PRESBYOPIA

Presbyopia: prevalence, impact, and interventions

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Presbyopia is an age-related loss of lens accommodation that results in an inability to focus at near distances. It is the most common physiological change occurring in the adult eye and is thought to cause universal near vision impairment with advancing age.

People who become presbyopic may complain of headaches and eye strain, and hold objects progressively further away from their eyes in order to be able to focus on them. However, while objects may then be in focus, they may become too small to be identified. The length of the arm also limits this compensatory mechanism. The most common remedy is the prescription of a pair of reading spectacles.

It is now increasingly recognised that presbyopia is an aspect of refractive error that needs to be addressed. Good near vision is important, even among populations who use it for tasks other than reading and writing.

Prevalence

The prevalence of presbyopia in low- and middle-income countries is not well known, as most studies of refractive error in these countries have been limited to distance vision. There are few presbyopia studies that have used a population-based approach, making it difficult to draw conclusions about the prevalence of presbyopia in the general population.

Another major problem with research in this area is that there is no universally accepted definition of presbyopia and no standardised technique to measure it. The prevalence of presbyopia will therefore depend on how it is defined, for example, the end point chosen and the distance at which near vision is tested.

Some studies, however, including our own study in rural Tanzania, can be used to construct a picture of the prevalence of presbyopia in low- and middle-income countries.

For our study (of people aged 40 and over), we used the N8 optotype (1M or 20/50 Snellen acuity) as the end point of near vision testing. This was selected as it matched the type size for newsprint in the country. We measured near vision by placing the near chart 40 cm away from the subject.

We defined people as presbyopic if both of the following were true:

- they were unable to read the N8 optotype with distance correction in place, if needed
- they were able to read at least one more line with the addition of a plus lens.

The degree of presbyopia was determined as the minimum amount of plus lens needed to achieve the maximum improvement in lines read to the end point (N8).

Using this definition, the prevalence of presbyopia in this population was found to be 62 per cent, with prevalence increasing with age.[1] Age-adjusted data showed higher prevalence among women than men. In multivariate analysis, women had 46 per cent higher odds (odds ratio of 1.46) of being presbyopic. Women also had more severe presbyopia than men across all age groups. Secondary education and residence in town (as opposed to a village) were also significantly associated with a higher prevalence of presbyopia. Only six per cent of the people with presbyopia in our study had the spectacles they needed.

A survey of ocular morbidity in rural Ugandan adults found presbyopia to be the most common cause of visual impairment in that country for which treatment was sought. Patients with uncorrected presbyopia accounted for 48 per cent of those presenting with visual impairment.[2]

Morny, using hospital chart reviews, found a prevalence of presbyopia equal to 65 per cent in Ghanaian women.[3]

In southern India, Nirmalan et al. used the same definition for presbyopia. They found a prevalence of 55 per cent in people aged 30 years and older.[4] As in our study, prevalence of presbyopia worsened with increasing age. Female sex, rural residence (as opposed to urban), myopia, and hyperopia were associated with presbyopia. A third of subjects with presbyopia were currently using spectacles.

Duarte et al. in Brazil estimated the prevalence of presbyopia in 3,000 adults of 30 years and older at 55 per cent.[5] Once again, age and female sex were associated with higher prevalence. In those who had near vision spectacles, 30 per cent had corrections that were ineffective. A total of 58 per cent of the sample reported requiring near vision for their routine daily tasks.

Studies of hospital patients conducted in Africa showed a younger onset of presbyopia and more severe prebyopia than studies conducted in Europe and North America.[6,7,8,9] Pointer, in his clinic-based study, observed that presbyopia affected women earlier than men.[10] In addition, several studies have correlated geographical variations in the age at onset of presbyopia with latitude and climate; hotter climates are associated with earlier onset of presbyopia.[11,12,13]

In summary, the studies to date of presbyopia in low- and middle-income countries suggest the following:

- more than half of adults over the age of 30 have presbyopia
- women have both a higher prevalence of, and more severe, presbyopia
- the majority of those with presbyopia do not have corrective spectacles.

Impact

Presbyopia affects quality of life. This seems straightforward in high-income countries, where reading and writing are the main near vision tasks undertaken. For example, McDonnell et al. showed that presbyopia was associated with substantial negative effects on health-related quality of life in a US population.[14]

However, it is a misconception to think that presbyopia has no impact on quality of life in populations where reading and writing are less a part of daily life, for example in the rural populations of low- and middle-income countries.

Our study in Tanzania showed that in rural communities, where near vision tasks other than reading and writing are predominant, uncorrected presbyopia had a substantial impact on quality of life.[15] We found that near vision was needed for winnowing grain, sorting rice, weeding, sewing, cooking food, dressing children, and lighting and adjusting lamps. Almost 80 per cent of people with presbyopia reported having problems with near vision and 71 per cent were dissatisfied with their ability to do near work.

Good near vision is needed in many work-

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Near vision testing in a rural community. TANZANIA

related tasks. For example, research in India showed that presbyopic factory workers were less productive than their co-workers (personal communication with Praveen K Nirmalan, LV Prasad Eye Institute, Hyderabad, India). After correction, their productivity improved significantly, which made the investment in corrective spectacles very beneficial. Also, as more transactions are done in writing, adults with poor reading vision will be at an economic disadvantage.

Finally, uncorrected presbyopia can hamper development. The World Health Organization (WHO) has placed increasing emphasis on adult literacy to improve attainment of development goals, but people require good near vision to be able to benefit from programmes to improve literacy.

Interventions

While new treatments are being developed for presbyopia, spectacles represent an effective, economic option for low- and middle-income countries. However, there is little research on the determinants of, and barriers to, the use of near-vision spectacles. We are still awaiting data on the availability and affordability of near-vision refractive error services, including a system for efficient dispensing of high-quality, affordable spectacles.

In our study in Tanzania, 92 per cent of people with presbyopia reported using the near-vision spectacles we gave them. Almost half of the people we studied were using them a few times a week. This gave us an indication of the usefulness of adequate near vision in rural Tanzania, where many subjects did not routinely read or write. Better near vision resulted in reported improvements in overall quality of life. An appreciation of the usefulness of having adequate near vision made subjects willing to pay for spectacles and obtain replacements if the need arose. A high proportion of people (69 per cent) were able to afford spectacles at a price that covered the cost and shipping of the spectacles. Men were more likely to be able to afford spectacles, whereas a higher proportion of women needed to rely on another person to help them afford spectacles.

The majority of people in our study did not know where to get spectacles. Among those who knew where to go, ten per cent were misinformed about where they were available and a third could not afford to travel to a location where spectacles could be obtained. In general, lack of knowledge about refractive services, poor accessibility, and additional costs (such as transport) raise further challenges for intervention programmes.

Our experience in Tanzania also suggested that many subjects were not aware that correction could return adequate near vision to them. Because presbyopia is a gradual process, others had forgotten the value of having good near vision. Refractive error correction programmes need to recognise this, and community awareness of presbyopia needs to be promoted.

Our data suggest that it is very difficult to obtain reading spectacles for persons in rural villages and small towns in Tanzania.[15] In southern India, Nirmalan et al. showed that a major proportion of people with presbyopia who had spectacles (93 per cent) had obtained their spectacle prescriptions from ophthalmologists, who work primarily in large cities.[4]

In general, assessment and correction of presbyopia require modest expertise and can be undertaken independently of fixed optical services. The ScoJo Foundation, which works in Africa, Latin America and Asia, has demonstrated a sustainable model to distribute high-quality, low-cost reading spectacles in rural areas. This organisation trains women to start their own small business to prescribe and dispense presbyopic spectacles at low prices. Such an approach can be an independent but integrated part of a comprehensive eye health solution, as it may be the first point of contact for those with other eye problems and could identify those in need of further eye care services (see box on page 44).

The future

Further research should be conducted to determine why women and persons who live in urban environments have more presbyopia. As low- and middle-income countries undergo the demographic transition towards an ageing population, the number of people with presbyopia will increase. The impact on quality of life for older persons is now clear and presbyopia should be part of the WHO refractive error agenda. Clearly, presbyopia poses an important public health challenge, because it affects older people's ability to maintain their economic independence. We need to start working towards effective solutions.

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