

The global burden of disabling hearing impairment: a call to action

Bulletin of the World Health Organization

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(Submitted: 09 August 2013 – Revised version received: 01 December 2013 – Accepted: 22 January 2014 – Published online: 18 February 2014.)

Bulletin of the World Health Organization 2014;92:367-373. doi:

<http://dx.doi.org/10.2471/BLT.13.128728>

Introduction

In general and irrespective of the age at which it develops, disabling hearing impairment has devastating consequences for interpersonal communication, psychosocial well-being, quality of life and economic independence.¹⁻³ If it develops in the young, such impairment impedes speech and language development and sets the affected children on a trajectory of limited educational and vocational attainment.⁴⁻⁶ Children with hearing impairment may also be at increased risk of physical, social, emotional and sexual abuse and even murder.^{7,8} In adulthood, disabling hearing impairment can lead to embarrassment, loneliness, social isolation and stigmatization, prejudice, abuse, psychiatric disturbance, depression, difficulties in relationships with partners and children, restricted career choices, occupational stress and relatively low earnings.^{2,9,10}

As part of its core function as the “watchdog” for the well-being of the world’s population, the World Health Organization (WHO) periodically provides estimates of the prevalences of major health conditions to guide policies and programmes in its Member States. This paper highlights the temporal trends seen in WHO’s global estimates of the prevalence of hearing impairment since 1985, against a backdrop of global epidemiologic transition and the United Nations’ emerging agenda for “disability-inclusive” development after 2015.¹¹ We explore the roadmap for the prevention of hearing impairment that was outlined in a resolution of the World Health Assembly in 1995¹² and suggest prerequisites for an effective and appropriate country-level response – especially for those low- and middle-income countries where the burden posed by such disability is particularly high.

Grades and functional status

For many years, WHO defined “disabling” hearing impairment as a permanent unaided hearing loss – in the better ear and averaged over frequencies of 0.5, 1, 2 and 4 kilohertz (kHz) – of more than 40 decibels (dB) in adults and 30 dB in children.¹³ Unfortunately, this definition makes comparison with other disabilities or degrees of disability difficult. For example, it excludes people with mild or unilateral hearing impairment and takes no account of any underlying functional impairment in different environmental contexts. In 2001, WHO published the *International classification of functioning, disability and health*, in which all impairments were assessed in relation to activity limitations and participation restrictions.¹⁴ This classification has since provided a uniform framework for evaluating and comparing diverse body dysfunctions.^{14,15} It recognizes the role of contextual factors – such as environmental noise – in exacerbating functional deficits in people with “mild” or “slight” hearing impairment. It also treats “disabling hearing impairment” – or hearing disability – as a complex phenomenon that embraces bodily functions and structures as well as factors related to activity, participation and context.

Prevalences of disabling impairment

In 1985, when the global prevalence of hearing impairment was first estimated, 42 million people – 0.9% of the world's population – were thought to have disabling hearing impairment.¹⁶ By 1995, the estimated number of people with such impairment had more than doubled, to 120 million – or 2.1% of the world's population – including about 70 million adults and 8 million younger individuals in developing countries.^{16,17} Of the 360 million people thought to have disabling hearing impairment in 2011, approximately 32 million were children younger than 15 years and, of these, 7.5 million were younger than 5 years.¹⁸ The burden of disabling hearing impairment among both children and the elderly is thought to be greatest in the Asian Pacific area, southern Asia and sub-Saharan

Africa.¹⁸

The Global Burden of Disease Hearing Loss Expert Group has recently proposed a modified classification of hearing impairment.¹⁹ According to this classification, about 538 million people older than 5 years have disabling hearing impairment.¹⁹ Although this classification still employs the better-ear hearing threshold, in decibels, averaged over frequencies of 0.5, 1, 2 and 4 kHz, it changes the threshold for disabling hearing impairment to 35 dB for all age groups and equates “unilateral hearing impairment” with “bilateral mild hearing impairment”. It also recalibrates the hearing scale in equal steps of 15 dB in an attempt to reflect crucial shifts in hearing perception more accurately. This new classification is consistent with the *International classification of functioning, disability and health* and with the increasing evidence that difficulties in language development may arise in children with a hearing loss of less than 35 dB. Approaches to the classification of auditory disorders in general are discussed elsewhere.²⁰

Several factors have contributed to the upward trend seen in estimates of the global prevalence of disabling hearing impairment. One is the increasing prevalence of presbycusis as mean life expectancy increases in many countries. Another is improvement in the technology available for the early detection and diagnosis of hearing impairment.¹⁸ A third reason is the widespread use of ototoxic medications for treating neonatal infections, ear infections, malaria, cancer, human immunodeficiency virus (HIV) infection and drug-resistant tuberculosis.²¹ Rubella, mumps and measles remain significant causes of hearing impairment in regions with inadequate vaccine coverage.¹⁸ Furthermore, rapid and uncontrolled urbanization in many emerging economies – coupled with a common lack of enforceable regulations on environmental and occupational noise – constitutes a growing source of noise-induced hearing impairment.^{22,23} In general, available estimates of the prevalence of hearing impairment remain crude because many countries struggle to conduct relevant population-based surveys using standardized protocols and classification methods.

Global health

Since 2001 the health priorities of donor-dependent countries have largely been driven by the Millennium Development Goals (MDGs). Although interventions based on these Goals have often reduced the incidence of fatal childhood illness and increased longevity, they appear to have had little impact on the global burden of disabling hearing impairment. The effective prevention, recognition and treatment of disabling hearing impairment are probably critical to the attainment of MDG 1 – eradication of global poverty – and MDG 2 – full access to primary education for all children.²⁴ People with HIV infection, tuberculosis or malaria – infections addressed by MDG 6 – are also at high risk of developing hearing impairment, either from their infections or their treatment.^{25–28} Many individuals with disabling hearing impairment are disadvantaged and vulnerable children, young adults in their prime years or elderly people in dire need of societal support. The challenges of living with such impairment, particularly in poorly-resourced countries, should engender prevention efforts. Recent developments aimed at redressing the omission of disability indicators in the current MDGs offer a useful window of opportunity. Since 2009 several agencies of the United Nations have been trying to develop strategies for mainstreaming disability into the global health agenda.²⁹ In September 2013, for example, a meeting of the United Nations General Assembly at the level of “heads of state and government” was held in New York City to discuss global action and national plans for ensuring a disability-inclusive post-2015 development agenda. The United

Nations Children's Fund has also convened a special forum of stakeholders to articulate action plans for children with disabilities – within the United Nations' larger post-2015 disability initiative. These efforts are primarily geared towards promoting access and inclusiveness for children and adults with disability. However, they also provide valuable platforms for advocating global support for effective programmes for the prevention of avoidable disabling hearing impairment. Additionally, among global advocates of neonatal and child survival, the need to pursue disability-free survival in the post-2015 agenda is the subject of growing awareness, acknowledgement and interest.³⁰ This is a striking departure from the almost exclusive focus on mortality reduction that has been observed since 2001.

Reducing the burden

Although hearing disability is usually experienced over a lifetime,¹⁻¹⁰ about half of the incidence of hearing impairment in all age groups could probably be avoided via known and proven methods.³¹ Approximately 141 million live births occurred in the world in 2012 and most of them – about 127 million – occurred in developing countries. The estimated incidence of permanent congenital or early onset hearing impairment in developing countries in 2012 – six cases per 1000 live births – was three times higher than in developed countries.³² Although priority must be given to the primary prevention of hearing impairment, especially in low- and middle-income countries, secondary and tertiary prevention via early detection and treatment of hearing impairment, especially in infants and young children, are still needed and should be actively encouraged.³³ Routine screening on school entry should be considered, as it can be more readily implemented than universal neonatal screening. The effective rehabilitation of a child with hearing impairment is complex. This is especially the case in countries that are poorly resourced, where assistive technology such as hearing aids or cochlear implants, on-going maintenance and inclusive educational support are not readily available.

Although the cost-effectiveness of hearing aids, cochlear implants and other hearing devices has been demonstrated in several studies, albeit predominantly in the developed world, the costs of acquiring and maintaining such a device remain prohibitive for most potential users in low- and middle-income countries.³⁴⁻³⁷ According to WHO, the target price for an “affordable” hearing aid should be no more than 3% of the per capita of the user's country.³⁴ When this definition was proposed, 3% of the per capita gross national product of Bangladesh, India, Kenya, Malawi and Nigeria was 26, 46, 26, 10 and 43 United States dollars (US\$), respectively. These target prices – which represent small fractions of the corresponding mean price of a hearing aid in a developed country – are too high for many low-income countries. In addition, they exclude the costs of ear moulds, maintenance and the periodic purchase of batteries. The scenario is even more daunting for cochlear implants, which are associated with an estimated lifetime cost of about US\$ 90 000 per child with severe to profound hearing impairment.^{38,39} Even the most advanced of the hearing devices currently available cannot restore “normal” hearing. Outcomes with the same device vary among patients because of a mix of individual biological, physiological and psychological factors. Many low- and middle-income countries have large shortages of trained professionals who can provide hearing assessments and on-going support services. For most hearing parents, enrolment of a child with a hearing disability in a school for the deaf, where the child will be taught sign language, is the least preferred but most affordable option for the child's education. Many of these problems could be resolved, at least partially, by improvements in the primary prevention of hearing impairment. Such prevention, if it is to be effective, requires a thorough understanding of the etiology of, and risk factors for, hearing impairment in a given region or population. Some preventable or treatable causes of hearing impairment – such as mumps, rubella, meningitis, otitis media, use of ototoxic drugs and harmful exposure to prolonged and excessive work place or leisure noise – were listed in 1995 in a resolution of the World Health Assembly.¹² This resolution, which outlined a “roadmap” for reducing the burden posed by disabling hearing impairment (Box 1), highlighted the need for routine immunization against the vaccine-preventable causes of such impairment, genetic counselling to reduce inherited hearing impairment – especially in regions with high rates of consanguineous marriage – and legislation for promoting and enforcing hearing conservation activities. Although much of the content of this resolution remains as relevant

today as it was almost two decades ago, there is a need to update the resolution's provisions and reaffirm its guiding principle in the light of important observations made since 1995.^{31,32,40–42}

Box 1. Recommended roadmap for the prevention of hearing loss¹²

Member States of the World Health Organization are required to:

- prepare national plans for the prevention and control of major causes of avoidable hearing loss and for early detection of such loss in neonates, infants, children and the elderly, within the framework of primary health care;
- take advantage of existing guidelines and regulations or introduce appropriate legislation for the proper management of particularly important causes of deafness and hearing impairment, such as otitis media, use of ototoxic drugs and harmful exposure to noise, including noise in the work environment and loud music;
- ensure the highest possible coverage of childhood immunization against the target diseases of the Expanded Programme on Immunization and against mumps, rubella and meningococcal meningitis whenever possible;
- consider setting up mechanisms for collaboration with nongovernmental or other organizations for support to – and coordination of – action to prevent hearing impairment at the country level, including the detection of hereditary factors and genetic counselling; and
- ensure appropriate public information and education for hearing protection and conservation in particularly vulnerable or exposed population groups.

Since the resolution was published, birth trauma, preterm birth, low birth weight, birth asphyxia and sepsis have been identified as risk factors for diverse developmental sequelae, including hearing impairment.⁴³ Similarly, severe neonatal jaundice – if not treated promptly – can be a contributor to disabling hearing impairment when combined with substantial glucose-6-phosphate dehydrogenase deficiency.^{43–45} Despite ample evidence of a link between hearing impairment and HIV infection, tuberculosis and malaria,^{25–28} such an association has rarely been acknowledged in the global fight against these “big three” diseases. Similarly, although childhood malnutrition is of great global health interest, the potential association between malnutrition due to protein–energy or micronutrient deficiency and hearing impairment has also largely remained uncharted.⁴⁶ The emerging global pressure for a disability-inclusive developmental agenda should serve as an impetus to update and adapt the current roadmap for the reduction of hearing impairment – and incorporate and integrate all known causal pathways for disabling hearing impairment and child survival.

WHO has recently developed a set of excellent and well-illustrated training guides for hearing care at the basic, intermediate and advanced levels.⁴⁷ The main aim of these guides is to equip primary care health workers and communities in developing countries with simple and effective methods to reduce the burden of hearing disorders.⁴⁷ The typical activities required at each level of prevention – from preconception to adulthood – are summarized in Table 1. Although the guides will eventually have to be tailored to the specific needs of each country, they already provide a useful starting point for the immediate implementation of activities to reduce the incidence of disabling hearing impairment.

- [Table 1. Activities for the primary and secondary prevention of disabling hearing impairment31](#)
html, 8kb

Leadership and engagement for national action

Global initiatives are helpful in attracting resources towards tackling particular health problems and generating awareness about them. However, the impetus for bold and effective actions against disabling hearing impairment would appear to rest almost entirely on the advocacy efforts of people with such impairment, their families and those serving their needs. For those with disabling hearing impairments, effective communication with relevant policy-makers is often very difficult. This is particularly true for the most impaired, especially individuals with untreated congenital or early onset profound hearing loss who lack access to any assistive technology.

It is noteworthy that the governments of China, India and Nigeria – countries with some of the highest burdens of disabling hearing impairment globally – have acknowledged the problem by establishing national ear care programmes or agencies. Such programmes and agencies should be nurtured and promoted in many more countries. However, the task of leading a national fight against an invisible and highly stigmatizing chronic condition such as disabling hearing impairment must be approached with great care.⁴⁸ In such a fight, the consequences of inaction or ineffective leadership are not usually fatal, so the benefits of the fight may not be very obvious to the public, especially in the short-term. Leadership by individuals with academic or professional qualifications is likely to be advantageous but perhaps not sufficient on its own to assure the required outcomes. Leaders must be visionary, self-motivated and held to measurable, time-bound targets within the framework of the 1995 World Health Assembly resolution and any other relevant global agenda. If WHO's Member States are held accountable to their obligations under the 1995 resolution, including the provision of periodic and independently verifiable reports, then the effectiveness of any relevant national agency is likely to be closely monitored. Since many governments lack the capacity to implement the roadmap in a comprehensive manner, public–private partnerships – including “north–south” humanitarian outreaches – need to be actively encouraged. Such partnerships must be supported with appropriate legislation, in line with the Convention on the Rights of Persons with Disabilities, 2006.²⁹ Additionally, WHO's regional offices should be willing, able and ready to provide technical assistance where required through established channels of collaboration.

Finally, a revised resolution on the prevention of disabling hearing impairment would need to reflect the on-going dialogue and global action plans for people with disability in the post-2015 developmental agenda of the United Nations and its sister agencies. At least five tasks are worth considering by developing countries. First, such countries could train and equip middle-level health personnel to provide hearing tests and intermediate-level care for individuals with hearing loss, within the framework of existing health-care systems. Second they could develop “tele-health” systems to help fill gaps – created by shortages in the human resources for health – in the delivery of services for the prompt diagnosis, treatment and prevention of disabling hearing impairment. Third, they could facilitate the access of people with disabling hearing impairment to free or affordable hearing devices, possibly through a consortium-buying programme in collaboration with the leading manufacturers. Fourth, they could provide resources for the routine developmental evaluation of those who survive the potentially fatal conditions that are established risk factors for hearing disability. Finally, they could fund population-based research to gain a better understanding of the epidemiological distribution of hearing impairment across different strata within the country and accurately guide the development of interventions against such impairment.

In conclusion, all Member States of WHO – and particularly those in the developing regions of Africa and Asia – should be alerted to the growing prevalence of disabling hearing impairment, which is a silent, invisible and life-long condition. The emerging global and high-level interest in a disability-inclusive developmental agenda offers a unique and timely opportunity, both to address the neglected needs and aspirations of those with disabling hearing impairment and to take the necessary actions to arrest the current upward trend in the burden posed by such impairment. Strong country-level leadership will be required if Member States in the regions most affected are to meet the goals outlined in the 1995 World Health Assembly resolution on the prevention of hearing impairment – and those of any future revision of that resolution.

Acknowledgements

We thank our colleagues at the Coalition for Global Hearing Health and the GBD 2010 Hearing Loss Expert Group for inspiring this work and Bradley McPherson for his valuable comments on Table 1.

Competing interests:

None declared.

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