

The Onset of Strabismus Complications Exemplifies the Foremost role of Contributing Factors Associated with the Parental History in Children's

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Abstract

The Strabismus instigates irreversible loss of vision if it is not treated properly. The information concerning the responsible factors behind the development of strabismus complications is usually found unclear and less investigated. Such circumstances forced the authors to determine the probable contributing factors associated with the same. The mean age of the children was reported to be 5.2. Among the whole population, 53.4 % of the children's had the age of 6, while 10.8% and 12.8 % were reported for children's having the age of 4 and 5, respectively. Data concerning the strabismus complications with special inference on the history, screen time of the patient, outdoor activity/playtime, and visual acuity status information were gained from either subject's accompanying guardian or parent. The Cross tabulation and Pearson Chi-square test to find out the link between variables toward the strabismus complications was done using the MS Office 2019 and SPSS 27.0.0. The link between major complaints found among the participants towards the parental history ($X^2 = 611.023$; $df = 280$; $P < 0.05$) has been verified, justifying the prominent role of parental history in developing eye complications in the children under the age of 10. In addition to this, the probable role of playtime, screen time, along with outdoor activity in children with special inference on the strabismus complications has also been verified. The finding of this investigation proposed to represent a candidate that can be used to develop a strategy to diagnose and rectify strabismus incidence in children.

Keywords: Strabismus, History, Children, Disorder, Vision

1. Introduction

The incidence of strabismus along with a plethora of complications in the eyes has been witnessed in schools and clinical studies over the world. The core element behind the development of strabismus is the misalignment of the eyes and it is usually noted as a childhood ocular disorder that results in weakened binocular depth perception. Besides the functional and physical threatening effects of the strabismus, a lot of aesthetic concerns are allied with the individual's interpersonal relationships, and image along with the social prejudice. Many of the children's recognized their dissimilar appearance in terms of their

ocular alignment and grieve due to the unfortunate cosmesis at a younger age which cause them towards isolation¹. Most children notice their different appearance and suffer from poor cosmesis at the age of four resulting in isolation. As a result of prominent evading linked with the individual's interpersonal relationships and other mental irritations from their environment, many of them are forced to undergo lengthy therapy or surgical correction in hopes of better ocular alignment². Due to these reasons, the early detection of complications followed by the commencement of the required and effective treatment is prominently recognized to be an

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effective way to combat the threatening effects thereby attaining better treatment results³.

Diminishing the rate of various complications in the eye including the chance of development of amblyopia simultaneously reduces the augmented risk of damage to the healthy eye⁴. One of the significant concerns regarding the strabismus is the major role of the same in developing amblyopia. The prominent social impact of strabismus and various eye complications has been in the current scenario and has been witnessed by many authors. According to them, the individuals having strabismus along with various eye complications are less likely to be considered for good jobs in society than the individuals having normal ocular alignment⁵. In these kinds of circumstances, we the research community have the responsibility to support them through effective research. For this purpose, it is essential to detect the chance of strabismus and probable contributing factors instigating the eye complications including the amblyopia at an earlier age. The precise analysis of the incidence of strabismus among the children using population-based approaches would definitely help the research community to develop effective strategies for the treatment of illness during the same period⁶. With regard to the above-discussed facts, the present investigation has intended to reveal the probable role of various contributing factors linked with the Parental History in children under the age of 6 years with special inference on the development of strabismus complications.

2. Materials and Methods

2.1. Study design and criteria for inclusion and exclusion

Subjects were 148 under the age of 10 from the following research departments and hospitals from Tamil Nadu, Karnataka, and Kerala; various branches of Rayhan hospitals, Narayana Nethralaya and Almas hospital, between January 2021 and January 2022. The children who are living in Kerala region and primarily visit the above-said hospitals for various eye-related treatments are selected for the present study. The children who had severe complications and unconscious nature are strictly excluded from this investigation. All the individuals who participated in the study are facing eye-related complications and are visiting the aforesaid

hospitals regularly for the treatments linked with eye complications. The mean age of the sample population was found to be 5.2. Among the whole population, 53.4 % of the children's had the age of 6, while 10.8% and 12.8 % were noted children's had the age of 4 and 5 respectively (Figure 1).

2.2. Ethical approval

The present investigation was approved by the Institutional ethics committee. The ethical process was approved by Al Rayhan Group of Institutions, Rayhan College and Hospital, Edapal, Malappuram, Kerala, India Kerala, India with reference number RREC/2021/0110. After providing a view concerning the aim and objectives of this investigation, consent to get the information from them was taken from either accompanying guardians or parents. Moreover, the individuals had also given complete right to take out from the investigation at any time during the process. Strict consideration was also addressed to maintain the confidentiality of the individuals.

2.3. Survey protocol

A detailed survey⁷ concerning the strabismus complications with special inference on the history, screen time of the patient, outdoor activity/playtime, and visual acuity status information was gained from either subject's accompanying guardian or parent or directly from the subject in certain circumstances. The data received from the subject were directly exported to the self-administered

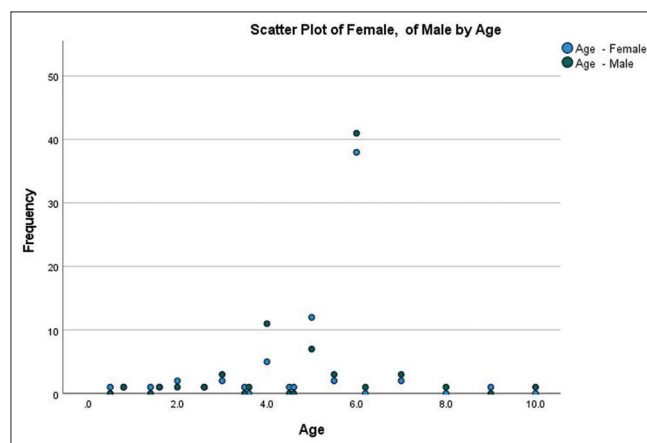


Figure 1. Age- and gender-wise frequency analysis of respondents.

questionnaire form which was electronically developed in the English language. The data regarding the sampling size are depicted in Figure 1. The data collection has been completed in the presence of Optometrists along with supervisors⁷. The face-to-face interview allows the author to collect data regarding the aforesaid aspects.

2.4. Data quality

To assure the quality of data, and accuracy followed by the consistency the questionnaire that was already prepared in the English language was then translated into the local language, Malayalam and back to English with the help of experts. Moreover, the supervisors along with the data collectors were offered a 3-day training focusing on how to approach the particular subject prior to data collection. A trial with 10% of the studied population was carried out in to test the language and research consistency.

2.5. Data analysis

Once the data have been gotten, it will be directly exported online and then to MS Office 2019 and SPSS 27.0.0 for statistical analysis. This study employed the applicability of the Cross tabulation and Pearson Chi-square test to find out the link between variables toward the strabismus complications. $P < 0.005$ was considered statistically significant for all the analyses.

3. Results

A total of 148 individuals participated in this study with a mean age of 5.2. Cross tabulation analysis revealed that about 48.64% of the individuals were noted to be females while the 51.36% of them were recognized to be males. As found in Table 1, about 47.0% and 20.1% of the studied population have been severely affected by defective vision (Figure 2) and squint, respectively ($X^2 = 406.151$; $df = 266$; $P < 0.05$) (Table 2). The squint represents the condition in which the eyes were a point in different directions and the condition was noted to be common among the young children in various conditions. Some of the individuals have faced more than one complex difficulty at a time (Table 1). For instance, about 2% and 4% of the studied population have critically faced the defective vision with asthenopic symptoms and defective vision with squint,

Table 1: Major complaints found among the respondents

Major complaints	Frequency	Percent
Asthenopic symptoms	24	16.1
Asthenopic symptoms, squint	1	0.7
Check up	4	2.7
Defective Vision	70	47.0
Defective Vision, asthenopic symptoms	3	2.0
Defective vision, head/chin tilting	1	0.7
Defective vision, poor eye contact	1	0.7
Defective vision, squint	6	4.0
Discoloration on sclera	1	0.7
Frequent blinking	1	0.7
Head/chin tilting	3	2.0
Squeezing	1	0.7
Squint	30	20.1
Squint, B/H: normal delivery	1	0.7
Squint, Occasional squinting noted after seizure	1	0.7

respectively ($X^2 = 406.151$; $df = 266$; $P < 0.05$). Very few individuals have got the Squint, occasional squinting noted after a seizure, asthenopic symptoms, and head/chin tilting.

The link between the major above said complaints observed in the participants towards the parental history ($X^2 = 611.023$; $df = 280$; $P < 0.05$) has been verified, justifying the prominent role of parental history in developing eye complications in the children under the age of 10 (Table 3).

While considering the historic background of the individuals (Figure 3), it was evident that most of the participants about 26% of the participants have a historic background in terms of using glasses ($X^2 = 768.408$; $df = 380$; $P < 0.05$) indicating the prominent role of the

Table 2: Pearson Chi-square analysis

Factors	Value	df	Significance (2-sided)
Major complaints	406.151	266	0.000
History	768.408	380	0.000
Strabismus assessment	716.665	399	0.000
Screen time	197.760	95	0.000
Out-door activity/play time	228.186	95	0.000
Visual acuity status	94.225	57	0.000

*The values were statistically significant at $P < 0.05$ level

Table 3: Pearson Chi-square analysis representing the link between the contributing factors

Link between the Contributing factors	Value	df	Significance (2-sided)
History versus visual acuity status	118.562	60	0.000
History versus major complaint	611.023	280	0.000
Play time versus major complaint	82.398	65	0.003
Play time versus visual acuity status	63.026	15	0.004
Screen time versus major complaint	70.068	30	0.004
Screen time versus visual acuity status	20.732	15	0.146
Strabismus assessment toward history	905.184	420	0.000
Strabismus assessment toward Screen time of patient	184.933	105	0.000
Strabismus assessment towards Out-door activity/ play time	98.149	105	0.669

*The values were statistically significant at $P < 0.005$ level

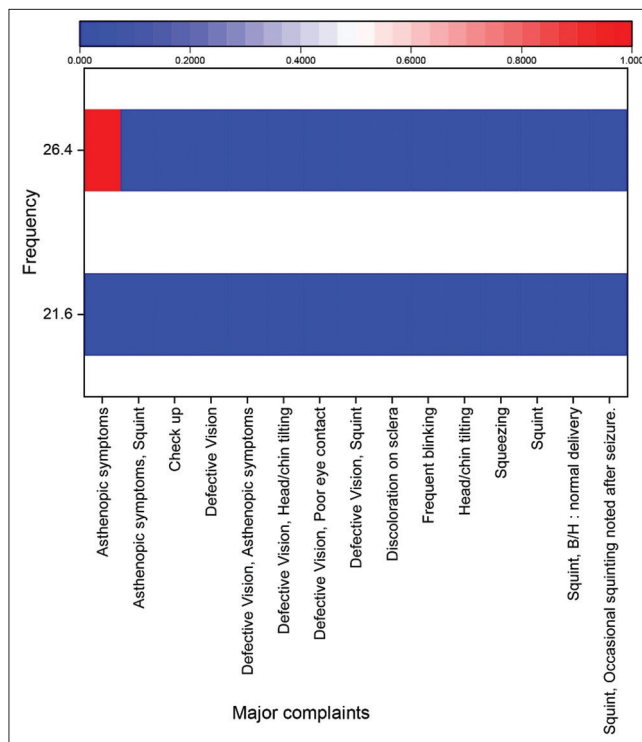


Figure 2. Heat map representing the major complaints found among the respondents.

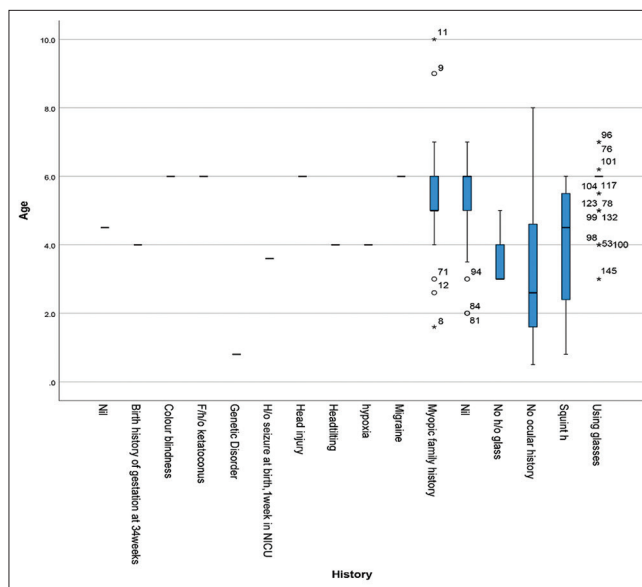


Figure 3. Influence of historic factors toward the eye complications in children.

same in eye complications, specifically toward the major complications as enlisted in Table 1 and Figure 2. The link between the historic background and the major complaints has been also witnessed in this study ($X^2 =$

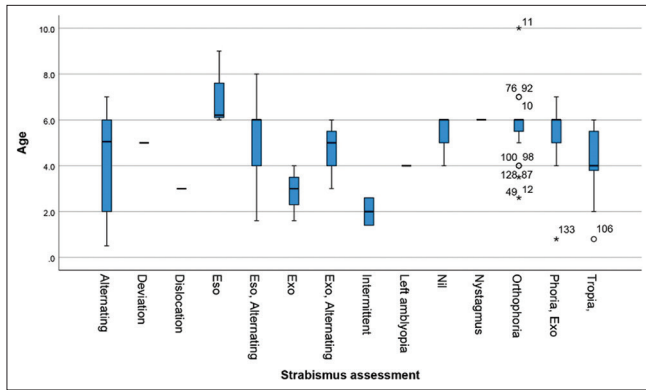


Figure 4. The strabismus assessment possessed an impact on eye complications in children.

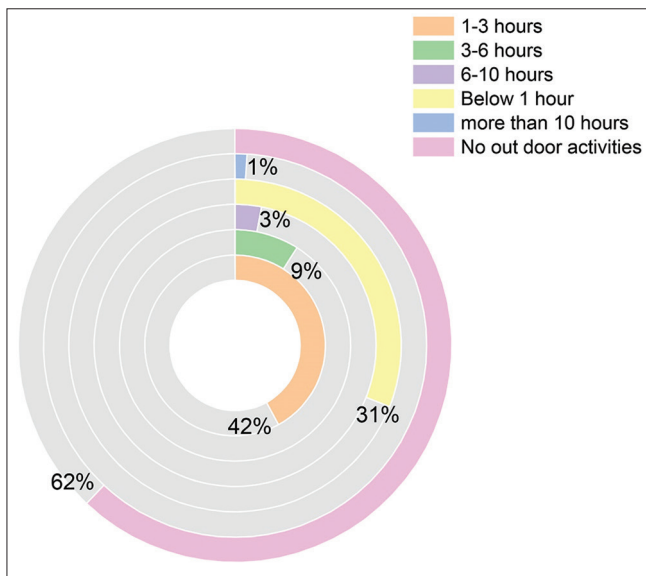


Figure 5. Influence of outdoor activities in eye complications.

611.023; $df = 280$; $P < 0.05$). The strabismus assessment (Figure 4) revealed that about 51% of the studied population are coming under orthophoria, while the remaining group is known to face the following severe complications; Phoria, Exo (8.1%), Tropic, Exo (4.7%), Alternating (6.1%), Eso, Alternating (3.4%). Moreover, the following complications are noted to be exhibited by 0.7 % of the population; alternating, orthophoria, deviation, dislocation, tropia, eso, alternating, tropia, eso, pseudo, and nystagmus ($X^2 = 716.665$; $df=399$; $P < 0.05$). The link between the strabismus towards the historical background nystagmus ($X^2 = 905.184$; $df = 420$; $P < 0.05$), screen time of patient ($X^2 = 184.933$; $df = 105$; $P < 0.05$) followed by the outdoor activity/playtime ($X^2 = 98.149$; $df = 105$; $P < 0.05$) also found to be important concern in the

current scenario. As illustrated in Figure 5, the influence of outdoor activity/playtime and screen time ($X^2 = 82.398$; $df = 65$; $P < 0.05$) toward the strabismus assessment ($X^2 = 98.149$; $df = 105$; $P < 0.05$) and major complaints ($X^2 = 82.398$; $df = 65$; $P < 0.05$) has been also witnessed to be important. Many of the studied individuals (84.6) are known to witness quantitatively abnormal conditions ($X^2 = 94.225$; $df = 57$; $P < 0.05$) while only 4% of the population are reported with a qualitatively normal condition in terms of visual acuity status. The influence of historical background, screen time and playtime concerning the development of complications including the visual acuity status of the studied individuals also verified in this investigation (Table 3).

4. Discussion

The onset of strabismus complications in children is predominantly noticed as a common condition that principally necessitates prior perspectives to distraught its vision and psycho-social effects in children. The present investigation has reported the fact that about 47%, 20.1% and of the individuals have faced the defective vision and squint, respectively. In agreement with these findings, an investigation by Sawers *et al.*⁸ reported that children having <7 years with squints may usually result in visual impairment completely unless proper treatment won't take place. In addition to the discussed factors by them, this study reported the link between the major complaints as enlisted in Table 1 various contributing factors including previous history, playtime, screen time, followed by outdoor activity/playtime. As found in this investigation, the gestational age⁹ has been noted to be a core point in risk instigated by the strabismus complications. About 0.7% of the individual in this study have faced the aforesaid complication, specifically the birth history of gestation at 34 weeks.

In addition to the contributing factors analyzed in this investigation, certain previous studies have reported the influence of the following factors in developing strabismus complications and are; older age of parents¹⁰, genetics, maternal cigarette smoking¹¹, neurodevelopmental impairment¹², chromosomal abnormalities, refractive error¹³, low Appearance-Pulse-Grimace-Activity- Respiration, prematurity, and cesarian delivery. In agreement with them, the present investigation has validated the probable influence of

genetic trait in developing strabismus complications. About 14.1% of the individuals are addressed the “myopic family history” as a prominent factor for developing the strabismus complications among children, which justifies the significance of the findings of this investigation.

The various forms of strabismus condition among children as found in this investigation have previously been reported by¹⁴. Among them, accommodative esotropia, congenital esotropia and intermittent exotropia are found to be common in children. However, the present investigation has also reported that certain other factors may also have a significant impact on strabismus-linked complications (Figure 1). Recent studies have validated that the increased screen time in children has instigated a prominent public health concern linked with the eye-health. Increased screen time in children also paid a significant contribution to digital eye strain; hence based on the findings of this investigation, it was reported that studies concerning the screen-based behavior with special inference the development of strabismus complications in children are essential to find out and rectify the problem linked with the complications. Moreover, one of the drastic facts reported in this investigation is that about 41.6% of the children are not involved in any other outdoor activities and they had principally spent their time on digital screens probably, which justifies the significance of the reported fact in the current scenario. An investigation by Munsamy *et al.*¹⁵ also validated the same concept in a different direction. However, the research community has not shown any direct evidence concerning the electronic device use and the development of myopia; but indirect evidence are there to illustrate the link between them. In our previous investigation¹⁶, the authors have verified the probable role of various contributing factors with special inference on digital screen use and eye health. Moreover, as discussed by the Friedman *et al.*,¹⁷ the visual activity may also encompass a prominent role in the quality of life of individuals.

5. Conclusion

The strabismus complications are principally reported as an ocular disorder commonly found among children. The condition becomes drastic and severe if the children have not got enough or proper treatment. Sometimes, it may result in psychosocial difficulties including

depressive mood disorder, low self-confidence, reduced employment and diminished personal relationships. To rectify such complications, enough scientific studies should be required. Hence, the present investigation validated the link between the probable contributing factors and the strabismus complications. Based on the various analysis performed in this investigation, it was reported that the historic background, playtime, screen time, and outdoor activity have played a prominent role in developing strabismus among children.

6. References

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