Knowledge, attitudes, and acceptance of Universal Newborn Hearing Screening among pregnant women attending an antenatal clinic in Tanzania

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Submitted: July 2026
Accepted: August 2026
Published: November 2026

Citation: Kahinga et al. Knowledge, attitudes, and acceptance of Universal Newborn Hearing Screening among pregnant women attending an antenatal clinic in Tanzania. South Sudan Medical Journal, 2026;19(4):247-252 © 2026 The Author (s) **License:** This is an open access article under CC BY-NC DOI: https://dx.doi.org/10.4314/ssmj.v19i4.7

ABSTRACT

Introduction: Congenital hearing loss profoundly impairs speech, language, and cognitive development. The Universal Newborn Hearing Screening (UNHS) programme advocates screening by one month, diagnosis by three months, and intervention by six months to mitigate these consequences. Maternal awareness and acceptance are critical to the successful implementation of screening programmes. This study assessed the knowledge, attitudes, and acceptance of newborn hearing screening (NHS) among pregnant women attending an antenatal clinic at a tertiary hospital in Tanzania.

Method: This cross-sectional study used simple random sampling to recruit 130 pregnant women. Data were collected using a validated structured questionnaire covering sociodemographic characteristics, nine knowledge items (good mastery threshold ≥ 6/10), and nine Likert-scale attitude items (positive baseline threshold ≥ 32/45).

Results: Of the 130 participants (mean age: 31.78 years), 36.9% (n=48) had good overall knowledge of NHS, and 83.8% could not identify objective testing methods. A positive attitude was observed in 73.8% (n=96) of participants, and 85.4% (n=111) accepted screening for their infants. Higher education level and employment were associated with higher knowledge scores (p=0.001; p=0.017), positive attitudes (p<0.001; p=0.007), and screening acceptance (p<0.001; p=0.006). Higher knowledge levels were associated with positive attitudes (p=0.007). Positive attitudes correlated with higher screening acceptance (p<0.001), but knowledge level did not statistically influence final acceptance (p=0.121).

Conclusion: Behavioural acceptance and positive attitudes toward infant hearing screening are high, but health literacy regarding objective testing methods remains low. Implementing universal screening is feasible but requires antenatal educational campaigns to prevent diagnostic loss to follow-up.

Keywords: knowledge, attitude, acceptance, newborn hearing screening, Tanzania

Introduction

Hearing loss represents one of the most prevalent sensory impairments affecting children globally. The World Health Organization (WHO) estimates that 34 million children worldwide have disabling hearing loss, and the majority reside in low- and middle-income countries (LMICs).[1] Congenital hearing loss severely impairs speech, language development and academic performance.[2]

Accordingly, Universal Newborn Hearing Screening (UNHS) programmes have been established in many high-income countries, and a few LMICs, to facilitate early diagnosis and intervention.[3,4] UNHS programmes follow the "1-3-6" benchmarks which involve screening by one month, diagnosis by three months, and intervention by six months to mitigate hearing loss consequences.[5] Otoacoustic Emissions (OAE) and Auditory Brainstem Response (ABR), objective screening tools, provide the technical foundation for the screening programme by offering high-sensitivity and specificity results.[3,5]

The implementation of UNHS remains limited across many LMICs, including those in sub-Saharan Africa. Key barriers include inadequate diagnostic infrastructure, a lack of national health policies, prohibitive equipment costs, low public awareness, and significant out-of-pocket expenses for parents.[6] Maternal knowledge, attitudes and acceptance are critical to programme success,[7–12] but regional data remain sparse. This study assessed the knowledge, attitudes, and acceptance of newborn hearing screening among pregnant women in a major national antenatal clinic.

Method

Study design and setting

This hospital-based, descriptive cross-sectional study was conducted at Muhimbili National Hospital (MNH), Tanzania's primary referral and teaching hospital. The study assessed knowledge, attitudes, and acceptance of UNHS among pregnant women attending the antenatal clinic between February and March 2025.

Study population, sample size and sampling technique

Using simple random sampling, 130 pregnant women were prospectively recruited. This sample size was calculated using Cochran's formula for cross-sectional studies, incorporating an expected population proportion (p) of 91.7 % derived from prior literature.[8] Based on a 95% confidence level (Z = 1.96) and a 5% margin of error (e = 0.05), a minimum sample size of 117 was determined. This was adjusted to 130 to account for an anticipated 10% non-response rate. Eligible participants included pregnant women aged 18 years or older who provided written informed consent. Women who were severely ill or lacked the cognitive capacity to participate in the interview were excluded.

Data collection instrument

A structured questionnaire was adapted from the literature to suit regional socioeconomic contexts. The instrument was developed in English, translated into Swahili, and validated for face and content validity by a panel of otorhinolaryngologists and audiologists. A pilot study was subsequently conducted with a convenience sample of 10 participants to evaluate the clarity of the Swahili version prior to deployment.

The questionnaire collected demographic data and assessed knowledge, attitude, and acceptance of NHS among study participants. A total of nine questions with a maximum score of ten were used to assess Knowledge. Eight questions were single-choice items worth one point each, and one question had two correct selections, with each correct selection scored one point; incorrect or 'I don't know' responses scored zero. A good knowledge level threshold score was ≥ 6 (60%), representing baseline mastery of essential newborn hearing concepts.

Attitude was assessed using nine items on a five-point Likert scale with a maximum score of 45. Based on modified Bloom's cut-off point, a positive attitude threshold score of ≥ 32(71.1%) was used. This criterion threshold was used instead of the standard median split or neutral midpoint threshold (27/45) to minimize central tendency bias and ensure classification reflected positive responses rather than neutral scores. Acceptance of NHS was evaluated with a single binary 'Yes/No' question.

Data analysis

Data were tabulated and analysed using Statistical Package for the Social Sciences (SPSS) Version 26.0. Categorical variables were described using absolute frequencies and percentages. Associations between demographic variables, knowledge level, attitude categories, and final binary acceptance outcomes were determined using Chi-square or Fisher's exact tests. Statistical significance was defined as a p-value < 0.05.

Ethical considerations

Ethical clearance was obtained from Muhimbili University of Health and Allied Sciences (MUHAS) (No. DA282/298/02L/444) and institutional permission from MNH (No. MNH/CRTCU/PERM/2025/017). Written informed consent was obtained from all participants. Confidentiality was maintained throughout, and data was used solely for research purposes.

Results

Participant characteristics

The study included 130 participants; 40.8% were aged 30-34 years, 52.3% had attained college or university education, 78.5% were married, 86.2% were employed or self-employed, and 43.1% had two or more children (Table 1).

Participants' knowledge of NHS

Only 36.9% (n=48) of the pregnant women had good knowledge, while 63.1% (n=82) had poor scores. Regarding screening intent, 86.2% of participants knew that all neonates require hearing tests, and 80.8% knew testing must precede speech development. However, 83.8% (n=109) were unable to identify valid objective screening methods (OAE/ABR), and 66.9%(n=87) reported the misconception that NHS is physically painful (Table 2).

Table 1. Participant characteristics (N=130)

Variable	Frequency n (%)
Age group (years) Mean: 31.78 ± 5.08	
20-24	11 (8.5)
25-29	31 (23.8)
30-34	53 (40.8)
35-39	25 (19.2)
40-44	10 (7.7)
Level of education	
None/Primary	23 (17.7)
Secondary	39 (30.0)
College/University	68 (52.3)
Occupational status	
Unemployed	18 (13.8)
Employed/ Self employed	112 (86.2)
Marital status	
Single/Others	28 (21.5)
Married	102 (78.5)
Parity (Number of children)	
None (First pregnancy)	30 (23.1)
One	44 (33.8)
Two or more	56 (43.1)

Table 2. Response to knowledge statements/questions regarding NHS (N=130)

Statement/Question	Correct Response n (%)	Incorrect / Don't Know n (%)
All newborns are required to have hearing screening.	112 (86.2)	18 (13.8)
Screening should occur within the first months of life. *	88 (67.7)	42 (32.3)
NHS minimizes delays in cognitive/educational milestones.	104 (80.0)	26 (20.0)
NHS detects hearing loss before speech development.	105 (80.8)	25 (19.2)
Initial NHS alone is NOT enough to confirm deafness.	81 (62.3)	49 (37.7)
NHS requires clinical follow-up (not a one-time test).	86 (66.2)	44 (33.8)
NHS is a non-painful clinical procedure.	43 (33.1)	87 (66.9)
NHS does not require an infant to be awake.	46 (35.4)	84 (64.6)
Known screening methods (OAE or ABR).	21 (16.2)	109 (83.8)

*Note: For timing, 'After speech development' = 28 (21.5%); 'At school age' = 14 (10.8%). Correct response = within first months of life.

Table 3. Distribution of participants' attitudes regarding NHS (N=130)

Attitude Statement	Disagree/Strongly Disagree n (%)	Neutral n (%)	Agree/Strongly Agree n (%)
Early detection allows effective clinical management.	4 (3.0)	10 (7.7)	116 (89.2)
NHS is an essential component of newborn care.	3 (2.3)	20 (15.4)	107 (82.3)
Screening must occur before hospital discharge.	20 (15.4)	31 (23.8)	79 (60.8)
NHS avoids long-term complications of hearing loss.	14 (10.8)	18 (13.8)	98 (75.4)
All infants should be screened regardless of risk status.	14 (10.8)	19 (14.6)	97 (74.6)
Hearing screening procedures are safe for my infant.	18 (13.8)	18 (13.8)	94 (72.3)
I would recommend NHS to other new mothers.	12 (9.2)	24 (18.5)	94 (72.3)
I support mandatory hearing screening for all newborns.	16 (12.3)	15 (11.5)	99 (76.2)
I am willing to pay out-of-pocket for NHS.	24 (18.4)	23 (17.7)	83 (63.8)

*Responses based on a 5-point Likert scale: 1 = Strongly Disagree to 5 = Strongly Agree.

Participants' attitudes toward NHS

A positive attitude was observed in 73.8% (n=96) of respondents. The value of early management was recognised by 89.2% (n=116) of participants. Willingness to pay out of pocket for screening services was supported by 63.8% (n=83) while 18.4% (n=24) explicitly disagreed with self-funding (Table 3).

Behavioural NHS acceptance and demographic associations

The acceptance rate for routine clinical screening was 85.4% (n=111). The primary motivation for screening was the benefit of early identification (62.2%). For the 14.6% (n=19) who rejected screening, the most identified barrier was a lack of sufficient information about the NHS (94.7%).

Higher education levels and employment were associated with greater knowledge (p=0.001; p=0.017) and positive attitudes (p<0.001; p=0.007). Higher knowledge levels were associated with positive attitudes (p=0.007). Acceptance of the screening was associated with education level (p<0.001), employment (p=0.006), and positive attitudes (p<0.001). However, knowledge levels had no statistical association with screening acceptance (p=0.121).

Discussion

This study shows a pronounced divergence between high acceptance of infant screening and low fundamental knowledge of objective testing methodologies in Tanzania. The good knowledge score (36.9%) observed in our study is lower than scores reported in the literature, where health literacy frequently exceeds 50%.[10,12] The difference observed could be due to the absence of national NHS protocols, inadequate infrastructure and lack of community health promotion campaigns on ear and hearing care.

Most pregnant women recognized the importance of early NHS to mitigate delays in speech development. Also, initial screening failure does not constitute definitive diagnosis deafness and acknowledged the necessity for diagnostic follow- up. The differentiation between screening and diagnosis from this cohort is incongruent with findings from Hong Kong, where approximately 80% of mothers assumed an initial 'pass' during screening guaranteed normal hearing. This increases the risk of loss to follow-up for late-onset hearing loss.[13]

In this study, over two-thirds of the participants thought that the objective screening tools cause pain and requires infant to be awake. This reflects a misconception about the physical nature of NHS and highlights the need for clinical education explaining that OAE and ABR tests are safe, rapid, non-invasive, and best performed during natural infant sleep.

The overall positive attitude rate (73.8%) and behavioural acceptance rate (85.4%) observed in this cohort are lower

than the 90% thresholds reported in the studies done in Saudi Arabia, Solomon Islands, South Africa and Nigeria.[8–10,12] The variation observed could be due to limited public exposure to audiological services.

The finding that 81.7% of participants with poor baseline knowledge accepted hearing screening for their newborns indicates that trust in clinical systems, and positive social influences, drive screening acceptance independently of clinical understanding. However, relying on unguided acceptance poses risks as without procedural knowledge, families may skip the diagnostic verification steps required if an infant fails the initial screening.

In this study, 63.8% of participants expressed willingness to pay out-of-pocket for NHS but this figure is lower compared to findings from Albania where self-funding willingness was 100%.[14] Because out-of-pocket costs present a barrier in resource-limited settings like Tanzania, universal tracking policies should integrate screening into standard, subsidized public perinatal care packages.

Study Limitation

The primary limitation of this study is its single-centre design at a national referral hospital, which likely over-represent urban and highly educated population relative to rural Tanzanian demographics. Therefore, the observed baseline knowledge, attitude and acceptance rates may not generalize to remote or primary healthcare settings. Multi-centre studies across diverse regional and rural facilities are needed to establish a comprehensive national baseline.

Conclusion

Acceptance and positive attitudes toward newborn hearing screening are high among the evaluated population, suggesting feasibility for the implementation of universal newborn screening programmes. However, deficits in procedural knowledge and persistent concerns about paediatric pain highlight a requirement for structured public health education. To optimize regional implementation, healthcare policies must integrate affordable screening services with targeted antenatal counselling to minimize loss to follow-up care.

Funding: None

Conflict of interests: None

Authors' contributions: AAK: conception and design, analysis, interpretation of data and drafting of the article. GSM: conception and design, data collection, analysis and interpretation of data. SCL: study design and interpretation of data. SM: study design and interpretation of data. All authors have read and approved the manuscript.

Acknowledgements: We thank the participants for their valuable time and cooperation, without them, this study would not have been possible. We also extend our sincere appreciation to the clinical staff, nursing teams and antenatal clinic coordinators at MNH for their logistical support during data collection phases. We also acknowledge the management of MNH and MUHAS for granting administrative permission and ethical approval, respectively. Finally, we thank the staff of the MNH and MUHAS Department of Otorhinolaryngology for their valuable support.

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