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Rapid Assessment of Refractive Error, Presbyopia, and Visual Impairment and Associated Quality of Life in Nampula, Mozambique

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Rapid Assessment of Refractive Error, Presbyopia, and Visual Impairment and Associated Quality of Life in Nampula, Mozambique

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Structured abstract: *Introduction:* Uncorrected refractive error is the leading cause of visual impairment worldwide and leads to an impaired quality of life. This study was designed to determine the prevalence of uncorrected refractive error and presbyopia, to assess spectacle coverage, and to evaluate visual health-related quality of life among persons aged 15–50 years old in Nampula, Mozambique. *Methods:* Participants were assessed using a validated rapid assessment of refractive error protocol, comprised of a demographic questionnaire, a standardized ophthalmic assessment to determine refractive status and spectacle coverage, and a modified vision-related quality of life questionnaire to assess the impact of uncorrected refractive error on participants' visual health status. *Results:* Among the 3,453 respondents, visual impairment prevalence was 3.5% (95%, *CI* 2.7%–4.2%), with 65.8% of those visually impaired being 35 years of age and older. Uncorrected refractive error prevalence was 2.6% (95%, *CI* 2.1–3.2%), and was the primary cause of visual impairment among 64.5% of cases. The spectacle coverage for uncorrected refractive error was 0%. Presbyopia prevalence was higher, at 25.8% (95%, *CI* 12.0–30.5%), with only 2.2% spectacle coverage. Respondents with visual impairment demonstrated statistically significantly lower quality of life scores compared to those without visual problems ($p < 0.01$). *Implications for practitioners:* The uncorrected refractive error problem and a distinct lack of spectacle coverage for refractive error and presbyopia indicate an urgent need for the development and delivery of a comprehensive refractive error service in the Nampula region of Mozambique.

In 1997, the International Agency for the Prevention of Blindness, in partnership with the World Health Organization (WHO), established the Vision 2020 initiative, with the ambitious goal of

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eliminating avoidable blindness by 2020. Since refractive error is the leading cause of global visual impairment, it was included as a priority condition under Vision 2020 (Thylefors, 1998; World Health Organization, 2007).

Approximately 10% of the world's population (670 million people) have uncorrected refractive error or presbyopia, due to the lack of availability or inaccessibility of refractive services, and 90% of those people reside in low- and middle-income countries (Dandona & Dandona, 2001a; Holden et al., 2008; Khanna, Raman & Rao, 2007; Reskinoff, Pascolini, Mariotti, & Pokharel, 2008). Without appropriate and timely interventions, the impact of visual impairment will escalate (Naidoo, 2007), especially in the context of increasing life expectancy and burgeoning population statistics evident in developing countries, predominantly in Africa (Turner, 2009).

Individuals with visual impairments face challenges that directly and indirectly affect quality of life, including socioeconomic status, health, and physical functionality (Gooding, 2006). Such conditions often lead to depression, poverty, and increased mortality (Holden, 2007). Therefore, to gather a comprehensive account of vision-related challenges and identify gaps in service delivery, it is crucial to assess individuals' perceived health and well-being status in addition to vision-specific experiences (Dandona & Dandona, 2001b; Polack, Kuper, Wadud, Fletcher, & Foster, 2008).

Approximately 24 million people inhabit Mozambique (Central Intelligence Agency [CIA], 2013). According to the United Nations Human Development Index, a composite measure designed to provide an indicator of human well-being, Mozambique currently ranks 185 out of 187 countries (United States Global Health Initiative, 2011). Mozambique is characterized by poverty, poor health service delivery, and inadequate health care infrastructure, problems that are particularly notable in the visual health sector. Recent situational analyses indicate that 17 ophthalmologists, 51 ophthalmic technicians, and 5 refractionists are available to manage the diverse visual health needs of the population of Mozambique (Vision 2020, 2012). Even when one considers refractive error alone, the Vision 2020 target of one visual health professional conducting refractive exams per 50,000 people would suggest the need for a minimum of 480 such personnel in Mozambique (Vision 2020, 2012).

The specific burden of uncorrected refractive error in Mozambique is essentially unknown. A study conducted among urban students between the ages 17 and 26 found the prevalence of refractive error in Mozambique to be 17.8%, with myopia prevalence being higher (13%) than hyperopia at 4.8% (Ruiz-Alcocer, Madrid-Costa, Perez-Vives, Albarran, & Gonzalez-Meijome, 2011). However there are no population-based studies providing data for the prevalence of refractive error. Given the lack of data, it is unsurprising to note that the National Plan for Ophthalmology (2007–2011) failed to provide sufficient emphasis on uncorrected refractive error as a major cause of severe visual impairment (Ministério Da Saúde [MISAU], 2007; USAID, 2007). The updated plan has been finalized and is awaiting ministerial approval.

To understand refractive error prevalence locally and to mount an appropriate health care response require accurate and timely information. Although population-based studies to estimate uncorrected refractive error can be complex, time-consuming, and costly, rapid assessment techniques can be employed to provide a quicker, less expensive, but scientifically rigorous manner of uncorrected refractive error estimation. Rapid assessments of refractive error methods have been described and applied previously in countries such as Eritrea (Chan, Mebrahtu, Ramson, Wepo, & Naidoo, 2013), Tanzania (Mashayo, Chan, Ramson, Chinanayi, & Naidoo, 2014), and India (Marmamula, Keeffe, & Rao, 2009). Rapid assessment of refractive error is a simple and cost-effective research method for conducting population-based cross-sectional studies on refractive error.

A study on rapid assessment of refractive error would inform the refractive error planning and policy development process, and would justify the inclusion of uncorrected refractive error as a priority condition in the next visual health plan for Mozambique, in line with Vision 2020 policy recommendations. Hence the aim of this study was to determine the prevalence of uncorrected refractive error and presbyopia, to assess spectacle coverage, and to investigate the vision-related quality of life in the Nampula district of Mozambique.

Methods

Ethical approval was granted by the Mozambican National Bioethics Committee for Health. The study was restricted to persons between 15 and 50 years of age who were residing permanently in households identified within each sample cluster. Respondents were required to provide their written informed consent before recruitment to the study. The research protocol adhered to the Declaration of Helsinki governing research involving human subjects. Participant identity was anonymized for data security and confidentiality purposes.

Sampling

This population-based cross-sectional study was conducted in the Nampula district of Nampula province in northeastern Mozambique. The Nampula district comprised a population of 824,578 in 2012 (2007 census estimates), with 571,284 urban and 255,294 rural inhabitants. A two-stage cluster sampling methodology was employed, with 58 clusters identified using a systematic random sampling method with probability proportionate to size. The calculation of sample size was based on several aspects, namely, the expected prevalence of refractive error in the country, the required precision of the estimate, confidence intervals for the estimates and the cluster sampling methodology.

The expected prevalence rate for uncorrected refractive error was set at 5%, with a precision rate of 20%, a significance level of 5%, and an alpha error level of 0.05. Powering the study at 95%, a sample size of approximately 1,819 was estimated to determine the prevalence of uncorrected refractive error. A design effect correction factor of 1.6 was also applied, which increased the required sample size to 2,910 subjects. To compensate for potential selection bias for nonrespondents (that is, persons not willing or available to participate in the study), a 10% increase of the sample was applied, yielding a required minimum sample size of 3,200 subjects.

Definitions

Typical or *normal vision* was defined as a distance visual acuity of 6/12 (20/40) or better. *Uncorrected refractive error* was classified as a binocular visual acuity of less than 6/12 (20/40), correctable to 6/12 (20/40) or better using a pinhole disc. *Presbyopia* was defined as binocular distance visual acuity of greater than 6/12 (20/40) (including corrected), but a binocular near-visual acuity of less than 6/12 (20/40) at a 40-centimeter (16-inch) reading distance for participants aged 35 and over. *Moderate visual impairment* was classified as visual acuity of less than 6/12 (20/40) but greater than 6/60 (20/200), and *severe visual impairment* was classified as less than 6/60 (20/200) but greater than 3/60 (10/200). Those with visual acuity of less than 3/60 (10/200) (including pinhole), or without perception of light, were classified as *blind*. *Spectacle coverage* was calculated as (met need/[met need + unmet need]) × 100%, whereby *met need* represented the number of people who had corrected refractive error, while *unmet need* represented the number of people who had uncorrected refractive error.

Procedures

Standard rapid assessment of refractive error methodology was applied, entailing a two-day personnel training session in the standardized protocol for enumeration, face-to-face interviews, clinical assessments, and recording data to be implemented. Study teams were comprised of two interviewers, one ophthalmic technician and one optometrist. Interobserver variability analysis was included in the training program, with variability deemed satisfactory once an acceptable level of agreement between study teams was reached (kappa value > 0.6). The process entailed a comparison of the trainee's findings with the clinical trainer to ensure consistency regarding their assessment of visual acuity, pinhole vision, causes of the visual impairment, and spectacle prescription. Following completion of training, a pilot study was conducted in a cluster community not included in the study. For the study, the optometrists had a dual responsibility to conduct clinical examinations and data quality audits after each household as well as at the end of each day.

A demographic and quality of life questionnaire was completed for each eligible participant. The quality of life questionnaire was designed to elicit information regarding the perceptions of participants regarding their visual health conditions and the effect visual impairment has had on their lives. The quality of life questionnaire was modified in accordance with the study population and design, taking into consideration the relevance of questions and the length of the questionnaire; the initial sections of the questionnaire were maintained. The questionnaire comprised two sections, the first 15 questions assessing functional difficulties related to vision loss, and a further eight questions assessing the impact of visual loss on general well-being. Responses were marked on a scale of 1 to 4, with 4 indicating least difficulty or effect on well-being (that is, highest quality of life). The minimum score one could attain for the overall questionnaire was 23, and

VQOL DOMAIN / ITEM		RESPONSE			
Answers are to be based on eyesight only (not any other reason).		All the time	Most of the time	Sometimes	Never
FUNCTIONALITY					
1	I have difficulty reading because of my eyesight.				
2	I have difficulty recognizing faces.				
3	I have trouble threading a needle for sewing clothes because of my poor eyesight.				
4	I have trouble slicing and preparing food because of my poor eyesight.				
5	When walking I can't see stones, potholes, bumps, or the walkway well.				
6	I need someone to help me walk around because of my eyesight.				
7	I have difficulty carrying out my obligations to my family because of my eye sight.				
WELL-BEING—*Indicate the response which best describes how you feel*					
8	I feel embarrassed because of my eyesight.				
9	I feel like a burden because of my eyesight.				
10	My poor eyesight interferes with my life.				

Figure 1. Quality of life questionnaire sample questions.

the maximum score was 92 (see Figure 1 for sample questions).

Monocular distance visual acuity of respondents was measured with a modified Snellen chart with tumbling "E" optotypes at a standard distance of six meters (20 feet) under normal daylight illumination. The right eye was tested first, followed by the left eye, initially without and subsequently with glasses, if participants brought them. Visual acuity was recorded as the smallest line correctly recognized on the chart. Respondents unable to see the 6/60 (20/200) letter were tested at three meters (10 feet) and then at one meter (3 feet). A multiple pinhole occluder was then used to determine whether visual acuity was optically correctable, then the smallest line correctly identified was recorded. Near vision was measured in all subjects 35 years and over using a Near Snellen chart with tumbling "E" optotypes at a standard test distance of 40 centimeters (16 inches). An ocular health assessment was conducted to determine the presence of ocular pathology using an ophthalmoscope. Participants found in need of advanced treatment were referred to their local public health facilities.

Statistical analysis

Data were entered into custom-designed databases, and were cleaned and analyzed using the statistical software package STATA 11.1 (StataCorp LP, College Station, Texas, USA). Data cleaning entailed checking validations (valid values), consistency (relationships upheld), logic (contradictions between values), and missing data edits (United Nations, 2000). Hypothesis tests were conducted at a 5% significance level. Chi-square tests were used to determine if there were any statistically significant relationships between specific variables. Multivariate analyses using logistic regression on refractive error, presbyopia, and visual impairment (odds ratio calculation with 95% *CI*) for demographic categories were determined. The formulas used to analyze multivariate logistics regression were:

1. logistic(RE) $= b_1$ i.sex $+ b_2$ i.education $+ b_3$ i.age $+ b_4$ i.occupation $+ \varepsilon$
2. logistic(Presbyopia) $= b_1$ i.sex $+ b_2$ i.education $+ b_3$ i.age $+ b_4$ i.occupation $+ \varepsilon$
3. logistic(Vision Impairment) $= b_1$ i.sex $+ b_2$ i.education $+ b_3$ i.age $+ b_4$ i.occupation $+ \varepsilon$

where i = categorical variable, and b_1 = coefficients (i = 1, 2, 3, 4).

Age group, gender, occupation and education were used as explanatory variables in the respective models. Refractive error, visual impairment, and presbyopia were adjusted by age and gender by first calculating the proportions of age and gender. Refractive error and visual impairment were calculated from the whole reference population of 15 to 50 years; however, proportions for presbyopia were calculated among those 35 years and older. The age- and gender-specific proportions were multiplied with the age- and gender-specific prevalence, and to get the overall prevalence the results were added for all age and gender groups.

Results

Demographics

A total of 3,457 respondents between the ages of 15 and 50 years were interviewed. Four respondents refused to have their eyes tested after being interviewed; therefore, 3,453 were examined, yielding a 99.9% response rate. The age profile of participants was not normally distributed (Kolmogorov-Smirnov test, $p < 0.01$). The median age of participants was 28, (interquartile range [IQR], the most central 50% of participants being between 18 and 38 years). A full description of the demographic profile of study participants is provided in Table 1.

Visual impairment

Out of the 3,453 respondents who were examined, 106 (3.1%) had moderate visual impairment, 16 (0.5%) had severe visual impairment, and a further 19 (0.6%) were classified as blind. The age- and gender-adjusted overall prevalence of visual impairment including blindness was 4.1% (95%, *CI* 3.3–4.8%), of which 64.5% were accounted for by uncorrected refractive error. Out of the overall 4.1% prevalence of respondents with visual impairments, 65.8% were 35 years and older and 3.5% (95%, *CI* 2.7–4.2%) had low vision. Differences in the proportion of respondents (typical vision, visual impairment, or blind classifications) were found to be statistically significant according to gender (more females were classified as normal, and more males were classified as visually impaired or blind; $\text{Chi}^2_3 = 6.93$, $p = 0.04$), and across age groups (the highest proportion of visually impaired and blind were in the over-45 age group, see Figure 2; $\text{Chi}^2_{18} = 124.28$, $p < 0.00$).

No differences in proportion were observed across the other explanatory variables—occupation and education level, for example. Multivariable logistic regression analysis employed with consideration to the survey design revealed that participants aged 45 years and over

Table 1
Demographic profile of RARE study participants.

Variable	Participants	
	n	%
Age group		
15–19	774	22.4
20–24	662	19.2
25–29	464	13.4
30–34	323	9.3
35–39	333	9.6
40–44	340	9.8
45 and above	561	16.3
Sex		
Male	1,572	45.5
Female	1,885	54.5
Spectacles wear		
Yes	161	4.7
No	3,286	95.0
No response	11	0.3
Education		
No formal education	441	12.8
Primary school incomplete	1,386	40.1
Primary school complete	415	12.0
Secondary school incomplete	731	21.2
Secondary school complete	406	11.7
Don't know	22	0.6
No response	56	1.6
Employment		
Yes	1,329	38.4
No	2,063	59.7
No response	65	1.9
Occupation		
Professional	13	0.4
Teacher	86	2.5
Shopkeeper	24	0.7
Clerical job	15	0.4
Labor, construction work	33	1.0
Laborer, farm or agriculture	1,281	37.1
Home duties	363	10.5
Armed service	62	1.8
Student or trainee	553	16.0
Do not work	429	12.4
Others	598	17.2
Personal income per fortnight		
<350 Mets (~US$10)	2,265	65.5
≥350 – <700 Mets (~US$10–$20)	547	15.8
≥700 – <1000 Mets (~US$20–$30)	134	3.9
≥1000 – <1400 Mets (~US$30–$40)	79	2.3
≥1400 – <1700 Mets (~US$40–$50)	55	1.6
≥1700 or more (~>US$50)	325	9.4
No Response	52	1.5

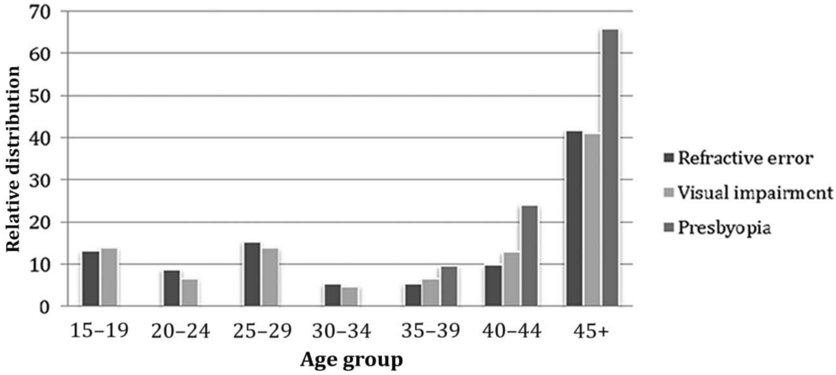

Figure 2. Differences in the proportions of respondents.

demonstrated the highest likelihood (7.14 times [95%, *CI* 3.57–14.30%]) of being visually impaired, compared to those in the 15–19 age category, while gender and education level did not show statistically significant odds ratios. A detailed breakdown of the odds ratio analysis for visual impairment is provided in Table 2.

Uncorrected refractive error

A total of 3,453 respondents participated in the clinical assessment. The age- and gender-adjusted prevalence of uncorrected refractive error was 2.6% (95%, *CI* 2.1–3.2%). Differences in the proportion of people with uncorrected refractive error were found to be statistically significant

Table 2
Odds ratios of explanatory variables, with refractive error, presbyopia, and visual impairment.

Variable	Refractive error OR (95% CI)	Presbyopia OR (95% CI)	Visual impairment OR (95% CI)
Gender			
Male	1	1	1
Female	1.16 (0.69–1.95)	1.14 (0.77–1.68)	0.79 (0.53–1.17)
Education			
No formal schooling	1	1	1
Primary school incomplete	1.31 (0.43–1.58)	1.31 (0.87–1.97)	0.91 (0.55–1.51)
Primary school complete	1.54 (0.22–1.91)	1.54 (0.93–2.57)	0.66 (0.28–1.57)
Secondary school incomplete	**1.22 (1.01–4.96)***	1.22 (0.73–2.04)	1.46 (0.69–3.09)
Secondary school complete	1.40 (0.70–4.15)	1.40 (0.70–2.77)	1.30 (0.51–3.34)
Age			
15–19	1	–	1
20–24	0.91 (0.38–2.19)	–	0.58 (0.24–1.39)
25–29	**2.68 (1.16–6.18)***	–	1.99 (0.93–4.27)
30–34	1.54 (0.54–4.38)	–	1.27 (0.45–3.56)
35–39	1.64 (0.53–5.09)	1	2.05 (0.84–5.01)
40–44	**3.03 (1.30–7.05)***	**2.85 (2.57–3.16)***	**3.39 (1.76–6.52)***
≥45	**7.66 (3.95–14.83)***	**5.89 (3.99–8.68)***	**7.14 (3.57–14.30)***

* $p < 0.05$; OR = odds ratio; CI = confidence interval.

between age categories ($Chi^2_6 = 49.59$, $p < 0.000$), with those over 45 years having the highest prevalence, accounting for 41.8% of cases (see Figure 2). Statistically significant differences were noted across education categories, with the highest proportion of uncorrected refractive error noted in those with a partial secondary education only ($Chi^2_6 = 13.21$, $p = 0.02$). No relationship was found between uncorrected refractive error and other explanatory variables.

Presbyopia

A total of 1,234 respondents (36%) were found to be 35 years and older, and were assessed according to the presbyopia protocol. The age- and gender-adjusted prevalence of presbyopia was 25.8% (95%, *CI* 12.0–30.5%). Most cases of presbyopia were found in individuals 45 years and older (66%, see Figure 2), a difference that was statistically significant ($Chi^2_2 = 88.45$, $p < 0.00$). The highest proportion of presbyopia according to occupation was found among agricultural workers (41.2%), and the differences observed across occupational categories was statistically significant ($chi^2_{11} = 27.63$, $p = 0.01$). There were no statistically significant relationships observed between other explanatory variables. The significant majority of people with presbyopia reported no history of spectacle use ($Chi^2_2 = 18.89$, $p < 0.00$).

Spectacle coverage

Among the participants, 161 individuals reported a history of spectacle use, the majority of whom were sourced through public hospitals (30%), street vendors or workers in markets (28.9%), and private optical shops (10.3%). Of those in possession of spectacles ($n = 161$ [4.6%]), the majority (71.5%) had post-primary levels of education.

Interestingly, none (0%) of the participants with refractive error (according to the study definition) had appropriate spectacles that could improve their visual acuity to normal levels. Furthermore, only seven (2.2%) of the presbyopic participants had their presbyopia adequately corrected. Of these seven participants whose spectacle needs were met, five were from an urban area and the other two were from rural areas.

Quality of life

Out of the 3,457 respondents, 20 did not complete the quality of life form and were excluded, leaving 3,437 participants eligible for analysis. Overall, participants with normal vision exhibited the highest average quality of life scores. Participants with visual impairments, refractive error, and presbyopia all demonstrated quality of life scores that were statistically significantly lower than those without such conditions. Blind participants exhibited the lowest quality of life scores of any group (mean quality of life = 50.4 ± 24.7). The mean plus-or-minus standard deviation of quality of life scores of the respondents and the statistical comparison of the mean scores are presented in Table 3.

Discussion

The observed prevalence of uncorrected refractive error (2.6%) and presbyopia (25.8%) in Nampula District is low compared to that reported in similar rapid assessment of refractive error studies in Eritrea (6.4% and 32.9%, Chan et al., 2013), India (4.3% and 63.7%, Marmamula et al., 2009), and Tanzania (7.5%

Table 3
Quality of life scores according to vision, refractive error, and presbyopia status.

Status (*n*)	Total QoL score (Mean ± SD)	Vision and functionality (Mean ± SD)	Well-being (Mean ± SD)	Independent samples *t*-test (Total QoL)
Overall (3437)	84.7 (9.6)	55.5 (6.2)	29.2 (4.3)	
Vision*				
Normal vision (2974)	86.3 (8.2)	56.6 (5.1)	29.7 (3.9)	$p < 0.01$**
Visually impaired (118)	77 (10.0)	49.9 (6.7)	27.1 (4.5)	
Blind (19)	50.4 (24.7)	30.9 (15.9)	19.5 (9.3)	
Refractive error*				
Refractive error (86)	78.2 (9.2)	50.8 (6.3)	27.4 (4.1)	$p < 0.01$
No refractive error (3035)	84.9 (9.0)	56.3 (5.7)	29.6 (4.1)	
Presbyopia†				
Presbyopia (316)	75.3 (9.6)	49.1 (6.3)	26.1 (5.1)	$p < 0.01$†
No presbyopia (864)	80.5 (9.1)	52.7 (6.9)	27.8 (4.8)	

* Excludes participants with presbyopia.
** Normal vision versus visually impaired and blind combined.
† Analysis confined to individuals > 35 years of age.
SD = standard deviation; QoL = quality of life.

and 46.5%, Mashayo et al., 2014). However, the most important finding to emerge from this study is the paucity of spectacle coverage (almost zero coverage) among those exhibiting significant uncorrected refractive error and presbyopia. This finding is particularly important because the significant majority of participants (69.4%) resided in urban areas, where better access to services relative to rural areas would be expected (Nampula Central Hospital, which provides centralized visual health services, is located in the Nampula District, where the study was conducted). In Eritrea, the coverage was 22.2% for refractive error and 10% for presbyopia (Chan et al., 2013), while in India, the coverage rates were marginally better at 29% and 19% for refractive error and presbyopia, respectively (Marmamula et al., 2009). Although such coverage rates are remarkably low, they still provide some semblance of an operational refractive error service, unlike the coverage rates in Nampula—0% (uncorrected refractive error) and 2.2% (presbyopia). These findings would support the view that a large proportion of the population in Mozambique do not appear to have access to health service delivery systems (USAID, 2007), including visual health services for uncorrected refractive error. Only in 2013 did the first optometrists graduate in Mozambique, and the paucity of human resources and services is reflected in the spectacle coverage results.

The rapid assessment of refractive error prevalence data reported here supplements avoidable blindness data collected previously among an older population group (> 50 years) in Nampula province. In 2011 a rapid assessment of avoidable blindness study revealed a prevalence of 6.3% for blindness and 8.6% for visual impairment (Sightsavers International, unpublished report). Collectively, the rapid assessment of refractive error and rapid assessment of avoidable blindness studies simultaneously suggest an urgent need to develop a coherent, comprehensive, affordable, and accessible refractive error service, which will form part of the national visual health strategy that focuses on increasing the number of adequately trained human resources and visual health facilities to meet current and future needs.

The quality of life data confirm an adverse effect of uncorrected refractive error, presbyopia, and visual impairment on self-reported quality of life. Blind participants reported the lowest vision-related functionality, well-being, and overall quality of life scores. Those with uncorrected refractive error, presbyopia, and visual impairment all reported a significantly lower quality of life relative to those without, indicating that the effect of such conditions is significant in their lives. These findings are in general agreement with previous studies on visual functioning and quality of life on those with cataract (Taylor et al., 2008) and refractive error (Coleman, Yu, Keeler, & Mangione, 2006; Owsley et al., 2007), and with findings that visual disabilities impact on quality of life (La Grow, Sudnongbua, & Boddy, 2011). Therefore, provision of spectacles, which is perhaps the simplest of visual health interventions, can improve vision-specific functionality, well-being, and general quality of life in those with uncorrected refractive error (Coleman et al., 2006; Owsley et al., 2007).

Sociodemographic change further represents a significant consideration. With the expected increase in life expectancy (World Health Organization, 2014; Population Reference Bureau, 2013), the age-dependent eye conditions such as presbyopia, cataract, and glaucoma are also most likely to increase and demand substantial allocation of resources. Furthermore, urban growth evident in sub-Saharan Africa (Kok & Collinson, 2006; Simon, McGregor, & Nsiah-Gyabaah, 2004), Mozambique included, is likely to increase myopia, which becomes increasingly prevalent in high-density populations (He et al., 2004; Saw et al., 2001; Xu et al., 2005). Urbanization tends to increase educational opportunities, and since level of education is also associated with myopia development (Ip, Rose, Morgan, Burlutsky, & Mitchell, 2008), urbanization is likely to play a significant role in the widespread trends of increasing myopia in young adults (Au Eong, Tay, & Lim, 1993; Wu et al., 2001), Mozambique included (Ruiz-Alcocer et al., 2011). The combined effects of population and life expectancy trends, increasing urbanization, and access to education will inevitably lead to more people with uncorrected refractive error, and further demands on a visual health service that cannot cater to current demands.

The recent and continued emergence of indigenously trained optometrists from the first and only optometry degree program in all of Lusophone Africa at Universidade de Lúrio in Nampula might provide the necessary impetus to deliver the quality care that can enhance the vision-related functioning and quality of life of the many people who, on the basis of this rapid assessment of refractive error study, remain so obviously in need.

Limitations

The study results are a prerequisite in implementing refractive and low vision services in Mozambique. However the quality of life component merits further study. Various factors, such as the validity of the tool in the Mozambican context, and respondents' demographics, language, and socioeconomic factors, all contribute to the findings, and the results relevant to this group might not necessarily be true for the rest of the Mozambican community; however, the findings are highly likely to reflect the same relationship between low quality of life and visual impairment.

The findings also suggest a need for further research, including aspects such as the prevalence of impaired vision not related to refractive error; the incidence of refractive error or impairment, which might indicate a sudden change in visual health and visual impairment not attributable to refractive error; and a comparison of the disparities of the prevalence of refractive error in similarly developed countries, and whether such disparities relate to educational, nutritional, or other factors.

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