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ORIGINAL RESEARCH

Characteristics of Visual Impairment and the Impact of Low Vision Assessment in a Tertiary Academic Hospital in Jordan

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Purpose: This project aims to describe the characteristics of patients with visual impairment referred from a tertiary academic hospital in Jordan for a comprehensive low vision evaluation and to study its impact on their functional needs.

Methods: A retrospective analysis of the records of 108 patients from the ophthalmology clinic at Jordan University Hospital over the period from January 2014 to December 2018 was performed. Gathered information included age, gender, clinical diagnosis, family history of ocular disease, and type of low vision aid prescribed and its impact on patients' functional needs.

Results: The mean age was 44.64 years (range 4–88). Most participants were in the 19–60 years age group (50.0%). Fifty percent of the participants were the offspring of consanguineous marriages. The main cause of visual impairment in this cohort was retinitis pigmentosa, followed by diabetic retinopathy. The majority of low vision aids were prescribed for near distance tasks, and reading spectacles were the most prescribed visual aid. Eighty-nine percent of patients reported functional improvement and retained their visual aids upon follow-up.

Conclusion: Retinitis pigmentosa was the main cause of visual impairment in this cohort of patients referred from a tertiary academic hospital for low vision assessment. We report a consanguinity rate of 50%. The overwhelming majority of patients reported functional improvement and retained their visual aids upon follow-up. Awareness and integration of low vision services into a multidisciplinary approach and improving referral protocols is essential to better address the needs of patients with visual impairment. Familial counselling regarding consanguineous marriages and emerging research to treat inherited retinal diseases should be pursued.

Keywords: vision impairment, low vision aids, retinitis pigmentosa, diabetic retinopathy, age-related macular degeneration

Introduction

Visual impairment is a global health problem with profound socioeconomic ramifications in both the developing and the developed world.[1] According to the World Health Organization (WHO), the majority of visually impaired individuals are in fact people with low vision (246 million people as compared to almost 40 million people who are legally blind).[2] Low vision is defined as visual acuity (VA) of equal or less than 6/18 but equal or better than 3/60 in the better eye, or a visual field of less than 20 degrees after the best correction of refractive errors and exhausting available medical, surgical and/or pharmacological treatments.[3]

Low vision can be a result of a variety of ocular and systemic disorders. These conditions can be either inherited or acquired. Examples include hereditary retinal disorders like retinitis pigmentosa and ocular albinism, diabetic retinopathy, cataract, glaucoma and age-related macular degeneration.[4] These disorders affect vision at different age groups with variable extents depending on the underlying disorder and time of onset, often profoundly influencing the accomplishment of daily activities and productivity.[5]

Recognizing low vision patients and referring them to a proper vision rehabilitation service remains a challenge even in tertiary medical centres. Visual rehabilitation has a role in restoring some vision, and hence, minimizing the degree of visual handicap. It aims at improving the quality of life for these patients in physical, social, functional, and psychosocial aspects.[6] This involves performing a thorough low vision assessment exam to explore their functional needs and limitations and training patients on the use of certain devices, termed low vision aids (LVAs), in an attempt to make the most of their residual vision and maximizing their ability to meet their visual needs.[7] Low vision devices function by enhancing perceived retinal images through magnification, image displacement, light filtering, or light condensation. Moreover, the perceived retinal image can be enhanced by improving contrast, brightness and spatial resolution.[8,9]

Provision of low vision services in developing countries is fraught with barriers and difficulties. Caregivers are either unaware or uninterested in referral, and robust low vision assessment centres are lacking and oftentimes inaccessible.[10] Even when adequate clinical services are available, dispensing LVAs is oftentimes difficult due to issues related to availability and cost. In Jordan, the provision of proper low vision services has been sporadic, but is gaining momentum.[11] Unpublished data from the Low Vision Project, which operated in the country on a voluntary basis from 2004 to 2008 reported that for every three children enrolled in a school for the blind, at least one can be moved and taught in a regular mainstream school for the sighted when provided with proper refraction and/or the correct LVA. Qutishat et al published an excellent report about the profile of low vision in the Middle Eastern country outlining the clinical measures and barriers pertaining to a centralized low vision service over a five year period.[12]

The transition from general ophthalmic care to specialized vision rehabilitation services in developing countries is still wanting, and very little information exists regarding the effects of such interventions. This study aims to examine the characteristics of patients with visual impairment referred from the ophthalmology clinic at Jordan University Hospital, a tertiary academic hospital in the capital Amman, for low vision assessment over the period of five years and to discuss the ocular pathology and visual requirements of those patients among different age groups and the impact of receiving the service on their visual and functional needs. This research will also comment on the challenges facing a multidisciplinary approach for low vision services and their sustainability.

Materials and Methods

Study Design

This research was conducted according to the guidelines of the declaration of Helsinki and was approved by the Institutional Review Board at Jordan University Hospital (Approval # 10/2021/29489). This is a retrospective case series of visually impaired individuals referred from the ophthalmology clinic at Jordan University Hospital to a dedicated low vision specialist service between January 2014 and December 2018. Out of 154 available records, the clinical characteristics of 108 patients were analysed through a specially designed data-collection sheet to gather information related to the study variables. Records with incomplete data and /or a follow-up period of less than 6 months were excluded from the analysis. The variables included demographic and clinical characteristics as well as recommended management interventions. During the study, the primary cause of visual impairment was recorded based on the diagnosis by the referring ophthalmologist. The low vision assessment was performed by one expert low vision specialist to assess for best corrected visual acuity for near and far, refraction, and contrast sensitivity. Further evaluation regarding colour vision and specific functional needs were appropriated as needed.

Participants enrolled in the study were categorized according to their age into three groups: from birth to 18 years, 19 to 60 years, and older than 60 years. Visual impairment was classified into four levels according to WHO criteria [4]: mild visual impairment (VA < 6\12 to ≥6\18), moderate visual impairment (VA 6/18 to ≥6/60), severe visual impairment (VA 6/60 to ≥3/60), and blindness (VA <3/60), all in the better eye with best correction.

All included subjects had a detailed low vision assessment including distance VA using the Lea symbols at 3 meters; near VA using the Lea symbol near vision chart at 40 centimetres; objective refraction using streak retinoscopy when possible or the auto-refractor followed by subjective refraction to record best corrected visual acuity for each eye; and VA for near and distance after using suitable near and far optical devices depending on patient demand and response.

Statistical Analysis

Low vision assessment data were extracted and recorded onto an Excel spreadsheet. The Statistical Package for Social Sciences SPSS version 21.0 (Chicago, USA), was used for analysis. Demographic characteristics and clinical characteristics of patients seen at the low vision clinic as well as interventions recommended were identified and analysed using frequency tables and percentages. We used mean (± standard deviation) to describe continuous variables (eg age). We used count (frequency) to describe other nominal variables. Chi-square test was utilized to compare low vision aid devices between different age groups. We adopted a "p" value of 0.05 as a significant threshold.

Results

A total of 108 subjects were included in this study. Of these, 61 (56.5%) were male and 47 (43.5%) were female (male to female ratio of 1.29:1). The mean age was 44.64 (±24.27) with a range of 4–88 years. The largest proportion of patients were in the 19–60 years age group (50.0%) followed by the over 60 age group (35.2%). The 0–18 age group had the smallest proportion with 14.8% of patients. Most of our patients were unemployed (42.2%) while students represented (33.3%) of our sample. Of note, 50.0% of the patients reported consanguineous marriages in the family (father and mother being first or second degree relatives). Furthermore, 38.8% of the patients reported a positive family history of their ocular diagnosis in one or more family members. Table 1 details the demographic and clinical characteristics of the study cohort.

The chief complaint of all patients was poor vision. The mean presenting distance VA was 1.25 (±0.79) logarithm of the Minimum Angle of Resolution (LogMAR). The mean distance VA after completing the low vision assessment was 1.06 (±0.81), which showed a statistically significant improvement (P < 0.05). The mean subjective refraction of the study cohort was −2.51 (± 6.22) diopters.

Utilizing the aforementioned WHO classification, 62 (57.4%) patients had moderate vision impairment, and 27 patients (25%) had mild vision impairment. Twelve patients (11.1%) had severe vision impairment, while 7 patients (6.5%) were considered blind. Figure 1 showcases the distribution of visual impairment among the different patient age groups.

Table 1 Demographic and Clinical Characteristics of Study Subjects

	Number (n=108)	Percentage (%)	Mean ±SD*
Age (year)			44.64±24.27
0–18	16	14.8	
19–60	54	50	
>60	38	35.2	
Gender			
Male	61	56.5	
Female	47	43.5	
Occupation			
Student	34	33.3	
Worker	25	24.5	
Unemployed	43	42.2	
Consanguinity			
Yes	54	50.0	
No	27	25.0	
Unknown	27	25.0	
Family history of ocular disease			
Yes	42	38.8	
No	34	31.4	
Unknown	32	29.8	

Abbreviation: *SD, standard deviation.
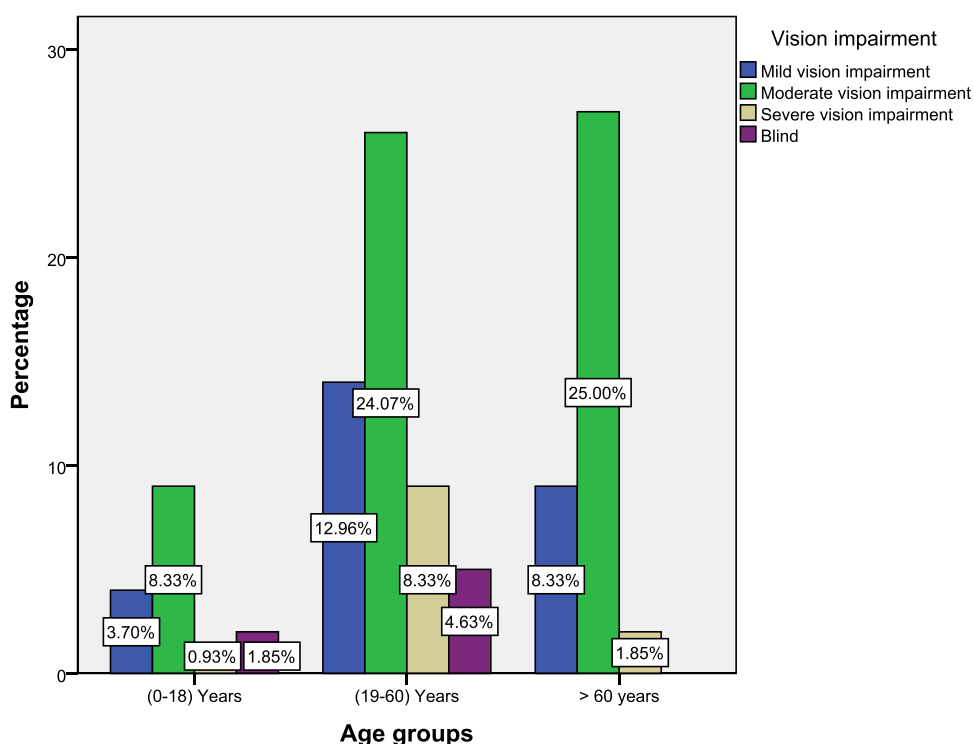
Figure 1 Visual impairment categories among different age groups of the study population.

Across all age groups, the most common cause of visual impairment was retinitis pigmentosa (50.0%), followed by diabetic retinopathy (18.75%), myopic degeneration (13.54%) and age related macular degeneration (12.50%). In the age group of 0–18 years, the most common causes of low vision were retinitis pigmentosa (9.4%) and myopic degeneration (5.21%). Diabetic retinopathy (13.54%) and age related macular degeneration (AMD) (10.42%) were the most common causes of visual impairment in patients aged >60 years. Table 2 summarizes the causes of visual impairment across all three studied age groups.

For distance vision and across all age groups, the most commonly prescribed LVA was the See TV and Keplerian telescope. Eighty-nine percent of patients in this category (17 out of 19 patients) reported an improvement in function and kept utilizing their LVAs upon further follow-up. For near tasks, 67 patients (62.0%) received reading spectacles followed by three patients (3.9%) receiving the Optima ® closed circuit television (CCTV). Three other patients (3.9%)

Table 2 Causes of Visual Impairment Across All Age Groups of Study Participants

Cause of Visual Impairment	Age Groups					
	0–18 Years		19–60 Years		> 60 Years	
	N= 15	15.60%	N= 51	53.10%	N=30	31.30%
Retinitis pigmetosa	9	9.40%	37	38.50%	2	2.10%
Myopic degeneration	5	5.20%	5	5.20%	3	3.10%
AMD*	0	0%	2	2.10%	10	10.40%
Diabetic retinopathy	0	0%	5	5.20%	13	13.50%
ROP**	1	1.00%	0	0%	0	0%
Glaucoma	0	0%	1	1.00%	0	0%
Microphthalmia	0	0%	1	1.00%	0	0%
Uveitis	0	0%	0	0%	1	1.00%
Keratoconus	0	0%	0	0%	1	1.00%

Abbreviations: AMD*, age-related macular degeneration; ROP**, retinopathy of prematurity.

were prescribed the reading spectacles with dome magnifier. Eighty-nine percent of patients who received LVAs for near (67 out of 75 patients) reported improvement in their daily near tasks like reading, writing and using their mobile phone. This percentage of patients retained their LVAs on further follow-up visits. Using the Chi-square test, there was no statistically significant difference between the distribution of low vision aid devices among different age groups (Table 3).

Discussion

This study investigated the characteristics and underlying causes of visual impairment of 108 patients who were referred to a comprehensive low vision service from the ophthalmology clinic of a tertiary academic hospital in Amman, Jordan. The types and outcomes of introducing the LVAs were also noted and analysed.

Visual impairment remains a major healthcare problem in both developed and developing countries. The increasing numbers of the visually impaired who can no longer be supported by optical, medical, or surgical treatments pose a challenge to eye care professionals. LVAs, as part of a comprehensive low vision service, can significantly improve patients' residual vision allowing them to perform daily tasks comfortably.

The provision of vision rehabilitation services is fraught with challenges. Multiple studies have highlighted the multifactorial causes in different settings.[13–15] Patient factors include low representation of services for people with visual disability, shortage of information available to visually impaired patients and hence reduced awareness of available services, patient mobility difficulties, financial constraints and high cost of optical devices. Practitioner factors include the low number of adequate referrals, reduced numbers of eye care professionals, lack of specific clinical diagnoses, limited education of optometrists in low vision assessment, long evaluation times, and the availability of equipment.[16,17]

It was also noted that the distribution of low vision services, especially in the Eastern Mediterranean region, varies between no coverage to less than 10%.[18] For all the above-mentioned reasons, prioritizing data collection and interpretation in this field is encouraged, as there is a growing interest in specialized rehabilitation services for people with low vision.[19–21]

The prevalence of visual impairment varies in different countries along with the main underlying causes. Globally, data showed that the main cause for visual impairment is uncorrected refractive errors.[22] A study in Saudi Arabia showed that optic nerve atrophy is the main cause.[23] Another study from the West Bank and Gaza done on causes of childhood blindness showed that retinal disorders were the main culprit.[24] Optic atrophy was the leading cause in Korea, whereas congenital cataract and degenerative myopia were the main causes in a report from China, while a paper from Ghana listed corneal and lens disease as the main causes.[25–27] In the developed world, age-related macular degeneration and diabetic retinopathy are the major causes of visual impairment.[1–4]

The most common cause of visual impairment in our study was retinitis pigmentosa (50%) followed by diabetic retinopathy (18.75%). In Jordan, Bakkar et al reported albinism as the most common cause for visual impairment and,

Table 3 Low Vision Aids Prescribed to Patients in Each Age Group

	Age Groups				P
	0–18 Years	19–60 Years	> 60 Years	Total	
Low vision devices	N=23	N=47	N=38		
For distance					>0.05*
See TV	5.3%	26.3%	15.8%	47.4%	
Keplerian Telescope	15.8%	21.1%	15.8%	52.6%	
For near					>0.05*
Reading glasses	7.9%	44.7%	35.5%	88.2%	
Dome magnifier	0.0%	1.3%	0.0%	1.3%	
Stand magnifier	0.0%	0.0%	1.3%	1.3%	
Reading Glasses with dome	0.0%	0.0%	3.9%	3.9%	
(CCTV)**	2.6%	1.3%	0	3.9%	

Notes: *The Chi-square test, **CCTV, closed circuit television.

subsequently, referral to a low vision service in the north of the country.[11] The aforementioned report was centre-based and got referrals from the city of Irbid, where a known cluster of albinism patients resides. Another study conducted by the German Jordan University Vision Rehabilitation Centre found that retinitis pigmentosa was the most common cause of visual impairment in patients referred from all over the country.[12] This is consistent with our findings, as both services are based in tertiary centres. Retinitis pigmentosa, as well as other inherited retinal dystrophies like Stargardt disease, is not uncommon in developing countries including Jordan, Malaysia and Nigeria; and although its inheritance is multi-factorial, consanguineous marriages play a significant role in its transmission.[28,29]

Our study reports a consanguinity rate of 50%, whereas the general consanguinity rate in Jordan is close to 35%.[30] Furthermore, 38.8% of our cohort reported a positive family history of their presenting ocular disease. Our findings rhyme with previous reports of causes of severe visual impairment and blindness in the country, again genetic diseases like retinitis pigmentosa being front and centre, followed by diabetic retinopathy and glaucoma.[31] Glatz et al published an excellent report about blindness and visual impairment in central Europe. Their findings showed that among the working-age adults and children in Austria, inherited retinal and choroidal diseases were the leading causes of visual impairment and blindness, drawing attention to further research in emerging treatments for those diseases.[32]

In our elderly age group (age >60 years), diabetic retinopathy was the leading cause of visual impairment, followed by age-related macular degeneration. This is consistent with the age bracket and the worrying trend of the diabetes mellitus pandemic and its complications.[33,34.]

This research found that patients referred to the low vision rehabilitation service were almost equally distributed between genders. This is a paradigm shift from previous studies from developing countries, where higher illiteracy rates among women and prioritizing eye care for males were contributory to the referral demographics.[35,36] The majority of patients in our study were between 19 and 60 years old (50%) with a third of patients being students who are more likely to seek low vision services because impaired vision is a big burden in continuing education. This is similar to the findings from other countries with percentages ranging between 57% and 73%.[37]

We report on the specifics of prescribing LVAs for all visual impairment patients who underwent evaluation upon referral. This was driven by the functional needs of the patients as assessed by the low vision specialist encounter. The majority of patients sought aids for near tasks like reading and writing, and most LVAs prescribed were reading spectacles (also known as "reading adds"). Most patients in this category reported improvement in their near task functionality and 89% retained their LVAs upon further follow-up visits. The See TV and the Keplerian telescope were the two most frequently prescribed LVAs for far tasks, with a total number of 9 and 10 patients receiving those aids, respectfully. Again, 89% of patient in this category reported an improvement in function and kept utilizing their LVAs. A similar study conducted in Egypt on the clinical outcomes of low vision aids found that 56% of patients showed improvement in near and distance best corrected visual acuity.[38] Another study from Turkey reported a treatment success rate of 46%.[39]

Low vision services in Jordan are far from streamlined. There are no low vision clinics at government hospitals and medical insurance does not cover the cost of LVAs as they are considered secondary and luxurious. The attitude towards referrals is perfunctory at best, and most low vision services are run by charities, or exist on the fringes of private eye centres. This suggests that the actual number of visually impaired patients requiring treatment is greatly underestimated. More centralized low vision clinics with robust referral systems are needed in major hospitals and even mobile clinics to reach remote areas. Patients and caregivers alike need to be educated about the need and availability of low vision assessment services.

Finally, low vision clinics should have a holistic approach when addressing visually impaired individuals to cover their physical and psychological needs. Genetic counselling is integral when addressing patients with inherited retinal diseases for instance, as they need guidance concerning consanguinity and family planning. This could be through a multi-disciplinary team of optometrists, occupational therapists and ophthalmologists working together in a standardized low vision clinic setting.

This study is inherently limited by its retrospective cross-sectional nature and by the fact that the analysis is hospital-based. The good number of participants and the strict inclusion of accurate information from well-kept records lend strength to this report, as well as the consistency of the low vision assessment services being provided by a single

professional. Prospective multicenter projects with prolonged follow-up periods are better suited to comment on the effects of low vision services on target patient groups. Quality of life metrics can also be utilized by subsequent studies to better quantify the effects of these interventions on patients with visual impairment.

Conclusions

In summary, the main cause of visual impairment in this cohort of 108 patients referred from a tertiary academic hospital in Amman for low vision assessment was retinitis pigmentosa, followed by diabetic retinopathy. Half of the referred patients were the offspring of consanguineous marriages. The majority of LVAs were prescribed for near distance tasks, and reading glasses were the most prescribed visual aid. Eighty-nine percent of patients reported functional improvement and retained their visual aids upon follow-up. Awareness and integration of low vision services into a multidisciplinary approach and improving referral protocols is essential to better address the needs of patients with visual impairment. Improving patient accessibility, screening campaigns, lowering the costs of visual aids and incorporating such services within insurance plans will further maximize the benefits of low vision services to the visually impaired. Further research concerning emerging treatments for inherited retinal diseases should be encouraged, and familial counselling regarding consanguinity marriages must be stressed by health care providers and policy makers.

Ethics Statement

This research was conducted according to the guidelines of the declaration of Helsinki and was approved by the Institutional Review Board at Jordan University Hospital (Approval # 10/2021/29489). All participants provided written informed consent. Parental informed consent was obtained for participants under 18 years of age.

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Disclosure

The authors report no conflict of interest in this work.

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