Prevalence of visual acuity anomalies among pupils in age 7 and 8 years in Westpomeranian Region (Poland)

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Abstract

Purpose: **Evaluation of visual acuity anomalies among 7 and 8 year olds pupils in Westpomeranian Region in the aspect of school nurses health services quality in that matter.**

Material and methods: **Representative sample (n=141) from the whole population of 7 and 8 years old pupils of Westpomeranian schools were screened for visual acuity with the use of Snellen standard boards. Classical methods for statistical analysis of results were used.**

Results: **141 children were examined, among them 59 (42%) from urban areas and 82 (58%) from rural areas. The prevalence of abnormal visual acuity in general population of children in the age of 7 and 8 years in the region was estimated on the base of results from studied sample on the level of 17.7%±5.0% for confidence interval 95% and was in the range 12.3-24.9%.**

Conclusions: **High prevalence of visual acuity anomalies in general population of pupils (17.7±5.0%) indicates that more intensive preventive care is needed, also serving by school nurses. Precision in defining methodical approach in nursing care and procedure standards with respect to the affected pupils will result in improved preventive strategies.**

Key words: pupils, visual acuity anomalies, school nurses.

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Introduction

Preventive health care over pupils is assigned to general practitioners, dentists, school nurses [1]. Planning and realization of health care services in the school area such as: health promotion, diseases prevention, diagnostic, care and treatment services belongs to school nurse duties [2]. Abnormal visual acuity and refraction errors are common and very troublesome changes in sight organ. Their role in creating well-being, life quality, learning progress and school functioning of a child is essential. Their basic reason is disproportion between eye optical refraction and eye bulb axis. The prevalence of this abnormality is frequent, 10-40% among school children [3-7].

Material and methods

Assuming that the expected prevalence of visual acuity anomalies is 10%, minimal sample number [8,9] was calculated as 139 from 41980 pupils, aged 7-8 years attending to Westpomeranian schools. From the list of public schools delivered by School Inspectorate, 5 placements with basic schools on their area were chosen randomly. With the agreement of all interested persons (pupils, parents, local authorities and school nurses) 141 children took part in our study. Their age was 7-8 years +/-3 months.

Each child, who accepted the procedure, was examined with the use of Snellen standard boards. Examined persons were standing front to the board, distance was 5 meters, board hanging at the level of their eyes, place (medical cabinet) was illuminated appropriately. The Snellen board contained black, dull numeric optotypes on white, dull background. The examination was done over each eye of a child, with appropriate covering of other eye at the same time. The task of a child was to read exactly numbers pointed by examiner. Visual acuity of examined persons was expressed as the ratio of the range to the Snellen board to the distance were healthy eye can see the sign normally. Normal visual acuity was noted as follows: visual acuity of right

Table 1. **II Quantitative comparison of number of pupils in age 7 and 8 years in Westpomeranian area, together with examined sample**

Age (years)	Sex	Westpomeranian schools population		Examined sample – cities (C)		Examined sample – villages (V)		Children from cities and villages – comparison C and V (p)	Examined sample	
		n	%	n	%	n	%		N	%
7	M	10 581	25.2	11	18.7	21	25.6	p>0.32	32	22.7
7	W	10 227	24.4	12	20.3	15	18.3	p>0.76	27	19.1
8	M	10 787	25.7	17	28.8	22	26.8	p>0.79	39	27.7
8	W	10 385	24.7	19	32.2	24	29.3	p>0.70	43	30.5
Total	M+W	41 980	100	59	100	82	100		141	100.0

eye VRE 1.0 (visus right eye) and visual acuity of left eye VLE 1.0 (visus left eye).

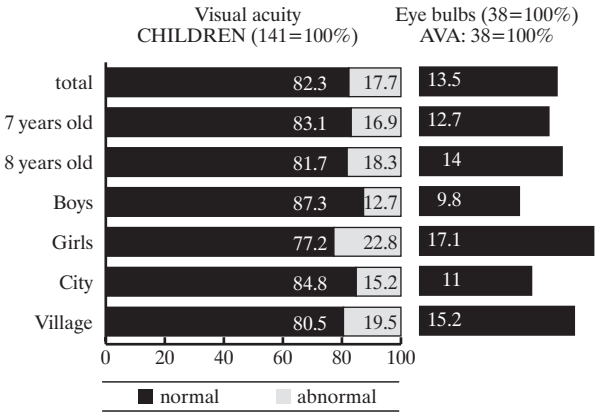
Obtained numeric data were statistically analysed [8,10]. Statistical was done with the use of STATISTICA 5.1 PL for Windows 95/NT software. Comparisons of quality features for both groups of children (rural vs city areas and with normal vs impaired visual acuity) were done with the use of chi-square test or chi-square test with Yates correction. For quantitative features U Mann-Whitney test was used. Correlation of two quantitative features was characterised by sample number (n), Spearman's rank correlation index (r_s), Pearson's lineal correlation index (r) and p values for these indexes in lineal correlation.

Results

141 children were examined, among them 59 (42%) from urban areas and 82 (58%) from rural areas. Representativeness of the sample shows *Tab. 1*, containing also the results of quantitative comparison of general population of 7-8 years old pupils of Westpomeranian region together with quantitative structure of examined sample, taking into account small cities and rural backgrounds. Compatibility chi-square (chi^2) test for structure of 7 and 8 years old children (boys and girls) of general population (N=41980) with the structure of examined sample (n=141), with the number of freedom degrees on level of 3 (n.f.d.=3) showed that chi^2 was 4.027 (by n.f.d.=3; p>0.20). This allows a statement that the structure of examined sample was compatible to the structure of general population under study and the results may be interpreted as representative for analysed population of 7-8 years old pupils in Westpomeranian area, with level of mistake ±5% (by n.f.d.=3; test $\chi^2=3.995$; p>0.20).

According to *Tab. 1* no statistically significant difference was seen among population structures of rural and urban areas. In examined sample 9 (6.38%) children were wearing correction glasses. Normal visual acuity of both eyes was estimated by 116 (82.3%) children, and by 25 pupils (17.7%) abnormalities in visual acuity of one or both eyes were detected. Study showed that 86.6% of children had normal visual acuity (NVA) of a right eye (RE) and 13.4% (19 children) had anomalies in that matter. Examination of visual acuity of left eye revealed 17 pupils (12.1%) having abnormal visual acuity (AVA). In the group of children with AVA, 12 (48% of that group) had vision errors of both eyes. After visual acuity evaluation of our studied sample (n=141) the number of children with AVA within this group was 25 (17.7%). Age, sex and environment structure evaluation of this group was done.

Figure 1. **Proportions of examined pupils/eye bulbs with NVA and AVA in total and according to age, sex, environment – Westpomeranian region**



Among children with AVA 10 (40%) were 7 years old, among them 6 girls and 4 boys, 15 (60%) children were 8 years old, among them 10 girls and 5 boys. Pupils from rural areas (64%) were dominating over children from urban areas (36%) in examined sample.

The prevalence of visual acuity anomalies in general population of children in the age of 7 and 8 years in Westpomeranian area was estimated on the base of results from studied sample on the level of 17.7%±5.0% for confidence interval 95% and was in the range 12.3-24.9%. *Fig. 1* shows percentage proportions of children and eye bulbs according to normal visual acuity (NVA) and abnormal visual acuity (AVA) screening test. These data support the importance of this health problem and indicate the necessity of diagnostic procedures to be performed by eye specialists among children in early school years, in Westpomeranian region.

Proportions of examined children shown in *Fig. 1* informs that abnormal results of visual test affected 17.7±5.0% of total examined population and they were higher by:

8 years old (18.3%) than 7 years old (16.9%); girls (22.8%) than boys (12.7%); children from village schools (19.5%) than city schools (15.2%).

It is obvious that proportions of eye bulbs with AVA were

different from proportions of children. AVA in total was noticed in 38 (13.5±5%) eye bulbs, and their specific proportions distribution were identical to evaluation of internal structure of studied children group. AVA was relatively more frequent by: 8 years old pupils (14.0%) than 7 years old pupils (12.7%); girls (17.1%) than boys (9.8%); children from village schools (15.2%) than from city schools (11.0%).

Discussion

Obtained results of visual acuity screening test were divided in two categories: normal visual acuity (NVA) and abnormal visual acuity (AVA) according to standards for nurse diagnosis delivered by Mother and Child Institute, School Medicine Department in 2003 [11,12]. Distribution and structure of this data were similar to results obtained in other studies, including studies done by eye specialists. Taking into account that screening tests (done by nurses) may be interpreted only as a probable diagnosis for a specialist and do not determine this diagnosis, our data and proportions of positive results (AVA) were comparable, although higher, with results of complex studies done by eye specialists. To prove this statement following positions from literature are worth mentioning.

In the year 2001 Muszyńska-Lachota [13] studied 138 children in 7-8 year of age from Westpomeranian region proving that among 7 years old children hyperopia was the dominating refraction error affecting 75% girls and 75.3 % boys. Emmetropia was detected in 11.7% girls and 19.7% boys. Myopia in 3.2% girls and 2.5% boys. Among 8 years old children hyperopia was also a common problem (80.8% girls and 74.1% boys); emmetropia was detected in 12.8% girls and 18.5% boys, astigmatism in 2.1% girls and 3.7% boys. The prevalence of particular refraction errors among both age groups showed no statistically significant difference.

According to Czepita et al. [14,15] study, 5023 pupils in the age 6-18 years examined in the are of city Szczecin 15% showed myopia. As the study reports the prevalence of myopia follows the age that is: in the group of 6-10 years old children was 1.5-7.8%, in the group between 11-14 years was 10.7-12% and by 15-18 years old children myopia was detected in 22-42% cases. No correlation between the degree of refraction error and sex was reported.

Pechmann et al. [16] reported myopia in about one third of examined population of 6000 children in age 6-19 years living in Szczecin. Correlation between growing number of children with myopia and the growing duration of education was noticed. It was reported that prevalence of myopia is similar to that in Europe and USA and lower than in Asian countries. It was also proved that genetical and environmental factor played an important role in developing myopia.

According to data from Health Care Statistical Reference Book of Westpomeranian region for year 2002, which was elaborated by Westpomeranian Center of Health Organisation and Promotion [17] from the examined 14 217 children in age of 6 years 7.2% were qualified to active health care, because of refraction errors and eye diseases and respectively 9.3% from the group of 10 years old children (16 294).

Studies done in other countries report diverse prevalence of refraction errors.

Kässmann-Kellner et al. [18] examining uncorrected visual acuity among German children in age 6-7 years (12192 person) stated that it was lower than 0.7 in 30.8% cases. Lee et al. [19] examining children in age 6-19 reported visual acuity lower than 20/30 without correction in 10.8% white persons and 19.1% Puertoricans in the same age. Myopia was more frequent in children from urban ares in that study. Wender et al. [20] reported impaired visual acuity more than 0.5 in 1.7% of Tanzanian children and youth from rural areas.

Since the year 2003 Poland has been coming through a next variant of health care system reform. According to that, children and youth preventive health care was assigned to:

1. general practitioner; 2. dentist; 3. nurse (school nurse). As a result of this system the only health care representative, responsible also for preventive activity in school is a nurse. Her responsibilities and assignments, among all in the area of pupil's visual acuity anomalies prevention are defined in several law acts, among them Act of Nurse and Midwife Profession together with Ministry of Health regulation about range and description of preventive, diagnostic, treatment and rehabilitation procedures done by a nurse without physician's order [21-24].

Reported visual acuity impairment prevalence among westpomeranian 7-8 years old pupils on the level of 17.7±5%, which imposes the duty of delivering proper information to parents of such children together with directing them to GP or eye specialist, should be also a supportive signal for the need of proper and precise nurse documentation. Namely, the result of physician consultation (GP or eye specialist) should be noted in nurse documentation allowing her to monitor doctor's orders, proper pupils education, eventually their parents, as well as in the range of school as house health care. It seems also that a better cooperation between teachers and school nurse is essential for improving the quality of preventive medicine among pupils. Having the results of physician consultation well documented, a nurse would be able to influence more efficiently adults around children (parents, teachers), focusing them on monitoring doctors orders realization by a child. Taking into account the results of our study, where each age group of examined young children showed consecutive raise of visual acuity anomalies (among 7 years old children 16.9% and 8 years old 18.3%) the need of regular, each year screening tests in that matter as routine nurse calendar procedure seems to be at least reasonable. This should be additionally calculated by National Health Fund as an accessory procedure to nurse duties. Proper and solid perfomance of screening tests, detailed documentation of preventive procedures, delivering high quality preventive care education are very time consuming. Moreover, time of nurse activity should take into account constant monitoring of preventive orders realization together with frequent teachers consultations.

Conclusions

Estimated prevalence of visual acuity anomalies in general population was 17.7±5.0%, 11.3 percentage points higher

from the proportion of pupils with correction glasses. Higher prevalence of vision anomalies was proven to be more frequent respectively in 8 years old children than in 7 years old, girls than boys, children from rural than urban areas. Precision in defining methodical approach in nursing care and procedure standards with respect to the affected pupils will result in improved preventive strategies.

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