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Prevalence and Etiological Findings of Hearing Impairment in Primary School Children in Kut City, Wasit Province, Iraq

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معدل انتشار وأسباب ضعف السمع لدى تلاميذ المدارس الابتدائية في مدينة الكوت، محافظة واسط، العراق

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Abstract:
Hearing impairment is an under-recognized problem in school-aged children that can affect speech, language, learning and social integration, and Iraqi data are scarce. This study aimed to estimate the prevalence of hearing impairment among primary school children in central Kut City and to describe the associated otological findings. This cross-sectional study included 841 children aged 7 to 12 years from four purposively selected government primary schools. Parents completed a self-constructed questionnaire, and all children underwent tuning-fork testing; those with a positive result underwent otoscopy, pure-tone audiometry in a sound-isolated room and tympanometry. Hearing impairment was defined as a pure-tone average (500 to 4000 Hz) greater than 30 dB HL in either ear, and children with wax or otitis media with effusion (OME) were retested one week after treatment. Hearing impairment was confirmed in 138 children (16.4%; 95% CI 14.1 to 19.1). Prevalence was higher in boys than in girls (30.99% vs 11.46%; $p < 0.001$), a difference that persisted after excluding the girls-only school, and varied between schools (12.7% to 35.3%; $p < 0.001$). Cerumen impaction accounted for 46.4% of cases, OME for 29.7% and sensorineural hearing loss (SNHL) for 22.5%. Hearing returned to normal after treatment in all children with reversible causes, leaving persistent SNHL in 3.7% of children (95% CI 2.6 to 5.2), with similar rates in both sexes. Most hearing impairment in these schools was due to reversible conditions, supporting school-based otological screening with audiometry and a clear referral pathway, although the purposive four-school sample limits generalization.

Keywords: Hearing impairment; Primary school children; Cerumen impaction; Otitis media with effusion; Sensorineural hearing loss.

الملخص
تُعدّ إعاقة السمع مشكلةً لا تحظى بالاهتمام الكافي لدى الأطفال في سن المدرسة، حيث يمكن أن تؤثر على النطق واللغة والتعلم والاندماج الاجتماعي، كما أن البيانات المتاحة حول هذا الموضوع في العراق شحيحة.

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هدفت هذه الدراسة إلى تقدير معدل انتشار إعاقة السمع بين تلاميذ المدارس الابتدائية في وسط مدينة الكوت، ووصف النتائج السريرية المتعلقة بالأذن. شملت هذه الدراسة المقطعية 841 طفلاً تتراوح أعمارهم بين 7 و12 عاماً، تم اختيارهم من أربع مدارس ابتدائية حكومية بطريقة العينة القصدية. قام أولياء الأمور بتعبئة استبيان أُعدّ خصيصاً لهذا الغرض، وخضع جميع الأطفال لاختبار الشوكة الرنانة؛ أما من كانت نتائجهم إيجابية، فقد خضعوا لفحص الأذن (تنظير الأذن)، واختبار السمع بالنغمات النقية في غرفة معزولة صوتياً، واختبار قياس ضغط الأذن (*tympanometry*). عُرّفت إعاقة السمع بأنها متوسط عتبة السمع للنغمات النقية (بين 500 و4000 هرتز) الذي يتجاوز 30 ديسيبل في أي من الأذنين. كما أُعيد فحص الأطفال الذين وُجد لديهم تراكم في الشمع أو التهاب الأذن الوسطى الارتشاحي (*OME*) بعد أسبوع من تلقي العلاج. تبيّن وجود إعاقة سمعية لدى 138 طفلاً (بنسبة 16.4%؛ فاصل ثقة 95%: 14.1 - 19.1). كان معدل الانتشار أعلى لدى الذكور مقارنة بالإناث (30.99% مقابل 11.46%؛ قيمة $p < 0.001$ - وهو فارق ظل قائماً حتى بعد استبعاد المدرسة المخصصة للإناث فقط - كما تباينت النسب بين المدارس (من 12.7% إلى 35.3%؛ قيمة $p < 0.001$). شكّل تراكم الشمع 46.4% من الحالات، والتهاب الأذن الوسطى الارتشاحي 29.7%، بينما كان فقدان السمع الحسي العصبي (*SNHL*) مسؤولاً عن 22.5% من الحالات. وبعد تلقي العلاج، استعاد جميع الأطفال الذين عانوا من أسباب قابلة للعلاج سمعهم الطبيعي، في حين بقي فقدان السمع الحسي العصبي مستمراً لدى 3.7% من الأطفال (فاصل ثقة 95%: 2.6 - 5.2)، مع تقارب النسب بين الجنسين. ونظراً لأن معظم حالات إعاقة السمع في هذه المدارس كانت ناجمة عن أسباب قابلة للعلاج، فإن النتائج تدعم إجراء فحوصات سمعية في المدارس باستخدام اختبارات قياس السمع، مع توفير مسار واضح لإحالة الحالات؛ ومع ذلك، تجدر الإشارة إلى أن الاعتماد على عينة قصدية من أربع مدارس فقط يحدّ من إمكانية تعميم النتائج.

الكلمات المفتاحية: ضعف السمع؛ تلاميذ المدارس الابتدائية؛ الصملاخ (شمع الأذن)؛ التهاب الأذن الوسطى الارتشاحي؛ فقدان السمع الحسي العصبي؛ الفحص المدرسي؛ العراق.

Introduction

The ability to communicate is a very essential aspect of living. Auditory system is most essential for communication and indispensable for mental and linguistic development. Hearing impairment is said to be present when there is difficulty in hearing conversational speech or identifying most sounds (World Health Organization [WHO], 2006). Adequate hearing is one of the main factors for good psychosocial development, by which individuals may express their thoughts, feelings, and wishes, and acquire life experience and knowledge (Kumar et al., 2019). Hearing is essential for communication and for speech, language and cognitive development. Hearing loss is among the most common disabilities worldwide and is often called a hidden disability (WHO, 2024). The WHO estimates that over 5% of the world's population lives with disabling hearing loss, including about 34 million children, and that most affected people live in low- and middle-income countries. For children, disabling hearing loss is defined as a loss greater than 30 dB in the better hearing ear (WHO, 2021).

Children with hearing impairment often have delayed speech and language development, which may lead to slower learning and difficulty progressing at school (Byrne et al., 2012). Even mild losses can affect educational performance (Eisenberg et al., 2012; Islam et al., 2012; Sekhar et al., 2013). Congenital hearing loss affects an estimated 4 to 6 per 1000 live births in developing countries (Olusanya & Newton, 2007), and middle ear disease is very common in childhood and is a frequent cause of reversible hearing loss (Elahi et al., 1998; Fiellau-Nikolajsen, 1983). Many causes of childhood hearing impairment, such as wax impaction and otitis media with effusion, are preventable or treatable when detected early.

Because ear disease often develops insidiously, children in disadvantaged communities may go unrecognized for long periods. Schools offer a practical setting for screening. Published data on childhood hearing impairment in Iraq are limited. We therefore aimed to estimate the

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prevalence of hearing impairment among primary school children in central Kut and to describe the associated otological findings.

Material and methods

Study design and setting

This cross-sectional study was conducted from January to May 2025 in central Kut City, Wasit Province, Iraq, and is reported in line with the STROBE checklist. Four government primary schools (three co-educational and one girls-only) were purposively selected to represent different parts of the city: two in the city center, one in the north and one in the south, with two schools in high-income and two in low-income areas. Schools A and C (high income) are in the city center, school B (low income) is in the north and school D (low income, girls only) is in the south. The schools were not randomly selected. All children in the four schools were invited to participate. A total of 841 children aged 7 to 12 years (first to sixth grade) were included. The four schools are referred to as A to D.

Screening questionnaire

Parents completed an Arabic questionnaire about their child's hearing before the school visit, so that examination could concentrate on children with possible hearing loss. The questionnaire was constructed by the authors on the basis of previous studies (Islam et al., 2012; Mann et al., 1998; Sapra et al., 2015); it was not formally validated.

Clinical and audiological assessment

All children underwent tuning-fork testing by Rinne and Weber, with a 256 and 512 Hz fork. Children with a tuning-fork result suggesting hearing loss underwent otoscopy to assess the external auditory canal and tympanic membrane, pure-tone audiometry using an Interacoustics AD629 audiometer (manufactured 2023) in a sound-isolated room, and tympanometry using an Oscilla TSM 500. Children whose tuning-fork test was normal did not undergo audiometry. Air-conduction thresholds were measured at 500, 1000, 2000 and 4000 Hz. Hearing impairment was defined as a pure-tone average of the four frequencies greater than 30 dB HL in either ear; all 138 cases met this definition. The ambient noise level of the room was not measured.

Findings were classified as follows: cerumen impaction when wax obstructing the canal was seen on otoscopy; otitis media with effusion on the basis of otoscopic findings and a tympanogram type A; foreign body when seen on otoscopy; and sensorineural hearing loss (SNHL) when both air- and bone-conduction thresholds exceeded 30 dB HL with an air-bone gap of less than 10 dB. Bone-conduction thresholds were measured with the AD629. Children with cerumen impaction or OME were retested after wax removal or treatment of OME (intranasal decongestant and steroid). Retesting was done one week after treatment.

Ethical considerations

Permission was obtained from the Wasit Directorate of Education, the school administrations and the children's families. The study was approved by Human/Animal Research Ethics Committee (H/AREC) at Wasit University. Children with abnormal findings were informed to their families and advised to seek further assessment; no formal follow-up was undertaken.

Statistical analysis

Data were analyzed using SPSS version 26. Categorical variables are presented as frequencies and percentages, and prevalence is given with 95% confidence intervals (Wilson method). The chi-square test was used to compare proportions between groups, and $p < 0.05$ was considered significant. Etiology-specific prevalence by sex was calculated using all examined children of each sex as the denominator. Differences in prevalence between schools were tested using the chi-square test, and the sex comparison was repeated after excluding the girls-only school. A trend across age groups was tested with the chi-square test for trend. Because children are clustered in only four schools, confidence intervals treat children as independent and are therefore likely to be too narrow.

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Results and discussion

Study population and overall prevalence

The study included 841 children, 628 girls (74.7%) and 213 boys (25.3%), aged 7 to 12 years (mean 9.19, SD 1.51 years). The sex imbalance reflects the inclusion of one girls-only school (school D, 425 girls). **Table 1** shows the schools.

Table 1. Children examined and hearing impairment by school.

School	Setting	Children (boys/girls)	Cases, n (%)	95% CI	Wax	OME	SNHL	Other
A	High income, center	165 (85/80)	32 (19.4%)	14.1–26.1	10	12	9	1[a]
B	Low income, north	85 (45/40)	30 (35.3%)	26.0–45.9	23	2	5	0
C	High income, center	166 (83/83)	22 (13.3%)	8.9–19.3	7	10	4	1[b]
D	Low income, south, girls only	425 (0/425)	54 (12.7%)	9.9–16.2	24	17	13	0
Total		841 (213/628)	138 (16.4%)	14.1–19.1	64	41	31	2

OME, otitis media with effusion; SNHL, sensorineural hearing loss. [a]Wax with OME; [b]aural foreign body.

Hearing impairment was confirmed in 138 children, an overall prevalence of 16.41% (95% CI 14.1 to 19.1). Prevalence was 30.99% in boys (66/213; 95% CI 25.2 to 37.5) and 11.46% in girls (72/628; 95% CI 9.2 to 14.2) (chi-square 42.8, df = 1, $p < 0.001$). Because the girls-only school contributes 425 of the 628 girls, we repeated the comparison within the three co-educational schools: 66 of 213 boys (30.99%) versus 18 of 203 girls (8.9%; 95% CI 5.7 to 13.6) had hearing impairment (chi-square 31.6, df = 1, $p < 0.001$). The sex difference therefore persists within co-educational schools, although case counts by sex for each individual school were not available.

Prevalence differed significantly between schools (chi-square 28.6, df = 3, $p < 0.001$), from 12.7% in school D to 35.3% in school B, where wax impaction accounted for 23 of 30 cases. Prevalence was similar in high-income schools (54/331, 16.3%) and low-income schools (84/510, 16.5%).

Etiological findings

Cerumen impaction was the most frequent finding (64 children, 46.38% of cases), followed by OME (41, 29.71%) and SNHL (31, 22.46%). One child had wax with OME and one had an aural foreign body (0.72% each). **Table 2** shows the findings by sex as a proportion of all children of each sex.

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Table 2. Otological findings among children with hearing impairment, by sex

Finding	Girls, n (% of 628)	Boys, n (% of 213)	Total, n (% of cases)	p (girls vs boys)
Cerumen impaction	32 (5.10%)	32 (15.02%)	64 (46.38%)	< 0.001
OME	16 (2.55%)	25 (11.74%)	41 (29.71%)	< 0.001
SNHL	23 (3.66%)	8 (3.76%)	31 (22.46%)	0.95
Wax + OME	1 (0.16%)	0	1 (0.72%)	Not tested
Foreign body	0	1 (0.47%)	1 (0.72%)	Not tested
All hearing impairment	72 (11.46%)	66 (30.99%)	138 (100%)	< 0.001

Denominators for girls and boys are all examined children of each sex. OME, otitis media with effusion; SNHL, sensorineural hearing loss.

Among the three main categories, the distribution of findings among affected children differed by sex (chi-square 8.99, df = 2, p = 0.011; the two single-case categories were excluded). When expressed relative to the whole sample, this difference was due to the higher prevalence of wax and OME in boys, whereas SNHL prevalence was practically identical in boys and girls.

Retest after treatment

On retest one week after treatment, hearing returned to normal (30 dB HL or better) in all children with cerumen impaction, OME, wax with OME or an aural foreign body. Persistent hearing impairment was therefore present in the 31 children with SNHL, 3.7% of all children examined (95% CI 2.6 to 5.2).

Age distribution

Table 3 shows cases and prevalence by age (age was not recorded for one non-affected child, so age-specific denominators total 840). Prevalence was highest at 11 years (32.7%), followed by 9 years (20.1%), and lowest at 12 years (5.7%). Prevalence differed between age groups (chi-square 30.8, df = 5, p < 0.001) but without a linear trend (p = 0.45). Age is closely tied to school in this sample: children aged 11 and 12 years came only from schools B and D, and school B had both the highest prevalence overall (50% at age 11, 15/30) and many 11-year-olds. The age pattern therefore cannot be separated from the school effect.

Table 3. Cases and prevalence by age and finding

Age (years)	Wax	OME	SNHL	Wax + OME	Foreign body	Total cases	Children in age group	Prevalence
7	5	8	6	1	0	20	138	14.5%
8	12	8	3	0	0	23	168	13.7%
9	21	7	7	0	0	35	174	20.1%
10	10	9	4	0	0	23	189	12.2%
11	14	9	9	0	1	33	101	32.7%
12	2	0	2	0	0	4	70	5.7%
Total	64	41	31	1	1	138	840	16.43%

Age was not recorded for one non-affected child. OME, otitis media with effusion; SNHL, sensorineural hearing los

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Discussion

In this school-based study from central Kut, the prevalence of hearing impairment (greater than 30 dB HL in either ear) was 16.4% among children aged 7 to 12 years. Most cases were associated with wax impaction or OME, which are common and treatable, and hearing returned to normal after treatment in all of these children. The persistent hearing loss was therefore the sensorineural loss in 3.7% of children (31/841). Because audiometry was performed only in children with a positive tuning-fork test, children with hearing loss who screened negative would have been missed, so the true prevalence may be higher. The four schools were purposively chosen and are not a random sample of Kut, so the figure describes these schools and cannot be generalized to the whole city.

Reported prevalence in school-age children varies widely, from 1.86% in China (Chen et al., 2011) and about 5% in Mozambique (Clark, 2008) to 8.8% in rural India (Kumar et al., 2019), 17.9% to 19.56% in other Indian studies (Mann et al., 1998; Parvez et al., 2016), 20.1% in Egypt (Taha et al., 2010) and 31.91% in Jaipur, India (Sapra et al., 2015). Our estimate lies within this range, putting in mind the different policies of early school screening between different countries.

Hearing impairment was more frequent in boys (30.99%) than in girls (11.46%), consistent with some studies (Abdel-Hamid et al., 2007; Hapunda et al., 2020; Tahir et al., 2011), whereas others found no association with sex (Kumar et al., 2019; Parvez et al., 2016). The difference persisted when the girls-only school was excluded (30.99% in boys vs 8.9% in girls in the co-educational schools), so it is not explained by that school alone. It should still be treated with caution, because the number of boys was small (213) and prevalence varied widely between schools (12.7% to 35.3%); a school-level analysis by sex was not possible. Differences in how parents of boys and girls completed the questionnaire could also contribute. When findings were expressed per child examined, the excess in boys was driven by wax (15.0% vs 5.1%) and OME (11.7% vs 2.6%), while SNHL was equally frequent in both sexes (3.7% vs 3.8%). Earlier comparisons of etiology by sex are scarce, and two studies found no association (Abdel-Hamid et al., 2007; Jalali et al., 2020).

Cerumen impaction was the most common finding (46.4% of cases), similar to the roughly 45% reported in other school studies (Hapunda et al., 2020; Kumar et al., 2019; Olusanya et al., 2000), whereas a Saudi study found 12% in a sample that included older children (Afaf et al., 2001). Wax and OME are reversible, and early identification offers an opportunity to restore hearing through simple treatment. The SNHL rate (3.7% of all children) is higher than expected from international school data; this may partly reflect the screening approach and the testing environment, and cannot be explained further in the absence of data on risk factors such as perinatal history, ototoxic drug exposure, family history or consanguinity.

Prevalence was highest at 11 years (32.7%) and lowest at 12 years (5.7%), with no linear trend. Other studies reported higher prevalence at 8 to 10 years (Chundathodi & John, 2016) or an association with age (Abdel-Hamid et al., 2007), while some found none (Hapunda et al., 2020; Kumar et al., 2019; Parvez et al., 2016). In our sample the 11-year-olds came from only two schools, one of which had the highest prevalence, so this age pattern may reflect school differences, and the small group at age 12 (n = 70, from one school) limits interpretation.

Strengths and limitations

Strengths include audiometric confirmation of every reported case, the use of tympanometry, examination in a sound-isolated room, and retesting of children with wax or OME after treatment. Limitations are as follows. First, only children with a positive tuning-fork test underwent audiometry, so children with hearing loss missed by tuning-fork testing, which is less sensitive for mild loss, were not detected, and its sensitivity here is unknown. Second, the four schools were purposively rather than randomly selected, the sample has a marked sex imbalance, only four schools were included, and confidence intervals do not account for

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clustering by school. Third, data were collected between January and May, a period when upper respiratory infections and OME are more frequent, which may inflate the prevalence of reversible causes. Fourth, the questionnaire was self-constructed and not formally validated. Fifth, ambient room noise was not measured. Sixth, risk factors were not collected, so this study describes associated findings and cannot establish causes. Seventh, there was no formal referral pathway or follow-up of affected children.

Conclusion

About one in six primary school children in the screened sample had hearing impairment, mostly due to wax impaction and OME, which are treatable and resolved after treatment, leaving persistent sensorineural hearing loss in 3.7% of children. Boys had a higher prevalence of wax and OME in this sample, including within the co-educational schools, although this needs confirmation in a larger sample balanced by sex and school. School-based otological screening, including audiometry and tympanometry, together with a clear referral pathway and health education for children, parents and teachers, could help identify these children earlier. Larger, multi-school studies that also test screen-negative children are needed to confirm these findings.

Based on these findings, school-based otological screening that includes otoscopy, tympanometry and audiometry, with a defined referral and follow-up pathway, should be considered; awareness of ear and hearing care should be raised among parents, teachers and school authorities, including at parent-teacher meetings; and larger multi-school studies with representative sampling should evaluate screen-negative children and collect risk-factor data.

References

[1] Abdel-Hamid, O., Khatib, O. M. N., Aly, A., Morad, M., & Kamel, S. (2007). Prevalence and patterns of hearing impairment in Egypt: A national household survey. *Eastern Mediterranean Health Journal, 13*(5), 1170–1180.

[2] Afaf, H. B., Tarek, S. J., Fatma, H. A., Daghistani, K. J., & Zakzouk, S. M. (2001). Hearing impairment and occluding wax in Saudi Arabian children: A cross-sectional study. *Bahrain Medical Bulletin, 23*(1), 16–20.

[3] Byrne, D. C., Themann, C. L., Meinke, D. K., Morata, T. C., & Stephenson, M. R. (2012). Promoting hearing loss prevention in audiology practice. *Perspectives on Public Health Issues Related to Hearing and Balance, 13*(1), 3–19.

[4] Chen, Y., Li, X., Xu, Z., Li, Z., Zhang, P., He, Y., Wang, F., & Qiu, J. (2011). Ear diseases among secondary school students in Xi'an, China: The role of portable audio device use, insomnia and academic stress. *BMC Public Health, 11*, Article 445. https://doi.org/10.1186/1471-2458-11-445

[5] Chundathodi, A., & John, H. G. M. (2016). Prevalence of hearing impairment in a rural primary school in Kerala. *Journal of Evidence Based Medicine and Healthcare, 3*(74), 4018–4020. https://doi.org/10.18410/jebmh/2016/858

[6] Clark, J. L. (2008). Hearing loss in Mozambique: Current data from Inhambane Province. *International Journal of Audiology, 47*(Suppl. 1), S49–S56. https://doi.org/10.1080/14992020802291723

[7] Eisenberg, L. S., Johnson, K. C., Martinez, A. S., Dumont, V. L., Ganguly, D. H., & Still, J. F. (2012). Studies in pediatric hearing loss at the House Research Institute. *Journal of the American Academy of Audiology, 23*(6), 412–421.

[8] Elahi, M. M., Elahi, F., Elahi, A., & Elahi, S. B. (1998). Pediatric hearing loss in rural Pakistan. *Journal of Otolaryngology, 27*, 348–353.

[9] Fiellau-Nikolajsen, M. (1983). Tympanometric prediction of the magnitude of hearing loss in preschool children with secretory otitis media. *Scandinavian Audiology, 17*, 68–72.

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[10] Hapunda, R. K., Aswani, J., Kipingor, M., & Munthali, J. (2020). Prevalence of hearing loss in primary school children in Lusaka, Zambia. *Medical Journal of Zambia, 47*(2), 91–97. https://doi.org/10.55320/mjz.47.2.85

[11] Islam, M. A., Islam, M. S., Sattar, M. A., & Ali, M. I. (2012). Prevalence and pattern of hearing loss. *Medicine Today, 23*(1), 18–21. https://doi.org/10.3329/medtoday.v23i1.11939

[12] Jalali, M. M., Nezamdoust, F., Ramezani, H., & Pastadast, M. (2020). Prevalence of hearing loss among school-age children in the north of Iran. *Iranian Journal of Otorhinolaryngology, 32*(109), 85–92. https://doi.org/10.22038/ijorl.2019.36090.2191

[13] Kumar, S., Aramani, A., Mathew, M., Bhat, M., & Rao, V. V. (2019). Prevalence of hearing impairment amongst school going children in the rural field practice area of the institution. *Indian Journal of Otolaryngology and Head & Neck Surgery, 71*(Suppl. 2), 1567–1571. https://doi.org/10.1007/s12070-019-01651-9

[14] Mann, S. B. S., Sharma, S. C., Gupta, A. K., Nagarkar, A. N., & Dharamvir. (1998). Incidence of hearing impairment among rural and urban school going children: A survey. *Indian Journal of Pediatrics, 65*, 141–145.

[15] Olusanya, B. O., & Newton, V. E. (2007). Global burden of childhood hearing impairment and disease control priorities for developing countries. *The Lancet, 369*(9569), 1314–1317. https://doi.org/10.1016/S0140-6736(07)60602-3

[16] Olusanya, B. O., Okolo, A. A., & Ijaduola, G. T. (2000). The hearing profile of Nigerian school children. *International Journal of Pediatric Otorhinolaryngology, 55*(3), 173–179.

[17] Parvez, A., Siddiqui, A. R., Khan, Z., Hashmi, S. F., & Khan, M. S. (2016). Prevalence of hearing impairment among primary school children in rural and urban areas of Aligarh, Uttar Pradesh, India. *International Journal of Community Medicine and Public Health, 3*(5), 1273–1277. https://doi.org/10.18203/2394-6040.ijcmph20161397

[18] Sapra, G., Srivastava, S. P., Modwal, A., Saboo, R., Saxena, G., & Gyanu, J. (2015). Hearing assessment of school going children of various schools in Jaipur, Rajasthan. *Scholars Journal of Applied Medical Sciences, 3*(2B), 638–645.

[19] Sekhar, D. L., Zalewski, T. R., & Paul, I. M. (2013). Variability of state school-based hearing screening protocols in the United States. *Journal of Community Health, 38*(3), 569–574.

[20] Taha, A. A., Pratt, S. R., Farahat, T. M., Abdel-Rasoul, G. M., Albtanony, M. A., Elrashiedy, A. E., Alwakeel, H. R., & Zein, A. (2010). Prevalence and risk factors of hearing impairment among primary-school children in Shebin El-Kom District, Egypt. *American Journal of Audiology, 19*(1), 46–60. https://doi.org/10.1044/1059-0889(2010/09-0030)

[21] Tahir, H., Abdullah, A., & Muhammad, R. (2011). Prevalence of hearing impairment in school children. *International Journal of Health Sciences (Qassim), 5*(2), 46–48.

[22] World Health Organization. (2006). *Primary ear and hearing care training resource: Trainer's manual, intermediate level*. World Health Organization.

[23] World Health Organization. (2021). *World report on hearing*. World Health Organization.

[24] World Health Organization. (2024). *Deafness and hearing impairment* [Fact sheet]. World Health Organization.

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