Nigerian Journal of Paediatrics 1990; 17(2): 49-53

Screening Audiometry In Nigerian School Children

F O OGISI* AND O D AMU**

SUMMARY

Ogisi FO and Amu OD. Screening Audiometry in Nigerian School Children. *Nigerian Journal of Paediatricts,* 1990; 17:49. Audiometric screening tests done on 292 six-year old primary school children in Benin, shows that 9.2% of the children had significant hearing impairment with elevation of hearing thresholds (HTL) above recommended screening levels at all or most of the frequencies tested; a total of 31% of all subjects had some threshold elevation although in the majority of cases only one or two frequencies were affected. Otoscopic abnormalities were evident in a higher proportion of children who had hearing impairment than in those with normal hearing. The need for routine audiometric screening of school children is emphasized.

INTRODUCTION

THE application of screening for detection of hearing impairment in school children has been practised for several decades. School hearing screening started in the early 1920's in North America and later in Britain with the use of "Fading number gramophone" audiometer which used speech signals.[1] [2] This was later replaced by the pure tone audiometer, and "sweep frequency audiometry" became the standard screening method. It has been estimated from various reports that in the early primary school age group (5–7 years), the detection rate of significant hearing impairment from school screening audiometry is in the region of 5–6%.[2–4] Without screening, most of such cases would be undetected, or would be detected too late for treatment or meaningful rehabilitation. It is now accepted that for any school health programme, to be complete, it should include audiometric screening because of the effect of hearing impairment on the child's socio-educational development. Indeed where facilities are available, children should be screened at various stages from infancy and particu-

College of Medical Sciences,
University of Benin, Benin-City.

Department of Surgery (ENT Unit)

*Senior Lecturer
**Lecturer
Correspondence: Dr. F O Ogisi

larly at school entry (5–6 years) to ensure that the child starts the school years with hearing adequate to enable it benefit maximally from the education.

Sweep frequency testing uses 4 frequencies, commonly 500, 1000, 2000 and 4000 Hz, though some workers recommend leaving out 500 Hz because of ambient noise interference. Recommended intensity levels also vary. Harrison and Watson[5] recommended 30, 25, 20 and 20 dB (ISO) respectively for the four frequencies above, these being approximate upper limits of normality in accoustic conditions of schools in which tests are generally made. A second screening is ideally recommended for children who fail the first before being sent for fuller otological examinations and tests.[4]

We report here the results of an audiometric screening programme carried out on 292 school entry age children in Benin-City.

MATERIALS AND METHODS

The subjects consisted of 292 primary one pupils of the University of Benin staff school. The 151 female and 141 children were aged 6 – 7 years.

Examination and testing of the children were carried out in the school's sick bay by arrangement with the school authorities and the sick bay staff. A secluded room in the building was used, tests being carried out during relatively quiet periods of the school day to reduce noise interference', as much as possible since a sound – treated or sound – proof room was not available. In addition, noise level was monitored with a noise – level meter (Peters S M 6) and whenever the level was excessive, the tests were deferred or discontinued. Generally, a maximum level of 45 – 50 dB was considered as acceptable. Each child was examined by otoscopy and any significant abnormality of the ear canal or tympanic membrane was noted. Small quantities of cerumen in the canal were disregarded or where possible, removed, to allow better visualization of the tympanic membrane.

Audiometric screening was done by the individual screening method, using a Peters AP6 portable audiometer with built – in rechargeable battery power – supply, and a single padded earphone for testing each ear in turn. The hearing threshold level (HTL) for each ear was obtained at each of the four frequencies 500, 1000, 2000 and 4000 Hz with referrence to the recommended screening levels or upper limits of normal (30, 25, 20 and 20 decibels respectively.) The child was requested to indicate by saying "yes" or by raising a finger whenever he or she heard the test tone. Subjects who had thresholds above the reference levels were retested whenever possible, particularly if initial responses appeared equivocal. The responses from the right and left ears were then considered together for each child in determining the individual performance.

RESULTS

The significant findings at otoscopy are shown in Table I. Of the 292 children, 83 (28%) had abnormalities in the ear canal or the tympanic membrane. The most common finding was the presence of occluding or impacted wax in one or both ears; this occured in 47 cases or over half of those with abnormalities. An appearance of dullness of the ear-drum, with inflammation in 2 cases, was evident in 18 children whilst there was retraction in 12 cases. One child had meatal stnosis in one ear, probably post-inflammatory, and another had a metal foreign body which was later removed.

Audiometric Screening:

Two hundred (68.5%) of the children had hearing thresholds at or below the upper

limits for all 4 frequencies in both ears. Sixteen (5.5%) had thresholds above normal in all frequencies in both ears, whilst a further 11 (3.7%) had raised thresholds in 3 of the 4 frequencies. Thus, 9.2% of all the children had significant hearing impairment as judged by raised thresholds at all or most the frequencies screened. Twenty-two percent of the children "failed" the screening at one or two frequencies (Table II).

Analysis of the individual ear responses shows that of the 584 ears tested, 366 (63%) had thresholds within normal limits in all the frequencies (Table III).

Comparison with Otoscopic Findings:
Of the 82 children with otoscopic abnormalities, 36 were in the group of subjects with entirely normal audiometric screening results, whilst the other 46 had elevated thresholds in some or all the frequencies. Thus, about 20% of normal-hearing children had otoscopic abnormalities as compared to 40% of the hearing-impaired group.

TABLE I

Otoscopic Abnormalities In 82 Children

Abnormalities	No. of Cases	% of Total
Occluding or impacted cerumen	47	56.6
Dulness of Tympanic Membrane + inflammation	18	21.7
Retraction	12	14.5
Scar	3	3.6
Perforation	1	1.2
Others	2	2.4
TOTAL	83	100.0

TABLE II

Audiometric Screening Results In 292 Children

Screening Result	No. of Children	% of Total
Normal threshold in one or both ears	200	68.5
Raised thresholds; all frequencies in both ears	16	5.5
Raised thresholds : 3 frequencies		
2 frequencies	26	8.9
1 frequency	39	13.3
TOTAL	292	100.0

TABLE III
Individual Ear Responses In 292 Children

	Number of Ears	Percentage
Normal	366	62.7
Threshold elevation:		
All frequencies	52	8.9
3 frequencies	51	8.7
2 frequencies	68	11.6
1 frequency	47	8.1

DISCUSSION

To obtain meaningful results from a hearing screening programme, it is essential to have standard and objective criteria as well as satisfactory testing conditions. It is often difficult to find suitable room for school audiometric examinations, and clearly in our environment, it is uncommon to have a separate clinic facility in primary schools for this purpose as in the present study, more so the ideal sound-proof room. However, the recommended intensity levels for screening should take into account, the average ambient noise conditions available in practice.

Screening methods may also need to be adjusted to suit circumstances; the more commonly used "sweep-frequency" method is less time-consuming but provides less information than the individual frequency testing done in our study.

Our results show an incidence of 9% of significant hearing impairment in the study group, with raised thresholds at all or most frequencies screened, excluding those children who showed losses at one or two frequencies. Obviously, a raised threshold at any one frequency is noteworthy but in this study we considered that a small deficit at one frequency alone is probably not significant, particularly at lower frequencies which are more likely to be affected by ambient noise in the test environment. Furthermore, a "pass" in one out of a subject's two ears for a given frequency is accepted as adequate hearing for the individual child. The relatively high proportion of screening failures amongst our subjects is a clear indication that a significant number of our school-age children may have hearing deficits sufficient to interfere with their performance in class.

The findings at preliminary otoscopy would suggest that in a fairly high proportion of children, hearing impairment is associated with easily treatable external and middle ear conditions such as impacted cerumen and otitis media; the addition of impedance audiometry in screening would be useful in the diagnosis of middle ear disease, particularly secretory otitis media, in such cases[2] [6]. These conductive losses are reversible with early diagnosis and appropriate treatment.

Even in cases of sensorineural losses, early diagnosis and follow-up are just as important for these children. Generally, children in whom the screening indicates definite impairment should be referred for more detailed audiological tests – by audiometry, impedance, in some cases where possible, electrical evoked response audiometry (ERA) to be followed by appropriate auditory rehabilitation; it has been stressed that very little (apart from epidemiological data) is to be gained in discovering cases of hearing impairment in school children unless something is done to alleviate the problems. It is also suggested that even a mild hearing-loss (15 dB or less) may require attention since over a long period, this is capable of affecting a young child's language and educational development[7] Such handicaps are detrimental to the child's future performance, and in a wider sense also, to the future of a nation. A greater appreciation of this may perhaps induce more emphasis being placed on school screening audiometry in an improved and expanded school health system in the country.

ACKNOWLEDGEMENTS

We wish to thank the Director of Health Services, University of Benin, Ven Dr P E I Nwabuoku, and the Headmistress of the University Staff School, Mrs C Adegoke for their co-operation.

This study was supported by a Research Grant from the University of Benin, Benin City.

REFERENCES

1. Northern JL and Dawns MP. Hearing in children. Baltimore, William and Wilkins; 1974; 93 – 132.
2. Fisch L. Development of School Screening Audiometry. BJ Auilogy 1981; 15: 87 – 95
3. Fabritius HF. Mass examination for dectection of hearing loss in school children in Norway. Acta Otolaryngologica 1968; Supplement 140: 123.
4. Newby HA. Public School Hearing Conservation Programs. In: Audiology. New Jersey, Prentice-Hall. 1979; 292 – 320.
5. Harrison K and Watson T. In: Scott-Browns Disease of the Ear, Nose and Throat.
   Ballantyne J and Groves J, Eds. London, Butte worths. 1971: 395 – 418.
6. Bluestone C, Beery Q, and Paradise J.Audiometry i relation to middle – ear effusions in children. Lary goscope 1973; 83: 594 – 604.
7. Kapur YP. Prevention of hearing impairment children. In: New Dimensions in Otolaryngology Head and Neck Surgery.
   Myers E, ed. Amsterdam, Excepta Medica 1985; 293 – 6.

Accepted 19th May, 1989