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Correlation between Sleeping Time and Myopia Patients under Age 10-50 Years in Pakistan

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Abstract

Introduction: Myopia is a serious eye-health problem worldwide. It is often complicated by retinal detachment, macular degeneration, glaucoma, and cataract, although the only systemic associations documented for myopia are higher risks of sleep disorders and depression. Nighttime exposure to ambient light and various lighting displays were proposed as environmental hazards for sleep.

Objectives: The purpose of the study was to determine the association between sleeping and developing myopia

Methods: A cross-sectional study was conducted from December 2020 to February 2021 in Madina Teaching Hospital, Faisalabad. Total study sample was 300 subjects of both genders, age ranging between 10-50 years of myopes were included through convenient Sampling technique. All other Refractive errors except myopia, fundus pathologies, systemic disease were excluded. After taking detailed history and ocular examination. A questionnaire containing the Pittsburgh Sleep Quality Index (PSQI) and Hospital Anxiety and Depression Scale (HADS). Data were analyzed by using Regression correlation test, with the help of SPSS software.

Results: Children (<20 years) in the high myopia group exhibited the poorest PSQI scores (P<0.01), while the adults showed no such correlations. Subscales of PSQI and HADS in children disclosed that the high myopia groups had the shortest sleep duration (P<0.01), worst subjective sleep scores (P<0.001), and latest bedtime (P<0.05). Regression analyses in children significantly correlated myopic errors with PSQI (P<0.05), sleep duration (P<0.01), and bedtime (P<0.01).

Conclusions: The result concluded that sleeping quality was significantly correlated with myopic refractive error, with the high myopia group worst affected.

Keywords: *Myopia, Refractive error, Sleep, Depression.*

Introduction

Asian particularly affected by myopia, it is serious eye health problem[1]. Myopia is also known as near-sightedness or short-sightedness is predicted to affected worldwide five billions peoples by 2050[2]. Most frequent cause of distant visual impairment and cause vast socio-economic burden[3]. Distant blur vision caused by myopia corrected by various ways, simple corrective strategies cannot cessation of pathological myopia that's tends to continuous progression. Such complications lead to permanent visual impairment while in severe cases tends to acquired blindness[4].

In some parts of Asia, one of retinal abnormalities associated with myopia is myopic macular degeneration which has been recognized as leading cause of visual impairment and blindness [5]. Myopia often complicated by retinal detachment, macular detachment, glaucoma cataract, although sleep disorder and depression identified as only systemic association for myopia [6]. Risk factors for myopia such as family history of myopia, urban living environment and lack of outdoor exposure have been identified by years of studies[1, 7].

Recent studies investigated relationship between myopia and sleep. Shorter sleep duration and poor sleeping quality correlated with high myopia[8]. In animal studies, ocular growth patterns influenced by light/dark or wake /sleep cycles[9]. Genetic factors that's lead to development of refractive error in human and retinal specific knockouts of clock gene induce myopia in mice were found regulated by circadian rhythm[10].

In Asian children, sleeping problem is also emerging issue and low school performance recently identified as associated with poor sleeping frequency[11]. Environmental hazards for sleep has been proposed as exposure to ambient light at night and various light display [12]. Outdoor activity in term of myopia progression has been recently established as antimyopiagenic factor[13],moreover other known factors included age, genetic predisposition, urbanization and near work[14]. Additionally, role of sleep has become more fascinating for myopia research since the exploration of intrinsically photosensitive retinal ganglion cell in retina (ipRGCs), their association with melatonin and sleep/wake cycles regulation[15].

Pathological myopia common feature involved retinal detachment and stretch that's lead to damage the intrinsically photosensitive retinal ganglion cell (ipRGCs) via photoreception of short wavelength light to modulate ocular growth and myopia progression in animals[16]. Thus new discovery in RGC of non-visual photoreceptor [17] could potentially influence the possibility of sleep disorder in myopes with retinal damage such as glaucoma[18]. Defect in light transmission and photoreception involves disorders such as blindness and cataract has been found associated with sleep and circadian rhythm disorders[19].

Potential cause of sleeping disorder is myopia, affected person influenced poor unaided vision which has been correlated with extensive retinal damage and neuronal dysfunction[20] furthermore status of ipRGCs in humans remains to evaluated. Although in high myopes dependence and use of optical correction devices (spectacles and contact lenses) cause high distress because these devices become lifeline for sight and for quality of life

(QOL) as well. It is well known fact that depressive subjects has worse sleep quality[21]. Indeed sleep quality of nonsurgical optical corrected myopes declined QOL with general and mental health[22].

Materials and methods

A cross-sectional study was conducted from December 2020 to February 2021 in Madina Teaching Hospital, Faisalabad. Total study sample was 300 subjects of both genders, age ranging between 10 to 49 years of myopes were included through non-probability convenient sampling technique. All other refractive errors except myopia, dry eye, corneal opacities, glaucoma, diabatic retinopathy, optic neuropathy, posterior segment pathologies, systemic diseases were excluded from the study.

All patients underwent detailed history and ocular examination. Data was collected through well-structured questionnaire. There were three sections in the questionnaire. First session containing question on demographic data (gender, age), detailed ocular history (parental history of myopia, daily number of various activities for example how much time spent on indoor and outdoor activities and eye using habits.

Second session of questionnaire including the Pittsburgh Sleep Quality Index (PSQI) to evaluate the sleeping duration and quality and Hospital Anxiety and Depression Scale (HADS) to determine the anxiety and depression to rule out the sleeping disturbances that's associated with myopia.

Third session of questionnaire constitute ocular examination which included visual acuity, objective refraction, subjective refraction, slit lamp examination. Visual acuity was measured by projection type Snellen chart. Objective refraction was done by using autorefractometer. Subjective refraction was done by using trial frame and trail lenses of trail box. Objective and subjective refraction was done for the evaluation and classification of degree of myopia. Degree of myopia was defined as mild, moderate and high myopia. Mild myopia included 0.5 Dipoter (D) to 3D, moderate degree of myopia 3D to 6D while high myopia above 6D. Slit lamp examination was done to rule out the anterior and posterior segment diseases to fulfilled the exclusion criteria.

Statistical analyses were performed by using Statistical Package for the Social Sciences (SPSS version 22). Age distribution and degree of myopia was in frequencies and percentages. To evaluate the correlation between sleeping time and refractive error myopia regression correlation test was used. P value <0.05 considered as significant value.

Results

In the present study age of the patient between 10-49years. Age distribution was in ranges as 10-19 years, 20- 29 years, 30 -39 years and 40 49years. 64% was female and 36% was male.

		AGE DISTRIBUTION				Total
		10-19 YEARS	20-29 YEARS	30-39 YEARS	40-49 YEARS	
MYOPIA	MILD DEGREE	59	36	21	29	145
	MODERATE DEGREE	31	32	15	11	89
	SEVERE DEGREE	23	29	9	5	66
Total		113	97	45	45	300

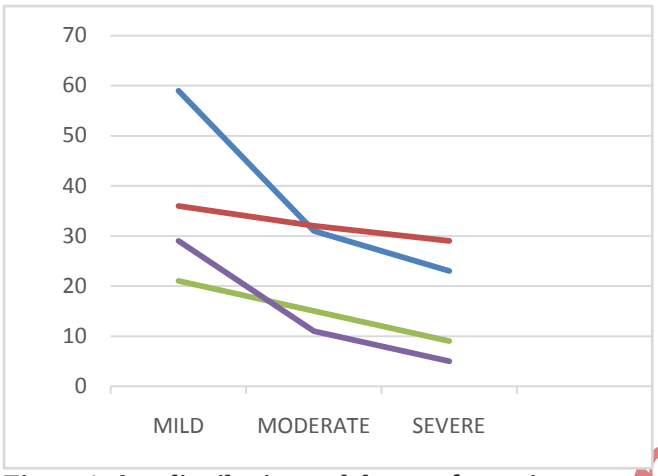

Figure 1. Age distribution and degree of myopia

Mild Myopia=0.5D-3D, Moderate Myopia=3D -6D, High Myopia =Above 6D

Subscale of PSQI scale included subjective sleep quality, sleep latency, sleep disturbance, sleep duration, use of sleeping medication and habitual sleep efficacy.

Table 2. PSQI subscale subjective sleep quality

DEGREE OF MYOPIA		SUBJECTIVE SLEEP QUALITY			
MYOPIA	**VERY G00D**	**FAIRLY GOOD**	**FAIRLY BAD**	**VERY BAD**	**P value**
MILD	80	53	12	0	0.031
MODERATE	48	33	17	1	0.001
SEVERE	2	3	20	41	0.000
	SLEEP LATENCY				

MYOPIA	**15 MINUTES**	**16-30 MINUTES**	**31- 60 MINUTES**	**>60 MINUTES**	
MILD	89	47	9	0	
MODERATE	35	47	6	1	
SEVERE	0	3	19	44	
	SLEEP DURATION				
MYOPIA	**>7HOURS**	**6-7 HOURS**	**5-6 HOURS**	**< 5 HOURS**	
MILD	91	35	19	0	
MODERATE	43	39	7	0	
SEVERE	0	2	15	49	
	HABITUAL SLEEP EFFICACY				
MYOPIA	85%	84-75%	74-65%	<65%	
MILD	91	35	19	0	
MODERATE	43	39	7	0	
SEVERE	0	2	15	49	
	SLEEP DISTURBANCE				
MYOPIA	**NOT DURING LAST WEEK**	**LESS THAN ONCE A WEEK**	**ONCE OR TWICE A WEEK**	**THREE OR MORE TIMES A WEEK**	
MILD	88	49	8	0	
MODERATE	45	34	9	1	
SEVERE	0	2	21	43	
	USE OF SLEEP MEDICATION				
MYOPIA	**NOT DURING THE LAST MONTH**	**LESS THAN ONCE A WEEK**	**ONCE OR TWICE A WEEK**	**THREE OR MORE TIMES A WEEK**	

MILD	140	5	0	0	
MODERATE	81	8	0	0	
SEVERE	3	23	30	10	

HOSPITAL ANXIETY AND DEPRESSION SCALE

(ANXIETY SUBSCALE)

MYOPIA	7 OR LESS (NON-CASES)	8-10 (DOUBTFULL CASES)	11-21(DEFINITE CASES)	**P value**
MILD	99	46	0	0.00
MODERATE	63	26	0	
SEVERE	0	16	50	
		(DEPRESSION SUBSCALE)		
MYOPIA	**15 MINUTES**	**16-30 MINUTES**	**31- 60 MINUTES**	
MILD	98	47	0	
MODERATE	61	28	0	
SEVERE	0	17	49	

Discussion

The present study results indicated that severe degree of myopes constitute very bad sleep quality. Severe degree of myopes comprises above 6D refractive error.41 patients of sever myopes constitute very bad scale of sleep quality index .If such sleep habits continued for several years it affect the systemic and ocular health because sleep duration is precisely related to health and growth in adolescence[23]. Furthermore, it has been found that myopia and sleeping disorder is frequently present in children, thus recommended a appropriate education at home and school, as it is regulating the level of environmental light population[24]. Circadian timing and school timing tremendously associated with present analysis in which 10-19years children were studied and typical period of the lifespan is prominent sleep phase delay[25].

This is supported by animal experimental study spontaneously myopia induce in chicks by keeping them awake in light environment of 50-lux. The authors postulated that in high energy level via ipRGCs signaling has high dopamine activity could provide activation of retinal dopaminergic pathway that's leads to axial elongation.Previous studies and present study results speculated that long-lasting near-sightedness, restricted visual field [26] and hyperopia [27] could induced stress in visual recognition that's leads to mood disorder since depression precisely associated with sleep disorder. Myopia is a condition that occurs when a person has As a result, children may be affected by this distress and incapacity both during the day and at night, perhaps leading

to sleep disturbances. intrinsically photosensitive retinal ganglion cell (ipRGC) is a type of retinal ganglion cell that is intrinsically photosensitive to light.

Conclusions

Sleep quality in children was found to be linked to myopic error, with those with high myopia is by far the most affected. The current findings suggested that myopia could have an impact on children's psychological profiles, which are influenced by their sleeping patterns, and lead to despression and anxiety.The finding that late sleepers are more prone to myopia beginning and progression shows a complicated link between circadian rhythm, indoor environment, regular indoor activities, and myopia development and progression. These findings may provide fresh insights into future myopia aetiology investigations and aid in the development of myopia prevention measures.

Limitation

Sample was adapted and derived from single institute, where subjects shared the same ethnic and cultural background. This could make the current study's findings less applicable to other populations.Current study duration was short. The study design was cross-sectional study that was snap-shot. Current study only focus on myopia, must considered other type of refractive errors as well .

Recommendations

To evaluate the prevalance and strong association longitudinal study must conducted. As a result, more research concentrating on samples from other regions, a broader time range, and more diversity are all desirable to see if these findings are generalizable. Longitudinal study will fresh insights into future myopia aetiology investigations and help to prevent the progression of myopia. Furthermore, refractive error mustdetermine by cycloplegic refraction that will increasing the reliability of refractive error.

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