Research of socioeconomic status and school-based health screening results of study with children after two years of COVID-19 pandemic

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ABSTRACT

Aim: Schools are the most effective environments for health screenings for children and adolescents. The aim of school health screenings is to contribute to the protection and maintenance of children's health status by early diagnosis and treatment of diseases. We aimed to reveal the health screening findings of children whose lifestyles changed during the pandemic period, and to compare according to socioeconomic status.

Material and Method: Students from three different schools which were grouped as low, middle and high socioeconomic status were included. Hearing test, visual acuity examination, orthopedic examination, blood pressure measurements, height, weight and anthropometric measurements were performed. Descriptive statistical methods were used in the evaluation of the data.

Results: 1322 students with parental consent were included in our study. 667 (50.5%) of the students were female, mean age was 11.4±1.1, and mean body mass index score was 19.6±4.0. When body mass index scores were evaluated, 202 (15.3%) students were overweight and 189 (14.3%) were obese. Visual acuity defect was found in 257 (19.4%) of the students and hearing loss in 309 (23.4%). As a result of orthopedic examination and blood pressure measurements, 67 (5.1%) scoliosis and 131 (9.9%) high blood pressure were determined. The rate of hypertension was found to be significantly higher in school students with high socioeconomic status compared to the others (p<0.001).

Conclusion: The health problems detected at a high rate in our study emphasize the importance and necessity of school health screening practices. We would like to emphasize the importance of health screenings especially for children and adolescent age groups and the need for studies with broad participation and screening of many parameters.

Keywords: Child health, health, schools, socioeconomic factors

INTRODUCTION

Schools are the most effective environments for health screenings for children and adolescents. The aim of school health screenings is to contribute to the protection and maintenance of children's health status by early diagnosis and treatment of diseases. Regular health screenings for students and school personnel are very effective practices in order to protect and maintain the physical, mental and social health of all school-age children (1). The scope of school health screenings, vision, hearing, anthropometric measurements, scoliosis, oral-dental health and blood pressure screenings are recommended basic health screenings. Many researchers have contributed to the literature by conducting school health screening studies and emphasized the importance of the subject (2,3).

Strategies for the protection and improvement of child and adolescent health are implemented in Turkey, as in other countries in the world. The main purpose of these practices is to enable individuals aged 6-19 to acquire healthy attitudes and behavior models, as well as to detect and treat diseases at an early stage. In this rapid growth process, early recognition of growth and development problems and existing diseases is very important for the success of treatment and to prevent permanent damages (4). Visual and hearing acuity examinations are frequently performed in health screenings. Because vision and hearing problems that are not detected in the early period can cause permanent sensory loss over time. Early diagnosis and treatment of vision and hearing disorders are critical to prevent lifelong vision

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and hearing impairments. However, visual and hearing impairments are closely related to children's academic success and quality of life (5).

Childhood obesity is one of the most important public health problems of our time. For this reason, another target in health screenings is to determine the body mass index of children and adolescents. Its prevalence continues to increase in our country as it is in the whole world. Obesity is the main cause of many diseases, especially cardiovascular diseases. On the other hand, it is known that overweight and obesity cause mental problems in adolescents, cause problems with their families and close circles, and academic failure (6). Orthopedic examinations are also carried out with the aim of investigating scoliosis in health screenings. Scoliosis can be recognized by a simple examination, the Adam's forward bend test. Early diagnosis and treatment of scoliosis, which is characterized by asymmetry in the vertebrae, is important in terms of preventing deformities that will develop over time and solving the problem with exercise without the need for a surgical procedure (7).

Due to the COVID-19 pandemic, which is the most influential health problem in recent years, changes have occurred in the lifestyles and daily routines of individuals in the society. In our country, education was continued online and schools were closed for a while in order to prevent transmission. In addition, the curfews also caused a decrease in the physical activities of children and adolescents, as in all age groups. However, priority was given to COVID-19 disease in health centers and routine health checks and elective procedures were postponed. During the pandemic period, routine health checks of school-age children could not be done.

The health of individuals in adolescence, where a rapid physiological and psychological development is experienced, can be affected by many variable conditions such as family, school, social relations, and socioeconomic conditions. It is known that a low socioeconomic environment can negatively affect the health status of children (8). The evaluation of the health status of students from different socioeconomic environments has been studied by different researchers before. In a study examining obesity in children aged 7-14 from different socioeconomic status in Turkey, it was stated that the prevalence of obesity was higher in students from middle and high socioeconomic status (9). In a recent study conducted in the Netherlands, it was emphasized that the children of families with low socioeconomic status had more frequent hospital admissions due to chronic diseases and growth retardation and therefore more health expenditures (10).

In this period when the devastating effects of the pandemic began to diminish and we are in the process of transitioning to normal life, we carried out school health screenings with the aim of conducting health examinations of children in secondary school and directing the detected health problems to treatment. In our study, we aimed to reveal the health findings of children whose lifestyles changed during the pandemic period, as in the whole population, and to compare them according to socioeconomic status.

MATERIAL AND METHOD

The study was carried out with the permission of Clinical Researches Ethics Committee of Tokat Gaziosmanpasa University School of Medicine (Date: 18.01.2022, Decision No: 21-KAEK-281). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Students studying in three different schools were invited to the study. The schools are designated as a rural public school, a public school in the city center, and a private school in the city center. The public school in the rural area was considered to have a low socioeconomic status (SES), the public school in the city center was considered to have a medium SES, and the private school in the city center was considered to have a high SES.

Hearing test, visual acuity examination, orthopedic examination, blood pressure measurements, height, weight and waist-hip circumference measurements were made to the students as part of the health screening. Body mass index percentile values were determined by evaluating the height and weight values measured in the examination according to age and gender. According to these percentile values, students; they were grouped as underweight, normal weight, overweight and obese and recorded in the data form (11). Senti Desktop type SID 100433 model hearing aid was used for the hearing test. Beforehand, the children were told how the test was administered, and then their earphones were put on. In four different frequencies, 500, 1000, 2000, 4000 Hertz, separately for both ears; It was tested with a sound of 40-30-20 dB. Students were seated so that they could not see the screen and were asked to press the button in their hand each time they heard a sound. Inability to hear sound of 30 dB and above at any of the four frequencies was accepted as a failing criterion (12). Snellen chart was used for visual examination. Visual acuity deficits of 0.8 and below were defined as visual acuity defect. Appropriate blood pressure monitors with pediatric cuffs were used for blood pressure measurements. After the results were recorded by us, percentile calculations were made according to age and gender, and a data form was created. Students whose systolic or diastolic

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blood pressure values were above the 95th percentile for age, gender, and height were considered to have hypertension (13). Height measurements were made with a tape measure hanging on the wall, without shoes, on a flat floor with the heels together, hips and shoulders against the wall. Care was taken to ensure that the line passing at eye-ear level was parallel to the ground. A digital scale sensitive to 100 grams was used for weight measurement and was checked before each measurement. Scoliosis examination was evaluated with the forward bending test. They were asked to bend forward 90 degrees from the waist without bending their knees and vertebral palpations were performed. After the results were recorded by us, percentile calculations were made according to age and gender, and a data form was created.

Descriptive statistical methods were used in the evaluation of the data. When comparing the means of quantitative variables between groups, the Significance of Difference between Two Means test and One-Way Analysis of Variance were used. Cross tables and chi-square tests were used to evaluate whether there was a relationship between qualitative variables. When p values were calculated less than 0.05, it was considered statistically significant. Ready-made statistical software was used in the calculations (IBM SPSS Statistics 19, SPSS inc., an IBM Co., Somers, NY).

RESULTS

A total of 1322 students with family consent for health screening practices were included in our study. Of the students, 667 (50.5%) were female and 655 (49.5%) were male. Their mean age was 11.4±1.1 years and their mean body mass index score was 19.6±4.0. When body mass index scores were evaluated, 122 (9.2%) students were underweight, 202 (15.3%) students were overweight, and 189 (14.3%) students were obese. In our study, quantitative variable data of students were compared according to gender. When the BMI percentile groups were evaluated, the obesity rate was 16.9% for male students and 11.7% for females. Obesity was observed more frequently in men than in women (p=0.017)

During the examinations, visual acuity defect was found in 257 (19.4%) of the students and hearing defect in 309 (23.4%) of the students. However, as a result of orthopedic examination and blood pressure measurements, 67 (5.1%) students had scoliosis and 131 (9.9%) students had high blood pressure. No statistically significant difference was found between the gender variable and the incidence of scoliosis (p=0.961), visual acuity defect (p=0.643), hearing impairment (p=0.887) and high blood pressure (p=0.277).

When the relationship between the quantitative variables and the SES of the schools was examined, a statistically significant difference was found between the waist-hip ratios of the students and the SES groups of the schools (p<0.001). No relationship was found between age, height, weight, BMI and SES groups (**Table 1**). In our study, in which the SES groups of the schools and the health problems detected in the examination findings were compared; hypertension detection rate was found to be significantly higher in students studying at a school with a high SES (p<0.001). Another finding is that a higher rate of scoliosis was detected in students studying at a school with a medium SES compared to the students in the other two schools (p<0.001). In addition, in the comparison of the incidence of hearing impairment, a statistically significantly higher rate of hearing impairment was found in the students in the low SES group than in the middle SES group (p=0.007). There was no statistical significance between the high SES group and the other groups in terms of hearing impairment (**Table 2**).

Table 1. Distribution of quantitative variables according to SES

Variables	Total	Socio-economic status (SES)			p
		Low SES	Middle SES	High SES	
		Mean±SD	Mean±SD	Mean±SD	
Age	11.45±1.07	11.34±0.86	11.5±1.15	11.48±1.11	0.080
Height	1.73±5.54	2.38±11.14	1.52±0.1	1.52±0.09	0.052
Weight	45.57±12.29	44.6±12.02	45.86±12.09	45.92±12.67	0.259
BMI	19.58±4.04	19.58±4.14	19.7±4.02	19.45±4.01	0.617
Hip-wrist ratio	0.82±0.07	0.85±0.09[a]	0.81±0.06[b]	0.83±0.08[c]	<0.001

One-way analysis of variance was used. (abc): Common letter as a line indicates statistical insignificance.

Table 2. Distribution of health problems identified by SES groups

Variables	Total n (%)	Socio-economic status (SES)			p
		Low SES	Middle SES	High SES	
		n (%)	n (%)	n (%)	
BMI percentile					0,206
Underweight	122 (9.2)	29 (8.9)	42 (8.1)	51 (10.6)	
Normal	809 (61.2)	212 (65)	307 (59.5)	290 (60.4)	
Overweight	202 (15.3)	43 (13.2)	94 (18.2)	65 (13.5)	
Obese	189 (14.3)	42 (12.9)	73 (14.1)	74 (15.4)	
Blood pressure percentile					<0.001
HT	131 (9.9)	26 (8)[a]	36 (7)[a]	69 (14.4)[b]	
Normal	1191 (90.1)	300 (92)[a]	480 (93)[a]	411 (85.6)[b]	
Scoliosis					<0.001
Positive	67 (5.1)	1 (0.3)[a]	61 (11.8)[b]	5 (1)[a]	
Negative	1255 (94.9)	325 (99.7)[a]	455 (88.2)[b]	475 (99)[a]	
Visual acuity defect					0.208
Positive	257 (19.4)	72 (22.1)	89 (17.2)	96 (20)	
Negative	1065 (80.6)	254 (77.9)	427 (82.8)	384 (80)	
Hearing loss					0.007
Positive	309 (23.4)	91 (27.9)[a]	98 (19)[b]	120 (25)[ab]	
Negative	1013 (76.6)	235 (72.1)[a]	418 (81)[b]	360 (75)[ab]	

Pearson chi-square test was used. (ab): A common letter as a line indicates statistical insignificance.

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In our study in which students' anthropometric measurements were made; When the waist-hip ratio was compared with other variables, it was observed that the waist-hip ratio was higher in male students (p<0.001). At the same time, there is a significant relationship between the waist-hip ratio and the classification of BMI percentiles. A higher waist-hip ratio was found in those classified as overweight and obese (p<0.001). Waist-hip ratios of students with scoliosis were found to be significantly lower than those without scoliosis (p=0.011). No significant difference was found between the waist-hip ratio and other variables (p>0.005). (**Table 3**)

Table 3. Comparison of quantitative variables according to BMI			
Variables		**BMI Mean±SD**	**p**
HT Percentile	HT	22.42±5.43	<0.001
	Normal	19.27±3.73	
Scoliosis	Positive	19.58±4.08	0.912
	Negative	19.53±3.38	
Visual acuity defect	Positive	19.47±4.05	0.049
	Negative	20.02±3.99	
Hearing loss	Positive	19.59±4.04	0.907
	Negative	19.56±4.06	
Significance test of the difference between two means or One-way analysis of variance was used. (abc): A common letter as a line indicates statistical insignificance.			

In our study, the BMI scores of the students and the findings related to the health problems detected were also compared. In the comparison, it was seen that the BMI scores of the students with HT were statistically significantly higher than the normotensive ones. (p<0.001). In addition, the BMI scores of the students with visual impairment were found to be higher than the others (p=0.049).

DISCUSSION

According to the Turkish Statistical Institute (TUIK) 2020 data, approximately 19.9% of Turkey's population consists of school-age children aged 5-17 (14). Children's academic success is closely related to school health. School health covers all the processes done to evaluate, improve and maintain the health status of students and staff at the school. Screenings in schools provide early detection and treatment of students' health problems. In our study, we evaluated the data of health screenings we conducted in 3 different secondary schools. It was observed that 14.3% of 1322 children who underwent health screening were obese and 9.9% had high blood pressure. 19.4% of them had visual acuity defect and 23.4% of them had hearing defect. In addition, scoliosis was found in 5.1% of them. A significant relationship was found between the SES of the schools where the children were educated and the presence of hypertension, hearing impairment and scoliosis.

Obesity in children is related psychological disorders, asthma, obstructive sleep apnea, orthopedic and cardiovascular problems, and metabolic syndrome (15). Due to high prevalence, obesity among children and adolescent is crucial public health problem globally. The German Children and Adolescents Health Survey (KIGGS) announced that up to 6.3% of children and adolescents were obese and up to 15% were overweight (16). Obesity in school-age children draws attention as an important public health problem due to its increasing incidence in Turkey also. Unhealthy diet and decreased physical activity are among the main reasons for increasing obesity (17). It is thought that the current COVID-19 pandemic process has increased the frequency of obesity for different reasons. When studies on the prevalence of obesity in school-age children in Turkey were evaluated, it was seen that the prevalence of obesity was 0.7% between 1990-1995, while it increased to 7.1% between 2011-2015 (18). Regarding current studies, Uyar et al.'s (19) study with primary school students in 2019 revealed that 12.4% were overweight and 15.8% were obese. In our study, it was shown that 15.3% of the students were overweight and 14.3% were obese. Compared to similar studies, the obesity rate in our study was higher. This can be explained by the rapid increase in obesity rates all over the world. In addition, the decrease in the rate of physical activity may have been caused by the transition to online education, curfews and home quarantines in the current COVID-19 pandemic. Possible negative effects of pandemic on nutrition of children were studied by various researchers. In a study conducted with 397 children and their parents in Greece during the early stages of the COVID-19 pandemic, it is reported that body weight increased in 35% of children/adolescents (20). Considering the relationship between gender and obesity in school-age children, it was reported that although the prevalence of obesity increased in both genders, the prevalence of obesity was higher in the male gender (3). In our study, no significant relationship was found between gender and obesity (p=0.223). Data on underweight children are also presented in related studies. In the study conducted by Çalışır et al. (21) in Aydın, it was stated that there was 2.8% of underweight children. In our study, the percentage of children who were evaluated as underweight according to percentile values was determined as 9.2%. The similarity of our results with the findings in similar studies shows that the treatment is as important as the detection of underweight children.

Childhood hypertension is thought to be a precursor to hypertension diagnosed in adulthood (22). In a study conducted to determine the prevalence of hypertension in school-age children in our country, the rates of

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prevalence were determined as 23.8% by Akdağ et al. (23). In our study, this rate was determined as 9.9%. In school-based blood pressure screening program study conducted with 22224 children in USA, it is found that prevalence of hypertension among children is 16.3 %. It is noteworthy that there are different prevalence of hypertension in different studies (24). It was thought that this situation may be caused by differences in the etiology of hypertension such as nutrition, sleep duration, obesity, and SES. Studies have found that as obesity increases, hypertension increases significantly (23,25) Similarly, in our study, the incidence of hypertension increases as BMI increases (p<0.001).

Visual defects, which are easy to detect and treat in school-age children, are one of the important health problems that affect school success. Therefore, it has an important place in school screenings. Common eye problems in school-age children are refractive errors, amblyopia, strabismus, and color blindness (26). Shrestha et al. (27) reported that the rate of visual acuity defect due to various reasons was 21.4 % in a study conducted with 2412 children in Nepal. Kalyoncu et al. (5) reported that visual acuity defect was 16.7% in school-age children in the examination performed with Snellen chart. In our scan, visual acuity deficits were found at a rate of 19.9%. This rate is consistent with the existing literature. In this case, it shows that the visual acuity defect detected in school age scans has not decreased over the years and reveals the importance of school scans.

Hearing loss has a very important place in speech and language development. Even mild hearing loss affects the social, mental and emotional development of the child. It can lead to learning difficulties and related academic failures. Early detection is very important in terms of preventing all these negativities. Various studies on the subject have been put forward by many researchers. In a study conducted with children aged 6-14 years in Kyrgyzstan, it was reported that 27.2% of the children had hearing impairment (28). Osei et al.'s (29) study of hearing screening for children aged 5-17 years in Ghana showed that 21% of participants failed the audiometric screening test. In our study, it was observed that 23.4% of the students failed the hearing test. Studies conducted in different countries have similarly reported a high rate of hearing loss among children and adolescents. These results point out the importance and necessity of hearing screenings.

Scoliosis is a vertebral column deformity that can lead to serious cardiopulmonary complications when diagnosed late. When the patient is diagnosed early, it can be treated with simple and inexpensive exercises without the need for surgical methods. Since the age

range of the risk group is 9-15, it is very important to be screened in school-age children (7). Scaturro et al.'s (30) study emphasis that school-based screening protocol had a very high specificity in early diagnosis of adolescent idiopathic scoliosis. In Italy, 2.01% of students were found to have scoliosis in school scoliosis screening for children aged 9-14 (31). In related studies, the rate of scoliosis detection in school scoliosis screenings was reported as 26.1% in Kosovo, 14.2% in Mexico, and 24.3% in Brazil (32-34). In a study conducted by Dığrak et al. (1) in Turkey with 1421 primary school students, the incidence of scoliosis was expressed as 5.1%. In our study, this rate was also stated. It was found to be 5.1%. The variations in prevalence between studies could be attributed to the different methods used to detect scoliosis. However, results of all studies indicate that routine scoliosis screening programmes are necessary.

In our study, when schools were classified according to their SES, there was no difference between genders, making comparison easier. No significant relationship was found between the SES of the schools and the classification of students according to their BMI percentiles (p=0.207). On the other hand, the rate of obesity was found to be 12.9% in a school with a low SES, 14.1% in a school with a medium SES, and 15.4% in a school with a high SES. However, this proportional increase is not statistically significant (p=0.206). In Ireland study conducted by Keane and colleagues (35), it was showed that an inverse relationship between SES and the prevalence of child overweight and obese. Patrick et al.'s (36) study conducted with 14842 children age 6–19 years that has found that lower family SES was associated with higher risk in childhood obesity and hypertension. Unlike the results of this study we found that the prevalence of hypertension was found to be higher in students from schools with high SES compared to those in schools with low and medium SES (p<0.001). In our comparisons made according to school SES groups, the frequency of HT and obesity seem to be incompatible with each other. High HT rate inconsistently with BMI rates in high SES group participants reminds that various factors may be effective in blood pressure control. Therefore, we would like to emphasize the importance of blood pressure measurements in all children, regardless of BMI. When the students with scoliosis were evaluated according to the SES of their schools, scoliosis was found less frequently in the students at the school with a medium SES (p<0.001). This result may be related to many factors such as the homework intensity of the students, the weight of the bags, and the carrying times of the bags. As far as we know, there is no other study investigating SES and scoliosis data.

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CONCLUSION

The importance of school health screenings, the effectiveness of which has been demonstrated by many researchers in the literature, remains up-to-date. In our study, similar to the studies conducted in previous years, high rates of health problems were detected. This result highlights the necessity of school health screening practices and their importance in maintaining and protecting children's health. We think that the need for these screenings has increased much more as routine health checks have been disrupted due to many restrictions and lifestyle changes that we have to experience during the COVID-19 pandemic process we are in. As a result, we would like to emphasize the importance of health screenings especially for children and adolescent age and SES groups, and the need for studies with broad participation and screening of many parameters.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Clinical Researches Ethics Committee of Tokat Gaziosmanpasa University School of Medicine (Date: 18.01.2022, Decision No: 21-KAEK-281).

Informed Consent: Parents of all participants signed the free and informed consent form because the participants were children

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The author has no conflicts of interest to declare.

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