Selected Summaries

Screening for hearing loss in infants

Olusanya BO, Wirz SL, Luxon LM. (College of Medicine, University of Lagos, Surulere, Nigeria; Great Ormond Street Hospital for Children NHS Trust, University College London, England.) Community-based infant hearing screening for early detection of permanent hearing loss in Lagos, Nigeria: A cross-sectional study. *Bull World Health Organ* 2008;**86:**956–63.

SUMMARY
The socioeconomic impact of deafness as a disability is now well accepted. The global prevalence of deafness has more than doubled from 120 million in 1995 to 278 million in 2005.[1,2] About 25% of this deafness is among children[1] and almost 90% of these children live in developing countries.[3]

Loss of hearing may be congenital or may develop later in childhood. The commonly used term for these conditions is 'Permanent congenital and early onset hearing loss' (PCEHL). Early detection of PCEHL can lead to effective interventions. In 1995, the World Health Assembly passed a resolution urging countries to develop national plans within their existing primary healthcare framework for early detection of hearing loss in children.[4]

This study assessed the feasibility of 2 screening methods—transient evoked otoacoustic emissions (TEOAE) and automated auditory brainstem responses (AABR)—in early detection of deafness in childhood, integrated with the peripheral healthcare system of Nigeria. The study was done in an inner city area of Lagos with a population of about 243 777; the area had 7 primary health centres (PHCs), and 1 general, paediatric and maternity hospital each. One of the key functions of the PHCs is routine immunization of children. In Nigeria the first immunization in childhood is BCG (Bacille Calmette–Guerin), which is given usually in the first month after birth. Four of 7 such centres enrolled 75% of all eligible children for BCG vaccination and were chosen as study sites. All children up to the age of 3 months, who attended the BCG clinics between July 2005 and April 2006, were enrolled in the study. Two community health workers and 2 part-time workers who had no experience in testing were trained for 2 weeks on simple anatomy of the external ear and the basic screening technique—1 of them did the screening and the other 3 played supportive administrative roles.

The first stage of screening (TEOAE) was done at all 4 centres. The children who failed or had abnormal findings were sent to 1 centre for the second stage of screening. Those who failed this too were sent for diagnostic evaluation by tympanometry with a high frequency (1000 Hz) probe tone. The transportation of mothers and children to the study centres was free and appropriate interventions such as counselling and/or hearing aids were provided as required.

The grading of hearing loss was based on the guidelines of the US Joint Committee on Infant Hearing (JCIH) and the WHO classification.[5] This categorizes hearing loss as mild, moderate, severe and profound, based on a response with 30–40 dB, 41–70 dB, 71–90 dB and >90 dB, respectively.

Of the 2991 infants who attended the centres, 2003 were ≤3 months of age and underwent the first stage of screening. Only 287 infants did not pass the first stage and underwent screening with AABR (second stage). Unfortunately, about half (148) of these infants defaulted and only 139 infants had an AABR done. Of these, 82 were referred for final diagnostic evaluation. Again, about one-third of the infants (32) missed the diagnostic evaluation session. Among the remaining 50 infants, 45 had some degree of hearing loss, making for a rate of 24.3 per 1000 (95% CI 18.2–32.3), and were recommended for early intervention.

In addition, every tenth infant (total 172) who cleared the first stage of screening (TEOAE) was also subjected to the second stage (AABR) and subsequent diagnostic evaluation to assess the possible false-negative rate associated with the screening. Only 11 of these 172 children were confirmed to have PCEHL. Thus, 56 of the 2003 infants who underwent TEOAE had hearing loss (28 per 1000, 95% CI 21.6–36.1).

COMMENT
Good hearing is essential for cognitive development because lack of it may lead to deranged speech, poor language skills and impaired psychological behaviour in children.[6] This makes early detection of hearing loss important. Maturation of the auditory path takes place within the first 18 months of life and is dependent on adequate acoustic stimulation. Therefore, the current recommendation is that hearing loss should be ascertained before the age of 3 months and an appropriate intervention done before the age of 6 months. TEOAE and AABR are used universally for screening hearing loss in early infancy and can detect unilateral or bilateral hearing loss.[7–9]

Childhood deafness is a public health problem in many underprivileged countries all over the world and the socioeconomic impact of undetected childhood deafness is large. Unlike most developed countries, developing countries do not have clear guidelines for the early detection of hearing loss in childhood.[10,11] This well planned study explored the feasibility of establishing a screening method at the community level by utilizing the existing healthcare infrastructure. The sample size was reasonably large and the non-medical peripheral-level workers did the screening procedures. The 2-stage screening method (TEOAE followed by AABR) used in this study has a sensitivity of 92%, specificity of 98% and a positive likelihood ratio of 61.

This study has some limitations, including a high default rate after the first screening and that the sensitivity and specificity obtained by this screening process may not be accurate. Also, if more infants who were negative at the first stage had been examined (than every tenth child), it would have led to more false-negative cases being detected, thus leading to a further reduction in the sensitivity of the test. Another concern is the large number (*n*=714) of infants excluded as they were >3 months of age.

The per child cost of community-based screening has been found to be far less in some other studies in Nigeria[12] and at other places[7–9] compared with hospital-based targeted screening. There is a considerable delay in diagnosing hearing loss in children and the reported mean age at the time of diagnosis has been reported to be high.[13,14] Hence, screening programmes such as this one could help in decreasing the age at which hearing loss is diagnosed.

In India, there is little reliable data on the magnitude of hearing loss in children and there is no policy for early detection and intervention. A retrospective study on 1000 school children in Kolkata[13] indicated a considerable delay in detection (mean age 3.03 years) of hearing loss resulting in late initiation of effective

intervention. Such children are likely to have learning and behavioural problems.

In India too, BCG is given as early as possible after birth or preferably along with the first dose of DPT (diphtheria–tetanus–pertussis) vaccine at 6 weeks. This allows health provider access to children either in the neonatal period or early infancy. A similar screening programme could therefore be instituted in India using the existing infrastructure.

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T. K. RAY
Department of Community Medicine
Lady Hardinge Medical College
New Delhi
tapasr60@hotmail.com

Medical literature and Chinese whispers

SUMMARY

Citation of previous work helps progressive building of new scientific concepts and is an important aspect of the scientific communication and publication process. In scientific publications, citations also serve as a persuasive tool for convincing readers. Thus, a study of citation patterns on a subject over time may help in understanding how scientific knowledge on that particular subject has evolved.

In this study, the author constructed a complete citation network of all English language papers published in journals indexed in PubMed on a specific subject and analysed the citation patterns. The subject selected for this purpose was whether beta-amyloid, a protein that accumulates in the brain in Alzheimer disease, is produced by and injures skeletal muscle of patients with inclusion body myositis.

A total of 242 published papers on the subject were identified and these had 645 citations to support or refute the hypothesis. A total of 220 553 citation paths supporting the hypothesis were identified. Ten most authoritative papers (papers most often used as citations), including 4 primary data papers, 5 model papers and 1 review paper, all supported the hypothesis. The analysis identified the existence of several forms of distortions in citation. These included: (i) a citation bias against papers that refuted or otherwise weakened the causative relationship of beta-amyloid with inclusion body myositis (with 94% of all citations being made to papers with original data supporting the hypothesis and only 6% to papers providing evidence against it); (ii) citation amplification, i.e. repeated use of citations to review papers that contained no original data on the subject; and (iii) citation invention. The last of these included several phenomena, including (a) citation of content of a previous paper but claiming a different meaning or implication for it than that in the original paper (citation diversion), (b) referring to a hypothesis generated in a previous publication as a fact by merely citing that paper (citation transmutation), (c) providing non-peer-reviewed conference abstracts as citations making these appear as peer-reviewed (back door invention), (d) supporting a claim with a citation to paper(s) which do not contain data on that claim (dead-end citation), and (e) including the words 'experimental results' in the title of a paper that does not contain any methods or results for an experiment (title invention).

In addition, the author was able to obtain 9 of 27 grant proposals on the subject submitted to the US National Institutes of Health using the Freedom of Information Act. Eight of these proposals requesting for future research funding had citation problems similar to those identified in the published literature.

These findings indicate that distortions in the use of citations in a scientific field, over a period of time, may lead to a cascading effect and result in an unfounded authority of claims and possibly a misleading belief system in the subject. Analysis of citation network may help clarify the validity of other published scientific belief systems, and help identify the existence of similar distortion of scientific evidence.

COMMENT

Except for path-breaking discoveries or absolutely novel ideas, which occur but rarely, most biomedical research is a slow, cumulative process where several studies taken together as a complex maze provide sufficient evidence to support or refute a hypothesis. Thus, each study advances the field only a tiny bit, providing a take-off point for further studies. This phenomenon