

Relationship between Refractive State and Nutritional Status among the children

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ABSTRACT

Objective: Refractive error and malnourishment both are common issues in developing countries therefore in this study main aim is to find the relationship between refractive state and nutritional status.

Material and Methods: This was a cross-sectional observational study conducted at Tehsil Headquarter Hospital Kamoke. The sample size was 200 children equally divided into well-nourished and malnourished groups with their age range between 3-12 years of both gender. First visual acuity was measured monocularly with Snellen's Chart. The amount and type of refractive error were assessed using cycloplegic refraction with cyclopentolate 1% eye drops. Eyes with amblyopia, strabismus and any other ocular pathology that affects vision were excluded. All children were referred from eye department to the nutritionist of this hospital to determine the nutritional status through WHO provided guidelines.

Results: There were a total of 101 (50.5%) males and 99 (49.5%) females in this study. The most common type of refractive error was Astigmatism which was present in 29 (29%) well-nourished and 31 (31%) malnourished children. The least common was hypermetropia which was present in only 3 children and all were females. However, myopia was present in 12 (12%) well-nourished and 11 (11%) malnourished children.

Conclusion: Thus, Refractive errors were present in both groups. The most common was Astigmatism and the least common was hypermetropia in both groups. The inferential statistics of this study concluded that refractive errors were not related with nutritional status but may be due to some factors.

Keywords: refractive state, nutritional status

INTRODUCTION

Vision plays an integral part in effective communication and learning. Eighty-five percent of visual information is received from the environment (1). According to the World Report on Vision, globally, at least 2.2 billion people have vision impairment or blindness. At least 1 billion have a vision impairment that could have been prevented or has yet to be addressed (2). Uncorrected refractive errors are a common cause of visual impairment worldwide (3, 4). Refractive errors are not equally distributed in countries. Prevalence of un-corrected refracted error was more in developing countries about 90%. Myopia is more common and has more prevalence in East Asian countries. Hypermetropia is more prevalent in Europe and western countries (5, 6).

Uncorrected refractive errors affect children's daily life due to poor vision, inability to perform daily activities, psychological problems and leading strabismus, anisometropia and amblyopia (5, 7). Generally, children do not complain about decreased vision and may not be aware of their problems. They may adapt their defective vision through strategies such as changing the classroom environment, bringing things closer, and paying attention to avoid tasks that require a lot of visual focus (3, 8).

Risk Factors associated with refractive error among children defined as the duration of watching television, mobilephone usage, the distance between children and television, a study in inadequate light and positive family history of refractive errors (9, 10).

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The relationship between visual impairment and poor diet has been recognized previously (11). Results indicate to that, nutrition plays an important role in the development of refractive errors (12). It has a profound effect on the development of future generations (13). Also, Globally visual impairment and malnourishment are major public health issues among school children leading to morbidity and mortality (14, 15). Especially, malnutrition is a burden in South Asian countries like India, Pakistan and Bangladesh as more than half of the children affected by malnutrition live in this regions (16, 17). It is estimated that, 428 children out of every 100,000 children aged <5 years of age are considered malnourished in Pakistan (16, 18). Therefore, this study aims to find the effect of nutritional status on refractive state of children.

Young children are living in extreme poverty conditions mostly affected by malnutrition with greater intensity due to low socio-economic status, environmental factors, political and cultural and educational background (19). Even if, refractive errors cannot be prevented but can be diagnosed early with regular eye examinations (1, 20). Therefore, experts recommend that the children should be screened for early detection of refractive errors (3, 8).

MATERIAL and METHODS

This study is a cross-sectional, case-controlled observational study which conducted at the “Department of Ophthalmology” of Tehsil Headquarter Hospital Kamoke, Pakistan during August and September, 2021. Helsinki (2008) principles were followed to conduct the study. Based on the study's objectives, a sample frame of 200 children was drawn by equally dividing into two group. Group one was a well-nourished group, and the Group two was malnourished. Both groups had similar characteristics of age, gender, economic status and demographic conditions.

The inclusion criteria for the study were set to be age range of 3-12 years, of either gender, present to OPD with blurring of vision or for visual screening and having best-corrected visual acuity (BCVA) of 6/9 or better on post-cycloplegic subjective refraction. Children with amblyopia, strabismus, ocular trauma, ocular pathologies that affect vision and age of less than 3 years and more than 12 years were excluded from the study.

All of the two hundred children have in the inclusion and exclusion criteria. After applying exclusion criteria, consent was taken from parents before collecting the data. A detailed anamnesis, including duration of blurring of vision, history of spectacles use, have been obtained. The visual acuity was checked monocularly by using Snellen's visual acuity chart at 6 meters. In case of substandard vision, pinhole test was done to assess the maximum improvement after correction. Amount and type of refractive error were assessed with cycloplegic refraction by using cyclopentolate 1% eye drops. For adequate cycloplegia and mydriasis, the cycloplegic drug was administered three times with the interval of 10 minutes and objective refraction was examined by using streak retinoscopy after 90 minutes of first drop. After 3 days of cycloplegic refraction, post cycloplegic subjective refraction in verbal children based on retinoscopy findings was measured.

The children were considered emmetrope if their visual acuity is 6/6 and require no correction. Myopia was considered as a refractive error requiring a minus sphere of 0.50 Diopter or more for correction and hyperopia if need a plus sphere of 1.00 D or more and Astigmatism with the cylindrical correction of ± 0.50 or more. Children who have different refractive states were recorded.

Strabismus was assessed by Hirschberg test, Cover-Uncover test and Extra Ocular Motility. Ocular pathology was ruled out by anterior and posterior segment examination via Slit Lamp Biomicroscopy and Fundoscopy.

The children were divided into case and control groups based on their nutritional status. Therefore, all children were referred from Department of Ophthalmology to the Nutritionist of Tehsil Headquarter Hospital, Kamoke, to find out their nutritional status and instruct them to report back again in Ophthalmology department. The Nutritionist made the diagnosis as the child is malnourished or nourished by two methods. First through Outpatient Therapeutic Program for children from 3 to 5 years of age and the second is WHO guided table used for children of age more than 5 years.

Data were recorded for each child in a Microsoft Excel file. After collection of data, the data was transferred into the SPSS and results were analyzed and organized by using SPSS 26 and Microsoft Excel. Descriptive and inferential statistical techniques were adopted to investigate the data and draw information based on data.

RESULTS

The total sample of 200 children's data was divided into different age groups. It was found that 99 (49.5%) children belonged to 9-12 years of age. However, 37 were included in 3-5 years of age while 64 children belonged to 6-8 years of age which were 18.5% and 32% respectively of the total sample.

The sample was equally likely divided into two clusters, well-nourished and malnourished. The group well-nourished was set as the control group and the malnourished group was set as the case group.

There were 101 (50.5%) boys and 99 (49.5%) girls in the total sample size. The sample was approximately equally divided into male and female representation.

In this study, the Emmetropia among boys and girls is common and amazingly equal in both malnourished and nourished groups. Most of the children belonged to 9 to 12 years of age group. Out of 114 (57%) emmetropes, 53 were from age group 9 to 12, 20 were from age group 3 to 5 and 41 were from age group 6 to 8. Well-nourished male children were leading in count as compared to well-nourished female children. Among the well-nourished group, out of total 58 were emmetropes among them, 31 were males, and 27 were females. However, in malnourished group emmetrope, the female count is slightly higher than the male count.

Myopia was present in 23 (11.5%) children, in which 14 were females, and 9 were males. Among 9 males, 7 were fully nourished, while 2 were malnourished. However, out of total 14 myopic females, 5 were well-nourished while 9 females were malnourished. Most of the children belong to the 9 to 12 years age group; 21 children were belonging to this age group

and 2 were from age group of 3 to 5 years. Hence, myopic girls were leading in count compared to boys in the nourished group while boys were dominant in count among the malnourished group.

The hypermetropic children were only 3 (1.5%) in the count, and all were girls. No Hypermetropia was seen in males either they are well-nourished or malnourished. However, one female from the control group belongs to the age group of 3 to 5 years while two females from the malnourished group belonging to 6-8 years age group were hypermetropia.

Astigmatism was present more among males of both groups. Astigmatism was present in 60 (30%) children, out of which 25 from 9-12 years age group, 14 from age group 3 to 5 years and 21 from age group 6 to 8 years. Sixteen well-nourished males and 19 malnourished males had Astigmatism. However, among the female of both groups, there were 13 well-nourished and 12 malnourished children.

Pearson correlation was used to check the degree of association between the refractive state and the nutritional state. The Pearson correlation coefficient (0.026) and Spearman correlation coefficient (0.023) were very low. Results show that the refractive state and nutritional state of children does not have a favourable relation. In other words, the degree of association between child's refractive state and nutritional status has nothing to do with each other. We cannot say that children with specific nutritional status are likely to have a refractive error based on the calculated value of the coefficient of correlation.

The Chi-Square tests results were insignificant, which shows a very weak association between refractive errors and nutrition status of children aged 3 to 12 years. Both incidents were independent of each other, or we are failed to establish an association between both conditions significantly (Chi-Square= 0.479, P value= 0.924).

Table 1: Comparison of Nutritional Status by Gender and Age

Nutritional Status	Age	Gender		Total
		Male	Female	
Fully Nourished	3-5 years	18	10	28
	6-8 years	13	16	29
	9-12 years	23	20	43
	Total	54	46	100
Malnourished	3-5 years	3	6	9
	6-8 years	19	16	35
	9-12 years	25	31	56
	Total	47	53	100
Total	3-5 years	21	16	37
	6-8 years	32	32	64
	9-12 years	48	51	99
	Total	101	99	200

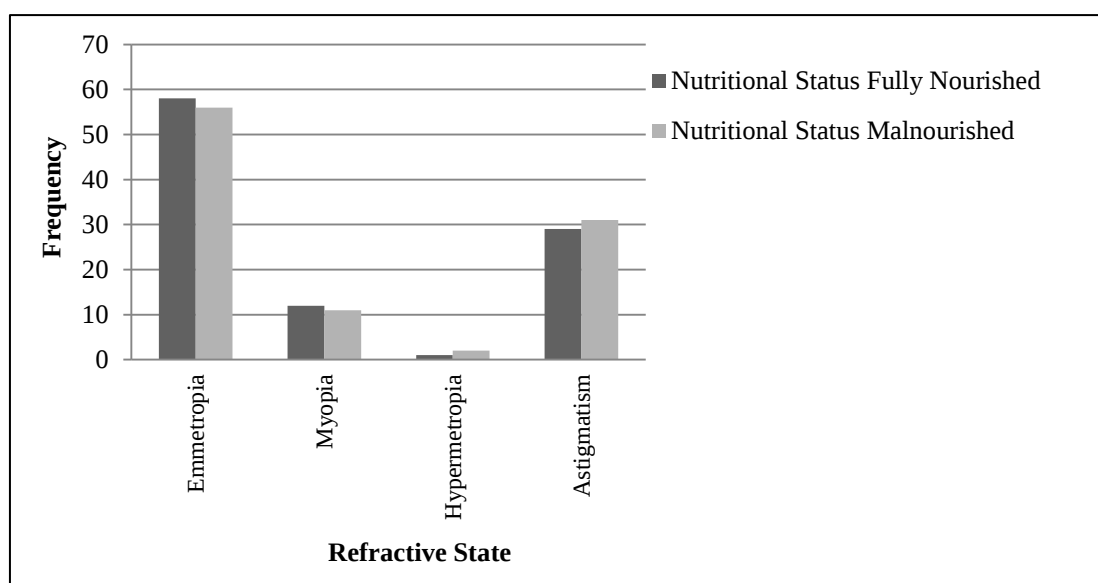


Figure 1: Refractive State Versus Nutritional Status

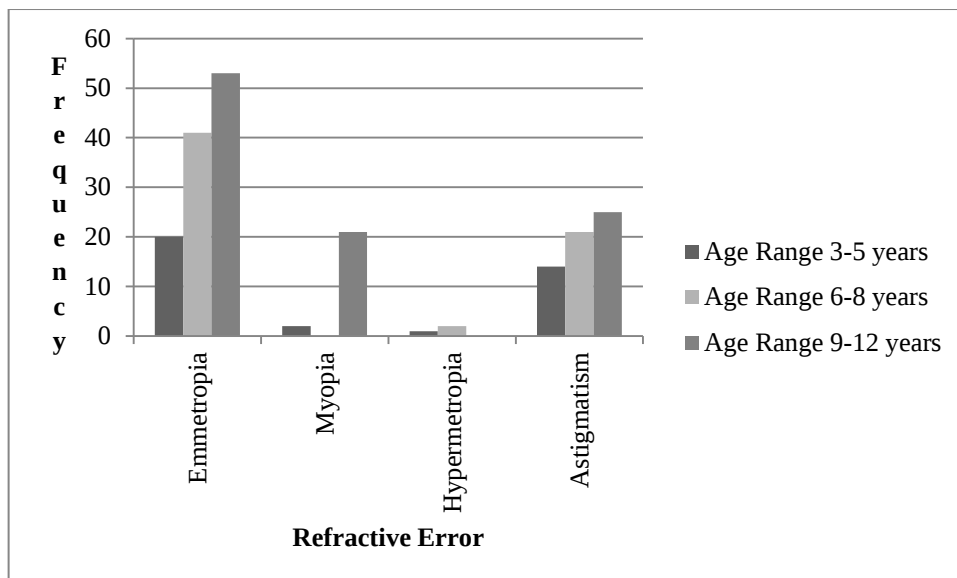


Figure 2: Age wise distribution of Refractive error

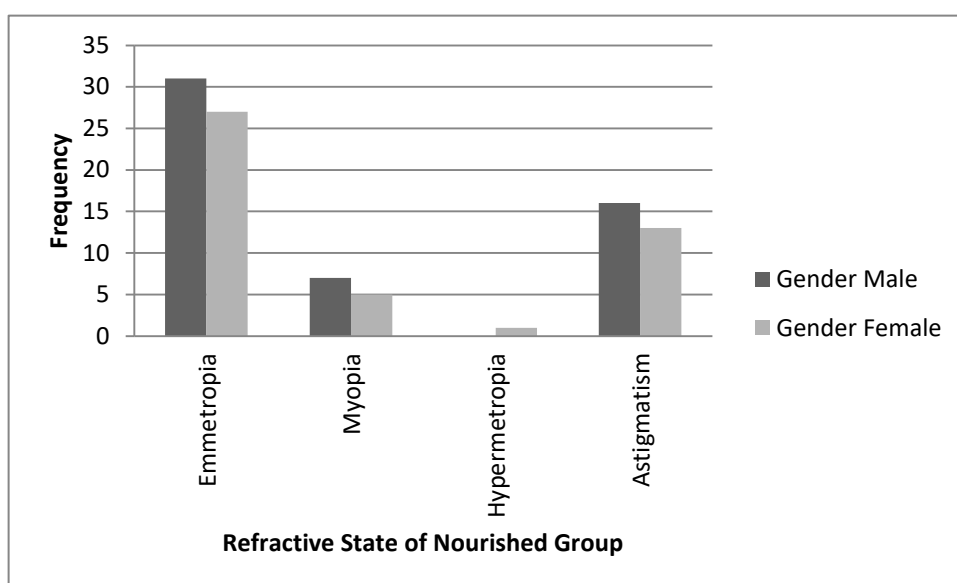


Figure 3: Gender wise distribution of Refractive State in Well-nourished Children

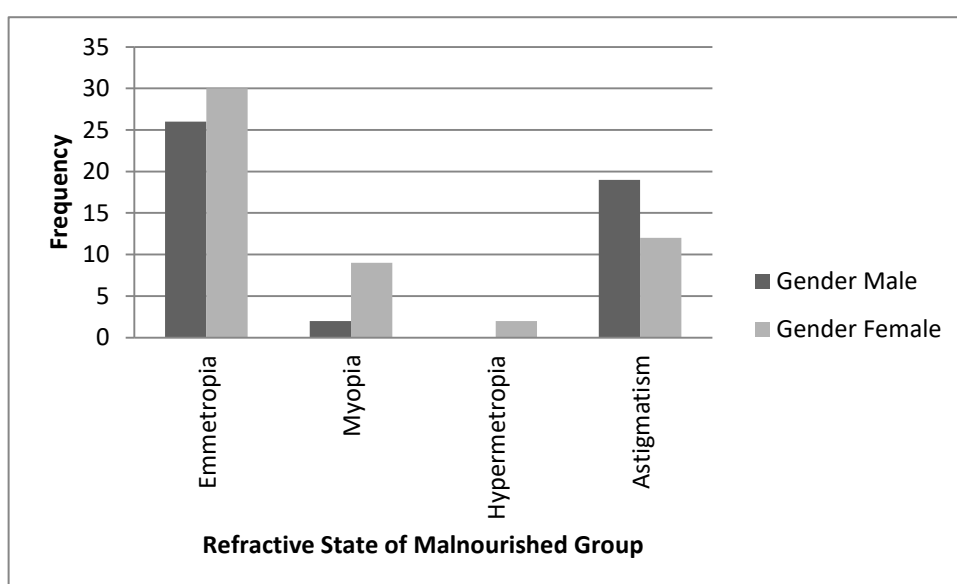


Figure 4: Gender Wise Distribution of Refractive State in Malnourished Children

DISCUSSION

Vision is the initial source of information in the human body. It is the door to getting knowledge and understanding of surroundings for newborns and early childhood. For children's proper intellectual development and smart decision-making ability, vision plays a key role in collaboration with other senses. In accessing health and quality of life, sight is among the important indicators. With excessive use of technological learning aids like the use of multi-media in schools, online classes, and tremendously increased on-screen time, especially in children have increased visual requirements. Accurate vision ability of the eye at an early age and its proper development is essential for further intellectual growth. The most common blip of an eye in school going children is a refractive error.

In the present study, in the total sample of 200 children, males were 101, while 99 were females with the age range between 3 to 12 years. Among them, 114 (57%) were emmetrope, 23 (11.5%) were myope, 3 (1.5%) were hyperope and 60 (30%) astigmatism. Astigmatism was found as major refractive error in both fully and malnourished group. However, the previous study conducted by Sajid Munir, Hussain Sherazi, Rehman, et al. found that myopia (40%) was the major refractive error above 5 years of age and hypermetropia (24%) was the major refractive error below 5 years of age (21).

The Refractive state of the eye seriously affects learning and creates difficulty (22). Another problem that is evident in children is malnutrition (23). Most diseases such as the refractive state in children, are due to a lack of nutrients in the diet.

Growth in the human body is subject to certain dietary requirements. If a diet is lacking the required amount of essential nutrients, such a condition is called malnutrition. Malnutrition leads to deficiency the optimal functioning of the human body and makes humans vulnerable to diseases. Most diseases in children are due to the lack of a balanced diet. By balanced or healthy diet, the diet means that contains adequate quantities of certain nutrients, minerals, proteins, and vitamins. Most body organs are in the development phase in early childhood, so the importance of a balanced diet becomes more prominent for the proper development of body organs.

Most of the children goes to school without breakfast. The reason is increasing of the use of junk food, children may sleep at late night. So, in the morning, they may not be able to go to school in good health (21). In this study, more females (53) were malnourished, and maximum frequency was found in the age range between 9 to 12 years, however, more males (54) belong to the well-nourished group with maximum number of children in 9 to 12 years of age group. Emmetropes were 58 and 56 in number in well-nourished and malnourished groups, respectively. Twelve myopes were found in fully nourished, and 11 were in the malnourished group. Hypermetropia was rarely observed and found among only 3 females, 1 children was in well-nourished group and 2 children were in malnourished group. Astigmatism was observed in 29 well-nourished children while among 31 malnourished children. While in a previous study, 16% of subjects with a diet poor in protein, fruits and vegetables and high in carbohydrates have poor visual acuity (24).

Moreover, in another previous study, higher frequency of hypermetropia 97 (55.1%) and emmetropic children 10 (5.7%) were found in the control group while myopia 3(1.6%) and astigmatism 94 (51.6%). Astigmatism was more prevalent in the studied group. Dantas, Brandt, & Leal was not found any biomicroscopic changes in the control group, however, biomicroscopic changes were detected in the malnourished group. Their study favours that early malnutrition effectively interferes with the visual health of individuals (19).

CONCLUSION

This study did not find any gender-specific pattern of refractive error depending on nutrition status. The refractive errors were present in boys and girls without any significant gender inclination. Among the children between 3 to 12 years old, the most affected age group was 9 to 12 years old. Among the three types of refractive errors, the most common refractive type was Astigmatism. Hypermetropia was the rare type of refractive type among children of both well-nourished and malnourished groups. Children aged between 3 to 12 years old are equally likely vulnerable to the incident of refractive error irrespective of their nutritional status. As an obvious result of statistics, there is no relation between the refractive error problem and nutritional status among the children. Based on our study results, we can say that there may be other factors than a nutritional status that are the main cause for the refractive error among the children.

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Ethical approval: The study was conducted according to the guidelines of the Declaration of Helsinki and approved by Local Ethical Committee. All procedures performed in studies with human participants met the ethical standards of the Institutional Research Commission and the 1964 Declaration of Helsinki and its subsequent amendments or comparable ethical standards.

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