Technical Report

Impact of Volunteer Optometric Services to Humanity (VOSH)/International in a Nigerian Rural Community

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Abstract

Background: The elimination of avoidable blindness and visual impairment requires enormous human and material resources supported by an enabling policy environment. The provision of a qualified workforce and funds for effective humanitarian clinics will address inherent gaps in the dispensation of primary eye-care services to rural and low income populations. This report highlights the oculo-visual anomalies observed in a Nigerian rural community during a humanitarian clinic.

Methods: Temperature check, registration, blood pressure check, case history, visual acuity check, external examination, direct ophthalmoscopy, refraction, tonometry and dispensing of drugs and spectacles were conducted by clinicians.

Results: Of the 186 patients examined, 42 (22.6 %) had pterygium, 35 (18.82%) had pinguecula, 20 (10.75 %) had conjunctivitis, 10 (5.38%) had glaucoma, 4 (2.15 %) had hypertensive retinopathy and 4 (2.15%) had dry eye. Ten (5.4%) patients had cataract in the right eye, 11 (5.9%) in the left eye and 78 (41.9%) in both eyes. There were 8 (4.30%) diagnosed of myopia, 18 (9.68%) with hyperopia, and 79 (42.47%) with presbyopia. Twenty-four (18.28%) required a distance correction, while 80 (43%) required a near correction. Thirty-four (8.28%) were referred for further eye-care, including those with high amounts of astigmatism or clinically significant anisometropia. Sixty (32.26%) were referred for high blood pressure management.

Conclusions: This report re-emphasizes the need for effective collaboration between optometry schools and volunteer optometric organizations in the provision of primary eye-care services for rural and low income populations in order to curb the enormous burden of oculo-visual anomalies and avoidable blindness.

Keywords: VOSH/International, Nigeria, Rural Community, Humanitarian Clinic.

Introduction

The socio-demographic status and life expectancy of many nations have improved significantly over the years. Consequently, the number of people who live into adulthood and the average age of populations have increased, with a paradigm shift of disease burden towards non-communicable diseases and disabilities [1]. Most of the causal factors of blindness and visual impairment, such as cataract and uncorrected refractive errors are subject to this epidemiological transition [1,2], with very substantial individual and societal cost implications [3,4]. During the past three decades, nations, intervention agencies and volunteer organizations have sustained targeted efforts towards the elimination of avoidable blindness and visual impairment by deploying huge human and financial resources to mitigate the causal factors through actionable programs.

The elimination of avoidable blindness and visual impairment requires the development of achievable and sustainable goals, enabling public policies and in most cases, demands strategic program designs, extensive logistics and resources which, at the moment, are beyond the reach of most low and middle income nations. These nations share an unequal burden of visual impairment with the high income ones, with prevalence rates 10-40 times greater than those of high income nations [5], and accounting for 90% of the world's visual impairment burden [6]. The Vision Loss Expert Group and International Agency for the Prevention of Blindness (IAPB) have reported that an estimated 253 million people are visually impaired worldwide. Of these, 36 million are blind, 217 million have moderate to severe visual impairment (MSVI), while 1.1 billion people globally are estimated to have functional presbyopia [7]. However, the disaggregation of the surveys further revealed that 89% of visually impaired people live in low and middle-income countries [7]. The World Health Organisation has reported that at least 2.2 billion people have a vision impairment or blindness, of which at least 1 billion cases are those of vision impairment that could have been prevented or yet to be addressed. The vast majority of the 2.2 billion are those with near impairment from presbyopia (1.8 billion). There are 123.7 million with moderate to severe vision impairment or blindness due to unaddressed refractive error, 65.2 million with cataract, 10.4 million with age-related macular degeneration, 6.9 million with glaucoma, 4.2 million with corneal opacities, 3 million with diabetic retinopathy, 2 million with trachoma and 37.1 million from other causes [8].

The burden of blindness and visual impairment among low and middle-income countries can be minimized by manipulating certain socioeconomic and health indices which affect health variables and outcomes. The ever-growing population of the world, presently estimated at about 7.79 billion people [8], portends a corresponding and exponential increase in global figures for blindness, severe and moderate visual impairments estimated at about 49.1 million, 33.6 million and 221.4 million people respectively [8].

Furthermore, Steinmetz [9] has posited that the leading global causes of blindness among persons aged >50 years were cataract (15.2 million cases [9% IU 12.7–18.0]), followed by glaucoma (3.6 million cases [2.8–4.4]), uncorrected refractive error (2.3 million cases [1.8–2.8]), age-related macular degeneration (1.8 million cases [1.3–2.4]), and diabetic retinopathy (0.86 million cases [0.59–1.23]), while the leading causes of moderate to severe visual impairment (MSVI) were uncorrected refractive error (86.1 million cases [74.2–101.0]) and cataract (78.8 million cases [67.2–91.4]).

The financial burden of eliminating blindness and visual impairment imposed on individuals is enormous and requires integrated actions by governments, business communities, and the non-profit sectors, including those of volunteer organizations. Volunteerism strengthens civic engagement; safeguards social inclusion, deepens solidarity and solidifies ownership of development results [10]. Furthermore, it provides a unique opportunity for identifying local priorities, cultural sensitivities, decision-making structures and access, all of which are community-specific. By filling the intervention gaps occasioned by scarce resources, volunteer organizations provide the relevant framework and coordination needed to mitigate the socio-economic consequences of blindness and visual impairment. The organizations also provide an opportunity to increase engagement for prolonged response and sustainability through strategic preparedness and effective response plan.

Volunteer Optometric Services to Humanity (VOSH)/International is a non-profit, non-governmental, non-sectarian global organization whose members offer clinical and academic skills, free-of-charge, to deliver vision care to people in need and strengthen optometric education throughout the world. VOSH/International believes in the freedom to see, it provides the gift of vision/eye health to people who

can neither afford nor obtain such care worldwide [11]. The primary goal of VOSH/International is to increase its global impact, whenever possible, by supporting sustainable eye clinics, optometry schools and optometric educators in areas lacking sufficient eye-care [11]. In line with its goal, VOSH/International sponsored a humanitarian clinic conducted by the VOSH (SVOSH) chapter of the Department of Optometry, Imo State University Owerri, Nigeria on 12th February, 2022. This report highlights the oculo-visual anomalies recorded during the humanitarian clinic.

Methodology

Locale

The humanitarian clinic was conducted at Ogbaku community in Mbaitoli Local Government Area of Imo State, Nigeria. Ogbaku is a rural community made up of 18 villages with geographical coordinates of 5.5569° N, 6.9511° E and an annual average temperature varying from 67°F to 87°F and rarely below 60°F or above 90°F. It has a tropical climate with the least amount of rainfall occurring in January and averaging up to approximately 17mm. In June, the precipitation reaches its peak, with an average of 363 mm, while the average annual rainfall stands at approximately 2219mm. The community has 5 primary and 2 secondary schools.

It is a low income agrarian community, basically made up of the aged and retired population. The community has pipe borne water supply and is connected to the national grid for electricity supply. It has a cottage hospital that carter for the health of the population, although there is no provision for health insurance.

Design

The humanitarian clinic adopted the population-based cross-sectional design.

Ethical considerations

The humanitarian clinic was adapted to the 1967 Helsinki Declaration on Human Researches (as modified in Fortaleza, 2013). Community approval and written informed consents of the patients were obtained. COVID-19 protocols were observed and all patients and clinicians wore facial masks.

Procedure for data collection

The procedures were carried out by the clinical students of the Department of Optometry, Imo State University Owerri, Nigeria as part of the community outreach program of their academic curriculum, under the supervision of faculty members. The following test stations were set up

during the clinic: temperature check, registration, sphygmomanometry, case history, visual acuity, external examination, direct ophthalmoscopy, refraction, tonometry, optics and dispensary. The examinations were preceded by free distribution of facial masks and COVID-19 protocols were strictly applied. The clinicians who checked temperatures ensured that only patients who had normal body temperatures signed the ethical consent forms prior to registration. All patients who had body temperatures higher than 37^0 C (98.6° F) were excluded from the humanitarian clinic and advised to seek medical care. All patients received the procedures in the outlined order.

Blood pressure checks were conducted with sphygmomanometers and stethoscopes; distance and near visual acuities were conducted with the Snellen's illiterate ''E'' charts and near charts respectively. External examinations were performed using pen torches, while ophthalmoscopy was performed with direct ophthalmoscopes. Objective refractions were performed with retinoscopes; while patients were subjectively refracted with loose lenses and hand-held Jackson cross cylinders. Refractive errors were considered as myopia ≥ -0.50DS, Hyperopia ≥ +0.50DS and astigmatism ≥ ±0.50DC. Patients aged ≥40 years were examined for intra-ocular pressure using the Perkins tonometerr. Schirmer II test was performed, using standard procedure, with Whatman NO. 41 filter paper to determine tear production. Aqueous deficiency dry eye syndrome (DES) was diagnosed as wetting length of <10mm in 5 minutes. Spectacles and medications were dispensed to patients according to need and availability, while referrals were made to the Optometry Clinic of the Department. Patients' data were treated with utmost confidentiality and safely stored.

Statistical analysis

Data were analyzed using descriptive statistics.

Results

A total of 186 patients, 60 males (32%) and 126 females (68%) were examined (Figure 1). One hundred and sixty nine (90.7%) reported their ages, ranging from 9-95 (60±16) years and a median age of 63 years (Figure 2). Ninety three responded with occupations, 68 (73%) were farmers, 9 (10%) drivers, 5 (5%) administrators, 4 (4%) manufacturers, 3 (3%) students, 2 (2%) traders, 1 (1%) engineer and 1 (1%) lawyer (Figure 3). The primary reasons for visit were reported as blurry vision at distance by 104 (55.9%) patients, blurry

vision at near by 94 (50.5%), itching by 91 (48.9%), light sensitivity by 87 (46.8%), eye pain by 61 (32.85), burning by 49 (26.35), tearing by 14 (7.5%) and eye infection by 4 (2.2%) (Figure 4). Personal health history revealed the following problems: 95 (50.1%) complained of headaches, 76 (40.9%) high blood pressure, 29 (15.6%) ulcer, 21 (11.3%) diabetes, 13 (7%) heart disease, 13 (7%) malaria, 8 (4.3%) cataract, 8 (4.3%) typhoid, 7 (3.8%) waist pain, and 6 (3.2%) arthritis (Figure 5). Two (1%) had previous diagnoses of glaucoma; while a total of 42 (22.6%) were taking at least one prescription or over-the-counter medication. Entry visual acuity ranged from LogMAR 0.00 (20/20) to 3.00 (No Light Perception) with a mean±SD of 0.87±0.83 (20/148) and median of 0.60 (20/80) in the right eye; mean±SD of 0.97±0.96 (20/187) and median of 0.60 (20/80) in the left eye (Figures 6). Powers of dispensed spectacles ranged from +2.00DS to -5.00DS. There were 8 (4.3%) patients diagnosed with myopia, 18 (9.7%) with hyperopia, and 79 (42.5%) with presbyopia (Figure 7). Twenty-four (13%) patients required distance corrections, while 80 (43%) required near corrections. Ninety nine (53.2%) patients had cataract, ten (5.4%) patients had cataract in the right eye, 11 (5.9%) in the left eye and 78 (41.9%) in both eyes. Forty-two (23%) patients had pterygium, 35 (19%) had pinguecula, 20 (11%) had conjunctivitis, 10 (5.4%) had glaucoma, 4 (2.2%) had hypertensive retinopathy and 4 (2.2%) had dry eye syndrome (Figure 8).

Discussion

The humanitarian clinic provided the first eye evaluation for the overwhelming population (81%) of the patients, while the evaluation interval of 19% of the patients ranged from 1-12 years with a median of 3 years. This is worrisome, and demonstrates to a large extent, the intervention gaps inherent in the Nigerian health-care delivery system and brings to the fore, the paucity of primary eye-care facilities in many rural communities in Nigeria and non-implementation of the National Eye Health Policy by the Nigerian government. It further highlights the need to provide humanitarian eye-care services for the rural, underserved and low income populations that are unable to afford treatment. Further to the intervention deficit within the community, there appeared to be a relative preference for unorthodox eye-care services due to poverty and ignorance which may have significantly added to the burden of oculo-visual morbidities among the locals.

The burden of cataract within the community was huge and may be associated with the predominance of the

aged and retired population in the area. This raises strong concerns over the potential threat of cataract blindness in the community if the trend remains unchecked, and calls for concerted efforts on the part of the government and relevant stakeholders to provide surgical interventions for the population to forestall further morbidities. The burden of cataract observed during the clinic aligns with previous evidences [9,12-15] which suggest that cataract remains a leading cause of avoidable blindness, but disagrees with the findings of Flaxman *et al*. [16]. Aging process impedes the transparency of the lens which tends to develop more rigid nucleus and increases the non-enzymatic and post-translational modifications of lens proteins, accumulation of fluorescent chromophores, susceptibility to oxidation, cross-linking and light-scatter [17]. The steady accumulation of chromophores, complex and insoluble crystallin aggregates in the lens nucleus leads to the formation of a brown nuclear cataract [17].

Pterygium, pinguecula and conjunctivitis were relatively predominant among the patients. This may be associated with the agrarian disposition of members of the community. Farmers are vulnerable to the ultra-violet rays of the sun, heat, wind, dust, environmental pollutants, insecticides and fertilizers which are known causal factors of ocular surface infections. Some population-based studies [18-20] have suggested that cumulative ultraviolet light exposure due to outdoor occupation is a major risk factor for the development of pterygium; however, other risk factors such as aging, dry eye and being male have also been reported [18-20]. Since the causal factors of pterygium, pinguecula and conjunctivitis are environmentally-mediated; their overwhelming presence among the patients may indicate the lack of access to basic amenities and hygiene education which characterize rural communities.

The prevalence of glaucoma among the patients was not critical. The mean monocular and binocular intraocular pressures (IOPs) were found to be within normal range with a mean value of 21 mmHg (median 18 mmHg) and a range of 12-36 mmHg in the right eye, a mean of 19 mmHg (median 18) and a range of 11-42 mmHg in the left eye; although 5.4% of the patients were diagnosed of glaucoma. However, the fatality suggests the need for regular follow-up on the patients for prompt intervention, considering the vision and economic losses associated with the burden of glaucoma. Although pterygium, pinguecula and conjunctivitis ranked second, third and fourth respectively in the patients' medical diagnosis, glaucoma was

considered the second blinding eye disease after cataract based on the Global Categorization System of the World Health Organization's (WHO) International Classification of Diseases 11 (2018) [21].

Although 41% of the patients were diagnosed with hypertension (HTN), only 5.3% had hypertensive retinopathy. This demonstrates a reasonable level of awareness of HTN, positive health-care seeking behavior and compliance with regular checks and treatment of HTN for three reasons: first, poorly controlled hypertension has been associated with Target-organ Damage (TOD) which occurs late in the progression of HTN; second, there has been sufficient supportive evidence that hypertensive retinopathy acts as a predictor of systemic morbidity and mortality due to TOD [22]; third, it has been hypothesized that the increase in the incidence of retinopathy is related to the degree of severity and duration of HTN [23]. The Blood pressure readings of the patients averaged 149/88 mmHg with a median of 149/90 mmHg, while systolic pressures ranged from 90-230 mmHg, and diastolic pressure ranged from 30-180 mmHg.

Dry Eye Syndrome (DES) was scarcely present and recorded among 2.2% of the patients. DES has been associated with certain risk factors such as age, female gender, tobacco consumption, anti-glaucoma medication, diabetes, eye allergies, vitamin A deficiency and contact lens wear [24]. In addition, environmental factors such as low-humidity, windy settings, air-conditioned rooms, extended periods of reading, driving and exposure to electronic devices have been implicated in the causation of DES [25]. The low occurrence of DES within the community suggests that the impact of the predisposing factors on the lifestyle of the population was negligible and supposedly, played no significant roles in the causation of DES.

Limitations

The humanitarian intervention was field-based; consequently, the deployment of sophisticated and immobile equipment for the delivery of rigorous and automated procedures and techniques could not be prioritized and effected. This may have significant effect on diagnostic and treatment protocols, especially in cases where standard practices require the engagement of digital devices and specialized skills to optimize care. Such cases were appropriately referred for further specialized attention. These included 34 (8.28%) patients with high amounts of astigmatism or clinically significant anisometropia, 60 (32.26%)

patients with HTN and 99 (53.2%) patients with cataract. Furthermore, the simultaneous engagement of the outreach and commercial activities by majority of the patients was not envisaged in designing the project. This could have significant impact on attendance, response rate, attrition and uptake of services during the humanitarian clinic.

Conclusion

This report provides valuable insights into inherent gaps in the delivery of primary eye-care services in a typical Nigerian rural community and the need for collaboration between optometry schools and volunteer organizations in reversing the growing trend of oculo-visual anomalies, especially in rural and low income populations. Furthermore, it addresses the qualitative and quantitative burden of oculo-visual anomalies in the community and provides empirical data for further studies and guidance for future interventions.

Recommendation

We recommend the strategic implementation of the National Eye Health Policy by the Nigerian government to ensure equitable access to quality eye care services, promotion of inter-sectoral collaboration and optimization of resources and skills for the elimination of avoidable blindness in Nigeria.

Authors' Contributions

Conceptualization: Akujobi and Arce-Moreira
Study design: Akujobi
Community mobilization: Ekenze
Logistics: Akujobi, Ekenze, Okere, Aliba, Duru, Igwe, Onyesom and Emerenwa.
Data collection: Akujobi, Ekenze, Obijuru, Vincent, Okere, Aliba, Duru, Igwe, Onyesom and Emerenwa.
Excel spreadsheet: Weaver, Akujobi and Vincent
Data curation: Akujobi, Weaver, McAlister and Arce-Moreira.
Software and data analysis: Weaver, Akujobi, McAlister and Arce-Moreira
Draft manuscript: Akujobi
Review of draft manuscript: Akujobi, Weaver, McAlister and Arce-Moreira
Zoom administration: Arce-Moreira

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Conflict of Interest

The authors declare that there is no conflict of interest.

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Figures:

Figure 1: Gender distribution of patients

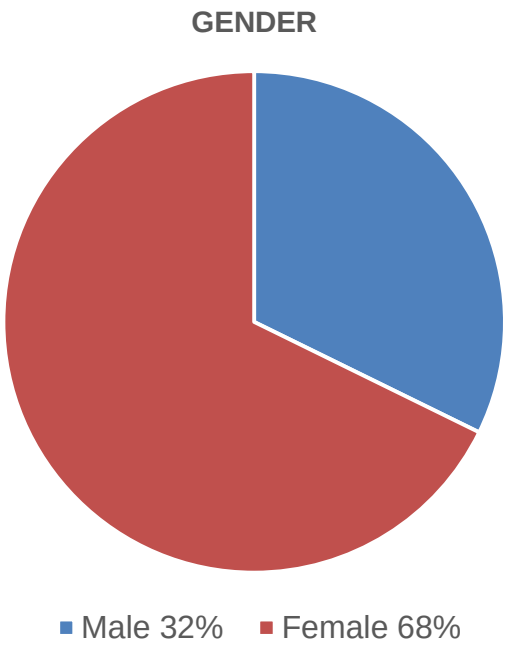

Figure 2: Age distribution of patients

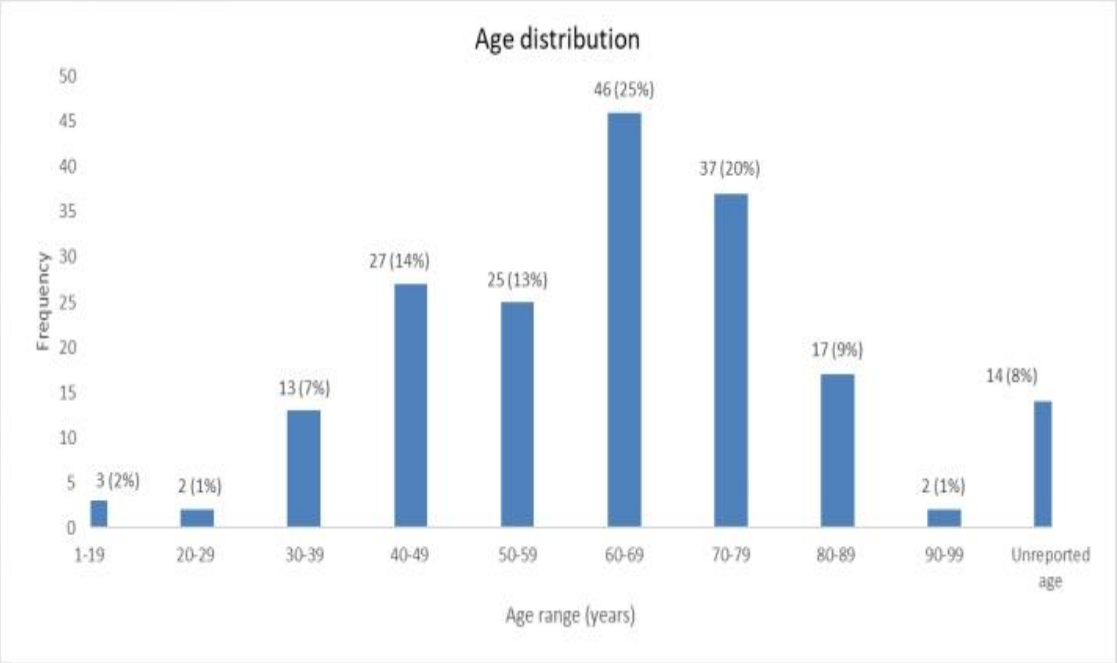

Figure 3: Occupation distribution of patients

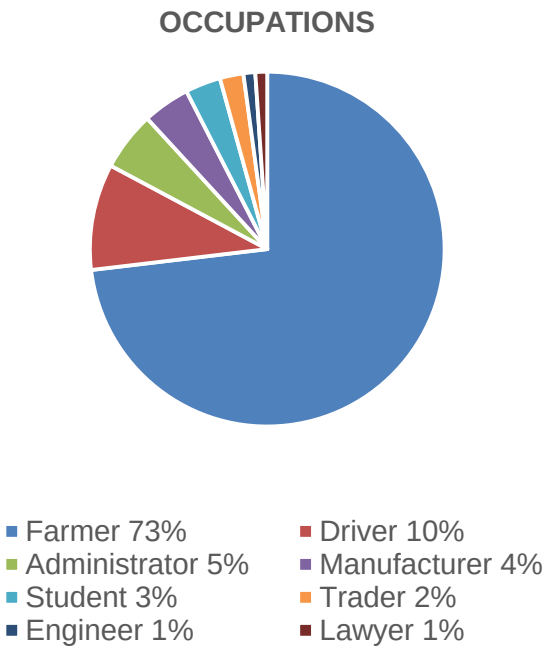

Figure 4: Reason for visit

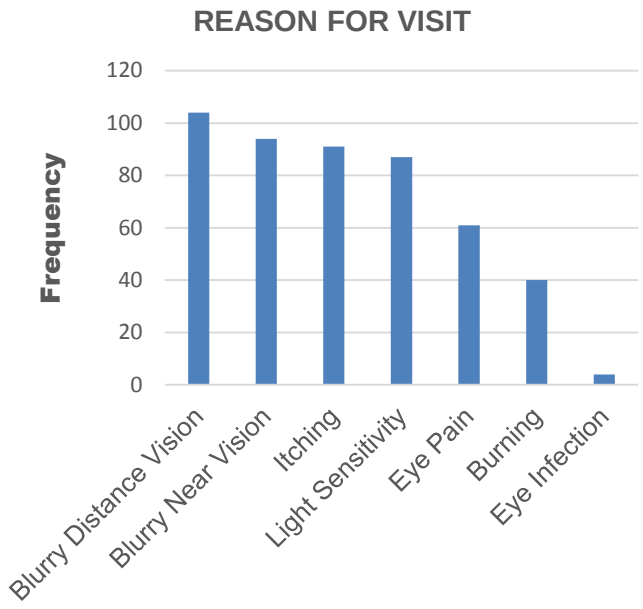

Figure 5: Personal health history of patients

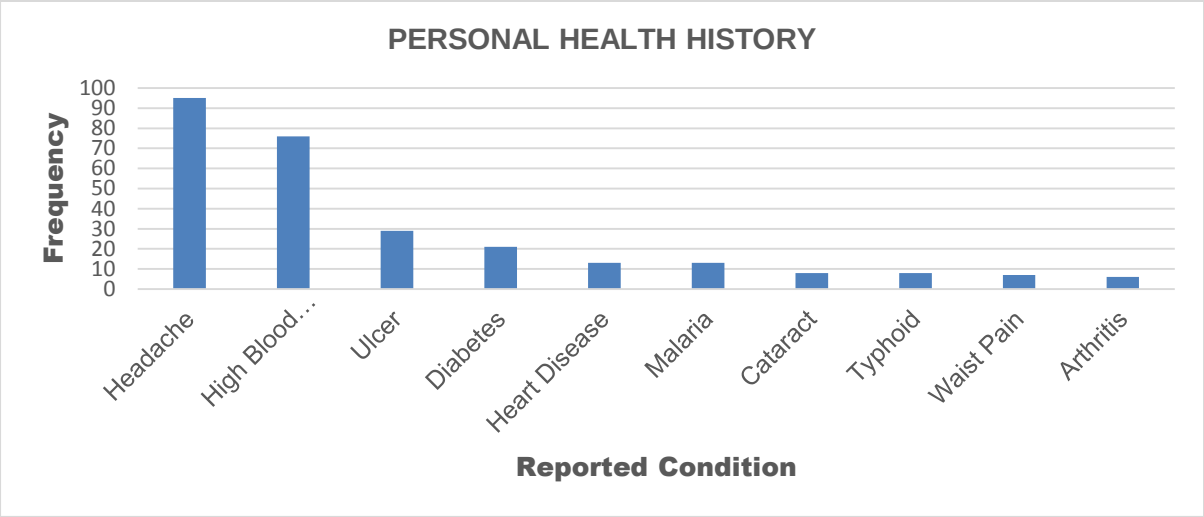

Figure 6: Entry visual acuities of patients (Log MAR)

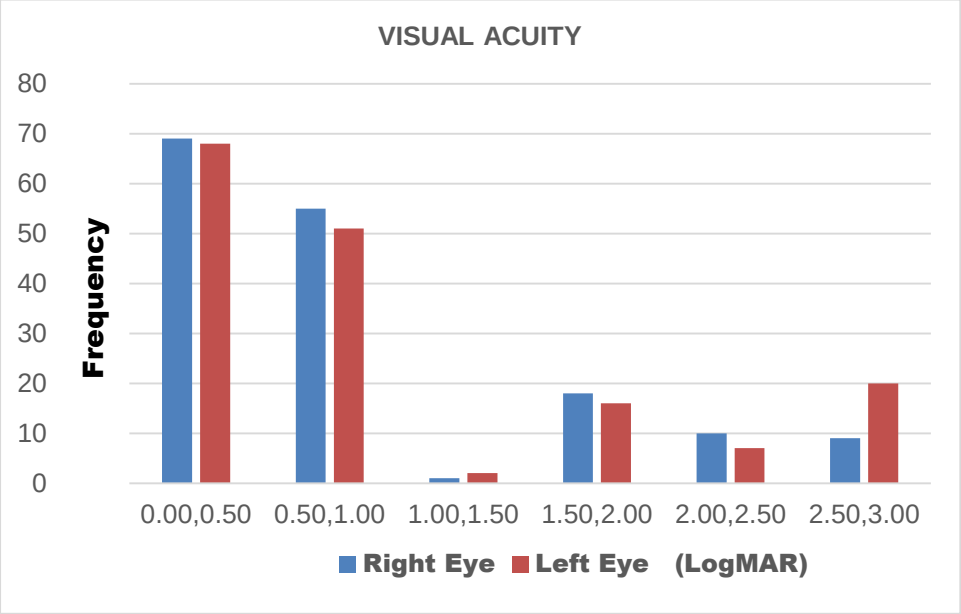

Figure 7: Refractive diagnoses of patients

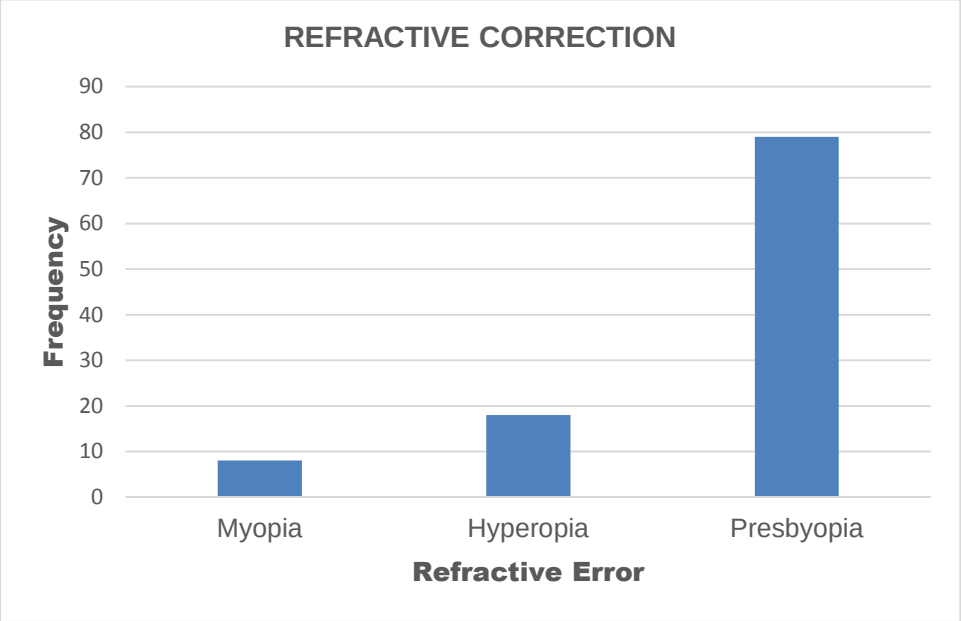

Figure 8: Medical diagnoses of patients