Research Article

Screening of Visually Impaired Children for Health Problems

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SUMMARY

Purpose: Disability is a significant problem and is accepted globally as a health priority in childhood. Like nonvisually impaired children, visually impaired children also need to use health services during childhood. The purpose of this study was to determine the health problems of visually impaired children.

Methods: A descriptive design was used. The subjects were 74 children with visual impairment attending primary school (aged 5–14 years), who agreed to participate and whose parents gave permission. Data were collected via physical examination including questionnaires and a physical assessment form. The health screening included physical measurements for height, weight, blood pressure, dental health, hearing, and scoliosis.

Results: The mean age of children was 10.43 ± 2.9 years. When the health screening results of children were examined, it was found that 25.7% of the children were overweight or obese, 35.1% of them had dental problems, 27.0% had hearing problems, and 39.2% had scoliosis risk. Systolic and diastolic blood pressures were normal in 91.8% and 93.2% of the children, respectively.

Conclusions: These findings showed the important role of school health nurses in performing health screenings directed at visually impaired children who constitute a special group for school health services. Health screening for height, weight, dental health, hearing, and scoliosis is suggested for visually impaired children.

Introduction

Disability is accepted as a significant public health problem and is considered a priority among health services [1]. Visual disability considerably affects the productivity and life quality of individuals. There are 285 million people with visual disability; 90.0% of them live in developing countries, and 3.0% are children [2]. In Turkey, there are 38,355 children (9.3%) with visual disabilities in public and private schools [3]. In Turkey, the rate of disabled individuals benefiting from health services is 55.7%; this ratio is 59.0% for visually disabled children [1].

Impaired vision from birth or early childhood can have profound impact on an infant or child's development with adverse consequences for mental health, restricting participation in social, physical, educational, and, later, employment opportunities [4]. The majority of children with severe visual impairment (6/60 or worse) have additional sensory, motor, or learning impairments with or without chronic disease [5]. Due to visual impairment, difficulties become apparent in school performance and other functions such as ability to safely participate in sports. In addition, visual impairment can affect quality of life and the effects are often life-long [6].

Visual disability appears as a factor affecting school success, health perception, development of self-responsibilities regarding health, and accessing health services in children and adolescents [2,7,8]. For this reason, the problems of visually disabled people have to be considered during childhood, and health screening should be performed [9,10].

Disability is one of the most important and universal health priorities in childhood. Disabled individuals need to benefit more from health services; however, access is still limited due to insufficient health services intended for their disability, coexistence of other health problems, increased problems and insufficiencies in self-care, and difficulties in expressing health problems [1,2]. When compared to nonvisually impaired children, visually impaired ones have similar or higher risk for some of these health problems.

In the literature, there is no screening study that looks at the wide range of health problems affecting the visually impaired.
Previous screening studies were particularly relevant to specific fields such as dental health, obesity, scoliosis, and psychosocial development [7,11,12]. Screening programs are carried out with a team approach in school health services. Nurses perform an important role in administering these services [10,13,14]. When the health of disabled people is considered, one of the important responsibilities of nurses is to determine other health problems which are specific to particular age groups which may accompany disability [1]. For this reason, carrying out the health screening of visually impaired children, like nonvisually impaired ones, as a part of school health services becomes more of an issue. This present study will provide awareness in the evaluation of health of special groups such as disabled persons, take required precautions for health problems of visually impaired children at an earlier age, and guide nurses working in this field.

The aim of this study was to determine health problems through screening visually impaired school-aged children.

Methods

Study design

This study was a descriptive design for finding to health problems in visually impaired children.

Setting and sample

This study was performed in a primary school for the visually impaired (Visual impairment is a decreased ability to see to a degree that causes problems not fixable by usual mean. The term includes both partial sight and blindness [15]). In Turkey, a primary school includes children from kindergarten to grade eight (aged 5–14 years). All children attended primary school for the visually impaired from kindergarten to grade eight were included in the study (N = 99). Parents who stated that their children were receiving services from a special doctor for monitoring health problems refused to participate. So, the sample consisted of 74 children who, with parental approval, agreed to participate in the study.

Ethical consideration

This study was approved by the Ethical Committee of the Faculty of Medicine, Ankara University (decision no. 25–503), the review board of the Turkish Republic Ministry of Education and school management. Initially, a voluntary informed consent form were sent to the parents; children whose parents agreed to participate were selected. An informed consent form was read to the children participating in the study. In this way, verbal and written approval was obtained. The results of the screening were informed to parents and the parents of children who had problems were advised to consult a health center.

Instruments

Data were collected through a physical examination which included a questionnaire and physical assessment form. The questionnaire was composed of two sections: The first section included questions related to sociodemographic features of children such as age, gender, economic status, chronic diseases, and regular drug use. The second section included questions related to eye health, nutritional habits, dental health, hypertension, ear/hearing health, and signs related to scoliosis. Each section was composed of open and close-ended questions. The physical assessment form was prepared to record the results of the health screening conducted among children.

An informed consent form, and questionnaire including questions about family health status were sent to the parents of participating children. Student information related to academic success and nonattendance were obtained from teachers. Information that could not be obtained from children and their parents was acquired from either school health nurses or recordings.

Children were invited to the health office for screening procedures one by one at a time determined by their teachers. Screening was performed by one of the researchers. Before the present study, the researcher had training and practice about screening during nursing education.

The health screening of each student took approximately 25 minutes. The screening items included height and weight, blood pressure, dental health, hearing, and scoliosis measurements.

Height and weight

Children’s weight was measured by electronic scales (± 100 g sensitivity); height was measured using a portable stadiometer. During the measurements, children removed their shoes and outer clothing. After their weight was measured, the resulting value was rounded up to the nearest 0.1 kg. During height measurements, children stood with their backs to the stadiometer, removed their shoes, and stood upright with their heels touching. Similarly, the resulting value was rounded up to the nearest 0.1 cm.

After the measurements, children’s body mass index was calculated. Children’s body mass index with respect to age and gender was evaluated with the percentile curves developed by Neyzi and colleagues for Turkish children [16]. Those who were between the 3rd and 97th percentile curve were evaluated as healthy.

Blood pressure

The children were told to rest for 15 minutes before which their blood pressure was measured by a sphygmonanometer placed on the right arm. Two measurements were made using the same method and same researcher. After 15 minutes from the first measurement, a second measurement was performed. The measurements were evaluated according to age and gender. With regard to blood pressure, children found to be either in the low or high categories were considered at risk. The low blood pressure is below 50th percentile (for systolic 100 mmHg, diastolic 60 mmHg); the high one is above 95th percentile (for systolic 132 mmHg, diastolic 92 mmHg). Below 90th percentile is normal, 90th–95th percentile is prehypertension, above 95th percentile is hypertension [9,17,18].

Dental screening

For evaluating dental [19] health, the decayed, missing, and filled teeth (dmft/DMFT) was used and then evaluated the primary teeth (dmft) and permanent teeth (DMFT) was used. The World Health Organization suggests that individuals younger than 30 years old should have a dmft score of 3 or less. Therefore, children with less than 3 were considered as having “no dental health problem”, whereas a score of 3 or higher was determined as having “dental health problem [19]”.

Hearing screening

The hearing screening involved the human voice and a whispering test. During the test, breath was exhaled 30–45 cm away
from the children (for volume standardization) and four random numbers were whispered at 1-second intervals. This test was performed with the right ear closed, and then with the left closed. Children who did not hear two or more numbers were deemed as unsuccessful and “with hearing defect”.

**Scoliosis screening**

Adam’s forward bending test is the best test for early diagnosis of scoliosis, a disease which causes body deformation and severe cardiopulmonary complications when left untreated. Children were asked to bend forward up to a 90-degree hip flexion with feet together, knees fully extended, arms dangling, and palms facing each other. This screening could detect rotational protrusion or asymmetry due to deformity of ribs caused by scoliotic spine [20].

**Data analysis**

Data were analyzed using the statistical package SPSS version 14.0 (SPSS Inc., Chicago, IL, USA). Continuous variables (such as height, weight) were presented as means and standard deviations, whereas categorical variables (such as socio demographic features and health screening items) as frequencies and percentages. Comparison of children’s descriptive features and findings from the screenings were evaluated with Chi-Square or Fisher’s exact test. A p value of less than 0.05 was considered to indicate statistical significance.

**Results**

The mean age of the children was 10.43 ± 2.88 years; 48.6% of them were male, 29.7% of them used regularly prescribed drugs, and 51.4% had at least one operation (most commonly eye problems). Visual disability was congenital in 74.3% of children and 77.0% of them were partially visually impaired. Except for visual disability, 78.4% had no other disability, and 64.9% did not have any disease. Chronic diseases such as diabetes, hypertension, and heart disease were present in 74.3% of the children’s parents; eye diseases (70.9%) were the most common among these diseases (Table 1).

Overall, 81.8% of children had three meals per day, and 79.7% of them typically had breakfast; however, 58.1% regularly skipped meals, with lunch (29.7%) being the most commonly skipped meal. As a result, 66.2% of children consumed fruits and vegetables 4–5 times per week.

In the evaluation of height and weight according to age and gender, 90.5% and 83.8% of children were “normal” (between 3rd and 97th percentile). The frequency of obesity determined according to body mass index (95th percentile and more) was 17.6%, whereas 9.5% of children were underweight (less than the 5th percentile). Systolic and diastolic blood pressures were normal in 91.8% and 93.2% of the children, respectively. In dental health evaluation, dmft/DMFT index of children was 3.2. Dental problems were found in 35.1% of children, hearing problems were found in 27.0% of the children, and risk of scoliosis was present in 39.2% of the children (16.2% had major curvature, and 23.0% had partial curvature) (Table 2).

Regular teeth brushing of 2–3 times per day was present in 25.7% of the children, whereas 36.5% of the children had toothaches, and 29.8% of them had gingival bleeding. At least one extracted permanent tooth was present in 41.9% of the children, 39.2% had three or more dental cavities, and 17.6% had dental fillings (Table 3).

Gender, age, and etiology of disability did not affect hearing problems (p > 0.050) (Table 4). Risk of scoliosis was found to be higher in male children aged 12 years old and above and in children with congenital visual disability. However, the difference between these groups was not statistically significant (p > .050).

**Discussion**

At school age, previously undetected health problems of disabled children and adolescents can be determined by comprehensive health screening. However, health screening for disabled children performed in Turkey is generally directed at only one health problem [7,21]. The healthcare system in Turkey may be lacking healthcare screenings for special groups, such as individuals with disabilities. For this reason, multidimensional health screenings should be performed for disabled children.

Measuring height and weight is very important in the evaluation of school-aged children’s growth. This study emphasizes that most of the children were in the normal range of height and weight according to age and gender, but ratio of height and weight problems (< 3rd percentile and > 97th percentile) was not low. This finding may be explained not only by the genetic features of visually impaired children, but also by some inappropriate behaviors in terms of nutritional habits. Lunch was the most commonly skipped meal showing the importance of nutritional services at school. In the literature, there is no other study aimed at evaluating weight and height states of visually impaired children. In comparison with the findings of previous studies performed on nonvisually impaired children, the weight and height states of visually impaired children seemed similar to nonvisually impaired children [8,13].

The prevalence of being underweight or obese among nonvisually impaired children ranged between 0.5%–16.1% and 0.9%–
Note

$\text{dmft} = \frac{d + f + m + l}{100}\%$

with nonvisually impaired ones.

habits of visually impaired children, especially when compared between the limited physical activity and inappropriate nutritional Table 3 ever the prevalence of obesity in visually impaired children was studied. When the present study was compared with previous studies, the prevalence of being 10.8%, respectively in different studies [13,22,23]. When the present study was compared with previous studies, the prevalence of being

Table 3 Dental Health Evaluation of Children (N = 74).

<table>
<thead>
<tr>
<th>Dental health evaluation</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular teeth brushing: 2–3 times/day</td>
<td>19</td>
<td>25.7</td>
</tr>
<tr>
<td>No</td>
<td>55</td>
<td>74.3</td>
</tr>
<tr>
<td>Having toothache</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>27</td>
<td>36.5</td>
</tr>
<tr>
<td>No</td>
<td>47</td>
<td>63.5</td>
</tr>
<tr>
<td>Having gingival bleeding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>22</td>
<td>29.8</td>
</tr>
<tr>
<td>No</td>
<td>52</td>
<td>70.2</td>
</tr>
<tr>
<td>Having an extracted permanent tooth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>31</td>
<td>41.9</td>
</tr>
<tr>
<td>No</td>
<td>43</td>
<td>58.1</td>
</tr>
<tr>
<td>Having three or more dental cavities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>9</td>
<td>12.2</td>
</tr>
<tr>
<td>No</td>
<td>65</td>
<td>88.8</td>
</tr>
<tr>
<td>Having dental fillings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>13</td>
<td>17.6</td>
</tr>
<tr>
<td>No</td>
<td>61</td>
<td>82.4</td>
</tr>
</tbody>
</table>

Pediatric hypertension carries important risks for morbidity in the short term, and for development of cardiovascular diseases in the long term. In this study, the prevalence of hypertension and prehypertension ranged from 1.4% to 4.1%, and from 2.7% to 6.8% respectively. We could not find in the literature any study concerning prevalence of hypertension in visually impaired children. The prevalence of hypertension or prehypertension in childhood and adolescence ranged from 1.0% to 18.4% [24,25]. The risk factors of hypertension in visually impaired children are thought to be similar to that of nonvisually impaired children. Subsequently, to prevent visually impaired children from being at risk for hypertension, health screening is important.

It has been reported in previous studies that dental problems are more commonly seen in disabled children. Furthermore, oral hygiene among disabled children is not sufficient, and these problems may give rise to dental and gingival diseases at early ages [7,26,27]. The dmft and the DMFT were used in evaluating general dental health. It is suggested that the dmft/DMFT should be lower than 3 in people less than 30 years of age. When compared with studies in the literature, mean dmft score (3.2) in this study are not at desired levels.

Frequency of brushing teeth affects both dental health and the occurrence of dental cavities [1,12]. This study revealed that the majority (73.4%) of children were brushing their teeth regularly. In Reddy and Sharma’s study [27], 89.8% of visually impaired children were brushing teeth at least once daily. However, in the study of Prashanth et al. (16), this rate was found to be 62.3% [12]. It can be noted that the findings of our study are compatible with those of the literature. Genetic predisposition and dental health behaviors of families are also important in the occurrence of dental health problems. For this reason, children and families need to be informed about dental health; parents should exhibit positive behaviors in order to act as appropriate role models. Education directed at accurate teeth brushing techniques and regular maintenance of dental health should be performed.

The estimated incidence of permanent congenital or early onset hearing impairment in developing countries in 2012 – six cases per 1,000 live births – was three times higher than in developed countries [28]. Hearing loss was determined in approximately one third of the children in this study. Similarly, Sharma and Ruscetta [29] found that the overall prevalence of ophthalmologic findings in children with sensorineural hearing loss was 21.7%. Hearing loss varies between 0.1% and 1.8% in studies conducted on nonvisually impaired children and adolescents [30,31]. When the present study was compared with these results, hearing problems were more common in visually impaired children. It has been noted in the literature that visual and hearing problems may coexist in some genetic diseases, such as Usher syndrome [21]. Therefore, this study revealed that the prevalence of hearing problems increases with age and increased prevalence of congenital etiologies of disability. Subsequently, screening for sensorial functions, such as sight or hearing, is very important for disabled individuals.

Scoliosis is an important health problem not only in our country but all over the world. Scoliosis may cause severe complications affecting body perception, self-esteem, and social life, unless diagnosed at an early stage. The prevalence of idiopathic scoliosis is 0.3%–2.0% worldwide [20]. In our study, approximately one third of the children (39.2%) were at risk for scoliosis. Only one study performed by Catanzari et al [11] showed that the risk of scoliosis is increased eight times in visually impaired children. It is thought that visually disabled children tend to bend towards the dominant-seeing side. Total visual loss may cause postural instabilities and increase risk of scoliosis. For this reason, screening should be performed on visually impaired children in order to diagnose possible scoliosis at an early stage.
There were some limitations in this study. The study was conducted on children from one of the schools for the visually impaired in Ankara. For this reason, these findings cannot be generalized to all visually impaired children. Physiological indicators of health (fasting, glucose level, cholesterol, hemoglobin and others) were not included in this study.

Implications

Children with visual disability usually have health problems in terms of growth, nutrition, dental problems, and hypertension. Visual disability in children can be a risk factor for scoliosis due to its adverse effects on posture. In addition to visual disability, extra health problems including obesity, hypertension, dental problems, hearing problems, and scoliosis could diminish quality of life, psychosocial health, and school performance in this group. The responsibilities of school health nurses in carrying out the screenings were also highlighted. Identifying problems associated with visual impairment will be helpful in planning future studies. Based on the results of this study, school health nurses will be able to compare visually impaired children to nonvisually impaired children in regular schools and be able to predict health risks.

Conclusion

This study underlines the importance of screenings to determine health problems of visually impaired children. The health problems of visually impaired children such as growth and nutritional problems, dental issues, hearing problems, and scoliosis were determined by health screenings in this study. To maintain, improve, and promote the health of children with visual problems, risk factors related to health should be addressed. Therefore, nurses have important responsibilities in carrying out screening programs for visually impaired children. School health nurses should be expected to perform health screenings for visually impaired children and to direct the children with health problems to health institutions. There were a few conditions in which our sample had some differences such as hearing loss, scoliosis and obesity. Therefore, parents should be educated about these conditions and their adverse effects on posture. In addition to visual disability, extra health problems including obesity, hypertension, dental problems, hearing problems, and scoliosis could diminish quality of life, psychosocial health, and school performance in this group.

Conflicts of interest

The authors have no conflicts of interest to declare.

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