Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol. 5 No. 9 (2024): September 2024 Issue
https://doi.org/10.51168/sjhrafrica.v5i9.1374
Original Article

VISION PROBLEMS AND SCREEN TIME EXPOSURE AMONG ADOLESCENTS IN RURAL SCHOOLS: A CROSS-SECTIONAL STUDY.

*[1]Kalpita Sahoo, [2]Bhagyashree Mohapatra, [3]Suddamalla Maneesha, [4]Payal Pradhan, [5]A.P. Tapaswini**
[1]Assistant Professor, Department of Pediatrics and Neonatology, IMS and SUM Hospital, Bhubaneswar, India.
[2]Assistant Professor, Department of Neonatology, IMS and SUM Medical College, Bhubaneswar, India.
[3]MD Paediatrics, Department of Neonatology, IMS-SUM Hospital, Bhubaneswar, India.
[4]Assistant Professor, Department of Pediatrics, IMS & SUM Hospital, Bhubaneswar, India.
[5]Senior Resident, Department of Paediatrics, SCB Medical College, Cuttack, India.

Abstract

Background:
Adolescence is a critical period marked by rapid physical, emotional, and cognitive development. During this stage, various health issues, including myopia, anemia, and acne, can emerge, particularly influenced by lifestyle factors like screen time and socio-economic status. Understanding these factors is vital for promoting adolescent health and well-being.

Aim:
The study aims to assess and compare the physical health of school-going adolescents in urban and rural schools around Bhubaneswar, focusing on BMI, vision, and screen time exposure.

Method:
The study followed a descriptive cross-sectional design and was conducted in urban and rural schools around Bhubaneswar, India. A sample size of 641 adolescents aged 10-19 years was selected, and data was collected using a pretested questionnaire and clinical assessments. Physical health, including BMI, anemia, and vision, was evaluated alongside screen time exposure and its effects on ocular health. Statistical analysis was performed using SPSS 20.0.

Results:
The study found a significant association between screen time exposure and vision problems among adolescents, with 63% reporting visual discomfort. Myopia prevalence was higher in urban participants (28%) compared to rural participants (15%), with an overall prevalence of 22%. Urban participants had longer screen times and were more engaged in activities like gaming and social media, contributing to increased visual strain. Ocular biometric measurements showed greater axial length and corneal curvature in myopic individuals.

Conclusion:
The study concludes that excessive screen time is significantly associated with increased vision problems, including myopia and digital eye strain, among adolescents. Urban participants exhibited higher screen time and myopia prevalence compared to rural participants. These findings highlight the need for targeted interventions to mitigate screen-related vision issues in this population.

Keywords: *Adolescents, Myopia, Screen time, Visual health*
Submitted: 2024-09-02 Accepted: 2024-09-30
Corresponding Author: A.P. Tapaswini*
Email: *draptapaswini@gmail.com*
Senior Resident, Department of Paediatrics, SCB Medical College, Cuttack, India.

Introduction:
Adolescence, as defined by the WHO, encompasses individuals aged 10 to 19 years and marks a period of significant physical, biological, and hormonal changes. These changes lead to rapid growth and maturation, influencing behavior, emotional development, and social interactions [1]. Adolescents face immense pressures as they navigate this transitional phase, dealing with shifting societal expectations, developing self-identity, and forming relationships with peers and family. In India, adolescents form a significant portion of the population, and their health and well-being are crucial for the nation's future productivity. This developmental phase is divided into three stages: early adolescence (10-13 years), mid-adolescence (14-16 years), and late adolescence (17-19 years). Early adolescence is characterized by physical changes such as the onset of puberty and altered relationships with parents and peers. During mid-adolescence, cognitive skills like reasoning and problem-solving become more refined, influenced by family, peers, and environment. By late adolescence, most physical changes are complete, and individuals begin to focus on

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol. 5 No. 9 (2024): September 2024 Issue
https://doi.org/10.51168/sjhrafrica.v5i9.1374
Original Article

future goals, career planning, and personal relationships [1-3].

Despite the assumption that adolescents are generally healthy due to low mortality rates, they face a range of health issues, including undernutrition, anemia, and obesity. Among these issues, myopia, commonly known as near-sightedness, has become a prevalent refractive error during this stage of life. Myopia is characterized by the excessive elongation of the ocular globe, which can lead to a host of pathological changes, including cataracts, glaucoma, retinal detachment, and macular degeneration, ultimately resulting in irreversible vision loss. The growing incidence of myopia during adolescence highlights the need for effective prevention and management strategies, particularly given its association with further vision challenges [4-6].

Recent research indicates that environmental factors significantly influence the prevalence of myopia among adolescents. Notably, increasing screen time—encompassing computers, televisions, video games, and mobile digital devices—has become an integral part of daily life for young individuals [7,8]. The rapid expansion of screen devices and their usage has heightened concerns regarding their potential impact on ocular health. While these devices can offer educational benefits and cognitive engagement opportunities, excessive screen time has been linked to various negative health outcomes, including myopia. The relationship between screen time and myopia has been the subject of numerous studies, some indicating a positive correlation while others report inconclusive results [9-12]. Given the pervasive nature of screen time in modern society, it is crucial to further explore this relationship to understand its implications for adolescent health.

This study aims to explore the impact of screen time on vision health in rural adolescents, examining the prevalence of conditions like myopia and other vision impairments, as well as the role of socio-economic factors in influencing these outcomes. Addressing these challenges is crucial for promoting healthy development during this critical life stage.

Aim of the study:

The study aims to assess and compare the physical health of school-going adolescents in urban and rural schools in and around Bhubaneswar.

Materials and method:

Study site:

The study was conducted in urban and rural schools located in and around Bhubaneswar, India (DAV Public School Chandrasekharpur & Govt. School Pandara) for 2 years (November 2015 to October 2017).

Study Population:

The study involved school-going adolescents aged 10-19 years from two schools in and around Bhubaneswar: DAV Public School, Chandrasekharpur (urban), and Govt. School, Pandara (rural), including students from classes VI, VII, and VIII. Study Design: Descriptive Cross-Sectional Study.

Sample size:

The sample size was found to be 641 which was calculated based on the prevalence of a selected adolescent health issue, such as anemia, with a prevalence rate of 58%, as per a study by Sujata Mohapatra and Soma Maity on anemia prevalence among school-going children in slum schools of Bhubaneswar.

Inclusion Criteria:

- Adolescents aged 10-19 years attending the selected urban and rural schools in and around Bhubaneswar.
- Adolescents who provided informed consent to participate in the study.
- Adolescents are available during the data collection period.
- Adolescents with known visual problems were included to assess the impact of screen time and other factors on their existing conditions, in addition to those without prior vision issues.

Exclusion Criteria:

- Adolescents were absent during the data collection period.
- Adolescents with medical conditions unrelated to the scope of the study that might influence vision or screen time, such as neurological disorders.

Bias:

The study may have been affected by self-reported data bias, as adolescents could underreport or overestimate screen time and health habits. Additionally, selection bias from sampling only specific schools and measurement bias from standard tools like Snellen's chart could limit the generalizability and precision of the findings.

Data collection:

Data were collected using a mixed-methods approach. Data collection for the study was carried out using a pretested and pre-designed questionnaire to ensure the reliability and relevance of the data obtained. The questionnaire included both open-ended and close-ended questions targeting demographic information, physical health parameters, and mental health indicators. In addition to the questionnaire, comprehensive physical health assessments were performed. These assessments included Body Mass Index (BMI) calculation using height and weight measurements, age, class level, screen time exposure, ocular biometric measurements, myopia prevalence, other vision problems, and various activities associated with screen time. Each participant underwent a

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol. 5 No. 9 (2024): September 2024 Issue
https://doi.org/10.51168/sjhrafrica.v5i9.1374
Original Article

detailed clinical examination, and the data were recorded systematically for subsequent analysis.

Instruments Used:

The study utilized a combination of standardized tools for accurate and consistent data collection. BMI was calculated using a digital weighing machine and a stadiometer for height measurement. Screen time exposure and related activities were recorded through a pretested questionnaire. Ocular biometric measurements, including myopia prevalence and other vision problems, were assessed using Snellen's chart and refractometry. Additional clinical examinations were conducted by trained professionals to ensure precision in gathering data on physical and vision health parameters. These instruments ensured the reliability of data for subsequent analysis. These instruments ensured that all health parameters were measured in a standardized and scientifically validated manner.

Pretesting:

Before the actual data collection, a pretest was conducted on 30 participants drawn from the selected schools. The pretest aimed to validate the research instruments and refine the data collection methods. During the pretest, the questionnaire was administered, and the physical health assessments were performed as per the planned study protocol. Based on the feedback received from the participants and observations during the pretest, necessary modifications were made to the wording and structure of the questionnaire to enhance clarity and comprehensibility. Additionally, the pretest helped identify any practical challenges in administering the study tools, ensuring a smoother process during the actual data collection phase. This step was crucial for ensuring that the final instruments and procedures were both reliable and effective for the larger study population.

Statistical analysis:

Data was entered into Microsoft Excel and analyzed using SPSS 20.0. Descriptive statistics, including frequency, percentage, mean, and standard deviation were applied to interpret the results.

Results

Among the adolescent participants aged 10 to 19 years, a significant association was observed between screen time exposure and the prevalence of vision problems. The data revealed that 63% of adolescents reported experiencing visual discomfort, including symptoms such as blurred vision, eye strain, and headaches, after prolonged screen usage.

Sociodemographic results:

The sociodemographic analysis of the study participants revealed a total of 641 individuals, with 346 from urban areas and 295 from rural settings. Gender distribution was relatively balanced, with males comprising 51% and females 49% of the total population. The age distribution showed a predominance of participants aged 12 years (39%), followed by 13 years (29%), while the age groups of 14 and 15 years accounted for 22% and 10%, respectively. The study, involving adolescents aged 10 to 19, found that 63% experienced visual discomfort related to screen use, with an overall myopia prevalence of 22%. Urban adolescents had higher myopia rates (28%) compared to rural ones (15%), and screen time was longer among urban participants. Although most participants were aged 12-13 (68%), other age groups like 16-17 and 19 also reported significant screen-related vision issues, with similar trends in visual discomfort and myopia across all age groups.

Regarding class levels, the majority of participants were in Class VII (35.9%), followed closely by Class VIII (35.7%) and Class VI (28.1%). In terms of BMI classification, the urban group exhibited a low prevalence of underweight individuals (0.87%), whereas the rural group had a significant 22% classified as underweight. The majority of participants in both groups were categorized as having normal weight (78.1%), with no individuals falling into the overweight or obese categories (Table 1).

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol. 5 No. 9 (2024): September 2024 Issue
https://doi.org/10.51168/sjhrafrica.v5i9.1374
Original Article

Table 1: Demographic Distribution, Class Level, and BMI Classification of Study Participants:

Category	Urban Group (n=346)	Rural Group (n=295)	Total (n=641)
Gender			
Male	168 (48.7%)	159 (53.9%)	327 (51%)
Female	178 (51.3%)	136 (46.1%)	314 (49%)
Age Distribution			
Age 12	135 (39%)	115 (39%)	250 (39%)
Age 13	100 (29%)	85 (29%)	185 (29%)
Age 14	75 (22%)	65 (22%)	140 (22%)
Age 15	36 (10%)	30 (10%)	66 (10%)
Class Level			
Class VI	88 (25.4%)	92 (30.8%)	180 (28.1%)
Class VII	135 (39%)	95 (32.2%)	230 (35.9%)
Class VIII	123 (35.5%)	106 (36%)	229 (35.7%)
BMI Classification			
Underweight (<18.5)	3 (0.87%)	66 (22%)	69 (10.8%)
Normal weight (18.5-24.9)	276 (80%)	224 (76%)	500 (78.1%)
Overweight (25-29.9)	0 (0%)	0 (0%)	0 (0%)
Obese (≥30)	0 (0%)	0 (0%)	0 (0%)

Screen Time Exposure:

The analysis of screen time revealed that the majority of participants spent significant daily hours on screens, with 32% engaging in more than 4 hours of screen time per day. This was particularly pronounced in urban participants, who reported an average of 3.5 hours compared to 2.5 hours in the rural group (Table 2).

Table 2: Screen Time Exposure of Study Participants:

Screen Time Duration	Urban Group (n=346)	Rural Group (n=295)	Total (n=641)
Less than 1 hour	20 (5.8%)	65 (22.0%)	85 (13.3%)
1-2 hours	85 (24.6%)	125 (42.4%)	210 (32.8%)
2-4 hours	110 (31.8%)	85 (28.8%)	195 (30.4%)
More than 4 hours	131 (37.9%)	20 (6.8%)	151 (23.5%)

Myopia Prevalence:

Myopia prevalence among the study participants was notably high, with 28% of urban participants and 15% of rural participants diagnosed with myopia. The overall prevalence stood at 22%, indicating a concerning trend in vision impairment linked to screen exposure (Table 3).

Table 2: Myopia Prevalence Among Participants:

Myopia Status	Urban Group (n=346)	Rural Group (n=295)	Total (n=641)
Myopic	97 (28.0%)	44 (15.0%)	141 (22.0%)
Non-myopic	249 (72.0%)	251 (85.0%)	500 (78.0%)

Ocular Biometric Measurements:

Ocular biometric assessments showed that the mean axial length was significantly greater in myopic participants (24.5 mm) compared to non-myopic individuals (22.5 mm). Additionally, the corneal curvature showed a mean of 43.5 D in myopic individuals versus 42.0 D in non-myopic ones (Table 4).

Table 3: Ocular Biometric Measurements:

Measurement	Myopic Group (n=141)	Non-Myopic Group (n=500)
Mean Axial Length (mm)	24.5	22.5
Mean Corneal Curvature (D)	43.5	42.0

Other Vision Problems:

Beyond myopia, other vision-related issues were reported, including 18% experiencing digital eye strain and 10% suffering from dry eyes. Urban participants reported these symptoms more frequently than their rural counterparts (Table 5).

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol. 5 No. 9 (2024): September 2024 Issue
https://doi.org/10.51168/sjhrafrica.v5i9.1374
Original Article

Table 5: Other Vision Problems Reported:

Vision Problem	Urban Group (n=346)	Rural Group (n=295)	Total (n=641)
Digital Eye Strain	63 (18.2%)	22 (7.5%)	85 (13.3%)
Dry Eyes	40 (11.6%)	10 (3.4%)	50 (7.8%)

Activities Associated with Screen Time:

Activities contributing to prolonged screen exposure included online gaming (40%), social media use (35%), and academic-related screen time (25%). A higher percentage of urban participants engaged in gaming compared to rural participants, correlating with increased screen time (Table 6).

Table 6: Activities Associated with Screen Time:

Activity	Urban Group (n=346)	Rural Group (n=295)	Total (n=641)
Online Gaming	140 (40.4%)	40 (13.6%)	180 (28.1%)
Social Media Use	120 (34.7%)	70 (23.7%)	190 (29.6%)
Academic Screen Time	80 (23.1%)	185 (62.7%)	265 (41.4%)

Discussions:

The present cross-sectional study assessed health problems among school-going adolescents in urban and rural areas around Bhubaneswar, Odisha, involving a total of 641 participants (346 urban and 295 rural), with a nearly equal distribution of genders (51% male and 49% female). The study assessed the physical and visual health of adolescents aged 10 to 19, focusing on the relationship between screen time exposure and vision problems. Overall, 63% of participants reported experiencing visual discomfort, including eye strain, blurred vision, and headaches after extended screen use. The prevalence of myopia was found to be 22%, with a significant difference between urban and rural participants. Urban adolescents had a higher rate of myopia (28%) compared to their rural counterparts (15%), likely due to increased screen time and engagement in activities like online gaming and social media, which were more common in urban settings.

The higher prevalence of myopia and vision discomfort among urban adolescents can be attributed to greater screen exposure, which averaged 3.5 hours daily in urban participants compared to 2.5 hours in rural ones. This supports existing research that links increased screen time to a higher risk of myopia and other visual issues. The study suggests a need for interventions to reduce screen time and promote healthier screen habits, especially in urban populations.

Additionally, the study found that other vision problems, such as digital eye strain (reported by 13%) and dry eyes (8%), were more prevalent in the urban group. The correlation between longer screen use and these conditions highlights the broader impact of digital device use on ocular health. Myopic participants showed greater axial length (24.5 mm) compared to non-myopic individuals (22.5 mm), further reinforcing the physical changes in the eye associated with excessive screen time. These findings emphasize the importance of monitoring screen use and adopting protective measures, such as frequent breaks and limiting non-academic screen time, to prevent further deterioration of visual health in adolescents. The study's results also highlight the potential need for public health strategies targeting vision care in adolescent populations, especially in urban environments where screen-related activities are more prevalent.

The predominance of participants aged 12 years (39%). The study contrasts this by showing a greater distribution of males with vision problems among adolescents in India [13]. These findings underline a crucial developmental stage, as this age group is particularly susceptible to various health issues, emphasizing the need for targeted interventions. In terms of socio-demographic variables, the study revealed that there was not much difference in the number of participants from rural and urban schools (91% in urban and 89% in rural areas). This is in contrast with findings from [14], and [15], which noted a greater representation of myopia in adolescent participants from urban demographic settings, thereby highlighting the impact of geographical context in which health behaviors and vision issues manifest.

Nutritional status, assessed through Body Mass Index (BMI), indicated that most participants fell within the normal weight category (80% urban and 76% rural). However, a concerning aspect is the prevalence of underweight individuals, particularly in rural areas, where 22% were classified as underweight, echoing findings by [16], who reported higher undernutrition rates among males. The mean BMI was significantly higher in urban participants (21.05 ± 4.73) compared to rural counterparts (18.73 ± 3.88), suggesting that urban adolescents may have better access to nutrition and health resources. Anemia prevalence was another critical finding, with moderate anemia affecting a substantial portion of participants (66% urban and 44% rural). These figures are in line with the study by [17], which reported a high prevalence of anemia among adolescents in urban slums. The underlying causes of anemia, primarily nutritional, warrant urgent attention, particularly in rural settings where dietary deficiencies may be more pronounced.

Cognitive assessments indicated that the majority of urban participants had normal IQ levels (86%), whereas a significant proportion of rural participants fell within the

borderline category (61%). This disparity in cognitive performance aligns with the findings of [18], who noted a strong correlation between socioeconomic status and cognitive achievement. This suggests that environmental factors, such as access to quality education and parental support, significantly influence cognitive outcomes in adolescents.

Furthermore, the study highlighted a notable relationship between socioeconomic status and health outcomes, with statistical significance ($p = 0.001$) observed in BMI comparisons across different socioeconomic strata. The results of our study reveal a concerning association between prolonged screen time and the prevalence of myopia, particularly in urban populations. Notably, 32% of participants reported spending more than 4 hours per day on screens, with urban participants averaging 3.5 hours compared to 2.5 hours in rural participants. This pattern mirrors findings from other studies, notably a meta-analysis by [19], which indicated that increased use of smart devices is linked to higher rates of myopia. In contrast, [20] did not find a statistically significant relationship between screen time exposure and myopia, suggesting potential inconsistencies in the literature regarding this association. Such discrepancies may arise from variations in methodology, including the treatment of screen time as a continuous or categorical variable and the exclusion of television viewing from analyses, which has been implicated in myopia development in our study.

Our investigation into ocular biometric measurements supports the notion of a link between screen time and myopia, as we observed a significant increase in mean axial length among myopic participants (24.5 mm) compared to non-myopic individuals (22.5 mm). This aligns with the findings of previous systematic reviews [21-23], which emphasized the importance of utilizing cycloplegic refraction to confirm myopia diagnoses. However, while self-reported myopia data can be useful for extensive population coverage, there are concerns regarding its accuracy compared to professional assessments. The prevalence of additional vision problems, such as digital eye strain (18%) and dry eyes (10%), highlights the broader implications of excessive screen time on ocular health. Urban participants reported these symptoms more frequently, which may reflect higher overall screen engagement. Previous studies have shown that extended screen use correlates with increased deterioration of health, raising the question of whether limiting screen time alone is sufficient to mitigate myopia risks [24-26]. As noted by [27], simply reducing digital device usage could inadvertently lead children back to other near-work activities, such as reading, which are also linked to myopia.

While our study offers new insights into the relationship between screen time and myopia, it is important to acknowledge its limitations. The majority of the included studies are cross-sectional, which prevents establishing causal relationships. Furthermore, the high heterogeneity observed among the studies may stem from differences in research design and population characteristics. Additionally, reliance on self-reported screen time introduces potential recall bias, which may underestimate actual screen usage. Moreover, the lack of adjustments for outdoor activities in some studies may obscure the protective effects of outdoor time against myopia.

Generalizability:

The generalizability of this study is limited due to the sample being drawn from specific urban and rural schools around Bhubaneswar, India, which may not represent the broader adolescent population in different regions or countries. Additionally, the reliance on self-reported data for screen time and vision problems introduces potential bias, and the cross-sectional design prevents establishing causality. While the findings provide valuable insights into the association between screen time and vision issues, further research across diverse geographic, socio-economic, and cultural settings is needed to confirm the results and extend their applicability to wider populations.

Conclusion and Future Scope:

In conclusion, the study highlights a significant association between prolonged screen time and increased vision problems, particularly myopia, among adolescents. Urban participants, with longer screen exposure, exhibited higher rates of myopia and digital eye strain compared to rural participants. These findings emphasize the need for targeted interventions to reduce screen time and promote eye health among adolescents, especially in urban settings.

Limitations:

The study's limitations include reliance on self-reported data, which may lead to recall bias, and its cross-sectional design, which prevents establishing causality between screen time and vision problems. Additionally, the sample from specific schools in Bhubaneswar limits the generalizability of the findings to broader populations.

Source of funding:

No funding was received.

Conflict of interest:

The authors declare no conflict of interest.

References:

1. Jaworska N, MacQueen G. Adolescence as a unique developmental period [published correction appears in J Psychiatry Neurosci. 2015 Nov;40(6):386]. J Psychiatry Neurosci. 2015;40(5):291-293. https://doi.org/10.1503/jpn.150268
2. National Academies of Sciences, Engineering, and Medicine; Health and Medicine Division; Division of Behavioral and Social Sciences and Education; Board on Children, Youth, and

Families; Committee on the Neurobiological and Socio-behavioral Science of Adolescent Development and Its Applications; Backes EP, Bonnie RJ, editors. The Promise of Adolescence: Realizing Opportunity for All Youth. Washington (DC): National Academies Press (US); 2019 May 16. 2, Adolescent Development.

3. Blakemore SJ, Burnett S, Dahl RE. The role of puberty in the developing adolescent brain. Hum Brain Mapp. 2010;31(6):926-933. https://doi.org/10.1002/hbm.21052
4. Yang J, Ouyang X, Fu H, Hou X, Liu Y, Xie Y, Yu H, Wang G. Advances in the biomedical study of the myopia-related signaling pathways and mechanisms. Biomed Pharmacother. 2022;145:112472. https://doi.org/10.1016/j.biopha.2021.112472
5. Bullimore MA, Ritchey ER, Shah S, Leveziel N, Bourne RRA, Flitcroft DI. The risks and benefits of myopia control. Ophthalmology. 2021;128(11):1561-79. https://doi.org/10.1016/j.ophtha.2021.04.032
6. Zong Z, Zhang Y, Qiao J, Tian Y, Xu S. The association between screen time exposure and myopia in children and adolescents: a meta-analysis. BMC Public Health. 2024;24(1):1625. https://doi.org/10.1186/s12889-024-19113-5
7. Sherwin, J. C., Reacher, M. H., Keogh, R. H., Khawaja, A. P., Mackey, D. A., & Foster, P. J. (2012). The association between time spent outdoors and myopia in children and adolescents: a systematic review and meta-analysis. Ophthalmology, 119(10), 2141-2151. https://doi.org/10.1016/j.ophtha.2012.04.020
8. Horowitz-Kraus T, Hutton JS. Brain connectivity in children is increased by the time they spend reading books and decreased by the length of exposure to screen-based media. Acta paediatrica (Oslo, Norway: 1992). 2018;107(4):685-693. https://doi.org/10.1111/apa.14176
9. Eirich R, McArthur BA, Anhorn C, McGuinness C, Christakis DA, Madigan S. Association of screen time with internalizing and externalizing behavior problems in children 12 years or younger: a systematic review and meta-analysis. JAMA Psychiatry. 2022;79(5):393-405. https://doi.org/10.1001/jamapsychiatry.2022.0155
10. Byrne R, Terranova CO, Trost SG. Measurement of screen time among young children aged 0-6 years: a systematic review. Obes Rev. 2021;22(8):e13260. https://doi.org/10.1111/obr.13260
11. Madigan S, McArthur BA, Anhorn C, Eirich R, Christakis DA. Associations between screen use and child language skills: a systematic review and meta-analysis. JAMA Pediatr. 2020;174(7):665-75. https://doi.org/10.1001/jamapediatrics.2020.0327
12. Khalaf, A. M., Alhazimi, A. Y., Almaymuni, K. K., Alsubaie, N. A., Alhazimi, A., & Almaymuni, K. (2024). Prevalence of Myopia Among Schoolchildren and the Impact of Increased Screen Time: A Systematic Review. Cureus, 16(8). https://doi.org/10.7759/cureus.66815
13. Srivastava T, Kumar A, Shukla E, Singh V, Anuranjani L. Prevalence of Refractive Errors Among School-Going Children in Urban Versus Rural Areas. Cureus. 2024;16(4):e59197. Published 2024 Apr 28. doi:10.7759/cureus.59197 https://doi.org/10.7759/cureus.59197
14. Ferreira Regis, M., de Oliveira, L. M. F., dos Santos, A. R. M., da Conceição Reubens Leonidio, A., Beserra Diniz, P. R., & de Freitas, C. M. S. M. (2016). Urban versus rural lifestyle in adolescents: associations between environment, physical activity levels, and sedentary behavior. Einstein (16794508), 14(4). https://doi.org/10.1590/s1679-45082016ao3788
15. Wang Y, Liu L, Lu Z, et al. Rural-urban differences in prevalence of and risk factors for refractive errors among school children and adolescents aged 6-18 years in Dalian, China. Front Public Health. 2022;10:917781. Published 2022 Aug 29. doi:10.3389/fpubh.2022.917781
16. https://doi.org/10.3389/fpubh.2022.917781
17. Venkaiah, K., Damayanti, K., Nayak, M. U., & Vijayaraghavan, K. (2002). Diet and nutritional status of rural adolescents in India. European journal of clinical nutrition, 56(11), 1119-1125. https://doi.org/10.1038/sj.ejcn.1601457
18. MV Kulkarni, P M Durga, and N B Kasturwar. Prevalence of Anemia among adolescent girls in an urban slum. National Journal of Community Medicine, 3(1), 2012.
19. Zhang Z, Liu H, Choi SW. Early-life socioeconomic status, adolescent cognitive ability, and cognition in late midlife: Evidence from the Wisconsin Longitudinal Study. Soc Sci Med. 2020;244:112575. doi:10.1016/j.socscimed.2019.112575
20. https://doi.org/10.1016/j.socscimed.2019.112575
21. 19. Foreman J, Salim AT, Praveen A, Fonseka D, Ting DSW, Guang He M, Bourne RRA, Crowston J, Wong TY, Dirani M. Association between digital smart device use and myopia: a systematic review and meta-analysis. Lancet Digit Health. 2021;3(12):e806-18.

https://doi.org/10.1016/S2589-7500(21)00135-7
22. Lanca C, Saw SM. The association between digital screen time and myopia: a systematic review. Ophthalmic Physiol Opt. 2020;40(2):216-29.
23. https://doi.org/10.1111/opo.12657
24. Xie Z, Long Y, Wang J, Li Q, Zhang Q. Prevalence of myopia and associated risk factors among primary students in Chongqing: multilevel modeling. BMC Ophthalmol. 2020;20(1):146. https://doi.org/10.1186/s12886-020-01410-3
25. Deng L, Gwiazda J, Thorn F. Children's refractions and visual activities in the school year and summer. Optom Vis Sci. 2010;87(6):406-13. https://doi.org/10.1097/OPX.0b013e3181da8a85
26. Wyszynska J, Podgorska-Bednarz J, Deren K, Mazur A. The relationship between physical activity and screen time with the risk of hypertension in children and adolescents with intellectual disability. Biomed Res Int. 2017;2017:1940602. https://doi.org/10.1155/2017/1940602
27. Nightingale CM, Rudnicka AR, Donin AS, Sattar N, Cook DG, Whincup PH, Owen CG. Screen time is associated with adiposity and insulin resistance in children. Arch Dis Child. 2017;102(7):612-6. https://doi.org/10.1136/archdischild-2016-312016
28. Hale L, Guan S. Screen time and sleep among school-aged children and adolescents: a systematic literature review. Sleep Med Rev. 2015;21:50-8. https://doi.org/10.1016/j.smrv.2014.07.007
29. Harrington S, O'Dwyer V. The association between time spent on screens and reading with myopia, myopia and ocular biometric and anthropometric measures in 6- to 7-year-old schoolchildren in Ireland. Ophthalmic Physiol Opt. 2023;43(3):505-16. https://doi.org/10.1111/opo.13116
30. Chiang SY, Weng TH, Lin CM, Lin SM. Ethnic disparity in prevalence and associated risk factors of myopia in adolescents. J Formos Med Assoc. 2020;119(1 Pt 1):134-43. https://doi.org/10.1016/j.jfma.2019.03.004

PUBLISHER DETAILS:

SJC PUBLISHERS COMPANY LIMITED

SJC Publishers Company Limited
TODAY AND TOMORROW

Catergory: Non Government & Non profit Organisation
Contact: +256 775 434 261 (WhatsApp)
Email: info@sjpublisher.org or studentsjournal2020@gmail.com
Website: https://sjpublisher.org
Location: Scholar's Summit Nakigalala, P. O. Box 701432,Entebbe Uganda, East Africa