

**RESULTS OF NEWBORN HEARING SCREENING: A COMMUNITY-BASED  
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**ABSTRACT**

**Introduction:** Hearing impairment refers to varied degrees of hearing loss, from hard-of-hearing to complete deafness. The Centers for Disease Control and Prevention (CDC) reports that of 1000 examined newborns, 1.7% had a hearing impairment in 2019. According to projections, the prevalence of inborn hearing loss ranges from 1.2–5.7/1000 neonates, and it is significantly higher in high-risk neonates. The purpose of this study is to investigate the outcomes of newborn hearing screening within a community-based framework. The aim is to identify the prevalence of hearing impairment and the effectiveness of early detection strategies in the community sector. **Method:** We used a longitudinal research design. Conducted over a 12-month period in a primary health center in Kakori, Lucknow, the research involved screening 505 newborns using otoacoustic emissions (OAE) tests. **Results and discussion:** The results showed an initial referral rate of 15.44%, with 10.49% of referrals for both ears, 2.17% for the right ear, and 2.77 percent for the left ear. These referrals were for further audiological evaluation, and 78 infants, or 15.44% of those screened, had confirmed hearing loss. Follow-up assessments revealed significant delays in diagnosis and intervention among families lacking access to resources. The findings underscore the importance of community engagement and tailored educational programs to improve screening follow-up and support systems. **Summary and Conclusion:** This investigation highlights the need for ongoing advocacy and resource allocation to enhance early hearing detection and intervention services in community settings, ultimately aiming to optimize developmental outcomes for affected infants.

**KEYWORDS:** hearing, screening, newborn, OAE, AABR, infant, community, and impairment.**INTRODUCTION**

Hearing loss is the most prevalent sensory impairment worldwide. Hearing impairment can vary from mild to severe.<sup>[1]</sup> Moderate to profound hearing loss is a disabling ailment that affects 360 million individuals globally, as per the World Health Organization's 2012 estimates.<sup>[2]</sup> Hearing loss is the second most prevalent cause of years lived with disability (YLD), representing 4.7% of the total YLD.<sup>[3]</sup> The often-cited prevalence data for India indicates that 6.3% of the population experiences substantial auditory impairment.<sup>[4]</sup> Four rural locations exhibit a greater prevalence of hearing loss compared to metropolitan areas.<sup>[5]</sup> The 58th round of the National Sample Survey Organization in 2002 revealed that 291 individuals per 100,000 population currently suffer from severe to profound hearing loss. A significant

proportion consists of youngsters aged 0 to 14 years. The survey findings indicated that approximately 7% of individuals possess congenital hearing loss.<sup>[6]</sup>

Childhood-acquired deafness significantly affects an individual's social, economic, and productive life. Simultaneously, there exists a significant deficiency of human resources within the healthcare sector to address this health concern. The Government of India has designated primary health care (PHC) as the preferred strategy for the prevention and management of deafness. The Union Government launched the NPPCD in 2006.<sup>[7]</sup> Among every 1000 children born in India, approximately 5–6 may experience hearing impairments.<sup>[8]</sup> Because most individuals with hearing impairments lack visual cues.

Unchecked children remain unidentified until the ages of 1 to 3 years, significantly exceeding the essential period for optimal speech and language development. However, newborn hearing screening allows for the prompt diagnosis and treatment of a hearing-impaired child. In this scenario, we expect the youngster to acquire language, communication, and social skills similar to those of their normally hearing counterparts, thereby avoiding a lifetime of disadvantages associated with hearing loss.<sup>[9]</sup>

Newborn hearing screening programs primarily concentrate on the early identification and management of hearing loss. Research indicates that neonatal screening should occur within one month of birth, diagnosis within three months, and rehabilitation should commence at six months of age.<sup>[10, 11]</sup> We must implement early identification and intervention via auditory habilitation and speech and language therapy during the critical developmental period (birth to 5 years).<sup>[12]</sup> Neonatal risk factors have been associated with hearing loss.<sup>[13]</sup>

India has not made large-scale efforts to test newborns or infants for hearing impairments. As part of its work to prevent communication disorders, the All India Institute of Speech and Hearing (AIISH) in Southern India regularly checks for hearing problems in babies in hospitals that are connected to the institute. These checks use behavioral observational audiometry, otoacoustic emissions (OAE) screening, and the high-risk register (HRR). In 2009–2010, 10 hospitals affiliated with AIISH evaluated a total of 12,416 neonates for auditory impairments. They recommended additional examination for 1010 infants.<sup>[14]</sup>

Eiserman et al. investigated the multistep screening process with 4,519 children aged 0–3 years, revealing a positive predictive value of OAE at 67.3 percent and an anticipated negative yield of 98.9 percent.<sup>[15]</sup>

Hearing impairment encompasses various levels of hearing loss, ranging from hard-of-hearing to complete deafness. The Centers for Disease Control and Prevention (CDC) reports that of 1000 examined newborns, 1.7% had a hearing impairment in 2019. According to projections, the prevalence of inborn hearing loss ranges from 1.2–5.7/1000 neonates, and it is significantly higher in high-risk neonates.

The purpose of this study is to investigate the outcomes of newborn hearing screening within a community-based framework.

The aim is to identify the prevalence of hearing impairment and the effectiveness of early detection strategies in the community sector.

## METHODS

A longitudinal research design was employed. Conducted over a 12-month period in a primary health center (PHC) in Kakori, Lucknow, the research involved screening 505 newborns using otoacoustic emissions (OAE) tests.

Newborns underwent otoacoustic emission audiometry (OAE) screening in both ears as a component of the hearing screening program. An audiologist conducted OAE screening in the PHC. We initially screened all healthy newborns using otoacoustic emission audiometry (OAE) within 48 to 72 hours, while we tested infants hospitalized in the NICU once their condition stabilized.

We collected details such as the mother's and infant's general medical history and sociodemographic profile (gender, birth weight, and weight based on gestational age) prior to the screening test.

Without any audiological expertise, one can complete OAE recording in less than one minute.<sup>[16]</sup> The test produces sound stimuli through the insertion of a tiny probe in the ear canal. Emissions are the result of sound impulses entering the inner ear through the middle ear.<sup>[17]</sup>

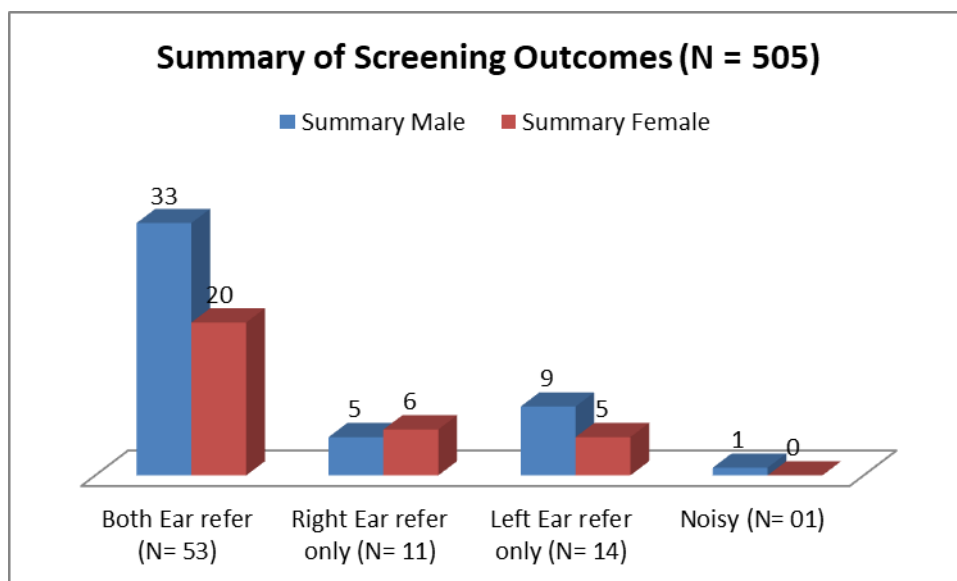
We used descriptive statistics to analyze the data in accordance with the study's objectives.

## RESULTS

We conducted the final analysis on 505 participants. There were 310 (61.36%) female cases and 195 (38.61%) male cases among the study infants.

Table 1 presents the overall number of infants who passed and were sent for the OAE test during hearing screening. 426 individuals (84.35%) successfully passed the test, while 79 individuals (15.64%) received a referral.

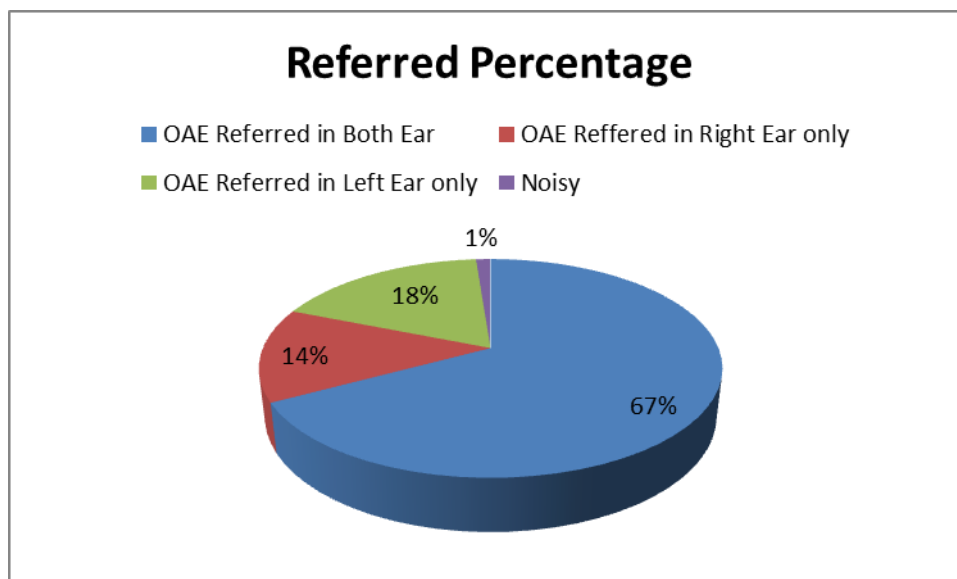
The results showed an initial referral rate of 15.44%, with 10.49% of referrals for both ears, 2.17% for the right ear, and 2.77 percent for the left ear. These referrals were for further audiological evaluation, and 78 infants, or 15.44% of those screened, had confirmed hearing loss. Follow-up assessments revealed significant delays in diagnosis and intervention among families lacking access to resources. The findings underscore the importance of community engagement and tailored educational programs to improve screening follow-up and support systems.

**Table 1: Number of Neonates/ Newborn Pass and Refer (N = 505)**

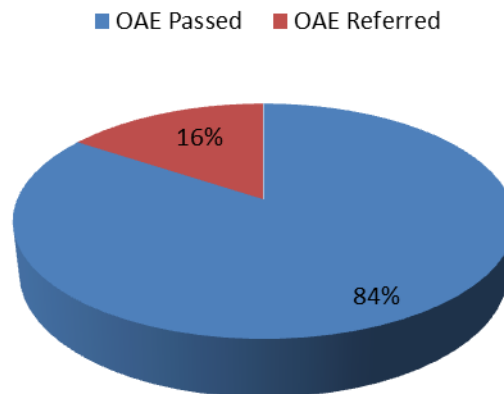
Pass/ Refer	Summary
Total Pass	426 (84.35 %)
Total Refer	79 (15.64%)

**Table 2: Summary of Screening out comes for Refer only (N = 79).**

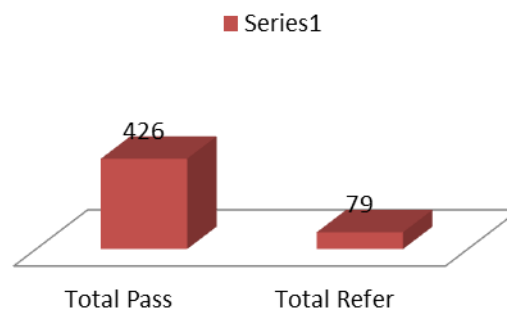
	Summary	
	Male	Female
Both Ear refer (N= 53)	33 (62.26%)	20 (37.73 %)
Right Ear refer only (N= 11)	05 (45.45 %)	06 (54.54%)
Left Ear refer only (N= 14)	09 (64.28 %)	05 (35.71%)
Noisy (N= 01)	01 (100%)	00

**Figure**

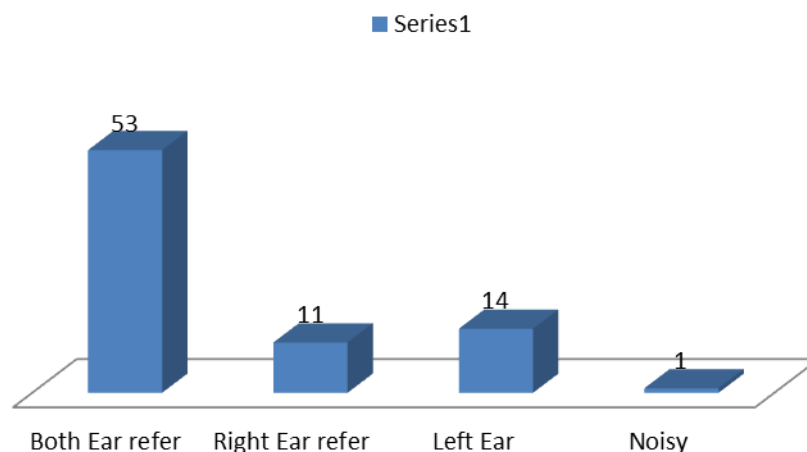
### Percentage of Pass and Refer



### Total Number 505



### Refer Comparison



### DISCUSSION

Consequently, newborn hearing screening is crucial; universal newborn hearing screening (UNHS) is superior to screening solely at-risk infants. Researchers advocate this strategy because it may overlook 50% of high-risk neonates, while universal screening evaluates all

neonates, thereby increasing the likelihood of identifying hearing impairment.<sup>[18]</sup> According to a recent study, the incidence of congenital sensorineural hearing loss is higher in high-risk neonates, ranging from 1 to 5 per 1000 infants.<sup>[19]</sup> In India, the rate is 10.2% among neonates.<sup>[20]</sup> The prevalence of hearing loss in newborns

in India varies from 1 to 8 per 1000 tested infants, which can be attributed to methodological inconsistencies among research.<sup>[19, 21, 22]</sup> The present study found a marginally reduced prevalence of hearing loss, which could be attributed to factors such as insufficient awareness, inadequate testing for both routine and high-risk variables, and a shortage of workers, which could lead to an expanded coverage area for screening and referral rates. Prior studies indicate that the incidence of hearing loss is higher in rural areas compared to urban populations.<sup>[20]</sup> and high-risk newborns.<sup>[18]</sup>

We advised all high-risk neonates who passed the hearing test to undergo regular follow-ups at 3, 6, and 12 months, as this could potentially lead to late-onset or progressive hearing loss. Follow-up is a significant challenge in newborn hearing screening programs due to factors such as change of address, difficulties in communication, rural demographics, inadequate parental engagement, illiteracy, and a lower socioeconomic level. Consequently, early hearing impairment and delayed speech and language development may go unrecognized. We provided speech therapy and milestone performance lists to enhance the follow-up rate.

## CONCLUSION

This investigation highlights the need for ongoing advocacy and resource allocation to enhance early hearing detection and intervention services in community settings, ultimately aiming to optimize developmental outcomes for affected infants.

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Appendices (Optional)-nil.

Highlights-nil.

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