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Student Educational Background, Perceptions and Expectations towards Optometry: an Emerging Eye Health Profession Mozambique.

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Student Educational Background, Perceptions and Expectations Toward Optometry: An Emerging Eye Health Profession in Mozambique

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Abstract

Background: The University of Lurio, School of Optometry in Mozambique is a new program in Africa. The school, the first to serve Portuguese-speaking Africa, can act as a template for such initiatives in other African countries and other limited-resource settings around the world. A major challenge facing such programs is the lack of knowledge about the profession, which impacts the recruitment of students and their expectations of the program. This study was conducted to understand students' pre-enrollment educational background, perceptions and career expectations as an optometrist in Mozambique so as to inform future enrollment and other similar initiatives. **Methods:** First-year optometry students were asked to complete a questionnaire containing open-ended, close-ended and Likert-scale questions. **Results:** Respondents perceived their language literacy skills as average or good. The majority of participants acknowledged that there is lack of eyecare personnel in Mozambique and agreed that optometry training will resolve this challenge. Students retained high expectations regarding their expected salary and work placement.

Conclusion: The timely understanding of the poor self-rating of the students' English language ability, gaps in their perception of the role of optometry in Mozambique, and expectations can assist planning for student support, awareness strategies for prospective students and sustainable eye health professional training. The results from the study can be useful when setting up new professional programs in other Lusophone African countries and similar settings, with particular relevance to optometry programs.

Key Words: competencies, expectations, optometry, education, Mozambique

Introduction

In October 2008, a consortium set out with the ambition of training Mozambique's first optometrists through a four-year optometry degree program. The training of optometrists and development of a new optometry cadre was viewed as a means to contribute to the development of a sustainable, cost-effective and comprehensive public eye health system, which is lacking in Mozambique and more broadly across sub-Saharan Africa.^{1,2} Optometry education is seen as a core and sustainable mechanism for overcoming the significant barrier of insufficient local eyecare human resources, and thereby represents a means to address the problem of avoidable blindness and visual impairment in developing nations.³ The Mozambique Eyecare Project's (MEP's) focus on Mozambique is timely and necessary given that resources in Lusophone Africa are particularly deficient, with 17 ophthalmologists and five expatriate optometrists for a population of 24 million.⁴ Various organizations continue to engage governments in developing countries to create education programs that produce optometrists and other eye health professionals. However, the underdeveloped status of underlying education systems in such countries⁵ poses significant challenges, which must be addressed if the optometry profession is to contribute meaningfully to the eyecare needs of people in Africa and in developing countries more generally.

In preparing the first optometrists in the country, initial student selection is an important component that can facilitate the graduation of optometrists who will prove to be competent practitioners. They will demonstrate a willingness to serve the public and to be integrated within the community following graduation. The selection process requires the development and implementation of strategies that ensure that the most appropriate students are selected into the program.⁶ Factors that generally influence career choices include academic achievements, exposure to career options, career guidance provided by teachers, family influence and admission and selection processes.⁷⁻⁹

Despite these influential factors, the process in Mozambique, as in many

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countries,¹⁰⁻¹³ is to allocate students to courses based on the score they achieved on a national university admission examination (high school examination). The higher their score on the national university admission examination, the higher the chance they are allocated to their first choice of study. Students are then given two options for their courses of interest. The University Administrative Committee oversees the allocation process at the university level. In the first year of their studies, optometry students are registered for basic science courses, such as biology, chemistry, physics and mathematics. Students also can enroll in elective courses, such as the English language, which is valuable because many educational materials are only available in English. Students are only exposed to optometry courses in the second semester of their studies. While a grade point traditionally used in student selection may provide some information regarding applicant average academic skills, it does not guarantee aptitude, motivation or knowledge of the program or the future profession.^{14,15}

In the academic environment, curriculum review is an integral and ongoing activity aimed at keeping the curricula up to date with current societal needs, meeting the requirements of governmental higher education accrediting bodies, and remaining accountable to stakeholders.^{16,17} However, there is a paucity of research relating to self-reported educational background and to student initial expectations toward a new program in a country.

The purpose of this paper is to provide an understanding of students' self-reported educational background, perceptions of the newly launched optometry program and expectations toward their future career as an optometrist in Mozambique, a country with limited prior experience or knowledge of optometry. The knowledge generated informs key decision-makers and educators with regard to the support needs of future students in neglected areas, informs awareness strategies for prospective students, and guides eye health human resources and service delivery planning.

Methods

Twenty-seven students (15 male, 12 female) who were newly enrolled in

the first and only Mozambican optometry education program at UniLúrio in Northern Mozambique were recruited into the study. To ensure that student perceptions were not biased, the data were collected during the first semester of study before the students registered for any optometry-related subjects. The only exposure of the students to the profession was the orientation given to them before they were recruited into the optometry program.

Each participant completed a four-part anonymous questionnaire, which addressed the following areas: socio-demographic characteristics, self-reported educational background, perceptions about the optometry profession and expectations of a career as an optometrist after leaving the university. The questionnaire was translated into Portuguese as this was the official language used at the university. The self-reported educational background section contained questions pertaining to participant reading, writing, speaking and computer skills and was included in the Likert-scale questionnaire, with three options to choose from: 3 Good, 2 Average or 1 Poor. At the time of the study, these students were enrolled in science-based subjects (biology, physics and chemistry) and numeracy skills subjects (mathematics).

Participants' perceptions were assessed by a series of questions designed to understand their choice of studies, the reasons for choosing the optometry program, and the reason for the need for an optometry program in Mozambique. We further explored knowledge of the

profession and expected plans on completion of their studies through a series of questions in relation to the 1) functions of an optometrist; 2) sector intended to work in; 3) area (geographic) intended to work in; 4) expected salary; and 5) countries intended to work in.

The study was conducted in accordance with the Tenets of the Declaration of Helsinki, and in line with normal quality assurance mechanisms in place at UniLúrio. Participants were provided with a description of the nature and intent of the study, and informed consent was obtained from each participant.

The data were entered into a Microsoft Access database and analyzed with Statistical Package for Social Sciences (SPSS edition 17.0). The results were analyzed using descriptive statistics.

Results

Demographic profiles of respondents

There were 27 students included in the study. Thirteen students (48.1%) joined the program immediately after completing their high school education, while the remaining students joined after a gap of one or two years following graduation from high school. The average age of participants was 21.9 years. Slightly more than half (55.6%) of the students were male (average age 21.7 years old) and 44.4% were female (average age 22.2 years old). The majority of students (63%, 10 males and 7 females) were from urban areas, and the remaining respondents were from semi-rural (11.1%, 2 males and 1 female) and rural areas (3.7%, 1 female). A demographic profile is provided in **Table 1**.

Table 1
Demographic Profile of Respondents

Demographic Characteristic	n (%)
Age (years)	
17-20	11 (40.8)
21-24	9 (33.3)
25-27	7 (25.9)
Sex	
Male	15 (55.6)
Female	12 (44.4)
Home location	
Rural	1 (3.7)
Semi-rural	3 (11.1)
Urban	17 (63)
No response	6 (22.2)
Last year of study	
2007	4 (14.8)
2008	7 (25.9)
2009	13 (48.1)
No response	3 (11.1)
Total	27 (100)

Self-reported educational background

The significant majority of students (66.67%) reported their English language skills as poor. Portuguese language skills were more typically categorized as good (77.78%). Females tended to rate their skills in languages higher than males, for both English and Portuguese. While a considerable number of students (22.2%) did not respond regarding their computer skills, the majority rated their computer skills as good, except for e-mail use, where 33% of the students rated their skills as poor. Full breakdowns of self-perceived literacy skills and computer skills are provided in **Table 2** and **Table 3**.

Perceptions of the optometry program

The highest proportions of students reported that general medicine (29.6%) or nutrition (22.2%) was their first choice of study. Only one student selected optometry as the first choice.

There was almost unanimous agreement regarding the need for the optometry training program because of the lack of other optometry programs in Mozambique (96.3%) and the need for optometry skills to address the eyecare provision problems in Mozambique (40.7%). A breakdown of the participants' perceptions of optometry is provided in **Table 4**.

Expectations toward a future career as an optometrist

The majority of students perceived the role of the optometrist as maintaining eye health, treating cataract and eye disease, and performing surgery. Nineteen students (70%) expressed a desire to work within the government sector on completion of their degree. In terms of the expected salary upon graduation, 10 students responded that their expected salary would be more than 20,000 Meticaís (652 USD) per month. However, even though the students opted to work within the public sector, almost the same number of respondents expressed their desire to work in urban areas. A full breakdown of the expectations of participants toward a future career in optometry is provided in **Table 5**.

Discussion

For the vast majority of people in Africa, eyecare services are not available, and

Table 2
Self-Perceived Literacy Skills of Respondents

Skills	Portuguese		English	
	Female n (%)	Male n (%)	Female n (%)	Male n (%)
Reading				
Poor	1 (3.7)	1 (3.7)	10 (37)	8 (29.6)
Average	0 (0)	2 (7.4)	5 (18.5)	1 (3.7)
Good	13 (48.1)	8 (29.6)	0 (0)	2 (7.4)
No response	1 (3.7)	1 (3.7)	0 (0)	1 (3.7)
Writing				
Poor	1 (3.7)	2 (7.4)	11 (40.7)	8 (29.6)
Average	0 (0)	1 (3.7)	4 (14.8)	2 (7.4)
Good	13 (48.1)	8 (29.6)	0 (0)	1 (3.7)
No response	1 (3.7)	1 (3.7)	0 (0)	1 (3.7)
Speaking				
Poor	1 (3.7)	2 (7.4)	10 (37.0)	7 (25.9)
Average	0 (0)	1 (3.7)	5 (18.5)	3 (11.1)
Good	13 (48.1)	8 (29.6)	0 (0)	1 (3.7)
No response	1 (3.7)	1 (3.7)	0 (0)	1 (3.7)

Table 3
Self-Perceived Computer Skills of Respondents

Computer skills	No response n (%)	Good n (%)	Average n (%)	Poor n (%)
Windows	6 (22.2)	12 (44.0)	4 (14.8)	5 (18.5)
E-mail	6 (22.2)	8 (29.6)	4 (14.8)	9 (33.3)
Internet	6 (22.2)	11 (40.7)	3 (11.1)	7 (25.9)
Word processor	6 (22.2)	9 (33.3)	6 (22.2)	6 (22.2)

Table 4
Perceptions of Respondents Toward the Optometry Program

Perceptions Questions	n (%)
First choice of program	
a. Dentistry	1 (3.7)
b. General medicine	8 (29.6)
c. Nutrition	6 (22.2)
c. Optometry	1 (3.7)
d. Pharmacy	1 (3.7)
e. Science biology	1 (3.7)
f. No response	9 (33.3)
Reasons for choosing to study optometry (multiple response)	
a. Optometry is necessary to solve the eye problem in Mozambique since there is a lack of optometrists	24 (63.1)
b. Optometry is new and interesting	5 (13.2)
c. I want to work in this area of health and it's my dream to work with people	5 (13.2)
d. I did not get accepted to do my first choice of study	2 (5.3)
e. I like physics and biology and this subject combines them both	1 (2.6)
f. It is nearly the same as general medicine	1 (2.6)
Need for an optometry program in Mozambique	
a. Yes	26 (96.3)
b. No	1 (3.7)
Reasons for the need of optometry program in Mozambique	
a. There is an absence of optometrists in Mozambique	11 (40.7)
b. Mozambique has a lot of eye problems	10 (37.0)
c. Many people are operated on without an optometrist and this can damage the eye	2 (7.4)
d. Because of the many climate problems which might affect vision	1 (3.7)
e. It highlights the large problems with vision in Africa	1 (3.7)
f. Optometry is a new course and no one knows about it	1 (3.7)
g. Motivates students to help minimize the problem of cataracts	1 (3.7)

the value of optometry services remains unknown or under-appreciated despite optometrists having a long history of practicing in parts of Africa.¹⁸ While some countries such as South Africa, Nigeria and Ghana have a long history of training optometrists, optometric teaching institutions are emerging for the first time in some African countries,¹⁸ such as Mozambique, Malawi, Eritrea and Kenya. The lack of familiarity with the profession is clearly reflected in the fact that only one student selected optometry as a first choice of study, compared to eight students who selected general medicine as their first choice. This can be due to the fact that the optometry profession is relatively new to Mozambique, and students are unaware of optometry as a profession or its potential in terms of scope of practice. Moreover, the social standing of an unfamiliar profession might not rank highly compared to medical doctors, who are usually well-respected within the community.¹⁸ Monetary return may also play a part in their choice of studies. Although students might acknowledge that there is a lack of optometrists to manage eye conditions in the country, they are faced with a dilemma of choosing the profession with a perceived income much lower than that of a medical doctor.¹⁹ This pilot project highlights the need to investigate the effect of recruiting students into programs that are not their first choice as well as to ascertain the value of recruiting students who did not select optometry at all into the program.

This study reveals that the majority of subjects rated their literacy skills in English as poor and their computer skills as good. A good command of the English language is important because, even though it is not an official language at the university, reference books, educational materials and online resources are predominantly written in English. Furthermore, the university encourages the learning of English as a second language. The use of online resources during assignments, for example, may be dependent on the Internet, suggesting that computer skills are equally important. This finding serves as a motivation for extra support and resources to be allocated to these areas of deficit.

The perceptions of optometry and the

Table 5
Expectations of Respondents
Toward a Future Career as an Optometrist

Expectations Questions	n (%)
Functions optometrists perform (multiple responses)	
a. To maintain eye health	25 (27.8)
b. To treat cataract and eye diseases	18 (20)
c. To improve quality of life by prescribing glasses and lenses	14 (15.6)
d. To perform surgical operations	10 (11.1)
e. To promote eye health care	9 (10)
f. To provide general optometry services	6 (6.7)
g. To develop new eye testing methods	3 (3.3)
h. To provide affordable eye care	2 (2.2)
i. To observe and analyze visual problems	2 (2.2)
j. To minimize blindness	1 (1.1)
Sector intended to work in after studies	
a. Government	19 (70.4)
b. Private practice	4 (14.8)
c. Non-profit organization	1 (3.7)
d. Academia/postgraduate	2 (7.4)
e. Private clinic	1 (3.7)
Types of area planned to work in	
a. Rural	1 (3.7)
b. Semi-rural	9 (33.3)
c. Urban	16 (59.3)
d. No response	1 (3.7)
Expected salary per month on completion of studies (Meticais)	
a. <3,000	3 (11.1)
b. 3,000-<10,000	1 (3.7)
c. 10,000-<20,000	3 (11.1)
d. 20,000-<45,000	5 (18.5)
e. 50,000-<100,000	3 (11.1)
f. 100,000-<150,000	1 (3.7)
g. >150,000	1 (3.7)
Countries to work in on completion of studies	
a. Mozambique	20 (74.1)
b. Overseas	7 (25.9)

general lack of knowledge of the profession further demonstrate the need to increase awareness of the profession in the country through advocacy efforts, which may bring about mobilization of resources for service delivery from government and the private sector and lead to the expansion of optometric practice.^{20, 21} More important is the identification of the need to build a marketing and recruitment strategy for prospective students to increase their familiarity with the profession and ideally make optometry a career of first choice.

In 2013, for a population of approximately 24 million, Mozambique had approximately 12 ophthalmologists, five expatriate optometrists and few mid-level ophthalmic technicians.⁴ The enormous demand may serve as a basis for expansion of the scope of optometric practice; however, currently, the scope does not involve the treatment of eye diseases and surgery.²¹

Also, a mismatch of expectations and reality may cause disappointment and dissatisfaction in career choices and might further cause attrition or decreased academic performance.²² The students' perception that the scope of practice of optometrists includes cataract surgery warrants an intervention that seeks to increase the understanding of the role of optometrists among potential students to avoid disappointment and thus drop-out of students. More importantly, there needs to be a focus on the value that optometrists add to the eyecare equation as well as on the research required to ensure such claims are evidence-based. The confusion about the different scopes of practice may be explained by the fact that Mozambique is grossly underserved by eyecare personnel, resulting in limited exposure of students to the various professionals and their respective scopes of practice. It is important to note that

the graduates are trained to use pharmaceutical agents for diagnosing eye diseases and therapeutic drugs for treating eye diseases. However, they are not allowed to use them at this stage due to the health professions regulations in the country. Defining the scope of practice of optometry, although not done in the study, is not always an easy task, but is important for the profession and optometric education.²³ Additionally, in some African languages the description of an optometrist translates to eye doctor and a similar terminology is used to describe ophthalmologists.

The majority of students (70%) expressed an interest in working within the government sector on completion of their studies. This decision may be influenced by the perception that working within the Government Ministries provides a stable form of employment. The introduction of this additional human resource into the public sector is significant because in most developing countries the public sector serves the majority of the population. The Ministry of Health, which is driving the educational agenda, will deploy graduates as the human resource to provide optometric services across the country. The strategic deployment of graduates will serve to contribute to efforts to address the refractive and eye health problems in Mozambique. To ensure sustainability and success of the program, there is a growing need to develop a strategic plan that would ensure that the financial and other resource needs of the education establishment can and will be met and training optometrists to solve the human resource challenge has proven to be cost-effective.²

It is significant that almost 60% of the students would want to work in an urban as opposed to rural area upon completion of their degree. This may be due to the fact that these students reside in an urban area and their familiarity with their own home environment might have influenced their preference to stay in an urban location.²⁴ The standard of living is also known to be relatively better in urban areas. While this is an inevitable phenomenon, it has the potential to perpetuate the imbalanced distribution of health workers between the rural and urban areas. The expectation to have to work in a rural area might also

be an indicator of job dissatisfaction and attrition. Therefore, it is important that students understand very early in the program that eye care is provided at district and regional levels. This approach to service delivery is adopted by the optometry program with the specific aim of increasing access and reaching out to the underserved rural areas in the country. The approach is also in line with VISION 2020: The Right to Sight campaign to combat avoidable blindness and low vision by placing sustainable, affordable and equitable comprehensive eye care within Primary Health Care Systems of developing and low-income countries, which includes human resource development as one of the pillars of the campaign.²⁵ Moreover, this also indicates that there is a need to consider enrolling students from rural areas in the student recruitment process to avoid high attrition rates in the future.

The salary expectations of the surveyed students appeared to be generally realistic. This most likely reflects the fact that public sector salaries in Mozambique are pre-determined on the basis of education level. Bachelor of Science (BSc) graduates typically earn a salary that is equivalent across multiple career disciplines (23,000 Meticaís, 750 USD per month). It is interesting to note that almost 26% of the students reported that they wish to work overseas after the completion of their studies. Although this creates opportunities for cross-country service delivery in Lusophone countries within Africa (Angola, Cape Verde, Guinea-Bissau, Sao Tome and Principe), it may also pose a challenge if these students emigrate and leave their country permanently. This highlights a need for Lusophone countries to work together to define strategies for preventing poorer nations from educating optometrists merely for “export.” Most optometry programs are struggling in difficult economic and/or political environments, but recent developments in communication and cooperation between the African countries will be a positive force toward seriously addressing the need for more optometric practitioners throughout the African continent.²⁶

The scope of this study is limited to the Mozambique experience, and caution

should be applied when interpreting its relevance to the Lusophone African countries. The small sample of 27 subjects makes it difficult to make broader projections, but does point to areas of further investigation and concern. Since there was no formal assessment of students’ literacy skills in the school, we can only rely on self-reported information, and this may have introduced respondents’ bias.

Conclusion

This study served to provide baseline information on the pre-competencies, perceptions and expectations of students in a new optometry program in Mozambique and can inform recruitment, education and service delivery efforts. Students enrolled in the Mozambican optometry education program at UniLúrio in Northern Mozambique held positive perceptions toward the program at the university and demonstrated a positive view toward their future careers as optometrists. Even though signs of confusion regarding scope of practice exist, the appreciation of the need for optometrists to address the eye health needs of the country was encouraging. Effort should thus be placed on giving students the necessary support and creating appropriate awareness of the profession in order to promote the development of optometrists as frontline health professionals who can help meet the eyecare needs in Mozambique. The information learned from the study can be useful for planning new professional programs in other Lusophone African countries and in similar settings, with particular relevance to optometry programs, and should be reinforced by prospective studies involving graduates of the program following their entry into clinical practice.

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References

1. Ackland P. The accomplishment of the global initiative VISION 2020:

- The Right to Sight and the focus for the next 8 years of campaign. *Indian Journal of Ophthalmology*. 2012;60(5):380-6.
2. Thompson S, Naidoo K, Harris G, Ferran J, Bilotto L, Loughman J. The development of a public optometry system in Mozambique: a cost benefit analysis. *BMC Health Services Research*. 2014;14:422.
 3. Naidoo KS, Wallace BD, Holden BA, Minto H, Faal HB, Dube P. The challenges of uncorrected refractive error: driving the agenda of the Durban Declaration on refractive errors and service development. *Clinical and Experimental Optometry*. 2010;9(3):131-6.
 4. Mozambique Eyecare Project. Available from www.mozeyecare.org/about-us/. Accessed on 20 Nov 2014.
 5. Nielsen L. Classification of countries based on their level of development: how it is done and how it could be done? *International Monetary Fund*. 2011, WP/11/31.
 6. Smedley BD, Stith AY, Evans CH. *The Right Thing to Do, The Smart Thing to Do: Enhancing Diversity in Health Professions - Summary of the Symposium on Diversity in Health Professions in Honor of Herbert W. Nickens, M.D.* National Academies Press, 31 Aug 2001.
 7. Rojewski JW, Hill RB. Influence of gender and academic risk behavior on career decision making and occupational choice in early adolescence. *Journal of Education for Students Placed at Risk (JESPAR)*. 1998;3(3):265-287.
 8. Bandura A. *Self-Efficacy in Changing Societies*. Cambridge University Press, 13 May 1997.
 9. Committee to Increase Minority Participation in the Health Professions: *Balancing the Scales of Opportunity: Ensuring Racial and Ethnic Diversity in the Health Professions*. National Academies Press, 1 Jan 1994.
 10. Al-Alwan IA. Association between scores in high school, aptitude and achievement exams and early performance in health science college. *Saudi Journal of Kidney Diseases and Transplantation*. 2009;20(3):448-453.
 11. McManus IC, Powis DA, Wakeford R, Ferguson E, James D, Richards P. Intellectual aptitude tests and A levels for selecting UK school leaver entrants for medical school. *BMJ*. 2005;331:555-559.
 12. Puddey IB, Mercer A, Carr SE, Loudon W. Potential influence of selection criteria on the demographic composition of students in an Australian medical school. *BioMedCentral Medical Education*. 2011;11:97.
 13. Talley NR, Mohr JI. The case for a national standard of grade weighting. *Journal of College Admission*. 1993;139:9-13.
 14. O'Neill LD, Korsholm L, Wallstedt B, Eika B, Hartvigsen J. Generalizability of a composite student selection procedure at a university-based chiropractic program. *Journal of Chiropractic Education*. 2009;23(1):8-16.
 15. Tutton P, Price M. Selection of medical students. Affirmative action goes beyond the selection process. *BMJ*. 2002;324(7347):1170-1171.
 16. Kretovcics M. Entry-level competencies: what student affairs administrators consider when screening candidates. *Journal of College Student Development*. 2002;43(6):912-920.
 17. Lovell C, Kosten L. Skills, knowledge and personal traits necessary for success as a student affairs administrator: a meta-analysis of thirty years of research. *NASPA Journal*. 2000;37:553-572.
 18. Carpenter J, Hewstone M. Shared learning for doctors and social workers: evaluation of a programme. *British Journal of Social Work*. 1994;26(2):239-257.
 19. Smith R. Why are doctors so unhappy? *British Medical Journal*. 2001;322(7294):1073-1074.
 20. Thulsiraj DR, Ramasamy D. Advocacy for eye care. *Indian Journal of Ophthalmology*. 2012;60(5):376-9.
 21. Baldwin WR. An international perspective on optometric education. *Optometry and Vision Science*. 1993;70(8):634-6.
 22. Tomlin JL, Bordbelt DC, Mary SA. Veterinary students' understanding of a career in practice. *Veterinary Record: Journal of the British Veterinary Association*. 2010;166(25):781-6.
 23. Lewis TL. Defining the scope of practice of optometry. *Optometry and Vision Science*. 1994;71(2):76-9.
 24. Cohen B. Urbanization in developing countries: current trends, future projections and key challenges for sustainability. *Technology in Society*. 2006;28(1-2):63-80.
 25. Holden B, Fricke T, Naidoo K. *Strategy for the Elimination of Vision Impairment from Uncorrected Refractive Error. Meeting of the Refractive Error Program Committee and IAPB Board of Trustees*. Chittagong, Bangladesh. 2008.
 26. Penisten DK. Optometric education and optometry in Africa. *Journal of American Optometric Association*. 1993;64(10):726-9.