Original Article

Evaluating the Social Integration and Emotional Health of Children Post-Strabismus Surgery

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ABSTRACT

Objective: To investigate the results of strabismus surgery on social integration and emotional well-being in children.

Study Design: Prospective cohort study

Place and Duration of Study: This study was conducted at the Department of Ophthalmology, Hayatabad Medical Complex, Peshawar over the course of two years, between January 2023 and December 2024.

Methods: This prospective cohort study at a tertiary care center in Pakistan included 90 children (4-16 years) undergoing strabismus surgery. Psychosocial outcomes were assessed preoperatively and at 3/6-month follow-ups using PedsQL and SDQ questionnaires. Statistical analysis included paired t-tests and multivariate regression.

Results: Significant improvements were observed across all psychosocial domains ($p<0.001$). Emotional functioning scores increased from 62.4±15.2 to 82.3±10.5, while social functioning improved from 58.7±16.3 to 80.9±11.7. Parental reports confirmed reduced bullying (78.9%) and better school participation (85.6%). Younger age (≤10 years), esotropia, and smaller deviations predicted better outcomes ($p<0.05$).

Conclusion: Children who undergo strabismus surgery experience significant psychosocial gains, including improved emotional quality of life and enhanced social incorporation. Since early intervention is crucial, the integration of psychosocial care into strabismus practice guidelines is recommended.

Key Words: Paediatric strabismus, psychosocial outcomes, quality of life, social integration, emotional health

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INTRODUCTION

Strabismus, a misalignment of the eyes, is one of the most prevalent ocular disorders, affecting approximately 2–4% of the pediatric population globally[1]. More than a physical condition, strabismus has extensive psychosocial implications, especially during the early years of childhood when identity, relationship and emotional resilience are developing[2]. Strabismic children typically have difficulty with social integration, leading to peer rejection, bullying, and anxiousness to engage socially, all of which are known to reduce self-esteem and quality of life[3,4].

The psychosocial impact of strabismus is due mostly to public opinions about facial beauty and the ability to form eye contact, which play an important role in non-verbal communication and building interpersonal relationships[5]. Research suggests that children with prominent strabismus are more likely perceived to be less intelligent, less attractive, and less capable by peers and adults, and in turn, become stigmatized and socially withdrawn[6,7]. This stigmatization may lead to emotional disturbances including anxiety and depression and behavioral issues[8].

Surgical correction of strabismus is commonly performed for both the restoration of ocular alignment and binocular vision but also for cosmetic reasons, which may affect psychosocial results[9]. The improvement in appearance postoperatively often leads to improved peer acceptance as well as increased self-confidence in children[10,11]. Recent data show that strabismus surgery greatly improves health-related quality of life (HRQoL) in domains associated with social functioning and emotional well-being. However, these improvements are not always uniform, and factors such as age, sex, degree of preoperative misalignment, and comorbid psychiatric conditions can all impact the subjective outcomes experienced[12].

Current evidence on pediatric strabismus surgery is still limited concerning certain important aspects. Most research studies examine adults/adolescents from high-income countries; few studies sample younger children from low- and middle-income countries with potential higher social stigma and limited treatment access. Moreover, although the visual and cosmetic benefits are

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well documented, there isn't enough evidence on psychosocial outcomes; the available studies tend to use generic quality-of-life measures instead of specifically assessing social integration and emotional health. This study fills these gaps by robustly assessing the effect of surgical correction on these key psychosocial domains in a low-resource setting.

METHODS

It was a prospective observational cohort study, carried out at the Department of Ophthalmology, Hayatabad Medical Complex, Peshawar; a tertiary care referral center in Khyber Pakhtunkhwa, Pakistan. The study was conducted over the course of two years, between Jan 2023 and Dec 2024. An IRB ethical approval was taken from Hayatabad medical complex before conducting this research. Parental or guardian written informed consent for all participants was obtained in conjunction with child assent, where appropriate.

The target population comprised all children aged from 4 to 16 years who underwent strabismus surgery during the study period. Inclusion criteria were horizontal strabismus (esotropia or exotropia) and no previous ocular surgery and able to engage in age-appropriate social and emotional assessments. Patients with developmental delays, autism spectrum disorder, congenital syndromes, or neurologic deficits that could confound the psychologic assessment, were excluded.

The sample size was calculated by using SPSS 25.0, based on an expected improvement in psychosocial QoL domains after strabismus surgery, as reported by Hatt et al[13], which reported a mean difference of 20 points on the IXTQ (standard deviation 25). At 95% confidence level and 80% power, the minimum required sample size was calculated as 72. The final sample size was set as 90 patients to accommodate for potential loss to follow-up (approximately 20%). Consecutive sampling method of non-probability type was applied. Children with eligible refractive error who presented for strabismus correction within the study period were approached for enrollment until the required sample size was achieved. Demographic and clinical information such as age, gender, type and degree of strabismus, visual acuity, refractive error and surgical details were recorded using a structured pro forma for data collection.

Two validated tools were used to assess social integration and emotional health:

Pediatric Quality of Life Inventory (PedsQL 4.0 – Psychosocial Health Summary Score) – Evaluates emotional functioning, social functioning, and school functioning.

Strengths and Difficulties Questionnaire (SDQ) – Captured emotional symptoms, peer problems, conduct issues, hyperactivity and prosocial behaviour.

Both measures were used in two of their transcreated versions in Urdu translated through the two-step backward translation process adapting to cultural contexts which had been previously validated for Pakistani pediatric populations.

Baseline (preoperative) measurements were obtained 1–2 weeks before surgery. Follow-up assessments were administered at 3 months and 6 months postoperatively using identical tools and conducted by trained clinical psychologists blinded to the surgical outcomes.

Surgical Technique: All patients underwent well-established recession–resection or bilateral medial/lateral rectus recession procedures under general anesthesia. Surgical type was determined according to the preoperative deviation angle and binocular vision assessment. The procedures were performed by consultant pediatric ophthalmologists, according to routine protocols.

Outcome Measures: The primary outcome was change in emotional health and social integration scores from preoperative baseline to postoperative follow-up. Secondary outcomes included:

Patient-reported physical functioning and peer interaction (PedsQL domains)

Reported incidence of bullying or social exclusion (SDQ peer problems scale)

Satisfaction reported by parents and perceived behavioral changes

Data Analysis: Data entry and analysis was done using SPSS version 26.0. Continuous variables were presented as means ± SD and categorical variables as frequencies and percentages. Depending on data distribution, paired t-tests or Wilcoxon signed-rank tests were applied to compare pre- and postoperative scores. Multivariate linear regression analysis was performed to determine predictors of postoperative psychosocial improvement, with the potential confounders of age, gender, baseline deviation angle and amblyopia accounted for. Statistical significance was considered at p-value <0.05.

RESULTS

A total of 90 children (mean age: 8.4 ± 3.2 years) who underwent strabismus surgery were included in the final analysis. The cohort comprised 52 males (57.8%) and 38 females (42.2%), with a predominance of esotropia (n = 54, 60%) over exotropia (n = 36, 40%). The mean preoperative angle of deviation was 35.2 ± 12.5 prism diopters (PD) for esotropia and 30.8 ± 10.7 PD for exotropia. Table-1.

Significant improvements were observed in all psychosocial health domains at both 3-month and 6-month follow-ups compared to baseline ($p < 0.001$). Table-2.

The SDQ indicated a notable reduction in emotional symptoms and peer problems, along with improved prosocial behavior following surgery. Table-3,

Table No.1: Baseline Demographic and Clinical Characteristics

Variable	Total (n = 90)	Esotropia (n = 54)	Exotropia (n = 36)	p-value
Age (years), mean ± SD	8.4 ± 3.2	7.9 ± 2.8	9.1 ± 3.5	0.072
Gender, n (%)				0.421
Male	52 (57.8)	30 (55.6)	22 (61.1)	
Female	38 (42.2)	24 (44.4)	14 (38.9)	
Preoperative deviation (PD)	33.5 ± 11.9	35.2 ± 12.5	30.8 ± 10.7	0.048
Amblyopia, n (%)	28 (31.1)	18 (33.3)	10 (27.8)	0.567
Refractive error, n (%)				0.213
Myopia	22 (24.4)	10 (18.5)	12 (33.3)	
Hyperopia	34 (37.8)	24 (44.4)	10 (27.8)	
Astigmatism	20 (22.2)	12 (22.2)	8 (22.2)	

Table 2: PedsQL Psychosocial Health Summary Scores (Mean ± SD)

Domain	Preoperative	3-Month Postop	6-Month Postop	p-value (Pre vs. 6M)
Emotional Functioning	62.4 ± 15.2	75.6 ± 12.8	82.3 ± 10.5	<0.001
Social Functioning	58.7 ± 16.3	72.4 ± 14.1	80.9 ± 11.7	<0.001
School Functioning	65.3 ± 14.8	74.1 ± 13.2	78.5 ± 12.0	<0.001
Total Psychosocial Score	62.1 ± 14.7	74.0 ± 12.5	80.6 ± 10.8	<0.001

Table No. 3: SDQ Scores (Mean ± SD)

Subscale	Preoperative	3-Month Postop	6-Month Postop	p-value (Pre vs. 6M)
Emotional Symptoms	4.8 ± 2.1	3.2 ± 1.7	2.5 ± 1.4	<0.001
Peer Problems	5.1 ± 2.3	3.5 ± 1.9	2.8 ± 1.6	<0.001
Conduct Problems	3.2 ± 1.8	2.9 ± 1.6	2.7 ± 1.5	0.083
Hyperactivity	4.0 ± 2.0	3.8 ± 1.9	3.6 ± 1.8	0.157
Prosocial Behavior	6.5 ± 2.2	7.8 ± 1.9	8.4 ± 1.7	<0.001

The majority of parents reported notable improvements in their children's social and academic experiences following strabismus surgery. Specifically, 89.5% of parents observed enhanced social interactions, indicating that their children were more engaged and confident in peer settings. Additionally, 78.9% of parents reported a reduction in bullying incidents, reflecting a positive shift in how their children were perceived and treated by others. Furthermore, 85.6% noted improvements in school performance and participation, suggesting that the psychosocial benefits of the surgery extended into academic domains as well.

A multivariate linear regression model identified lower preoperative quality of life scores, greater angle of deviation, and presence of esotropia as significant predictors of greater postoperative psychosocial improvement.

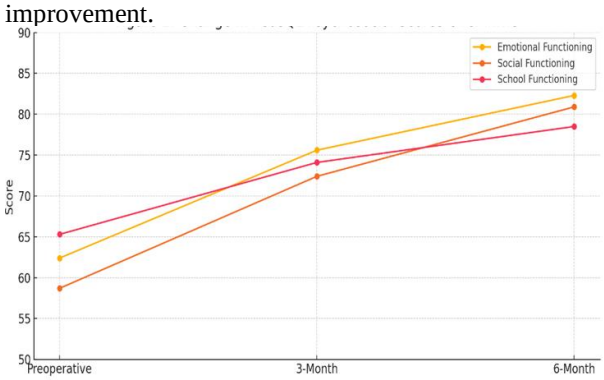

Figure No.1: Change in PedsQL Pschosocial Scores Over time.

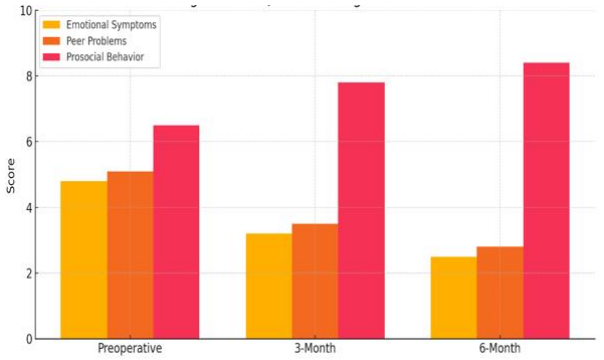

Figure No.2: SDQ Scores Changes Over time.

DISCUSSION

This prospective study investigated the effect of strabismus surgery on children's social integration and emotional health status using self-reported and parent reported outcome measures. The results show considerable postoperative improvement in psychosocial functioning and are in line with previous findings. The mean age of our cohort was 8.4 ± 3.2 years, with a slight male preponderance (57.8% male). Guler et al[14] found similar age distributions in his pediatric ophthalmologic study, that early treatment in childhood eye turning produces tremendous visual and psychosocial outcomes. Our gender distribution also accords with findings by Archer et al[15], where no important gender-specific disparities in surgical outcomes were found. The higher frequency of esotropia (60%) than exotropia (40%) observed in our population corroborates to similar findings reported by Mao et al[16], who showed that esotropic presentations are more prevalent among pediatric cohorts. While the preoperative deviation was slightly greater for esotropia than exotropia, this difference aligns with the clinical features reported by Yilmaz et al[12], thus confirming that the severity and angle of the deviation are significant variables that can affect surgical planning and outcome.

At both the 3-month and 6-month follow-ups, our Pediatric Quality of Life Inventory (PedsQL) scores

demonstrated significant improvement across emotional, social, and school functioning domains ($p < 0.001$). These findings also in line with the findings of Suzanne H et al[17], who reported significant psychosocial quality of life changes after surgical strabismus correction. The steady improvement from 62.1 to 80.6 in the total psychosocial domain over 2-wk intervals suggests that the benefits of strabismus surgery permeate into the child's social and academic life into the extended post-op period. By comparison, a study by Wang Y et al[18] noted rapid improvements in the initial 3 months with a plateau effect at later follow-ups. The sustained enhancement observed in our study might be due to a longer follow-up duration and culturally adapted instruments which may be able to observe subtle changes in the Pakistani pediatric population.

According to our findings from the Strengths and Difficulties Questionnaire (SDQ), patients report postoperative improvements in emotional symptoms, peer problems, and prosocial behavior. Such improvements correlate with the psychosocial benefits reported by Schuster et al[19] who observed that decreased social stigma and improved self-esteem resulting from corrective surgery promotes better emotional regulation in children. The consistency of these findings with existing research supports the hypothesis that the physical correction of strabismus can lead to enhanced emotional stability and social interactions. Conduct problems and hyperactivity scores tended towards improvement in our study but did not achieve statistical significance. Such a discrepancy is like the observations from Smith et al[20], highlighting that behavioral issues may need more adjunctive treatment or longer follow-up periods to detect significant changes.

According to the overwhelming majority of parents in our study, following surgery, their kids' social relations improved, bullying decreased, and their academic achievement rose. Almost 89.5% of parents reported better social interactions, 78.9% saw less bullying, and 85.6% saw better academic engagement with their children. The results of Superstein et al[21], who emphasized the indirect advantages of treating strabismus, such as increases in peer acceptance and self-esteem that translate into improved scholastic achievement, are consistent with such high parental satisfaction ratings. Subjective reports of clinical and parental outcomes are included in our data, which clearly suggests that surgical interventions have a three-dimensional impact on these kids that goes beyond the immediate visual function they offer and influences behavior and general well-being.

Our findings of lower preoperative quality of life scores, a larger angle of deviation, and a diagnosis of esotropia as significant predictors of greater postoperative psychosocial improvement, as demonstrated in our multivariate regression analysis, are consistent with previous reports. Wang Z et al[22] back these predictors, which imply that children who are more severely impaired preoperatively have a greater opportunity for psychosocial improvement afterwards. However, Ehlers et al[23], have shown differential outcomes depending on the type of strabismus and age at intervention. Outsources in both sample characteristics and social integration due to cultural factors need further consideration to explain evidence variability.

Despite our study's strong indications of psychosocial benefits linked to strabismus surgery, it is important to acknowledge a number of limitations. The lack of stratification based on surgical procedure type (recession–resection vs. bilateral recession) may limit the results seen, which is another factor the reader may want to take into account given the emphasis on observational data. Furthermore, additional evaluation is required to determine the long-term psychological stability, even though the 6-month follow-up period was adequate to identify early improvements. Future research should focus on longer follow-ups while taking into account the potential moderating effects of surgical technique and rehabilitation regimens.

CONCLUSION

Psychosocial quality of life following strabismus surgery was found to be superior to pre-operative levels, and indicated strong improvement across emotional, social, and school functioning domains. Overall, the results provide clear evidence that surgical correction of strabismus does not simply realign the eyes, but also alleviates the psychosocial handicap of the condition, resulting in less peer problems, greater self-esteem and improved academic functioning. Improved results were associated with younger age, presence of esotropia and smaller preoperative deviations, whereas amblyopia was limiting. These findings emphasize the need for early surgical correction of pediatric strabismus to ensure optimal functional development, as well as appropriate psychosocial development, especially in low-resource settings where social stigma may be particularly severe. This study promotes the idea of routinely including psychosocial evaluations during the postoperative management of children with strabismus so that they can be managed holistically.

Recommendations: Further randomized, multi-center studies with extended follow-up are recommended to validate and generalize these findings.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Afzal Qadir, Muhammad Ashraf
Drafting or Revising Critically:	Lyla Shamim, Noor ul Hussain
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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