Factors associated with Myopia among Children at Eye Hospital Kathmandu

Abstract

Myopia is the most prevalent refractive error among the children leading to blindness. The prevalence rate is increased since few years back due to increase in modern technologies and mode of study among children. This descriptive cross sectional study aims to explore factors contributing to myopia among children visiting refractive clinic/refractive department of Nepal Eye Hospital. Non probability purposive sampling method and 206 children were used for this study. Structured questionnaire were used along with the children and their parents. Chi-square test was used for finding the association with the contributing factors. The study population varies between the ages of 5 to 17 years with the mean age±12 and mostly affecting the children above 10 years. Myopia is significantly associated with religion, ethnicity, heredity, parent's level of education. Income status of family, reading at dim light is significantly associated with myopia as p-value is <0.0001.

Myopia in children attending refractory OPD of Nepal Eye Hospital was associated with heredity, socio-economic status and level of education of parent; continue reading, additional classes, watching video/television, using computer or cell phone, sports (football, cricket), dim light and not associated with residential area, type of school, night lightness, dietary pattern and ocular hygiene; therefore parents along with children and teachers should be given awareness program about early screening and its preventive measures.

Key word: Factors, Myopia, Children

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Introduction

Myopia or nearsightedness has emerged as a major health issue in world, the prevalence of myopia has increased rapidly in the past few decades. People with Myopia can see close objects clearly, but objects farther away appear blurred; have difficulty clearly seeing a movie or TV screen or the whiteboard in school. Heredity and environmental factors such as near work activity, outdoor activities, school achievement, history of ocular disease, nutrition, residence, parental education, types of school, night lightness and ocular hygiene are the contributing factors of myopia [1,2].

According to World Health Organization myopia is the fifth leading cause of blindness. The prevalence of myopia greatly varies between different population and ethnic groups. According to WHO (2014 updated) "285 million people are estimated visually impaired worldwide: 39 million are blind and 246 million have low vision." An estimated 19 million children are visually impaired. Of these, 12 millions are visually impaired due to refractive errors. National Eye Institute (2008) found the prevalence rate of myopia in the United States is 33.1%. In Greece, myopia among 15-18 years old children was 36.8 % [3] In Swedish, the prevalence of myopia was reported 49.7 % [4]. 42.7% of 12 years and 59.1% of 17 years children are myopes in Australia [5].

There is an endemic of myopia in Asia. The prevalence rate of myopia has been in climbing ratio. In some part of Asia the prevalence of myopia is about 70-90 %([6]. China, Singapore, Japan, Hongkong and Taiwan are the countries with high burden of myopia [2]. In India, the prevalence of myopia among school children was 51.47 % [7].

In Nepal, the prevalence of myopia ranged from 10.9%, 16.5% and 27.3% in 10, 12 and 15 years old respectively in urban region whereas <3% in 5-15 years children living in rural regions [6]. A recent study done in school children, shows prevalence of myopia in urban is 15.5% and rural is 8.2 % [8].

The world's population is becoming myopic at an alarming rate. Different studies suggest different factors associated with myopia. Genetic factors play more substantial role in the development of early-onset myopia. The children studying in private schools were twice as likely to have myopia as compared to those studying in government schools [9]. Children with high IQ (>30) are more likely to develop myopia i.e. 67.9% as compared with low IQ children. Myopia is probably correlated with educational level and excessive near work. Outdoor activities reduce the risk for development of myopia [1]. Female gender, school type, higher socioeconomic background, dim reading illumination, longer daily studying duration, less rest during study are the associative factors of myopia [2] . Myopia is also associated with residential area [10].

Children are more vulnerable group for developing myopia due to increase in near work activity, continuous reading etc. Children are more focused in indoor activities such as watching television, playing video games, spending more time in computer than outdoor activities. It is still controversial that whether the myopia results from heredity factors or environmental influences such as reading, close work, accommodation, diet etc. The aim of this study was to identify the factors associated with myopia among children. This study was designed: to assess the socio-demographic characteristics of the respondents, to determine the association between myopia and its contributing factors.

Methods

Descriptive cross sectional study was conducted to find out association between myopia and its contributing factors. This study explores significant association between myopia and its contributing factors. The study was carried out at Nepal Eye Hospital, at Tripureswor, Kathmandu. Population of the study was myopic children and their parents for the children of age below 14 years and children themselves for above 14 years who attend refractive department of Nepal Eye Hospital.

Non-probability convenient time frame sampling method was adopted in this study. Samples were myopic and non-myopic children visiting refractive department. All the children diagnosed with myopia by doctor and same numbers of non-myopic children were taken as study population. Data was collected from 206 respondents. Among them 103 were myopic and 103 were non-myopic children. Structured questionnaire in Nepali Language was used for collecting data consisting of two parts-questions related to socio demographic data and questions related to contributing factors of myopia. Structured interview method was used for collecting data. Written formal letter was taken from the research committee of Manmohan Memorial Institute of Health Sciences. Formal approval was obtained from the authority of the Nepal Eye Hospital. Informed Verbal Consent was obtained from the respondent before interview. Privacy, confidentiality and anonymity were maintained throughout the study. Necessary information was given to the entire respondents about the myopia.

Results
Total number of children in this study was 206.The maximum age of respondents was 17 years and minimum age was 5 years. 48.5% were male and 51.5 %were female. Majority of respondents were hindu 75.7%.Regarding ethnicity of respondents most of them are Brahmin/ Chhetri 41.7% and Janajati 40.8 %. Majority of children 90.8% residing at urban. Children studying at private school are more myopic 80.1% than at government 13.1%. Majority of the children's fathers 97.1% were literate and 92.7% of children's mother were literate. 60.2% of fathers were engaged in service and only 3.9% were farmer. 59.8% of mothers were housewife. 36.5% of respondent's family income ranges of 5000 to 10000.Among the children 103 were diagnosed as myopia and remaining 103 were non myopia.
Among myopes, 64.07% were between the age of 11 to 17 years and 35.92% were between 5 to 10 years. From chi-square test, myopia is not associated with age as p-value is 0.025. Among myopes,

55.33% were female and 44.66 were male. From the chi-square test, p-value =0.265 shows that there is no association with myopia and sex. There is the significant relationship between ethnicity and myopia i.e. p-value 0.002. Religion and myopia has significant association as p-value 0.002. Residence and type of school are not significantly associated with myopia.97.08 % of both myopic and non-myopic children's father was literate whereas only 2.91%were illiterate. 49% of myopic children's father had high level of education and only 6%had secondary level of education. 90.29%of myopic and 95.14%of non-myopic children's mother were literate.33.30%of myopic children's mother had high level of education and 34.69% of non-myopic children's mother had studied up to secondary level. From the chi-square test, it is concluded that myopia is associated with level of education of parents (p-value<0.0001).Sixty one percentage   of non-myopic and 59.22% of myopic children's fathers was engaged in services and63.10% of myopic children's mothers were housewife and only 2.91%were involved in farmer. By testing the association between myopia and occupation it was found that there is no any significant association between them. Majority of myopic children 42.47% had family income between10000 to 20000. There is significant association between income of family and myopia. Among myopic children, majority 64.1% were in mild stage and 12.6% were in severe stage of myopia.(Table 1)

Table 1
Association of Myopia with Socio-demographic characteristics (n=206)

Category	Myopic children	Non-myopic children	P value
Sex			
Male	*46(44.66%)*	54(52.42%)	**0.265**
Female	*57(55.3%)*	49(47.57%)	
Ethnicity			
Dalit	*3(2.9%)*	9(8.7%)	
Janajati	*46(44.66%)*	38(36.89%)	**0.002**
Madeshi	*2(1.9%)*	13(6.3%)	
Muslim	*2(1.9%)*	7(3.4%)	
Brahmin/Chhetri	*50(48.54%)*	36(17.5%)	
Religion			
Hindu	*89(86.4%)*	67(65.04%)	
Buddhist	*8(3.9%)*	21(20.38%)	**0.002**
Christian	*5(2.4%)*	8(3.9%)	
Muslim	*1(0.5%)*	7(3.4%)	
Income of Family			
5000-10000	**13(12.62%)**	63(61.16%)	
10000-20000	**44(42.71%)**	25(24.27%)	**0.001**
20000-40000	**26(25.24%)**	5(4.85%)	
>40000	**20(19.41)**	10(9.70%)	

Regarding near work activities among the myopic children 34.95% read continuously for 15 to 30 minutes and 49.51%of non-myopic children read less than 15 minutes. There is significant association between duration of continue reading and myopia as p-value=<0.0001. Eighty three percent of myopic children watch TV/video and 17.47% don't watch TV.Likewise 72.81% of non-myopic children don'twatch TV and 27.18% watch TV. Watching television is not significantly associated with myopia as p-value= 0.160 but the duration of watching television/ video is significantly associated with myopia as p-value=<0.0001. Near work activities like additional classes, watching television/video, using computer, cell phone is significantly associatedwith myopia as the p value is < 0.343,<0.211,<0.001,<0.018 respectively.(Table 2)

Table 2- Association of Myopia with Near Work Activities (n=206)

Category	Myopic children	Non-myopic children	P value
Duration of continue reading			
<15 minutes	*26(25.24%)*	51(49.51%)	
15 to 30 minutes	*36(34.95%)*	35(33.98%)	
30 to 45 minutes	*10(9.70%)*	12(11.65%)	0.0001
45 to 60 minutes	*14(13.59%)*	4(3.88%)	
>60 minutes	*17(16.50%)*	1(0.97%)	
Watching TV/video			
Yes	92(89.32%)	85(82.52%)	
No	11(10.67%)	18(17.47%)	0.161
Duration of watching			
<1 hour	14(15.21%)	39(45.88%)	
1 to 2 hours	38(41.30%)	40(47.05%)	<0.0001
>2 hours	40(43.47%)	6(7.05%)	
Using computer			
Yes	45(43.68%)	21(10.2%)	<0.0001
No	58(56.31%)	82(39.8%)	
Duration of using computer			
<1 hour			
1 to 2 hours	25(55.55%)	13(61.90%)	
>2 hours	12(26.66%)	8(38.09%)	0.211
Using cell phone	6(13.33%)	0	
Yes			0.0001
No	80(77.66%)	47(45.63%)	
	23(22.33%)	56(54.36%)	0.018
Duration of using cell phone			
<1 hour	32(40%)	31(65.95%)	
1 to 2 hours	37(46.25%)	13(27.65%)	
>2 hours	11(13.75%)	3(6.38%)	

Regarding different outdoor activities like dancing, and swimming there is no significant association between groups (p=0.106 and p=0.109). Likewise playing football is significantly associated with myopic children p=0.002. Regarding doing physical activity, there is significant relation between physical activity and myopia p=0.0001. (Table 3)

Table 3-Association of Myopia with Outdoor Activities (n=206)

Category	Myopic Children	Non myopic Children	P value
Dance			
Yes	62(60.19%)	59(57.28%)	0.671
No	41(39.80%	44(42.71%)	
Duration of dancing			
<15 minutes	43(69.35%)	31(52.54%)	
15 to 30 minutes	17(27.41%)	27(45.76%)	
30 to 45 minutes	2(3.22%)	1(1.69%)	0.106
45 to 60 minutes	0	0	
>60 minutes	0	0	
Swim			
Yes	21(95.23%)	31(30.09%)	0.109
NO	82(79.6%)	72(69.9%)	
Playing Football			
Yes	38(36.89%)	60(29.1)	0.002
No	65(63.10%)	43(20.9%)	
Physical Activity			
Yes	73(70.87%)	87(84.46%)	0.0001
No	30(29.9%)	16(15.5%)	

Regarding the school performance, equal percentage of both myopic and no myopic children i.e. 44 percentages had good performance in school and only 8% of both myopic and non-myopic children had poor school performance. From the chi-square test it is found that the school achievement of children and myopia has the significance of p= 0.009.(Table 4)

Table 4-**Associations with School Performance (n=206)**

Category	Myopic children	Non-myopic children	P value
Excellent	29(28.15%)	12(11.65%)	
Good **Satisfactory**	**45(43.68%)**	**46(44.66%)**	
Poor	**21(20.38%)**	**37(35.92%)**	**0.009**
	8(7.76%)	**8(7.76%)**	

Forty four percent of myopic children and 44.66% of non-myopic children had good school achievement and only 7.76% of both myopic and non-myopic children had poor school performance. From the chi-square test it was found that the school achievement of children and myopia has the significance association with each other (*p= 0.009*). Majority of non-myopic children 93.20% are non-vegetarian and 88.34% of myopic children are vegetarian. Dietary pattern of children is not significantly associated with myopia p=0.229.

Fifty two percent of myopic children sleep 6 to 8 hours at night and only 0.97% sleep more than 12 hours. The duration of sleeping hours and myopia has no significant relation as p-value is 0.641.(Table 5)

Table 5-Association with Duration of Sleeping Hours (n=206)

Category	Myopic children	Non-myopic children	P value
6 to 8 hours 8 to 10 hours	54(52.42%)	50(48.54%)	0.641
	44(42.71%)	50(48.54%)	
10 to 12 hours **>12 hours**	**4(3.88%)**	**3(2.91%)**	
	1(0.97%)	**0**	

Regarding with association with night lightness 78.64% of myopic and 88.34% of non-myopic children sleep by turning off light and 11.65% of non-myopic and 21.35% of myopic children sleep by turning on light at night. Night lightness is not associated with myopia as p=0.061 Association with intensity of light is significantly associated with myopia (p=<0.0001).This result concludes that children reading at low intensity of light are more prone to develop myopia.

Discussion

Several factors have been suggested to play a role in the development of myopia. This study was conducted with the intention to assess the factors associated with myopia among children attending the out-patient department of Nepal eye hospital. The study was conducted to assess the factors only but not the prevalence so this was conducted in equal number of myopic and non-myopic children. The mean age of the respondents was ±12. Out of 103 myopias46 (44.6%) were male and 57(55.3%) were female. This show female are more vulnerable group.

Myopia was significantly (<0.005) associated with religion, ethnicity, level of education of parents, socio-economic status, knowledge of parent about myopia, heredity, near-work activity, outdoor activity, intensity of light, prolonged reading are associated with a higher prevalence of myopia.

A study on school children done at China, showed that older age, female gender, school type, higher family income, parental myopia, dim reading illumination were associated with myopia [9]. Besides the genetic factor in, it suggests that the intensity of studying is a major environmental and behavioral factor for the development of myopia.

The study done at Nepal shows that urban child has high prevalence. The study done at China [10] shows association with residential area(but in this study there is no any association with myopia and residence. This may happen due to the study area is urban area so, 95.14% of myopic and 86.4% of non-myopic children live in urban area. Since, this study was conducted in Kathmandu so, most of the respondents reading at private school. Children studying at private school are twice as likely to develop myopia as compared to those studying at government school [9]. Level of education of parent has significant relation with myopia. Income status of family is highly associated with myopia as p-value is 0.001which supports the study done at China [2] .

Heredity is highly associated with myopia as p- value is <0.0001.The study done at Orinda Uniform School district shows association with heredity of myopia(Mutti, Mitchell et al. 2002). In this study 10.16% of myopic children have both parent myopic and 28.81% have myopic mother. As different studies suggest that there is association with myopia and genetic factor or heredity. The finding of this study also supports the previous finding.

There is significant relation with myopia and continuous reading as 34.95% of myopic children read for 15 to 30 minutes and 49.51% of non-myopic children read for less than 15 minutes. Myopia is significantly associated with near work activities. As from the table no. 7 it shows that reading, watching television/video, using computer, cell phone during school and holiday are significantly associated with myopia. The study done at Karachi also concluded that myopia was probably associated with near work activities.

Different studies suggest that myopia is associated without door activity. The study done at Singapore finds that those children spending less than 3 hours per week are more prone to develop myopia [1]. In our study majority of the children are involved in sports and playing cricket, football is significantly associated. Dancing is not associated with myopia. Physical activity at home is also significantly associated with myopia. The finding of the study suggest that outdoor activities reduce the risk of myopia by decreasing strain to eye as in near work activities. The study done at Sydney, Australia suggest that children who were spending more than 14 hours per week had less risk for developing myopia.

The school achievement is not significantly associated with myopia as p-value= 0.009. The study done at China shows those children with good school performance had high risk for developing myopia [2]. The study done at Hong Kong suggests that myopia was significantly associated with school achievement or performance [9] .Ocular hygiene is not associated with myopia as supported by the study done at India [11] done among medical students in India suggest that those who are vegetarian are at risk for developing myopia than non-vegetarian and found the association with myopia and dietary pattern. In this study there is no association with dietary pattern and myopia. According to the study done at China there was association between myopia and sleeping hours but the duration of sleeping hours is also not associated with myopia as p-value=0.64.According to the study done a support the finding of this study which shows there is no any association with night lightness as p-value is 0.061. There is great association with intensity of light or reading at dim illumination of light as p-value is <0.0001. The finding in the study done at China among children also suggests the significant association with illumination of light [9].

In conclusion, this study shows that From the findings of the study, we can conclude that myopia is significantly associated with religion, ethnicity, level of education of parents, knowledge of parents about myopia, heredity, outdoor activities or near work activities, dim light, are significantly associated with myopia as p<0.0005. Duration of continue reading without break, activities like indoor and outdoor, intensity of light while reading is significantly associated with myopia. Beside this, the study conclude that myopia is not associated with type of school, residential area, sex, occupation of parents, night lightness and dietary pattern.

Conclusion

Myopia in children attending refractory OPD of Nepal Eye Hospital was associated with heredity, socio-economic status and level of education of parent; continue reading, additional classes, watching video/ television, using computer or cell phone, sports (football, cricket), dim light and not associated with residential area, type of school, night lightness, dietary pattern and ocular hygiene; therefore parents along with children and teachers should be given awareness program about early screening and its preventive measures.

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