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Original Research Article

PREVALENCE AND PATTERNS OF EAR AND HEARING CONDITIONS IN PRIMARY SCHOOL CHILDREN IN ASABA, NIGERIA.

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This study was a collaborative effort among all authors. Each author reviewed and approved the final version of the manuscript for publication.
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ABSTRACT
Hearing impairment affects 34 million children globally, with prevalence rates of 3.4%–12.8%, often due to infections and fluid buildup. Despite the importance of school-based screenings for early detection, they remain rare in developing countries. This study assessed ear health among students at Uzoigwe Primary School, Asaba, Delta State, Nigeria. A descriptive cross-sectional study was conducted on 969 students using multiphasic sampling. In Phase 1, trained teachers screened for hearing impairments. In Phase 2, resident doctors performed detailed ear examinations, including otoscopy. Data analysis was done using IBM SPSS 22.0. Results showed that 92% of pupils had no ear-related issues. Among the 8% requiring further screening, 2% were diagnosed with conditions such as otalgia, otitis media, cerumen impaction, tinnitus, and hearing impairment. Otalgia was most common, particularly in students aged 10–14. Males had higher chronic otitis media rates, while females had more hearing impairment and cerumen impaction. No significant associations were found between age, sex, or class and these conditions. The study highlighted the need for routine school-based ear screenings. Despite the low prevalence, it enables early intervention and prevents long-term hearing loss and speech delays.

Keywords: *School-based screening, ear assessment, early intervention*

1.0 INTRODUCTION

The ear serves as the organ of hearing. Hearing impairment significantly impacts a child's educational progress and overall quality of life (World Health Organization, 2021). The World Health Organization (WHO) estimated that a staggering number of 34 million children are hearing impaired worldwide(World Health Organization, 2021). A study of hearing impairment among children in primary schools in Australia identified a prevalence estimate of between 3.4% and 12.8% depending on the type of hearing impairment identified (Choi *et al.*, 2017). Prevalence of significant hearing loss among school children has also been found to be 5.6% in a Nepalese study (Maharjan *et al.*, 2021)and 10% in a Zimbabwean study (Pedersen *et al.*, 2022).

Identified causes of childhood hearing impairment have been found to include chronic ear infections like otitis media, systemic infections like meningitis, and collection of fluid in the ear, e.g., chronic non-suppurative otitis media (WHO, 2021; Kaspar *et al.*, 2018; Sarafraz & Ahmadi, 2009). A hearing screening conducted among some primary schoolers in the Solomon Islands showed that Otitis Media with Effusion (OME) was significantly associated with hearing impairment assessed in the study (Kaspar *et al.*, 2018). Another study of pre-schoolers in Wuhan, China identified the prevalence of cerumen impaction among 10% of the pupils assessed (Ping *et al.*, 2017). This (cerumen impaction) is likewise seen as the most prevalent condition in school health outreach in Samoa (Kaspar *et al.*, 2021). In Ibadan North LGA of Oyo State Nigeria, the prevalence of hearing impairment among primary school pupils was 30.1% (Akande & Adeosun, 2020). Ear assessment programs integrated into primary school health services can facilitate early detection and intervention for hearing problems (WHO, 2021). Despite the importance of early detection and intervention, routine ear assessment programs for preschoolers and primary school children are rare in developing countries (Olusanya *et al.*, 2000). There is also limited research on the outcomes of ear assessment programs among primary school students in Delta State, Nigeria. This research aimed to investigate the outcome of ear assessments among students at Uzoigwe Primary School in Asaba, Delta State. By evaluating the effectiveness of ear assessment screening programs, this study seeks to identify areas for improvement and facilitate better hearing health outcomes among school children. This research will contribute to the existing literature by providing insights into the outcomes of ear assessments in a specific primary school setting in Delta State, Nigeria.
The objectives of this research was to determine the prevalence of ear diseases and hearing impairment, identify patterns of ear diseases and to determine the association between the occurrence of ear disease and the classes of the school children in Uzoigwe Primary School, Asaba.

2.0 MATERIALS AND METHODS

Study Area:
Uzoigwe Nursery and Primary School, Asaba, is one of the schools affiliated with the Department of Public Health, Federal Medical Centre (FMC), Asaba. The school is located in Asaba, the capital city of Delta State, Nigeria. It is owned and operated by the Delta State Government, and it is one of the prominent public nursery and primary schools in the state. The school has 969 students enrolled during the 2023/2024 academic year (Uzoigwe, 2024)
Study design: A descriptive cross-sectional study design was employed.

Study population: The study population was the total number of pupils enrolled for that academic year in the primary school section of Uzoigwe Nursery and Primary School, Asaba, Delta State at the time of the study**.**

Inclusion criteria: All pupils enrolled in the primary section of the school during the 2023/2024 academic year.

Exclusion criteria: Primary school pupils who were not in school at the time of the study.

Sampling Selection Technique: A multistage screening approach was employed.
Phase 1: All the primary school pupils went through the first screening using the child's history of ear pain, discomfort, or hearing impairment and the teachers' identification of children with poor responses to audible signals. The questions asked were; anyone showing signs of ear impairment, anyone having ear pain, and anyone with an ear discharge.
Phase 2: All pupils identified from phase 1 had their history taken and ear examination including otoscopy done by the resident doctors.

Data Collection Methods:
In the first phase of screening, schoolteachers played a key role after receiving training on the basics of ear diseases and hearing impairments, including how to recognize signs of these conditions in children. The pupils identified were then referred to doctors for the second phase of screening, ensuring a more focused and informed medical assessment. The second phase of the screening exercise was carried out by the resident doctors in the Department of Public Health and supervised by the Otolaryngologists. Residents who did the otoscopic examinations were trained on proper usage and interpretation of findings from the otoscope before the screenings. Resident doctors took the history from all the students identified by the teachers and then performed ear examinations including otoscopy.

The age and classes of all the pupils with ear or hearing disorders were collected and the pupils were referred for appropriate follow-up management at the Ear, Nose and Throat (ENT) clinic of FMC Asaba with parental involvement.

Plans for Data Management:

Data Analysis:

The data collated was screened for completeness by the researchers, coded, and entered in IBM Statistical Product and Service Solutions (SPSS) version 22.0 software. Data for continuous variables like age were grouped into intervals. All data such as age interval, sex, class grade, and ear conditions identified were expressed in frequency and proportions in tables and graphs. Bivariate analysis to determine the significance of the pupils' age, sex, and class on their ear conditions was done.The level of significance was set at 0.05.

Research Outcome:

The primary outcome of this research is to determine the outcome of ear assessments among primary school students at Uzoigwe Primary School, Asaba, Delta State.

Ethical Considerations:

Informed assent was obtained from participants and consent from their legal guardians and the school authority. Confidentiality and privacy of participants were ensured throughout the research process. Participants were also informed of their right to withdraw from the study at any point without consequences.

Ethical approval was also obtained from the Research and Ethics Committee of FMC, Asaba.

3.0 RESULTS

Nine hundred and sixty-nine (969) pupils took part in the first phase of the screening done by the teachers from which 76 pupils were identified and brought for further assessment to undergo the second phase carried out by the doctors. At the end of Phase 2, 20 pupils were eventually identified to have various ear impairments, and they were given letters to be given to their parents for referral ENT clinic at FMC, Asaba.

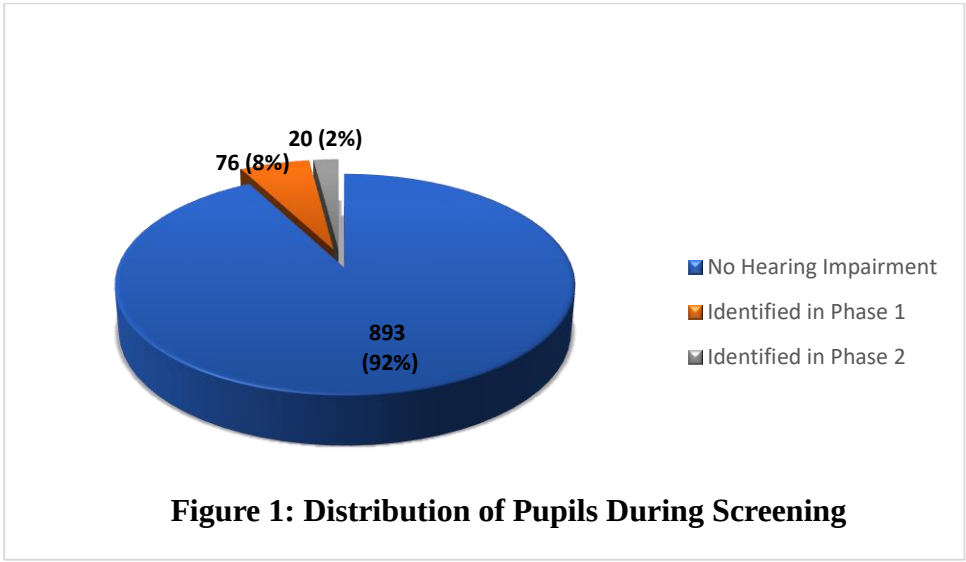

Figure 1: Distribution of Pupils During Screening

Figure 1 shows the distribution of the pupils during the screening. In Phase 1, 92% (893) of the pupils were found to have no hearing or ear impairment. In Phase 2, the remaining 8% (76) of pupils were screened, and eventually only 20 (2%) of the pupils were identified with ear/ hearing impairment.

Table 1: Pattern of ear/ hearing impairment identified at Uzoigwe N/P School

Ear/ hearing impairment	Frequency	Percent
Otalgia	11	55.0
Acute Otitis Media (AOM)	3	15.0

Chronic Suppurative Otitis Media (CSOM)	2	10.0
Hearing Impairment	2	10.0
Cerumen Impaction	1	5.0
Tinnitus	1	5.0

Table 1 shows the pattern of ear/hearing impairment identified at the Uzoigwe Nursery and Primary School, Asaba during the screening exercise. Across the sample, various ear/hearing issues such as acute otitis media, chronic suppurative otitis media, hearing impairment, otalgia, cerumen impaction, and tinnitus were identified. The leading impairment was otalgia (55%), followed by acute otitis media (15%), while there were only singular cases (5%) of cerumen impaction and tinnitus.

Table 2: Association between the age, sex, and class of pupils and their Ear/Hearing Impression

Variable	**Screening Impression**						***LR***	**p-value**
	Acute Otitis Media n (%)	**Chronic Suppurative Otitis Media n (%)**	**Hearing Impairment n (%)**	**Otalgia n (%)**	**Cerumen Impaction n (%)**	**Tinnitus n (%)**		
Age (years)							7.434	0.684
< 10	1 (50.0)	0 (0.0)	0 (0.0)	1 (50.0)	0 (0.0)	0 (0.0)		
10 – 14	1 (5.9)	2 (11.8)	2 (11.8)	10 (58.8)	1 (5.9)	1 (5.9)		
15 – 19	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)		
Sex							7.658	0.176
Male	1 (14.3)	2 (28.6)	0 (0.0)	4 (57.1)	0 (0.0)	0 (0.0)		
Female	2 (15.4)	0 (0.0)	2 (15.4)	7 (53.8)	1 (7.7)	1 (7.7)		
Class							8.230	0.606
Pry 3	1 (16.7)	1 (16.7)	1 (16.7)	3 (50.0)	0 (0.0)	0 (0.0)		
Pry 5	1 (14.3)	0 (0.0)	1 (14.3)	5 (71.4)	0 (0.0)	0 (0.0)		
Pry 6	1 (14.3)	1 (14.3)	0 (0.0)	3 (42.9)	1 (14.3)	1 (14.3)		

Table 3 shows the distribution of the various ear conditions across the pupils' ages, sex, and class. It also shows the level of significance of the association between these variables. Otalgia (ear pain) was the most frequently reported condition, especially among the 10–14 age group (58.8%). Pupils under 10 years experienced acute otitis media and otalgia while chronic suppurative otitis media, hearing impairment, cerumen impaction and tinnitus were not experienced by pupils in this age group. The 10–14 age group exhibited a broader range of conditions, including otitis media, hearing impairment, otalgia, cerumen impaction, and tinnitus. In the 15–19 age group, only acute otitis media was observed. Cases of chronic suppurative otitis media, hearing impairment, otalgia, cerumen impaction, and tinnitus were not identified in this age group.

Both males and females showed similar distributions of otalgia, though chronic suppurative otitis media was more common in males. Females exhibited more proportion with hearing impairment, cerumen impaction, and tinnitus. The prevalence of conditions varied slightly across classes, with primary 5 showing the highest rate of otalgia (71.4%). Primary 6 recorded cerumen impaction and tinnitus in addition to otalgia and otitis media. However, there was no statistically significant association between age, sex, or class and the occurrence of ear/hearing conditions, as indicated by the p-values (0.684, 0.176, and 0.606, respectively).

4.0 DISCUSSION

This study highlights the effectiveness of a two-tier screening process in detecting ear and hearing impairments. The large proportion of pupils cleared during Phase 1 (92%) reflects the low prevalence of ear/hearing issues in the study population while the focused assessment in Phase 2 allowed for accurate diagnosis and referral of the remaining 2%. The identification of pupils with ear/hearing conditions, although relatively low, emphasizes the importance of routine screenings in school settings. Early identification is crucial for timely medical intervention, which can help prevent long-term consequences such as speech delay, learning difficulties, and social isolation. The

low yield of the study may be because only one school was involved in the screening and it was only the point prevalence measure as other studies had a varied record of as low as 6% and as high as 60% yield in multi-school and periodic studies (Akande & Adeosun, 2020; Kaspar *et al.*, 2018; Olajuwon *et al.*, 2018; Adegbiji *et al.*, 2018).
The study reveals that ear and hearing issues, particularly otalgia, are prevalent among schoolchildren but do not appear to have significant associations with age, sex, or class. Otalgia can be primarily due to ear-related issues like infection or eustachian tube dysfunction, or it may be referred from another source, like teeth or throat problems. This suggests a significant proportion of the population may experience discomfort potentially due to infection or other ear-related issues or pain referred from another non-ear source.
Acute Otitis Media (AOM) and Chronic Suppurative Otitis Media (CSOM) are significant due to their potential to cause hearing loss if left untreated (Akande & Adeosun, 2020). These conditions are among the most common ear diseases identified in primary school children, both in Nigeria and internationally (Kaspar *et al.*, 2018; Adegbiji *et al.*, 2018). Research has shown a strong link between these conditions and children from low socioeconomic backgrounds, likely due to hygiene and environmental factors associated with their living conditions (Eziyi *et al.*, 2018). Hearing impairment, although observed in only 10% of cases, underscores the risk of long-term sensory deficits. Even mild hearing loss can disrupt a child's educational progress and overall development. Similarly, the less frequent occurrences of cerumen impaction and tinnitus still deserve attention, as they can also impair hearing and negatively impact quality of life. While otalgia was the most prevalent condition across all groups, the diverse range of other ear issues, such as hearing impairment and CSOM, emphasizes the need for enhanced screening and preventive strategies in schools to promote early detection and intervention.
The absence of statistically significant associations (p-values > 0.05) suggests that the occurrence of these conditions may be influenced by other factors not captured in this analysis, such as environmental or genetic factors. However, the small sample size in some categories (e.g., age groups under 10 and 15–19) could have limited the power to detect significant differences. Future studies should aim for larger, more diverse samples to explore these associations more robustly.

5.0 CONCLUSION

In conclusion, this study demonstrates the effectiveness of a two-tier screening process in identifying ear and hearing impairments among schoolchildren. Although the overall prevalence was low, conditions like otalgia, acute otitis media, and chronic suppurative otitis media were identified, highlighting the importance of routine school-based screenings. These screenings enable early intervention, preventing long-term issues such as hearing loss, speech delays, and learning difficulties. While no significant demographic associations were found, future research with larger, more diverse populations (more schools) is needed to explore socioeconomic and environmental factors further. Nonetheless, the study emphasizes the critical role of regular screenings in promoting ear health and supporting children's educational and social development.

RECOMMENDATION

Implement Routine Ear Health Screening in Schools: It is recommended that regular ear assessments be incorporated into the school health programs. Early detection of hearing impairments can prevent long-term academic and social difficulties, improving overall pupil well-being.

Increase Awareness among Teachers and Parents: Teachers and parents should be educated on the signs of hearing impairments and ear health issues. Training sessions and awareness campaigns could help in the early identification of potential problems, enabling timely intervention.

Establish Supportive Interventions for Affected Pupils: Children identified with hearing impairments should be given access to appropriate academic accommodations, such as hearing aids, specialized teaching strategies, or speech therapy, to support their learning and development.

Promote Long-Term Follow-Up and Support: After initial assessments, follow-up programs should be developed to ensure that pupils with ear issues receive continuous care. This can include regular check-ups and adjustments to interventions based on their evolving needs.

Encourage Policy Change for School-Based Health Services: Governments and educational authorities should consider enacting policies that mandate ear health screening and ensure that resources are allocated for early detection and treatment of hearing impairments in schools. These recommendations aim to improve ear health outcomes among primary school pupils, fostering a supportive learning environment where every child can thrive academically and socially.

LIMITATION

Sampling Bias: The data collected through questionnaires from teachers might be influenced by subjective opinions or misinterpretations of ear health signs by these teachers. This could lead to underreporting or misidentification of hearing problems among pupils.

Variability in Academic Performance: Academic performance is influenced by various factors beyond ear health, such as socio-economic status, cognitive abilities, and family support. Isolating the impact of hearing impairments on academic achievement may be challenging due to these confounding variables. Despite these limitations, the research will provide valuable insights into the prevalence and impact of ear health issues among primary school pupils, contributing to the development of more effective interventions.

CONFLICT OF INTERESTS

The researchers involved in this study on the outcomes of ear assessments among primary school pupils declare no conflicts of interest. The study is independent, with no financial, personal, or professional relationships that could bias the design, execution, or interpretation of the research. The research was conducted impartially and aims to provide objective and unbiased findings that were presented objectively and without influence from external parties.

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