

# Parental Perceptions and Attitudes toward Childhood Hearing Health in N'Djamena, Chad

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**How to cite this paper:** Taoussi, A.A., Attimer, K.A. and Ndolé, A. (2025) Parental Perceptions and Attitudes toward Childhood Hearing Health in N'Djamena, Chad. *International Journal of Otolaryngology and Head & Neck Surgery*, **14**, 349-362. <https://doi.org/10.4236/ijohns.2025.146038>

**Received:** October 21, 2025

**Accepted:** November 16, 2025

**Published:** November 19, 2025

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## Abstract

**Background:** Childhood hearing loss represents a major yet underexplored public health issue in sub-Saharan Africa. Parents play a key role in early detection and management; however, their knowledge, perceptions, and attitudes toward pediatric hearing health remain poorly understood in Chad. **Objective:** To assess parental knowledge, perceptions, and attitudes regarding childhood hearing health in N'Djamena, in order to identify barriers to early detection and access to care. **Methods:** A descriptive cross-sectional study was conducted among 346 parents of children aged 0 - 11 years, selected through stratified random sampling across the ten districts of N'Djamena. Data were collected using a structured questionnaire and semi-structured interviews. Quantitative analyses included frequencies and chi-square tests, while qualitative data were analyzed thematically. **Results:** Of the 346 participants, 91.9% reported awareness of childhood hearing loss. However, knowledge of specific risk factors and early warning signs was limited. Mothers more frequently identified behavioral warning signs (57.2% vs. 31.6% among fathers,  $p < 0.001$ ), while fathers cited infectious and traumatic causes more often ( $p < 0.05$ ). Only 46.0% of parents viewed preschool hearing screening as beneficial, and 47.7% expressed confidence in the hearing care system. Access to audiological services was considered adequate by 28.0% of respondents, while 35.0% supported inclusive education for children with hearing loss. **Conclusion:** Despite high overall awareness of childhood hearing loss, substantial gaps persist in recognizing subtle risk factors and early symptoms, as well as in confidence toward existing care systems. Strengthening health education, improving access to hearing services, and promoting inclusive education are key priorities for equitable pediatric hearing care in Chad.

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## Keywords

Childhood Hearing Loss, Parental Attitudes, Hearing Screening, Health Education, Inclusive Education, Chad

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## 1. Introduction

Hearing constitutes a child's primary gateway to the world of sound, language, and communication. It shapes cognitive development, emotional balance, and social integration. When impaired early in life, it disrupts the entire process of learning, emotional growth, and school performance, with long-term consequences on quality of life and social participation.

According to the World Health Organization (WHO), disabling hearing loss in children is defined as a permanent hearing threshold greater than 30 decibels (dB) in the better hearing ear. This level of impairment significantly interferes with speech and language development, education, and social participation. Globally, nearly 34 million children live with disabling hearing loss, more than half of which could be prevented through early screening and timely intervention [1] [2]. However, in many low- and middle-income countries, hearing screening and rehabilitation services remain scarce, leading to delayed diagnosis and frequently inadequate management [3].

Parents occupy a central place in this detection chain. They are often the first to notice signs of a hearing problem—speech delay, lack of reaction to sounds, or social withdrawal—and to direct the child to a healthcare professional [4] [5]. Nevertheless, several studies have shown that parental knowledge and attitudes vary according to sociocultural and educational background. In the United Arab Emirates, for example, only one-third of parents correctly identify the causes and early signs of childhood hearing loss, despite generally positive attitudes toward screening [2]. In Saudi Arabia, awareness is higher, but limited understanding of perinatal causes—particularly neonatal jaundice and the use of ototoxic medications—remains common [3] [4] [6].

In other contexts, traditional beliefs continue to influence perceptions of hearing impairment. In India and Pakistan, deafness is sometimes attributed to supernatural causes or treated with traditional remedies [7] [8]. In South Africa, despite such beliefs, most mothers are willing to consult a specialist as soon as they suspect a problem [9].

This paradox—where overall positive attitudes toward screening coexist with persistent knowledge gaps—highlights the importance of strengthening health education and community awareness. In the Chadian context, characterized by a scarcity of Ear, Nose and Throat (ENT) and audiology services concentrated in N'Djamena and by the low visibility of hearing disorders in public health policies, no previous study has explored these dimensions. Analyzing parental perceptions is therefore crucial for guiding national strategies for the prevention and early

management of childhood hearing loss.

The objective of this study was to assess the knowledge, perceptions, and attitudes of parents toward childhood hearing health in N'Djamena, with the aim of identifying the main obstacles to early screening, access to care, and educational inclusion of children with hearing loss.

## 2. Materials and Methods

### 2.1. Study Design

A descriptive cross-sectional study was conducted in N'Djamena, Chad, between January and March 2023, to assess parents' knowledge, perceptions, and attitudes regarding childhood hearing health.

### 2.2. Study Population

The target population included parents of children aged 0 to 11 years residing in N'Djamena. The upper age limit of 11 years was chosen to encompass the critical period for language acquisition and school integration, which are particularly sensitive to hearing disorders.

### 2.3. Sample Size

The minimum required sample size was calculated using the standard formula:

$$n = t^2 \times p \times (1 - p) / m^2$$

where  $t = 1.96$  (corresponding to a 95% confidence level),  $p = 0.658$  (estimated proportion of parents with insufficient knowledge of hearing loss risk factors, according to Ayas *et al.*, 2021 [2]), and  $m = 0.05$  (margin of error).

Based on these parameters, the required sample size was 346 participants.

### 2.4. Inclusion and Exclusion Criteria

#### **Inclusion criteria:**

- Being a parent of at least one child aged 0 - 11 years;
- Residing in N'Djamena;
- Providing informed consent;
- Being able to understand and respond to the questionnaire (verbally or in writing).

#### **Exclusion criteria:**

- Being a parent of only children older than 11 years;
- Not residing in N'Djamena;
- Refusal or inability to participate in the study.

### 2.5. Sampling Method

A stratified random sampling technique was applied. The study population was divided across the ten districts of N'Djamena, then stratified by sex (mothers/fathers) to ensure balanced representation. On average, 17 to 18 mothers and 17

fathers were randomly selected from each district.

## 2.6. Data Collection

Data were collected using two complementary tools:

1. A structured questionnaire, administered individually, assessing:
  - Knowledge of risk factors and early signs of hearing loss,
  - Attitudes toward screening and management,
  - Perceived accessibility and quality of hearing care,
  - Opinions regarding the schooling of children with hearing impairment.
2. Semi-structured interviews, conducted immediately after questionnaire completion, to explore parental beliefs, perceptions, and motivations in greater depth.

Data collection was performed by medical students trained in ethical and confidential interviewing techniques. All instruments were developed in collaboration with specialists in pediatric hearing health, and pretested on a pilot sample to ensure clarity, cultural relevance, and reliability.

## 2.7. Data Analysis

Quantitative data were entered and analyzed using SPSS version 26. Descriptive statistics (frequencies, percentages, means, and standard deviations) were calculated. The Chi-square test was applied to compare differences between mothers and fathers concerning knowledge of risk factors and recognition of early signs of hearing loss. The level of statistical significance was set at  $p < 0.05$ .

Qualitative data obtained from interviews were transcribed verbatim and analyzed using inductive thematic analysis, aimed at identifying recurrent themes and context-specific features.

## 2.8. Ethical Considerations

The research protocol was approved by the Dean of the Faculty of Human Health Sciences, University of N'Djamena, and by the relevant local administrative authorities. Written informed consent was obtained from all participants after a detailed explanation of the study's objectives and procedures, including their right to withdraw at any time.

All data were anonymized and treated confidentially, in accordance with the Declaration of Helsinki, while respecting cultural sensitivities related to childhood hearing loss.

## 3. Results

### 3.1. Sociodemographic and Occupational Characteristics of Participants

A total of 346 parents participated in the study, including 170 fathers (49.1%) and 176 mothers (50.9%), with a sex ratio of 0.97.

The age of fathers ranged from 21 to 65 years (mean:  $40.4 \pm 9.5$  years), and that

of mothers from 18 to 51 years (mean:  $29.7 \pm 6.5$  years). The most represented age groups were 34 - 41 years among fathers (80/170; 47.1%) and 26 - 33 years among mothers (96/176; 54.5%).

Regarding educational level, 159 participants (45.9%) had higher education, 155 (44.8%) had secondary education, and 10 (2.9%) had never attended school.

Occupationally, fathers were mainly teachers (22.4%) or students (21.8%), while mothers were predominantly students (50.6%) or housewives (31.3%).

Detailed characteristics are presented in **Table 1**.

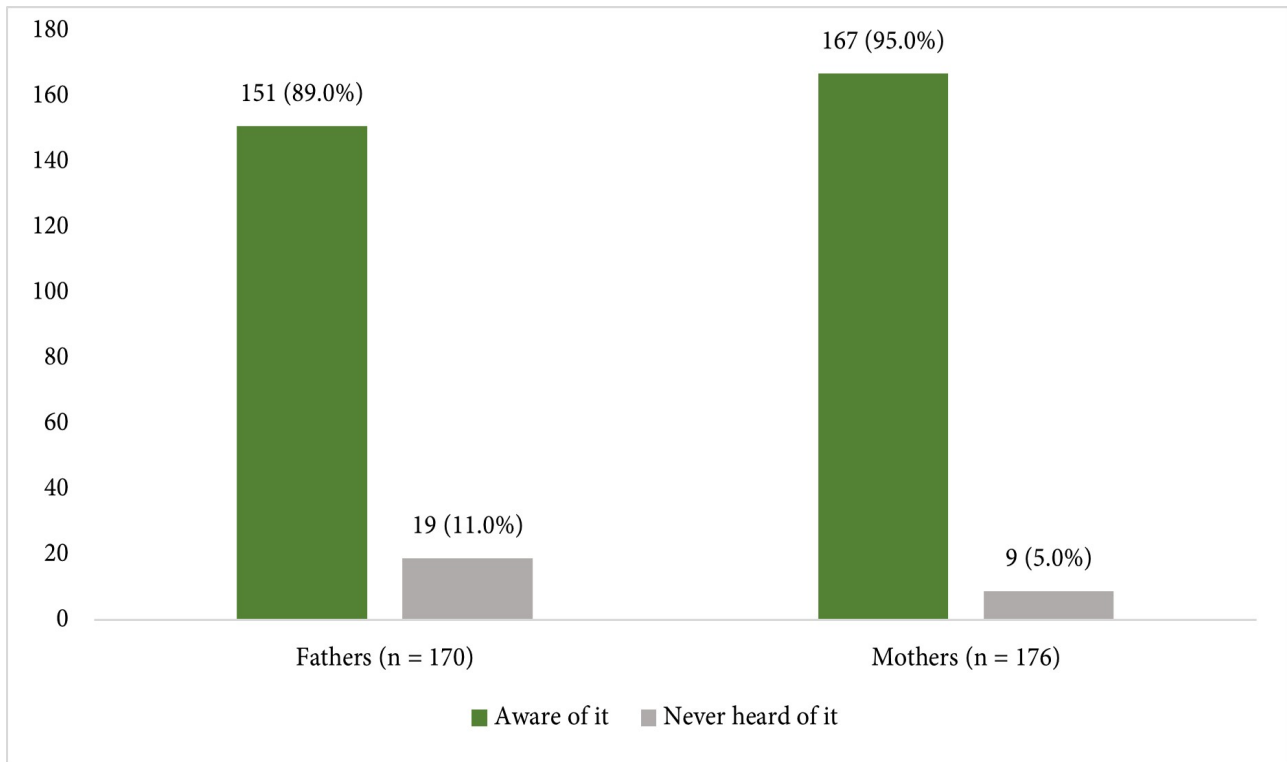
**Table 1.** Sociodemographic and occupational characteristics of the participants (n = 346).

Characteristics	Fathers (n = 170)	Mothers (n = 176)	Total (n = 346)
<b>Sex ratio (M/F)</b>	0.97		
<b>Average age (<math>\pm</math>SD)</b>	40.4 $\pm$ 9.5 years	29.7 $\pm$ 6.5 years	
<b>Age range</b>	21 to 65 years	18 to 51 years	
<b>Age groups (years)</b>			
18 - 25	8 (4.7 %)	43 (24.4 %)	51 (14.7 %)
26 - 33	21 (12.4 %)	96 (54.5 %)	117 (33.8 %)
34 - 41	80 (47.1 %)	28 (15.9 %)	108 (31.2 %)
42 - 49	34 (20.0 %)	7 (4.0 %)	41 (11.8 %)
50 - 57	17 (10.0 %)	2 (1.1 %)	19 (5.5 %)
58 - 65	10 (5.9 %)	0 (0.0 %)	10 (2.9 %)
<b>Education level</b>			
No formal education	3 (1.8 %)	7 (4.0 %)	10 (2.9 %)
Primary	9 (5.3 %)	13 (7.4 %)	22 (6.4 %)
Secondary	73 (42.9 %)	82 (46.6 %)	155 (44.8 %)
Higher/University	85 (50.0 %)	74 (42.0 %)	159 (45.9 %)
<b>Profession</b>			
Teacher	38 (22.4 %)	6 (3.4 %)	44 (12.7 %)
Nurse	15 (8.8 %)	12 (6.8 %)	27 (7.8 %)
Physician	5 (2.9 %)	2 (1.1 %)	7 (2.0 %)
Trader	18 (10.6 %)	12 (6.8 %)	30 (8.7 %)
Worker	15 (8.8 %)	0 (0.0 %)	15 (4.3 %)
Student	37 (21.8 %)	89 (50.6 %)	126 (36.4 %)
Unemployed	30 (17.6 %)	—	30 (8.7 %)
Housewife	—	55 (31.3 %)	55 (15.9 %)
Lawyer	3 (1.8 %)	0 (0.0 %)	3 (0.9 %)
Military	9 (5.3 %)	0 (0.0 %)	9 (2.6 %)

## 3.2. Parental Knowledge about Childhood Hearing Loss

### 1) General Awareness

Among the 346 parents surveyed, 318 (91.9%) reported having heard about childhood hearing loss. Awareness was slightly higher among mothers (167/176; 95.0%) compared to fathers (151/170; 89.0%). The distribution is illustrated in **Figure 1**.



**Figure 1.** Parents' self-reported prior awareness of childhood hearing loss.

Bar chart comparing the number (and percentage) of fathers and mothers who have heard of childhood hearing loss.

- N: Total number of parents surveyed (n = 346).
- Fathers (n = 170) vs Mothers (n = 176).
- Y-axis values: Number of parents.
- Green bars: "Aware of it"; gray bars: "Never heard of it."

## 2) Knowledge of Causes and Risk Factors

The most frequently cited causes were chronic otitis media (217/346; 62.7%) and head trauma (167/346; 48.3%).

Fathers were significantly more likely than mothers to mention head trauma (94/170; 55.0% vs. 73/176; 41.4%,  $p = 0.008$ ) and severe malaria (17/170; 10.0% vs. 9/176; 5.1%,  $p = 0.048$ ).

Mothers more frequently mentioned prenatal infections such as rubella and syphilis (21/176; 11.9% vs. 7/170; 4.1%), though the difference was not statistically significant ( $p = 0.072$ ).

Other causes, including measles, meningitis, and ototoxic medications, were less frequently reported. Details are summarized in **Table 2**.

**Table 2.** Parental knowledge regarding the causes and risk factors of childhood hearing loss.

Recognized Risk Factor	Fathers (n = 170)	Mothers (n = 176)	Total (n = 346)	p-value
Family history of hearing loss	22 (13.0%)	21 (12.0%)	43 (12.4%)	0.80
Prenatal infections (rubella, syphilis)	7 (4.0%)	21 (12.0%)	28 (8.1%)	0.072
Chronic otitis media	111 (65.0%)	106 (60.2%)	217 (62.7%)	0.36
Meningitis	31 (18.0%)	21 (12.0%)	52 (15.0%)	0.13
Measles	19 (11.3%)	14 (8.2%)	33 (9.5%)	0.36
Severe malaria	17 (10.0%)	9 (5.1%)	26 (7.5%)	0.048*
Noise exposure	65 (38.2%)	54 (30.5%)	119 (34.4%)	0.12
Ototoxic medications	1 (0.6%)	1 (0.6%)	2 (0.6%)	1.00
Head trauma	94 (55.0%)	73 (41.4%)	167 (48.3%)	0.008**
Malnutrition	1 (0.6%)	1 (0.6%)	2 (0.6%)	1.00

Thresholds:  $p < 0.05$ ; \*\* Statistically significant; \* Borderline significance.

### 3) Recognition of Early Warning Signs

The most frequently recognized early sign was lack of startle response to loud sounds, cited by 256 parents (74.0%), with no significant sex difference ( $p = 0.44$ ). Lack of response to sounds was reported by 193 parents (55.8%;  $p = 0.81$ ), and speech delay by 159 parents (46.0%).

Mothers were significantly more likely than fathers to identify social withdrawal or isolation as a warning sign (57.2% vs. 31.6%,  $p < 0.001$ ).

Additionally, 34 parents (9.8%)—19 fathers and 15 mothers—mentioned lip reading or reliance on facial expressions as a potential indicator of hearing difficulty.

Frequencies of recognition for each sign are presented in **Table 3**.

**Table 3.** Parental recognition of early signs of childhood hearing loss.

Recognized Early Sign	Fathers n = 170	Mothers n = 176	Total n = 346	p-value
Delayed language development	75 (43.8%)	84 (47.5%)	159 (46.0%)	0.48
Lack of response to sounds	96 (56.2%)	97 (55.1%)	193 (55.8%)	0.81
Social withdrawal or isolation	54 (31.6%)	101 (57.2%)	155 (44.8%)	<0.001***
No startle response to loud noises	129 (75.9%)	127 (72.2%)	256 (74.0%)	0.44
Only follows facial expressions	19 (11.0%)	15 (8.5%)	34 (9.8%)	0.42

Thresholds:  $p < 0.05$ ; \*\*\* Highly significant.

### 3.3. Attitudes toward Hearing Screening and Management

Among all respondents, 159 (46.0%) considered preschool hearing screening useful, whereas 187 (54.0%) did not see its relevance. When asked about their intention to have their child screened before school age, 121 parents (35.0%) were in favor, 89 (25.8%) opposed, and 136 (39.2%) undecided. Concerns about screening were common: 183 parents (52.9%) feared that it could cause unnecessary stress for the child or family. Nevertheless, 286 parents (82.7%) stated they would consult a specialist if hearing impairment was suspected.

However, only 165 (47.7%) expressed confidence in the hearing care system, and 97 (28.0%) perceived audiology services as accessible.

Parental opinions are detailed in **Table 4**.

**Table 4.** Parental attitudes toward hearing screening and management.

Assessed Item	Yes (%)	No (%)	Uncertain (%)
Preschool hearing screening is considered useful	159 (46.0%)	187 (54.0%)	
I would have my child screened before school age	121 (35.0%)	89 (25.8%)	136 (39.2%)
I am afraid that screening may cause unnecessary stress	183 (52.9%)	163 (47.1%)	
I would consult a specialist in case of suspected hearing issues	286 (82.7%)	60 (17.3%)	
Confidence in the healthcare system	165 (47.7%)	181 (52.3%)	
Perceived accessibility to hearing care services	97 (28.0%)	249 (72.0%)	

### 3.4. Parental Perceptions Regarding Schooling of Hearing-Impaired Children

Support for inclusive schooling among parents of children with hearing loss was relatively low: 121 (35.0%) were in favor, while 225 (65.0%) expressed reservations or opposition. The distribution of opinions is illustrated in **Figure 2**.

### 3.5. Qualitative Insights from Semi-Structured Interviews

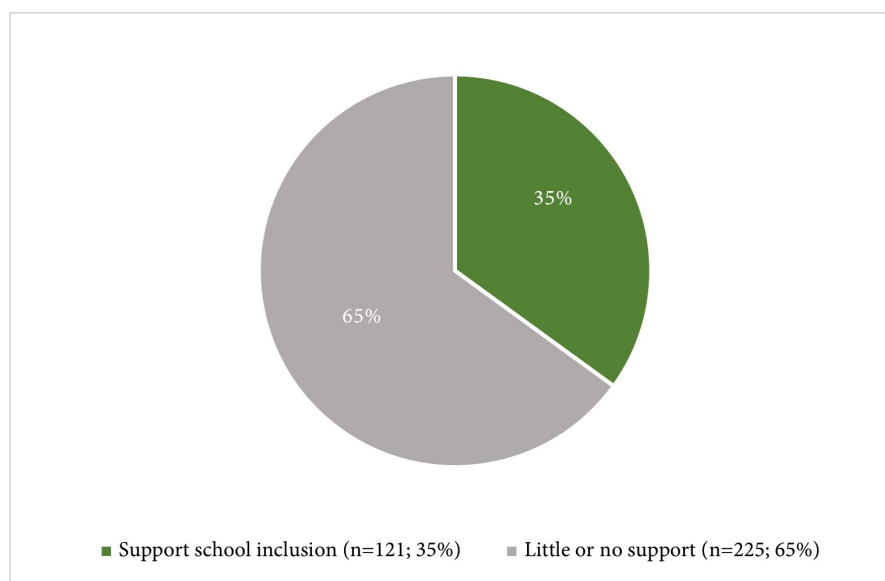
In addition to the quantitative data, qualitative information collected through semi-structured interviews provided a deeper understanding of parents' perceptions and motivations regarding childhood hearing health.

Overall, the interviews revealed that, despite parents' general goodwill and awareness of the importance of early detection, several recurrent barriers hinder timely hearing screening and management. These barriers include limited geographical and financial access to specialized services, lack of information about hearing screening procedures, and unawareness of available services. Emotional factors such as anxiety about screening outcomes and fear of stress for the family were also frequently mentioned. In addition, some parents expressed fatalistic beliefs, viewing hearing loss as "God's will" or a condition that cannot be prevented or treated.

Many participants also reported uncertainty about where to access appropriate care, reflecting a general mistrust of the existing health system and limited visibility of audiology services. With regard to schooling, most parents favored specialized education, expressing concerns about stigma and insufficient teacher support for inclusion in mainstream classrooms.

Pie chart showing the distribution of parental opinions regarding the educational inclusion of children with hearing loss:

- Supportive (35%, green segment): proportion of parents in favor of inclusive schooling.
- Little or no interest (65%, gray segment): proportion of parents expressing unfavorable or indifferent views.
- Sample size: n = 346.
- %: percentage.



**Figure 2.** Parental perceptions regarding the schooling of children with hearing impairment.

## 4. Discussion

This study represents the first in-depth analysis of parental knowledge, perceptions, and attitudes toward childhood hearing health in Chad. Conducted in N'Djamena, it highlights a high level of general awareness of childhood hearing loss (91.9%), comparable to findings reported in other contexts such as the United Arab Emirates, Saudi Arabia, and Pakistan [2] [8] [10]. However, this general awareness coexists with persistent gaps in the recognition of specific risk factors and early warning signs.

### 4.1. Knowledge of Causes and Risk Factors

Parents primarily identified tangible causes such as chronic otitis media and head trauma, consistent with the findings of Alsudays *et al.* [6] and Mazlan and Dar [8]. This focus on visible or immediately perceived causes reflects an empirical understanding of hearing loss, emphasizing acute threats rather than less apparent factors such as congenital infections, neonatal jaundice, or ototoxic medications. Similar trends have been observed in the Solomon Islands [11] and South Africa [12] [13].

These results underscore the need for targeted health education programs that highlight the significance of invisible but equally critical risk factors for childhood hearing loss. Community-based awareness campaigns should emphasize maternal and perinatal risks and the importance of preventive measures, such as vaccination against rubella and measles, and early detection of otitis.

### 4.2. Recognition of Early Warning Signs

Recognition of early signs was found to be uneven across respondents. While obvious signs—such as lack of startle response to loud noises—were well identified,

more subtle indicators (e.g., delayed speech, reliance on lip-reading, or social withdrawal) were often overlooked.

Mothers demonstrated greater sensitivity to behavioral manifestations, likely due to their close daily interaction with children and their role as primary observers, as previously reported by Al-Saleh *et al.* [14] and Moeller [15]. In contrast, fathers tended to emphasize biomedical or traumatic causes, confirming patterns observed in other sociocultural settings [6] [10]. These findings suggest the value of gender-differentiated educational interventions, leveraging the complementary strengths of both parents to improve early detection of hearing impairment.

### 4.3. Attitudes toward Screening and Access to Care

Less than half of the parents (46.0%) considered preschool hearing screening useful, a proportion similar to those reported in other African contexts [16]-[18]. The main reservations expressed were emotional concerns and negative perceptions of screening, which some parents associated with unnecessary stress for the child—an observation consistent with Olusanya *et al.* [17]. Nevertheless, the majority (82.7%) reported a willingness to consult a specialist if hearing loss was suspected, which is an encouraging indicator of parental readiness for medical follow-up. Moeller [19] demonstrated that such early parental involvement is a key factor in improving language and cognitive outcomes in children with hearing impairment.

The structural barriers identified—low confidence in the healthcare system (47.7%) and limited access to audiology services (28.0%)—reflect the systemic challenges typical of low-resource settings: insufficient infrastructure, shortage of trained professionals, and concentration of services in urban areas. These observations are consistent with Neumann *et al.* [20], who emphasized global disparities in newborn and pediatric hearing screening coverage. Developing local capacity, training audiology and ENT personnel, and integrating hearing screening into primary healthcare represent essential strategies to bridge these gaps.

### 4.4. Educational Inclusion and Sociocultural Barriers

The limited support for inclusive schooling (35%) reveals the presence of deep-rooted sociocultural barriers. In Chad, deafness is often surrounded by spiritual or fatalistic beliefs, with some parents perceiving it as “God’s will” or a test of destiny. These perceptions, sometimes reinforced by fear of social judgment, delay the search for medical care and hinder the inclusion of affected children. Many parents fear that their children will be stigmatized or mocked at school, and they point out the lack of teacher training to accommodate hearing-impaired pupils in mainstream classrooms. These perceptions are consistent with findings reported in other sub-Saharan African countries, particularly Nigeria and South Africa [17] [18] [21].

Inclusive education must go beyond merely placing hearing-impaired children in mainstream classrooms. It requires a societal change in perception, along with

the training of teachers, adaptation of learning environments, and collaboration between the health and education sectors to ensure true integration and equal opportunities for all children.

#### 4.5. The Paradox between Awareness and Specific Knowledge

This study highlights a striking paradox: many parents are aware of childhood hearing loss, yet few clearly understand its causes and early signs. Awareness often remains surface-level, shaped by general health messages or exposure to severe cases, without fostering a genuine preventive understanding. Interviews also revealed that hearing screening is poorly known, mainly because of limited information and lack of accessible services. In addition, religious and traditional beliefs can discourage families from seeking care, as hearing loss is sometimes viewed as inevitable or divinely ordained.

Bridging this gap between awareness and action requires simple, locally adapted health education programs delivered in antenatal clinics, schools, and through community radio. Such initiatives could transform general awareness into practical knowledge and encourage earlier engagement with hearing care services.

#### 4.6. Strengths and Limitations

Among its strengths, this study stands out for its diverse and representative sample, its mixed-methods design combining quantitative and qualitative data, and the prior validation of its data collection tools. It provides a valuable baseline for future research on pediatric hearing health in urban African contexts and highlights parental attitudes in an understudied population.

However, several limitations should be acknowledged:

- The geographic restriction to N'Djamena limits the generalizability of findings to rural settings.
- A potential social desirability bias may have influenced some self-reported attitudes.
- The study did not include rural populations, where structural and cultural challenges may be even more pronounced.
- In addition, other sociodemographic variables—such as parental education level, socioeconomic status, and occupation—could have acted as confounding factors influencing parental knowledge and attitudes, and should be controlled for in future research.

#### 4.7. Perspectives

The findings of this study open practical perspectives for both the public health and education sectors. To strengthen community awareness, hearing health education programs should be implemented through existing structures, such as antenatal and postnatal consultations, routine pediatric visits, and school-based parent meetings. These programs should emphasize less visible causes of hearing loss, early warning signs, and the shared role of both parents in early detection.

At the national level, a progressive strengthening of audiology capacity is urgently needed. This should begin with the training of qualified personnel (doctors, nurses, and community health workers), which is a prerequisite for the effective decentralization of hearing screening services beyond N'Djamena. In the meantime, mobile screening units and temporary community-based campaigns could be deployed, together with the gradual provision of appropriate audiological equipment to regional hospitals.

Finally, a multisectoral collaboration involving the health, education, and social sectors, together with civil society organizations and local media, is crucial to promote inclusive education and combat the stigma associated with hearing impairment. Such coordinated efforts could pave the way for a national strategy for early hearing detection and intervention in Chad.

## 5. Conclusions

This study, the first of its kind in Chad, reveals a typical paradox observed in low-resource settings: a high level of general parental awareness of childhood hearing loss, combined with incomplete knowledge of its risk factors and early warning signs. Significant gender differences were observed, emphasizing the need for complementary and differentiated educational approaches for mothers and fathers. Ambivalent parental attitudes toward hearing screening and the limited acceptance of inclusive schooling reflect persistent cultural and structural barriers.

These findings call for coordinated actions at multiple levels. Priority should be given to community health education to improve awareness and understanding of early signs and less visible risk factors. In parallel, pediatric audiology and ENT services must be strengthened through capacity building and decentralization to ensure wider access to care. Finally, sustained advocacy for educational inclusion is essential to guarantee equal opportunities for children with hearing loss and to reduce stigma within the community.

Further research, particularly in rural areas, as well as the evaluation of culturally tailored interventions, will be crucial for developing evidence-based national policies aimed at ensuring early, equitable, and effective management of childhood hearing loss in Chad.

## Acknowledgements

The authors sincerely thank the participating parents for their trust and cooperation throughout the study.

We also express our gratitude to the local administrative and health authorities of N'Djamena for their support and facilitation during data collection.

## Conflict of Interest

The authors declare that they have no conflicts of interest related to the conduct, authorship, or publication of this study.

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