

# Integration of optometry at the national health system: the case of the first optometrists in Mozambique

## Abstract

**Introduction:** In the last two decades an increasing number of African countries have established Optometry training to tackle the largely unmet eye health needs of the population. However not sufficient evidence exist on how the profession is integrated and contributing to national health systems. In Mozambique, the optometry program started under the Faculty of Health Sciences in the public Lúrio University in 2009. From 2012 to 2016, 23 graduates were employed by the National Health System (NHS).

**Objective:** The aim of this research is to document the integration of Optometrists at the National Health System in Mozambique.

**Methods:** This is a descriptive, quantitative and cross-sectional study. Questionnaires and structured interviews were administered to all participants.

**Results:** The response rate was 100% and the Optometrists were found practicing in 10 of the 11 provinces of the country distributed among primary, secondary and tertiary health facilities, providing refraction and managing common ocular pathologies along with the Ophthalmic Technicians, resolving the majority of patient needs and needing to refer 28% of cases to other professionals. The lack of equipment was the main expressed barrier to the provision of effective eye care services. According to them, the optometry curriculum responds well (91%) to the competencies required at the workplace. Areas for improvement training and provision of services were identified and presented in the study

**Conclusion:** Optometrists are providing effective services needing to work closely and in coordination with other professionals. This research revealed the need for equipment provision and continuing education.

**Keywords:** optometrists, national health system, primary eye care

**Abbreviations:** ARBO, association of regulating bodies in optometry; BHVI, Brien Holden vision institute; DIT, Dublin institute of technology; HIV, human immunodeficiency virus; MEP, Mozambique eye care project; NGO's, non-governmental organizations; NHS, national health system; OTs, ophthalmology technicians; SD, standard deviation; SPSS, statistical package for the social sciences; URE, uncorrected refractive error; WCO, world council of optometry; WHO, world health organization

## Introduction

According to the world report on vision published in October 2019, globally at least 2.2 billion people have a vision impairment or blindness, of whom at least 1 billion have a vision impairment that could have been prevented or has yet to be addressed.<sup>1</sup> In sub-Saharan Africa, an estimated 3.6 million people are blind, 17.4 million have moderate and severe visual impairment, and 100 million have near vision impairment. The majority of people who are visually impaired are over 50 years old and many live in rural areas. The distribution of available eye health providers is highly unequal, with most of them deployed in the urban areas.<sup>2</sup> It is estimated that in Mozambique, with a population of 28 million (census 2017) there are 720,000 visually impaired people, of which 190,000 are blind. The main causes of blindness are: cataracts, glaucoma, opacification of the cornea (trachoma), refractive amblyopia, trauma and retinitis associated with HIV.<sup>3</sup> In a rapid assessment of refractive error study conducted in Nampula, Mozambique, visual impairment prevalence was 3.5% among people aged 15 to 50 years. Uncorrected refractive

error was the primary cause of visual impairment among 64.5% of cases. Prevalence of presbyopia was 25.8% and the spectacle coverage for uncorrected refractive error and presbyopia was 0% and 2.2% respectively.<sup>4</sup> These reflect the needs to tackle refractive error as a public health concern in Mozambique. Global action plans for the prevention of avoidable blindness and visual impairment recommend that national programmes train and maintain an eye health workforce whose size and composition is proportionate to the eye care needs in the population.

The Lancet commission on education of health professionals for the 21st century recommended the adoption of competency-based curricula that are responsive to rapidly changing needs and competencies should be adapted to local contexts, while harnessing global knowledge and experiences.<sup>5</sup> Mozambique has eleven provinces and in some there are no ophthalmologists in public hospitals. In the Country, there are 13 ophthalmologists, 5 of which are in Maputo Central Hospital. Many ophthalmologic primary care is provided by ophthalmology technicians (OTs) and ophthalmology nurses distributed throughout all provincial hospitals. Optometrists are the cadre of eye care workers that are trained to correct refractive errors to prevent visual impairment and blindness so it will be expected that adequate numbers of optometrists will be trained to reduce the prevalence of avoidable vision impairment due uncorrected refractive errors (URE). Globally defined competencies for optometrists include the diagnosis, management and/or, where appropriate, referral of patients with these leading causes of vision impairment and blindness.<sup>6</sup> Mozambique adhered to the WHO Vision

Volume 12 Issue 3 - 2022

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**Received:** August 27, 2022 | **Published:** September 13, 2022

2020 Strategy and established a National Eye Health Plan (2015-2019) with a view to eliminating curable blindness in 2020.<sup>7</sup> For this purpose, several objectives were covered: Technological provision of provincial hospitals, increasing the training of ophthalmologists and Ophthalmology technicians, placement of eye care services in all District Hospitals, to conduct studies on the prevalence of various pathologies and increased supply of eyeglasses to the population.

Still in the process of adherence to the 2020 vision program, in 2009 Mozambique started implementing The Mozambique Eyecare Project (MEP) which is a higher education partnership between the Dublin Institute of Technology (DIT), the Brien Holden Vision Institute (BHVI), the University of Ulster and Universidade Lúrio (UniLúrio), to facilitate the development, implementation and evaluation of the first and only optometry programme in lusophone Africa.<sup>8</sup> The four year optometry program was based on a curriculum developed by the Brien Holden Vision Institute with competencies drawn from the global competency-based model of the World Council of Optometry (WCO) and the Association of Regulating Bodies in Optometry (ARBO).<sup>9</sup> The need to mobilise optometry to deal with uncorrected refractive error as part of the global initiative Vision 2020: The Right to Sight, has been accompanied by the possibility of better integration of optometry into prevention of blindness in general, with some major benefits in areas such as: Teaching eye care personnel, especially in refraction and low vision care; Providing screening and vision care services at secondary and tertiary levels; Detection and management of potentially blinding diseases such as cataract, diabetes and glaucoma; Research into the understanding of global eyecare needs and solutions, especially in vision correction and vision care service delivery as well as Building economic and logistical models of self-sustainable eyecare.<sup>10</sup>

In Mozambique, the optometry profession was conceived to be part of the national health system, with the integration of the majority of optometrists until now trained in the public Lúrio University in the Mozambican National Health System (NHS). This study is aimed to analyze the integration of optometry professionals in the NHS in Mozambique after 5 promotions of graduates has been recruited thus facilitating optometry curriculum review, its evaluation and maintenance over the time and its ability to respond to the local reality. Furthermore, we will generate information to facilitate the process of the functionality of the recently created Mozambican Optometry Association (2019) and the consequent regulation of the profession within the country through the creation of the Optometry Board.

## Objective

The aim of this research is to document the integration of optometrist at the National Health System in Mozambique.

## Methods

We conducted a cross-sectional study with a mix methods approach consisting in structured interviews to all optometrists providing eye health services in Mozambique (n=23). We included questions in relation to geographical distribution, working conditions (equipment and infrastructures), satisfaction in the workplace, and relationship with other eye health professionals, daily clinical practice and accordance between training received and eye care needs of the population. Interviews took place telephonically and were recorded with participants being contacted first by email and telephone messages to confirm availability. Data was collected between February and June of 2016. For data analysis, answers were categorized and treated with SPSS program to extract frequencies, percentages and

standard deviations. Frequencies were calculated in relation to the gender of optometrists, Location, type and eligibility of health center, professionals with whom optometrists work, clinical procedures and services provided, diagnostics, pathologies met, barriers (languages, training, equipment and other professionals), participation in outreach Campaigns, adequacy of training received, number and characteristics of the patients attended, service effectiveness and availability of equipment at the workplace.

A predefined list of ocular conditions was presented to participants to identify which conditions whether they were diagnosed and referred or diagnosed and treated on a regular basis among their patients. A predefined list of services and tasks was presented to participants including clinical procedures performed. To finalize, in the form of open questions, optometrists were asked to refer to the following aspects: areas of improvement in the ophthalmic sector, reasons for low satisfaction, areas of training to be improved in the optometry course, areas of continuous training, barriers for an effective provision of eye care services and eye conditions met and not addressed by optometrists. These answers were described and shown in a table. The sample of the study includes all the optometrists graduated in Mozambique on the first 5 promotions and serving at the NHS. All participants responded voluntarily and signed informed consent was obtained prior to the data collection. Ethical approval was provided by Lúrio University ethical committee.

## Results

### Sample description

A sample of 23 were enrolled in the National Health System and therefore included in the study (11 women and 12 Men) we obtained a high response rate of 100%. Participants distribution as shown in table 1, cover most of the provinces in Mozambique attending at different levels of the health system. The average age of participants was 26 (SD=2) years old. Regarding the year of graduation, 5 were graduated in 2013; 5 in 2014; 9 in 2015 and 4 in 2016. Their provinces of origin were Nampula (n=10), Cabo Delgado (n=4), Zambezia (n=3), Maputo (n=2), Niassa (n=1), Sofala (n=1) and Tete (n=1). The average months working at the NHS for the participants was 18 (SD=11).

From Optometrists interviewed, the workplace was designated in locations according to their preferences in 8 cases (35%), partially meeting their preferences 4 (17%), and 11 (48%) were designated in workplaces that were not of their preferences. Satisfaction according to the designated workplace was at the moment of the interview: Very Good for 10 (44%), Good for 9 (39%), Low for 1 (4%) and Very Low for 2(9%). Reasons for low satisfaction among optometrists were related with the localization of the health center, inability to develop professional competencies and feeling under-utilized at the workplace. The location of Optometrist among provinces, the type of center and health personnel at the Eye care Service where Optometrists are integrated is summarized in the Table 1.

According to study participants, Ophthalmic Technicians (OT) are generally responsible for primary eye care in all health care facilities. Optometrists participate in the primary eye care of patients along with OTs in 11 (48%) cases where patients are distributed randomly from the admission desk between both cadres. Optometrists are responsible for refraction services in 22 (96%) cases and OTs participate in refraction services in 5 cases (22%) according to optometrist responses.

### Provision of services

In relation to clinical services that Optometrists performed regularly, 100% (n=23) provide refractive services; 96% (n=22)

use ophthalmic drugs for diagnosis (Anaesthetics and Mydriatics); 91% (n=21) perform cycloplegic refractions; 87% (n=20) perform tonometry; 74% (n=14) Perform dilated fundus eye exam; 57% (n=13) performed removal of foreign body, 35% (n=8) biometry; 13% (n=3)

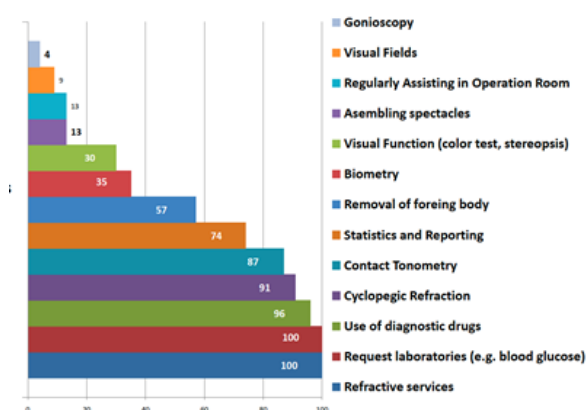
provide services for low vision rehabilitation and 9% (n=2) perform campimetry. All Information regarding the Services Provision is Summarized in Figure 1.

**Table 1** Optometrists at the NHS in Mozambique: location, type of center and available human resources at the workplace

Province	Health facility (type of health care)	Eye health personnel where optometrists are located (2017)		
		Ophthalmologist	Optometrist	Ophthalmic technician
Cabo Delgado	Provincial Hospital (Tertiary)	1	1	3
	District Hospital (Secondary)	0	1	1
Inhambane	Provincial Hospital (Tertiary)	1	1	3
	Rural Hospital (Secondary)	1	1	1
Manica	Provincial Hospital (Tertiary)	1	1	5
Maputo (City)	Central Hospital (Tertiary)	5	2	3
	General Hospital (Secondary)	1	2	2
Maputo (Province)	Provincial Hospital (Tertiary)	1	2	1
	General Hospital (Secondary)	1	1	2
Nampula	Central Hospital (Quaternary)	3	2	10
	District Hospital (Secondary)	0	1	1
Niassa	Provincial Hospital (Tertiary)	1	1	2
Sofala	Central Hospital (Quaternary)	3	1	6
	Health Center (Primary)	0	1	2
Tete	Provincial Hospital (Tertiary)	0	2	2
Zambézia	Provincial Hospital (Tertiary)	1	2	3
	District Hospital (Secondary)	1	1	2

**Table 2** Eye conditions diagnosed and managed by optometrists in the NHS

Eye Disease	n (%)
Conjunctivitis	16 (70.0%)
Dry Eye	16 (70.0%)
Pterygium	15 (65.0%)
Blepharitis	15 (65.0%)
Chalazion	13 (57.0%)
Amblyopia	12 (52.0%)
Tracoma	8 (35.0%)
Uveitis	5 (22.0%)
Glaucoma	4 (17.0%)
Retinopathies	0 (0.0%)



**Figure 1** Proportion of optometrists performing health procedures.

In relation to patient characteristics, Optometrists in Mozambique attend an average of 17 (SD=8) patients per day at the workplace. Average values expressed by optometrists shows that patients' age distribution is as follows: 6% of patients are 0 to 2 years of age, 17% from 3 to 17 years, 46% from 18 to 49 and 30% are 50 years of age or older. Most common Eye conditions found by optometrist was refractive error in 66% of patients, anterior segment ocular conditions in 40% of patients and posterior segment ocular conditions in 16%.

Optometrists manifest they are able to fully attend the patients needs and resolve 72% of cases and need to refer the other 28% cases to other specialists. 70% of patients attended daily for optometrists corresponding to new patients and 30% to follow up consultations.

Specifically ocular conditions diagnosed and treated by optometrists are presented in Table 2. Optometrists that do not treat the eye condition refer to the patient after being diagnosed.

In relation to outreach campaigns, 12 (52%) Optometrists were involved in campaigns organized by the eye sector and only 2 (9%) participated in their planification. Most common outreach campaigns were screening for cataracts (n=9), trachoma (n=3), and refractive errors at schools (n=4). Other interventions and outreach campaigns not existing that Optometrist suggested according to their contexts were: Preventing eye trauma at work, screening for refractive error in adult population, screening for glaucoma, increase awareness for traditional medicine risks, early detection of retinoblastoma at the health centers and identification and follow up of albino patients since birth.

In relation to availability of equipment, the proportion of optometrists with access to a predefined list of equipment is presented in Figure 2. 78% have access to slit lamps to perform eye examinations while only 61% can access a Retinoscope to perform gold standard refractive services. Health services at the quaternary level were generally better equipped and lack of essential equipment was referred by optometrists working at the primary, secondary and tertiary level.

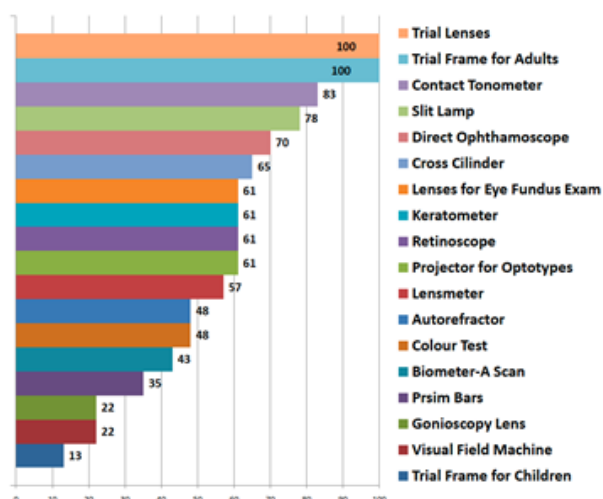


Figure 2 Availability of eye care equipment at the workplace.

### Quality of eye care services

Regarding Optometrist’s perception of quality of eye care services offered at the eye sector they belong to, 11 (48%) believe eye health services offered respond efficiently to patient needs while 6 (26 %) believes that patient needs are partially attended and 6 (26%) believes that patient need are not responded adequately. Proposals for improving quality of services at the Eye Care sector were collected through open question. Issues expressed by Optometrist and their frequencies where: Make available essential clinical equipment for 83% participants (n=19), Improve infrastructures for 30% (n=7), Improve coordination between professionals and patient’s flow for 26% (n=6), Facilitate Low cost spectacles 26% (n=6), Increase human resources: 22% (n=5), Implement outreach campaigns 22% (n=5), Availability of medicines: 17% (n=4), Provide training to health professionals 17% (n=4) and provide Resources for Low vision rehabilitation 13% (n=3).

### Perceived barriers for eye care provision

Table 3 summarizes the whole information regarding perceived barriers for eye care provision. Optometrists were asked if they found barriers to respond to patient needs regarding 4 subjects: received training, availability of equipment at the workplace, relations with other professionals and local language used by local patients.

Table 3 Barriers to respond to patient eye health needs

Perceived barriers	n (%)	Proposals to reduce barriers
Availability of equipment	17 (74.0%)	Increase equipment and provide adequate maintenance
Local language	8 (35.0%)	Search for support in local health workers
Relation with other health professionals	7 (30.0%)	Define reference terms for optometry in Mozambique  Increase awareness among health professionals regarding competences of optometrists  Create national association of optometrists

### Training

Optometrists were asked if training received at Lúrio University corresponded completely, fairly or not sufficiently with the essential competencies at the workplace according to real patient needs. 21 (91%) of participants considered that training corresponded well (70%) or very well (21%) with competencies required on the field. Participants also were asked which areas should be improved at the curricula of the University after their experiences on the field. They responded openly, no-preselected, which areas should be improved. Answers were accounted for and are presented in Table 4. Regarding post-graduate training received at the workplace, 10 (44%) Optometrists attended different short courses (from one day to one week long) organized by Health Institutions or NGO’s and covering the following subjects: Biometry (n=4), Tonometry (n=2), Attendance of patients with cataracts (n=2), diagnosis and treatment of neglected ocular conditions (n=2) and Health management (n=2).

Table 4 Optometrists training self-evaluation and suggestion of curriculum improvement

Optometrist training self-evaluation	
Answers	n (%)
Training match completely	5 (21.0%)
Training match fairly	16 (70.0%)
Training does not match sufficiently	2 (9.0%)
Areas suggested for participants to be improved in training curricula	13 (57.0%)
Diagnosis and treatment of pathologies	
Advanced optometry (pediatrics, geriatrics, orthoptic)	4 (17.0%)
Special Eye Exams (Tonometry, Biometry, Campimetry)	3 (13.0%)
Ocular emergency attendance	3 (13.0%)
Internship with real patients	2 (9.0%)
Health center management	2 (9.0%)

### Academics and research

Among respondents, 8 (35%) Optometrists are working in health facilities that are linked to research institutions, although none of them declare to have participated in any research or study. 5(22%) Optometrists have presented scientific communications in International optometry forums (4 at the WCO Meeting in Mozambique and 1 in WCO in Colombia) and 3 (13%) have presented communications in National scientific events. 10 (43%) manifest to attend regular clinical sessions at the hospital.

### Discussion

Optometrists are found available at primary, secondary and tertiary services in Mozambique needing to work closely with other professionals. This study informs on the most common eye conditions they are dealing with and their perspective for strengthening the Optometry training curriculum in order to respond to eye health needs in Mozambique as well as barriers they found to provide eye care service. Optometry has evolved in the developed world over the past century. Optometrists in America and Australia are responsible for more than 70% of primary eye and vision care services. However, in the developing world where the demand for eye care is greater, the profession is in its early stages of development.<sup>11</sup> Looking at the global level where optometry is making efforts to be recognized and integrated in the health systems, further work is also still required in

many countries to ensure that positions for optometrists in the public sector are established as a vital part of the wider eye health team.<sup>12</sup> It can be affirmed that Mozambique is an example of success with majority of optometrists integrated in the NHS.

Joint efforts in scaling up education and training for the health workforce is one of the six strategic areas in the African roadmap in this area.<sup>13</sup> Proposed interventions include promoting and facilitating the harmonisation of curricula, educational standards, accreditations, and professional regulations. The interventions will support the realisation of the Global Strategy on Human Resources for Health: Workforce 2030 since it is a core mandate of WHO to facilitate and share best practices, provide technical support to the health workforce and broaden the scope of different cadres.<sup>14</sup>

In our study once excluded optometrists working in education or unemployed, the response rate was 100% (n=23), showing that in Mozambique Optometrists, despite being few, are contactable and eager to transmit their experiences. Similar studies analysing practices and services delivered by Optometrist like in South Africa and Ghana included higher samples, 117 (55%) and 90 (62%) participants respectively.<sup>15,16</sup> Optometrists practicing in Mozambique are distributed in 10 of the 11 provinces of Mozambique with the exception of Gaza province. They develop their duty from primary to tertiary services and are mainly distributed in urban populations. In terms of gender distribution, in our study 48% of optometrist were female and 52% were male compared with the study in South Africa having a higher percentage of female participants (55%). This higher rate of female optometrists is usually observed in developed countries for health care occupations.<sup>17</sup> However other examples shows a higher rate of male professionals among optometrists as in the case of Ghana (68,9% of males) and India (60% of males) reflecting that the gender inequality in the sub-Saharan Africa region remains one of the highest and is declining slower than in other regions.<sup>18,19</sup> Can be said that while in Mozambique gender inequities are still frequent in the socio-economic sphere, this homogeneity can be attributed to the general tendency to increase the entry of women at the higher level education, despite the lack of clear gender policies in universities in Mozambique, as shown in report made in 2014 (revised in 2017) by the ministry of education.<sup>20,21</sup>

Optometrist that were part of our study are young (26 +/-2 years of age) similar to a study in Ghana (29 +/- 3 years of age). Therefore their perspectives can be considered as a valuable information as they will be potentially working at the NHS for many years, by the other side may represent a disadvantage as they may not be very experienced at this point as the accumulated period of working experience among participants is less than two years, Maake found that 90.9% of optometrist in Kwa-Zulu Natal were 30 years old and found that most of optometrist professionals (54,5%) were less than five years of experience.<sup>22</sup>

From the 23 optometrists interviewed, 83% are working in urban areas delivering eye health services mostly at the tertiary or quaternary level; while 26% are located in rural areas at the secondary and primary level (district and general hospitals and primary health centers). This reality is in concordance with other studies where optometrists were located in urban areas.<sup>19,22</sup> The South African Health National Council reported that optometric services are less exploited in the country, is evident that the efforts for planning and implementing efficient programs to overcome the lack of specialized human resources in rural areas and at the primary level needs to be continued towards universal access to eye care services.<sup>23</sup>

This study shows that most patients' problems find the necessary solution with the optometrists (72%) who, together with ophthalmology technicians, constitute a gateway and selection of patients to the other levels or to the solution of their problems at the primary level, corroborating with results of Sundling et al. in a study developed in Norway where only 6% of patients with optical disorders need to be referred to a ophthalmologist.<sup>24</sup> Nearly half of the interviewed in our study has enrolled in some kind of training activity at least once since integrated in the NHS, meaning that continuous education is not sufficiently comprehensive, nor in the number of participants neither in frequency of participation in such events for Optometrists in Mozambique. Thite et al. revealed that in India, 51% of optometrists have graduation degree and this was related to better optometric practice.<sup>18</sup> Similar studies in Ghana and South Africa did not include this question, although their approach wanted to know what kind of continuous education was of preference among optometrists being conferences the most common platform chosen by participants, which may suggest that continuous education is a more established practice in these countries.

Despite all the optometrist declared to have in their workplace basic equipment such trial lenses and trial frame (100%), equipment for optometry practice such as slit lamp, direct ophthalmoscope, retinoscope, lensometer or prism bars were limited available at their office. Important instruments used in specialized eye health such as visual field exams, gonioscopy and biometry were absent for the majority of optometrist while some relevant equipment are more frequently available such as contact tonometer (83%). Most of the studies report lack of equipment as a strong barrier for effective practice in some areas such as contactology, binocular vision and low vision, similarly to what was found in this study.<sup>16,18,22</sup>

According to WHO, the implementation of eye health and other competencies embraces the principles of partnership, relevance, ownership and people centeredness.<sup>25</sup> Currently, legislation is a key factor in the countries where there are optometry professionals and the basis of hot discussions. Leasher refers that in the United States the profession has stabilized years ago. Therefore, there are still countries, such as Mexico, that have no legislation for optometry professionals, differently to Colombia where they have standard rules.<sup>26</sup> In Mozambique, despite being recognized and providing services within the health system, the optometry profession is not yet regulated. This study demonstrates how this issue is creating a disparity (lack of standardization) of optometry services in the country, as shown by the 100% of them performing mydriatic refraction when needed and about 70% of them diagnosing, treating and following up pathologies such as conjunctivitis, dry eye, blepharitis, chalazion and hordeolum, but a smaller proportion treats complex conditions such uveitis and glaucoma, 22% and 17%, respectively. Walls in 1996 referred to the need of optometrists to have the opportunity to work freely in their domain including diagnosis and treatment of non surgical Conditions.<sup>27</sup>

Optometrists were also asked which areas of training received at the Lúrio University when graduating they would like to improve, mentioning particularly advanced optometry (pediatrics, geriatrics, low vision), specialized eye exams and ocular emergencies. These data show that the course of Optometry at Lúrio University is able to prepare them well to respond to patients needs in the Country, but we are challenged to make optometry a more expansive profession by fortifying the aforementioned areas in order to respond to local needs.

## Limitations

One of the limitations of the study is related to the study design, since it was through semi structured interviews, which may affect the accuracy of certain information difficult to remember eg: total number of patients attended or what percentage of them corresponds to children, adults, elderly, women, men, etc. Further data research is needed in order to know the epidemiology of eye care patients and characteristics in Mozambique.

As the profession is not yet legislated in the country it was difficult for the interviewees to define the exact characteristics of their daily work, in cases where the optometrist is not sure or does not know if it is permitted or not to perform certain clinical procedures.

## Conclusion

The results show that most patients' problems find the necessary solution with the optometrists who, together with ophthalmology technicians, constitute a gateway and selection of patients to the other levels or to the solution of their problems at the primary level. Most of the patients seen in the eye health sector find their eye health needs met with the optometrists, minimal percentage is referred to other specialists.

The results have shown as well that the first trained Optometrists in Mozambique had relatively less practical exposure to diagnosis and treatment of ocular pathologies what has been addressed afterwards with a review and extension of the curriculum in partnerships with public Hospitals and private clinics around the country for internships of the Optometry trainees. This change may have enriched the curriculum and clinical exposure of the subsequent generations of Optometry trainees.

Barriers to provide effective eye care services mainly related to lack of Eye Care equipment. Most participants consider that training responds well to competencies required on the field. Diagnosis and treatment of ocular diseases needs to be strengthened and more exposure to patients searching eye care services as part of the Optometry training. Creating a National Council of Optometrists to increase awareness among health professionals reflects a common claim among participants and a National Board of Optometrists to support policies and regulation of the profession. Provide opportunities for permanent training and research as well as to define and disseminate optometrist's competences among health professionals may contribute to fully integrate Optometrists at the NHS and improve provision of eye care services in Mozambique.

## Acknowledgements

Special thanks to the Mozambican optometrists for their availability and willingness to provide the information.

## Conflicts of interest

The authors declare they have no conflicts of interest with research performance or manuscript elaboration and publishing.

## References

- Layton N, Borg J. Global perspectives on assistive technology: proceedings of the GReAT consultation. World Health Organization, Geneva, Switzerland. *WHO*. 2019;2:22–23.
- Bourne RRA, Flaxman SR, Braithwaite T, et al. Magnitude, temporal trends, and projections of the global prevalence of blindness and distance and near vision impairment: a systematic review and meta-analysis. *Lancet Glob Health*. 2017;5(9):888–897.
- Zambujo Y. The mozambican ophthalmological assistance situation. *Ophthalmology*. 2010;34:417–419.
- Loughman J, Nxele LL, Faria C, et al. Rapid assessment of refractive error, presbyopia, and visual impairment and associated quality of life in namputa, Mozambique. *Journal of Visual Impairment & Blindness*. 2015;109(3):199–212.
- Frenk J, Chen L, Bhutta ZA, et al. Health professionals for a new century: transforming education to strengthen health systems in an interdependent world. *Lancet*. 2010;376(9756):1923–1958.
- Moodley VR, J Loughman, KS Naidoo. Recruitment and selection strategies in optometric education towards addressing human resource disparities in sub saharan Africa. *Africa Educ Rev*. 2015;12(3):429–446.
- Neuherz I, Zicai Z. Mozambique strategic plan, 2016–2020. *Light for the World*. 2020;1:1–20.
- Loughman J. Access to optometric education: challenges in sub-saharan Africa. *LICEJ*. 2014;5(3):1–20.
- Thompson S, Naidoo K, Harris G, et al. The development of a public optometry system in Mozambique: a cost benefit analysis. *BMC Health Serv Res*. 2014;1(14):422.
- Holden BA, Resnikoff S. The role of optometry in vision 2020. *Community Eye Health*. 2002;15(43):33–48.
- Shah K, Naidoo K, Bilotto L, et al. Competency based assessment of refractive error measurement in a Mozambique optometry school. *Optometric education*. 2017;42(2):27–37.
- Thomas JF. A vision for optometry in oman. *Oman J Ophthalmol*. 2013;6(2):75–76.
- The African council of optometry, the brien holden vision institute, the international agency for the prevention of blindness and vision aid overseas. Situation analysis of optometry in Africa, 2016.
- Roadmap for scaling up the human resources for health for improved health service delivery in the African region 2012–2025: adopted by the sixty-second session of the regional committee. *WHO*. 2013.
- Kiely PM, Chappell R. A global competency based model of scope of practice in optometry. *World Council of Optometry*. 2015.
- Mashige KP, Naidoo KS. Optometric practices and practitioners in KwaZulu-Natal, South Africa. *African Vis Eye Heal*. 2010; 69(2):77–85.
- Boadi Kusi SB, Ntodie M, Mashige KP, et al. A cross-sectional survey of optometrists and optometric practices in Ghana. *Clin Exp Optom*. 2015; 98(5):473–447.
- Grant VJ, Robinson E, Muir P. Sex ratios in healthcare occupations: population based study. *BMJ*. 2004;328(7432):141–142.
- Thite N. Pattern of optometry practice and range of services in India. *Optom Vis Sci*. 2015;92(5):615–622.
- Hunguana C. Study report on gender in higher education in Mozambique. 2014.
- Hakura MD, Hussain MM, Newiak MM, et al. Inequality, gender gaps and economic growth: comparative evidence for sub-saharan Africa. *IMF*. 2016.
- Tvedten I. Mozambique country case study: gender equality and development. *World development report*. 2012.
- Maahe ME, Moodley VR. An evaluation of the public sector optometric service provided within the health districts in KwaZulu-Natal, South Africa. *Afr Vis Eye Health*. 2018;77(1):407.
- Sundling V, Gulbrandsen P, Bragadottir R, et al. Optometric practice in Norway: a cross-sectional nationwide study. *Acta Ophthalmol Scand*. 2007;85(6):671–676.
- World Health Organization. Core competencies for the eye health work force in the WHO African Region. 2019.
- Leasher J, Pike S. Optometry in the Americas. optometric care within the public health community. *Cadyville NY*. 2009.
- Walls LL. Issues for optometrists relating to interprofessional relations in a hospital and medical center. *Optom Vis Sci*. 1996;73(5):307–308.