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## Original Research Article

## Awareness of hearing loss in newborns and newborn hearing screening facilities among parturient

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## ABSTRACT

**Background:** Parental awareness about hearing loss in newborns and newborn hearing screening programs are important for the early identification and intervention in children with hearing loss. Limited studies have explored the awareness of parturient mothers towards newborn hearing loss, newborn hearing screening, its importance and, the facilities for early hearing screening programs available at hospitals and clinics in the Indian scenario.

**Materials and Methods:** The current study investigated the awareness of parturient about newborn hearing loss, newborn hearing screening facilities and its importance through a self-administered questionnaire survey. A total of 317 parturient across different clinics and hospitals in the city of Mangalore, state of Karnataka participated in the survey.

**Results:** Majority of the parturient mothers (71.29%) were aware of the probability of hearing loss among newborns and only 56.46% of the participants had knowledge about the risk factors for newborn hearing loss. Only 42.58% have heard about newborn hearing screening before and 57.42% of the participants were unaware of the hearing screening programs available in hospitals and clinics and its importance.

**Conclusion:** Despite of the education or socio-economic status, there exists a lack of knowledge among parturient mothers about hearing loss in newborns and newborn hearing screening. Responses from the current study raise concern about the need to educate the public particularly the new mothers or expecting mothers about the newborn hearing loss, risk factors for newborn hearing loss, hearing screening programs available in hospitals and clinics and its importance. Early identification of hearing loss in children is crucial for the successful implementation of early hearing intervention and better prognosis.

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## 1. Introduction

Hearing loss in newborns could be attributed to various factors including pre-, peri-, and post-natal factors along with genetic predisposition factors.<sup>1</sup> The genetic cause can be syndromic or non-syndromic constituting about 30% and 70% respectively of hereditary hearing loss.<sup>1,2</sup> Other leading causes of hearing loss in infants include infections like toxoplasmosis, rubella, cytomegalovirus, herpes (TORCH complex infections), Zika virus, prematurity,

low birth weight, low APGAR scores, hyperbilirubinemia, hypoxia, head trauma, childhood infection, exposure to noise and ototoxicity and of all profound hearing loss were reported to be high among children with a family history of consanguineous marriage.<sup>3–6</sup> Exposure to environmental factors such as the noise produced by the life-supporting equipment in the neonatal intensive care unit (NICU) has also been reported to be a cause of hearing loss in newborns.<sup>6</sup>

The Joint Committee on Infant Hearing (JCIH) 2019 position statement has made Early Hearing Detection and Intervention (EHDI) mandatory to assure that all infants

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with hearing loss must be identified as early as possible and to receive appropriate intervention no later than 3-6 months of age. The EHDI has facilitated the feasibility of Universal Newborn Hearing Screening (UNHS) as well the advantages of early identification and intervention of hearing loss in children.<sup>7</sup> The use of oto-acoustic emission (OAE) tests and automated auditory brainstem response (AABR) has facilitated to rule out various hearing conditions including auditory neuropathy.<sup>8</sup>

Universal newborn hearing screening has been employed in hospitals and clinics across different countries enabling early identification and management of hearing loss.<sup>9</sup> It has been evidenced that UNHS programs have been successful to some extent in preventing the effect of hearing loss speech and language development in hearing impaired children.<sup>10,11</sup> However, the extent to which the general public particularly parents of newborns is aware of the hearing loss in newborns and the newborn hearing screening programs available across hospitals and clinics is still questionable.

Studies have explored the awareness and attitude of parents towards neonatal hearing loss and newborn hearing screening programs and the responses are variable. Inadequate knowledge among mothers as well as general public regarding hearing loss in infants were reported<sup>9,12–15</sup> In contrary, good maternal knowledge about the risk factors for hearing loss among newborns and the awareness about the availability of treatment options for hearing loss was also been reported with majority of the mothers expressing the desire to test their children for hearing loss at the time of birth and concern about the child's hearing.<sup>16</sup> In the same line, optimistic attitude among parents towards the neonatal hearing screening and hearing aids for the infants were also been reported.<sup>17</sup>

Most of the studies in literature have highlighted parental awareness about hearing loss in children, the risk factors for hearing loss and the impact of hearing loss in children. There are only limited studies that have explored the awareness of parturient mothers towards newborn hearing loss, newborn hearing screening programs, as well as the facilities for early hearing screening programs available at hospitals and clinics specifically in the Indian scenario. Awareness among public especially the parturient population is important for the successful implementation of early hearing screening programs. Early identification of hearing loss in newborns is important for the adequate development of speech and language skills, academic profile, socio- economic and psychological aspects, which in turn improves the quality of life. Early identification and intervention are the key to better prognosis.

In this light the current study focuses on investigating the awareness of parturient about hearing loss in newborns, newborn hearing screening program, its importance, and the facilities for newborn hearing screening that are available in

the hospitals and across Mangalore city of the Karnataka state, India. This helps to explore the extent to which parturient are aware of the same and to identify the factors contributing to awareness/lack of awareness about the same. This will also help to design awareness programs to promote awareness about neonatal hearing loss, newborn hearing screening programs available in hospitals and clinics to reach the public.

## 2. Materials and Methods

### 2.1. Ethics committee approval

The Institutional Ethics Committee approval (FMIEC/CCM/141/2021) was taken before the commencement of the study.

### 2.2. Questionnaire

The questionnaire for the survey was framed under the domains of 1) Awareness of hearing loss in newborns 2) Awareness of risk factors for hearing loss in newborns 3) Awareness of newborn hearing screening programs, 4) Awareness about the importance of early identification and intervention in newborns and 5) Awareness about the facilities available for newborn hearing screening. The questionnaire for the survey was framed in English language and was validated by five qualified professionals from the field of Speech and Hearing and the questionnaire was further modified incorporating the suggestions. The final questionnaire for the survey consisted of 22 self-administered open-ended and closed-ended questions. The English questionnaire was translated to Kannada language and was validated by five qualified professionals from the field with proficiency in Kannada language to check for the accuracy and correctness of the content.

### 2.3. Participants

A total of 317 parturient mothers between the age range of 23 to 35 years who were selected using a convenient sampling method. The participants were selected from various obstetrics & gynaecology clinics and hospitals across Mangalore city in the state of Karnataka, India. Parturient who were under medication or counselling for postpartum depression or who had experience in the field of audiology were excluded from the study.

### 2.4. Methodology

An observational qualitative descriptive study design was adopted for the survey. The questionnaire for the survey was circulated directly to participants with their language of choice. The participation in the survey was completely voluntary and a written consent was taken from all the participants after describing the need for the survey to the participants. The participants were requested to attempt all

the questions and provide genuine answers.

### 2.5. Data analysis

The responses from all the participants were subjectively analysed for the individual completion of survey. The incomplete responses were discarded from the analysis. The obtained data were processed and analysed using SPSS version 20. Descriptive statistics were used and the responses were determined in terms of mean, standard deviation, frequency counts and percentage scores.

## 3. Results

### 3.1. Awareness of hearing loss in newborns

The results showed that out of the 317 participants who completed the survey, 71.29% (226 participants) were aware that hearing loss can be present among newborns and remaining 28.7% (91 participants) were completely unaware of the same. 76.34% (242 participants) were aware that hearing loss can affect the child's speech and language development whereas 23.66% (75 participants) were unaware of the effect of hearing loss on the speech and language development of the child. 76.65% (243 participants) were aware that hearing loss if present can affect the academics, social life, and emotional wellbeing of the child. However, 23.34% (74 participants) were unaware about the effect.

### 3.2. Awareness about risk factors for hearing loss in newborns

56.46% (179 participants) were aware that congenital ear abnormalities and/or genetic factors could be a risk factor for hearing loss in newborns. However, only few participants were aware of the high-risk factors for newborn hearing loss such as preterm birth, neonatal jaundice, low birth weight as a cause of hearing loss in newborns. Table 1 depicts the possible risk factors for hearing loss in newborns and the awareness of parturient about the same.

### 3.3. Awareness about newborn hearing screening programs

More than half the participants; 57.42% (182 participants) responded that they have never heard of newborn hearing screening and the remaining 42.58% (135 participants) reported that they heard about newborn hearing screening before.

The participants who were aware of newborn hearing screening programs reported that they have come across the same through various sources like work place (1.48%; 2 participants), being a healthcare worker/medical professional (9.63%; 13 participants), from relatives (5.93%; 8 participants), from prenatal classes (0.74%;

**Table 1:** Risk factors for hearing loss in newborns and the awareness among parturient about the risk factors

| <b>Risk factors for hearing loss in newborns</b>                        | <b>Awareness among participants about the risk factors causing hearing loss in newborns</b> |
|---|---|
| Alcohol consumption   | 24.30% (77 participants)  |
| Smoking   | 24.93% (79 participants)  |
| Alcohol consumption and smoking   | 4.74% (15 participants)   |
| Medicines taken by the mother during pregnancy                          | 29.02% (91 participants)  |
| Preterm birth   | 32.18% (102 participants)   |
| Neonatal jaundice   | 14.51% (46 participants)  |
| Preterm birth and neonatal jaundice                                     | 12% (38 participants)   |
| Low birth weight  | 19.24% (60 participants)  |
| Preterm birth, neonatal jaundice and low birth weight                   | 10.09% (31 participants)  |
| Cleft lip/palate  | 16.40% (51 participants)  |
| Preterm birth, neonatal jaundice, low birth weight and cleft lip/palate | 8.20% (25 participants)   |
| Ear abnormalities   | 56.78% (179 participants)   |
| Genetic conditions  | 56.15% (177 participants)   |
| Ear abnormalities and genetic conditions                                | 40.38% (128 participants)   |

1 participant), through friends (5.18%; 7 participants), through internet, advertisements and reading (2.93%; 4 participants), from hospital and doctor (74.07%; 100 participants).

Most of the participants who were aware of the newborn hearing screening programs (94.07%; 127 participants) were also aware that it can be done soon after birth within the hospital and the remaining 5.93% (8 participants) were not sure about how early hearing screening can be done in children. Also 79.3% (107 participants) of the mothers who were aware of the newborn hearing screening believed that hearing screening programs could rule out hearing loss in children as young as newborns whereas 20.70% (28 participants) did not.

Of the total participants who completed the survey, a majority of 88.32% (280 participants) considered identification of hearing loss at the time of birth as a necessity and a small number of participants (11.68%; 37 participants) still did not consider it as a necessity. Another noticeable response from the survey was that a significant percentage, i.e.; 85.80% (272 participants) expressed their willingness to involve their children in the newborn hearing screening program as well as to do follow-ups including detailed audiological evaluation if required in case if the initial hearing screening showed a refer. However, a small percentage of participants; 14.2% (45 participants) expressed their unwillingness to involve their child neither

in newborn hearing screening program nor to do further audiological evaluation.

### 3.4. Awareness about the importance of early identification and intervention

70.03% (222 participants) of the total participants agreed to the idea that the early identification of hearing loss in children should be followed by early intervention whereas 29.97% (95 participants) were not sure about the need for early intervention. A significant percentage of 67.82% (215 participants) were completely unaware about the treatment options available for children with hearing loss and 32.18% (102 participants) knew about the various treatment options that are available.

84.86% of the participants (269 participants) considered hearing aids or other amplification devices acceptable if the child has a hearing loss and rest of the 15.14% (48 participants) expressed their unwillingness for the same.

A positive response towards recommending newborn hearing screening to their friends and family were expressed by 94% of the participants (298 participants) and only 6% (19 participants) were not ready to recommend newborn hearing screening to their friends and family.

### 3.5. Awareness about facilities available for newborn hearing screening

65.3% (207 participants) of participants were aware of the facilities for newborn hearing screening that were available in the consulting hospitals whereas 34.7% (110 participants), which is a significant percentage to be considered, were unaware of these facilities available in their consulting hospitals.

70% (222 participants) reported that they neither have received any kind of counselling or awareness program from the hospital regarding the newborn hearing screening and facilities available nor its importance whereas few of the participants, i.e; 29.97% (95 participants) reported that they have received counselling or attended awareness programs on newborn hearing screening during their consultations.

On completion of the survey, majority of the participants (297 participants; 93.69%) disclosed that availability of audiologist is mandatory in all the hospitals having child care and related health programs and only 6.31% (20 participants) did not consider the availability of audiologist as a necessity in hospitals for children and health care programs.

## 4. Discussion

The aim of the current study was to investigate the awareness of parturient about hearing loss in newborns, newborn hearing screening program, and facilities for newborn hearing screening that are available in the hospitals and across Mangalore city of the Karnataka state, India.

The responses revealed that majority of the participants were aware that hearing loss can be present at birth and its effect on speech and language development, academic and social development of the child. These findings are in line with the previous study where 51.29% of the mothers who participated in the survey exhibited good knowledge about the neonatal hearing loss and 90.10% of the mothers were aware that neonatal hearing loss and speech and language development are related.<sup>17</sup> Another study has reported controversial findings wherein the mothers had lack of awareness about neonatal hearing loss but majority of the participants were aware that speech and language problems could be caused by hearing loss.<sup>18</sup> These mixed findings with respect to the awareness about the importance of newborn hearing screening could be attributed to various factors including the education, economic status, parental perception and various social factors.<sup>19</sup>

The responses with respect to the risk factors causing hearing loss varied among the participants. Majority of the participants were aware of some of the risk factors like congenital ear abnormalities and/or genetic abnormalities, medicines taken by the mother during pregnancy, preterm birth, smoking and/or alcohol consumption as causes for hearing loss in newborns. However, in the current survey, other factors like toxoplasmosis, rubella, cytomegalovirus, herpes infections, neonatal jaundice, low birth weight, NICU admission more than 5 days, cleft left lip/palate are known to only minor group of parturient mothers as a major cause for neonatal hearing loss. In one of the studies, mothers were aware of only middle ear infections, alcohol consumption during pregnancy and ototoxicity as risk factors<sup>18–21</sup> and majority of the participants were unaware of other risk factors that can cause hearing loss such as the NICU admission for more than 5 days, prematurity, rubella and jaundice.<sup>21</sup> The lack of awareness about the risk factors could be attributed to multiple factors like cultural beliefs or linguistic variations, parental education or socioeconomic factors.<sup>19–22</sup>

Even though more than half the participants in the current survey were aware of the newborn hearing screening facilities available in the consulting hospitals, majority of them had lack of awareness about newborn hearing screening programs and its importance. Studies have findings in tune with the current findings wherein mothers exhibited poor knowledge about newborn hearing screening.<sup>19,23</sup> Educational and financial status, parental perception and other social factors such as cultural beliefs can contribute to the lack of awareness about newborn hearing screening.<sup>24</sup> In contrast, a study has also reported that only a small percentage of mothers were aware of the facilities available for the newborn hearing screening.<sup>25</sup> This indicated that even though newborn hearing screening has been made mandatory across countries, the extent to which it has reached the general public is a matter to be

of concern.

Despite of the lack of awareness about newborn hearing screening as observed in the current survey, about 85.8% of the total participants expressed their willingness to get their child undergo newborn hearing screening and let their child use hearings aids or any other amplification device if hearing loss is diagnosed. However, few participants expressed their unwillingness which could be due to socio-economic factors or cultural beliefs<sup>19</sup> or could be cosmetic concerns; the fear that the child will be treated differently by the society. Similar finding were reported in a study where 99% of the participant mothers showed positive response towards their desire to screen their baby soon after birth and high acceptance of hearing aids as a preliminary intervention option if required.<sup>19,22,26</sup>

## 5. Conclusion

The current survey demonstrates that despite of the lack of awareness about risk factors for hearing loss in newborns, majority of participants showed a positive response towards getting get their child screened for hearing loss. However, there were atleast a small number of participants who did not want their newborn to undergo newborn hearing screening as well as hearing aid even if required. Also, majority of parturient who participated in the survey were not much aware of high-risk factors like neonatal jaundice, low birth weight, etc. as a matter of concern for the child. The survey highlights the need for counselling sessions for the parturient mothers during their consultations. This will help in educating the young mothers about the probability of hearing loss in newborns which should not be missed, the relevance of understanding the risk factors for hearing loss, importance of newborn hearing screening and early intervention which will help to improve the quality of life of the child. Awareness programs among public particularly parturient; expecting or new mothers regarding the risk factors for hearing loss in newborns and the audiology services available across hospitals and clinics would facilitate early identification of hearing loss and intervention. Parental awareness and knowledge are the key for successful implementation of any newborn hearing screening program. Also, it should also be taken into consideration that health professionals need to create more awareness programs by considering the cultural and religious concerns of the community that they are working with in order to promote knowledge and awareness among the general public regarding the importance of newborn screening and the facilities available for the smooth implementation of the same.

## 6. Source of Funding

None.

## 7. Conflict of Interest

None.

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