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Prevalence, causes and factors associated with vision impairment in Limpopo province

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Background: Epidemiological data on the prevalence, causes and risk factors associated with vision impairment (VI) is necessary to evaluate the effectiveness of eye care services.

Aim: To determine the prevalence, causes and factors associated with VI among patients presenting to public hospitals of Limpopo province, South Africa.

Setting: This study was conducted in public hospitals.

Methods: A retrospective chart review of patients seen from April 2019 to March 2022 in 29 public hospitals was conducted. The following information was extracted: demographic information, medical history, visual acuity (VA), refractive and ophthalmoscopy findings.

Results: Of the 1140 participants, 56.1% were women. Participants' ages ranged from 5 to 94 years. The prevalence of VI was 61.5%. Most had moderate-severe VI (57.3%), followed by blindness (22.7%) and mild VI (20.0%). The leading causes of VI were uncorrected refractive error (URE) (28.1%), cataract (26.0%) and glaucoma (25.0%). The main causes of blindness were glaucoma (42.8%) and cataract (32.1%); while URE (7.5%), retinal anomalies (7.5%) and corneal anomalies (6.9%) accounted for almost equal proportions of blindness. Participants aged 50–64 years (odds ratio [OR]: 1.7; 95% confidence interval [CI]: 1.2–2.6); 65 years and older (OR: 6.6; 95% CI: 4.3–10.2); and those diagnosed with systemic hypertension (OR: 2.5; 95% CI: 1.9–3.2) and diabetes mellitus (OR: 2.9; 95% CI: 1.9–4.4) had increased risk of VI.

Conclusion: The prevalence of VI in this population is relatively high. The main causes of VI are correctable, suggesting the need for improved measures to prevent avoidable VI.

Contribution: The study addresses the gap in the province's current prevalence, causes and factors related to VI.

Keywords: vision impairment; blindness; presenting visual acuity; uncorrected refractive error; cataract; glaucoma.

Introduction

Vision, one of the most dominant senses, is integral for interpersonal and social interactions.[1,2] The World Health Organization (WHO) has reported that approximately 2.2 billion people in the world have vision impairment (VI) from various causes and at least 1.0 billion of these, could have been prevented or are yet to be addressed.[3] The WHO classifies VI based on presenting visual acuity (PVA) in the better eye as mild VI (PVA less than 6/12 but equal to or better than 6/18), moderate VI (PVA less than 6/18 but equal to or better than 6/60), severe VI (PVA less than 6/60 but equal to or better than 3/60) and blindness (PVA less than 3/60 to no light perception).[4] Vision impairment can result in poor psycho-social well-being, physical health, economic participation and educational achievements leading to a generally decreased quality of life.[3,5,6]

Despite VI being a global public health problem, its magnitude varies in different regions.[3] Furthermore, the prevalence and causes of VI vary across and within countries according to the availability, accessibility and affordability of eye care services as well as the eye care literacy of the population.[3,7,8,9] For instance, the prevalence of distance VI is estimated to be four times higher in low- and middle-income regions than in high-income regions.[7] The causes of VI can be congenital or acquired, and differ among the different age groups. In most cases, the causes of avoidable VI such as cataracts are more prevalent in low- and middle-income regions while uncorrected refractive error (URE) remains the leading cause of reversible VI among adults and children globally. In high-income regions, glaucoma and age-related macular degeneration

(ARMD) are most prevalent among the adult population.[3,7] The leading cause of VI among children in low-income regions is congenital cataract while retinopathy of prematurity is more likely to be the leading cause in middle-income regions.[3] The risk factors for acquired VI include rapid population growth, ageing and lifestyle changes.[3,7] Globally, the percentage of elderly people is increasing because of high life expectancy, improvements in healthcare systems and more effective management of non-communicable diseases (NCDs) in many regions including Africa.[3,7,9] Thus, the risk of more people acquiring VI because of age-related diseases is expected to increase exponentially.[3,7,8] It is estimated that over the next 25 years, the number of people with blindness will reach 61 million while 474 million and 360 million will have moderate to severe VI (MSVI) and mild VI, respectively.[7,9] The goal of the WHO is to reduce the prevalence of avoidable VI and improve access to comprehensive eye care services that are integrated into health systems.[10]

The Limpopo province is in the northernmost part of South Africa. The province borders Mpumalanga, Gauteng and North West provinces within the country. In 2020, the population size of 5.9 million made it the fifth populous province in the country.[11,12] It is estimated that 42.0% of the population does not have a steady income and 26.0% live below the poverty line.[12] An early study reported that 62.7% of participants utilised public eye care services in the Capricorn district of Limpopo province.[13] Currently, there are 38 public health facilities (37 hospitals and 1 health centre) that provide eye care services in the Limpopo province. Public eye care services are provided by optometrists, ophthalmic nurses and ophthalmologists.

This study aimed to determine the prevalence, causes and factors associated with VI among patients presenting to public hospitals in Limpopo province, South Africa. Early detection and effective management of visual anomalies are vital in combating VI.[3,7] Therefore, data and information on the distribution and prevalence of VI as well as the causes and factors associated with VI would be valuable for policymakers, eye care service personnel and the Department of Health for appropriate planning, resource allocation, effective management of VI and can serve as a baseline for future studies. Several population-based studies[14,15,16] have reported on the prevalence and causes of VI to establish its magnitude and trends. While population-based studies are suitable to establish the prevalence and causes of VI, such studies are expensive and time-consuming.[1,17] In contrast, hospital-based studies are less expensive and provide useful information about disease trends, risk factors, outcomes of treatment and patterns of care.[1,8,17]

Research methods and design

Study design

The study used a quantitative retrospective design where the presence, causes and factors associated with VI were determined from patient clinical records.

Study site

The study was conducted at sampled public hospitals that offer optometry services in Limpopo province, South Africa. Limpopo province is divided into five district municipalities including Capricorn, Waterberg, Vhembe, Mopani and Sekhukhune.[12,13] Each district municipality has one secondary hospital while the two tertiary hospitals are based in the Capricorn district. Out of the 37 public hospitals providing optometry services in the province (30 primary hospitals, 5 secondary hospitals and 2 tertiary hospitals), data were collected from 29 hospitals representing approximately 80% of the public hospitals. A saturated sample for secondary and tertiary-level hospitals was included in the study because they were fewer than the primary-level hospitals. Simple random sampling was used to select the 22 primary-level hospitals from the different districts whereby each primary-level hospital had the same chance of being chosen for the sample. All primary-level hospitals in the province are relatively homogeneous for optometry services in terms of optometry personnel, infrastructure, diagnostic equipment and management of ocular anomalies. Ophthalmology services are available in only three public hospitals in the province. Patients presenting to the public hospitals are either self-referred or referred by outreach optometrists from district clinics and/or schools within local municipalities or by medical doctors and other healthcare practitioners.

Study population

The study population comprised all patients aged 5 years and older who were registered in the optometry patient registers in public hospitals of Limpopo province for eye care services from April 2019 to March 2022. The age reference criterion assumed that a person aged 5 years and older is schoolgoing and/or able to understand the instructions given during an eye examination.

Sampling technique

Systematic random sampling was used to sample patient hospital files from the optometry patient registers at sampled hospitals within each district until the target sample size was reached. This involved selecting patient files at a regular interval where every *n*th case after a random start was included.

Sample size

The sample size was calculated using Equation 1:

$$n = \frac{z^2 pq}{d^2} \quad \text{[Eqn 1]}$$

where n is the sample size; z is the upper point of the standard normal distribution, which is 1.96 constant when using a 95% confidence interval (CI); d is the clinically acceptable margin of error of 5% (0.05); p is the expected prevalence and $q = 1\text{-}p$.[18]

Taking into consideration the highest reported prevalence of VI found in a review of the literature to be 41.3% (0.413) and $d = 0.05$ (the absolute precision, taken as 0.05), the sample size was determined using Equation 2:

$$n = \frac{(1.96)^2 \times 0.413\,(1-0.413)}{(0.05)^2} \quad \text{[Eqn 2]}$$

$$= \frac{3.8416 \times 0.413 \times 0.587)}{0.0025}$$

$$= 373$$

To make allowance for attrition, a 10% increase was made resulting in a required minimum sample size of 411 participants. Table 1 displays the distribution of hospitals and the corresponding sample sizes across various districts.

Inclusion and exclusion criteria

Files of all registered patients aged 5 years and older whose clinical records were complete and appropriately recorded were included. The patients' hospital files were sampled once and reviews and/or follow-up visits were excluded to avoid repetition (this was verified by allocating individual files with codes). Files with incomplete clinical records were excluded.

Data collection

Optometry patient registers were used to sample hospital files for clinical records to determine the level of vision and diagnoses. The clinical records were reviewed for case history, PVA, best-corrected VA (BCVA), visual fields (VF), intraocular pressure (IOP), refraction and ophthalmoscopy findings. The final ocular diagnoses and corresponding management plans were noticed. This information was extracted and recorded in a record card (Appendix 1) that was designed using previous literature.[17,19] The same record card was used at all sampled hospitals in the province. Only clinical records of patients assessed in standardised optometry clinics that used appropriate standardised optometric instruments were included. Only one researcher was responsible for reviewing the records, extracting and capturing the data for consistency.

In accordance with the recommendation from the WHO, the magnitude of PVA in the better eye was used to determine the level of VI. The levels of VI, which were classified using the revised International Classification of Diseases, 11th revision (ICD-11) included: mild VI (PVA less than 6/12 but equal to or better than 6/18), moderate VI (PVA less than 6/18 but equal to or better than 6/60), severe VI (PVA less than 6/60 but equal to or better than 3/60) and blindness (PVA less than 3/60 to no light perception). This classification of VI is commonly used in clinical settings and research studies.[4,9,20,21] The causes of VI were determined based on the findings of refraction, ophthalmoscopy and final ocular diagnosis recorded in the clinical files. Where two or more conditions were found to be the causes of VI, the most preventable and/or treatable condition or the condition that resulted in the person with VI was noticed as the primary cause of VI. This approach was used in previous studies.[22,23,24,25] The record card was verified, clinically validated and standardised to ensure content validity. A pilot study involving hospital files for 15 patients at three hospitals was undertaken. Based on the pilot study no amendments were made to the record card or data collection process; however, the researcher's skill for file sampling and data capturing was honed. The three hospitals where the 15 hospital files for the pilot study were obtained, were considered for this study. However, the data from the 15 hospital files were not included in the data analysis and results. The researcher double-checked each data entry at a subsequent interval to verify the accuracy of data capturing. Any inconsistencies in data capturing were cross-checked against the patient clinical card and resolved before data analysis.

TABLE 1: Distribution of hospitals and sample sizes in each district.

District	No. hospitals	Sample size	
		n	%
Capricorn	8	281	24.6
Mopani	5	179	15.7
Sekhukhune	6	179	15.7
Vhembe	5	196	17.2
Waterberg	5	305	26.8
Total	**29**	**1140**	**100.0**

Data analysis

Data were collected manually, captured using Microsoft Excel and analysed using the Statistical Package for Social Sciences (SPSS) version 29 (IBM, Chicago, Illinois, United States). Descriptive statistics including frequencies and percentages, were used to summarise the categorical data such as age, gender and presence of VI. The frequency distribution of age was examined for normality to further analyse data using appropriate tests. To account for possible associations, comparisons of risk factors by outcome were made using the chi-square and Wilcoxon rank-sum tests. Risk factors (age, gender and chronic diseases) significant at the bivariate level with the outcome of interest were included in a multivariable model to determine the outcome variable independent factors. Odds ratios (ORs) and *P*-values were reported where a P-value < 0.05 was considered statistically significant.

Ethical considerations

Ethical clearance to conduct this study was obtained from the University of KwaZulu-Natal Humanities and Social Sciences Research Ethics Committee (reference no. HSSREC/00004472/2022). Thereafter, gatekeeper permission was obtained from the Limpopo Provincial Department of Health (reference no. LP_2022-12- 004) and Pietersburg and Mankweng hospitals to use the health facilities as a base for data collection. Anonymity was ensured by providing individual codes to all hospital files.

Results

Demographic characteristics

The sample included 1140 clinical records with more women (n = 640, 56.1%) than men (n = 500, 43.9%). The patients'

ages ranged from 5–94 years with a median (interquartile range [IQR]) of 55 (31–68) years. The majority of patients were 65 years and older (*n* = 369, 32.4%) followed by those 50–64 years (*n* = 268, 23.5%), 18–35 years (*n* = 192, 16.8%), 36–49 years (*n* = 166, 14.6%) and 5–17 years (*n* = 145, 12.7%). Most patients (*n* = 861, 75.5%) presented at primary level hospitals than secondary level hospitals (*n* = 199, 17.5%) and tertiary level hospitals (*n* = 80, 7.0%). There were more Africans (*n* = 1130, 99.1%) than other racial groups (*n* = 10, 0.9%). Just less than half of the patients had chronic illnesses (*n* = 503, 44.1%) and of these 35.6% (*n* = 179) had two or more chronic illnesses. The most common chronic illnesses were hypertension (*n* = 379, 75.3%), diabetes mellitus (*n* = 163, 32.4%), retroviral diseases (*n* = 89, 17.7%), asthma (*n* = 11, 2.2%) and other (*n* = 50, 9.9%). Based on public hospital income classification tariffs, most patients (*n* = 615, 54.0%) were classified as fully subsidised for healthcare services, followed by those subsidised by 80% (*n* = 509, 44.6%) and 30% (*n* = 12, 1.1%) while a few participants (*n* = 4, 0.4%) were not subsidised or classified as private patients.

Vision impairment

Table 2 shows the distribution of VI categories based on distance PVA and BCVA. Of the 1140 patients sampled, most patients (*n* = 701, 61.5%) were classified with VI based on PVA. This included 402 patients with MSVI, followed by 159 with blindness and 140 with mild VI. When the BCVA was considered, approximately 41% of participants were classified with VI (Table 2). This included most patients with MSVI (*n* = 235, 50.4%), followed by blindness (*n* = 133, 28.5%) and mild VI (*n* = 98, 21.0%).

Causes of vision impairment

Table 3 shows the causes of VI stratified for the different levels of VI categories. Overall, the most common causes of VI were URE (*n* = 197, 28.1%), cataract (*n* = 182, 26.0%) and glaucoma (*n* = 175, 25.0%). Retinal and corneal anomalies accounted for approximately 10% of the causes of VI. In the categories of mild VI and MSVI, URE and cataract were the main causes of VI. In contrast, glaucoma was the most common cause of VI in the blindness category and accounted for more than 40% of cases.

Factors associated with vision impairment

Table 4 shows the bivariate and multivariate logistic regression analysis for VI. The bivariate logistic regression analysis showed that patients aged 50–64 years (OR: 1.7; 95% CI: 1.2–2.6); 65 years and older (OR: 6.6; 95% CI: 4.3–10.2); and those diagnosed with hypertension (OR: 2.5; 95% CI: 1.9–3.2) and diabetes mellitus (OR: 2.9; 95% CI: 1.9–4.4) had significantly increased risk of VI. In terms of causes of VI, cataract (OR: 5.9; 95% CI: 3.9–8.6); glaucoma (OR: 3.8; 95% CI: 2.6–5.3); pseudophakia (OR: 1.8; 95% CI: 1.1–3.0); and retinal anomalies (OR: 5.9; 95% CI: 2.3–15.1) were significantly associated with increased risk of VI. Ocular surface diseases (OR: 0.3; 95% CI: 0.2–0.5) were significantly associated with reduced odds of VI. In the multivariate regression analysis, cataracts (OR: 5.9; 95% CI: 2.9–12.1); glaucoma (OR: 3.2; 95% CI: 1.9–5.4) and retinal anomalies (OR: 7.5; 95% CI: 2.5–22.2) were the only variables significantly associated with increased odds of VI. While ocular surface diseases (OR: 0.6; 95% CI: 0.4–0.9) were significantly associated with reduced odds of VI in the multivariate logistic regression.

Discussion

Vision impairment is a major cause of disability worldwide and a global public health problem. This study aimed to provide data on the prevalence, causes and factors associated with VI among patients presenting to public hospitals in the Limpopo province, South Africa. The prevalence of VI based on PVA was 61.5% and the main causes of VI were URE (28.1%), cataract (26.0%), and glaucoma (25.0%). In terms of the level of VI, most patients were classified with MSVI (57.3%), while an almost equal distribution had mild VI (20.0%) or blindness (22.7%). In

TABLE 2: Distribution of vision impairment categories based on distance presenting visual acuity and best-corrected visual acuity.

VI category	VA criteria	Better eye			
		Presenting VA		Best-corrected VA	
		n	%	*n*	%
Mild VI	6/18 ≤ VA < 6/12	140	20.0	98	21.0
MSVI	3/60 ≤ VA < 6/18	402	57.3	235	50.4
Blindness	VA < 3/60	159	22.7	133	28.5
Total	-	**701**	**61.5**	**466**	**40.9**

MSVI, moderate to severe vision impairment; VA, visual acuity; VI, vision impairment.

TABLE 3: Causes of vision impairment based on presenting visual acuity.

Causes of VI	Severity of vision impairment						Total (*N* = 701)	
	Mild VI (*n* = 140)		Moderate-severe VI (*n* = 402)		Blindness (*n* = 159)			
	n	%	*n*	%	*n*	%	*n*	%
Uncorrected refractive error	57	40.7	128	31.8	12	7.5	197	28.1
Glaucoma	25	17.9	82	20.4	68	42.8	175	25.0
Ocular surface diseases	16	11.4	10	2.5	0	0.0	26	3.7
Corneal anomalies	2	1.4	17	4.2	11	6.9	30	4.3
Cataract	25	17.9	106	26.4	51	32.1	182	26.0
Pseudophakia	11	7.9	32	8.0	5	3.1	48	6.8
Others	2	1.4	1	0.2	0	0.0	3	0.4
Retinal anomalies	2	1.4	26	6.5	12	7.5	40	5.7

VI, vision impairment.

TABLE 4: Bivariate and multivariate logistic regression for vision impairment.

Factors associated with vision impairment	Bivariate logistic regression			Multivariate logistic regression		
	OR	95% CI	*P*	OR	95% CI	*P*
Age (years)						
5–17	Ref	-	-	Ref	-	-
18–35	1.1	0.7–1.7	0.986	0.8	0.5–1.3	0.435
36–49	1.3	0.8–1.9	0.302	0.7	0.4–1.2	0.177
50–64	1.7	1.2–2.6	0.008	0.7	0.4–1.3	0.261
≥65	6.6	4.3–10.2	< 0.001	2.3	0.7–7.4	0.156
Gender	-	-	0.246	-	-	-
Female	Ref	-	-	-	-	-
Male	0.9	0.7–1.1	-	-	-	-
Hypertension	-	-	< 0.001	-	-	0.779
No	Ref	-	-	Ref	-	-
Yes	2.5	1.9–3.2	-	1.3	0.8–2.0	-
Diabetes mellitus	-	-	< 0.001	-	-	0.209
No	Ref	-	-	Ref	-	-
Yes	-	-	-	1.5	0.8–2.9	-
HIV	-	-	0.695	-	-	-
No	Ref	-	-	-	-	-
Yes	0.9	0.59–1.4	-	-	-	-
Cataract	-	-	< 0.001	-	-	< 0.001
No	Ref	-	-	Ref	-	-
Yes	5.9	3.9–8.6	-	5.9	2.9–12.1	-
Glaucoma	-	-	< 0.001	-	-	< 0.001
No	Ref	-	-	Ref	-	-
Yes	3.8	2.6–5.3	-	3.2	1.9–5.4	-
Pseudophakia	-	-	0.017	-	-	0.882
No	Ref	-	-	Ref	-	-
Yes	1.8	1.1–3.0	-	1.1	0.5–2.3	-
Refractive error	-	-	0.167	-	-	-
No	Ref	-	-	-	-	-
Yes	0.8	0.7–1.1	-	-	-	-
Ocular surface disease	-	-	< 0.001	-	-	0.006
No	Ref	-	-	Ref	-	-
Yes	0.3	0.2–0.5	-	0.6	0.4–0.9	-
Corneal anomalies	-	-	0.111	-	-	-
No	Ref	-	-	-	-	-
Yes	1.5	0.9–2.5	-	-	-	-
Retina anomalies	-	-	< 0.001	-	-	< 0.001
No	Ref	-	-	Ref	-	-
Yes	5.9	2.3–15.1	-	7.5	2.5–22.2	-

CI, confidence interval; OR, odds ratio.

our study, the prevalence of VI is different from other studies conducted in Africa and causes are comparable to those reported in African countries (Table 5). Some studies[17,22,26,27,28] have reported lower prevalence values compared with this study (Table 5). Although these studies were also hospital-based and used a similar design as our study, the variation in prevalence values may be because of differences in the definition of VI, study setting (rural and/or urban), sampling techniques and socio-demographic characteristics of patients attending these hospitals. For instance, some of these studies[17,26,27] used a cut-off PVA of less than 6/18 in the better eye, while our study used a PVA of less than 6/12. Furthermore, Limpopo province is generally a rural province with higher poverty rates, limited access to ophthalmology services and non-sustainable effective refractive error coverage in public hospitals.[11,12] The increase in the percentage of patients who were 50 years and older in this study might have contributed to the higher rates of VI because of age-related eye diseases, which are prevalent among these age groups.[3,7,29,30]

Uncorrected refractive error was the leading cause of VI and accounted for most cases of mild VI and MSVI in this study (Table 3), a finding consistent with previous reports.[3,7,9] Reduced vision from refractive error can be simply corrected with spectacles, contact lenses or refractive surgery following eye examination and proper diagnosis.[1,9,35] This assertion is supported by the findings in this study, which showed that the prevalence of VI decreased to 40.9% after optical correction. These findings suggest the need for the government to provide a sustainable supply of spectacles to minimise the burden of refractive error in this region. Furthermore, there should be greater efforts towards eye care literacy and eye care-seeking behaviours to improve awareness and uptake of spectacles in province.

TABLE 5: Prevalence and causes of vision impairment reported in subjects of different African countries as compared with findings of our study.

Authors	Country	Study type	*N*	Age (years)	VI definition	VI (%)	MVI (%)	MSVI (%)	Blindness (%)	Main causes of VI (%)
Leshabane et al. (current study)	South Africa	H-B	1140	5–94	PVA < 6/12	61.50	20.0	57.3	22.7	URE (28.1), cataract (26.0), Glaucoma (25.0)
Akpabla and Signes-Soler[26]	Ghana	H-B	1323	≥ 6	PVA < 6/12	28.40	NR	68.8	28.9	Cataract (50.2), URE (19.7), Glaucoma (15.9)
Ezinne et al.[31]	Nigeria	H-B	500	4–96	PVA < 12	NR	10.8	67.2	22.0	Cataract (42.2), URE (21.4), glaucoma (16.2)
Ajayi et al.[27]	Nigeria	H-B	1310	2–105	PVA < 6/18	33.97	NR	7.7	13.6	Cataract (29.7), glaucoma (17.8), retinal disorders (13.0)
Maake and Oduntan[17]	South Africa	H-B	400	≥6	PVA < 6/18	28.00	NR	17.1	10.9	URE (38.0), cataract (25.9), glaucoma (17.6)
Seid et al.[22]	Ethiopia	H-B	322	≥20	PVA< 6/12	37.58	23.1	9.1	3.3	NR
Isawumi et al.[32]	Nigeria	H-B	617	≥17	PVA < 6/24	100.00	NR	71.5	28.5	Cataract (36.5), glaucoma (20.1), refractive error (19.3)
Alemayehu et al.[28]	Ethiopia	H-B	391	≥18	PVA < 6/12	28.60	5.1	22.7	NR	Diabetic retinopathy (36.6), cataract (26.8), URE (16.1)
Bizuneh et al.[33]	Ethiopia	C-B	626	≥18	PVA < 6/12	6.70	NR	2.3	0.8	URE (62.0), cataract (19.0)
Deme et al.[34]	Ethiopia	C-B	655	≥40	PVA < 6/18	37.60	NR	12.6	1.2	NR
Hydara et al.[15]	Gambia	P-B	9188	≥35	PVA < 6/12	13.40	3.3	8.9	1.2	Cataract (44.6), URE (40.6)
Tagoh et al.[16]	Zimbabwe	C-B	519	5–100	PVA < 6/12	56.80	17.1	39.7	13.1	URE (54.2), cataract (24.8)

Source: Please see full reference list of Leshabane MM, Rampersad N, Mashige KP. Prevalence, causes and factors associated with vision impairment in Limpopo province. Afr Vision Eye Health. 2024;83(1), a956. https://doi.org/10.4102/aveh.v83i1.956

C-B, community-based; H-B, hospital-based; MSVI, moderated-severe vision impairment; MVI, mild vision impairment; NR, not reported; P-B, population-based; PVA, presenting visual acuity; SA, South Africa; URE, uncorrected refractive error; VA, visual acuity; VI, vision impairment.

Cataracts were the second main cause of VI and blindness possibly because of the high number of patients aged 50 years and older in this study. This result is consistent with previous reports[7,27,28] which suggested that the high prevalence of cataracts was influenced by participants aged 50 years and older. Also, the majority of participants in this study were from remote and rural areas with poor access to cataract surgery services, which leads to increased backlog because of long cataract waiting lists in public hospitals. Consistent with early studies in Limpopo province,[17,36,37] cataracts were among the main causes of VI and blindness in the province. Cataract surgery is the only way to remove cataracts and restore vision. It is therefore recommended that the government of Limpopo province scale up cataract surgery services to reduce the burden of VI and blindness associated with this condition.

Glaucoma, the main cause of irreversible blindness, was the third main cause of VI and the leading cause of blindness in this study (Table 3). As this disease is more prevalent in older persons and people of African descent, glaucoma screening procedures are warranted in this area. Furthermore, as the ageing population increases, early detection, effective intervention, improved surveillance systems and community awareness initiatives are necessary to manage the burden associated with glaucoma.[9]

Bivariate logistic regression analysis showed that patients' increased age and chronic diseases (such as hypertension and diabetes mellitus) were significantly associated with increased risk of VI. This is consistent with findings from several reports,[3,9,20,28,32,38,39,40] which confirm that non-communicable, chronic diseases such as hypertension and diabetes mellitus may be a cause of VI. Moreover, Kolli et al.[41] suggested that these diseases may indirectly increase the risk of VI by reducing participation in healthy behaviours. In the multivariate regression analysis, cataracts, glaucoma and retinal anomalies were significantly associated with increased odds of VI. This is not an unexpected finding as the common feature of these diseases is that they all result in severe vision loss if left untreated. We suggest the implementation of effective eye health promotion involving health education, improvements in access and acceptability of health services and advocacy for improved government support for blindness prevention programmes in this area.

Strengths and limitations

This study has several strengths. Firstly, it included a relatively large sample size. Secondly, the classification of VI was based on the ICD 11. The limitation of the study is that it is a hospital-based study and is subjected to the limitations of facility-based studies such as limited generalisability of the findings. Despite this limitation, this study provides valuable information that is useful to the Department of Health authorities, policymakers and eye care personnel for effective planning of eye care services and to serve as a base for further research studies.

Conclusion

The prevalence of VI among the patients presenting to public hospitals in Limpopo province is relatively high. The leading causes of VI were URE, cataracts and glaucoma suggesting the need for improved strategies to address reversible and prevent avoidable VI. Comprehensive programmes that focus on improved effective refractive error coverage with the provision of a sustainable supply of affordable optical devices, increase in coverage for cataract surgery services and awareness and accessibility of eye care

services in the province are necessary to reduce the burden of VI among patients who utilise public hospitals for eye care services.

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Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

M.M.L., N.R. and K.P.M. conceptualised the project and the design. M.M.L. wrote original draft. N.R. and K.P.M. supervised the project, guided and reviewed all drafts up to the final article.

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Data availability

The data that support the findings of this study are available from the corresponding author, M.M.L., upon reasonable request.

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The views and opinions expressed in this article are those of the authors and are the product of professional research. The article does not necessarily reflect the official policy or position of any affiliated institution, funder, agency or that of the publisher. The authors are responsible for this article's results, findings and content.

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Appendix 1 starts on the next page →

Appendix 1

Record Card

BIOGRAPHICAL INFORMATION											
Hospital Name:							District				
Patient No.:				Reference no.:							
Age/ DOB:		Gender		Male		Female			Prefer not to say		
Ocular History:											
Medical History:											
CLINICAL FINDINGS, DIAGNOSIS AND MANAGEMENT											
Presenting VA	Distance						Near				
	R		L				R		L		
Refractive Findings	Distance			BCVA			Near			BCVA	
	R						R				
	L						L				
Visual Fields	Temporal		Nasal				Temporal		Nasal		
	R		R				L		L		
Vision Impairment	Yes	R	L	BOTH			No	Remark			
Category	Mild		Moderate				Severe		Blindness		
Low Vision	Yes	No	LV & VRSs provided/Remarks:								
Intraocular Pressure	R	L									
Colour Vision	R						L				
Ophthalmoscope Findings	R						L				
Other Tests (Specify)	R						L				
Final Diagnosis	R						L				
Management Plan	R						L				

Source: Maake MM, Oduntan OA. Prevalence and causes of visual impairment in patients seen at Nkhensani hospital eye clinic, South Africa. Afr J Prim Health Care Fam Med. 2015;7(1):728. https://doi.org/10.4102/phcfm.v7i1.728; Mashige KP, Oduntan OA. Axial length, anterior chamber depth and lens thickness: their inter correlations in black South Africans. Afr Vis Eye Health, 2017;76, a362. https://doi.org/10.4102/aveh.v76i1.362

DOB, Date of birth; R, Right Eye; L, Left Eye; VA, Visual Acuity; BCVA, Best corrected visual.