Student's Journal of Health Research Africa
Vol. 4 No. 6 (2023): June 2023 Issue
https://doi.org/10.51168/sjhrafrica.v4i6.506
Original article

AN OBSERVATIONAL STUDY ON ASSOCIATION OF OCULAR MORBIDITIES WITH BODY MASS INDEX IN CHILDREN.

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Abstract

Background:

It is important to determine the effects of obesity and hypertension on the eyes so that they might be utilised as prognostic indicators. In children and adolescents who are overweight and/or have SAH, this paper intended to evaluate the prevalence of ophthalmological changes.

Methods :

This hospital based Cross sectional observational study was conducted on paediatric patients presenting to the outpatient department of ophthalmology at Pradyumna Bal Memorial Hospital, which is affiliated with Kalinga Institute of Medical Sciences, KIIT University, located in Bhubaneswar, Odisha, India. The procedure was executed between September of 2020 and September of 2022. The sample population of this study included 500 patients. The institutional ethical committee approved the study.

Results:

In our survey, there were marginally more girls than men. Within the age groupings (groups a, b, and c) and the plethora of diseases specific to each group, there was statistical significance. Half of the participants in our study are underweight, whereas a smaller percentage are fat. According to our study, socioeconomic status is a key factor in visual morbidities. Lower middle class makes up the majority of the kids.

Conclusion :

Obesity and SAH have links to changes in the ophthalmology, particularly in the retinal vascular diameter. A quantitative evaluation is not possible due to a lack of standardisation.

Keywords: Ocular morbidity, prevalence, school children, BMI, Visual acuity, Submitted: 2023-06-23 Accepted: 2023-06-26

1. Introduction:

Ocular morbidity encompasses a range of ocular pathologies that may result in visual or non-visual impairment. As of mid-year, 2016, the estimated population of India was 1.311 billion according to a reputable source [1]. According to the demographic data of 2011, the population of Madhya Pradesh was 72,597, accounting for 6% of the total population of India [2]. As per the demographic statistics of India up until 2014, the age group of 0-4 years constituted 8.9% of the total population, while the age group of 5-9 years accounted for 9.0% of the population. The age group of 10-14 years constituted 9.7% of the population, and the

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age group of 15-19 years constituted 10.1% of the population. It can be inferred that children make up approximately 37.7% of the Indian population [2]. Globally, there exists an estimated population of 1.4 million paediatric individuals who are visually impaired. Approximately 73% of individuals reside in low-income nations, as per reference [3]. The incidence of visual impairment in developed nations is reported to be as low as 0.1 per 1000 children aged 0-15 years, while in developing countries, it is estimated to be as high as 1.1 per 1000 children [4].

India has an estimated prevalence of 320,000 paediatric cases of blindness, which surpasses the corresponding figures of other nations across the globe [5]. The estimated prevalence of low vision in India is approximately 0.80 per 1000 individuals, as reported in literature [6]. Studies conducted on population-based samples have estimated the prevalence of blindness to be 1.25 per 1000 children in rural areas [7] and 0.53 per 1000 children in urban areas [8] within the age range of 5 to 15 years. Among paediatric patients aged 5-15 years, the prevalence of visual impairment is 6.4%, with refractive errors being the primary aetiology [9]. The significance of timely identification and management of ocular morbidity and visual impairment in paediatric patients can be underscored by the observation that 30% of India's visually impaired population experience vision loss prior to reaching 20 years of age [10].

The management of paediatric blindness is regarded as a top priority in the "Vision 2020-The Right to Sight Programme" established by the World Health Organisation (WHO) [11]. The correlation between childhood blindness control and childhood life expectancy can be established due to the diverse range of conditions that are associated with blindness, which can result in childhood fatality [12]. Research on the prevalence and distribution of ocular pathologies in paediatric populations is of paramount significance. Certain ocular disorders may result in ocular morbidity, manifesting as discomfort, while others may culminate in irreversible blindness. Moreover, although certain ailments such as refractive errors and cataract are amenable to medical intervention, others such as measles and vitamin A deficiency are predominantly avoidable [13].

In India, the prevalence of blindness among the paediatric population is primarily concentrated within the age group of children under five years old. Perinatal insults, occurring during the prenatal or neonatal period, are a prevalent aetiology for paediatric ophthalmological disorders. Any anomaly in the visual system during the initial developmental and maturation phase can alter the typical development of the occipital cortex and result in enduring and profound visual impairment [14]. A range of interventions may be utilised to manage paediatric disorders through the implementation of optical, orthoptic, medical, and surgical modalities. The selection of appropriate interventions in paediatric patients is crucial, given their limited ability to articulate their symptoms and heightened susceptibility to developing amblyopia as a result of early-onset visual impairment [15].

Childhood visual impairment has a significant impact on the holistic development of children, including their personality and self-esteem. In many cases, paediatric patients may lack awareness of their visual impairment and may experience difficulty communicating their ocular abnormalities. However, a meticulous examination, even by carers, can aid in identifying ocular impairments and mitigating ocular risks. Paediatric individuals may exhibit various adaptive behaviours in response to visual challenges, such as squinting, holding reading materials in close proximity, rubbing their eyes, and displaying a preference for seating arrangements in the front row [16, 17]. The initial manifestations of refractive errors may manifest as ocular discomfort accompanied by or without conjunctival hyperaemia, cephalalgia, and lacrimation. Frequently, these observations elude parental detection due to insufficient knowledge.

There is a paucity of hospital-based research on ocular morbidity in paediatric patients. The data collected from these investigations could prove valuable in enhancing extant primary ocular healthcare facilities, thus mitigating the incidence of paediatric blindness and severe visual debilita-

tion and promoting optimal growth and maturation. The current research endeavour sought to evaluate the correlation between body mass index (BMI) and ocular pathologies among school-aged children.

2. Materials and Methods:

This cross-sectional observational study was conducted on paediatric patients presenting to the outpatient department of ophthalmology at Pradyumna Bal Memorial Hospital, which is affiliated with Kalinga Institute of Medical Sciences, KIIT University, located in Bhubaneswar, Odisha, India. The procedure was executed between September of 2020 and September of 2022. The sample population of this study included 500 patients. The institutional ethical committee approved the study.

2.1. Inclusion criteria:

- Children from 6-16 years of age
- Children who came for ocular evaluation and management
- Informed consent from parents

2.2. Exclusion criteria:

- Children below 6 years and above 16 years of age
- Uncooperative and hostile patients
- Patients without consent

2.3. Examination:

General examination, calculation of BMI, separate calculation of BMI according to sex, ophthalmological examination, dilated static retinoscopy, slit lamp biomicroscopy and applanation tonometry was conducted.

2.4. Statistical Analysis:

All the data was encoded and documented utilising the MS Excel software application. The statistical software package, SPSS v26 (IBM Corp.), was utilised for the purpose of conducting data analysis. The study employed descriptive statistics to present the data in a medical and academic format. Continuous variables were expressed as means and standard deviations, as well as medians and interquartile ranges. Categorical variables were presented as frequencies and percentages. The study utilised appropriate graphical representations, such as histograms and column charts for continuous data and bar charts and pie charts for categorical data, to facilitate data visualisation. To assess the statistical significance between the two methods utilised, we employed the CHI SQUARE TEST for comparing continuous data. A statistically significant result was obtained when the p-value was less than 0.05.

3. Results:

A total of 500 children between 6 years and 16 years of age were examined in the eye department during the study period. These children were divided into groups based on age: 6-9 years, 10-13 years, 14-16 years. Maximum number of children who attended OPD were from age group 14-16 years which was 14-16 years i.e. 237 (46.2%) [Figure 1].

The gender distribution was 242 (48%) males and 258 (52%) females. In all group females were prominent except for the age group 14-16 years [Figure 2].

The highest frequency i.e. 222 (44.4%) was recorded in normal BMI (<25 kg/m^2), which was followed by 215 (43%) in underweight (<18.5 kg/m^2). It was followed by 49 (9.8%) in overweight (<30 kg/m^2) and 14 (2.31%) in obese (≥30 kg/m^2) [Figure 3].

4. Discussion:

Vision is crucial to the mental, physical, and psychological development of children and adolescents, although it is vital to the development of all age groups. The majority of adult blindness is readily treatable and preventable. However, if it is not detected and prevented in a timely manner, it can result in a permanent impairment. There are few population-based reports on the prevalence of ocular disease and visual impairment among adolescents. The data obtained in the present study is essential for designing programmes to reduce

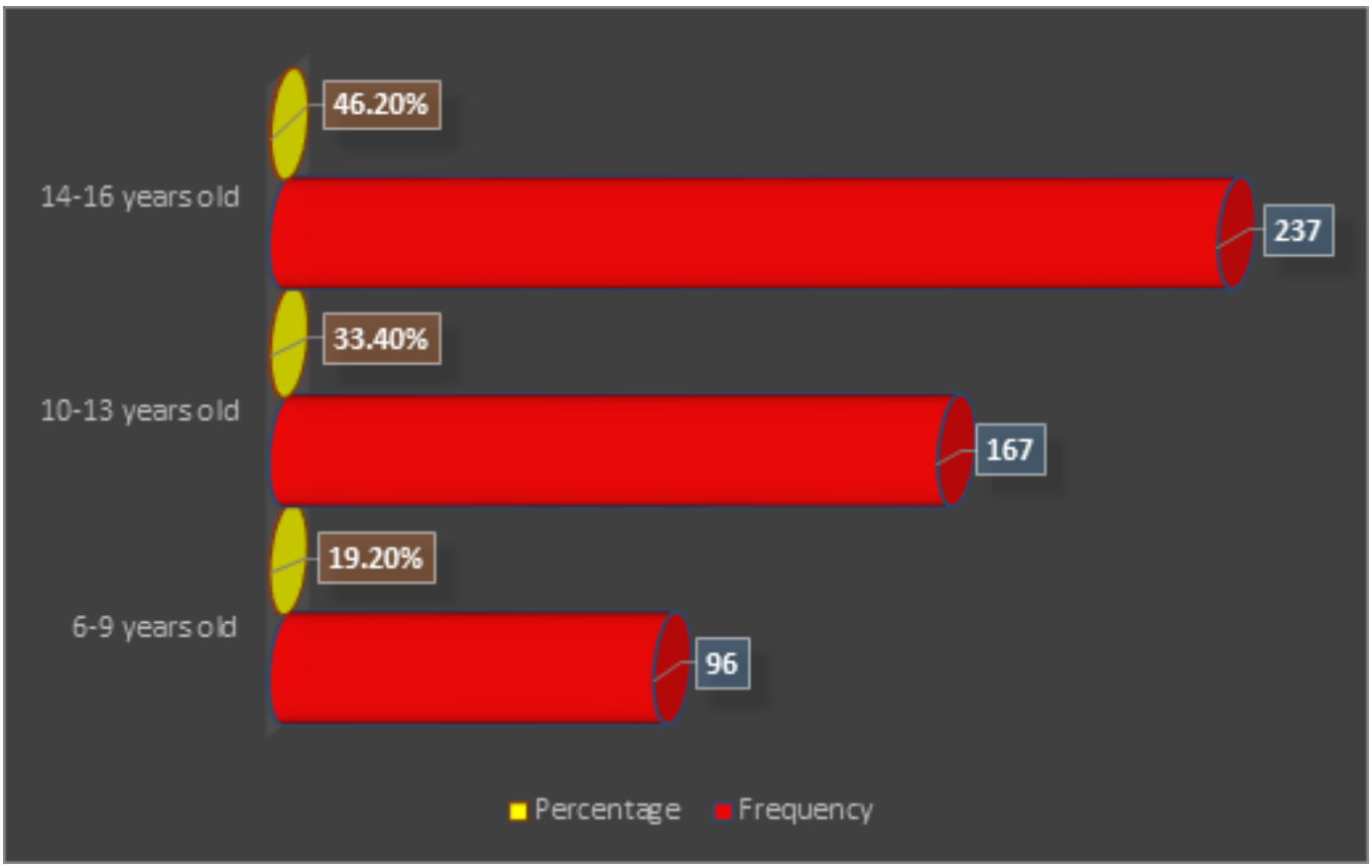

Figure 1: **Distribution of age**

the prevalence of visual impairment among the younger population. This study was carried out to determine the prevalence of ocular disease among adolescents.

In the present investigation, 500 children aged 6 to 16 years were examined. These children were divided into three age groups: 6 to 9 years, 10 to 13 years, and 14 to 16 years. In the present study, there were 242 (48%) males and 258 (52%) females with ocular morbidity. This was comparable to studies conducted in Berhampur [18], Mengaluru [19], Allahabad [10], Etawah [22], Dezful, Iran [23], Chennai [24], and South East Turkey [26], where males predominated, but distinct from those conducted in West U.P [20], Southeast Iran [21], Central Ethiopia [25], Rural Karnataka [27], and Saudi Arabia [30], where females predominated. These differences could be attributable to disparities in sample size, the age group selected for the study, gender bias, and the prevalence of ocular morbidity in different regions of the world, relative to the present study.

We compared the categories of ocular morbidities between studies published after 2010 with sample sizes >500 and our own results. Studies that only compared refractive errors were omitted from the table. Comparable to studies conducted in Mengaluru [19], Vietnam [28], etc., the most prevalent ocular morbidity in our study was refractive error. Compared to studies conducted in Central Ethiopia [25], conjunctivitis was the most prevalent ocular morbidity in Etawah [22]. This is likely due to the hazy local environment (mostly agricultural communities), the study season (which favours vernal catarrh), and the climate. In addition, rural living is a risk factor for chronic allergic conjunctivitis in children [25]. The higher incidence of allergic conjunctivitis may be due to the tropical climate with extended summers and the low socioeconomic status of the Institution's patient population.

In our study, myopia (21.2%) was the most

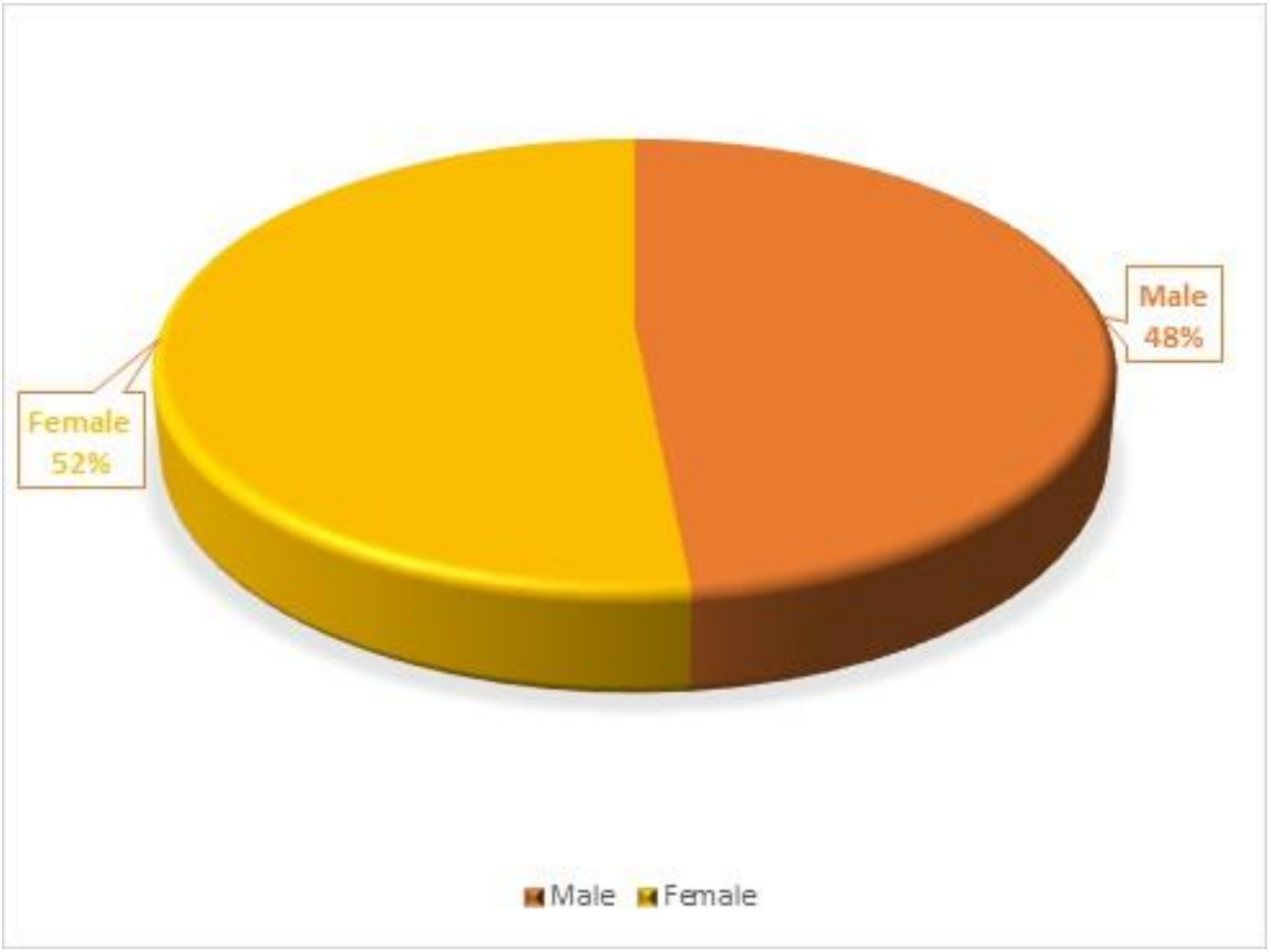

Figure 2: **Sex distribution**

prevalent refractive error, followed by astigmatism (14%), hypermetropia (5.6%), and hypermetropia astigmatism (3.6%). We compared our results to those of studies published after 2010 with sample sizes exceeding 500. Myopia was most prevalent in West Bengal (54.44%), followed by hyperopia (24.85%) and astigmatism (20.71%) [31]. This was not the case in Nepal, where astigmatism was the most prevalent refractive error (46.99%), followed by myopia (34.21%) and hyperopia (14.61%) [29], similar to a study conducted in Central Ethiopia [25]. In West China, the prevalence of hyperopia and astigmatism were nearly identical [32]. An important distinction between these investigations is the age range of the samples. In some studies, sampling was population-based and included 5-year-olds, whereas in other studies, sampling was school-based and included 7- to 15-year-olds or similar age groups [30]. Since some studies have suggested that ethnicity, genetics, and lifestyle may be determinants of myopia [33], myopia may be influenced by these factors.

5. Limitation:

Due to the sample size of this study being hospital-based, they do not reflect the prevalence of the disease in the community. This was a limitation for this study.

6. Conclusion:

In our study, marginally more females than males participated. Perhaps as a result of less outdoor activity during the Covid Era. Refractive errors (myopia, hyperopia, and astigmatism)

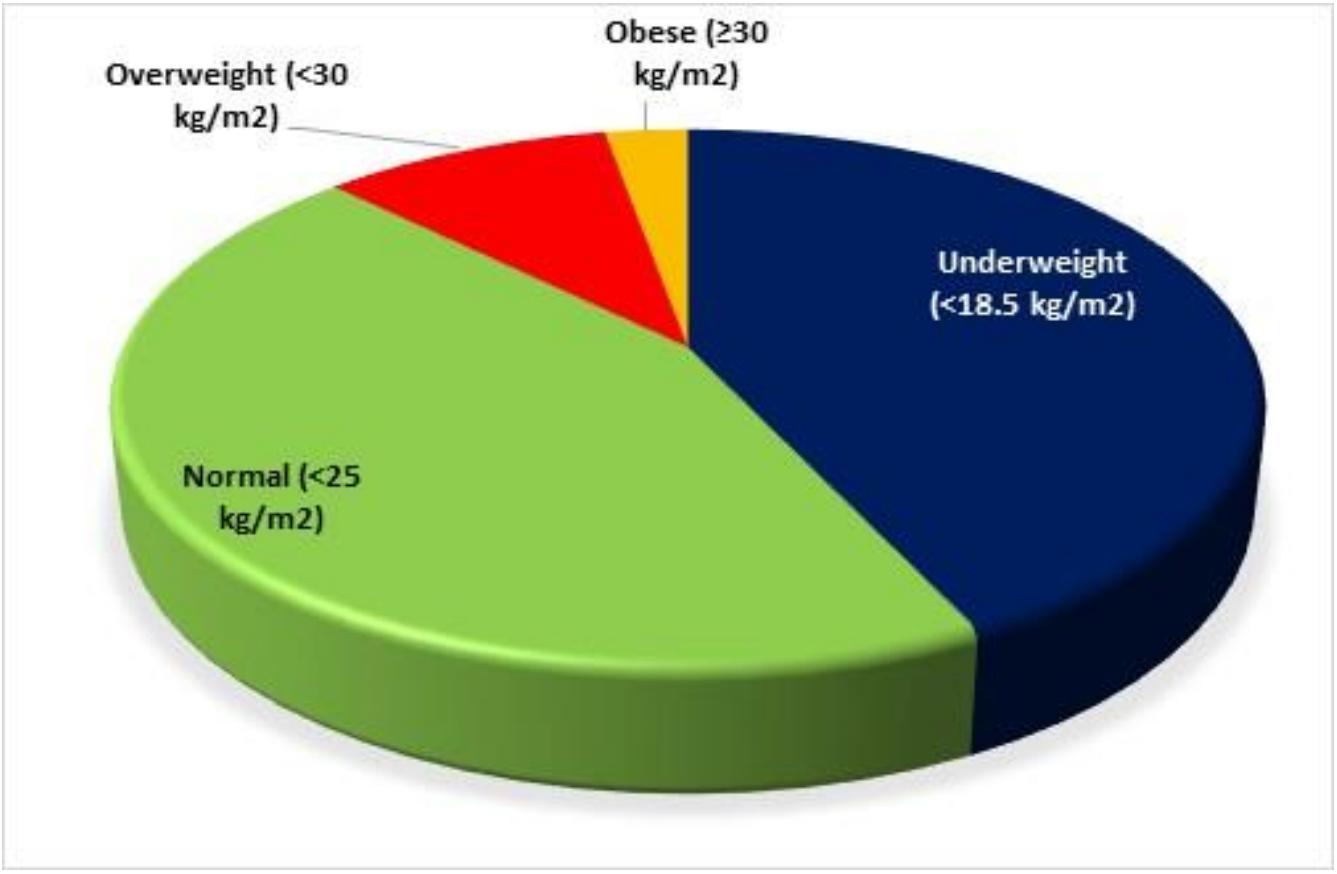

Figure 3: **BMI distribution**

were the most prevalent among all patients. Half of the participants in our study are underweight, while a smaller proportion are obese. Refractive error, mild visual impairment, and xerophthalmia are the leading causes of ocular morbidity in adolescents. These findings highlight the magnitude and severity of ocular morbidity in an age group that policymakers typically do not perceive to be at risk in this regard.

7. Acknowledgement:

None

8. List of abbreviations:

WHO- World Health Organisation
BMI- Body Mass Index

9. Source of funding:

Nil.

10. Conflict of Interest:

None.

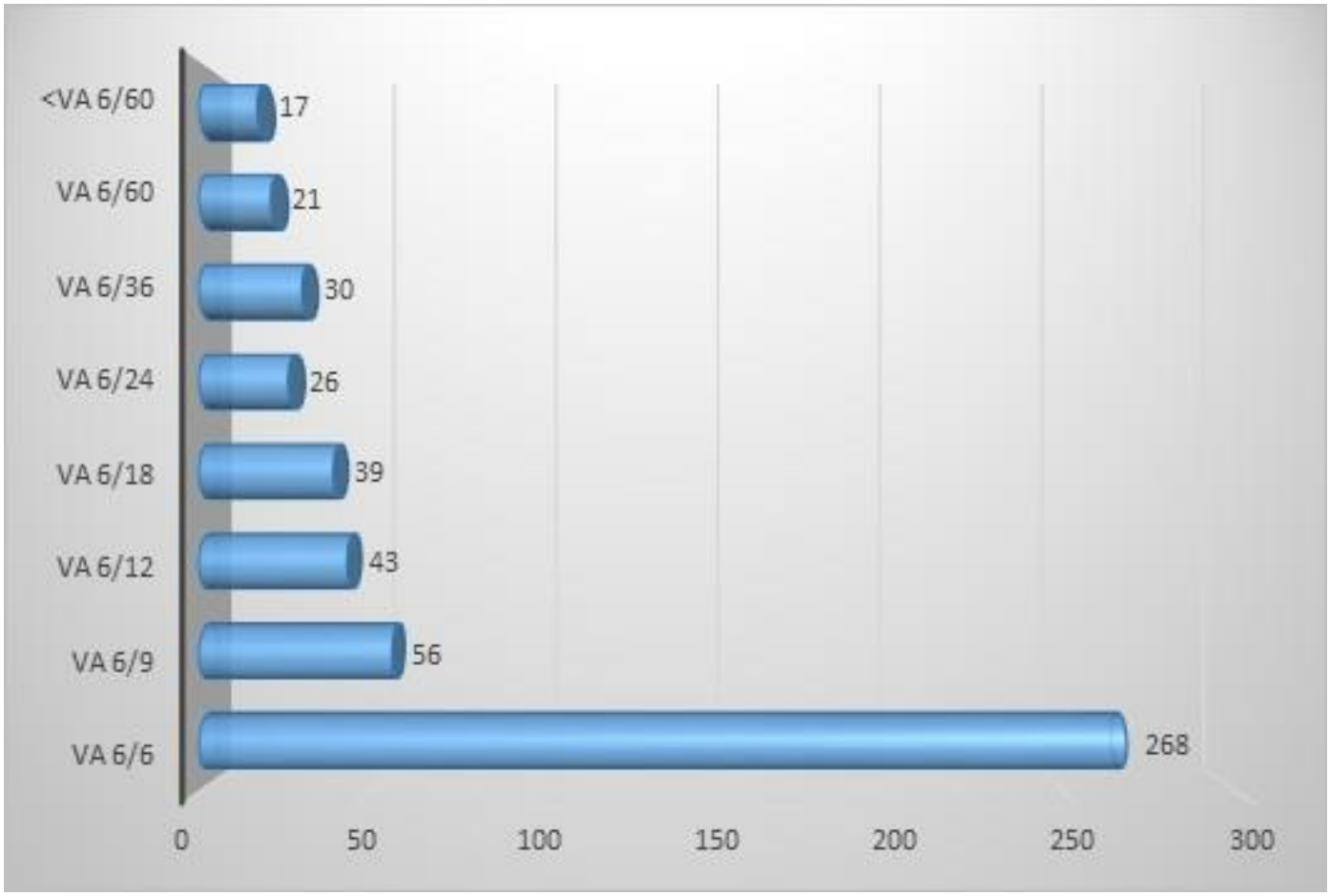

Figure 4: Right eye visual acuity

11. Publisher details:

Publisher: Student's Journal of Health Research (SJHR)
(ISSN 2709-9997) Online
Category: Non-Governmental & Non-profit Organization
Email: studentsjournal2020@gmail.com
WhatsApp: +256775434261
Location: Wisdom Centre, P.O.BOX. 148, Uganda, East Africa.

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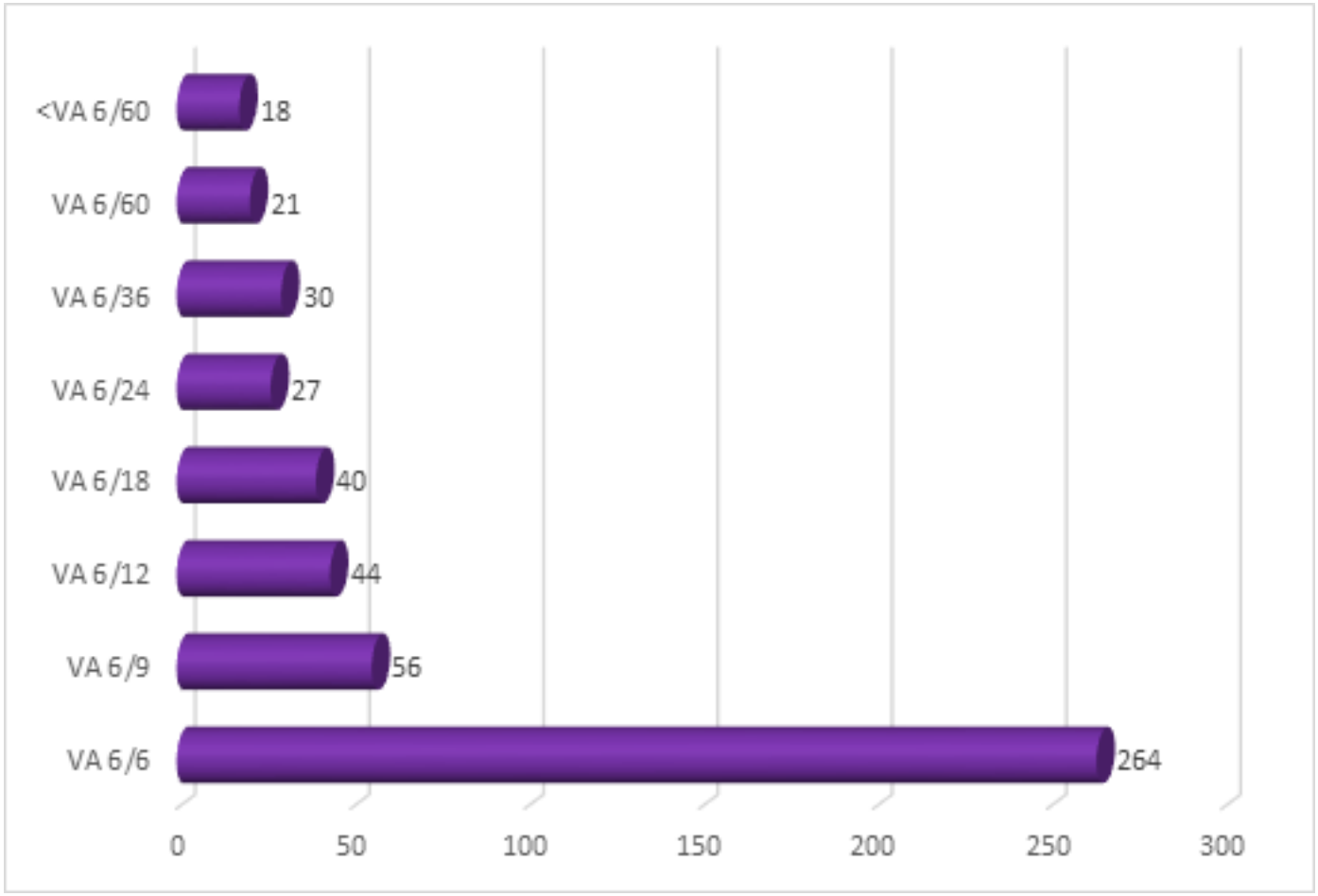

Figure 5: Left eye visual acuity

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