

Prevalence of Hearing Loss among First Grade School Children in Tirana, Albania – A Repeated Cross-Sectional Survey

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Abstract

Background: Hearing Loss (HL), which affects disproportionately children in low income countries, is increasing worldwide. HL could be associated with a range of speech, language and cognitive problems in children. In Albania the information about this condition is largely outdated. In this context, the aim of this paper was to assess the prevalence of HL among first grade school children in Tirana, the capital city of Albania.

Methods: A cross-sectional survey was carried out for three consecutive years during 2008-2011, in 163 schools of Tirana. In total 15,163 first-grade pupils were screened in order to detect those with a high probability of HL, which were later invited to undergo definitive diagnosis procedures. During the first year of study a hearing threshold of ≥ 35 dB for the better ear was used as a cut-off whereas a threshold of ≥ 30 dB was used for the two remaining study waves.

Results: In total, the prevalence of any suspected hearing impairment was 4.4%. The 3-year prevalence of total diagnosed conductive and sensorineural HL was 3.61% and 0.09%, respectively, with no clear trends across the study years. The total prevalence of Otitis Media with Effusion and Chronic Otitis Media was 1.36% and 0.17%, respectively.

Conclusions: Hearing loss prevalence among children aged 6-7 years in Albania during 2008-2011 was relatively low. However, in absolute numbers, around 3,000 children would benefit from the early detection of such condition.

Keywords: Albania; Hearing Impairment; School-age children; Prevalence

Introduction

Hearing loss is becoming an issue of increasing importance worldwide. For instance, WHO world estimations of people living with hearing difficulties have risen steadily from 120 million in 1995 [1], to 250 million in 2000 [2] whereas in 2011 there were about 360 million living with disabling hearing loss of which 32 million were children aged 0-14 years [3]. Increasing trends of hearing impairment were observed among youngsters as well: among adolescents aged 12-19 years it was observed an increasing prevalence of any hearing loss between 1988-1994 (14.9%) and 2005-2006 (19.5%) [4]. The global prevalence of hearing loss among children aged 0-14 years old was 1.7% in 2011, and substantially higher in low income countries compared to high-income ones [5].

Hearing impairments during childhood might have negative effects as they could delay the development of speech, language and cognitive skills of the affected children often resulting in poorer school performance compared to children with normal hearing capabilities [3]. For instance, a study among 1228 school children found that 3rd grade children with hearing impairment had significantly lower scores

for reading vocabulary, language mechanics, word analysis and spelling as well as lower scores on a range of functional tests whereas no differences were observed among 6th and 9th graders [6]. Other studies have suggested relationships between hearing impairment in children with worse school performance and language skills among children aged 0-18 years [7], 11 years [8] and 6-12 years [9]. In addition, children with hearing impairments showed persistent low school performance even after individualized education plan efforts [10,11]. There is evidence that the earlier the hearing impairments are detected and addressed the better the outcomes in terms of improvements of language and comprehension skills [12]. In children under 15 years of age, disabling hearing impairment is defined as permanent unaided hearing threshold for the better ear of ≥ 31 dB calculated as the average hearing threshold level at four frequencies 0.5, 1, 2 and 4 kHz whereas for adults the average threshold is ≥ 41 dB [13].

The prevalence of hearing impairment among school aged children has been assessed in both developed and developing countries, but the results vary substantially due to different kinds and degrees of hearing impairment assessed and different age-groups included. Globally, the prevalence of hearing impairment defined by a threshold of ≥ 35 dB in the better ear was 1.4% among children 5-14 years old in 2008 [14]. In developed countries, the prevalence of any hearing impairment and

mild sensorineural hearing loss among school aged children was 11.3% and 5.4%, respectively, among 1228 US children in grades 3, 6 and 9 [6]. A large study including more than 6000 children aged 6-19 years reported that 14.9% of them had some kind of hearing impairment [15], a study among 6581 grade 1 and grade 5 children in Australia found that the prevalence of slight/moderate bilateral sensorineural hearing loss was 0.88% [16] whereas a UK study suggested that 2.05% of children aged 9-16 years had permanent hearing impairment [17]. In developed countries, the prevalence of hearing impairments among primary school children ranged from 8.8% in Iran [18], 15% in Malaysia [8] but 2.4% in Zimbabwe [19].

In Albania the information about the prevalence of hearing impairment in the general population as well as in the community of children is scarce. Some screening efforts date back to 1980 and were carried out by the professionals of Mother Teresa University Hospital Center in Tirana (UHCT), the only tertiary hospital in the country. Therefore, there is immediate need to update the figures about hearing impairment prevalence among children in this South-European country. In this context, the aim of the present paper is to provide the scientific community with updated information about the prevalence of hearing impairment among first grade school children of Tirana in order to shed light upon this largely under researched area in Albania.

Methods

Study population and sampling

This project was carried out during 2008-2011 under the technical and scientific responsibility of the otorhinolaryngology service, University Hospital of Tirana [20]. A specific component of this exercise included the screening of hearing impairment among school-age children of Tirana aiming to collect epidemiological data on prevalence of hearing impairment in the group of children in order to educate and raise the awareness of pedagogical staff regarding the childhood hearing problems.

The cross-sectional survey was repeated three times consecutively during the 2003-2004, 2004-2005 and 2005-2006 academic years. The sampling framework included all primary schools in urban Tirana. Among those we selected randomly and proportional to size around 20% of these schools at each academic year under study, thus resulting in 55 schools sampled during the first wave of the survey, 53 schools during the second wave and 55 schools during the third wave of the survey, for a total of 163 schools surveyed. In all the selected schools we examined all the first grade pupils. From 16,229 first grade pupils in all surveyed schools during the 3-years study period we examined 15,163 pupils or 93.4% of the target sample. More detailed information about the percentage of the sample covered during each of the study years is presented in (Table 1).

Academic year	No of schools	No of children	No of 1st grade children	Examined children	Children with suspected hearing impairment	Showed up for stage 2 diagnosis	Didn't show up for level 2 diagnosis
2003-2004	55	49471	5622	5392 (95.9) *	152 (2.8) †	123	29
2004-2005	53	49413	5459	5077 (93.0)	257 (5.1)	239	18

2005-2006	55	49244	5148	4694 (91.2)	262 (5.6)	224	38
Total	163	148,128	16,229	15,163 (93.4)	671 (4.4)	586	85
* Proportion of examined children among all 1st grade children.							
† Proportion of children with suspected hearing impairment among examined children.							

Table 1: Distribution of screened children according to academic study year and prevalence of suspected hearing impairment, Tirana, Albania

Data collection

The screening process comprised of two stages. During the first stage, the screening process aimed to detect children who had a high probability of experiencing any kind of hearing impairment and defined in this paper as “suspected cases”. In the second stage, the suspected cases identified during the first stage, were then invited to undergo specialized diagnostic tests in order to confirm the diagnosis and the potential cause.

In the first stage of the screening program, four Otolaryngology Trainees near the premises of Otorhinolaryngology Service at UHC “Mother Teresa” were trained about the use of screening tools thus enabling them to master the basic screening techniques. Each selected school was contacted and the school director was explained the aim of the study thus ensuring excellent cooperation with the pedagogical staff. Simple questionnaires were distributed to parents and teachers with the aim to detect severe cases of hearing impairment prior to screening efforts. Pupils were retrieved in small groups of 4-5 children and examined and then they were sent back to their respective class thus allowing for the other children to be examined without interfering with the pedagogical process. To detect children who might suffer from any hearing impairment, tonal audiometry was used. During the first academic year under survey (2003-2004) a hearing threshold for the better ear of ≥ 35 dB was used as a cut-off for diagnosing any hearing impairment (suspected cases) whereas during the two subsequent academic years under survey the threshold used was ≥ 30 DB. On average each tonal audiometry examination lasted about 10 minutes.

Every case suspected by the examiners to have any hearing impairment during the first stage of screening was then invited to undergo a second level examination in the Audiology Section of the Service of Otorhinolaryngology in the UHC “Mother Teresa” in Tirana where the final diagnosis was set. A letter was sent to the respective parent of suspected cases explaining that their children might suffer some kind of hearing impairment and inviting them to accompany their children to the premises of the Service of Otorhinolaryngology in the UHC “Mother Teresa” for a free of charge final diagnosis of the problem. From 671 suspected cases, only 586 children underwent second stage total diagnostic examination. For the 85 children detected with potential hearing impairment during the first stage of screening process, the reasons for not showing up for further diagnostics examinations was the reluctance of their parents about the “free-of-charge” nature of the medical visit as well as their negligence.

During the second stage, a series of procedures were used in order to set the final diagnosis. An extended Otorhinolaryngological medical visit was carried out for the thorough examination of nose, ear and

throat in order to detect any problem that might have affected the hearing process. This was done for every child suspected to have any hearing impairment and detected during the first stage of screening. To set the final diagnosis we used the tympanometry, stapedial reflex and tonal audiometry examinations.

Based on the results of Otorhinolaryngological visit, potential causes of hearing impairment were diagnosed. These events included the Otitis Media with Effusion, Chronic Otitis Media, earwax, etc. In addition, hearing loss was categorized into sensorineural hearing loss and conductive hearing loss which comprised also children with Otitis Media with Effusion and Chronic Otitis Media.

Free of charge specialized care and support was offered for cases diagnosed with hearing impairment. Those cases diagnosed with Otitis Media with Effusion or Chronic Otitis Media were treated free of charge for the respective conditions. Cases diagnosed with sensorineural hearing loss were equipped with hearing aid devices when appropriate. Cases diagnosed with conductive hearing loss were treated for their primary (adenoids, tonsils, etc.) and secondary conditions.

Calculation of prevalence rates

In order to calculate the yearly prevalence rate of conductive or sensorineural hearing loss and the prevalence rate of Otitis Media with Effusion and Chronic Otitis Media we divided the respective number

of children diagnosed with a specific condition by the number of children screened in each of the academic years under study. To calculate the total prevalence of these conditions we divided the total cases with a specific event by the total population of children screened. Prevalence rates were expressed per 100 children. Absolute numbers and respective percentages were calculated and reported.

Results

The number of schools, number of children, 1st grade children and the number of examined children are presented in (Table 1). In each academic year under study more than 90% of eligible 1st grade children were screened, whereas during the three-year period of the study 93% of all 1st graders were screened. The prevalence rates of any suspected hearing impairment showed an increasing trend from 2.8% during 2003-2004 academic years to 5.1% and 5.6% during the two other academic years under study. In total, the prevalence of any suspected hearing impairment was 4.4%. Table 2 presents the results of final examination of children detected during the first stage of the screening program and who showed up for further examination of their problem. Among children who showed up, 25 of them resulted to have normal hearing (3 at 1st year, 8 at 2nd year and 14 at the 3rd year of study) after thorough ORL examination. The cause of their suspected hearing impairment resulted to be of mechanical nature, such as earwax, after the removing of which the hearing was restored (Table 2).

Academic year	Screened children	Stage children	Conductive hearing loss			Total conductive hearing loss	Sensorineural hearing loss	Normal hearing†
			Tympanic effusion	Chronic otitis media	Conductive hearing loss			
2003-2004	5392	123	37 (0.69) *	6 (0.11) *	73 (1.35) *	116 (2.15) *	4 (0.07) *	3
2004-2005	5077	239	89 (1.75)	7 (0.14)	130 (2.56)	226 (4.45)	5 (0.10)	8
2005-2006	4694	224	80 (1.70)	13 (0.28)	112 (2.39)	205 (4.37)	5 (0.11)	14
Total	15,163	586	206 (1.36)	26 (0.17)	315 (2.08)	547 (3.61)	14 (0.09)	25

* Absolute number and prevalence rate expressed per 100 screened children (in parenthesis)

† These cases were suspected to have any hearing impairment during the first stage but after further examination their hearing resulted normal. For example, they had earwax which was removed.

Table 2: Prevalence of various diagnoses after specialized medical diagnostic procedures

The 3-year prevalence of total conductive hearing loss (comprising Otitis Media with Effusion, Chronic Otitis Media and conductive hearing loss diagnoses) was 3.61% whereas the prevalence of sensorineural hearing loss was 0.09% during the same period of time. The prevalence of total conductive hearing loss was lower during the first year under study (2.15%) and then showed inconsistent trend during the two other years under study (4.45% and 4.37%, respectively). The total 3-year prevalence of Otitis Media with Effusion and Chronic Otitis Media was 1.36% and 0.17%, respectively. Regarding Otitis Media with Effusion, its prevalence was very low during the first year of screening (0.69%) and then more than doubled in the subsequent years. Whereas the prevalence of Chronic Otitis Media increased monotonically over the years from 0.11% in 2008-2009 academic year, to 0.14% in 2009-2010 academic year and 0.28% in 2010-2011 academic year (Table 2).

Discussion

This is the first large scale screening effort aiming to detect the prevalence of hearing loss among primary school children in Albania. Our findings suggest that hearing loss has a relatively low prevalence among children aged 6-7 years. The prevalence of total conductive and sensorineural hearing loss was 3.61% and 0.09%, respectively, during the 3-year study period. Therefore, the prevalence of any hearing loss (conductive+sensorineural) was 3.70% in this large sample of 1st grade children. We found an extremely low prevalence of sensorineural hearing loss of only 0.09%. The prevalence of other causes of conductive hearing loss such as Otitis Media with Effusion and Chronic Otitis Media was 1.36% and 0.17%, respectively.

The prevalence of conductive or sensorineural hearing loss was more or less stable during the three years under study. We think that the lower prevalence detected at the 1st year under study for these two

types of hearing loss are attributed to the higher threshold used in the first year of study (≥ 35 dB) compared to a threshold of ≥ 30 dB used in two remaining study years. A higher threshold means that fewer pupils will be suspected as having a hearing impairment and this subsequently affects the prevalence rates.

The especially low prevalence of sensorineural hearing loss might be attributed to several factors which are present in the Albania population. The most important factors contributing to this low prevalence is the mentality of the parents in Albania: they consider a child with hearing impairment as handicapped or disabled and therefore they send these children to special schools in order to avoid the judgment from the society. This is a pity since these children could benefit from the right interventions and the use of hearing aid devices.

Despite the low prevalence of hearing loss impairment, the findings could have important implications. The prevalence of 3.70% is translated into 561 children in our study population and, taking into account that we surveyed only about 20% of schools in Tirana, the absolute number of children aged 6-7 years who could benefit from different interventions could be approximately 3,000 for the 3-years under study. As we explored in the introduction of this paper, hearing impairment among school children could affect their language and social skills as well as their school performance [3,6-9]. For example, Otitis Media with Effusion (OME), which might affect 9 out of 10 pre-school aged children [21], could be an important treatable cause of hearing loss. Furthermore, in up to 40% of cases this condition might become recurrent and in 10% of cases it lasts longer than 1 year [22] thus increasing the risk of hearing loss if untreated. A study found that 1 in 4 school children aged 7 years had some degree of Otitis Media with Effusion [23]. However, routine screening for OME is not recommended because the evidence of more benefits from early detection is lacking [24]. The low prevalence of Otitis Media with Effusion in our study and other studies is due to the different aims of each study: we aimed to detect the hearing impairment and selected only children who showed such signs on tonal audiometry whereas other studies physically examined all children for signs of Otitis Media with Effusion and thus reported much higher prevalence [23]. Otitis Media with Effusion often accompanies conductive hearing loss [25] and if the disease persists then the child could exhibit adverse school or developmental effects [26-28].

There is evidence that Chronic Otitis Media is the commonest cause of hearing loss among children in low and middle income countries [29-31]. However, this condition was not very prevalent (0.17%) in our group of children possibly because Chronic Otitis Media thrives due to overcrowding, poor hygiene control and nutrition and lack of medical care conditions which are not prevalent in Albania as compared to some African countries [30,31].

Our results are in concordance with previous studies which have found that conductive hearing loss is more prevalent than sensorineural one among school children [8,18]. The prevalence of unilateral sensorineural hearing loss among school-children is reported to be 3%-5% [6,15]. Children with sensorineural hearing loss often required extra educational plans and efforts [7].

Apart from academic and developmental problems, hearing loss among children constitutes a financial burden as well. For example, in USA the total costs of OME, a common cause of hearing loss, amount up to 4\$ billion dollars each year [32]. If the hearing problems are left untreated then the costs of hearing impairment could be very high. For example, in Europe the annual cost of mild, moderate and severe/

profound hearing impairment per person were 2,200, 6,600 and 11,000 Euros, respectively, whereas the total cost of hearing impairment in Europe would be around 300 billion Euros including all costs related to this condition [33].

In this context, the detection and appropriate treatment of children with hearing impairments in Albania should be given the appropriate priority among other health services as it can save future individual disabilities and societal costs.

In summary, this paper has provided with recent information about the prevalence of hearing impairment among school children in Albania based on screening efforts. The prevalence of hearing loss among children in this South-Eastern European country is relatively low compared to other reports. However, the consistent findings during the three consecutive waves of the survey suggest that the information is robust. However, further cross-sectional surveys are needed in order to confirm the trends observed in our study.

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