Awareness of Auditory Development in Expectant Mothers

Corresponding author

SONA MERIN JACOB

Post Graduate Student (MASLP),

Dr. M. V. Shetty College of Speech and Hearing,

Malady Court, Kavoor,

Mangalore University-15

DR. SATISH KUMARASWAMY

Ph. D (Speech and Hearing)

Professor,

Dr. M. V. Shetty College of Speech and Hearing,

Malady Court, Kavoor,

Mangalore University-15

ABSTRACT

Auditory development is a sophisticated biological and neurological journey that begins long before birth as the physical structures of the ear reach functional maturity by the second trimester of pregnancy. Studying this developmental trajectory is of paramount importance because the auditory system serves as the primary gateway for language acquisition, literacy and social emotional bonding. Studying pregnant women's awareness of auditory development is important, especially in India. Given mothers' pivotal role in monitoring child development, their understanding of auditory development is crucial. Addressing this gap could reveal insights into early hearing issue detection. The study utilized a questionnaire for survey gathering data from 30 expectant mothers aged 23 to 35 years.11 questions explored knowledge,10 questions explored attitude and 10 questions explored perceptions of auditory development. The study found that pregnant women, on average, exhibited a 80% knowledge level regarding the importance of auditory development during gestation. However, their attitude towards this aspect was notably high at 81.53%. Generally positive attitude among expectant mothers and moderate positive perception on auditory development. The finding sheds light on a crucial aspect of maternal knowledge concerning hearing and its development. This understanding is pivotal for successful early identification and intervention programs. The study's contribution lies in revealing mothers' knowledge, attitude

and perspective towards monitoring their child's speech, language and motor development emphasizing the importance of this awareness for early intervention strategies.

Key words: Auditory development, Newborn, Pregnant women, Knowledge, Attitude, Perception

INTRODUCTION

Auditory development is the process by which a child learns to detect, discriminate, identify and comprehend sounds (Norman,1982).Auditory development is one of the earliest and most important areas of growth for a developing baby. Even before birth, the fetus begins to sense and respond to sound making hearing a key foundation for later communication, learning and emotional bonding.

During pregnancy, the baby's auditory system develops rapidly. By around 18th to 20th week, the structures of the inner ear are formed, and by about 25 to 28 weeks the fetus can begin to hear sounds within the womb. These sounds include the mother's voice, her heartbeat, breathing and even muffled external noises such as music or conversation. The womb acts as a natural filter, so what the baby hears is softened and rhythmic rather than sharp. The mother's voice is especially significant. Mothers are the primary caregivers and first observers of a child's hearing and communication behavior. Early auditory development depends heavily on how quickly hearing difficulties are recognized and addressed. Mothers play a central role in noticing early warning signs such as lack of startle response, delayed babbling or poor response to sound. When mothers have good awareness they are more likely to seek early screening and intervention which directly improves outcomes in speech and language development, especially in children with hearing impairment

Auditory development refers to the hierarchical acquisition of listening skills progressing from awareness of sound to understanding spoken language (Daniel,1976). Hearing repeated patterns of sound helps form neural connections that are essential for language acquisition. Gentle talking, reading aloud or singing during pregnancy can provide positive stimulation without overwhelming the baby. After birth babies continue to build on these early experiences. They show a preference for familiar voices and sounds they heard during pregnancy and these auditory memories support early social interaction and language learning.

Auditory development is closely related to speech and language and is studied in the field of Audiology and Speech Language Pathology. Early exposure to sound is very important because the brain has high plasticity during the first few years of life, often referred to as a critical period. Factors such as hearing ability, environment and interaction with caregivers influence this development but Hearing loss can delay it. Overall, proper auditory development is essential for communication, learning and social interaction.

Child's acquisition of auditory skills is strongly influenced by the quality of interaction and stimulation provided by parents, especially during the early years when the brain is highly sensitive to sound and language input.

However, when parents have limited knowledge about normal auditory development or are unaware of the importance of early auditory stimulation, children may not receive adequate listening experiences. This lack of stimulation can lead to delayed development of auditory and speech skills, reduced vocabulary growth and difficulties in language comprehension. Therefore, parental knowledge plays a crucial role in shaping a child's auditory development and lack of awareness can significantly hinder the development of essential listening and language skills. Awareness helps mothers protect their baby's developing ears by avoiding prolonged exposure to loud noises which can cause stress or even hearing damage in utero. When parents are aware of how delicate the fetal auditory system is, they tend to avoid excessive noise, monitor volume in social settings and consult the doctor about any hearing health issues. Awareness can be done by providing expectant mothers with clear, visual information such as brochures or posters that highlights the timeline of fetal hearing. Awareness can also be spread through prenatal workshops where mothers are taught practical ways to engage with their babies such as reading aloud or singing to foster early brain growth. Digital platforms and support groups also play a vital role by sharing tips and safety guidelines regarding noise exposure.

Traditionally in many tribal areas, mothers may have limited exposure to information about normal auditory milestones, early signs of hearing loss and available intervention services. Tribal populations also often experience challenges such as geographical isolation, lower literacy levels, cultural beliefs about illness and limited availability of audiological services which further increase the risk of late identification of hearing problems. In recent years, tribal communities have shown increasing access to updated technology such as smartphones and internet connectivity, which has significantly improved opportunities for health education and awareness. Mobile phones with internet access allow mothers to receive information through videos, social media and government health portals about normal hearing milestones, early signs of hearing loss and the importance of early intervention. Alongside the, Anganwadi centres under the Integrated Child Development Services (ICDS) play a vital role in rural and tribal areas by conducting regular awareness sessions on child health and development. These centres provide mothers with basic education on auditory milestones, speech development, nutrition and early childhood care through informal teaching and community interaction.

Audiologists play a crucial role in improving maternal awareness of auditory development, especially in tribal and underserved communities where access to specialist services may be limited by conducting awareness studies, surveys and interviews to evaluate mothers' knowledge of normal hearing milestones, risk factors for hearing loss and available intervention options. This information helps them design community based and culturally appropriate awareness programs ensuring that messages about hearing health are delivered in a simple, acceptable and locally relevant manner. Additionally, they provide training to mothers on auditory stimulation techniques that support listening and language development at home.

Desjardin (2005) investigated maternal perceptions of self efficacy and involvement in auditory development on 24 mothers of children with hearing aids and 30 mothers of children with cochlear implant demonstrated that mothers of children with cochlear implants reported significantly higher levels of self-efficacy compared to mothers of children using hearing aids.

Dudda , Muniyappa , Puttaraju and Lakshmi (2017) examined the awareness on risk factors, early identification and intervention of infant hearing loss among puerperal mothers revealed that they have moderate levels to high level of awareness.

Kaspar, Newton, Kei, Driscoll, Swanepoel and Goulios (2018) evaluated prevalence of otitis media and risk factors for sensorineural hearing loss among infants indicated that importance of initiating infant ear and hearing program.

Lam, Won, Law, Lee and McPherson(2018) investigated maternal knowledge and attitudes to universal newborn hearing screening found that most mothers had positive attitudes toward universal newborn hearing screening.

Yahya, Muneef, Majed, Alhashem and Khalifah (2020) assessed parental awareness and attitude towards the causes, risk factors, consequences and importance of early detection of infant hearing indicated that mothers are less aware.

Rautara, Sahoo, Dash and Bhoi (2021) analyzed awareness on hearing health, hearing impairment and intervention among pregnant women suggested that pregnant women have moderate awareness on hearing health, hearing impairment and intervention .

Zahir , Ravindran , Abraham and Sasidharan (2024) assessed awareness on hearing loss in newborns and hearing screening facilities among parturient and found that they have limited awareness.

Jacob, Srividya and Babu (2024) conducted a study in Kerala among 103 pregnant women and indicated that pregnant women were less aware about the significance of auditory development

Ravi, Gunjawate, Yerraguntla, Rajashekhar and Lewis (2025) in their systematic review across multiple clinical setups in India on Knowledge and Attitude of parents/caregivers towards Hearing loss and screening in newborns showed inconsistent levels of awareness regarding newborn hearing screening and parents/caregivers demonstrated positive attitudes toward hearing screening and available intervention options.

Raj, Preet, Naman, Bhagyalakshmi, John and Sanatombi (2026) analyzed community awareness and attitudes on hearing impairment among 1000 subjects revealed that moderate awareness on hearing loss.

NEED OF THE STUDY

Maternal involvement in monitoring a child's developmental milestones, including hearing, is essential for ensuring timely intervention when needed. However, there is limited research focusing on the awareness of auditory development among expectant mothers, particularly in tribal group regions in Kerala, India. Therefore, the proposed study seeks to look at expecting mothers' knowledge, attitudes and perceptions about auditory development. It focuses on the impact of normal hearing on speech, language and overall development.

METHODOLOGY

Aim of the study

The aim of the study was to evaluate the knowledge, attitude and perceptions on auditory development among expecting mothers in tribal population in Kannur and Wayanad districts of Kerala.

Subject selection

Expectant mothers in age range 23-35 years participated in the present study.

Inclusion criteria

- Subjects included were expecting mothers of 3 to 7 months gestation period.
- Subjects residing in the selected tribal area for at least 6 months.
- Expectant mothers attending antenatal clinics, community health centers or outreach programs in the selected area.

Exclusion criteria

- Mothers who have any sibling/family member with hearing impairment were not included.
- Pregnant women with diagnosed severe psychiatric illness or cognitive impairment.
- Women with professional medical or audiology training.

Procedure

The study was carried out in 3 phases.

Phase 1: Development of Questionnaire.

Self structured 31 Yes/No questionnaire in English was developed .

A. Validity

The Questionnaire was reviewed by five Audiologists for content and linguistic accuracy and revisions were made based on their suggestions.

B. Questions

KNOWLEDGE ON AUDITORY DEVELOPMENT

1.Hearing development in the fetus begins during

☐ First trimester ☐ Second trimester ☐ Third trimester

2.The fetus can respond to sounds while inside the womb.

☐ Yes ☐ No ☐ Don't know

3.Do you know that a detailed fetal anomaly scan is recommended around 18–22 weeks of gestation?

☐ Yes ☐ No ☐ Don't know

4.An anomaly scan can help detect structural abnormalities of the fetus.

☐ Yes ☐ No ☐ Don't know

5.Exposure to very loud sounds during pregnancy may affect the baby's hearing.

☐ Yes ☐ No ☐ Don't know

6.Hearing development before birth plays a role in language development after birth.

☐ Yes ☐ No ☐ Don't know

7.Newborn hearing screening helps in:

☐ Early detection of hearing loss ☐ Improving baby's weight ☐ Preventing infections

8.Hearing problems detected early can be treated or managed effectively.

☐ Yes ☐ No ☐ Don't know

9.Untreated hearing loss in infants can affect:

☐ Speech and language development ☐ Social interaction ☐ Academic performance

10.Ear infections during infancy can lead to hearing problems if untreated.

☐ Yes ☐ No ☐ Don't know

11.Hearing loss in children can impact academic and social development.

☐ Yes ☐ No ☐ Don't know

ATTITUDE TOWARDS AUDITORY DEVELOPMENT AND HEARING CARE

Scale:

1 – Strongly Disagree

2 – Disagree

3 – Neutral

4 – Agree

5 – Strongly Agree

1.I believe my baby's hearing development is important.

☐Strongly disagree ☐Disagree ☐Neutral ☐Agree ☐Strongly agree

2.I feel it is necessary to talk or sing to my unborn baby.

☐Strongly disagree ☐ Disagree ☐Neutral ☐Agree ☐Strongly agree

3.I am concerned about the effects of loud noise during pregnancy.

☐Strongly disagree ☐Disagree ☐Neutral ☐Agree ☐Strongly agree

4.Protecting my baby's hearing should begin during pregnancy.

☐Strongly disagree ☐Disagree ☐Neutral ☐Agree ☐Strongly agree

5.Newborn hearing screening should be mandatory for all babies.

☐Strongly disagree ☐Disagree ☐Neutral ☐Agree ☐Strongly agree

6.Early identification of hearing problems can improve a child's quality of life.

☐Strongly disagree ☐Disagree ☐Neutral ☐Agree ☐Strongly agree

7.I am willing to seek medical advice if I suspect hearing problems in my baby.

☐Strongly disagree ☐Disagree ☐Neutral ☐Agree ☐Strongly agree

8.Pregnant women should be educated about fetal and infant hearing development.

☐Strongly disagree ☐Disagree ☐Neutral ☐Agree ☐Strongly agree

9.I am willing to follow medical advice to protect my baby's hearing.

☐Strongly disagree ☐Disagree ☐Neutral ☐Agree ☐Strongly agree

10.I consider hearing health as important as physical health in infants.

☐Strongly disagree ☐Disagree ☐Neutral ☐Agree ☐Strongly agree

PERSPECTIVES TOWARDS AUDITORY DEVELOPMENT AND HEARING

1.Talking to the unborn baby helps in bonding and auditory stimulation.

☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly agree

2.Pregnant women should avoid loud environments to protect the baby's hearing.

☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly agree

3.Awareness about fetal hearing development is currently inadequate.

☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly agree

4.Healthcare professionals play an important role in educating mothers about hearing development.

☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly agree

5.Family members should support pregnant women in maintaining a quiet and healthy environment.

☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly agree

6.Newborn hearing screening should be explained clearly to all parents.

☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly agree

7.Cultural beliefs may influence awareness about infant hearing care.

☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly agree

8.Early hearing assessment reduces long-term communication difficulties.

☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly agree

9.Community based awareness programs can improve knowledge about auditory development.

☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly agree

10.I would recommend hearing screening and follow-up to other expectant mothers.

☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly agree

Phase 2: Administration of the questionnaire

Informed consent was obtained from each subject. The questionnaire was then administered via phone call collecting demographic information and data on maternal knowledge, attitude and perception on auditory development.

Statistical analysis

Collected responses were categorized by pregnancy status and education level. Responses were collected and later analyzed using SPSS23 software. Frequency, Percentages, Mean and Standard Deviation were calculated to determine knowledge, attitude and perception among subjects.

RESULTS AND DISCUSSION

The aim of the study was to evaluate the knowledge, attitude and perceptions on auditory development among expecting mothers in tribal population of Kannur and Wayanad districts of Kerala and results obtained are discussed below.

Figure 1

Knowledge on auditory development

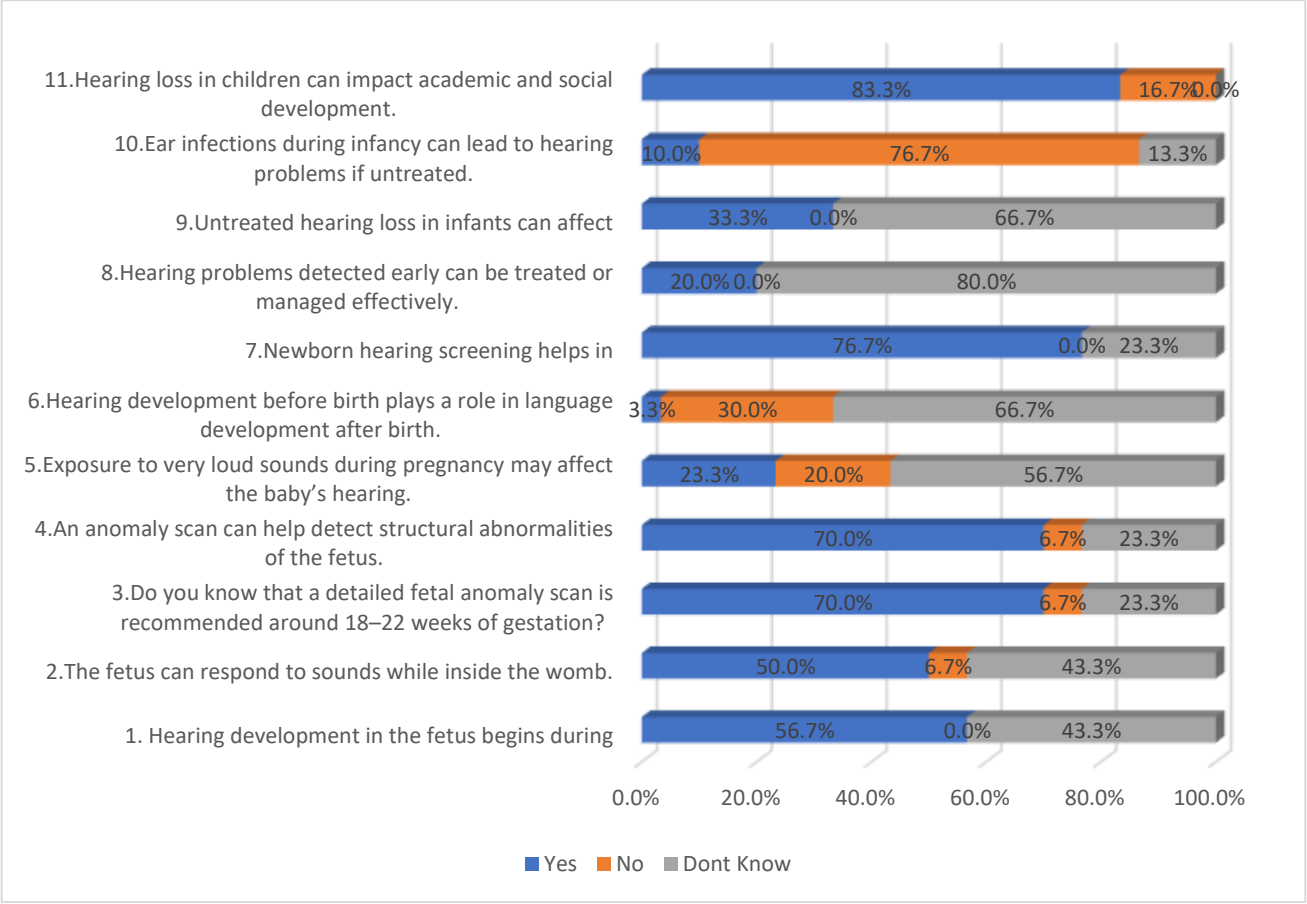

Figure 1 shows that among 35 subjects, 80% had moderate level of knowledge and 3% had an adequate level of knowledge on auditory development.

Figure 2

Attitude on auditory development

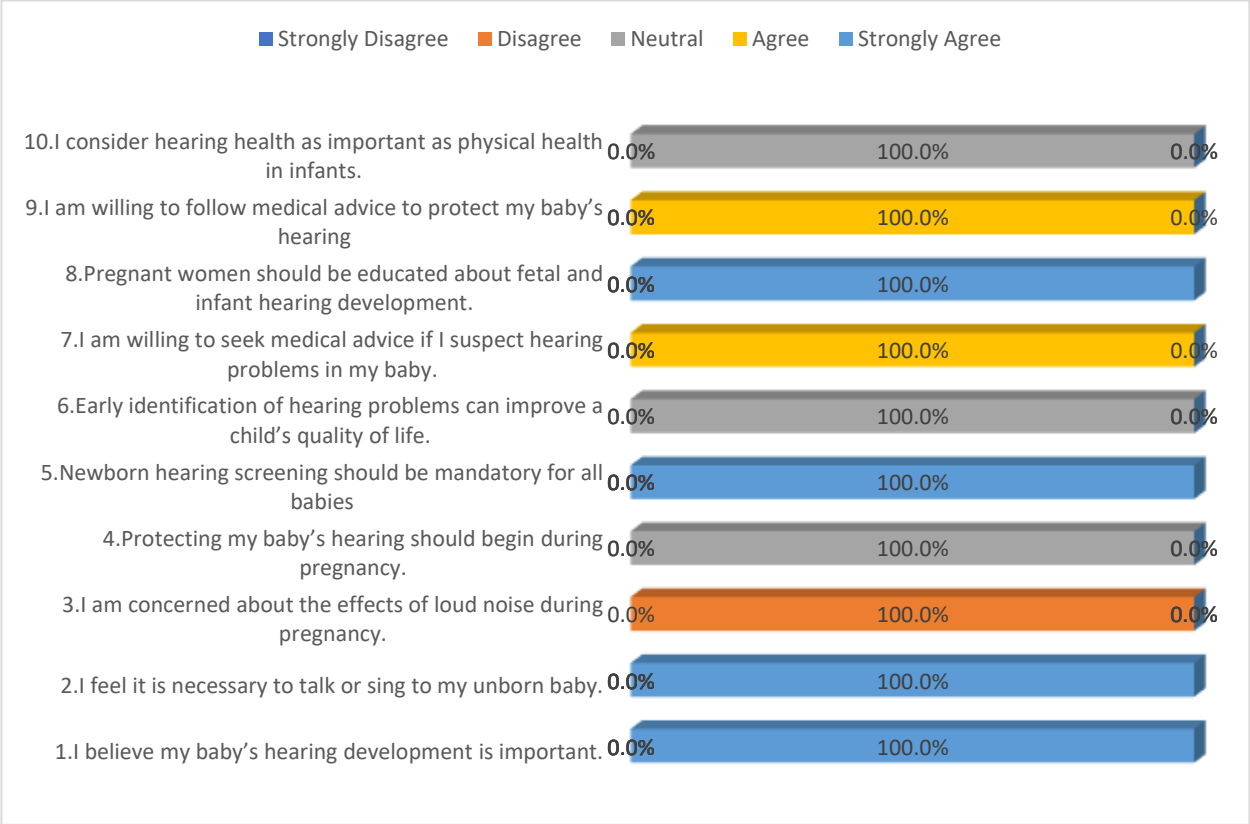

Figure 2 shows that among 10 questions subjects strongly agreed to 2 questions, agreed to 2 questions and disagreed to 2 questions.

Figure 3

Perceptions on auditory development

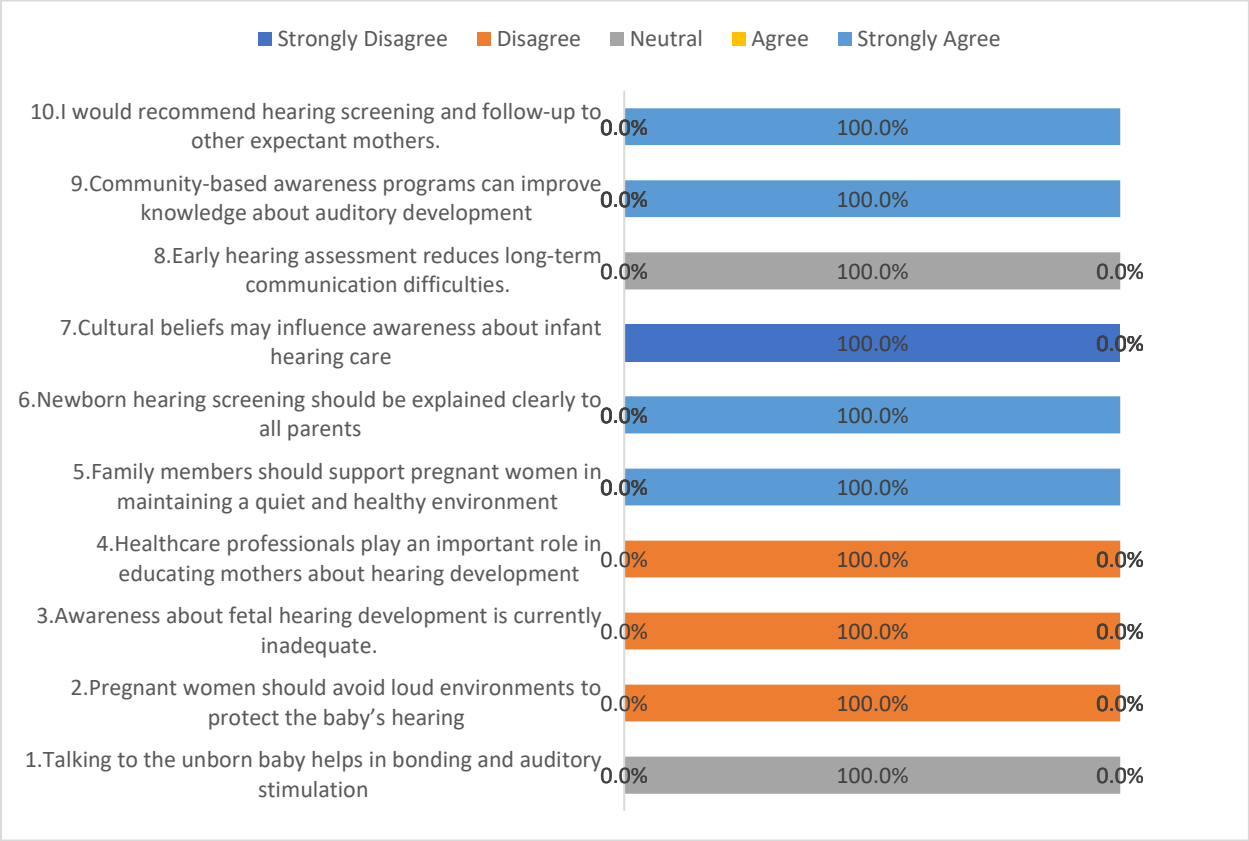

Figure 3 shows that among 10 questions subjects strongly agreed to 4 questions, agreed to 0 question and disagreed to 3 questions.

DISCUSSION

The findings revealed that pregnant women's knowledge is about 80% and 3% had adequate knowledge because pregnant women had some basic awareness through community interactions, previous pregnancy experiences and occasional health education programs but only a few had adequate knowledge. Regarding attitude among 10 questions subjects strongly agreed to 2 questions, agreed to 2 questions and disagreed to 2 questions suggesting that subjects held a positive attitude towards the importance of auditory development because they understood that hearing is essential for a child's speech, communication, learning and social interaction. Within the perception subjects strongly agreed to 4 questions, agreed to 0 question, and disagreed to 3 questions indicating a positive perception because the subjects were aware through personal experiences, community influence and limited health education but certain misconceptions, lack of detailed knowledge, cultural beliefs or limited access to healthcare information may have influenced their disagreement with some statements. Hence this present study is in accordance with previous studies by Raj et al 2026.

SUMMARY & CONCLUSION

Auditory development is the systematic development of listening skills through meaningful auditory experiences (Warren, 19994). The present study's aim was to examine the knowledge, attitude and perception of pregnant women on auditory development. The results showed that pregnant women had moderate knowledge level, positive attitude and positive perception on awareness of auditory development. Similarly, Yahya et al (2020) found that a majority of mothers were aware that ear infections such as discharge and pain as well as head injuries or a slap to the ear could lead to hearing loss in infants. Lam et al (2018) identified that the knowledge level regarding hearing development was low but participants still expressed positive attitudes towards Universal Newborn Hearing Screening (UNHS). Most participants held a positive attitude towards new born hearing screening. These findings emphasize the need for educating parents about auditory developmental milestones identified through screening. Since a child's speech, language and motor development are closely linked to hearing ability. Maternal understanding of auditory development is essential for the effectiveness of early identification and intervention programs.

LIMITATIONS

- The findings cannot be generalized to all tribal populations.
- Differences in language, literacy level, and cultural beliefs may have affected the subjects understanding of the questions and responses.
- The study mainly assessed knowledge, attitude and perception through self-reported responses, which may be influenced by response bias or misunderstanding.
- Limited access to healthcare facilities and health education in tribal areas may have affected the depth of knowledge among participants.

FUTURE DIRECTIONS

- Include a larger and more sample from different tribal regions
- Awareness programs on auditory development should be improved using simple language and local methods.
- Health education provided during pregnancy check ups should be improved and made more effective.

REFERNCES

[1]. Abdullah, N. C., Zakaria, M. N., Majid, A. H. A., Hamzah, S., Ismail, A. I., & Mukari, S. Z. M. S. (2017). Determinants of employees' awareness for universal newborn hearing screening: Evidence from Malaysia. *International Journal of Economics and Perspectives, 11*(4), 219–229.

[2]. Al-Yahya, K., Al-Muneef, A. A., Al-Majed, F. S., Al Hashem, F. Y., & Al-Khalifah, A. S. (2018). Maternal knowledge and awareness of neonatal hearing loss: A local survey from Saudi Arabia. *Prevalence, 1*(5), 124–129.

[3]. Augustine, A. M., Kurien, A. K., Davis, S. M., et al. (2014). Neonatal hearing screening—Experience from a tertiary care hospital in Southern India. *Indian Pediatrics, 51*, 179–183.

[4]. Dudda, R., Prasad, H. M., Puttaraju, S., & Lakshmi, M. S. (2017). A qualitative study on knowledge and attitude towards risk factors, early identification and intervention of infant hearing loss among puerperal mothers: A short survey. *Journal of Clinical and Diagnostic Research, 11*(7), MC01–MC04.

[5]. Flexer, C., Madell, J. R., Wolfe, J., & Schafer, E. C. (2008). Why is hearing important in children? In *Pediatric audiology: Diagnosis, technology, and management* (pp. 54–64). Thieme Medical Publishers.

[6]. Kaspar, A., Newton, O., Kei, J., Driscoll, C., Swanepoel, D. W., & Goulios, H. (2017). Parental knowledge and attitudes to childhood hearing loss and hearing services in the Solomon Islands. *International Journal of Pediatric Otorhinolaryngology, 103*, 87–92.

[7]. Lahav, A., & Skoe, E. (2014). An acoustic gap between the NICU and womb: A potential risk for compromised neuroplasticity of the auditory system in preterm infants. *Frontiers in Neuroscience, 8*, 381. https://doi.org/10.3389/fnins.2014.00381

[8]. Lam, M. Y. Y., Wong, E. C. M., Law, C. W., Lee, H. H. L., & McPherson, B. (2018). Maternal knowledge and attitudes to universal newborn hearing screening: Reviewing an established program. *International Journal of Pediatric Otorhinolaryngology, 105*, 146–153. https://doi.org/10.1016/j.ijporl.2017.12.025

[9]. Madell, J. R. (2011). Testing babies: You can do it! Behavioral Observation Audiometry (BOA). *Perspectives on Hearing and Hearing Disorders in Childhood, 21*(2), 59–65.

[10]. Morzaria, S., Westerberg, B. D., & Kozak, F. K. (2004). Systematic review of the etiology of bilateral sensorineural hearing loss in children. *International Journal of Pediatric Otorhinolaryngology, 68*(9), 1193–1198.

[11]. Moeller, M. P. (2000). Early intervention and language development in children who are deaf and hard of hearing. *Pediatrics, 106*(3), e43. https://doi.org/10.1542/peds.106.3.e43

[12]. Pynnonen, M. A., Handelsman, J. A., King, E. F., Singer, D. C., Davis, M. M., & Lesperance, M. M. (2016). Parent perception of newborn hearing screening: Results of a US national survey. *JAMA Otolaryngology–Head & Neck Surgery, 142*(6), 538–543.

[13]. Querleu, D., Renard, X., Versyp, F., Paris-Delrue, L., & Crèpin, G. (1988). Fetal hearing. *European Journal of Obstetrics & Gynecology and Reproductive Biology, 28*(3), 191–212.

[14]. Reddy, M. V. V., Bindu, H., Reddy, P. P., & Rani, U. P. (2006). Role of intrauterine rubella infection in the causation of congenital deafness. *Indian Journal of Human Genetics, 12*(3), 140–143.

[15]. Sahoo, S., Rautara, S., Dash, N., Panigrahi, S., & Kandpal, B. (2021). A qualitative study on awareness of hearing health, hearing impairment and intervention among pregnant women and mothers of newborn in rural Khordha district. *Annals of Medical and Health Sciences Research, 11*(S3).

[16]. Swanepoel, D., & Almec, N. (2008). Maternal views on infant hearing loss and early intervention in a South African community. *International Journal of Audiology, 47*(Suppl 1), S44–S48. https://doi.org/10.1080/14992020802301168

[17]. Uakarn, C., Chaokromthong, K., & Sintao, N. (2021). Sample size estimation using Yamane and Cochran and Krejcie and Morgan and Green formulas and Cohen statistical power analysis by G*Power and comparisons. *Apheit International Journal, 10*(2), 76–88.

[18]. Ulusoy, S., Uysal, H., Cingi, C., & Yilmaz, H. B. (2013). Analysis of hearing screening test findings of 11,575 newborns in Turkey. *Otolaryngology–Head and Neck Surgery, 149*(2 Suppl), P240–P241.

[19]. Wong, Y. A., Siti, Z. M. S. M., Deepashini, H., & Rafidah, M. (2019). Knowledge and attitude on childhood hearing loss among mothers and mothers-to-be in urban and rural areas in Malaysia. *International Journal of Pediatric Otorhinolaryngology, 124*, 79–84. https://doi.org/10.1016/j.ijporl.2019.03.021

[20]. Zabeeri, N., Al Naimi, S. N., Al Noaimi, D. A., et al. (2020). Knowledge and perception on hearing loss, hearing management modalities, speech and language pathology among general public in Al-Khobar, Kingdom of Saudi Arabia. *Research Square*, 1–12.