Original Article

Strength and Inter-Relationship of Different Body Parameters of Obesity in Our Local Racial and Ethnic Background

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ABSTRACT

Objective: By defining the strength of each parameter of obesity in our population as a source of local data for comparison with other ethnic and racial groups, we can focusing on the best parameter of obesity in our routine clinical workup for CVD risk.

Study Design: Observational study

Place and Duration of Study: This study was conducted at the Department of Medicine, Rai Medical College Sargodha and Private Consultancies of the participants from January, 2020 to December, 2020.

Materials and Methods: After informed consent and applying inclusion/exclusion criteria, all obese looking or having a sagging or protuberant tummy, 20-70 years old, were evaluated for different parameters of obesity as per standard practices.

Results: Out of 928 eligible participant 344 (37.07%) were males and 584 (62.93%) were females. Only 4 (0.07%) female weighed below the IBW. 12 (2.05%) females and 40 (11.63%) male had WC below the respective cut off values. When assessed by W: HtR, only 16 (4.65%) males were below the cut off value. When evaluated by W: HR, 12 (2.05%) females and 16 (4.65%) males were below the cut off values. On BMI scale 16 (4.65%) females and 42 (8.9%) males fell in the healthy range between 18-25. 120 (20.555) females and 130 (23.97%) male were in the borderline range of 26-30. 120 (32.255) females and 80 (23.25%) males were in the low risk range of 31-35. 136 (23.29%) females and 42 (15.11%) males were in medium risk range of 36-40. 112 (19.18%) females and 20 (5.18%) males were in the high risk range of 40 and above.

Conclusion: All the parameters of obesity, WC, W: HtR and W: HR, have their limitations. BMI unexpectedly turned out to miss out the most. This can be explained by the fact that all these parameters including most practiced BMI were designed to stratify the CVD and DM risk not the obesity per se. IBW still is the best parameter to define obesity. This study shall lead to further and larger multicenter studies to develop better understanding of anthpometric parameters for our own population.

Key Words: Obesity, Metabolic Syndrome, Anthpometric measurements

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INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) or Adult-Onset Diabetes Mellitus (DM) and visceral obesity are Siamese Twins. Chronic excessive calories consumption overexpose the liver to free fatty acids, leading to hyperinsulinemia and insulin resistance. Term Diabesity is coined for it. By 2010 estimates 285 million, 90% type2, had DM.

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It is expected to rise to 439 million, 7.7%, by 2030. Asia is the epicenter: China, Pakistan, Indonesia, Bangladesh and India being among the top 10. [1-3]

This epidemic of modern age, involving nearly a third of world population, spares no ethnic, socioeconomic and age group. [4] Historically it had always been more prevalent in women. In low-income countries, obesity is generally more prevalent among middle-aged adults from wealthy and urban social strata; whereas in high-income societies, obesity affects both sexes and all ages, but is disproportionately greater in socioeconomically disadvantaged groups.[5]

Obesity traditionally defined by Ideal body weight (IBW) according to sex, body frame and height, doesn't precisely predict cardiovascular diseases (CVD), cerebrovascular events (CVA), hypertension (HTN), diabetes (DM) and dyslipidemia. Most of epidemiological studies use Body Mass Index (BMI) as a better predictor of CVD. A greater cardio metabolic risk is associated with the localization of

excess fat in the visceral adipose tissue and ectopic depots (such as muscle and liver). It leads to increased fat to lean mass ratio [6], reflected in sex specific Waist: Hip Ratios (W: HR), Waist: Height (W: HtR) and Waist Circumference (WC), each havingits own limitations.[7]

MATERIALS AND METHODS

Obesity was defined by the simplest and most practiced parameter as "Looking Obese" or with "sacking or protuberant tummy" as the entry point into the study. After securing informed consent and applying exclusion criteria, these were evaluated further on different parameters of obesity as per standard practices. [8-11, 15]

Study Design: Observational study with convenient sampling technique

Study Period: From 1st January, 2020 to 31st December, 2020.

Inclusion Criteria: 20-70 years age, both sexes.

Exclusion Criteria:

- Seriously sick patient or terminally ill patient.
- Pregnancy
- Ascites
- Steroid and Thyroid disorder

Sample Size and Sampling Technique: A minimum sample size of 285 patients was calculated to maintain a 5 percent margin of error, a 95 percent confidence interval and a 75 percent response distribution, using a Rao soft sample size calculator.

Statistical Analysis: Data analysis was done on Microsoft Excel version 2016 and Statistical Package for Social Sciences software version 25. Descriptive statistics (i.e., frequency distribution, percentages, mean and standard deviations) was the primary analytical methods.

RESULTS

We had 928 eligible participants in this study, 344 (37.07%) males and 584 (62.93%) females. All, except 4 (0.68%) females and 16 (4.65%) males, weighed below the IBW. Only12 (2.05%) females had WC below the cut off value of ≤85cm while 44 (12.79%) male had WC below the cut off value of ≤90Cm. When assessed by W: HtR, only 16 (4.65%) males were below the cut off value of 0.5, all the females were above it. When evaluated by W: HR, 16 (2.74%) females were below the cut off value of 0.85 and 24 (6.98%) males were below the cut off value of 0.90. On BMI scale 16 (4.65%) females and 42 (8.9%) males fell in the healthy range between 18-25. 120 (20.555) females and 130 (23.97%) males were in the borderline range of 26-30. 120 (32.255) females and 80 (23.25%) males were in the low-risk range of 31-35. 136 (23.29%) females and 42 (15.11%) males were in medium risk range of 36-40. 112 (19.18%) females and 20 (5.18%) males were in the high-risk range of 40 and above.

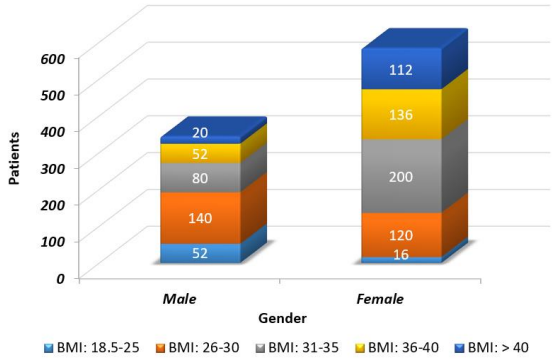

Figure No.1: Patients ratio

Table No.1: Gender wise detail

Parameter		Gender					
		Male (344)			Female (584)		
		Patients	Mean	Std. Dev.	Patients	Mean	Std. Dev.
IBW	Above	328 (95.35%)	±61.44	±7.71	580 (99.32%)	±47.44	±7.81
	Below	16 (4.65%)	±63.79	±0.79	4 (0.68%)	±52.02	±2.64
WC	Above	300 (87.21%)	±109.08	±8.00	572 (97.95%)	±107.23	±9.35
	Below	44 (12.79%)	±73.80	±18.21	12 (2.05%)	±81.97	±2.16
WC/H_t	Above	328 (95.35%)	±0.62	±0.08	584 (100%)	±0.68	±0.08
	Below	16 (4.65%)	±0.38	±0.09	0 (0.00%)	±0.00	±0.00
WC/H	Above	320 (93.02%)	±1.04	±0.05	568 (97.26%	±0.98	±0.07
	Below	24 (6.98%)	±0.75	±0.18	16 (2.74%)	±0.83	±0.03

Table No.2: BMI mode detail

BMI	Male					Female				
	18.5-25	26-30	31-35	36-40	> 40	18.5-25	26-30	31-35	36-40	> 40
Mean	22.85	28.23	32.59	36.44	44.23	22.59	27.75	32.34	36.87	45.75
Std. Dev.	1.70	1.11	1.37	0.94	1.98	1.94	1.19	1.48	1.40	7.51

DISCUSSION

Both physical inactivity and unhealthy calorie rich western diet had resulted in world-wide epidemic of DM and obesity. In its 2008–2013 Action Plan WHO included DM in its list of preventable non-communicable diseases. [12] Term "Diabesity" was coined for these Siamese Twins.

Ideal body weight (IBW) for height and frame were initially developed in the late 1800s. Hamwi and Devine seminal equations were very popular in their times. Robinson et al. and Miller et al. used 1959 and 1983 Metropolitan Life Insurance Company data to make their suggestions. Hammond introduced metric version of the Hamwi equation. In our study all except 4 (0.07%) females turned out to be below the IBW. This simplistic approach fails to give a range and doesn't incorporate multiple comorbidities and mortality-specific causes, age and ethnicity. Shah et al. highlighted IBW formulas tendency to under and overestimated at shorter and taller heights respectively. BMI concept was developed to quantify adiposity independent of height over arange of target weights by a Belgian mathematician in 1832,[13,14] In our study 30.17% person were in the low risk range, 20.25%were in the medium risk range and 14.22% were in high risk range. 35.35%fell in the healthy or borderline range. By applying this parameter CVS risk may be better predicted but one may miss the obesity. With further insight, abdominal obesity or more specifically Visceral Obesity rapidly established its role as a widely accepted anthropometric measurement due to its better ability to assess overall cardio metabolic risk better than BMI which assesses only the overall obesity, we observed similar trends. [5-8] World Health Organization (WHO) has recommended standardized protocols for these measurements since 1990. [15]

In our study the only 2.05% females and 4.45% males had a normal W: HR. This speaks strongly in favour of using it as a criteria for obesity and to predict the risk of future chances of developing DM and CVD. Hoorn Study showed the superiority of W: HR to BMI in predicting the incident of diabetes in 50–75-years old. [16] Being somewhat oversimplification as it does not differentiate subcutaneous fat from visceral fat even after adjusting for age and BMI. Going well with the limitations, only 2.05% females and 11.63% males had a normal WC.

Off the multiple ratios to differentiate between upper and lower body obesity Waist/Hip ratio (WHR)proved to be the strongest as only 4.65% of makes fell below while all the females were above the cut of value. The variations in results of Iranian, US based survey in Whites and African American, the San Antonio Heart Study on non-Hispanic Whites and Mexican Americans, Korean surveys and INTERHEART study reinforce this argument,[17-19])we need to work more to develop our own parameters for indigenous population.

WC better predicts the future risk of DM,[20] it was accepted as a criterion for MetS by the National Cholesterol Education Program Adult Treatment Panel III, The American Heart Association/National Heart, Lung, and Blood Institute (AHA/NHLBI) and International Diabetes Federation (IDF).Like IBW, WC has limitations at both extremes of stature, short statured populations like Chinese and Asians have higher CVD risks than Caucasians, at the same WC value. W: HtR better predicts CVD risk with a cutoff of 0.5 for Asian and Chinese populations irrespective of weight,(21-7)as a better surrogate.

All obesity parameters must accommodate race and ethnicity. Northern Indians are our closest cousins have paradoxically higher prevalence of DM for BMI: IDF proposed cut points with an optimal sensitivity and specificity for WHR. [28] South Asian populations have a unique thin–fat phenotype, with more visceral obesity and high body fat content without much increase in BMI. [29]

CONCLUSION

All the parameters of obesity, WC, W: HtR and W: HR, have their limitations. BMI unexpectedly turned out to miss out the most. This can be explained by the fact that all these parameters including most practiced BMI were designed to stratify the CVD and DM risk not the obesity per se. IBW still is the best parameter to define obesity. This study shall lead to further and larger multicenter studies to develop better understanding of anthpometric parameters for our own population.

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

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