

Universal newborn hearing screening in South Africa: a single-centre study

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ABSTRACT

Hearing screening for newborn babies is an established protocol in many high-income countries. Implementing such screening has yielded significant socioeconomic advantages at both an individual and societal level. This has yet to permeate low/middle-income countries (LMIC). Here, we illustrate how newborn hearing screening needs to be contextually adapted for effective utilisation and implementation in an LMIC. Specifically, this advocates the use of auditory brainstem testing as the first-line approach. We propose that such adaptation serves to maximise clinical efficacy and community participation at a reduced cost.

INTRODUCTION

Newborn hearing screening facilitated a silent revolution for the hearing-impaired yielding significant personal, societal and economic benefits.¹ However, universal screening still faces barriers, namely the need to pragmatically integrate screening with existing health infrastructure, cost considerations and access to healthcare,¹ thus presenting unique challenges depending on the geographical context.

Otoacoustic emissions (OAE) and automated auditory brainstem responses (AABR) have made screening possible, with factors such as cost and training ease being the main considerations when designing a programme.^{1,2} OAEs have historically been cheap and quick but as many as 40% of babies can fail this test requiring referral to specialists for either a repeat OAE or an auditory brainstem response (ABR).³ Technological advances since the advent of screening have seen both the cost-base and time required to perform AABR considerably reduced⁴ making this an attractive first-line option. Such a proposition is strengthened when considering the cost of follow-up, poor compliance due to limited access to healthcare and maternal anxiety being decisive factors.

Accordingly, in settings where early discharge is the norm and access to healthcare is poor, we propose that it may be more

effective to screen neonates with AABR as the first-line tool.

METHODS

Two thousand two hundred sixty-nine healthy neonates were recruited from the maternity wards following written parental consent in Amajuba district, KwaZulu-Natal, South Africa. Babies were generally tested within hours of birth as healthy babies are discharged at 6 hours post delivery. Testing was always performed in a silent room within the hospital.

To assess the ABR and OAE for each neonate, we used the Path-Sentiero-Advanced-Screener (Landsberger, Germany). For auditory brainstem testing, we implemented a chirp stimulus (broadband 1–8 kHz) with alternating polarity and a stimulus rate of 85 Hz and sound level of 35 dBHL.⁵ For transient OAE, a non-linear broadband click stimulus was presented at a fixed sound level of 80 db sound pressure level (SPL).⁶ All testing was performed by an audiologist with expertise in paediatric testing (AG), assisted by two research nurses.

Patient and public involvement statement

After identification of the community's needs, the researchers engaged in consultation with the department of health district and hospital managers who were in full support of potentially developing a screening programme. Patients were not involved in the design of the study as it was incorporated into the existing maternal and child healthcare services.

RESULTS

We observed that in neonates screened with ABR, 2120 babies passed the test, and 149 of the cohort failed the screening. Contrastingly, the OAE test passed only 655 babies in the cohort and failed 1614 babies. Accordingly, OAE testing would have resulted in most babies needing referral.



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DISCUSSION

Our findings highlight that adopting the OAE first protocol in our sample would have resulted in 1465 unnecessary referrals, imparting significant financial burden on both the individual and the healthcare system as well as considerable anxiety for already disenfranchised parents. Although the cost base of ABR testing is higher, when factoring in not only the equipment costs but also the costs associated with consumables and maintenance, this can effectively be mitigated against by the volume of avoidable referrals. We thus highlight the need for contextually relevant screening as a prerequisite to effectively engage all stakeholders including the families, government services and clinicians in order for such programmes to be deemed viable. Ideally, children need to be screened prior to discharge as the birth hospital is the ideal setting to ensure compliance. For a service to be successful in the South African context where early hospital discharge is the norm, screening programmes have to adjust to ensure uptake.

These findings have a wider contextual implication, as healthcare resources across the board are continually being stretched. Thus, a critical spotlight is currently being placed on expensive initiatives such as screening programmes to adapt to simultaneously maximise clinical efficacy and community participation at an ever-reducing cost.

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