



High levels of noise, notably from traffic, are an integral part of city life. GHANA

PHOTO: JOZUADOUGLAS/PIXABAY

Noise-induced hearing loss



Shelly Chadha
Technical Officer, WHO
Programme on Ear and
Hearing Care, World
Health Organization,
Geneva, Switzerland

Loud sounds, loud music and noise have become an integral part of modern-day society. Seeping into every aspect of our everyday life, noise is one of the most important environmental risks to health today.¹ In Western Europe alone, over one million healthy 'life years' are lost daily due to environmental noise.² High levels of occupational noise continue to pose a problem in all regions of the world.³ The rise of personal audio devices and smartphones poses an additional challenge, because they are often used at loud volumes for long periods.⁴

The impact of loud sounds on hearing is indisputable. Exposure to loud sounds, especially when prolonged and regular, causes permanent damage to sensory cells and other structures within our ears, resulting in irreversible hearing loss, often accompanied by troublesome tinnitus. Noise exposure has also been shown to have an impact on other aspects of health. It has been associated with cardiovascular diseases (such as high blood pressure and ischaemic heart disease, including myocardial infarction), sleep disturbance, cognitive impairment (in children) and annoyance.

Cause for concern

The World Health Organization (WHO) estimates that over 460 million people worldwide currently experience moderate or higher levels of hearing

loss.⁵ Projections suggest that this number will continue to rise and could double by 2050, unless action is taken. While this growth is largely attributed to ongoing demographic changes, the persistence of risk factors such as noise exposure contributes to this upward trend.

Noise is a challenge in the workplace, with as many as 25–33% of the workforce in Europe being exposed to high-level noise.⁶ While similar data is

not available from some parts of the world, there is good reason to believe that the problem is widely prevalent especially in low- and middle-income countries where the regulatory environment is less likely to support hearing conservation efforts and the informal sector remains largely unregulated.⁷

Non-occupational noise has also emerged as a problem, particularly with the current easy access to technology. As the sales of smartphones continues to soar globally (1.5 billion devices sold in 2016 alone), the risk of hearing loss to the young listener is real. The World Health Organization estimates that 50% of those between 12 and 35 years of age listen to unsafe levels of sound through personal audio devices (such as smartphones or portable

Continues overleaf ➤

“Exposure to loud sounds, especially when prolonged and regular, causes permanent damage”

IN THIS ISSUE

- 1 Noise-induced hearing loss**
Shelly Chadha
- 4 Effect of noise on the ear**
Valerie E Newton and Dolores Umapathy
- 6 Occupational noise-induced hearing loss**
Catalina Valencia-Mayer and Diego J Santana-Hernández
- 8 Environmental and recreational noise-induced hearing loss**
Suneela Garg and Palak Goel
- 11 Challenging ideas about noise and hearing**
Paddy Ricard
- 12 Is it too loud?**

music/video players), and approximately 40% are exposed to potentially damaging sound levels in nightclubs, music venue and bars. Overall, 1.1 billion young people face the risk of hearing loss simply due to their recreational habits.⁴

The omnipresence of noise, its high potential for damage to hearing and health and the permanence of its auditory impact are all reasons why this hazard needs to be targeted as a public health priority. Addressing it and mitigating its impact requires a comprehensive effort that is a combination of:

- Policies, legislation and enforcement
- Awareness
- Technological advancements.

Policy development and implementation

The implementation of hearing conservation programmes has played a key role in controlling occupational noise and many countries have effectively enacted relevant policies bringing significant benefits to the affected population.⁸ However, in many parts of the world, such policies are either not developed or not well implemented. Legislation is also required to limit exposure to environmental noise (e.g. traffic and aircraft noise) and recreational sounds.² The WHO Environmental Noise Guidelines for the European Region provide a strong basis for policy development in the environmental context.¹ In all cases, legislation needs to be enforced in order to have a positive impact.

Recently, WHO, in collaboration with the International Telecommunications Union (ITU) launched the Global Standard for Safe Listening Devices and Systems.⁹ Developed through a consultative process with participation of key stakeholders in this field, this Standard provides a series of evidence-based recommendations to limit noise exposure through these devices. Currently, WHO is also working on formalising a regulatory framework for recreational places in order to minimise the risk of hearing loss to people who visit this type of venue.



Wearing hearing protectors can reduce the risk of noise-induced hearing loss.

Creating awareness

It is essential to the prevention of noise-induced hearing loss that people be aware of the risks posed by loud sounds and take concrete steps to protect themselves from this. Simple steps can go a long way in mitigating risk posed by exposure to loud sounds in occupational and recreational settings, such as:

- Using hearing protectors like earplugs
- Listening to music at lower volumes
- Limiting time spent in noisy activities
- Staying away from sources of noise
- Taking regular listening breaks.

The adoption of such safety measures can only occur through heightened awareness and behaviour change.

WHO's Make Listening Safe initiative, launched in 2015, aims to raise awareness of recreational noise exposure. It focuses mainly on safe listening through personal audio devices and at entertainment venues. World Hearing Day, celebrated every year on 3rd March, is another opportunity to organise events to raise awareness.

Technological advancements

It is essential that, as awareness rises among target groups, safe listening and protective options be made available to them. Technology



This journal is funded by CBM



Editor
Dr Paddy Ricard

Editorial committee
Dr Diego J Santana-Hernández (Chair)
Dr Ian Mackenzie
Professor Valerie E Newton
Dr Tony Sirimanna
Professor Andrew Smith

Regional consultant
Professor Jose M Acuin (Philippines)

Editorial assistant
Joanna Jeremy

Design
Lance Bellers

Printing
Newman Thomson

Online edition (free)
View and download issues for free by clicking on the 'CEHH Journal' tab on <http://disabilitycentre.lshtm.ac.uk>

How to subscribe
The paper version of the journal is sent free of charge to readers working in low- and middle-income countries. To subscribe, please send your

name, occupation, postal address, phone number and email address to: Joanna Jeremy, Community Eye and Hearing Health, International Centre for Eye Health, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT, United Kingdom. Email: Joanna.Jeremy@lshtm.ac.uk

For the paper version, may we suggest that readers in high-income countries make an annual donation of UK £10.

Please contact Joanna Jeremy (as above).

Correspondence
Please send all enquiries to: Joanna Jeremy (for contact details, see left).

Copyright
Articles may be photocopied, reproduced or translated, provided they are not used for commercial or personal profit. Acknowledgements should be made to the author(s) and to *Community Eye and Hearing Health*.

can play a key role both in limiting occupational and environmental exposure and in reducing unsafe listening. Some examples of beneficial technologies are:

- Effective and comfortable hearing protectors.
- Efficient headphones or earphones that can cancel or reduce external noise.
- Accurate and easy-to-use apps that can monitor outside noise or calculate noise exposure through one's personal audio systems (player and headphones). For example, the NIOSH SLM app is an accurate tool for external noise measurement and the 'HearAngel' app is useful for monitoring sound exposure through headphones.
- Simple tools for hearing testing that can be used by people to assess and monitor their own hearing status, as well as tools that can be used for checking hearing within the community. One free option is WHO's recently launched 'hearWHO' app.
- The availability of smart devices (smartphones, MP3 players and ear/headphones) with safe listening features.

The availability of safe listening features on smartphones is important because it will help reduce exposure to recreational noise. The WHO-ITU Global Standard recommends that⁹:

- Every device shall measure the listener's use of their 'sound allowance', based on a choice of two modes of reference exposure (one for adult listeners, one for children). (Sound allowance is estimated on the basis of a reference exposure, which in this case is 80 dB for 40 hours a week).

WHO/ITU RECOMMENDATIONS FOR SAFE LISTENING

Safe 'sound dose' at work

85 dB for a maximum of 40 hours per calendar week, for the duration of one's work life*

Safe 'sound dose' outside work

80 dB for a maximum of 40 hours per calendar week, during one's lifetime*

*If noise levels (dB) are above the limit, then duration of exposure needs to be reduced (see articles on pages 4, 8 and 11)

- Each device should include options for volume limiting and parental volume control.
- Each device shall provide the user with personal usage information, personalised messages and cues for action, and general information on safe listening.

The implementation of these recommendations in smartphones and MP3 players will empower their users to make safe listening choices and protect their hearing. Governments should mandate these features by developing suitable policies and regulations. Manufacturers can implement these voluntarily, while civil society can play a key role through advocacy for their adoption.

Conclusion

Protecting our ears from loud sounds is a key strategy to check the current trend of rapidly rising prevalence of hearing loss. A start has already been made, but strong action involving multiple stakeholders is still required. This will positively impact the hearing health of people across the world.

References

- ¹ Environmental Noise Guidelines for the European Region. Geneva: WHO, 2018. www.euro.who.int/__data/assets/pdf_file/0008/383921/noise-guidelines-eng.pdf?ua=1
- ² Burden of disease from environmental noise. Quantification of healthy life years lost in Europe. Geneva: WHO, 2011. www.euro.who.int/__data/assets/pdf_file/0008/136466/e94888.pdf
- ³ Occupational noise. Assessing the burden of disease from work-related hearing impairment at national and local levels. Geneva: WHO, 2004. www.who.int/quantifying_ehimpacts/publications/en/ebd9.pdf
- ⁴ Make Listening Safe. Geneva: WHO, 2019. www.who.int/pbd/deafness/activities/MLS/en/
- ⁵ Estimates. Geneva: WHO, 2019. www.who.int/deafness/estimates/en/
- ⁶ Risk Observatory Thematic Report. Belgium: European Agency for Safety and Health at Work, 2005. <https://osha.europa.eu/en/tools-and-publications/publications/reports/6905723>
- ⁷ Quiet please: reducing occupational exposure to harmful noise. Report by Humphreys G. Bull World Health Organ 2019;97: 650–651.
- ⁸ Stocks SJ et al. Trends in incidence of occupational asthma, contact dermatitis, noise-induced hearing loss, carpal tunnel syndrome and upper limb musculoskeletal disorders in European countries from 2000 to 2012. Occup Environ Med. 2015 Jan 9;72: 294–303.
- ⁹ Safe Listening Devices and Systems. A WHO-ITU standard. Geneva: WHO, 2019. <https://apps.who.int/iris/bitstream/handle/10665/280085/9789241515276-eng.pdf?ua=1>



HANNAH AYUKAWA

Hearing protection should be worn not just at work but also during noisy activities, such as ice sculpting. CANADA