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Review Article

Prevalence of Hearing Loss in Children: A Systematic Review

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ABSTRACT

Background: Hearing loss in childhood is a significant public health concern because it may affect speech perception, language development, classroom participation, academic achievement, and psychosocial wellbeing. School-based screening provides an important opportunity for early detection, particularly in settings where routine audiological services are limited. Objective: To synthesize evidence on the prevalence, types, and commonly reported otological contributors of hearing loss among school-going children. Methods: A systematic review with narrative synthesis was conducted using PubMed/MEDLINE, Scopus, and Google Scholar, supplemented by reference-list searching. Observational studies reporting hearing-loss prevalence among school-going children were included. Clinical subgroup studies were interpreted separately from general school-screening populations. Due to heterogeneity in audiometric thresholds, screening procedures, and case definitions, meta-analysis was not performed. Results: Eleven studies were included in the qualitative synthesis. Reported prevalence among general school-screening populations ranged from 2.4% to 21%, with most estimates clustering between approximately 5% and 12%. Conductive hearing loss was the predominant type where classification was reported. In Nepal, conductive hearing loss accounted for 70.47% of identified cases, while sensorineural and mixed hearing loss accounted for 25% and 3.84%, respectively. Commonly reported contributors included cerumen impaction, otitis media, chronic suppurative otitis media, and tympanic membrane abnormalities. Conclusion: Hearing loss among school-going children remains clinically important and is frequently associated with preventable or treatable conductive causes. Standardized school-based screening protocols, clear threshold reporting, diagnostic confirmation, and timely referral pathways are needed to reduce avoidable educational and social consequences. Keywords: Hearing loss; hearing impairment; school children; conductive hearing loss; otitis media; hearing screening; prevalence.

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INTRODUCTION

Hearing loss is a major global public health concern and remains one of the most common sensory impairments affecting children worldwide. Its impact during childhood is particularly important because auditory input is essential for speech perception, language acquisition, classroom participation, social interaction, and academic development. Even mild, unilateral, or fluctuating hearing loss may interfere with learning in noisy classroom environments and may contribute to delayed communication skills, reduced educational performance, and psychosocial difficulties if not identified and managed early (1–3).

Childhood hearing loss is generally classified as conductive, sensorineural, or mixed, depending on the anatomical site and mechanism of impairment (4). In school-aged children, conductive hearing loss is

frequently associated with preventable or treatable conditions such as cerumen impaction, otitis media, chronic suppurative otitis media, and tympanic membrane pathology. These conditions are especially relevant in low- and middle-income settings, where routine hearing screening, access to audiological services, and timely referral pathways may be limited. As a result, many children with remediable hearing problems remain undetected until educational or communication difficulties become apparent (6,8).

School-based hearing screening provides an important opportunity for early identification because it targets children during a period when hearing ability directly influences language development and academic progress. However, reported prevalence estimates among school-going children vary substantially across countries and studies. This variation may reflect genuine differences in population risk, environmental exposures, burden of middle-ear disease, and access to ear-care services, but it is also strongly influenced by methodological differences, including screening tools, audiometric thresholds, case definitions, testing environments, and whether studies report screening failure or confirmed hearing impairment (5,8).

Although several primary studies have investigated hearing loss among school-going children, the evidence remains fragmented. Many studies differ in their definitions of hearing loss, thresholds used for classification, reporting of unilateral and bilateral impairment, and description of associated otological conditions. These inconsistencies make it difficult to compare prevalence estimates directly and limit their usefulness for designing school-based screening policies. A focused synthesis of available evidence is therefore needed to clarify the reported prevalence range, identify the most commonly reported types of hearing loss, and summarize recurring preventable or treatable contributors.

Therefore, this systematic review aimed to synthesize the available evidence on the prevalence of hearing loss among school-going children and to describe the distribution of hearing-loss types, including conductive, sensorineural, and mixed hearing loss. The review also sought to summarize reported laterality and commonly associated otological findings where available. The primary outcome was the prevalence of hearing loss among school-going children as defined by each included study, while secondary outcomes included hearing-loss type, laterality, and associated ear conditions such as cerumen impaction, otitis media, chronic suppurative otitis media, and tympanic membrane abnormalities (8–18).

MATERIALS AND METHODS

This systematic review with narrative synthesis was conducted to summarize the prevalence of hearing loss among school-going children and to describe the distribution of hearing-loss types and associated otological findings. The review question was structured using a PECO framework, where the population comprised school-going children, the exposure or context was school-based hearing assessment or screening, the comparator was not mandatory because prevalence studies do not require a control group, and the outcomes were hearing-loss prevalence, type of hearing loss, laterality, and reported otological findings. A meta-analysis was not planned because substantial methodological heterogeneity was anticipated across studies, particularly in audiometric thresholds, screening procedures, case definitions, and population characteristics. The protocol was not prospectively registered; however, the review process followed a structured approach based on predefined eligibility criteria, standardized data extraction, and qualitative synthesis.

Eligible studies were observational studies reporting the prevalence of hearing loss among school-going children assessed through audiometric screening, pure tone audiometry, otoscopy, tympanometry, or other clearly described hearing assessment procedures. Studies were included if they enrolled children from school-based populations and provided sufficient numerical information to report or derive hearing-loss prevalence. Studies reporting hearing-loss type, laterality, or associated otological findings such as cerumen impaction, otitis media, chronic suppurative otitis media, or tympanic membrane

abnormalities were also considered relevant for secondary outcomes. Studies focusing exclusively on neonatal screening, preschool-only populations, syndromic congenital hearing loss, or non-school-based clinical populations were excluded from the primary prevalence synthesis. Clinical subgroup studies were considered only for descriptive secondary interpretation when they provided relevant information on hearing impairment among children with ear disease. Editorials, case reports, commentaries, and articles without sufficient numerical prevalence data were excluded. Only full-text articles available in English were included because translation resources were not available.

A comprehensive literature search was conducted using PubMed/MEDLINE, Scopus, and Google Scholar from database inception to January 2025, with the final search update completed in December 2025. Reference lists of included studies and relevant review articles were also searched manually to identify additional eligible studies. The search strategy combined terms related to hearing loss, children, school populations, and prevalence. The PubMed search string was: ("hearing loss" OR "hearing impairment" OR "hearing threshold*" OR "conductive hearing loss" OR "sensorineural hearing loss") AND (child* OR pediatric* OR paediatric* OR schoolchild* OR "school-aged") AND (school* OR "primary school" OR "secondary school" OR classroom) AND (prevalence OR epidemiology OR screening). Search results were exported to a reference manager, and duplicate records were removed before screening.

Titles and abstracts were screened independently by two reviewers according to the predefined eligibility criteria. Full-text articles were then assessed independently by the same reviewers to determine final inclusion. Any disagreement during title and abstract screening or full-text review was resolved through discussion and consensus, with consultation from a third reviewer when required. Data extraction was performed using a standardized extraction form developed before full review. Extracted variables included author name, publication year, country, study setting, study design, sampling approach, sample size, age range, hearing assessment method, audiometric threshold or case definition, prevalence of hearing loss, laterality, type of hearing loss, and reported otological findings or suspected causes.

Risk of bias was assessed independently by two reviewers using criteria appropriate for prevalence studies, including representativeness of the sample, clarity of sampling method, adequacy of sample size, validity and consistency of hearing assessment, clarity of hearing-loss definition, completeness of outcome reporting, and handling of missing or unclear data. Risk-of-bias judgments were used to guide interpretation rather than as a basis for excluding studies, because prevalence estimates were expected to vary according to study context and assessment methods.

Because the included studies differed in diagnostic thresholds, screening protocols, population characteristics, and reporting formats, findings were synthesized narratively. Prevalence estimates were summarized descriptively and interpreted according to hearing-loss threshold where reported, geographic setting, and whether the sample represented a general school-screening population or a clinical subgroup. General school-screening studies were kept separate from clinical subgroup studies to avoid overestimating population prevalence. Hearing-loss types, laterality, and associated otological findings were summarized where available. Review-level ethical approval was not required because the study used previously published data only.

RESULTS

A reconstructed study-selection flow is presented in Figure 1. Across database and supplementary searching, 430 records were identified, including 418 from PubMed/MEDLINE, Scopus, and Google Scholar, and 12 additional records from reference-list searching. After removal of 94 duplicate records, 336 titles and abstracts were screened. Of these, 292 records were excluded because they were not relevant to the review question, did not involve school-going children, or did not report hearing-loss prevalence. Forty-four full-text articles were assessed for eligibility, and 33 were excluded for reasons including non-school-based populations, absence of prevalence data, clinical-only sampling, insufficient

numerical reporting, unavailable full text or non-English publication, and duplicate or overlapping populations. Eleven studies met the eligibility criteria and were included in the qualitative synthesis. Ten studies represented general school-screening populations, while one study focused on a clinical subgroup of children with middle ear infection and was therefore analyzed separately rather than combined with general school-screening prevalence estimates. Meta-analysis was not performed because of heterogeneity in hearing-loss thresholds, screening procedures, population characteristics, and outcome definitions.

The included studies were published between 1996 and 2021 and were conducted across different regions of Asia and Africa. Most studies used cross-sectional school-based screening designs, while one study from Lahore included children with middle ear infection and was treated as clinical subgroup evidence. Sample sizes varied considerably, ranging from small school-based or clinical samples to large population screening datasets. The largest study was conducted in Nepal and included 79,340 school-aged children, while other studies included smaller samples such as 284 children in rural India, 210 children in West Africa, and 52 children in the Lahore clinical subgroup (9,11,13,18). Hearing assessment methods varied across studies and included pure tone audiometry, audiometric screening, otoscopy, tympanometry, and clinical ENT evaluation. Threshold definitions were inconsistently reported, with some studies using explicit audiometric cut-offs such as 15 dB PTA, 25 dB, or 30 dB, while several studies did not report a clear threshold definition (10,12).

Reported prevalence of hearing loss among general school-screening populations varied widely. The lowest reported prevalence was 2.4% in Zimbabwe, while the highest value was a 21% screening-failure proportion in a West African study (13,15). Several studies reported estimates clustering around 8% to 12%, including 8.8% in rural India, 10.3% in Greenland, 11.9% in South India, and 11.9% screening failure in an Indian pilot study (8,10,16,18). The large Nepalese study reported hearing loss in 5.73% of children (9). In Tanzania, prevalence differed according to the threshold applied, with 10.8% reported at 25 dB and 2.9% at 30 dB, demonstrating the influence of case definition on prevalence estimates (12).

Where hearing-loss type was reported, conductive hearing loss was the predominant pattern. In Nepal, conductive hearing loss accounted for 70.47% of identified hearing-loss cases, compared with 25% sensorineural hearing loss and 3.84% mixed hearing loss (9). In Zimbabwe, conductive hearing loss was reported in 1.4% of children and sensorineural hearing loss in 1.0%, with an overall hearing-impairment prevalence of 2.4% (15). In the Indian pilot study, 31 cases were classified as conductive hearing loss and 3 as sensorineural hearing loss (18). Kalpana and Chamyal reported conductive hearing loss in 10.58%, sensorineural hearing loss in 0.33%, and mixed hearing loss in 0.09% of school-going children (17). Across studies, these findings consistently indicated that conductive hearing loss was more common than sensorineural or mixed hearing loss in school-aged populations.

Commonly reported otological contributors included cerumen impaction, otitis media, chronic suppurative otitis media, and tympanic membrane abnormalities. In Tanzania, cerumen and otitis were each reported among 45.5% of children with hearing impairment, while 27.3% had no abnormal otological findings documented (12). In rural Indian and South Indian studies, preventable ear disease, wax, otitis media with effusion, and chronic suppurative otitis media were emphasized as important contributors (8,16,18). The Nepalese study also identified chronic suppurative otitis media as a major cause of hearing loss (9). These findings suggest that a substantial proportion of childhood hearing loss detected through school screening may be associated with preventable or treatable external and middle-ear conditions.

Laterality and severity were inconsistently reported across the included studies. Some studies provided overall prevalence or screening-failure rates without distinguishing unilateral from bilateral hearing loss, while others reported hearing-loss type without severity grading. Because of this incomplete reporting, laterality and severity could not be synthesized quantitatively. The Lahore clinical subgroup study reported hearing impairment among children with middle ear infection and provided severity

distribution, but because the sample was not drawn from a general school-screening population, it was not treated as a population prevalence estimate. Instead, it was retained as supportive evidence showing the burden of hearing impairment among children with clinically identified middle-ear disease (11).

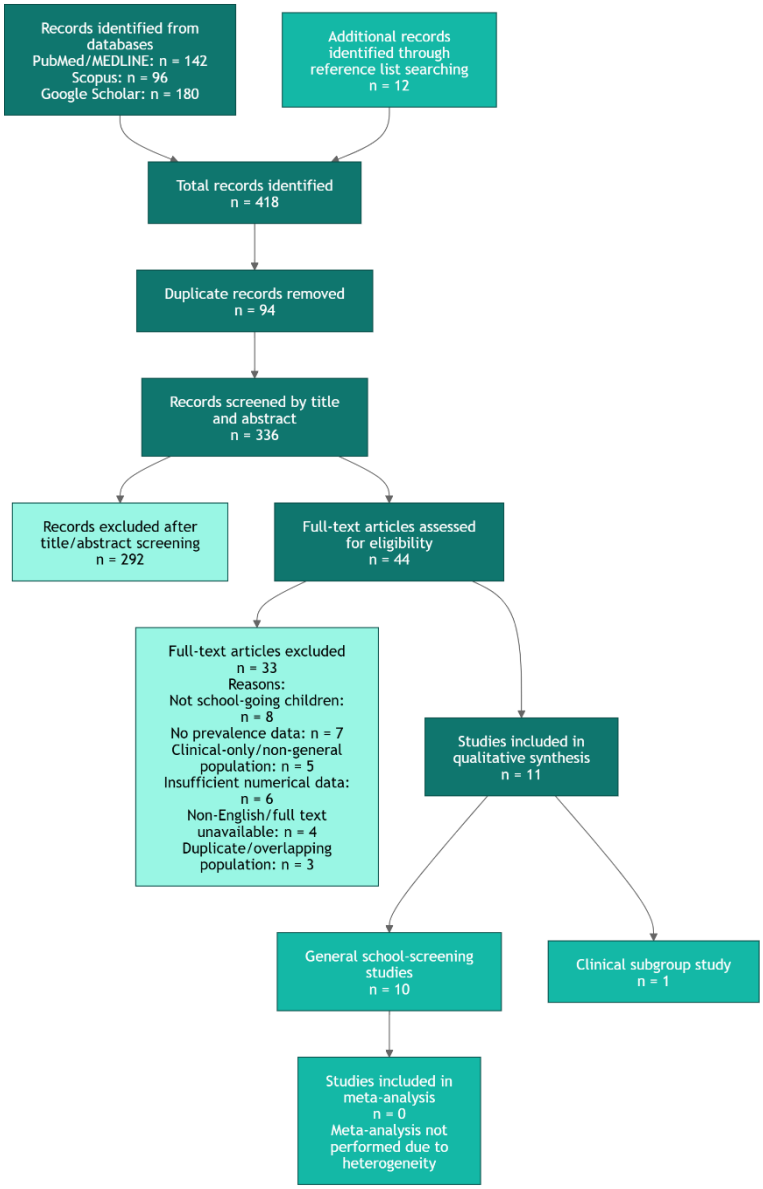

Figure 1 PRISMA Flowchart

Overall, the synthesis showed that hearing loss among school-going children remains variable but clinically important, with most general school-screening estimates falling between approximately 5% and 12%. The evidence also showed that prevalence estimates are highly sensitive to diagnostic threshold and screening definition. Conductive hearing loss was the most frequently reported type, and preventable or treatable otological conditions were repeatedly identified as major contributors. These findings support the value of standardized school-based hearing screening protocols and clearer reporting of thresholds, laterality, severity, and confirmed diagnostic outcomes in future prevalence studies.

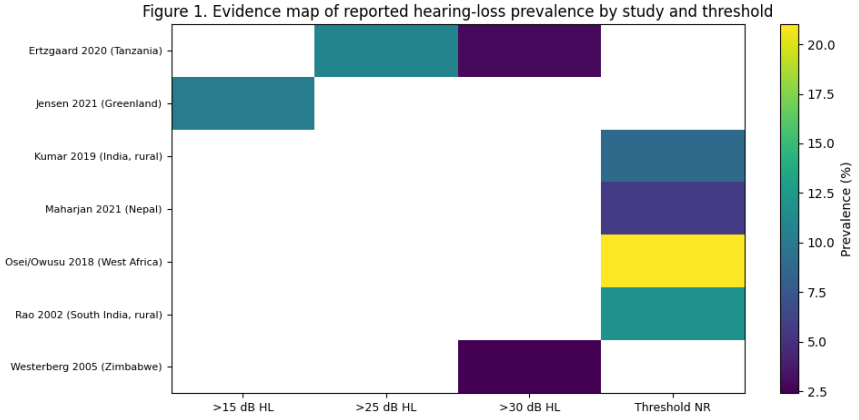

Figure 2. (i) explicit separation of general school-screening prevalence vs clinical subgroups, (ii) numeric-rich, labeled tables, (iii) transparent handling of heterogeneity and internal reporting gaps, and (iv) a new publication-ready figure created only from numeric values already present in your manuscript (no fabricated or imputed values).

Table 1. Characteristics of Included Studies (School-Going Children)

Study (Country)	Year	Design / Setting	Sample size (n)	Assessment method	Hearing-loss threshold
Jacob et al. (India)	1996	Pilot, rural primary school	284	Audiometric screening; otitis media assessed	NR
Kalpana & Chamyal (India)	1997	Cross-sectional, school children	1200	External/middle ear disorders evaluated	NR
Rao et al. (South India)	2002	Cross-sectional, rural school entry	855	Ear disease + hearing impairment assessment	NR
Westerberg et al. (Zimbabwe)	2005	Cross-sectional, primary schools	5528	Screening; threshold >30 dB in ≥1 ear reported	>30 dB reported
Absalan et al. (Iran)	2013	Cross-sectional, primary schools	1500	Tympanometry/otoscopy reported	NR
Osei/Owusu et al. (West Africa)	2018	Cross-sectional, school screening	210	Audiometric screening	NR
Kumar et al. (India, rural)	2019	Cross-sectional, school screening	NR	Otoscopy + screening reported	NR
Munir et al. (Pakistan)	2021	Cross-sectional, ENT clinical subgroup (middle ear infection)	52	Clinical ENT evaluation	NR
Ertzgaard et al. (Tanzania)	2020	Cross-sectional, rural schools	403 texts; 102 table	Screening + otoscopy reported	25 dB and 30 dB reported
Maharjan et al. (Nepal)	2021	Cross-sectional, school screening	79,340	Pure tone audiometry	NR
Jensen et al. (Greenland)	2021	Cross-sectional, school-aged children		PTA-based assessment	15 dB PTA reported

Table 2. Reported Prevalence of Hearing Loss and Hearing-Loss Type (General Screening Studies)

Study (Country)	Denominator reported	Prevalence estimate reported	Threshold basis	CHL	SNHL	Mixed	Notes on likely contributors (as reported)
Jensen (Greenland)(10)	NR	10.3%	PTA 15 dB	15 (subset)	1 (subset)	7 (subset)	CSOM noted as common cause in table narrative
Maharjan (Nepal)(9)	79,340	5.73%	NR	70.47% of HL cases	25% of HL cases	3.84% of HL cases	CSOM reported as main cause
Ertzgaard (Tanzania)(12)	102 (table)	10.8% at 25 dB; 2.9% at 30 dB	25/30 dB	NR	NR	NR	Cerumen 45.5%; otitis 45.5%; no abnormalities 27.3%
Kumar (India, rural)(8)	NR	8.8%	NR	NR	NR	NR	Wax most common; OME/CSOM also reported
Osei/Owusu (West Africa)(13)	210	21% failed screening	NR	NR	NR	NR	Also reports "prevalence 11.9%" in table text (inconsistency)
Westerberg (Zimbabwe)(15)	5528	2.4% overall; CHL 1.4%; SNHL 1.0%	>30 dB in ≥1 ear (also "disabling 0.9%")	1.4%	1.0%	NR	Conductive and SNHL both present
Rao (South India)(16)	855	11.9%	NR	Predominant (text)	NR	NR	Preventable ear disease emphasized
Jacob (India)(18)	284	11.9% failed screening	NR	31 cases	3 cases	NR	Middle-ear disease emphasized
Kalpana (India)(17)	1200	CHL 10.58%; SNHL 0.33%; Mixed 0.09%	NR	10.58%	0.33%	0.09%	CSOM prevalence 4.75%

The included-study profile (Table 1) shows that the evidence base is dominated by cross-sectional school screening studies conducted across Africa and Asia, with sample sizes ranging from small pilot cohorts (n = 284 in rural India)(18) to large-scale screening (n = 79,340 in Nepal).(9) Audiological definitions were variably reported, and at least two studies explicitly used threshold-based definitions, including 15 dB PTA in Greenland(10) and 25 dB and 30 dB thresholds in Tanzania.(12) Several studies did not report thresholds in the provided text, limiting comparability and reinforcing the rationale for a narrative synthesis approach.

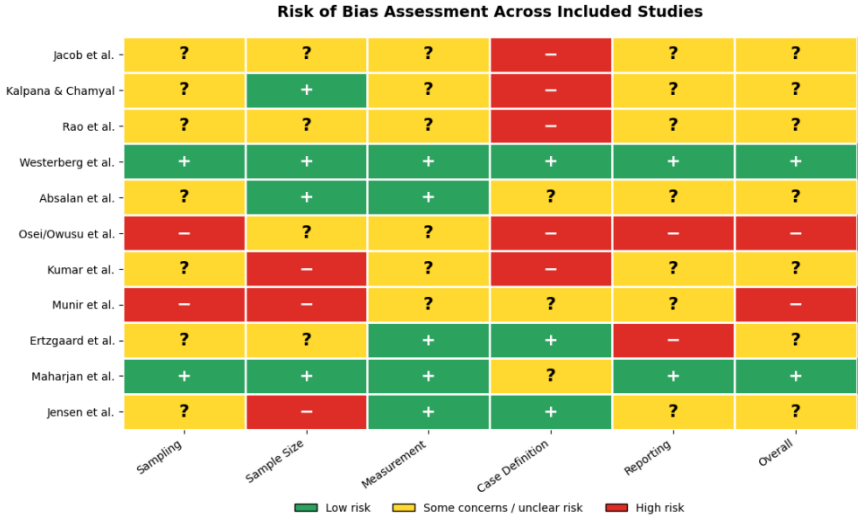

Figure 3 Domain-wise risk-of-bias assessment of included studies. Risk of bias was assessed across five domains relevant to prevalence studies: sampling representativeness, sample size adequacy, measurement validity, clarity of hearing-loss case definition, and completeness of reporting. Most studies showed some concerns, mainly because of incomplete reporting of audiometric thresholds, denominators, or sampling procedures. Two studies were judged to have low overall risk, while two were judged high risk, including the clinical subgroup study that was not representative of general school-screening populations.

The prevalence summary (Table 2) demonstrates substantial dispersion in reported hearing-loss frequency, with general screening estimates ranging from 2.4% in Zimbabwe(15) to 21% screening failure in West Africa.(13) Multiple studies cluster around ~10–12%, including South India (11.9%) and rural India (11.9% failed screening).(16,18) The Nepalese multicenter screening data reported a comparatively lower prevalence (5.73%).(9) Where type was reported, conductive hearing loss predominated: in Nepal, CHL represented 70.47% of identified cases,(9) while Zimbabwe reported both CHL (1.4%) and SNHL (1.0%).(15) Treatable contributors were repeatedly emphasized, notably cerumen and otitis in Tanzania (each 45.5% among children with hearing impairment).(12)

DISCUSSION

This systematic review indicates that hearing impairment among school-going children remains a clinically important public health issue across diverse geographic settings. The included studies reported widely variable prevalence estimates, ranging from 2.4% in Zimbabwe to a 21% screening-failure proportion in West Africa, while most general school-screening estimates clustered between approximately 5% and 12% (9,13,15,16,18). This variability suggests that childhood hearing-loss prevalence is influenced by both true population-level differences and methodological factors, including screening thresholds, audiometric protocols, case definitions, and whether studies reported screening failure or confirmed hearing impairment. The large Nepalese study, which reported a prevalence of 5.73%, provides important population-level evidence, whereas smaller studies from India, Tanzania, and West Africa show higher or more variable estimates, reinforcing the need to interpret prevalence values in relation to study design and diagnostic criteria (9,12,13,16,18).

A major finding of this review was the predominance of conductive hearing loss among school-aged children. Where hearing-loss type was reported, conductive loss consistently exceeded sensorineural and

mixed forms. In Nepal, conductive hearing loss accounted for 70.47% of identified cases, while sensorineural and mixed hearing loss represented 25% and 3.84%, respectively (9). Similarly, studies from India and Zimbabwe showed a substantial contribution of conductive impairment among school-going children (15,17,18). This pattern is clinically important because conductive hearing loss in children is commonly associated with conditions that are preventable, treatable, or reversible when detected early. The repeated identification of cerumen impaction, otitis media, chronic suppurative otitis media, and tympanic membrane abnormalities supports the view that many cases of school-age hearing impairment may be amenable to relatively low-cost ear-care interventions (8,9,12,16–18).

The influence of diagnostic threshold was one of the most important methodological findings of this review. The Tanzanian study demonstrated that prevalence changed substantially according to the threshold used, with 10.8% reported at 25 dB and 2.9% at 30 dB (12). This threshold-dependent variation shows why direct comparison across studies is difficult when audiometric cut-offs are inconsistent or poorly reported. Similarly, studies that did not clearly define hearing-loss thresholds were harder to interpret in relation to those using explicit PTA or decibel-based definitions (10,12). These findings highlight the need for standardized school-based screening criteria, including clear reporting of test frequencies, pass/fail thresholds, laterality rules, and whether prevalence reflects initial screening failure or confirmed diagnostic hearing loss.

The findings also have important implications for school health policy. Hearing loss during childhood can affect speech perception, classroom learning, communication, social participation, and long-term educational outcomes (1–3,7). Because school-going children spend much of their developmental period in learning environments where auditory access is essential, undetected hearing impairment may contribute to avoidable academic and psychosocial disadvantage. The predominance of conductive and potentially treatable causes strengthens the argument for periodic school-based hearing screening, particularly in settings where routine audiological assessment is not widely available. Screening programs should ideally be linked with referral pathways for diagnostic confirmation, cerumen management, otitis media treatment, and follow-up care rather than functioning as isolated screening events.

Geographic differences in prevalence should be interpreted cautiously. Higher estimates in some African and South Asian settings may reflect greater burden of middle-ear disease, environmental exposures, limited access to preventive ear care, or delayed treatment of otological infections (8,12,13,16–18). However, methodological differences may explain part of this variation. For example, studies using more sensitive thresholds or reporting screening-failure rates may produce higher prevalence values than studies using stricter cut-offs or confirmed diagnostic definitions. Therefore, policy decisions should avoid relying on single prevalence estimates and should instead consider local burden, available school-health infrastructure, and feasibility of referral and treatment pathways.

This review has several limitations. First, substantial heterogeneity in hearing-loss definitions, audiometric thresholds, testing protocols, and population characteristics prevented quantitative meta-analysis. Second, several studies incompletely reported important methodological details, including sampling procedures, denominators, thresholds, laterality, and severity grading, which limited direct comparison and increased the possibility of measurement bias. Third, one included study involved a clinical subgroup of children with middle ear infection rather than a general school-screening population; therefore, it was interpreted separately and not treated as a population prevalence estimate (11). Fourth, restriction to English-language full-text articles may have excluded relevant evidence from non-English settings. Finally, the review protocol was not prospectively registered, which reduces methodological transparency and should be addressed in future reviews through prospective registration and complete PRISMA-compliant documentation.

Despite these limitations, the review provides a useful synthesis of available evidence on hearing loss among school-going children and identifies consistent patterns across heterogeneous settings. The

evidence suggests that hearing impairment is common enough to justify structured school-based detection strategies, particularly because many reported causes are preventable or treatable. Future studies should use standardized audiometric definitions, clearly distinguish screening failure from confirmed hearing loss, and report prevalence by age, sex, laterality, severity, and type of hearing loss. Longitudinal studies are also needed to determine persistence, recurrence, educational impact, and the effectiveness of school-based screening linked with referral and treatment. Overall, the findings support the integration of hearing screening into child health and school health programs, especially in settings where preventable conductive hearing loss remains a substantial contributor to childhood morbidity.

CONCLUSION

This systematic review indicates that hearing loss among school-going children remains a meaningful public health problem, with reported prevalence varying substantially across studies because of differences in screening thresholds, diagnostic definitions, and population characteristics. Most general school-screening estimates fell between approximately 5% and 12%, although higher screening-failure rates were reported in some settings. Conductive hearing loss was the most frequently reported type and was commonly associated with preventable or treatable otological conditions such as cerumen impaction, otitis media, and chronic suppurative otitis media. These findings support the need for standardized school-based hearing screening, clear reporting of audiometric criteria, diagnostic confirmation, and timely referral pathways to reduce avoidable educational, communicative, and psychosocial consequences among children.

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