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# Newborns Matters: The Case for Universal Screening, Timely Intervention, and Sustainable Care in Iran

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Congenital hearing loss is a major, often underrecognized global public health challenge (1). Its significance stems from the fact that it is among the few pediatric disabilities for which early identification and intervention can profoundly alter developmental outcomes (2). Without detection in the neonatal period, its consequences extend beyond auditory impairment to affect speech, language, cognition, education, social participation, family well-being, and lifetime productivity (2). In Iran, newborn hearing screening programs have expanded substantially in recent years. A national analysis reported that in 2022, 1,006,293 of 1,106,072 newborns underwent hearing screening, corresponding to a coverage rate of 90.97%. The study also estimated a mean prevalence of congenital hearing loss of 3.3 per 1,000 births and showed that a two-step screening strategy using otoacoustic emissions followed by automated auditory brainstem response is the most cost-effective approach, with an incremental cost-effectiveness ratio of 3297.2 US PPP per quality-adjusted life year (3). These findings are encouraging, indicating that large-scale newborn hearing screening is both feasible and economically justifiable within the Iranian health system. Nevertheless, screening represents only the initial component of a comprehensive care pathway. Effective early hearing detection and

intervention programs must ensure timely diagnostic confirmation, appropriate amplification, early rehabilitative services, and, when indicated, cochlear implantation to achieve optimal developmental outcomes.

The burden of congenital hearing loss is immediate and accumulates over time. In infancy and early childhood, untreated bilateral hearing loss disrupts spoken language acquisition during the critical window of neuroplasticity. Affected children often experience delayed vocalizations, impaired receptive language, and suboptimal speech intelligibility, which undermine overall communication competence. These early neurodevelopmental deficits frequently translate into long-term challenges in literacy, academic achievement, and socio-economic integration (4). From a cognitive standpoint, delayed auditory access can interfere with efficient language processing, working memory, and executive function, particularly when diagnosis and rehabilitation occur after the first year of life (5). Socially and psychologically, children may experience frustration, withdrawal, reduced peer interaction, and lower self-esteem. Families also bear a significant emotional burden, often facing uncertainty, repeated medical visits, communication strain, and long-term caregiving stress (6).

The economic consequences are equally profound. Hearing loss entails substantial direct medical costs, encompassing longitudinal audiology assessments, hearing technology (hearing aids and cochlear implants), surgical interventions, and intensive rehabilitation. However, the indirect economic burden often outweighs direct costs, driven by productivity losses among caregivers, specialized educational requirements, and diminished lifetime earning capacity for the affected individual. Consequently, early detection transcends clinical necessity; it represents a pivotal societal investment with high economic returns (7). Universal newborn hearing screening has therefore become the cornerstone of modern early hearing detection and intervention programs. International guidance from the Joint Committee on Infant Hearing (JCIH) continues to support the

well-established **1-3-6 benchmark**: screening completed by **1 month**, diagnosis by **3 months**, and intervention initiated by **6 months**. JCIH further recommends that programs with high performance should aspire to an even faster **1-2-3 timeline** (8). Importantly, the JCIH 2019 statement also emphasizes early amplification options, including hearing aids and cochlear implants, and notes the need to consider lowering the age for cochlear implantation below 12 months in appropriate candidates (8).

The value of screening is not limited to earlier diagnosis; it can also accelerate definitive intervention. Recent evidence (2024) underscores that while newborn hearing screening (NHS) has significantly expedited the referral process to cochlear implant committees, bottlenecks within the surgical pathway persist. Even for infants identified early, intra-institutional delays remain a critical barrier, potentially deferring definitive intervention beyond the optimal neurodevelopmental window (9). This is an important lesson for health systems: screening works, but it does not automatically eliminate bottlenecks. Referral networks, diagnostic capacity, surgical access, and rehabilitation services must function together.

For infants with severe-to-profound bilateral sensorineural hearing loss, amplification alone may not provide sufficient auditory access, and cochlear implantation can be transformative (10). Evidence and expert consensus increasingly support implantation in very young children when clinically appropriate (11,12). In well-selected cases, early cochlear implantation can support spoken language development, auditory awareness, improve developmental abilities and later educational attainment (13). However, cochlear implantation is not a “stand-alone cure.” Outcomes depend heavily on timely diagnosis, family engagement, auditory-verbal therapy, device use, and structured follow-up. The earlier the auditory signal reaches the brain, the greater the chance of meaningful language acquisition, even in the unilateral hearing loss (14,15).

In Iran, the main challenge is no longer whether newborn hearing screening is needed, but how to ensure that every screened infant moves rapidly through diagnosis and treatment. Coverage above 90% is impressive, but the remaining gap still leaves thousands of infants unscreened each year. In addition, screening coverage alone does not guarantee timely diagnosis, appropriate amplification, or access to cochlear implantation. The system must therefore prioritize referral tracking, regional diagnostic capacity, equitable access to pediatric audiology, and reimbursement structures that reduce out-of-pocket barriers for families.

A practical policy agenda for Iran should include five priorities. First, maintain and expand universal newborn hearing screening with sustained quality assurance. Second, strengthen follow-up systems to minimize loss to diagnosis after failed screening. Third, ensure affordable access to hearing aids, cochlear implant evaluation, surgery, and mapping services. Fourth, invest in early intervention programs, including speech-language therapy and auditory-verbal rehabilitation. Fifth, develop national outcome registries to monitor long-term language, educational, and psychosocial results.

In conclusion, congenital hearing loss is common, consequential, and highly time-sensitive. The evidence from Iran and international guidelines is clear: **the earlier the identification, the better the developmental outcome**. Newborn hearing screening should be regarded not as an isolated test but as the entry point to a comprehensive system of care. For Iran, the next step is to move beyond high screening coverage toward guaranteed diagnostic follow-up, timely intervention, and equitable access to cochlear implantation and rehabilitation. The ultimate goal is not simply to detect hearing loss, but to ensure that every child with hearing loss has the opportunity to develop language, participate fully in society, and reach their potential.

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