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Original research

The prevalence of uncorrected refractive errors in underserved rural areas

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Abstract

Purpose: To determine the prevalence of uncorrected refractive errors, need for spectacles, and the determinants of unmet need in underserved rural areas of Iran.

Methods: In a cross-sectional study, multistage cluster sampling was done in 2 underserved rural areas of Iran. Then, all subjects underwent vision testing and ophthalmic examinations including the measurement of uncorrected visual acuity (UCVA), best corrected visual acuity, visual acuity with current spectacles, auto-refraction, retinoscopy, and subjective refraction. Need for spectacles was defined as UCVA worse than 20/40 in the better eye that could be corrected to better than 20/40 with suitable spectacles.

Results: Of the 3851 selected individuals, 3314 participated in the study. Among participants, 18.94% [95% confidence intervals (CI): 13.48–24.39] needed spectacles and 11.23% (95% CI: 7.57–14.89) had an unmet need. The prevalence of need for spectacles was 46.8% and 23.8% in myopic and hyperopic participants, respectively. The prevalence of unmet need was 27% in myopic, 15.8% in hyperopic, and 25.46% in astigmatic participants. Multiple logistic regression showed that education and type of refractive errors were associated with uncorrected refractive errors; the odds of uncorrected refractive errors were highest in illiterate participants, and the odds of unmet need were 12.13, 5.1, and 4.92 times higher in myopic, hyperopic and astigmatic participants as compared with emmetropic individuals.

Conclusion: The prevalence of uncorrected refractive errors was rather high in our study. Since rural areas have less access to health care facilities, special attention to the correction of refractive errors in these areas, especially with inexpensive methods like spectacles, can prevent a major proportion of visual impairment.

Keywords: Uncorrected refractive errors; Population-based study; Un-met need

Introduction

Refractive errors are the most common visual disorder in children,[1–4] and uncorrected refractive errors have been identified as the leading cause of visual impairment in many age groups across the world.[1,5,6] A report by Nidoo in 2010 revealed that uncorrected refractive errors were responsible for 101.2 million cases of visual impairment and 6.8 million cases of blindness. A World Health Organization report states that approximately 43% of visual impairment is attributable to uncorrected refractive errors.[7]

Uncorrected refractive errors impair the quality of life of millions of people of different ages, genders, and ethnicities, and they impose heavy burdens on the families of the affected individuals as well as the society as a result of loss of

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manpower.[8] Moreover, uncorrected refractive errors at young ages can lead to amblyopia which negatively affects their educational, occupational, and athletic performance.

Over the past decade, different surveys on populations with different ethnic and cultural backgrounds have shown that different factors contribute to the development of refractive errors. These include genetics, environmental factors, and socio-economic status.[8,9] The association between long-term near work and myopia has also been examined in some studies.

Although the effect of uncorrected refractive errors on morbidity and mortality has been well established in previous studies,[10−12] there are limited reports on the prevalence of uncorrected refractive errors in underserved rural areas, especially in Iran.[13−15] A great proportion of the Iranian population lives in rural areas, and they usually have less access to health services, which affects the diagnosis and treatment of refractive errors. The present study was conducted to determine the prevalence of uncorrected refractive errors based on demographic variables and the determinants of the unmet need for correction in the affected population.

Methods

Study type

The present study was conducted cross-sectionally in 2015. The target population of the study was rural-dwellers in underserved regions in Iran. Two underserved rural regions were selected from the north and southwest of Iran.

Sampling approach

Sampling in this study was done using the multistage cluster method. First, two rural districts were randomly selected from the north and southwest of Iran using national data on underserved regions. From the southwest of Iran, Shahyoun District was selected from the Khouzestan province, and from the north of Iran, Kajour District was selected from the Mazandaran Province. Once the target districts were determined, a list of all villages in the districts was prepared, and a number of them were randomly selected. The number of selected villages was proportionate to the total population of each district. Therefore, since Shahyoun has less populated villages, 15 villages were selected in Shahyoun and 5 in Kajour. At this stage, necessary arrangements were made with health authorities and staff, and all over 1 year old rural-dwellers were invited to participate in the study upon signing an informed consent form. For those under 18 years, consents were obtained from the head of the household. Appointments were set for consenting participants to have their examinations at the study site.

Given the main objective of the survey, the sample size was calculated based on the prevalence of visual impairment in a sample Iranian village. Therefore, for a rate of 6.3%, a precision level of 0.01, and a 95% confidence level, the sample size was calculated as 2267. This was corrected to 3400 after applying a 1.5 design effect, and finally to 3740 after correcting for a 10% non-response rate.

The designated site for study examinations included a room with normal illumination (1300 lux with lights on). For each participant, first demographic data were collected through an interview, and then vision examinations were conducted. All vision tests were performed by two optometrists whose agreement was initially tested in 35 people. According to the intraclass correlation coefficients (ICC), the inter-examiner agreement was 0.897 for manifest refraction and 0.923 for uncorrected visual acuity (UCVA).

Examination

For each participant, first the UCVA was tested with the Snellen E chart at 6 m. Children under 5 years of age who could not respond to this chart were given instructions and tested with Lea Symbols.

In the next stage, autorefraction was done using the Nidek Ref/Keratometer ARK-510A. If autorefraction could not be done for any child, objective refraction was determined by retinoscopy. For all subjects, autorefraction results were checked through retinoscopy (Heine Beta 200 retinoscope, HEINE Optotechnik, Germany) to determine objective refraction. Then all cases with UCVA worse than 20/20 underwent testing for subjective refraction, and their best corrected visual acuity was determined. Finally, all subjects had the slit-lamp exam by an ophthalmologist, and all those under 20 years of age had cycloplegic refraction after instilling cyclopentolate 1%.

Definitions

In individuals under 20 years of age, since cycloplegic refraction was done, myopia and hyperopia were defined as a spherical equivalent of −0.5 diopter (D) or worse and +2.0 D or worse, respectively. For participants older than 20 years of age, myopia and hyperopia were defined as a spherical equivalent of −0.5 D or worse and +0.5 D or worse, respectively. A cylinder power worse than 0.5 D was considered astigmatism. To calculate the met and unmet need for spectacles, the definitions proposed by Bouene et al[8] were used. Need for spectacles was defined as a UCVA worse than 20/40 in the better eye that could be corrected to better than 20/40 with suitable spectacles. Met need was calculated as the proportion of individuals with need who achieved 20/40 vision or better with their current spectacles. Unmet need was calculated as the proportion of individuals with need who did not achieve 20/40 vision or better with their current spectacles or did not have any spectacles at all.

Statistical analysis

The prevalence of uncorrected refractive errors and unmet need for spectacles was summarized as mean and 95% confidence intervals (CI). The effect of cluster sampling was considered in the calculation of CI. Simple and multiple

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