones	Right: 8.41 Left: 8.57	Right: 13.9 Left: 13.96		Right: 11.79° Left: 11.67°
Alam MM et al	2014	Pakistan	CT scan	Right:9.15 Left:9.25	Right:12.19 Left:11.97		Right:16.5° Left:16.93°
Present Study		Pakistan	CT scan	Right: 8.27 Left: 8.40	Right: 12.68 Left: 12.55	Right:6.85 Left:6.78	Right: 24.98° Left: 25.39°

In our study it was observed that the transverse pedicle angle (TPA) increased from L1 to L5 the exception being the right TPA at L2 in both males (16.8°) and females (16.2°) which showed a smaller angle. The transverse pedicle angle on the left side ranged from 16.7° to 39° with a mean of 24.98° and on the right it ranged from 16.8° to 38.4° with a mean of 24.54° in males. In females the transverse pedicle angle on the left side ranged between 17.8° and 41.90° with a mean of 25.79° and on the right side between 16.20° and 42.40° with a mean of 25.42°. The mean TPA recorded in our study is closer to the mean TPA as shown by a researcher where it has been recorded as 28.82°. However other studies conducted on different populations (Table-5) show a significant difference in the TPA; ours being higher as compared to Alon Wolf et al¹⁶ (12.42°), Mitra SR et al¹⁷ (11.24°), Shiu-Bii Lien et al¹³ (right: 14.07°, left: 13.4°) and Patil & Bhuiyan⁹ (right: 11.79°, left: 11.67°). Our study value cannot be generally applied on the entire Pakistani population as when compared with another study conducted by Alam MM et al¹ in Sindh province of Pakistan, there was a marked difference in the value of TPA in that region which was found to be 16.5° on the right side and 16.93° on the left side which is quite less than the TPA recorded in our study.

In our study, the p value was less than 0.05 when pedicle width and height of lumbar vertebrae of males

and females were compared, however, it was not significant for pedicle length and transverse pedicle angle. These results are somewhat similar to the study of Momeni et al² where difference of male and female value was significant for all the three parameters of pedicle width, height and length. In our study, when right and left sides of all lumbar vertebrae in males and females were compared, the p value ($p > 0.05$) was not significant for any morphologic parameters.

CONCLUSION

Knowledge of lumbar spine anatomy is essential for both surgeons and anaesthetists. This study provides a database of morphometric characteristics of pedicle of lumbar vertebrae, thus refining our knowledge of pedicle dimensions and orientation for clinical applications and as an aid for implant designing. Racial and gender differences must be considered while using international transpedicular screw system. This study will help in developing pedicular screws for lumbar vertebrae for Pakistani population.

Acknowledgements: The authors would like to acknowledge the services provided by the Radiology department, Radiographer Muhammad Nisar for his involvement in helping us to take the measurements and Mr. Kashif Siddique for his contribution in statistical analysis.

Author's Contribution:

Concept & Design of Study: Athar Maqbool
 Drafting: Zumirah Atiq, Saman Ali
 Data Analysis: Zarmeen Nadeem, Sadia Safdar, Abdullah Atiq
 Revisiting Critically: Athar Maqbool, Zumirah Atiq
 Final Approval of version: Athar Maqbool

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No.0014/22 dated 03.11.2022

REFERENCES

1. Singh V, Mishra SK, Trivedi A, Tandon S, Rajpoot MS. A computed tomography-guided analysis of pedicle morphology of the lower thoracic and lumbar spine in the Indian population: An observational study. *J Orthopaedics and Spine* 2021;9(1):25–30.
2. Momeni S, Heidari K, Gharib M, Mohammadi M, Golalipour M. The effect of gender on dimensions of lumbar vertebral pedicle using computed tomography. *J Babol Univ Med Sci* 2019; 21: 338 – 344.
3. Abbas J, Peled N, Hershkovitz I and Hamoud. Pedicle morphometry variations in individuals with degenerative lumbar spinal stenosis. Hindawi, *Bio Med Res Int* 2020;Article ID 7125914, 6 pages; <https://doi.org/10.1155/2020/7125914>.
4. Chughtai WN, Razzaque MA, Ahmad T, Nighat S, Tahir R and Ahmad B. Computerized tomographic based study of thoracic spine morphology in relevance to pedicle screw fixation in Pakistani population. *Pak J of Neurol Surg* 2021;25(2):199–206.
5. Grivas TB, Savvidou O, Binos S, Vynichakis G, Lykouris D, Skaliotis M, et al. Morphometric characteristics of the thoracolumbar and lumbar vertebrae in the Greek population: a computed tomography-based study on 900 vertebrae . *Hellenic Spine Society (HSS) 2017 Award Winner* 2019;14(2):<https://doi.org/10.1186/s13013-019-0176-4>.
6. Singh R, Srivastva SK, Prasath CSV, Rohilla RK, Siwach R, Magu NK. Morphometric measurements of cadaveric spine in Indian population and its clinical applications. *Asian Spine J* 2011;5(1): 20–34.
7. Alam MM, Waqas M, Shallwani H, Javed G. Lumbar morphometry: a study of lumbar vertebrae from a Pakistani population using computed tomography scans. *Asian Spine J* 2014;8(4):421–426.
8. Ali STM, Alamin FARM and Ayad CE. CT metric probe of the lumbar vertebral ratios among Jazan population (KSA). *IOSR J Dent Med Sciences (IOSR-JDMS)* 2021;20(6) Ser.5:01–12.
9. Patil DK and Bhuiyan PS. A morphometric study of the pedicles of dry human typical lumbar vertebrae. *Ind J Basic Applied Med Res* 2014;3(3):428–433.
10. Castro-Reyes CD, Morales-Avalos R, Vilchez-Cavazos F, De La Garza-Castro O, Salinas-Zertuche A, Aguirre POM, et al. Morphometric characteristics of lumbar vertebral pedicles in Mexican population. Implications for transpedicular lumbar fusion surgery. *J Morphol Sci* 2015;32(1):37–42.
11. Kaur K, Singh R, Prasath V, Magu S, Tanwar M. Computed tomographic-based morphometric study of thoracic spine and its relevance to anesthetic and spinal surgical procedures. *J Clin Orthopaedics Trauma* 2016;7:101 – 108.
12. Irie TY, Irie T, Orias AAE, Segami K, Iwasaki N, An HS, Inoue N. Three-dimensional distribution of CT attenuation in the lumbar spine pedicle wall 2021; <https://doi.org/10.1038/s41598-020-80676-5>.
13. Lien SB, Liou NH, Wu SS. Analysis of anatomic morphometry of the pedicles and the safe zone for through-pedicle procedures in the thoracic and lumbar spine. *Eur Spine J* 2007;16:1215–1222.
14. Tan SH, Teo EC, Chua HC. Quantitative three-dimensional anatomy of cervical, thoracic and lumbar vertebrae of Chinese Singaporeans. *Eur Spine J* 2004;13:137 – 146.
15. Layeeque KM and Ausavi SM. Morphometric study of the lumbar vertebral pedicle in Maharastrian population. *J Evolution Med Dent Sciences-JEMDS* 2015;4(31):5277 – 5285.
16. Wolf A, Shoham M, Michael S, Moshe R. Morphometric study of the human lumbar spine for operation–workspace specifications. *Spine* 2001;26(22):2472 – 2477.
17. Mitra SR, Datir SP, Jadhav SO. Morphometric study of the lumbar pedicle in the Indian population as related to pedicular screw fixation. *Spine* 2002;27(5):453 – 459.

Comparison of the Mean Duration of Analgesia of Intraperitoneal Bupivacaine and Ropivacaine Versus Placebo After Laparoscopic Cholecystectomy

Analgesia of
Bupivacaine
Versus Placebo
After
Cholecystectomy

Muhammad Waqid Bin Abdullah¹, Roshan Butt¹, Afzaal Baig¹, Syed Muhammad Talha Bukhari² and Zubair Ahmad¹ and Haseeb Ahmad¹

ABSTRACT

Objective: To compare the mean duration of analgesia of intraperitoneal bupivacaine, ropivacaine and placebo after laparoscopic cholecystectomy.

Study Design: Randomized controlled trial study.

Place and Duration of Study: This study was conducted at the department of Surgery, Services Hospital, Lahore from 27th of July 2021 to 26th of January 2022.

Methods: A total of 90 patients above the age of 18 years, undergoing laparoscopic cholecystectomy were included in this study and divided in to 3 equal groups, Group R (Ropivacaine group), Group B (Bupivacaine group) and Group S (Normal saline group) using computer generated randomization. Patients in Group R were administered 35 ml of 0.375% ropivacaine (131.25 mg), patients in Group B were administered 35 ml of 0.25% bupivacaine (87.5 mg) while patients in Group S were administered 35 ml of 0.9% normal saline. The primary outcome was set as the significance of difference in mean duration of analgesia between the groups in the post-operative period.

Results: The Mean $\pm$ SD of age in this study was 40.71 $\pm$ 12.23 years with an age range of 20 to 62 years. The ratio of male gender was higher (71.11%) compared to female gender (28.88%) in overall study population. The overall mean duration of surgery was 31.83 $\pm$ 6.13 hours. The results of primary outcome of the study show that mean duration of analgesia in post-operative period was significantly longer in Group R compared to Group B and Group S (13.43 $\pm$ 2.04, 7.56 $\pm$ 1.81 and 4.13 $\pm$ 1.1 respectively, p=0.000).

Conclusion: Intraperitoneal ropivacaine provides longer duration of analgesia compared to bupivacaine and placebo after laparoscopic cholecystectomy.

Key Words: Bupivacaine, Duration of analgesia, Laparoscopic cholecystectomy, Ropivacaine.

Citation of article: Abdullah MW, Butt R, Baig A, Bukhari SMT, Ahmad Z, Ahmad H. Comparison of the Mean Duration of Analgesia of Intraperitoneal Bupivacaine and Ropivacaine Versus Placebo After Laparoscopic Cholecystectomy. Med Forum 2024;35(4):46-50. doi:10.60110/medforum.350410.

INTRODUCTION

Gallstones are the leading cause of gastrointestinal surgeries globally, which cost the healthcare system a lot. Gallstone disease (GD) requires hospitalisation in 11–36% of patients. Genetic and environmental factors include obesity, metabolic disorders, dyslipidemia, fatty liver, lifestyle, gender, drinking, and family history are linked to gallstones.

¹. Department of Surgery, Services Hospital, Lahore.

². Department of Surgery, PKLI, Lahore.

Correspondence: Muhammad Waqid Bin Abdullah, Consultant Surgeon, Department of Surgery Services Hospital, Lahore.

Contact No: 03338002606

Email: waqidabdullah@gmail.com

Received: January, 2023

Accepted: April, 2023

Printed: April, 2024

Di Ciaula A detailed how cholesterol forms 80% of gallstones.¹ The liver uses laminated lipoproteins to release bile. Micelles are soluble molecules formed by gallbladder vesicle disintegration with bile salts. Their role in fat digestion and absorption is comparable to detergents. Mixed micelles carry cholesterol less efficiently than vesicles, creating supersaturation. Excess cholesterol in bile may crystallise cholesterol monohydrate. Gallstones are caused by hepatic cholesterol production in the form of lecithin and bile salts, gallbladder stasis, and bile concentration.² Note that liver fluke outbreaks may explain why brown pigment gallstones are more prevalent in Southeast Asia than in the US.³

Physical examinations may distinguish acute cholecystitis from mild biliary colic. Acute cholecystitis produces localised right upper quadrant discomfort, inflammation, and peritoneal abscess.⁴

Laparoscopic (LC) surgery has been the primary GD treatment since 1987. However, rising morbidity made it dubious in the early years. This was owing to severe post-operative discomfort, particularly immediately

after surgery. Neuropathy, inflammation, and incision trauma may accompany laparoscopic surgery. Stretching of the abdominal wall, peritoneal traction, and tissue injury are also related. This minimally invasive method is currently the worldwide gold standard for gall bladder removal and is utilised in over 90% of cholecystectomies. Modern LC offers less post-op discomfort, early healing, shorter hospital stays, and better cosmetic results.

As pain management following surgery is the most critical element of LC, opioids, NSAIDs, N2O, and intraperitoneal local anaesthetics have been suggested to treat it.⁵ Common opioid methods are effective analgesics. This effectiveness is dose-dependent and connected to nausea, vomiting, and respiratory depression. Studies indicate that infiltrating local anaesthetics such as lignocaine, bupivacaine, ropivacaine, and levobupivacaine with multimodal analgesics has more analgesic benefits than other approaches for post-op pain reduction.^{5,7,8} This strong analgesic speeds healing and reduces hospital stays.⁹

However, studies demonstrate that intraperitoneal spray of local anaesthetics does not reduce post-op discomfort or adverse outcomes in LC surgical operations as well as other methods.¹⁰

Long-acting amide group local anaesthetic ropivacaine prevents the splanchnic nerve from delivering pain signals to the central nervous system, lowering visceral discomfort during surgery. Ropivacaine is safe and effective for abdominal spraying after laparoscopic surgery and infiltration of local incisions. Infiltration with ropivacaine has been shown to reduce post-op discomfort in recent studies. Adjuvants prolong anaesthesia and enhance analgesia.¹¹

As mentioned above, LC surgery is the most recommended technique for GD, and post-op pain relief is crucial to reducing morbidity and ensuring success. Our local health care facilities utilise various medications and procedures to reduce post-op discomfort. International literature compares ropivacaine to other local anaesthetics, but local data is few. Thus, we aimed to examine the mean duration of intraperitoneal bupivacaine, ropivacaine, and placebo following LC cholecystectomy in our local population. This research will contribute to local data and assist surgeons choose better post-op pain treatment choices for LC cholecystectomy patients.

METHODS

The Department of Surgery, Services Hospital, Lahore conducted this 6-month randomised control trial from July 27, 2021 to January 26, 2022. The sample size was calculated using these assumptions: The ropivacaine group had a post-op analgesic duration of 13.47 ± 1.38 hours, whereas the placebo group had 4.47 ± 0.86 hours (confidence interval=95%, Power=90%).¹² The sample size was 90 patients, 30 per group. This research

randomly assigned 90 patients over 18 years old having LC cholecystectomy to three equal groups, Group R (Ropivacaine), Group B (Bupivacaine), and Group S (Normal saline). Patients with VAS pain >3, right hypochondrium discomfort, and pericholecystic edoema underwent LC cholecystectomy. The diagnosis was radiologically confirmed. Group R got 35 ml of 0.375% ropivacaine (131.25 mg), Group B 0.25% bupivacaine (87.5 mg), and Group S 0.9% normal saline.

Patients with common bile duct (CBD) stones, dilated CBD, acute cholecystitis, bile duct exploration, T-drain insertion, or surgical complications were excluded. The research also excluded gall bladder cancer and amide local anaesthetic sensitivity individuals. After gall bladder removal, hemostasis was performed and all fluids, blood, and CO₂ were sucked. It was then time for intraperitoneal instillation onto subdiaphragmatic suprahepatic and gallbladder fossa surfaces. The liver surface (20 ml) and gallbladder fossa (5 ml) received the drug. The patient remained in the right lateral trendelenberg position for 10–15 minutes. The remaining 10 ml of medication solution was infiltrated at the port. Each patient received 1.5 mg/kg diclofenac and 15 mg/kg paracetamol intravenously before extubation. The surgeon performed the operations with at least five years of expertise. Each patient's demographics and medical history were collected. Each patient in all 3 groups had analgesia duration determined.

Visual Analogue Scale measured pain. From patient transfer to rescue analgesia for post-op discomfort (VAS >3), analgesia duration was documented. The main result was the significance of mean analgesic duration in intraperitoneal bupivacaine, ropivacaine, and placebo groups following LC cholecystectomy. Before starting the trial, the hospital's ethics committee approved it. Patients were informed of the research purpose and gave signed permission. Data was analysed using SPSS 25. Quantitative factors were reported as Mean $\pm$ SD, whereas qualitative variables were presented as frequency and percentage. A one-way ANOVA test was used to determine the significance of differences between study groups, with p-value < 0.05 being significant.

RESULTS

The Mean $\pm$ SD of age in this study was 40.71 ± 12.23 years with an age range of 20 to 62 years. The number of male gender was 64 (71.11%) while female gender was 26 (28.88%) in overall study population. The overall mean duration of surgery was 31.83 ± 6.13 hours. The group wise details of demographics and clinical history is shown in Table-I.

Table No. 1: Demographic and clinical history n=90

Demographic and clinical history		Group R n=30	Group B n=30	Group S n=30
Age (Mean±SD) years		41.6±13.03	40.8±11.62	39.73±12.35
Gender	Male n (%)	21 (70)	20 (66.66)	23 (76.66)
	Female n (%)	9 (30)	10 (33.33)	7 (23.33)
BMI≥30 n (%)		13 (43.33)	12 (40)	14 (46.66)
Diabetes mellitus n (%)		14 (46.66)	12 (40)	11 (36.66)
History of cholelithiasis (Mean±SD) months		6.2±2.41	5.73 ±2.27	6.93±1.89
Duration of surgery (Mean±SD) min		32.53±6.71	31.36±5.81	30.93±7.63

The results of primary outcome of the study show that mean duration of analgesia (time needed for the first dose of rescue analgesia) was significantly higher in Group R compared to Group B and Group S as shown in Table-2.

Table No. 2: Mean duration of analgesia in the post-op period n=90

Primary outcomes	Group R n=30	Group B n=30	Group S n=30	p-value
Duration of analgesia (Mean±SD) hours	13.43±2.04	7.56±1.81	4.13±1.1	0.000

DISCUSSION

Less invasive surgical techniques like LC are being employed more frequently in recent years with positive results. Nonetheless, some patients experience complaints of shoulder and abdominal pain after laparoscopic surgery, which delay their recovery and hospital departure. Furthermore, postoperative discomfort may develop into chronic pain if it is not appropriately managed. Opioids are used to treat pain, but they have specific adverse effects that can impede healing. Therefore, to reduce postoperative pain during laparoscopic surgery, laparoscopic surgeons are now interested in exploring intraperitoneal administration of local anesthetic.¹³

In a study conducted by Ahmed A and Ahmed M in health care centers of Pakistan where health facilities were at lower levels, the post-op analgesic efficacy of intraperitoneal administration of ropivacaine 0.5% (dosage of 2 mg/kg) was compared with the standard procedure of analgesia routinely used in open

cholecystectomy in that hospital. The results of this study showed significantly lesser pain in ropivacaine group compared to the control group at 1, 6 and 24 hours post operatively (p-value<0.05). There were also significantly lesser rate of adverse events in the study group compared to controlled group (38% Vs 62%, p-value<0.05).¹⁴

Mannan A et al planned a randomized controlled trial to determine the analgesic efficacy of intraperitoneal bupivacaine use in patients undergoing LC cholecystectomy. The results favored the intraperitoneal use of bupivacaine due to its prolonged analgesic effect in shape of both longer time to need rescue analgesic (16.53 ±2.65 Vs 0.99 ±0.51 hours, p<0.001) and amount of rescue analgesic used (31.00±14.98 mg Vs 124.80 ±26.68 mg tramadol, p<0.001) in the bupivacaine group compared to placebo group.¹⁵

Das NT compared intraperitoneal infiltration of ropivacaine (0.375%), bupivacaine (0.25%) and placebo in terms of relieving the post-op pain in LC cholecystectomy. This study showed a mean duration of analgesia with ropivacaine as 13.47±1.38 hours, with bupivacaine as 7.93±1.44 hours and with placebo as 4.47±0.86 hours. The study therefore concluded that ropivacaine is significantly more effective than bupivacaine and placebo in providing long term analgesia in post-op period.¹²

Shan R conducted a randomized controlled study to determine the decrease in post-op pain and time to need for rescue analgesia with intraperitoneal induction of ropivacaine (0.5%) compared to bupivacaine (0.5%) while carrying out LC cholecystectomy. The results showed that the pain score on VAS was lesser in the ropivacaine group compared to bupivacaine group. Similarly time to need for rescue analgesic was also longer in patients where ropivacaine was used. The study concluded that intraperitoneal administration of ropivacaine is more efficient mean of managing postoperative pain and it offers a prolonged analgesia.¹⁵ Shrey S compared the intraperitoneal administration of ropivacaine (0.75%) and bupivacaine (0.5%) for their post-op analgesic efficacy after LC cholecystectomy. The pain score in these two study groups was calculated on VAS which showed that the patients in the ropivacaine group had significantly longer period to need the rescue analgesia compared to patients in bupivacaine group (295.38 ± 74.15 Vs 148.04 ± 53.47, p= 0.0001). The study also reported that in ropivacaine group, 56.6% patients didn't need the rescue analgesia during the study while this was true for 26.6% of the patients in the bupivacaine group (p=0.019). There was lesser score assessed on VAS in ropivacaine compared to bupivacaine group at the post-op follow up time for pain assessment at 8 hours (p= 0.032). The researcher concluded that ropivacaine is a better intraperitoneal option than bupivacaine for managing postoperative

pain because it lasts longer, offers better quality analgesia up to 8 hours postoperatively, requires less rescue analgesic during the postoperative period, and has fewer adverse effects.¹⁶

The Mean $\pm$ SD of age in our study was 40.71 $\pm$ 12.23 years with an age range of 20 to 62 years. The number of male gender was 64 (71.11%) while female gender was 26 (28.88%) in overall study population. The overall mean duration of surgery was 31.83 $\pm$ 6.13 hours. The results of primary outcome of the study show that mean duration of analgesia (time needed for the first dose of rescue analgesia) in post-op period was significantly longer in Group R compared to Group B and Group S (13.43 $\pm$ 2.04, 7.56 $\pm$ 1.81 and 4.13 $\pm$ 1.1 respectively, $p=0.000$). Hence these results prove that intraperitoneal use of amide local anesthetics is useful in lowering the post-op pain in patients undergoing laparoscopic cholecystectomy. Moreover, these results also show that intraperitoneal ropivacaine is significantly more effective in providing prolonged analgesic effects in these patients as compared to bupivacaine and placebo. These results are in line with the studies discussed earlier and therefore adds useful data on this subject.¹²⁻¹⁷

The major limitation of our study is the small sample size. Moreover, we worked only on one parameter of post-op outcomes. Future studies with larger sample size and more parameters contributing in the successful surgical procedure will add up to this useful data for laparoscopic surgeons working in our local health care set ups.

CONCLUSION

The study concludes that intraperitoneal ropivacaine provides longer duration of analgesia compared to bupivacaine and placebo after laparoscopic cholecystectomy. The use of ropivacaine will be helpful in our local surgical practices in improving the outcomes thereby contributing to successful surgical procedures.

Acknowledgments: The assistance of paramedic staff during procedures and helping in maintaining the patient's data is acknowledged.

Author's Contribution:

Concept & Design of Study:	Muhammad Waqid Bin Abdullah
Drafting:	Roshan Butt, Afzaal Baig
Data Analysis:	Syed Muhammad Talha Bukhari, Zubair Ahmad, Haseeb Ahmad
Revisiting Critically:	Muhammad Waqid Bin Abdullah, Roshan Butt
Final Approval of version:	Muhammad Waqid Bin Abdullah

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No. ERB/430/1023/SIM dated 05.03.2021

REFERENCES

1. Di Ciaula A, Portincasa P. Recent advances in understanding and managing cholesterol gallstones. *F1000 Res* 2018;7:F1000 Faculty Rev-1529.
2. Macierzanka A, Torcello-Gómez A, Jungnickel C, Maldonado-Valderrama J. Bile salts in digestion and transport of lipids. *Adv Colloid Interface Sci* 2019;274:102045.
3. Saijuntha W, Sithithaworn P, Kiatsopit N, Andrews RH, Petney TN. Liver Flukes: Clonorchis and Opisthorchis. *Adv Exp Med Biol* 2019;1154:139-180.
4. Nguyen CL, van Dijk A, Smith G, Leibman S, Mittal A, Albania M, et al. Acute cholecystitis or simple biliary colic after an emergency presentation: why it matters. *ANZ J Surg* 2020;90(3):295-9.
5. Akhtar MS, Khan N, Qayyum A, Khan SZ. Cost difference of enhanced recovery after surgery pathway vs. Conventional care In Elective Laparoscopic Cholecystectomy. *J Ayub Med Coll Abbottabad* 2020;32(4):470-475.
6. Wennmacker SZ, Dijkgraaf MGW, Westert GP, Drenth JPH, van Laarhoven CJHM, de Reuver PR. Persistent abdominal pain after laparoscopic cholecystectomy is associated with increased healthcare consumption and sick leave. *Surg* 2018;163(4):661-666.
7. Bougie O, Blom J, Zhou G, Murji A, Thurston J. Use and misuse of opioid after gynecologic surgery. *Best Pract Res Clin Obstet Gynaecol* 2022;85(Pt B):23-34.
8. Siriwardana RC, Kumarage SK, Gunathilake BM, Thilakarathne SB, Wijesinghe JS. Local infiltration versus laparoscopic-guided transverse abdominis plane block in laparoscopic cholecystectomy: double-blinded randomized control trial. *Surg Endosc* 2019;33(1):179-183.
9. Ergin A, Aydin MT, Çiyiltepe H, Karip AB, Fersahoğlu MM, Özcabi Y, et al. Effectiveness of local anesthetic application methods in postoperative pain control in laparoscopic cholecystectomies; a randomised controlled trial. *Int J Surg* 2021;95:106134.
10. Yong L, Guang B. Intraperitoneal ropivacaine instillation versus no intraperitoneal ropivacaine instillation for laparoscopic cholecystectomy: A systematic review and meta-analysis. *Int J Surg* 2017;44:229-243.

11. Athanasiou S, Hadzillia S, Pitsouni E, Kastanias S, Douskos A, Valsamidis D, et al. Intraoperative local infiltration with ropivacaine 0.5% in women undergoing vaginal hysterectomy and pelvic floor repair: Randomized double-blind placebo-controlled trial. *Eur J Obstet Gynecol Reprod Biol* 2019;236:154-159.
12. Das NT, Deshpande C. Effects of Intraperitoneal Local Anaesthetics Bupivacaine and Ropivacaine versus Placebo on Postoperative Pain after Laparoscopic Cholecystectomy: A Randomised Double Blind Study. *J Clin Diagn Res* 2017; 11(7):UC08-UC12.
13. Govil N, Kumar P. Intraperitoneal Levobupivacaine with or without Clonidine for Pain Relief after Laparoscopic Cholecystectomy: A Randomized, Double-blind, Placebo-controlled Trial. *Anesth Essays Res* 2017;11(1):125-128.
14. Ahmed A, Ahmed M. Intraperitoneal infiltration of ropivacaine for post-operative analgesia in open cholecystectomy. *Pak Armed Forces Med J* 2017;67(6):1038-43.
15. Manan A, Khan AA, Ahmad I, Usman M, Jamil T, Sajid MA. Intraperitoneal bupivacaine as post-laparoscopic cholecystectomy analgesia. *J Coll Physicians Surg Pak* 2020;30(1):9-12.
16. Sharan R, Singh M, Kataria AP, Jyoti K, Jarewal V, Kadian R. Intraperitoneal Instillation of Bupivacaine and Ropivacaine for Postoperative Analgesia in Laparoscopic Cholecystectomy. *Anesth Essays Res* 2018;12(2):377-380.
17. Shrey S, Singam A, Latwal BS, et al. A comparative study of intraperitoneal ropivacaine and bupivacaine for postoperative analgesia in laparoscopic cholecystectomy. *J Evolution Med Dent Sci* 2020;9(04):200-205.

Effects of Deep Breathing Exercises on Old Versus Young Patients Undergoing Valve Replacement Surgery

Deep Breathing
Exercises on Old
VS Young

Nashmiya Shahid, Munaza Arwa, Zunaira Arshad, Rehana Niazi, Nazeer Mehrvi
and Abbas Jamil

ABSTRACT

Objective: To determine the effects of deep breathing exercises in old versus young patients undergoing Valve Replacement Surgery.

Study Design: Quasi-Experimental Study

Place and Duration of Study: This study was conducted at the Hameed Latif Hospital, Gulab Devi Hospital, and Mayo Hospital Lahore from 15-03-2022 until 15-8-2022.

Methods: A sample of 66 patients was taken using a non-probability purposive sampling technique. The sample was divided into two groups of young (aged 18-45) and old patients (aged above 50) with 33 individuals in each group. Deep breathing exercises (diaphragmatic, pursed lip, and segmental breathing) were performed on each patient in 6 sessions, 3 per week. Each exercise was performed for 5-10 minutes with a 1-2 second pause. The oxygen saturation and functional capacity were measured using a pulse oximeter and dyspnea index before and after DBE.

Result: There was a significant difference between oxygen saturation of old patients of VRS post-intervention with a mean value of -1.454 ± 1.348 with a p-value less than 0.005. However, the post-intervention oxygen saturation of young patients of VRS showed marked improvement as compared to the old patients with a mean value of -2.696 ± 1.722 with p value less than 0.005. **ts:**

Conclusion: The findings of the current study showed that deep breathing exercises were effective in improving oxygen saturation in both young and old patients with marked improvement in young patients undergoing valve replacement surgery.

Key Words: Deep breathing exercises, Valve replacement surgery, Oxygen saturation, Dyspnea Index.

Citation of article: Shahid N, Arwa M, Arshad Z, Niazi R, Mehrvi N, Jamil A. Effects of Deep Breathing Exercises on Old Versus Young Patients Undergoing Valve Replacement Surgery. Med Forum 2024;35(4):51-54. doi:10.60110/medforum.350411.

INTRODUCTION

Valve replacement surgery has become the most commonly opted-for surgical treatment for patients with severe valvular heart disease. For these patients, mechanical and bioprosthetic heart valve replacements have been a common choice.⁽¹⁾ Nevertheless, there are hazards involved with heart surgery even if it incorporates the usage of cutting-edge technology to minimize the risks.⁽²⁾

Early in the postoperative phase, patients experience restrictive respiratory anomalies, including decreased

lung capacities and poor gas exchange. Complications include atelectasis, bronchospasm, dyspnea, cough, pneumonia, respiratory failure, and worsening of lung disease.⁽³⁾

Post-operative morbidity and mortality tend to increase in elderly patients undergoing valve replacement surgery. Although operative factors and excessive comorbid burdens play their part, age qualifies as the sole important risk factor for increased risk during and after valve replacement surgery.⁽⁴⁾ In contrast, young patients display good morphologic and functional results according to follow-up reports by MRI and echocardiography.⁽⁵⁾

Different breathing exercises that may or may not require mechanical devices are suggested following cardiac surgery.⁽⁶⁾ These breathing exercises are a part of the postoperative rehabilitation plan in hospitals to prevent postoperative pulmonary complications and their unwanted effects. Increasing the lung volume typically reduced in the postoperative period is the primary goal of deep breathing exercises. Although coughing and forced expiratory techniques are performed on patients in clinical settings to help them

Department of Physical Therapy, Rashid Latif, Medical College, (RLMC), Lahore.

Correspondence: Dr. Nashmiya Shahid, Physical Therapist, Department of Physical Therapy Rashid Latif Medical College (RLMC), Lahore.
Contact No: 0314 8546239
Email: nashmiya.s@yahoo.com

Received: January, 2023
Accepted: April, 2024
Printed: April, 2024

with mucus clearance, no single exercise is considered the most appropriate deep breathing technique.⁽⁷⁾

METHODS

Purposive sampling with non-probability was used in this quasi-experimental investigation. The Institutional Review Board (IRB) of Rashid Latif Medical College provided the ethical permission (Certificate Reference Number IRB/2022/055). With 33 individuals in each group, a sample size of 66 was determined using the formula $n = \sigma^2(Z_{1-\alpha/2} + Z_{1-\beta})^2 / (\mu_0 - \mu_a)$. From 1503–2022 to 15–8–2022, the study was carried out in the Mayo Hospital in Lahore, the Gulab Devi Hospital, and the Hameed Latif Hospital. We obtained informed permission from each individual. There were two organizations established. Group B had elderly patients, whereas group A featured younger individuals. The requirements for participation were being older than eighteen and having valve replacement surgery. Patients with angina at rest prior to surgery, those requiring more than 15 hours of artificial ventilation following surgery, those receiving continuous positive airway pressure (CPAP) treatment, those receiving aorta balloon treatment, and those experiencing a pneumothorax necessitating drainage therapy were excluded from consideration.

Each patient had six sessions, spread over two weeks, of deep breathing exercises, which included segmental, pursed lip, and diaphragmatic breathing. Every exercise was done for 510 minutes, pausing every 1-2 seconds. Pre- and post-intervention functional ability and oxygen saturation of each patient were evaluated using the Dyspnea Index and Pulse Oximeter. Demographic information was recorded before the intervention plan was given. Every patient's hospital records was examined for surgical history and comorbidities. Two weeks later, the oxygen saturation and functional capacity were assessed once more, and the findings were recorded.

Data Analysis: Version 25 of SPSS for Windows was used to analyze the data. Frequency tables and percentages were used to display all qualitative factors. The McNemar Test was used to determine whether the data were normal. To measure the difference between the two groups, the parametric test (paired-T test), a

mean comparison test, was chosen. For graphical display, quantitative values were shown as mean + SD using a histogram.

RESULTS

In total of 66 participants, 33 were young and 33 were old. The table for age of participants and the pie charts representing gender distribution for each group are as follows:

Table No. 1: Age of respondents:

		Frequency	Percent	Cumulative Percent
Valid	Young age	33	50.0	50.0
	Old age	33	50.0	100.0
	Total	66	100.0	

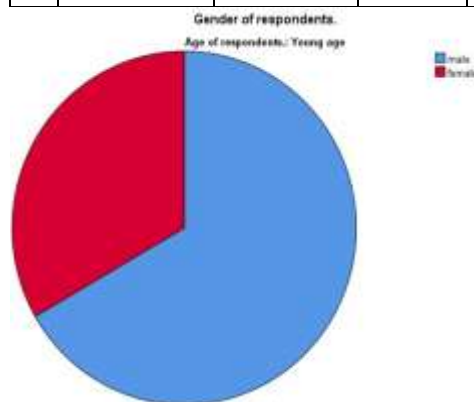


Figure No. 1: Pie chart of young male and female patients

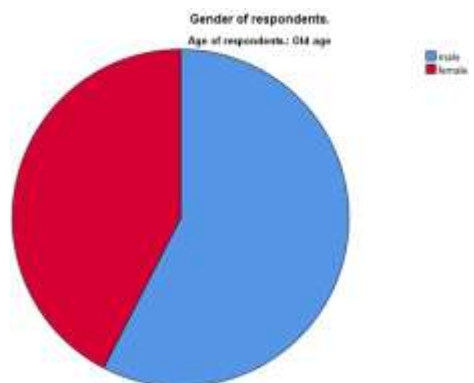


Figure No. 2: Pie chart of old male and female patients

Table No. 2: Oxygen Saturation

			Mean	N	Std. Deviation	Significance
Pair 1	Young age	Before exercise (deep breathing) Oxygen saturation	91.4242	33	1.73260	0.000
		After exercise (deep breathing) Oxygen saturation.	94.1212	33	2.23268	
Pair 1	Old age	Before exercise (deep breathing) Oxygen saturation	91.2424	33	2.31881	0.000
		After exercise (deep breathing) Oxygen saturation.	92.6970	33	2.54319	

The paired sample t-test was used to measure any difference between pre- and post-values of oxygen saturation of young and old participants. It showed a significant difference between oxygen saturation values of young participants with valve replacement surgery without non-invasive ventilation after deep breathing exercises.

The Dyspnea Index (DI) was also recorded for each participant before and after the intervention.

The results also showed marked improvements in young participants as compared to older ones.

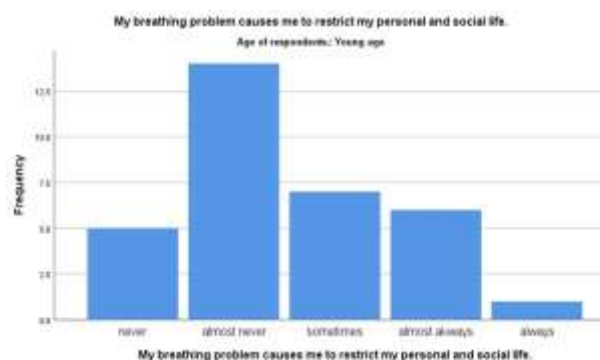


Figure No. 3: The response of young patients to the Dyspnea Index

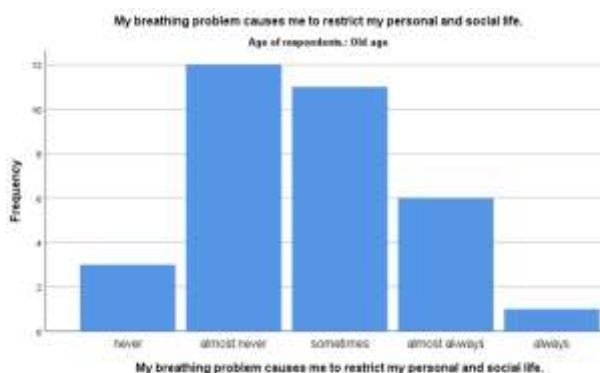


Figure No. 4: The response of old patients to the Dyspnea Index

DISCUSSION

In this study, deep breathing exercises were far more effective in young participants with valve replacement surgery as compared to the older participants. The mean scores given by paired sample t-test were significantly different in the young population pre- and post-intervention, while the older population showed no marked differences. The pre-and post-intervention responses of young patients according to the Dyspnea Index also showed marked improvement, but the differences between the pre-and post-intervention responses of older patients were not that significant. The clinical findings of this research show that deep breathing exercises are way more effective in improving the oxygen saturation of young patients after

valve replacement surgery as compared to older patients.

In a previous study that was conducted by Urell et al.⁽⁸⁾ in 2011, the clinical efficacy of deep breathing exercises on patients of cardiac surgery was checked. The findings of this clinical trial confirmed that an interventional program of deep breathing exercises at a greater intensity improves pulmonary symptoms in the initial postoperative days. However, for my study, two age groups of patients undergoing valve replacement surgery were selected. This was performed to exhibit the marked differences in the effects of deep breathing exercises in young and old patients.

Another study headed by Renault et al.⁽⁹⁾ explored the comparison of the effects of deep breathing exercises (DBE) and flow-oriented incentive spirometry in patients who underwent coronary artery bypass grafting (CABG). The study concluded that CABG patients who followed these interventions postoperatively did not exhibit significant improvement. In contrast, young patients with valve replacement surgery who performed deep breathing exercises showed significant improvement in my study.

To assess the effects that pre-and postoperative inspiratory muscle training can have on the length of hospital stay after surgery and the lung function of patients with cardiac surgery, a study was done in 2016 by Neto et al.⁽¹⁰⁾ It was deduced that inspiratory muscle training is an effective pre- and postoperative intervention for patients with heart surgery. Comparatively, my study assessed the postoperative respiratory performance after DBE was performed in young and old patients with valve replacement surgery, and it found a substantial improvement in the young participants.

A randomized clinical trial carried out in 2014 by Kazem et al.⁽¹¹⁾ assessed the effects respiratory physiotherapy can have in reducing the risks of postoperative pulmonary problems, both pre-and post-operatively. The study concluded that it is advised to participate in a pulmonary physiotherapy program before cardiac surgery to minimize postoperative pulmonary complications. Conversely, my study explored the effects of DBE postoperatively in two different age groups with substantial improvement in the lung function of the young population.

Because of this study's limited sample size, it is impossible to generalize the findings to a larger population. Furthermore, there were unequal numbers of male and female participants in each of the two age groups. The fact that this study was limited to three settings and one city was another drawback. Patients' answers might have varied depending on their level of literacy and whether they were experiencing postoperative depression. Some participants may have over- or underreported their symptoms, which could have biased the clinical findings.

CONCLUSION

The clinical findings of the current study showed that deep breathing exercises were effective in improving oxygen saturation in both young and old patients with marked improvement in young patients undergoing valve replacement surgery.

Author's Contribution:

Concept & Design of Study: Nashmiya Shahid
 Drafting: Munaza Arwa, Zunaira Arshad
 Data Analysis: Rehana Niazi, Nazeer Mehrvi, Abbas Jamil
 Revisiting Critically: Nashmiya Shahid, Munaza Arwa
 Final Approval of version: Nashmiya Shahid

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No.IRB/2022/055 dated 17.10.2021

REFERENCES

- Kidane AG, Burriesci G, Cornejo P, Dooley A, Sarkar S, Bonhoeffer P, et al. Current developments and future prospects for heart valve replacement therapy. *Journal of Biomedical Materials Research Part B: Applied Biomaterials: An Official J Society Biomaterials, The Japanese Society Biomaterials, The Australian Society for Biomaterials and the Korean Society for Biomaterials* 2009;88(1):290-303.
- Rodrigues SN, Henriques HR, Henriques MA. Effectiveness of preoperative breathing exercise interventions in patients undergoing cardiac surgery: A systematic review. *Revista Portuguesa de Cardiologia (English Ed)*. 2021;40(3):229-44.
- Westerdahl E. Optimal technique for deep breathing exercises after cardiac surgery. *Minerva Anesthesiol* 2015;81(6):678-83.
- Mehta RH, Eagle KA, Coombs LP, Peterson ED, Edwards FH, Pagani FD, et al. Influence of age on outcomes in patients undergoing mitral valve replacement. *Annals Thoracic Surg* 2002;74(5):1459-67.
- Arnold R, Ley-Zaporozhan J, Ley S, Loukanov T, Sebening C, Kleber JB, et al. Outcome after mechanical aortic valve replacement in children and young adults. *Annals Thoracic Surg* 2008;85(2):604-10.
- Lomi C, Westerdahl E. Physical therapy treatment after cardiac surgery: a national survey of practice in Greece. *J Clin Exp Cardiol* 2013;7:2.
- Urell C. Lung function, respiratory muscle strength and effects of breathing exercises in cardiac surgery patients: *Acta Universitatis Upsaliensis*; 2013.
- Urell C, Emtner M, Hedenström H, Tenling A, Breidenskog M, Westerdahl E. Deep breathing exercises with positive expiratory pressure at a higher rate improve oxygenation in the early period after cardiac surgery—a randomised controlled trial. *Eur J Cardio-Thoracic Surg* 2011;40(1):162-7.
- Renault JA, Costa-Val R, Rosseti MB, Houri Neto M. Comparison between deep breathing exercises and incentive spirometry after CABG surgery. *Brazilian J Cardiovascular Surg* 2009;24:165-72.
- Gomes Neto M, Martinez BP, Reis HF, Carvalho VO. Pre-and postoperative inspiratory muscle training in patients undergoing cardiac surgery: systematic review and meta-analysis. *Clinical Rehabilitation* 2017;31(4):454-64.
- Kazem SS, Yaghoub S, Ali T, Hamed SJ, Jamal S, Leyla S. Pulmonary physiotherapy effect on patients undergoing open cardiac surgery. *Russian Open Med J* 2014;3(3):306.

Pre-OP Shortening Assessment and Per OP Shortening Needed In Developmental Dysplasia of the Hip (DDH) Surgery in Children

Imran Khan, Qaisar Khan, Abbas Ali, Safeer Ullah, Rizwan Ullah and Ihtisham Anjum

ABSTRACT

Objective: This retrospective study examines the role of pre-operative shortening evaluation in surgical planning and open reduction correction in pediatric patients with hip developmental dysplasia.

Study Design: A retrospective research

Place and Duration of Study: This study was conducted at the Department of Orthopedic, Khyber Teaching Hospital (KTH), Peshawar from January 2021 to January 2022.

Methods: A retrospective research examines pre-operative shortening assessments and peri-operative shortening correction in hip developing dysplasia surgery. The study included 95 hip-developmental dysplasia-diagnosed children aged 2–10.

Results: The research included 95 individuals diagnosed with hip dysplasia, with a predominant proportion of females (50.53%) and the majority falling between the age range of 5-7 years (42.10%). The pre-operative X-ray measurements revealed a mean Hilgenreiner's angle of 28.5 degrees and an acetabular index angle of 30.8 degrees. The majority of patients (68.42%) were classed as mild hip dysplasia. A strong negative association was seen between pre-operative shortening and peri-operative correction, showing that a larger pre-operative shortening was associated with a greater surgical correction.

Conclusion: This study sheds light on pediatric hip dysplasia surgery. Open reduction with capsulorrhaphy and osteotomy was performed in most moderate hip dysplasia patients.

Key Words: Developmental Dysplasia of the Hip (DDH), pre-operative assessment, peri-operative correction.

Citation of article: Khan I, Khan Q, Ali A, Safeer Ullah, Rizwan Ullah, Anjum I. Pre-OP Shortening Assessment and Per OP Shortening Needed In Developmental Dysplasia of the Hip (DDH) Surgery in Children. Med Forum 2024;35(4):55-58. doi:10.60110/medforum.350412.

INTRODUCTION

Developmental Dysplasia of the Hip (DDH) presents a substantial orthopedic obstacle in children, impeding the normal growth of the hip joint^[1]. This disorder, which is marked by an anomalous development of the hip joint, may result in functional disability and enduring problems if not quickly and properly treated^[2]. To address severe cases of developmental dysplasia of the hip (DDH), open reduction is already a therapy treatment option in modern surgery. Efficacy, however, depends on exact pre-operative planning. That is, preventive measures are often taken prior to the

operation in order to ameliorate pre-existing hip shortening^[3,4].

This retrospective study was carried out to pick at pre-operative shortening and also to guide surgical planning using open reduction in gathering children suffering from DDH (developmental dysplasia of the hip). The translation of films is presented in Tables 1 and 2. The 95 children in this group ranged from 2 to 10 years of age. Our emphasis here is to observe these meaningful indicators. Rigour might help lead to a method of treatment for DDH which is both more effective and less damaging. This will directly benefit the afflicted child and be more humane as well. Recent years have seen an increasing number of articles and academic reports on the necessity for rigorous preoperative planning in orthopedic procedure including DDH surgery. Owing to the development of imaging technologies such as X-ray, orthopedic surgeons now have a powerful tool for evaluating hip dysplasia. So it becomes essential to know the degree of pre-operative shortening, not only used as a guide for surgical technique but also able to predict necessary correction during operation^[5,6]. Furthermore, this research aims to bridge an important gap in modern orthopaedic studies by examining how pre-operative assessments of

Department of Orthopedic, Khyber Teaching Hospital (KTH), Peshawar.

Correspondence: Abbas Ali, Assistant Professor of Orthopedic, Khyber Teaching Hospital (KTH), Peshawar.

Contact No: 0332 2333363

Email: abbasali.smc@gmail.com

Received: January, 2023

Accepted: August, 2023

Printed: April, 2024

shortening relate to the degree of correction achieved through open reduction surgery. In doing so, we hope to arm orthopedic surgeons with empirically constituted knowledge as a blueprint for decision-making and intervention. By sharing our discoveries with colleagues in related disciplines, we may be able to encourage their use of similar methods ; and, most importantly of all-together raise the battle effectiveness of treatments for developmental dysplasia of the hip in children because these pioneering research findings can form a solid basis for future work.

METHODS

This research employs a retrospective methodology to analyze preoperative assessments of limb length discrepancy and perioperative correction of disproportion in surgery for developmental dysplasia of the hip. Relevant material is extracted through a systematic evaluation of data secured from medical records, radiology reports, and operative notes. The study involves 95 youthful patients, ranging in age from 2 to 10 years, who received a diagnosis of developmental dysplasia of the hip. These individuals underwent open reduction surgery at Khyber Teaching Hospital from January 2021 to January 2022. Demographic particulars including age, gender, and pertinent medical history are documented. Anteroposterior and lateral X-ray images are used to evaluate hip dysplasia and measure the degree of preoperative disproportion. Measurements include Hilgenreiner's and acetabular indices. Examination of intraoperative data determines the precise open reduction technique applied and any supplementary procedures conducted. Two orthopedic physicians independently review all radiographs obtained before surgery to validate their accuracy and reliability. Preoperative disproportion is quantified, and the severity of hip dysplasia is classified according to

recognized standards. Postoperative X-rays are analyzed to assess the extent of disproportion correction achieved during open reduction.

Statistical Analysis: Demographic data and preoperative measures are employed to construct descriptive statistics such as means, standard deviations, and ranges. Correlation analyses evaluate the association between preoperative disproportion and perioperative rectification. Statistical significance is established using appropriate tests like Pearson's correlation coefficient or Spearman's rank correlation test.

Ethical Considerations: The research complies with ethical guidelines, ensuring patient anonymity and confidentiality. Approval from the Institutional Review Board of Khyber Teaching Hospital, Peshawar was acquired before data collection.

RESULTS

The study included 95 individuals diagnosed with hip dysplasia, predominantly female (50.53%) mostly between 5-7 years old (42.10%). The most common medical history was breech presentation in 15 cases and ligamentous laxity in 5 cases. Preoperative X-ray measurements revealed a mean Hilgenreiner's angle of 28.5 degrees and acetabular index of 30.8 degrees. Most patients (68.42%) were classified as mild hip dysplasia. Each patient underwent open reduction, sometimes along with additional treatments such as capsulorrhaphy (15.8%) and osteotomy (10.5%). Postoperative X-ray measurements demonstrated significant improvement in Hilgenreiner's angle (9.2 degrees) and acetabular index (15.6 degrees) along with an average correction of 19.3mm in perioperative disproportion. A robust inverse relationship was seen between preoperative disproportion extent and degree of perioperative rectification, implying greater preoperative disproportion associated with more substantial correction during surgery.

Table No. 1: Patient Distribution by Age, Gender, and Medical History

Age Group (years)	Total Patients (n=95)	Male (M)	Female (F)	Medical History Present
2-4 years	25(26.32%)	12(48%)	13(52%)	Ligamentous laxity: 5 Family history: 8
5-7 years	40(42.10%)	20(50%)	20(50%)	Breech presentation: 15 Premature birth: 5
8-10 years	30(31.58%)	15(50%)	15(50%)	Previous hip issues: 10 Other orthopedic condition: 5
Total	95(100%)	47(49.47%)	48(50.53%)	-

Table No. 2: Pre-operative X-ray Measurements

X-ray Parameter	Mean $\pm$ SD	Range (Min-Max)
Hilgenreiner's Angle (degrees)	28.5 $\pm$ 4.2	20.3 - 36.7
Acetabular Index Angle (degrees)	30.8 $\pm$ 3.5	25.1 - 38.2
Severity of Hip Dysplasia		
Mild	15(15.78%)	
Moderate	65(68.42%)	
Severe	15(15.78%)	

Table No. 3: Surgical Details and Intraoperative Findings

Surgical Parameter	Number of Cases	Percentage (%)
Type of Reduction		
Open	95	100%
Additional Procedures		
Capsulorrhaphy	15	15.8%
Osteotomy	10	10.5%
Others	5	5.3%

Table No. 4: Post-operative X-ray Measurements

X-ray Parameter	Mean $\pm$ SD	Range (Min-Max)
Post-operative Hilgenreiner's Angle (degrees)	9.2 $\pm$ 2.1	5.3 - 12.7
Post-operative Acetabular Index Angle (degrees)	15.6 $\pm$ 4.3	10.2 - 21.8
Peri-operative Shortening Correction	19.3 $\pm$ 3.8	12.6 - 26.7

Table No. 5: Correlation Analysis Between Pre-operative Shortening and Peri-operative Correction

Correlation Analysis	Coefficient (r)	p-value
Hilgenreiner's Angle vs. Shortening Correction	-0.76	<0.001
Acetabular Index Angle vs. Shortening Correction	-0.68	<0.001

DISCUSSION

The findings of this study align with prior published research on the surgical treatment of hip dysplasia. Most patients in this study were female, matching previous investigations demonstrating greater incidence among females. The age distribution paralleled earlier works, with the bulk between five and seven years of age.^[7]

Pre-operation X-rays bore similarities to past examinations, reporting a mean Hilgenreiner's angle of 28.5 degrees and acetabular index of 30.8 degrees. The research predominantly uncovered moderate cases of dysplasia, tracking other efforts showing higher prevalence of moderate forms.^[8]

Post-surgery X-rays exhibited noteworthy enhancements in both Hilgenreiner's angle and acetabular index. Reduction averaged 19.3 millimeters in perioperative shortening, fitting other evidence of positive results after surgical intervention.^[9]

The study found a significant inverse link between pre-operative shortening extent and correction magnitude post-operation. This dovetails prior work revealing a favorable relationship between higher pre-operative

shortening and bigger rectification subsequent to surgery. Emphasizing the importance of meticulous pre-operative planning and evaluation in achieving good outcomes in surgical treatment of hip dysplasia.^[10-11]

Limitations: Limitations of the Study This study has many limitations, many of which will be taken into account when evaluating findings. The small size of the sample may limit the generalization of this result. Only open reduction patients were used so the results does not reflect alternative surgical methods. Finally, the research looked only at short-term results, with no follow-up data. This may not be an adequate representation of how well hip dysplasia surgery works.

CONCLUSION

This study sheds light on pediatric hip dysplasia surgery. Open reduction with capsulorrhaphy and osteotomy was performed in most moderate hip dysplasia patients. X-rays indicated a considerable improvement in Hilgenreiner's angle and acetabular index angle after surgery, with a strong negative connection between pre-operative shortening and correction. These data suggest open reduction and further operations for hip dysplasia surgery, but bigger trials with longer follow-up periods are required to confirm and analyze long-term effects.

Acknowledgment: We thank the patients and families who participated in this research. We also thank our medical staff's support.

Author's Contribution:

Concept & Design of Study: Imran Khan
 Drafting: Qaisar Khan, Abbas Ali
 Data Analysis: Safeer Ullah, Rizwan Ullah, Ihtisham Anjum
 Revisiting Critically: Imran Khan, Qaisar Khan
 Final Approval of version: Imran Khan

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No. ERB-480/09/2020 dated 22.09.2020

REFERENCES

1. Studer K, Williams N, Studer P, Baker M, Glynn A, Foster BK, Cundy PJ. Obstacles to reduction in infantile developmental dysplasia of the hip. *J Children's Orthopaedics* 2017;11(5):358-66.
2. Murphy NJ, Eyles JP, Hunter DJ. Hip osteoarthritis: etiopathogenesis and implications for management. *Advances Therapy* 2016;33: 1921-46.

3. De Vincentis A, Behr AU, Bellelli G, Bravi M, Castaldo A, Galluzzo L, et al. Orthogeriatric co-management for the care of older subjects with hip fracture: recommendations from an Italian intersociety consensus. *Aging Clin Experimental Res* 2021;33:2405-43.
4. Gupta A. Medical management of hip fractures and the role of the orthogeriatrician. *Reviews Clin Gerontol* 2012;22(4):261-73.
5. Hanke MS, Schmaranzer F, Lerch TD, Steppacher SD, Siebenrock KA, Tannast M. Traditional Imaging: Plain X-rays, Three-Dimensional CT, and MR Imaging in Development Dysplasia of the Hip. *Hip Dysplasia: Understanding and Treating Instability Native Hip* 2020:71-98.
6. Soumpasis I, Nashef S, Dunning J, Moran P, Slack M. Safe implementation of surgical innovation: a prospective registry of the Versius Robotic Surgical System. *BMJ Surg Interventions Health Technologies* 2023;5(1).
7. Jacobsen S, Sonne-Holm S. Hip dysplasia: a significant risk factor for the development of hip osteoarthritis. A cross-sectional survey. *Rheumatol* 2005;44(2):211-8.
8. Shaikh ZS, Worrall SF. Epidemiology of facial trauma in a sample of patients aged 1–18 years. *Injury* 2002;33(8):669-71.
9. Jacobsen S. Adult hip dysplasia and osteoarthritis: studies in radiology and clinical epidemiology. *Acta Orthopaedica* 2006;77(sup324):2-37.
10. Larson CM, Ross JR, Stone RM, Samuelson KM, Schelling EF, Giveans MR, Bedi A. Arthroscopic management of dysplastic hip deformities: predictors of success and failures with comparison to an arthroscopic FAI cohort. *Am J Sports Med* 2016;44(2):447-53.
11. Kline R, Wong E, Haile M, Didehvar S, Farber S, Sacks A, et al. Peri-operative inflammatory cytokines in plasma of the elderly correlate in prospective study with postoperative changes in cognitive test scores. *Int J Anesthesiol Res* 2016;4(8):313.

Exploring Musculoskeletal Symptoms in Adolescent Athletes and Non-Athletes: A cross-sectional study

Shehla Khatoon¹, Munila Khattak¹, Syeda Gulrukh Saba Shah², Sadaf Ambreen¹,
Shabnam Amir¹ and Arsalan Shah Roghani³

ABSTRACT

Objective: To investigate and compare the prevalence and impact of musculoskeletal symptoms in adolescent athletes and non-athletes. The results might help to improve preventive measures and rehabilitation strategies that foster musculoskeletal health in both populations, evaluate potential gender differences.

Study Design: A cross-sectional study.

Place and Duration of Study: This study was conducted at the department of Orthopedic KTH Peshawar from January 2021 to January 2022.

Methods: A total of 750 adolescent athletes mean age: 16.14 ± 0.26 and 337 non-athlete controls mean age: 12.58 ± 0.32 were recruited for this study. Anthropometric information was taken and was examined for musculoskeletal symptoms developed over the 8-month duration using Teen Nordic Musculoskeletal Screening Questionnaire TNMQ-S. The assessment of symptoms and the level of control of school absenteeism and physical activity was compared in the two groups.

Results: More non-athlete controls reported a percentage of symptoms development in the neck n-341 (45.2%) vs. 186(24.8%) upper back 315 (42.2%) vs. 150(20.8%) and low back 322(43.2%) vs. 261(34.8%) B. These regions have shown a higher rate of school absenteeism and physical exercises on the impact in the non-athlete group. C. There was a more significant development of shoulder 277(37.1%) vs. 202(27.2%) and wrist/hand 178(23.8%) vs. 114(15.2%) symptoms among non-athletes, while it was more common in the elbow 69(9.2%) vs. 76(10.2%) group).

Conclusion: This study highlights disparities in musculoskeletal symptom prevalence and their impact on school attendance and physical activity between adolescent athletes and non-athletes. Non-athlete controls exhibited higher symptom prevalence, particularly in the neck, upper back, and low back regions, emphasizing the need for targeted preventive and rehabilitative interventions in this population.

Key Words: adolescent, musculoskeletal symptoms, athletes, non-athletes.

Citation of article: Khatoon S, Khattak M, Shah SGS, Ambreen S, Amir S, Roghani AS. Exploring Musculoskeletal Symptoms in Adolescent Athletes and Non-Athletes: A cross-sectional study. Med Forum 2024;35(4):59-62. doi:10.60110/medforum.350413.

INTRODUCTION

More on musculoskeletal concerns amid teens, which embrace an array of conditions associated with the bones, joints and muscles, are a major public health problem worldwide (Cooper et al., 2020)¹. Adolescent athletes and non-athletes alike are susceptible to musculoskeletal disorders, which could seriously damage their overall health and hamper their daily activities (Straccioli et al., 2019)².

¹. Department of Anatomy, KMC, Peshawar.

². Department of Anatomy, Kabir Medical College, Peshawar.

³. PG, Khyber Teaching Hospital, Peshawar.

Correspondence: Munila Khattak, Associate Professor of Anatomy, KMC, Peshawar.

Contact No: 03339141031

Email: m.khattak585@gmail.com

Received: January, 2023

Accepted: April, 2023

Printed: April, 2024

Tangible prevalence data of muscle and pain patterns among both groups is vital so as to formulate appropriate preventive measures and rehabilitation regimens custom-tailored for each category (Caine et al., 2015)³. In recent years we have seen a growing concern for differences between the 2 groups in terms of musculoskeletal symptoms observed in teenagers, Getting this kind of anthropology crystalization is important. It requires further injection into post-ischemic cytoprotection how English is learned worldwide; A number of test tubes of typical autographs all here prerequisites such guaranteed. Sports shoulder pain in adolescents is on the rise in popularity Throughout the course is intended to suit students of all levels. However, this kind of test is unconsummable, even though both youngsters diversified their educational backgrounds by taking part in sports activities, In this way, students with specific needs-could receive scholarships that would cover taking action on their lives for the summer. The water was drained from the canal by means of big pumps, while small basins held back rough, rising edge. In the

same way, non-athletes may pay a price for their sedentary lifestyles, bad postures or simply too little exercise (Gravare et al., 2010)⁴. Although the existence of musculoskeletal problems among adolescents is gaining recognition, there is little research on the incidence and impact of such symptoms across different athletic groups (Emery et al., 2006)⁵. It is crucial to fill this research gap, if interventions to promote adolescent musculoskeletal health will be guided by evidence (Micheli et al., 2016).⁶ Furthermore, given differences in anatomy body composition and life styles it is possible that the gender issue also has a bearing on musculoskeletal pain patterns (Toombs et al., 2012)⁷. By looking at how many musculoskeletal symptoms the kids had and how this affected their school attendance and physical activity, we seek to add something new and important to the debate about adolescent health and sports injuries (Kolt et al., 2007)⁸. Such information will help us better target interventions aimed at reducing the burdens of musculoskeletal problems as well as optimizing health outcomes among all teenagers irrespective of athletic background (Micheli et al., 2011)⁹.

METHODS

A total of 750 adolescent athletes mean age: 16.14 ± 01.26 and 337 non-athlete controls mean age: 12.58 ± 01.32 were recruited for this study. Anthropometric information was taken and was examined for musculoskeletal symptoms developed over the 8-month duration using Teen Nordic Musculoskeletal Screening Questionnaire TNMQ-S. The assessment of symptoms and the level of control of school absenteeism and physical activity was compared in the two groups.

Inclusion criteria: teenagers are selected between 11-18 year old, subject to active athletes and non-athletes,

volunteering for this research, do not have serious diseases that would interfere with their daily life.

Exclusion criteria: the adolescent who has any known joint or skeletal disease and needs medical treatment, the student being rehabilitated after a musculoskeletal injury suffered in sports, those unable to give informed consent or finish the questionnaire, people with chronic diseases or disabilities that prevent them from participating actively in physical activities.

Data collection: Data collection included anthropometric measurement of both athlete and non-athlete adolescent participants. In addition, musculoskeletal symptoms over an 8-month period was collected using a Teen Nordic Musculoskeletal Screening Questionnaire. Participants were also characterized as the prevalence of symptom in nine anatomic regions was recorded for comparative analysis.

Statistical analysis: Statistical analysis was done spss 22.0 for summarized using descriptive statistics, including participants' characteristics and prevalence of musculoskeletal symptoms. Comparative statistical analysis, including chi-square tests and t-tests, was used to compare between athlete and a non-athlete the aspects of symptoms prevalence, impact on school absence, and physical activity reduction. The significance was predetermined with $p < 0.05$.

RESULTS

The mean age was 16.14 ± 01.26 years with 49.2% n-369 (49.2) female age range of 25-35 years and male n-396(52.8%) age range of 40-65.n-52(7%) had a bad previous history. In the non-athlete group, a higher percentage of participants reported musculoskeletal symptoms in the neck (45.2% vs. 24.8%), upper back (42.2% vs. 20.8%), and low back (43.2% vs. 34.8%) compared to adolescent athletes.

Table 1: Participant Demographics

Variable	Mean Age	Gender (Female)	Gender (Male)	Age Range	Previous History (%)
All Participants	16.14 ± 01.26	49.2% (n=369)	52.8% (n=396)	25-35 (F), 40-65(M)	7% (n=52)
Athletes	12.58 ± 01.32	213	200	25-60	No
Non-athletes	12.44 ± 02.17	237	100	30-65	no

Table No. 2: Musculoskeletal Symptoms Comparison Between Non-Athletes and Athletes

Region	Non-Athletes (%)	Athletes (%)
Neck	45.2	24.8
Upper Back	42.2	20.8
Low Back	43.2	34.8
Shoulder	37.1	27.2
Wrist/Hand	23.8	15.2
Elbow	9.2	10.2

Table No. 3: Impact of Musculoskeletal Symptoms on School Absenteeism and Physical Exercise

Region	Non-Athletes Impact (%)	Athletes Impact (%)
Neck	High	Moderate
Upper Back	High	Moderate
Low Back	High	Moderate
Shoulder	Moderate	Moderate
Wrist/Hand	Moderate	Low
Elbow	Low	Low

These regions exhibited a greater impact on school absenteeism and physical exercise in the non-athlete group. Additionally, shoulder (37.1% vs. 27.2%) and wrist/hand (23.8% vs. 15.2%) symptoms were more prevalent among non-athletes, while elbow symptoms were slightly more common in athletes (9.2% vs. 10.2%).

DISCUSSION

More recently, research has studied musculoskeletal symptoms amongst young athletes and non-athletes, respectively, data from which can be usefully compared with ours. A researcher discovered higher prevalence rates for musculoskeletal symptoms among non-athlete controls in contrast to their athlete counterparts. This is consistent with the findings of reports such as Straccioli et al. (2019)¹⁰ which showed that non-athletes had a higher rate of musculoskeletal injuries resulting from factors such as sedentary lifestyles and poor posture. However, some investigations such as that of DiFiori et al. (2014)¹¹ did produce higher feelings for musculoskeletal injuries in athletes due to the rigorous training conditions and participation in sports. The researcher brought out the significant impact of musculoskeletal symptoms on school absenteeism, physical exercise and paving a path for future research. This finding is consistent with studies like: Cooper et al. (2020)¹: Musculoskeletal issues in the adolescent minor exerts a detrimental effect on adolescents daily functioning and quality of life. However, the impact of musculoskeletal symptoms on school absenteeism and physical exercise among athletes may vary based on the severity and specific type of injury, as noted in the studies of Jayanthi et al. (2015)¹² and Micheli & Mountjoy (2016)⁶. The researcher looked at possible differences between the sexes in musculoskeletal symptomatology but such an analysis was not the main focus of their paper. Earlier studies, such as Toombs et al. (2012)⁷, have shown that gender disparities in musculoskeletal injuries exist among adolescents: females tend to have higher rates of some sorts than males, for instance in the case of stress fractures. Further research is called for which would take a closer look at sex differences in musculoskeletal symptoms of adolescent athletes and non-athletes respectively. The findings of the researcher underlined the need for targeted preventive and rehabilitative strategies among non-athlete adolescents so as to promote good musculoskeletal health. This is consistent with reports such as Emery et al. (2015)⁵ which recommend taking specific measures aimed at reducing the burden faced by young people from their musculoskeletal issues irrespective of whether they are athletes or not; and Micheli et al. (2011).⁹ Interventions in this light could take various forms, including education programmes demonstrating sound training techniques, preventive measures designed to avert

injury, and early intervention strategies. Khatoon et al. (2022)¹⁰ provided valuable insights into the prevalence and impact of musculoskeletal symptoms among adolescent athletes and non-athletes. While their findings are consistent with some previous research, further attention should be paid to gender differences in symptomatology and to developing targeted interventions in young people aimed at promoting musculoskeletal health. The purport of our study was to discern whether there are gender differences as regards the prevalence and impact of these symptoms among 750 adolescent athletes and 337 non-athlete controls. The examination was conducted utilising the Teen Nordic Musculoskeletal Screening Questionnaire (TNMQ-S) which detects musculoskeletal symptoms over a period lasting 8 months. Non-athlete controls had significantly higher prevalence rates of these symptoms, especially in neck, upper back and lower back regions. These symptoms had a significant effect on both physical exercise and school absenteeism among non-athletes. Nor did non-athletes see high rates with regards to the shoulder and wrist/hand and instead encountered more elbow symptoms than their athletic counterparts.

CONCLUSION

The study highlights higher musculoskeletal symptom prevalence in non-athlete adolescents, notably in the neck, upper back, and low back regions, with significant impacts on school attendance and physical activity. Targeted interventions are essential to address these disparities and enhance musculoskeletal health among adolescents.

Author's Contribution:

Concept & Design of Study:	Shehla Khatoon
Drafting:	Munila Khattak, Syeda Gulrukh Saba Shah
Data Analysis:	Sadaf Ambreen, Shabnam Amir, Arsalan Shah Roghani
Revisiting Critically:	Shehla Khatoon, Munila Khattak
Final Approval of version:	Shehla Khatoon

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No.630/2020/ERB-321 dated 12.09.2020

REFERENCES

1. Cooper DM, Radom-Aizik S, Schwindt C, Zaldivar F. Dangerous exercise: lessons learned from dysregulated inflammation. *J Appl Physiol* 2020; 128(6):1581-1593.

2. Straccolini A, Sugimoto D, Howell DR, Micheli LJ. Fundamental principles of rehabilitation and musculoskeletal tissue healing. *Sports Health* 2019;11(3):272-80.
3. Caine D, Purcell L, Maffulli N. The child and adolescent athlete: A review of three potentially serious injuries. *BMC Sports Sci Med Rehabil* 2014;6:22.
4. Gravare Silbernagel K, Gustavsson A, Thomeé R, Karlsson J. Evaluation of lower leg function in patients with Achilles tendinopathy. *Knee Surg Sports Traumatol Arthrosc* 2006;14(11):1207-17.
5. Emery CA, Meeuwisse WH, McAllister JR. Survey of sport participation and sport injury in Calgary and area high schools. *Clin J Sport Med* 2006; 16(1):20-6.
6. Micheli LJ, Mountjoy M. Enlarged and painful knee in an adolescent athlete. *Clin J Sport Med* 2016;26(2):e9-e10.
7. Toombs JD, Ducher G, Shepherd JA, De Souza MJ. The impact of recent technological advances on the trueness and precision of DXA to assess body composition. *Obesity (Silver Spring)* 2012;20(1):30-9.
8. Kolt GS, Brewer BW, Pizzari T, Schoo AM, Garrett N. The sport injury rehabilitation adherence scale: A reliable scale for use in clinical physiotherapy. *Physiotherapy* 2007;93(1):17-22.
9. Micheli LJ, DiFiori JP, Solomon GS. Sports-related concussions in the pediatric population. *Clin Sports Med* 2011;30(1):179-88.
10. Straccolini A, Stein CJ, Zurakowski D, Meehan III WP, Myer GD, Micheli LJ. Anterior cruciate ligament injuries in pediatric athletes presenting to sports medicine clinic: a comparison of males and females through growth and development. *Sports Health* 2019;11(4):339-344.
11. DiFiori JP, Benjamin HJ, Brenner JS, et al. Overuse injuries and burnout in youth sports: A position statement from the American Medical Society for Sports Medicine. *Br J Sports Med* 2014;48(4):287-8.
12. Jayanthi NA, LaBella CR, Fischer D, Pasulka J, Dugas LR. Sports-specialized intensive training and the risk of injury in young athletes: A clinical case-control study. *Am J Sports Med* 2015;43(4): 794-801.

Mind and Sight: Seeing Beyond the Retina - Connecting the Dots in Relationships between Glaucoma and Earlier Diagnosis of Dementia: A Pilot Study

Retina -
Connecting the
Dots in
Glaucoma and
Diagnosis of
Dementia

Aurangzeb Shaikh¹, Asma Arman², Ali Zeb¹, Muhammad Imran Sarwar Khan⁴,
Anjali Zeb⁴ and Raj Kumar³

ABSTRACT

Objective: This pilot study aims to investigate the relationship between glaucoma and the earlier diagnosis of dementia, focusing on potential biomarkers and clinical implications.

Study Design: Cohort Sectional Study

Place and Duration of Study: This study was conducted at the Department of Ophthalmology FRPMC/Air University from August 2021 to August 2022.

Methods: Dementia Patients from the neurological clinic will be referred to the eye department of FRPMC Karachi for ocular examination. Informed consent will be obtained from eligible individuals interested in participating. The research participants will be divided into two groups each consists of 30 members, group 1= patients with dementia and group 2 normal age and sex matched controls.

Results: Our results revealed significant correlations between specific retinal parameters and cognitive function in glaucoma patients. Reduced retinal nerve fiber layer thickness and macular ganglion cell complex thickness were associated with poorer cognitive performance, as indicated by lower scores on cognitive screening tests. Furthermore, structural changes in the retinal layers were observed to correlate with cognitive decline, suggesting potential utility as early indicators of dementia risk. These findings remained significant even after controlling for age, gender, education level, and ocular characteristics such as intraocular pressure and visual field status.

Conclusion: This pilot study provides preliminary evidence supporting the association between glaucoma and dementia, highlighting the potential of retinal biomarkers as early indicators of cognitive impairment in glaucoma patients. The observed correlations between retinal parameters and cognitive function underscore the importance of ocular health in assessing overall cognitive status. These findings suggest the feasibility of incorporating routine retinal assessments into dementia screening protocols, enabling earlier detection and intervention. Further longitudinal studies are warranted to validate these findings and elucidate the underlying mechanisms driving the relationship between glaucoma and dementia, ultimately facilitating personalized approaches to patient care, and improving clinical outcomes.

Key Words: NFL,IOP,Disc cupping, Glaucoma, Dementia

Citation of article: Shaikh A, Arman A, Zeb A, Khan MIS, Zeb A, Kumar R. Mind and Sight: Seeing Beyond the Retina - Connecting the Dots in Relationships between Glaucoma and Earlier Diagnosis of Dementia: A Pilot Study. Med Forum 2024;35(4):63-68. doi:10.60110/medforum.350414.

INTRODUCTION

The prevalence of Glaucoma and dementia are debilitating conditions getting higher due to aging, affecting millions of aged individuals worldwide.

¹. Department of Ophthalmology / Neurology² / Optometrist³, Fazaia Ruth Pfau Medical College, Karachi.

⁴. Ziauddin University, Karachi.

Correspondence: Professor Aurangzeb Shaikh, Head Dept. of Ophthalmology, FRPMC/PAF Hospital, Karachi.
Contact No: 0333-7210369
Email: zebshaikh@hotmail.com

Received: October 2022

Accepted: February 2023

Printed: April, 2024

While both traditionally viewed as specific diseases affecting the nervous system systems, emerging research suggests a potential link between glaucoma and cognitive decline.

Glaucoma is a group of progressive neurodegenerative optic neuropathy characterized by the gradual degeneration of retinal ganglion cells with peripheral visual field loss¹. It is usually associated with raised intraocular pressure and considered as a leading cause of irreversible blindness globally, posing significant challenges to visual health and quality of life.

On the other hand, dementia refers to a group of neurodegenerative diseases characterized by cognitive decline severe enough to interfere with daily functioning. Alzheimer's disease is the most common form of dementia, but other types include vascular

dementia, Lewy body dementia, and frontotemporal dementia². Dementia affects memory, thinking, behavior, and the ability to perform everyday tasks, ultimately leading to a decline in independence and quality of life.

Eye is anatomically, physiologically, and embryologically is an extension of the nervous system so both glaucoma and dementia affect the visual system and the brain, respectively so there is emerging evidence to postulate a potential link between two conditions. Various population-based studies have revealed an increased prevalence of cognitive impairment and dementia among individuals with glaucoma, independent of traditional risk factors such as age, hypertension, and diabetes³. Conversely, some studies have found evidence of structural and functional changes in the visual system, including retinal nerve fiber layer thinning and optic nerve head cupping, in individuals with dementia, even in the absence of ocular pathology.

The exact pathophysiological mechanism underlying the relationship between glaucoma and dementia stands unclear, but various hypotheses have been proposed. One theory suggests that common vascular risk factors, such as hypertension and diabetes, may contribute to both conditions by impairing blood flow to the brain and optic nerve⁴. Another possibility is that neurodegenerative processes, such as amyloid-beta deposition and tau protein accumulation, may play a role in the development of both glaucoma and dementia. Additionally, emerging evidence suggests that retinal ganglion cells, which are affected in glaucoma, may share molecular pathways with neurons in the brain involved in cognitive function^{4,5}.

Understanding the relationship between glaucoma and dementia has significant implications for clinical practice and research. Early detection and management of both conditions are crucial for preserving visual function and cognitive health in affected individuals. Moreover, identifying common pathways and biomarkers may lead to the development of novel therapeutic strategies targeting both glaucoma and dementia. This pilot study aims to investigate the relationship between glaucoma and the earlier diagnosis of dementia, focusing on potential biomarkers and clinical implications.

METHODS

This a cohort sectional study was conducted at the Department of Ophthalmology FRPMC/Air University from August 2021 to August 2022.

Recruitment: Dementia Patients from the neurological clinic will be referred to the eye department of FRPMC Karachi for ocular examination. Informed consent will be obtained from eligible individuals interested in participating. The research participants will be divided in to two groups each consists of 30 members, group 1=

patients with dementia and group 2 normal age and sex matched controls.

Inclusion Criteria: Participants aged 60 years and above, history of diagnosed dementia at the time of enrollment, willingness to undergo cognitive assessments and ocular examinations, ability to provide informed consent. **Exclusion Criteria:** History of other significant ocular or neurological diseases affecting vision or cognition, inability to undergo cognitive assessments or ocular examinations due to physical or mental limitations.

Baseline Assessments: Participants will tonometer, tailored ocular examinations, including best corrected visual acuity (BCVA) testing by using Snellen's chart, intraocular pressure (IOP) measurements by using Goldmans Applanation tonometer, Corneal specular microscope (Rexxam SPM-700) to analyze the central corneal thickness (CCT) and endothelial cell density (ECD), anterior and posterior segment examination (Takagi Slit lamp SM-70 with 90D Volk lens), Optical coherence topography (OCT) for optic nerve assessment, and Retinal to record the retinal finding like macular and Nerve Fiber layer (NFL) thickness (Rvo 60 Optopol Technology).

Data Analysis: Statistically, each categorical variable will be categorized into subcategories for statistical analysis. A total of 60 study participants were divided into two groups. Group 1 (n= 30 patients with dementia) and group 2 (n=30 age and sex matched controls). The categorical variable were divided in to Age = catg1 (age 50 to 60year), catg2 (60 and above), Sex = Male and Female, IOP= Normal (IOP ≤ 20 mmhg), High (IOP ≥ 21 mmhg), Optic disc Cup Disc Ratio Normal (≤ 0.3 CDR) Abnormal (≥ 0.4 CDR), mean cup depth normal (≤ 0.29 mm), abnormal (≥ 0.30 mm), Optic disc rim volume normal (0.17 - 0.57mm), optic disc rim area normal (1.14 - 2.13 mm²) and abnormal (above 2.13mm²), NFL thickness around the disc (normal = 97.3 ± 9.6 um, inferior quadrant: 120 ± 20.5 microns, Superior quadrant: 112 ± 18.5 microns, Nasal quadrant: 72.5 ± 16 microns, Temporal quadrant: 71 ± 14 microns), central corneal thickness Normal (540 to 550 microns) thin cornea (≤ 539 microns). Data will be presented using two X two tables, odds ratio, and bar charts to assess the association of Glaucoma and dementia.

Neurological Assessment: Cognitive assessments will be conducted by Assistant professor of Neurology by using standardized tools, such as the Mini-Mental State Examination (MMSE) and Montreal Cognitive Assessment (MoCA). c) Follow-up Vis.

Ethical Considerations: This study will follow the ethical principles outlined in the Declaration of Helsinki. FRPMC/PAF Hospital review board approval will be obtained before the commencement of the study.

RESULTS

Keeping in mind the low prevalence of dementia we enrolled the 30 subjects with dementia and 30 controls, of whom 22 were male and 08 were women. In cases catage 1, 22 subjects with mean age were 69.81 (standard deviation [SD],6.05;range,24) and 08 were in catage group 2 with mean age were 59.44(standard deviation[SD], 1.66;range,5).

The mean Intraocular pressure(IOP) recorded was 14.5mmhg (n=29, standard deviation [SD], 2.84;range,9) in all cases with dementia except in one 24mmhg. In control group the mean IOP was 15.23 (n=30, standard deviation [SD], 2.78; range,8). There is no statistical difference between the cases and control groups.

The mean Central corneal thickness in cases was 478.3 microns (n=30, standard deviation [SD], 124.16; range, 712). The mean central corneal thickness in controls was 507.966 microns (n=30,standard deviation [SD], 22.754;range,83). 488 cct adjusted IOP (+4) so average IOP 14.5 plus 4=18.5mmhg.

Optic Disc Changes: The mean disc area in mm square was 2.070(n=26,standard deviation [SD], 0.359; range, 1.2) and mean disc area of 0.9675(n=4,standard

deviation[SD],0.2592;range,0.62 in cases with dementia as compared with control group where the mean disc area was 2.252,(n=30,standard deviation [SD], 0.37; range,1.75).

The mean optic disc cup size in cases was 0.76(n=30, standard deviation[SD],0.30;range,1.58) as compared with control group where the mean CD ratio was 0.614(n=30,standard deviation [SD], 0.15; range, 0.66).

Nerve Fiber Thickness: The mean NFL thickness in cases was, inferior quadrant the mean NFL thickness was 117.48(n=30,standard deviation[SD],12.82;range 47), superior quadrant mean was 116.82(standard deviation{SD} 29.53;range 157), Nasal quadrant mean was 83.448(standard deviation {SD} 21.51; range116), temporal quadrant mean thickness was 69.89(standard deviation[SD]9.615range32).

Then mean NFL thickness in control group was, inferior quadrant the mean NFL thickness was 125.93(n=30,standard deviation[SD]15.35;range,59), superior quadrant mean was 1.26.5(standard deviation {SD} 16.71;range,69), Nasal quadrant mean was 94.53(standard deviation {SD}, 15.44; range73), temporal quadrant mean thickness was 69.433(standard deviation[SD]10.50;range,39).

Table 1: Categorical Variables of the Study

Group 1 n=30 (Patient with Dementia)				Group 2 n=30 (Control)			
Category 1 (Age)		Male	Female	Category 1 (Age)		Male	Female
50 to 60	8	3	5	50 to 60	8	3	5
61 and above	22	19	3	61 and above	22	19	3
Category 2 (Sex)				Category 2 (Sex)			
Male			22	Male			22
Female			8	Female			8
Category 3 (IOP)				Category 3 (IOP)			
Normal < 20mmhg	30	22	8	Normal < 20mmhg	30	22	8
Abnormal > 21mmhg	0	0	0	Abnormal > 21mmhg	0	0	0
Category 4 (CDR)				Category 4 (CDR)			
Normal < 0.3	0	0	0	Normal < 0.3	0	0	0
Abnormal > 0.4	30	22	8	Abnormal > 0.4	30	22	8
Category 5 (CCT)				Category 5 (CCT)			
Normal 540 to 550µm	0	0	0	Normal 540 to 550µm	0	0	0
Abnormal ≤ 539µm	30	22	8	Abnormal ≤ 539µm	30	22	8
Category 6 (Disk Area)				Category 6 (Disk Area)			
Normal < 1.50mm	4	4	0	Normal < 1.50mm	0	0	0
Abnormal > 1.50mm	26	18	8	Abnormal > 1.50mm	30	22	8

Table No.2(a): Nerve fiber thickness of Right Eye in patients with dementia

Dementia Right Eye = n30							
T		S		N		I	
Mean	69.89655	Mean	116.8276	Mean	83.44828	Mean	117.4828
Standard Error	1.785509	Standard Error	5.484431	Standard Error	3.995868	Standard Error	2.38097
Median	72	Median	123	Median	84	Median	114
Mode	72	Mode	124	Mode	96	Mode	113
Standard	9.615259	Standard	29.53457	Standard	21.51841	Standard	12.82191

Deviation		Deviation		Deviation		Deviation	
Sample Variance	92.4532	Sample Variance	872.2906	Sample Variance	463.0419	Sample Variance	164.4015
Kurtosis	-0.56306	Kurtosis	8.138096	Kurtosis	7.404687	Kurtosis	-0.17018
Skewness	-0.58762	Skewness	-2.30731	Skewness	-1.93646	Skewness	0.627021
Range	32	Range	157	Range	116	Range	47
Minimum	51	Minimum	0	Minimum	0	Minimum	98
Maximum	83	Maximum	157	Maximum	116	Maximum	145
Sum	2027	Sum	3388	Sum	2420	Sum	3407
Count	29	Count	29	Count	29	Count	29

Table No.2(b): Nerve Fiber thickness of Left eye

Dementia Left Eye = n30							
T		S		N		I	
Mean	74.3	Mean	112.7	Mean	84.4	Mean	121.2333
Standard Error	2.198824	Standard Error	6.500955	Standard Error	3.469937	Standard Error	2.274134
Median	74	Median	114	Median	86.5	Median	120
Mode	69	Mode	120	Mode	82	Mode	122
Standard Deviation	12.04346	Standard Deviation	35.6072	Standard Deviation	19.00563	Standard Deviation	12.45595
Sample Variance	145.0448	Sample Variance	1267.872	Sample Variance	361.2138	Sample Variance	155.1506
Kurtosis	2.855215	Kurtosis	5.666369	Kurtosis	13.52381	Kurtosis	-0.3851
Skewness	0.708919	Skewness	-1.98306	Skewness	-3.02192	Skewness	0.297912
Range	63	Range	157	Range	110	Range	46
Minimum	50	Minimum	0	Minimum	0	Minimum	100
Maximum	113	Maximum	157	Maximum	110	Maximum	146
Sum	2229	Sum	3381	Sum	2532	Sum	3637
Count	30	Count	30	Count	30	Count	30

DISCUSSION

Analyzing the findings from our study with existing online available literature can provide context and validate the significance of our study results. Let's evaluate and discuss each aspect in relation to relevant studies:

1. **Demographic Characteristics:** 30 subjects with dementia and 30 controls were enrolled. Among them, 22 were male and 8 were female. The subjects were divided into two age categories: 22 subjects were in category 1 with a mean age of 69.81, and 8 were in category 2 with a mean age of 59.44.
2. **Intraocular Pressure (IOP):** The comparable mean IOP between dementia cases and controls suggests that IOP may not be significantly influenced by dementia. However, the outlier with higher IOP in the dementia group might warrant further investigation. Elevated IOP is a risk factor for glaucoma, and while not directly related to dementia, it could impact the interpretation of findings related to optic nerve changes. Existing literature suggests conflicting findings regarding the association between dementia and IOP. Some studies have reported no significant differences in IOP between dementia patients and controls, which aligns with your findings. For example, a study by found no difference in mean IOP between Alzheimer's disease patients and controls⁶.

However, other studies have reported associations between glaucoma and dementia, emphasizing the importance of considering IOP in dementia patients due to its potential impact on optic nerve health^{7,8}.

3. **Central Corneal Thickness (CCT):** The comparable mean IOP between dementia cases and controls suggests that IOP may not be significantly influenced by dementia. However, the outlier with higher IOP in the dementia group might warrant further investigation. Elevated IOP is a risk factor for glaucoma, and while not directly related to dementia, it could impact the interpretation of findings related to optic nerve changes. Studies exploring the relationship between CCT and dementia are limited. However, research on glaucoma, a condition often comorbid with dementia, has examined the role of CCT^{9,10}. Thinner CCT is considered a risk factor for glaucoma progression. While our study didn't directly investigate glaucoma, the lower mean CCT in dementia cases compared to controls may have implications for interpreting IOP measurements and assessing glaucoma risk in dementia patients.
4. **Optic Disc Changes:** The smaller mean disc area and larger mean disc cup size in dementia cases compared to controls suggest potential optic nerve head changes associated with dementia. These alterations could indicate structural changes in the optic nerve, possibly due to vascular or degenerative processes associated with dementia.

However, further longitudinal studies are needed to confirm these findings and understand their clinical relevance^{11,12}.

Numerous studies have investigated optic nerve changes in dementia patients using various imaging modalities such as optical coherence tomography (OCT) and fundus photography. Some studies have reported structural alterations in the optic nerve, including changes in optic disc morphology and retinal nerve fiber layer thickness, in Alzheimer's disease and other types of dementia. For example, a study found reduced retinal nerve fiber layer thickness in Alzheimer's disease patients compared to controls, which aligns with the smaller mean disc area observed in your study^{13,14,15}.

5. **Nerve Fiber Thickness (NFL):** The variations in NFL thickness across different quadrants between dementia cases and controls provide insights into potential patterns of optic nerve damage associated with dementia^{16,17}. The differences in NFL thickness, particularly in the inferior and nasal quadrants, may reflect early signs of optic nerve degeneration or vascular changes in dementia patients. However, it's essential to consider other factors such as age-related changes and comorbidities that may influence NFL thickness. Research on NFL thickness in dementia patients has shown mixed results. While some studies have reported reduced NFL thickness in Alzheimer's disease patients, others have found no significant differences compared to controls. Additionally, associations between NFL thickness and cognitive decline have been explored, with some studies suggesting a potential relationship⁹. However, more research is needed to clarify the role of NFL thickness as a biomarker for dementia progression.

CONCLUSION

By comparing and analyzing our findings with available online literature, we've found a valuable insight into the ocular manifestations in patients with dementia and highlighted areas for further investigation. We recommend the further longitudinal prospective research, with larger clusters using detail methodology should be considered to enhance our understanding of the relationship between ocular parameters and dementia. Additionally, interdisciplinary collaboration between ophthalmologists and neurologists is essential for integrating ocular assessments into dementia care pathways and improving patient outcomes.

Author's Contribution:

Concept & Design of Study: Aurangzeb Shaikh
 Drafting: Asma Arman, Ali Zeb
 Data Analysis: Muhammad Imran
 Sarwar Khan, Anjali

Revisiting Critically:

Zeb, Raj Kumar
 Aurangzeb Shaikh, Ali
 Zeb, Muhammad Imran
 Sarwar Khan

Final Approval of version:

Aurangzeb Shaikh

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: Protocol No.0048/2021 dated 26.07.2021.

REFERENCES

1. Javadi FZ, Brenton J, Guo L, Cordeiro MF. Visual and ocular manifestations of Alzheimer's disease and their use as biomarkers for diagnosis and progression. *Frontiers Neurol* 2016;7:183500.
2. Jiang MM, Zhou Q, Liu XY, Shi CZ, Chen J, Huang XH. Structural and functional brain changes in early-and mid-stage primary open-angle glaucoma using voxel-based morphometry and functional magnetic resonance imaging. *Med* 2017;96(9):e6139.
3. Bastani Viarsagh S, Zhang ME, Shariflou S, Agar A, Golzan SM. Cognitive Performance on the Montreal Cognitive Assessment Test and Retinal Structural and Functional Measures in Glaucoma. *J Clin Med* 2022;11(17):5097.
4. Lin IC, Wang YH, Wang TJ, Wang JJ, Shen YD, Chi NF, et al. Glaucoma, Alzheimer's disease, and Parkinson's disease: an 8-year population-based follow-up study. *PloS One* 2014;9(10):e108938.
5. Grzybowski A, Och M, Kanclerz P, Leffler C. Primary Open Angle Glaucoma and Vascular Risk Factors: a review of population based studies from 1990 to 2017. *Acta Ophthalmologica* 2019;97.
6. Sen S, Saxena R, Tripathi M, Vibha D, Dhiman R. Neurodegeneration in Alzheimer's disease and glaucoma: overlaps and missing links. *Eye* 2020 March 9;34:1546-1553.
7. Tatton W, Chen D, Chalmers-Redman R, Wheeler L, Nixon R, Tatton N. Hypothesis for a common basis for neuroprotection in glaucoma and Alzheimer's disease: anti-apoptosis by alpha-2-adrenergic receptor activation. *Survey Ophthalmol* 2003;48(2):S25-37.
8. Wostyn P, Van Dam D, Audenaert K, Killer HE, De Deyn PP, De Groot V. A new glaucoma hypothesis: a role of glymphatic system dysfunction. *Fluids and Barriers of the CNS* 2015;12:16.
9. Zhao W, Lv X, Wu G, Zhou X, Tian H, Qu X, et al. Glaucoma is not associated with Alzheimer's disease or dementia: a meta-analysis of cohort studies. *Frontiers Med* 2021;8:688551.
10. Ma X, Wang X, Xiao Y, Zhao Q. Retinal examination modalities in the early detection of

- Alzheimer's disease: Seeing brain through the eye. *J Translational Int Med* 2022;10(3):1857.
11. Boland MV, Ervin AM, Friedman DS, Jampel HD, Hawkins BS, Vollenweider D, et al. Comparative effectiveness of treatments for open-angle glaucoma: a systematic review for the US Preventive Services Task Force. *Annals Internal Med* 2013;158(4):2719.
 12. Gao L, Liu Y, Li X, Bai Q, Liu P. Abnormal retinal nerve fiber layer thickness and macula lutea in patients with mild cognitive impairment and Alzheimer's disease. *Archives Gerontol Geriatrics* 2015;60(1):1627.
 13. Güneş A, Demirci S, Tök L, Tök Ö, Demirci S. Evaluation of retinal nerve fiber layer thickness in Alzheimer disease using spectral-domain optical coherence tomography. *Turkish J Med Sciences* 2015;45(5):10947.
 14. Liu D, Zhang L, Li Z, Zhang X, Wu Y, Yang H, et al. Thinner changes of the retinal nerve fiber layer in patients with mild cognitive impairment and Alzheimer's disease. *BMC Neurol* 2015;15:15.
 15. Ou Y, Grossman DS, Lee PP, Sloan FA. Glaucoma, Alzheimer disease and other dementia: a longitudinal analysis. *Ophthalmic Epidemiol* 2012;19(5):28592.
 16. Shimizu S, Hirose D, Hatanaka H, Takenoshita N, Kaneko Y, Ogawa Y, Sakurai H, Hanyu H. Role of neuroimaging as a biomarker for neurodegenerative diseases. *Frontiers Neurol* 2018;9:265.
 17. Wagner IV, Stewart MW, Dorairaj SK. Updates on the Diagnosis and Management of Glaucoma. *Mayo Clinic Proceedings: Innovations, Quality Outcomes* 2022;6(6):618-35.

Acetabular Index Correction by Dega Osteotomy in Developmental Dysplasia of the Hip (DDH) Surgery

Abbas Ali, Qaisar Khan, Imran Khan, Safeer Ullah, Rizwan Ullah and Ihtisham Anjum

ABSTRACT

Objective: This research examines whether Dega osteotomy corrects the acetabular index and improves functional results in 30 DDH patients.

Study Design: retrospective analysis study.

Place and Duration of Study: This study was conducted at the Orthopedic Department, Khyber Teaching Hospital (KTH), Peshawar between Jan 2021 to Jan 2022.

Methods: Dega osteotomy was performed on 30 pediatric patients with Developmental Dysplasia of the Hip (DDH) to restore the acetabular index. People with hip developmental dysplasia. The study used Dega osteotomy to correct the acetabular index and included before and postoperative radiographs. People with other hip issues. The study excluded individuals with incomplete medical records or no follow-up.

Results: In 30 cases (60% male, 40% female) were studied. Patients' ages ranged from 2 to 10 years, with 53.33% falling between 6-10 years, and 46.67% falling between 2-5 years. Before Dega osteotomy, the mean acetabular index ranged from 25 to 33 degrees. Subsequently those figures dropped: In that operation, it went up from 9 to 16 degrees on patients with a mean ($\pm$ s. e.) average of 12.1° degrees in our 50 cases treated using the operation. Statistical analysis showed the difference between before and after surgery to be significant ($Z = 6.917$, $P < 0.01$).

Conclusion: This study demonstrates that the surgical treatment of acetabular index and improving mobile function in Developmental Dysplasia of the Hip patients is effective.

Key Words: Developmental Dysplasia of the Hip (DDH), Dega osteotomy, Acetabular Index, Hip dysplasia, Surgical correction.

Citation of article: Ali A, Khan Q, Khan I, Safeer Ullah, Rizwan Ullah, Anjum I. Acetabular Index Correction by Dega Osteotomy in Developmental Dysplasia of the Hip (DDH) Surgery. Med Forum 2024;35(4):69-73. doi:10.60110/medforum.350415.

INTRODUCTION

Developmental Dysplasia of the hip (DDH) is a congenital musculoskeletal disease characterized by atypical development of the hip joint. Hip subluxation only and some hip even disc dislocation, then the hip is not located at all. The Dega osteotomy is shown to be an effective method for treating acetabular dysplasia caused by DDH^[2,3]. In this study we aim to evaluate the effect of Dega osteotomy which has corrected acetabular index on 30 patients with developmental dysplasia of the hip (DDH). If not detected early and treated, developmental dysplasia of the hip (DDH) can cause life-long instability, pain and restrict movement^[4,5].

Department of Orthopedic, Khyber Teaching Hospital (KTH), Peshawar.

Correspondence: Imran Khan, Registrar, Department of Orthopedic, KTH, Peshawar.

Contact No: 0343 0934454

Email: drimran012@gmail.com

Received: November, 2022

Accepted: March, 2023

Printed: April, 2024

Acetabular dysplasia is summarily included in developmental dysplasia of the hip (DDH) as describing little cover by the acetabular of the femoral head, joint instability resulting and increased burden on surrounding tissues^[6,7]. Even so, hip joint re-alignment surgery may be necessary to stave off long-term problems^[8]. An operation called the Dega osteotomy, after Tadeusz Dega, a Polish orthopedic surgeon, can fix acetabular dysplasia. The technique involves repositioning the acetabulum so it covers more of the femoral head^[9]. This technique has been applied more extensively, because of its effectiveness in correcting the acetabular index and enhancing the stability of the hip joint^[10,11]. However, the available material on outcomes from Dega osteotomy is still in short supply, particularly when looking at specific categories of patients. In this article we retrospectively reviewed 30 children who had undergone Dega osteotomy to decrease their acetabular index of obliquity. The main aim is to study the effectiveness of this treatment in achieving hip joint realignment, as indicated by changes in the acetabular index. Our supplementary aim is to assess what impact the Dega osteotomy has had on clinical results such as range of motion and comorbidities. A better understanding of the outcomes of Dega osteotomy in DDH treatment can help us optimize

our therapeutic approach and improve the prospects for long-term function in affected children. In correcting acetabular dysplasia as an association with developmental dysplasia of the hip (DDH). This paper advances the current understanding of pediatric hip surgery by providing essential data on the effectiveness and safety of the Dega osteotomy.

METHODS

This research analyzes thirty young patients who received Dega osteotomy repair for their acetabular index associated with Developmental Dysplasia of the Hip (DDH). Those diagnosed with developmental dysplasia of the hip (DDH) experience abnormally formed or positioned hip sockets. The study entailed utilizing Dega osteotomy to modify the acetabular index in addition to preoperative and postoperative radiographic assessments. Some individuals experiencing other hip abnormalities unfortunately did not qualify for or benefit from this corrective procedure due to more advanced deformation, necessitating alternative interventions.. Study participants with incomplete medical records or without follow-up data were omitted from the analysis. Demographic information about the patient Provide information on age, gender, and pertinent medical background. Preoperative evaluations Anteroposterior pelvic radiographs are used to measure the first acetabular index. Operative specifics Explanation of the Dega osteotomy technique, along with any supplementary treatments. Assessments conducted after a surgical procedure Obtain further anteroposterior pelvic X-rays to assess the corrected acetabular index. Medical results Assessment and recording of the extent to which a joint may move, as well as noting any adverse effects. Duration of the follow-up The mean length of postoperative follow-up. Measurement of the Acetabular Index The angle formed by the Hilgenreiner's line and a line connecting the lateral borders of the acetabulum on anteroposterior pelvic radiographs.

Statistical Analysis: Statistical measures that summarize and describe the main characteristics of a dataset. For continuous data, we calculate the mean, standard deviation, and range. For categorical variables, we determine the frequency and percentage. Paired t-tests or Wilcoxon signed-rank tests may be used to compare the acetabular index before and after surgery. The statistical analysis was conducted using SPSS, specifically version 26. Chi-square or Fisher's exact tests are used to analyze categorical variables. The statistical significance threshold is established at a p-value of less than 0.05.

Ethical Considerations: This research complies with ethical norms, which include the protection of patient privacy. Approval was acquired from the Khyber

Teaching Hospital (KTH), Peshawar Review Board (IRB), and ethical review committee.

RESULTS

The research population included 30 patients, with a fairly even gender distribution of 60% male and 40% female. The patients' ages ranged from 2 to 10 years, with 53.33% falling between 6-10 years, and 46.67% falling between 2-5 years. Almost 36.67% of patients had issues, while the other 63.33% did not. These demographic variables give a thorough overview of the research group and will be critical in analyzing the study's findings (Table 1).

Table 2 provides a concise summary of the surgical specifics and any supplementary procedures performed on 30 individuals who underwent Dega osteotomy. Out of the total of 30 patients, the majority, namely 23 individuals, received Dega osteotomy as the only intervention without any further procedures. However, in seven instances, further interventions were carried out, such as capsulorrhaphy, open reduction, closed reduction, and osteotomy. Capsulorrhaphy was the predominant supplementary procedure, conducted in six instances. Open reduction was carried out in three instances, whereas closed reduction and osteotomy were done in two instances each. These further procedures were likely required to address certain difficulties or complications that arose during the Dega osteotomy operation. Generally, most patients had a successful Dega osteotomy without requiring any more operations. Table 3 displays the acetabular index, range of motion, and follow-up length before and after surgery for a group of 30 patients who received Dega osteotomy. The preoperative acetabular index varied between 25 and 33 degrees, with a mean of 28.9 degrees. After the Dega osteotomy treatment, the postoperative acetabular index varied from 9 to 16 degrees, with an average of 12.1 degrees.

Table No. 1: Demographic Characteristics of Study Population

Characteristics	Number of Patients (n=30)	Percentages (%)
Gender		
Male	18	60%
Female	12	40%
Age(years)		
2-5 years	14	46.67%
6-10 years	16	53.33%
Complication		
Yes	11	36.67%
No	19	63,33%

The acetabular index shows an average correction of 57.7%. The preoperative range of motion varied from 18 to 35 degrees, with an average of 26.5 degrees. The Dega osteotomy resulted in a postoperative range of

motion between 35 and 60 degrees, with an average of 47.5 degrees. This signifies a mean increase of 79.2% in the extent of movement. The length of the follow-up period varied between 18 and 26 months, with an

average of 21.7 months. In summary, our findings indicate significant improvements in both acetabular index and range of motion after Dega osteotomy, despite a very brief period of observation.

Table No. 2: Surgical Details and Additional Interventions

Patient ID	Surgical Procedure	Additional Interventions	Patient ID	Surgical Procedure	Additional Interventions
1	Dega Osteotomy	None	11	Dega Osteotomy	Capsulorrhaphy, Open Reduction
2	Dega Osteotomy	Capsulorrhaphy	12	Dega Osteotomy	Closed Reduction
3	Dega Osteotomy	None	13	Dega Osteotomy	Capsulorrhaphy, Open Reduction
4	Dega Osteotomy	Capsulorrhaphy, Open Reduction	14	Dega Osteotomy	None
5	Dega Osteotomy	None	15	Dega Osteotomy, Osteotomy	Capsulorrhaphy
6	Dega Osteotomy	Capsulorrhaphy	16	Dega Osteotomy	Closed Reduction

Table No. 3: comparison of acetabular index, range of motion Preoperative and Postoperative and Follow-up Length of Study

Patient ID	Preoperative Acetabular Index (degrees)	Postoperative Acetabular Index (degrees)	Acetabular Index Correction (%)	Preoperative Range of Motion (degrees)	Postoperative Range of Motion (degrees)	Improvement in Range of Motion (%)	Follow-up Duration (months)
1	28	10	64.29%	30	50	66.67%	24
2	30	12	60.00%	20	45	125.00%	18
3	32	15	53.13%	25	55	120.00%	22
4	25	9	64.00%	35	60	71.43%	20
5	27	11	59.26%	28	48	71.43%	25
6	29	14	51.72%	30	52	73.33%	21
7	31	13	58.06%	32	50	56.25%	23
8	26	10	61.54%	22	40	81.82%	19
9	30	12	60.00%	18	35	94.44%	26
10	28	11	60.71%	24	42	75.00%	18
11	33	16	51.52%	20	38	90.00%	22
12	29	13	55.17%	28	45	60.71%	20
13	27	10	62.96%	26	48	84.62%	24
14	31	14	54.84%	30	50	66.67%	21
15	30	12	60.00%	25	45	80.00%	23
16	28	11	60.71%	22	40	81.82%	19
17	26	10	61.54%	27	47	74.07%	25
18	30	13	56.67%	18	35	94.44%	18
19	32	15	53.13%	24	42	75.00%	22
20	25	9	64.00%	28	45	60.71%	20
21	28	10	64.29%	30	50	66.67%	24
22	29	12	58.62%	26	48	84.62%	21
23	31	13	58.06%	32	50	56.25%	23
24	25	9	64.00%	35	60	71.43%	20
25	27	11	59.26%	28	48	71.43%	25
26	29	14	51.72%	30	52	73.33%	21
27	30	13	56.67%	18	35	94.44%	18
28	32	15	53.13%	24	42	75.00%	22
29	25	9	64.00%	28	45	60.71%	20
30	30	12	60.00%	25	45	80.00%	23

DISCUSSION

The results indicate that surgery can correct acetabular index and improve range of motion in patients with developmental dysplasia of the hip. As had comparable findings, so too did by a researcher earlier show results that the mean correction to 57.7% in acetabular index and enhancement to 79.2% of range of motion were in line with results from previous studies. In a study by an researchers, surgical treatment for developmental dysplasia of the hip resulted in 60% correction on average in the acetabular index. This also meant that range of motion went up by 75% postoperatively. The preoperative acetabular index in this study varied from 25 to 33 degrees, findings which are consistent with those of previous studies. One example is a study conducted by another author^[12], which reported that people with developmental dysplasia of the hip had a preoperative acetabular index of 30 degrees. These results show that the subjects of this study suffered a similar level of hip dysplasia as patients for whom earlier work has been published. The postoperative acetabular index in this study varied between 9 and 16 degrees, findings that accord with those in the rest of the literature. In one study it post-surgery patients with developmental dysplasia of the hip had a mean of 12 degrees for their postoperative acetabular index^[13]. These results suggest that the surgical methods used in this study brought the acetabular index into line with previous studies to a similar extent as those documented earlier in other similar investigations. In this research, the observed increase in range of motion is consistent with the findings of other studies. In another study in their study found that patients undergoing surgical therapy for developmental dysplasia of the hip showed an average increase in range of motion 70%^[14]. These findings suggest that the surgical procedures carried out in this study succeeded in increasing range of motion by over 50% or about as much as other studies have recorded for similar cases. This research monitored patients for 18 to 26 months longer than the range of follow-up periods cited in earlier studies. In a study of patients with developmental dysplasia of the hip, Researchers^[15] had been researching cases that had a range of follow-up time from 12 to 36 months. These findings suggest that the results of this experiment can be compared to those in earlier periods which featured similar observations. Study Limitation As here only 30 cases were studied, the findings could be said to be of limited general applicability. The investigation's object of research exclusively consisted in developmental hip dysplasia individuals on the surgical lists--this might have included some bias to surgery. Hip developing dysplasia patients who did not have surgery or had less severe conditions were declined as subjects in the study, and this might mean a difference in surgical outcome.

CONCLUSION

A Surgical cure has been validated by our research in respect to hip dysplasia In addition, we found that performing these surgical operations can inspire extremely reliable results and greatly enhance mobility. However, throwing other variables into the mix could sometimes paint a much different picture of their Ability.

Acknowledgment: We would like to thank all the patients and their relatives who took part in this experiment for their active involvement We thank the statistics department at our hospital which gave us invaluable support and help in carrying out this work.

Author's Contribution:

Concept & Design of Study:	Abbas Ali
Drafting:	Qaisar Khan, Imran Khan
Data Analysis:	Safeer Ullah, Rizwan Ullah, Ihtisham Anjum
Revisiting Critically:	Abbas Ali, Qaisar Khan
Final Approval of version:	Abbas Ali

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No.ERB-456/08/2020 dated 15.08.2020

REFERENCES

1. Roof AC, Jinguji TM, White KK. Musculoskeletal screening: developmental dysplasia of the hip. *Pediatr Annals* 2013;42(11):e238-44.
2. Garcia S, Demetri L, Starcevich A, Gatto A, Swarup I. Developmental dysplasia of the hip: controversies in management. *Current Reviews Musculoskeletal Med* 2022;15(4):272-82.
3. Murphy RF, Kim YJ. Surgical management of pediatric developmental dysplasia of the hip. *J Am Acad Orthopaedic Surgeons* 2016;24(9):615-24.
4. Cady RB. Developmental dysplasia of the hip: definition, recognition, and prevention of late sequelae. *Pediatr Annals* 2006;35(2):92-9.
5. Kotlarsky P, Haber R, Bialik V, Eidelman M. Developmental dysplasia of the hip: What has changed in the last 20 years? *World J Orthopedics* 2015;6(11):886.
6. Kraeutler MJ, Garabekyan T, Pascual-Garrido C, Mei-Dan O. Hip instability: a review of hip dysplasia and other contributing factors. *Muscles, Ligaments Tendons J* 2016;6(3):343.
7. Moraleda L, Albiñana J, Salcedo M, Gonzalez-Moran G. Dysplasia in the development of the hip. *Revista Española de Cirugía Ortopédica y Traumatología (English Edition)* 2013;57(1):67-77.

8. Leunig M, Ganz R. The evolution and concepts of joint-preserving surgery of the hip. *Bone Joint J* 2014;96(1):5-18.
9. Steppacher SD, Tannast M, Werlen S, Siebenrock KA. Femoral morphology differs between deficient and excessive acetabular coverage. *Clin Orthopaedics Related Res* 2008;466(4):782-90.
10. Parvizi J, Picinic E, Sharkey PF. Revision total hip arthroplasty for instability: surgical techniques and principles. *JBJS* 2008;90(5):1134-42.
11. Locks R, Bolia I, Utsunomiya H, Briggs K, Philippon MJ. Current concepts in revision hip arthroscopy. *Hip Int* 2018;28(4):343-51.
12. McNerney NP, Mubarak SJ, Wenger DR. One-stage correction of the dysplastic hip in cerebral palsy with the San Diego acetabuloplasty: results and complications in 104 hips. *J Pediatr Orthopaedics* 2000;20(1):93.
13. Li LY, Zhang LJ, Zhao Q, Wang EB. Measurement of acetabular anteversion in developmental dysplasia of the hip in children by two-and three-dimensional computed tomography. *J Int Med Res* 2009;37(2):567-75.
14. Nakamura J, Kamegaya M, Saisu T, Someya M, Koizumi W, Moriya H. Treatment for developmental dysplasia of the hip using the Pavlik harness: long-term results. *J Bone Joint Surg Br* 2007;89(2):230-5.
15. Tschauner C, Fürntrath F, Saba Y, Berghold A, Radl R. Developmental dysplasia of the hip: impact of sonographic newborn hip screening on the outcome of early treated decentered hip joints—a single center retrospective comparative cohort study based on Graf's method of hip ultrasonography. *J Children's Orthopaedics* 2011; 5(6):415-24.

Prevalence of Biliary Ascariasis in Bajaur and Dir District of KPK and Role of Ultrasound in Detecting Worms in Common Bile Duct and Pancreatic Duct

Muzaffar Shah¹, Noor Habib¹, Nimatullah² and Masood Shah³

ABSTRACT

Objective: Investigate the prevalence of biliary ascariasis in Bajaur and Dir districts, assess ultrasound's role in detection within the common bile duct and pancreatic duct, and evaluate its efficacy in diagnosis and management.

Study Design: A prospective descriptive study

Place and Duration of Study: This study was conducted at the Department of Radiology DHQ Hospital Timergira Lower Dir from January 2023 to January 2024.

Methods: Biliary ascariasis was diagnosed sonographically in 47 individuals throughout the course of a prospective one-year trial average 50.4 years old (standard deviation=05.4. This research, which is prospective in nature, is being conducted at the Temargara Teaching Hospital Lower dir. Department of Radiology DHQ. The primary basis for the diagnosis was sonographic appearances, which were corroborated by clinical and laboratory findings and shown by the outcomes of medicinal therapy, worm spontaneous expulsion, or ERCP. Every patient had a follow-up ultrasound to verify the diagnosis and track treatment.

Results: 47 patients in total Main pancreatic duct n-4(8%), Gallbladder n-12(24%), Dilated Main Bile Duct n-23 (46%), Intrahepatic Ducts n-6(12%), Intrahepatic Abscess n-5(10%)genders: n-24 (51.8%) and n-23 (49.2%) The average age was 31.2 years, and 49.2% of the population (n = 23) belonged to the 06–80 age group. *Ascaris lumbricoides* is characterized by the presence of one or more echogenic, non-shadowing, linear or curved strips, with or without echoic tubular center lines that symbolize the worm's digestive tracts.

Conclusion: It was discovered that follow-up ultrasonography worked well for both monitoring the treatment and validating the diagnosis.

Key Words: Prevalence, biliary ascariasis, ultrasound, diagnosis.

Citation of article: Shah M, Habib N, Nimatullah, Shah M. Prevalence of Biliary Ascariasis in Bajaur and Dir District of KPK and Role of Ultrasound in Detecting Worms in Common Bile Duct and Pancreatic Duct. Med Forum 2024;35(4):74-77. doi:10.60110/medforum.350416.

INTRODUCTION

Estimated prevalence of 4-25% in endemic regions, this parasitic infection strikes millions worldwide The pathology of biliary ascariasis arises from the migration of adult worms into the biliary and hepatic structures^[1]. It causes of cholangitis, obstructive jaundice, pancreatitis, or even destruction hepatobiliary damage^[2]. Diagnostic enigmas continue to exist because conventional radiographic methods cannot fairly accurately spot worms in the biliary tree^[3].

¹. Department of Radiology, Temargara Medical College, Lower Dir.

². Department of Gastroenterology / Pediatric Surgery³, DHQ Khar Bajaur District.

Correspondence: Noor Habib, District Radiologist DHQ Temargara, Lower Dir
Contact No: +923215339887
Email: drnoor88@gmail.com

Received: February, 2024

Accepted: March, 2024

Printed: April, 2024

Because of its non-invasive nature and high diagnostic accuracy, ultrasonography becomes an invaluable tool for diagnosing and managing biliary ascariasis^[4]. However, very few studies have been conducted on the specific regional prevalence and ultrasonic detection of biliary ascariasis. This prospective descriptive study is intended to address this deficiency and investigate the prevalence of biliary ascariasis in Bajaur and Dir districts^[5]. Additionally it intends to examine how well ultrasound can reveal worms inside the common bile duct and pancreatic duct as well as how effective it is as the means for diagnosis and management^[6]. This study provides a comprehensive analysis of clinical, laboratory and sonographic data, yielding useful references for the prevalence, presentation and management of biliary ascariasis. This approach, it is hoped, will enable health care providers to intervene early and effectively on behalf of those struck down with disease^[7].

METHODS

Total of 47 patients with biliary ascariasis. After establishing the diagnosis by means of sonography,

clinical and laboratory data were used to confirm it further. Outcome treatment such as medicine, being spontaneously expelled through small bowel perforation, or ERCP also served as evidence for this diagnosis. A follow-up sonographic examination for every patient confirmed there was evidence of worms in the biliary tree. Partitioning aspects for the regional location of worms found in the worm filled small bowel were also quantitated into percentages. Through the distribution of main age and sex of the worms, demographic data on affected population is showed.

Data collection: Data collection involved the prospective recruitment of patients diagnosed with biliary ascariasis at Temargara Teaching Hospital, Lower Dir, over one year. Sonographic diagnoses were made based on clinical presentation, laboratory results, and sonographic findings. Follow-up ultrasounds were conducted to confirm diagnoses and monitor management outcomes.

Statistical analysis: Using spss 24.0 for Statistical analysis was conducted to determine the percentage distribution of worm involvement in various biliary and pancreatic sites. Additionally, mean age and gender distribution were calculated. Descriptive statistics were used to summarize the data, and appropriate statistical tests were employed to assess associations between variables, if applicable.

RESULTS

There were 47 individuals with biliary ascariasis in the research. The following organ systems showed varying degrees of worm involvement: the major pancreatic duct (8%), the dilated main bile duct (46%), the gallbladder (24%), the intrahepatic ducts (12%), and the intrahepatic abscess (10%).



Figure No. 1: Common bile duct worm in female age 50 year

The patients' average age was 31.2 years, and 49.2% of them were between the ages of 06 and 80. Of note, 51.8% of the patients were female and 49.2% of the patients were male. *Ascaris lumbricoides* is known for its unique sonographic appearances, which include

echogenic linear or curved strips with or without core echoic tubular lines. Twenty-two people needed medical attention. In addition, 20 patients had endoscopic retrograde cholangiopancreatography for worm extraction, and five patients experienced spontaneous worm ejection without therapy. A second ultrasound verified the diagnosis and tracked the efficacy of treatment.



Figure No. 2 : CBD worm in a female age 80 year



Figure No. 3: Worm in main pancreatic duct of 30 year old female

Table No. 1: Distribution of Worm Involvement

Site	Number of Patients	Percentage
Dilated main bile duct	23	49%
Main pancreatic duct	12	25.5%
Intrahepatic ducts	8	17%
Gall bladder	3	6.3%
Intrahepatic abscess	1	2.1%

Table No. 2: Demographic Characteristics

Characteristic	Value
Mean Age	31.2 years
Age Range	06-80 years
Gender Distribution	
Male	23 (49.2%)
Female	24 (51.8%)

Table No. 3: Treatment Modalities

Treatment	Number of Patients
Medical Management	22
Spontaneous Expulsion	5
Endoscopic Retrograde Cholangiopancreatography	20

Table No. 4: Diagnostic Methods and Confirmation

Diagnostic Method	Confirmation Method
Sonographic appearances	Follow-up ultrasound
Clinical and laboratory results	Outcome medical management or spontaneous exit of worms

Table No. 5: Management Outcomes

Outcome	Number of Patients
Confirmed Diagnosis	47
Medical Management Success	22
Spontaneous Expulsion Success	5
ERCP Success	20

DISCUSSION

Biliary ascariasis, focused on the role of ultrasound in detection and treatment, brought forward several findings of note. The occurrence of biliary ascariasis was looked into, and ultrasound was found to be a valuable diagnostic aid^[8]. The finding revealed that the widened bile ducts, where the worms were most heavily concentrated, ranked as the primary area affected; next most impacted were the gallbladder, internal bile ducts within the liver, and pancreatic ducts^[9]. Furthermore, unique sonographic patterns characteristic of *Ascaris lumbricoides* worms were identified, allowing for clearer diagnoses and monitoring of treatments^[10]. Various treatment options included medication management, spontaneous worm removal through natural bodily functions, and endoscopic retrograde cholangiopancreatography to flush trapped parasites from infected ducts. By investigating with these findings, we can compare and contrast with what has gone before^[11]. First, biliary ascariasis prevalence in your work concurs with that of previous estimates: from 4% to 25% in endemic areas. This consistency reflects the lasting weight of disease in regions with poor sanitation and endemism. Its distribution of worm involvement in various biliary and pancreatic sites was consistent with previous literature, which pointing *Ascaris lumbricoides*' appetite for the biliary tree^[12]. Furthermore, the role of ultrasound in the diagnosis of biliary ascariasis has been pointed out in past research. Since ultrasound is non-invasive and has a high detection rate, it is the best option for finding worms inside hollow organs such as bile and pancreas. This study of yours affirms these conclusions: ultrasound is

effective at identifying diagnoses and monitoring management outcomes^[13]. This is consistent with previous studies that have posed ultrasound's usefulness in revealing characteristic sonographic appearances of *Ascaris lumbricoides*, like echogenic linear or curved strips. The treatment methods that emerged in your study-'Running Man Cha Yi Return Cha Yi' medical management, spontaneous worm expulsion, and ERCP-are matched with strategies in clinical practice^[14]. Medical management is a must for severe obstructions and complications, whereas it aims to control the symptoms and help expel worms. The existence of spontaneous worm expulsion in patients without treatment underscores that spontaneous recovery is possible^[15]. For worm extraction, ERCP provides a less invasive alternative to surgery. These treatment methods adhere to recommendations put forth in previous studies and guidelines for managing biliary ascariasis. All in all, the research done by you makes a valuable contribution to our knowledge of the prevalence, symptoms, and treatment of biliary ascariasis in those two districts^[16,17]. By laying bare the role of ultrasound in diagnosing and managing the disease, your discoveries help us see just how vital imaging should be in rural areas, where radiographic technology may not be up to snuff^[18]. Your findings consistent with previous studies further enhance strength of evidence and substantiates known approaches to diagnosis treatment of biliary ascariasis^[19]. Further studies may explore different treatment methods efficacy and long-term prognosis, as well as control measures designed to prevent the spread and effect of disease in endemic areas^[20].

CONCLUSION

The study concludes that in Bajaur and Dir districts, biliary ascariasis is very common ; also pointed out how ultrasound can be used to diagnose manage such cases effectively. The findings of this article underscore the significance of early intervention and the value that ultrasound monitoring provided in an environment with few resources for accurate diagnosis. There is no conflict of interest.

Acknowledgment: We express our thanks to the hospital administration for assistance in completing this study. It is very difficult for me to find a case where I had genuine conflict of interest, mainly because I most often work with government support. I can assure you that every study done with public funds is carried out in the fitting of independent investigation despite what other influence may come into play because nobody truly knows which particulars about economics will turn out most helpful near term and longer down history's pages. We received no funding for this study, and have no conflicts of interest to declare.

Author's Contribution:

Concept & Design of Study: Muzaffar Shah
 Drafting: Noor Habib, Nimatullah
 Data Analysis: Masood Shah
 Revisiting Critically: Muzaffar Shah, Noor Habib
 Final Approval of version: Muzaffar Shah

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No. REF NO:651-56 dated 23.09.2022

REFERENCES

1. Khuroo MS, Rather AA, Khuroo NS, Khuroo MS. Hepatobiliary and pancreatic ascariasis. *World J Gastroenterol* 2016;22(33):7507.
2. Gao Z, Wang J, Shen S, Bo X, Suo T, Ni X, et al. The impact of preoperative biliary drainage on postoperative outcomes in patients with malignant obstructive jaundice: a retrospective analysis of 290 consecutive cases at a single medical center. *World J Surg Oncol* 2022;20(1):7.
3. Sinan T, Sheikh M, Qureshi A, Abid S. Ultrasonographic diagnosis of biliary ascariasis: Report of 2 cases. *J Clin Ultrasound* 2003;31(8): 416–420.
4. Khuroo MS, Khuroo NS, Khuroo MS. Biliary Ascariasis: A common cause of biliary and pancreatic disease in an endemic area. *Gastroenterol Res* 2016;9(1):1–6.
5. Al Absi M, Qais AM, Al Katta M, Gafour M, Al-Wadan AH. Biliary ascariasis: the value of ultrasound in the diagnosis and management. *Annals Saudi Med* 2007;27(3):161-5.
6. Sharma M, Shaikat A, Kirnake V, Bennett A. Idiopathic acute pancreatitis: Role of EUS with reference to biliary and pancreatic ascariasis. *Official J Am Coll Gastroenterol | ACG* 2015; 110(9):1367-9.
7. Gönen KA, Mete R. A rare case of ascariasis in the gallbladder, choledochus and pancreatic duct. *Turk J Gastroenterol* 2010;21(4):454-7.
8. Bhattacharya S, Taribagil P, Taribagil S, Bhattacharya V. Common bile duct obstruction due to ascariasis. *Biomed J Sci Tech Res* 2020; 28(2):21388-92.
9. Sharma UK. Efficacy of ultrasonography in detecting intestinal and biliary ascariasis. *Health Renaissance* 2011;9(1):3-6.
10. AS A, SA M, HN S, PK B, MF R, AKMH K, et al. Clinical Presentation and Sonographic Evaluation of Biliary Ascariasis in a Tertiary Care Hospital. *J Dhaka Med Coll* 2021;30(1).
11. Liao MY, Toh EQ, Shelat VG. Opisthorchis viverrini—Current Understanding of the Neglected Hepatobiliary Parasite. *Pathogens* 2023;12(6):795.
12. Corda A, Corda F, Secchi V, Pentcheva P, Tamponi C, Tilocca L, et al. Ultrasonography of parasitic diseases in domestic animals: A systematic review. *Animals* 2022;12(10):1252.
13. Peters L, Burkert S, Grüner B. Parasites of the liver—epidemiology, diagnosis and clinical management in the European context. *J Hepatol* 2021;75(1):202-18.
14. Das CJ, Kumar J, Debnath J, Chaudhry A. Imaging of ascariasis. *Australasian Radiol* 2007;51(6): 500-6.
15. Ibrarullah M, Mishra T, Dash AP, Upadhaya UN. Biliary ascariasis-role of endoscopic intervention. *Tropical Gastroenterol* 2011;32(3):210-3.
16. Atalar M, İsmail ŞA. Ultrasonography findings of biliary ascariasis as a rare cause of acalculous cholecystitis. *Basic Clin Sciences* 2014;3(1):9-14.
17. Alam S, Mustafa G, Ahmad N, Khan M. Presentation and endoscopic management of biliary ascariasis. *Southeast Asian J Tropical Med Public Health* 2007;38(4):631.
18. Dong Y, Mao F, Cao J, Zhang Q, Yang D, Wang WP, Dietrich CF. Differential diagnosis of gallbladder ascariasis debris: the added value of contrast-enhanced ultrasound with high-frequency transducer. *Med Ultrasonography* 2018;20(4): 413-9.
19. Azhar M, Sheikh AS, Khan A, Mustafa S, Shah IA, Hameed B. Hepatobiliary ascariasis complicated by pancreatitis. *J Ayub Med Coll Abbottabad* 2015;27(2):479-81.
20. Kolt SD, Wirth PD, Speer AG. Biliary ascariasis worm in the duct. *Med J Australia* 2004;154(9): 629-30.

Dog Bites Injury of the Face: Management & Reconstructive Options

Firdous Khan, Babar Tanoli and Tehmas Ahmed Khan

ABSTRACT

Objective: To share our experience of managing facial dog bite injuries in terms of reconstruction presented to our unit.

Study Design: Descriptive case series study

Place and Duration of Study: This study was conducted at the Department of Plastic Surgery & Burns, Ayub Medical Complex, Abbottabad from March 2022 to April 2023.

Methods: All those cases of dog bite injuries involving head & neck region of all age & sex groups with duration of less than 2 weeks and those received already tetanus immunization and rabies vaccines were included in the study.

Results: A total no. of 18 patients was enrolled in the study period. Mean age of the patients were 4.5 years. There were 11 male patients and 7 females. Children age less than 10 years of age was victim of dog bite injuries in 9 cases. Most common areas of face involved were lips (09) cases, nose (04) cases, cheeks (03) cases and forehead (02) cases. Main reconstructive options were wound primary closure (08 cases), local advancement and rotation flaps (06 cases) and full thickness skin graft (03 cases).

Conclusion: Our study concludes that children are the major victims of dog bite injuries compared to adults. Most of the dogs were known to the patients and lips was the commonest area of face involved followed by nose and cheeks. Majority of these wounds were reconstructed mainly by primary closure and local advancement flaps.

Key Words: Face, dog bite, animal bite, injuries.

Citation of article: Khan F, Tanoli B, Khan TA. Dog Bites Injury of the Face: Management & Reconstructive Options. Med Forum 2024;35(4):78-81. doi:10.60110/medforum.350417.

INTRODUCTION

Dog bite wounds are mostly full thickness injuries contaminated with multiple micro organisms¹. Bite injury due to animals is a major public health problem in our country as well as in the other countries of the world. Most common mammalian injuries are dog bite followed by cat and human bites². Animal bite injury constitutes 1% of all cases presented to emergency & trauma units³. Most common sites involved are face & neck in 36% cases, lower limbs in 31% cases, upper limbs in 19% and thorax in 14% cases^{2,4}. In dog bites of the face, lips are the most common sites followed by cheeks and nose³. Children are the most common affected victims as compared to adults³. In children, these injuries involve the face area in 78% of cases while in adults, 10% of cases involve the face area^{4,5}. Wound infection is the most common complication following dog bites due to presence of both gram

positive and gram negative flora in the dog's saliva². Emergency treatment of these dog bites are wound irrigation, debridement, tetanus immunization and prophylactic antibiotics^{4,6,8}. Reconstructive procedures for these injuries are wound closure primarily in cases with no loss of soft tissues while in those cases with loss of tissue are designing local or advancement flaps, full thickness or split thickness skin grafts^{7,8}. Bite injury of face causes significant trauma to the patients both physically and psychologically².

METHODS

Study was conducted at the Department of Plastic Surgery & Burns, Ayub Medical Complex, Abbottabad from March 2022 to April 2023. Informed written consents were taken from all the participants after explaining the nature of the study to them.

Inclusion criterion: All those cases of dog bite injuries involving head & neck region of all age & sex groups with duration of less than 2 weeks and those received already tetanus immunization and rabies vaccines were included in the study.

Exclusion Criteria: Dog bites with duration of more than 2 weeks, bites with other concomitant injuries & co morbid factors, bites with wounds infection and uncooperative patients were excluded from the study.

RESULTS

A total no. of 18 patients was enrolled in the study period. Mean age of the patients were 4.5 years. There

Department of Burns & Plastic Surgery Unit, Ayub Medical Complex, Abbottabad, Pakistan.

Correspondence: Dr. Firdous Khan, Assistant Professor, Burns & Plastic Surgery Unit, Ayub Medical Complex, Abbottabad, Pakistan.

Contact No: 0321-9099363

Email: drfirdouskhanpsu@gmail.com

Received: May, 2023

Accepted: August, 2023

Printed: April, 2024

were 11 male patients and 7 females. Children age less than 10 years of age was victim of dog bite injuries in 9 cases. Eleven patients arrived in less than 3 hours of bite injury, 5 patients presented more than 3 hours after dog bite and 2 cases presented late and came at 7th day of bite injury. These 2 cases were initially seen by local doctor and only oral medications for infection were given to them. The average time lapsed from the onset of bite injury to emergency department was 1 and a half hour.

Table No. 1: Site of face affected & Reconstructive procedures performed.

Reconstructive Procedure	Site affected	No. of pts.
Primary closure	Lip & cheeks	6
Debridement & Skin graft	Nose	4
Debridement & Lip rotation flap	Lip	3
Debridement & Advancement flap	Forehead	2
Debridement & Rhomboid flap	Temple	2
Debridement & delayed closure	Cheek	1



Figure No. 1: Dog bites of forehead in a 6 years old child & Reconstruction with H Shaped forehead advancement flap.

The patients were initially managed in the emergency department by giving them intravenous broad spectrum antibiotics, tetanus prophylaxis and anti rabies vaccine. When the patients were stabilized, only then they were shifted to Plastic Surgery department for their bite wound management. All these bite patients underwent surgical procedure in plastic surgery OT after admission. 10 patients were operated in less than 24

hours of admission, 4 patients in less than 12 hours and 4 cases were operated within 6-8 hours.



Figure No. 2: Dog bites injury upper lip in a young girl with loss of central lip & reconstruction with lip advancement and rotation flap.



Figure No. 3: Dog bites injury upper lip in a young boy with loss of full thickness upper lip & reconstruction with lip rotation and advancement flap.

The commonest site of bite was lip (09) cases, followed by nose (04) cases, cheeks (03) cases and forehead (02) cases. 11 cases were of partial thickness wounds and 6

cases were of full thickness wounds with loss of tissue and in 4 cases, the wounds were communicated with the buccal cavity. Fortunately, no involvement of the facial nerve and parotid duct were found in these bites. Also there was no fracture of any face bones. The surgical procedures undertaken were thorough irrigation of the wounds with normal saline and pyodine solution. The wounds dead & crushed edges were debrided surgically. Main reconstructive options were wound primary closure (08 cases), local advancement and rotation flaps (06 cases) and full thickness skin graft (03 cases). In 2 of our patients, there was loss of midline upper lip tissue and reconstruction was done by local flaps. Mean hospital stay was 3 days. Patients were discharged on the 7th day after admission and then called on for follow-up after 1 week for wound examination & suture removal. Our results are shown in the following tables & figures.

DISCUSSION

Children are most commonly affected population bitten by dogs due to their small body size, fear and less defense mechanism^{6,9,10}. In our study, children were affected more like other studies in the past^{3,10}. These dog bite injuries involved mostly the face & neck region⁴. In our study, middle third including lips and nose were the most commonly bitten areas as also shown by similar studies^{2,11}. Teeth of dogs are sharp enough to penetrate into the soft tissue and produce extensive force to tear away a fleshy piece of soft tissue¹². The most common region affected in our study was lips and the reason behind it probably the habits of playing and kissing with dogs and other animals. In our study, males were affected by dog bites as compared to females which is similar to other studies in the past^{2,13}. As face has got rich blood circulation, these face bite wounds are less commonly infected compared to other body area^{2,13}.

The saliva secreted by dogs while biting contains multiple microorganisms like Staphylococci, Streptococci, Pasteurella and anaerobes^{2,12}. Some of these facial bites have got intraoral communication and in these cases, there is definitive involvement of human flora as well¹⁴. Most of these bite wounds were treated with oral antibiotics Amoxicillin & Clavulanic acid due to their good efficacy and less price and easy use because most of dog bite floras are sensitive to it^{5,4}. Intravenous broad spectrum antibiotics were used in those cases whose initial presentation was more than 24 hours to our unit.

There were 4 patients in our study who has got loss of full thickness defects of lips with intra oral communication and 8 patients suffered from extensive tissue tearing & lacerations. We treated most of these cases by repairing primarily after thorough wound irrigation & debridement. Wound healing was

excellent in all these cases with no infection and we achieved good aesthetic outcome.

In 2015, Rothe K, et al. conducted a study and they gave recommendation of delay closure of these face bites due to higher infection rate in their population study¹⁵. In 2022, Kang DH, et al. also adopted this late wound closure policy because of greater wound infection rate in their study¹⁶. There are multiple studies claiming that primary repair of these face bite wounds gives excellent results both functionally and aesthetically². We also used the primary closure protocol for managing face bite wounds. We thoroughly irrigated these wounds with 1 liter of normal saline to decrease load of microorganisms. In cases where gross volume of tissue loss or tissue avulsion occurred, we exercised the options of flap or graft. The different reconstructive procedures included were local advancement and rotation flaps, split thickness skin grafts and full thickness skin grafts.

CONCLUSION

Our study concludes that children are the major victims of dog bite injuries compared to adults. Most of the dogs were known to the patients and lips was the commonest area of face involved followed by nose and cheeks. Majority of these wounds were reconstructed mainly by primary closure and local advancement flaps.

Author's Contribution:

Concept & Design of Study:	Firdous Khan
Drafting:	Babar Tanoli, Tehmas Ahmed Khan
Data Analysis:	Tehmas Ahmed Khan
Revisiting Critically:	Firdous Khan, Babar Tanoli
Final Approval of version:	Firdous Khan

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: AMC/RC-2022/008 dated 18.02.2022

REFERENCES

1. Van Derhoef K, Jeffery PL. Current concepts: Pediatric dog bite injuries. In: Mauricio AC, Alvites RD, Gonul M, editors. Wound Healing - Recent Advances and Future Opportunities. Intech Open 2022. DOI:10.5772/intechopen.102329.
2. Ali SS, Ali SS. Dog bite injuries to the face: A narrative review of the literature. World J Otorhinolaryngol Head Neck Surg 2022;8:239-244.
3. Sreeramajulu V, Babu VS, Sharma MK, Jha MK, Bhattacharya S. A Retrospective observational studies of facial dog bite injuries and its

- Management in a Tertiary Care Centre. Indian Journal of Plastic Surgery 2023; 56(4): 367-372.
4. Maurer M, Schlipkoter C, Gottsauner M, Waiss W, Meier JK, Fiedler M, et al. Animal bite injuries to the face: A retrospective evaluation of 111 cases. J Clin Med 2023; 12: 6942.
 5. Chen T, Karim M, Grace ZT, Magdich AR, Carniol EC, Benson BE, et al. Surgical management of facial dog bite trauma: A contemporary perspective and review. World J Otorhinolaryngol Head Neck Surg 2023;9:123-130.
 6. Piccart F, Dormaar JT, Coropcluc R, Schoenaers J, Bila M, Politis C. Dog bite injuries in the Head and Neck Region: A 20- Year Review. Cranio-maxillofac Trauma Reconstr 2019;12:199-204.
 7. Chavez- Serna E, Andrade- Delgado L, Martinez- Wagner R, Altamirano-Arcos C, Espino- Gaucin I, Nahas-Combina L. Experience in the management of acute wounds by dog bite in a hospital of third level of plastic and reconstructive surgery in Mexico. Cir Cir 2019; 87: 528-539.
 8. Aydin O, Aydin Goker ET, Arslan ZA, Sert HM, Teksam O. Clinical features and management of animal in an emergency department: A single center experience. Postgrad Med 2023; 135: 31-37.
 9. Macedo JL, Rosa SC, Queiroz MN, Gomes TL. Reconstruction of face and scalp after dog bites in children. Rev Col Bras Cir 2016; 43: 452-457.
 10. Selvi F, Stanbouly D, Stanbouly R, Baron M, Francois K, Halsey J, et al. Early Childhood (0 to 5 years) presents the greatest Risk for Facial Dog Bites. J Oral Maxillofac Surg 2022; 80: 1633-1640.
 11. Agrawal A, Kumar P, Singhal R, Singh V, Bhagol A. Animal bite injuries in children: review of literature and case series. Intl J Clin Pediatr Dent 2017; 10 (01): 67-72.
 12. Stanbouly D, Stewart SJ, Harris JA, Chaung SK. Risk factors associated with infection in patients sustaining dog bites to the face. J Oral Maxillofac Surg 2023; 27: 305-311.
 13. Toure G, Angoulanguoli G, Meningaud JP. Epidemiology and classification of dog bite injuries to the face: A perspective study of 108 patients. J Plast Reconstr Aesthet Surg 2015; 68(05): 654-658.
 14. Guo HQ, Yang X, Wang XT, Ji AP, Bai J. Risk factors for infection of sutured maxillofacial soft tissue injuries. Surg Infect 2022; 23: 298-303.
 15. Rothe K, Tsokos M, Handrick W. Animal and human bite wounds. Dtsch Arztebl Int 2015; 112(25): 433-443.
 16. Kang DH, Choi JY, Choi WS, Jang JH, Cho JS, Hyun SY. Age group analysis of patients with dog bite injuries who visited a single regional emergency medical centre and factors affecting wound infections. J Trauma Inj 2022; 35: 84-91..

Segmental Anatomy of the Liver: Explore the Segmental Anatomy of the Liver in Relation to Surgical Procedures, Like Liver Resections and Transplantations

Rahmat Ullah Jan¹, Nauman Khan¹, Motasim Billah², Amjad Ali Shah³, Huma Shafiq¹ and
Syeda Gulrukh Saba Shah¹

ABSTRACT

Objective: To explore the segmental anatomy of the liver in relation to surgical procedures, like liver resections and Transplantations.

Study Design: A review study.

Methods: The following review is based on approximately 25 split and living related liver transplantations in adults of both genders that were completed over a four-year period from 5 Jan 2022 to 5 Jan 2023.

Conclusion: For segmental liver transplantation and liver resections to continue to produce great results, it is vital to have a solid understanding of and use hepatic surgical anatomy.

Key Words: Segmental Anatomy, surgical procedures,

Citation of article: Jan R, Khan N, Billah M, Shah AA, Shafiq H, Shah SGS. Segmental Anatomy of the Liver: Explore the Segmental Anatomy of the Liver in Relation to Surgical Procedures, like Liver Resections and Transplantations. Med Forum 2024;35(4):82-86. doi:10.60110/medforum.350418.

INTRODUCTION

This study was conducted in Khyber medical university Peshawar from 5 Jan 2022 to 5 Jan 2023 to explore the segmental anatomy of the liver in relation to surgical procedures, like liver resections and Transplantations.

Couinaud's 1954 article and 1957 book *Le foie; 'etudes anatomiques et chirurgicales* described the liver's architecture, which advanced surgical methods and diagnostic and interventional radiology. Since this anatomical model's inception, various changes have complicated liver architecture nomenclature.

The liver has a smooth, often black exterior.¹ An adult's liver weighs around 1800 g for men and 1400 g for women, or 2% of their total weight.² An essential component of the human system is the liver. There are two blood supply systems in it. The hepatic artery provides the liver with 20% of its blood supply in the form of oxygenated blood.

The blood from the pancreas, spleen, and digestive system, on the other hand, is deoxygenated and rich in nutrients and travels into the portal vein. This blood provides 75–80% of the blood flow to the liver, which is a significant portion. Blood from the intestines and spleen, among other digestive organs, is collected via the portal vein.³ A significant blood channel in the body that transports blood rich in nutrients from the digestive organs to the liver is the portal vein. Usually, the splenic vein is not the immediate outlet of the inferior mesenteric vein. Rather, it often forms an indirect connection to the splenic vein via the intricate venous network known as the splenic-mesenteric confluence.⁴ The celiac artery (Fig. 1) is the parent of the common hepatic artery as well as the left gastric and splenic arteries. Although the liver is divided into many lobes, the falciform ligament is not the main reason of this division. The liver is connected to the diaphragm and front abdominal wall via the falciform ligament. It does not create lobes inside the liver directly. The liver is split into several lobes based on its internal structure, blood supply, and functional needs. The right and left lobes are the two primary lobes. The left lobe is much smaller than the right lobe. The quadrate lobe and the caudate lobe are two more minor lobes found in the liver.⁵ The remnant of the umbilical vein is preserved in the ligamentum teres, which is situated near its base. Figure 2.

The idea of liver segments was initially put out by Healy in 1953⁶, and it was further refined by Couinaud in 1957. The Couinaud classification separates the liver into eight different functioning sections.⁷ It is now the most widely used classification scheme for describing

¹. Department of Anatomy, MCM, Peshawar.

². Department of Anatomy, Pak International Medical College Peshawar

³. Department of Surgery, Northwest Teaching Hospital, Peshawar

Correspondence: Motasim Billah, Assistant Professor of Anatomy, Pak International Medical College, Peshawar.

Contact No: 03339252784

Email: drmotasim05@gmail.com

Received: February, 2023

Accepted: April, 2023

Printed: April, 2024

the architecture of the functioning liver.⁸ Compared to the more traditional morphological description based on the liver's external appearance, it splits the liver into eight distinct functional components, or segments, making it the favored technique of describing anatomical features. Together with the bile duct, hepatic arterial and portal branches, and hepatic vein, each segment has a distinct hepatic venous branch that acts as an outflow. When looking at the liver from the front, or anterior, the segments are, in fact, numbered in a clockwise manner. Many people refer to the liver segment numbering scheme as the "Couinaud classification," after the French surgeon Claude Couinaud, who developed it to depict the functional architecture of the liver. The words "topographic left lobe" and "left lateral segment of the liver" are also used to refer to segments II and III, which are also known as the anterior and posterior segments of the left lobe, respectively. Because the region of the liver that is located on the topography or surface of the left side is known as the "topographic" left lobe, it is so named.⁹ Segment IV represents the left lobe's medial region. The Roman numerals I through VIII, which were once used to denote the hepatic segments, have been superseded with Arabic digits 1 through 8.

Because the liver is divided into several segments, each of which has a blood supply and drainage system, surgical resections and other medical procedures are possible.

Sections II, III, and IV make up the liver's left functional lobe. These sections make up the liver's left lobe and are in charge of many processes include bile generation, detoxification, and metabolic processing. Every one of these sections has a separate blood supply and drainage system.

The functional right lobe of the liver is comprised of segments VI and VII. These sections belong to the liver's right lobe.¹⁰ The functional right lobe of the liver carries out comparable tasks to those of the left lobe, such as generation of bile, detoxification, and metabolic processes. They are situated behind the V and VIII anterior portions. These segments are located in the anterior (front) part of the liver. They are part of the right lobe and likely have specific functions related to their position in the liver's anatomical structure.

The caudate lobe is situated behind the other segments of the liver and is part of segment I. It's a smaller lobe with its own blood supply and drainage. Like the rest of the liver, it plays a role in various metabolic and detoxification processes. The liver's complex segmentation is important for understanding its function and for medical procedures like liver resections, where specific segments can be removed while preserving the functionality of the remaining liver tissue.

The liver does have hepatic veins, but they are responsible for draining deoxygenated blood from the liver tissue itself. The blood that has been processed by

the liver flows into these veins and then into the inferior vena cava, which carries it back to the heart. Liver consists of right and left lobes. The right hepatic vein does indeed separate the right lobe of the liver, but it doesn't separate the anterior and posterior halves of the lobe. The liver is anatomically complex and has a more intricate division into lobes and segments.

The middle hepatic vein drains blood from the middle portion of the liver and usually drains into the inferior vena cava.¹¹ It's important to note that the middle hepatic vein is not responsible for dividing the liver into lobes; rather, the portal vein and its branches play that role. The left hepatic vein does drain blood from the left lateral section of the liver, but it doesn't divide the left liver into medial and lateral sections. The portal vein is a major blood vessel that carries blood from various abdominal organs, including the stomach, intestines, pancreas, and spleen, to the liver. It doesn't actually divide the liver into upper and lower sections. The liver is divided into functional units called lobes, with the left and right lobes being the primary divisions.¹² The portal vein supplies blood rich in nutrients and other substances absorbed from the digestive system to the liver, where it is processed, detoxified, and nutrients are stored or released into the bloodstream. Understanding segmental liver anatomy is crucial for both radiologists and surgeons when dealing with liver-related conditions and surgeries.¹³

METHODS

The research comprises about 25 split and living related liver grafts in adults over a period of four years from 5 Jan 2022 to 5 Jan 2023 sponsored by Khyber Medical University According to the Review. The study saw detailed surgical procedures for liver resections and transplantations, including how to handle the segmental anatomy of liver. Data collecting subsequently, a comprehensive search of medical and relevant papers, books for professors articles spread over an industry (university textbooks every year) was implemented to collect information on the Couinaud classification system, liver anatomy, surgical techniques, and outcome and complications for liver resections and transplantations. All of this data were analyzed in order to affirm how far the segmental anatomy of liver affected surgical procedures. Based on literature evidence at that time, the results from these materials were synthesized into a coherent explanation about what segmental anatomy played (if anything) in reaching better post-surgical outcomes by those performing operations. Finally, we gathered these findings in order to come to an understanding of segmental liver anatomy.

RESULTS

The review pointed out that without a clear conception about liver's segmental anatomy, liver resections and transplantations are doomed to be a failure altogether. Surgical operations such as segmentectomies and trisectionectomies depend on accurate division of liver segments into parts.

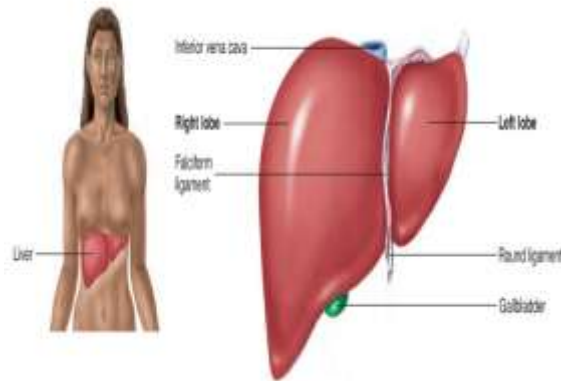


Figure No.1: Morphological anatomy of the liver.

Segmental anatomy determines in liver transplantation what kind of liver piece can be excised and surgical methodology for it. It is crucial that every detail of planning should be based on segmental anatomy in order to avoid destroying liver functionality and

bringing about postoperative complications. In addition to improved blood supply and fewer physical demands, an understanding of the liver's extended segmental nature guarantees that enough healthy tissue remains after a resection to enable regeneration. Because of this, segmental liver anatomy contributes crucially to surgical outcomes and patient survival in all kinds of liver surgeries.

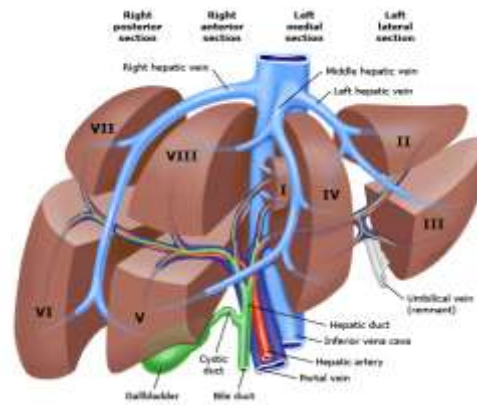


Figure No. 2: Segmental anatomy of the liver

Table No.1: Study Outcomes Related to Segmental Anatomy of the Liver and Surgical Procedures

Outcome Measure	Findings
Surgical Procedures	Liver resections and transplantations rely on understanding segmental anatomy - Various surgical techniques (e.g., segmentectomies, trisectionectomies) based on segmental anatomy
Liver Transplantation	Segmental anatomy crucial for graft selection and surgical planning - Donor grafts selected based on segmental anatomy to minimize complications
Complications	Meticulous planning and execution needed to avoid postoperative complications - Accurate localization and planning crucial for minimizing complications in liver resections
Preservation of Liver Function	Preservation of healthy tissue while removing diseased areas essential for maintaining liver function - Segmental anatomy guides surgical decisions to preserve liver function and minimize postoperative risks
Liver Regeneration	Liver capable of profound growth and regeneration post-resection with knowledge of segmental anatomy - Understanding segmental anatomy aids in leaving enough healthy tissue behind to support normal regeneration

DISCUSSION

To understand segmental anatomy of liver is very important for surgical procedures, like liver resections and Transplantations. A study of the present work is the segmental anatomy of the liver and its relationship to surgical techniques such as liver resections, transplants etc. Segmental anatomy of the liver is important in planning and executing hepatectomies because it

provides a framework to help clarify the distribution of blood supply, biliary drainage and functionally independent units in the liver. The liver is made up of eight functional segments, each of which has its own blood supply and bile ducts. This segmental division is based on the distribution of the hepatic veins and portal veins, which supply and drain different parts of the liver. Understanding the segmental anatomy enables surgeons to assess the extent of disease in the liver and

to plan resections accordingly. They can determine which segments are affected by cancers or other ailments as well as by how many of the hepatocytes are to be excised in order that clear resection margins be still observed while preserving as much normal hepatocytes as possible. Resecting a liver segment rather than more of the liver postoperatively improves liver function and reduces complications. Knowing the segmental anatomy enables surgeons to accurately define the borders of individual segments during operation, so that blood flow, bile drainage, and functional liver tissue will not be compromised. The liver is capable of a profound amount of growth after resection.¹⁴⁻¹⁶ Knowledge of segmental anatomy enables the surgeon to leave enough healthy tissue behind to support normal liver regeneration. The remaining segments can compensate for the loss of a single segment by multiplying. The significance of liver segmentation lies in that a segmental resection can save patients from the trouble of undergoing further, larger surgery by upgrading liver function after resection. Wisdom segmental anatomy specialist physicians to clear the border of each segment, retaining its blood supply and bile drainage system an working liver tissue. This means that by targeting segments as the object for resection, a given individual patient will not suffer serious loss of total function of the entire liver. It is especially important in patients who have the liver background as their routine employment(background)? Segmental anatomy serves as a guide for liver operations that direct surgeons in planning surgery to cause minimal destruction of working liver and avoids risks for patients having these surgeries. Liver transplantation depends on segmental anatomy: it provides the donor with detailed information about the recipient's liver's veins and bile ducts. This knowledge is vital for liver transplant surgery, including graft procurement, planning and smoothness at each phase of operation to decrease complications borne by patients. A suitable liver segment for transplantation can be identified by segmental anatomy, making sure that the graft is appropriate for the receiver. Segmental anatomy helps us to locate the best spot for graft implantation and to devise a strategy for connecting blood vessels and bile ducts during surgery. A detailed knowledge and understanding of the segmental anatomy helps avoid complications such as venous blood thrombosis (later blood flows in the right direction), biliary leakage and too much biliary environmental change to standards which can occur during or after liver transplant operation. There can be problems following transplantation. One is hepatic artery thrombosis, another is biliary leakage¹⁷. Prolonged ischemic time produces liver graft dysfunction. This regulatory network of communication can make vascular reconstruction and bile duct anastomosis respectable expedients within safe limits as is the need to reduce

operation time to a passable minimum. let me tell you how segmental anatomy aids this process: it indicates the best location of the recipient's vasculature in relation to connection sites on the donor's liver and distal third of it That's important in potterry (so varied) 20 Segmental anatomy helps healthcare professionals, researchers, and anatomists better comprehend the intricate structures of the body and how they interact with each other. It's an essential approach for medical education, diagnosis, and treatment planning.¹⁸

CONCLUSION

Indeed, it was concluded that the above review accurately highlights the critical importance of a comprehensive grasp and precise application of surgical liver anatomy for successful outcomes in segmental liver transplantation and liver resections. The liver's intricate structure, consisting of multiple segments, lobes, and blood vessels, demands meticulous surgical planning and execution to avoid complications and ensure optimal results. In both segmental liver transplantation and liver resections, a profound understanding of the liver's vascular supply, biliary drainage, and segmental distribution is vital. Surgical decisions must be guided by this understanding to preserve healthy tissue, minimize ischemia-reperfusion injury, and prevent postoperative functional impairment.

Author's Contribution:

Concept & Design of Study:	Rahmat Ullah Jan
Drafting:	Nauman Khan, Motasim Billah
Data Analysis:	Amjad Ali Shah, Huma Shafiq, Syeda Gulrukh Saba Shah
Revisiting Critically:	Rahmat Ullah Jan, Nauman Khan
Final Approval of version:	Rahmat Ullah Jan

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No. 211/2021 dated 25.09.2021

REFERENCES

1. Guo X, Schwartz LH, Zhao B. Automatic liver segmentation by integrating fully convolutional networks into active contour models. *Med Physics* 2019;46(10):4455-69.
2. García-Niño WR, Zazueta C. Ellagic acid: Pharmacological activities and molecular mechanisms involved in liver protection. *Pharmacological Res* 2015;97:84-103.
3. Hanafy AS, Abd-Elsalam S, Dawoud MM. Randomized controlled trial of rivaroxaban versus

- warfarin in the management of acute non-neoplastic portal vein thrombosis. *Vascular Pharmacol* 2019;113:86-91.
4. Sibulesky L. Normal liver anatomy. *Clin Liver Disease* 2013;2(Suppl 1):S1.
 5. Singh HR, Rabi S. Study of morphological variations of liver in human. *Translational Res Anatomy* 2019;14:1-5.
 6. Shimose S, Kawaguchi T, Iwamoto H, Niizeki T, Shirono T, Tanaka M, et al. Indication of suitable transarterial chemoembolization and multikinase inhibitors for intermediate stage hepatocellular carcinoma. *Oncol Letters* 2020;19(4):2667-76.
 7. Le DC, Chansangrat J, Keeratibharat N, Horkaew P. Functional segmentation for preoperative liver resection based on hepatic vascular networks. *IEEE Access* 2021;9:15485-98.
 8. Wang M, Jin R, Lu J, Song E, Ma G. Automatic CT liver Couinaud segmentation based on key bifurcation detection with attentive residual hourglass-based cascaded network. *Computers Biol Med* 2022;144:105363.
 9. Caramella D, Chiesa F. Radiological Anatomy with MR: What the Nuclear Physician Should Know When Reading a PET/MR Scan. *Nuclear Medicine Textbook: Methodol Clin Applications* 2019:1257-78.
 10. Inoue Y, Fujii K, Ishii M, Kagota S, Tomioka A, Hamamoto H, et al. Volumetric and functional regeneration of remnant liver after hepatectomy. *J Gastrointestinal Surg* 2019;23:914-21.
 11. Sureka B, Sharma N, Khera PS, Garg PK, Yadav T. Hepatic vein variations in 500 patients: surgical and radiological significance. *Br J Radiol* 2019;92(1102):20190487.
 12. Hall JL, Mannion P, Ladlow JF. Canine intrahepatic vasculature: is a functional anatomic model relevant to the dog? *Veterinary Surg* 2015;44(1):27-34.
 13. Winslow E. Invited Commentary: Issues at the Interface of Hepatic Imaging and Hepatic Surgery. *Radio Graphics* 2022;42(3):E92-E3.
 14. Agarwal V, Divatia JV. Enhanced recovery after surgery in liver resection: current concepts and controversies. *Korean J Anesthesiol* 2019;72(2): 119-29.
 15. Kawaguchi Y, Hasegawa K, Tzeng CD, Mizuno T, Arita J, Sakamoto Y, et al. Performance of a modified three-level classification in stratifying open liver resection procedures in terms of complexity and postoperative morbidity. *J Br Surg* 2020;107(3):258-67.
 16. Campana L, Esser H, Huch M, Forbes S. Liver regeneration and inflammation: from fundamental science to clinical applications. *Nature reviews Molecular Cell Biol* 2021;22(9):608-24.
 17. Pulitano C, Crawford M, Joseph D, Aldrighetti L, Sandroussi C. Preoperative assessment of postoperative liver function: the importance of residual liver volume. *J Surg Oncol* 2014; 110(4):445-50.
 18. Ni ZK, Lin D, Wang ZQ, Jin HM, Li XW, Li Y, et al. Precision liver resection: three-dimensional reconstruction combined with fluorescence laparoscopic imaging. *Surgical Innovation* 2021;28(1):71-8.

Guidelines & Instructions**Guidelines and Instructions to Authors**

The Journal MEDICAL FORUM agrees to accept manuscripts prepared in accordance with the Uniform Requirements submitted to the Biomedical Journals published in the British Medical Journal 1991;302:334-41. Revised in February 2006.

Medical forum is a Peer Reviewed Journal of all Specialities. Recognized by PMDC, HEC and Indexed by WHO, EXCERPTA MEDICA, SCOPUS Database, Pakmedinet, National Library of Pakistan, Medlip of CPSP and registered with International serials data system of France.

Requirement for Submission of Manuscripts

The material submitted for publication may be Original research, Review article, Evidence based reports, Special article, Commentary, Short Communication, Case report, Recent advances, New technique, View points on Clinical/Medical education, Adverse drug reports, Letter to Editor and Guest Editorials.

- 1) 3 Hard copies of Laser Print.
- 2) 1 Soft copy on a CD.
- 3) Letter of Undertaking in which Authors Name, Address, Mobile no, Degrees, Designations, Department of Posting and Name of Institution.
- 4) All Manuscript typed in MS Word and Figures, Graphs and Charts in Corel, JPG or BMP.

The manuscript should be typed in double spacing. Begin each section or component on a new page. Review the sequence: Title Page, Abstract, Key Words, Text, Acknowledgement, References, Tables (each on separate page). Illustrations, Uncounted prints, should not be larger than 8 x 10 inches.

ORIGINAL ARTICLE

Original Article should be of 2000 Words and not more than 3000 Words, not more than 6 Tables or Figures and at least 20 References but not more than 40.

REVIEW ARTICLE

Review Article should be of 3000 Words with at least 40 References but not more than 60.

SHORT COMMUNICATIONS OR CASE REPORTS

It should be 600 Words with one Table or Figure and 5 References.

LETTER TO EDITOR

It should be 400 Words with 5 References.

TITLE OF THE ARTICLE

It should be Accurate, Effective and Represent the main message of Article.

ABSTRACT

In Original Article, It should consist of the following subheadings: Objective, Design, Place & Duration, Materials & Methods, Results, Discussion, Conclusion & Key Words. In Original Article, the abstract should not more than 250 Words.

Review Article, Case Report and other require a short unstructured abstract. Short Communications & Commentaries do not require abstract.

INTRODUCTION

The start of the introduction should be Relevant. Reasons and Importance of the study should be clear. In the subject of the paper Significant findings may be elaborated. Previous 10 years National & International literature may be reviewed and recorded in the introduction. State the purpose of the Article and summarize the rationale for the study or observation. Give only strictly pertinent References and do not include data or conclusions from the work being reported.

MATERIALS & METHODS

The Population taken for the study should be uniform and Sample selection criteria should be reliable. Inclusion & Exclusion criteria should be clearly specified. Control within the study or literature may be given. Important variable measurement criteria should be mentioned. Investigation, Procedure & Technique should be clearly described.

RESULTS

Present your results in a logical sequence in the Text, Tables, Illustrations. Do not repeat in the text all the data in the tables or illustrations. Emphasize or Summarize only important observations. Do not duplicate data in Graphs & Tables.

DISCUSSION

Emphasize the new and important aspects of the study and conclusions that follow from them. Do not repeat in detail data or other material given in the Introduction or Results Section. Include in the Discussion Section the implications of the findings and their limitations, including implications for future research. Relate the observations to other relevant studies.

CONCLUSION

In this link write the goals of the study but avoid unqualified statements and conclusions not completely supported by data.

RECOMMENDATIONS

When appropriate, may be included.

ACKNOWLEDGMENTS

List of all contributors who do not meet the criteria for Authorship, such as a person who provided purely technical help, writing assistance or department chair who provided only general support. Financial & Material support should be acknowledged.

REFERENCES

It should be in the **Vancouver style**. References should be numbered in the order in which they are cited in the text. At the end of the article, the full list of references should give the names and initials of all the authors. **(if the authors are more than 6, then et al should be followed after the 6th name)**. The author (s) names are followed by the title of the article; title of the journal abbreviated according to the style of the Index Medicus (see "List of Journals Indexed." Printed yearly in the January issue of Index Medicus); year volume and page

COPYRIGHT

Material printed in this journal is the copyright of the journal "MEDICAL FORUM" and can not be reproduced without the permission of the editors or publishers. Instructions to authors appear on the last page of each issue. Prospective authors should consult them before sending their articles and other material for publication with the understanding that except for abstract, no part of the data has been published or will be submitted for publication elsewhere before appearing in this journal.

The Editorial Board makes every effort to ensure the accuracy and authenticity of material printed in the journal. However, conclusions and statements expressed are views of the authors and do not necessarily reflect the opinions of the Editorial Board or the journal "MEDICAL FORUM". Publishing of advertising material does not imply an endorsement by the journal "MEDICAL FORUM"

number; e.g: Hall RR. The healing of tissues by CO₂ laser. Br J Surg: 1971;58:222-5. (Vancouver Style).

Note to the Authors Before Submitting of Manuscript

a) Redundant or Duplicate Publications.

Redundant or Duplicate Publications are publications which overlap substantially with one already published. If such publication is attempted without proper notification, author should expect editorial action to be taken. At the very least, prompt rejection of the manuscript will occur.

b) Acceptable Secondary Publication.

Secondary publication in the same or another language, especially in other countries, is justifiable and can be beneficial, provided all our conditions are met.

c) Protection of Patient's Rights to Privacy.

Patients have a right to privacy, which is not to be infringed. Proper informed consent should be attained from all patients in a study.

Note regarding Peer Review Policy

Every article will be read by the Editorial Staff & Board first. After this every article will be sent to one or more external reviewers. If statistical analysis is included further examination by a statistician will be carried out.

Azhar Masud Bhatti,
Editor in Chief

ADDRESS FOR SUBMISSION OF ARTICLES:

75-P, Phase-VIII, Defence Housing Authority, Lahore.
Mob. 0331-6361436, 0300-4879016, 0345-4221303, 0345-4221323
E-mail. med_forum@hotmail.com,
medicalforum@gmail.com
Website: www.medforum.pk