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Prevalence and associated factors of visual impairment among adults attending Phelophepa Train, South Africa

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Background: Visual impairment (VI) is caused by various conditions such as uncorrected refractive error (URE), cataracts, glaucoma, diabetic retinopathy (DR), trauma and HIV or AIDS complications.

Aim: This study determines the prevalence and associated factors of VI among adults aged 35 years and older attending the Phelophepa Train in the Eastern Cape.

Setting: Data were collected at the Phelophepa eye clinic using participants from the Eastern Cape province, South Africa.

Methods: A quantitative and cross-sectional study was conducted using a systematic random sampling method to select a sample of record cards from 563 participants. Statistical Package for Social Sciences (SPSS) was used to perform bivariate analyses, linear regression analysis and confidence intervals (CI).

Results: The mean age was 59.17 ± 12.95 years (range = 35–93 years). The prevalence of VI and blindness was 57.6% (95% CI: 53.0% – 61.0%), VI was 51% and blindness at 6.6%. The majority were females and resided in rural areas, with low socioeconomic status being a significant risk factor for VI ($P < 0.001$). The primary causes of VI were URE (38%), cataracts (20%), glaucoma (2.3%), DR (1.6%) and corneal opacities (0.5%). The most prevalent chronic diseases were hypertension (HTN) (28.4%), followed by comorbidities of HTN and diabetes mellitus (DM) (17.94%), HIV/AIDS (7.82%) and DM (5.20%) ($P = 0.01$).

Conclusion: Visual impairment and blindness among adults ≥ 35 years old were high, with primary causes including URE, cataracts, glaucoma, DR and corneal opacities.

Contribution: Sustainable programmes should be established to provide optimal optical correction for UREs and cataract removal.

Keywords: blindness; cataract; glaucoma; hypertension; refractive error; visual impairment.

Introduction

A variety of conditions, including refractive error, cataract, glaucoma, corneal opacity, age-related macular degeneration (ARMD), diabetic retinopathy (DR),[1,2,3] trauma and systemic conditions such as hyperthyroidism,[4] rheumatoid arthritis, HIV/AIDS complications and hypertension (HTN) can lead to visual impairment (VI).[5] Visual impairment is a functional limitation of the eye(s) that results in reduced visual acuity (VA), visual field loss, visual distortion, perceptual difficulties or any combination of the aforementioned.[6,7] According to the World Health Organization (WHO),[1] VI is defined as presenting distance VA worse than 6/18 to no light perception (NLP) in the better-seeing eye, also including near VA worse than N6 with existing correction,[8,9] and this was the cut-off VA used for the current study. The severity of VI can range from mild VI to total loss of the ability to perceive light or blindness. Therefore, VI is categorised into mild or no VI (category 0) for VA > 6/18, moderate VI (category 1) for VA < 6/18 to > 6/60, severe VI (category 2) for VA < 6/60 to > 3/60 and blindness (category 3, 4 and 5) for VA < 3/60 to NLP.[8,10,11,12]

Literature has indicated that uncorrected refractive error (URE), cataracts, glaucoma, corneal opacity and DR are significant causes of VI.[2,6] There is also a significant association between factors such as increasing age,[11,13] gender and economic status with preventable VI. There seems to be a lack of data on the prevalence of VI among patients from underserved rural communities, which led to this investigation from the Phelophepa setting in the Eastern Cape province of South

Africa. Consequently, it is necessary to document the prevalence of VI in disadvantaged communities, particularly in sub-Saharan Africa, to develop effective and sustainable programmes geared towards eliminating VI.

Globally, there were an estimated 43.3 million individuals who were blind in 2020, and 295 million with moderate and severe visual impairment (MSVI), thus placing a significant cost on public health systems worldwide.[14,15] Cataracts (26%) and URE (49%) are the leading causes of visual loss worldwide.[14,16] There is a higher prevalence of vision loss among women (55%), persons ≥ 50 years (80%) and populations of underdeveloped countries (90%) than among other demographic groups.[15,17] Xulu-Kasaba and Kalinda estimated the pooled prevalence of VI and blindness in South Africa by reporting a 2% prevalence for blindness and a 12% prevalence for MSVI.[18]

Visual function impacts physical and emotional well-being and is necessary for optimum orientation in an individual's social and functional life.[19] Furthermore, VI has a substantial financial impact on individuals affected and their families, caretakers and the community.[20]

Sight performs around 80% of the functions of all five senses, and it is claimed that human beings are visually motivated for survival.[19] As a result, VI affects every aspect of living, including self-esteem and mental health, thus limiting educational achievement, employment, social interactions and independence, resulting in reduced quality of life.[21,22,23] According to the American Medical Association's guide, complete loss of vision in both eyes is considered to have 100% visual impacts on an individual's physical, psychological and emotional well-being.[24,25]

Most causes of VI can be avoided or treated, including URE, cataracts, glaucoma and DR. However, because of an increased concentration of available eye care services in the South African urban areas, there is an imbalance in the provision of these services in rural areas. Thus, the Phelophepa Train was introduced in South Africa to provide these services to rural communities.[26] Early proper eye health services and interventions (such as optimal spectacle provision and timely referrals to Eye Specialists) can reduce and eliminate VI development. Avoidable blindness and VI are serious public health challenges, especially in underserved countries with inadequate healthcare services.

This study aimed to determine the prevalence of VI among patients aged 35 years and older visiting the Phelophepa Train eye clinic in the Eastern Cape province (South Africa) from 30 January 2023 to 31 March 2023. The knowledge gap is that the researcher observed that there seems to be a lack of data available on the prevalence and common aetiologies of VI among patients attending the Phelophepa Train, particularly from underserved rural communities in South Africa and, in this case, the Eastern Cape. Therefore, the findings of this study may assist eye health professionals and health policymakers in developing proper eye health interventions to address the health needs of all patients.

Research methods and design

A quantitative investigation followed a retrospective, descriptive and cross-sectional study design. The study population included patients who attended the Phelophepa Train eye clinic in the Eastern Cape from 30 January 2023 to 31 March 2023. Secondary de-identified data were collected from the existing paper-based clinical record cards of patients who consulted. Only patients seen in the Eastern Cape province, South Africa, were included in this study. Only adults aged 35 years and older were considered for the study. The exclusion criteria were that all patients below the age of 35 years did not form part of this study. Clinical record files with incomplete data were also excluded. This study did not include patients from other provinces besides the Eastern Cape.

A systematic random sampling method was used to select patients' files for the study. The sample size was calculated using Slovin's formula, which stated as $n = N/(1 + N(e)^2)$,[27] where n = sample size, N = population size and e = the margin of error.[28] The target population was 4550 potential participants' clinical record cards of all patients who visited the eye clinic while the Train was stationed in the Eastern Cape for 9 weeks in 2023 (stations visited, namely: King William's town, Middledrift, Stutterheim and Queenstown). The acceptable margin of error was considered at 5%; therefore sample size was found to be as follows: $n = N/(1 + N(e)^2) = 368$.

The sample size was then augmented to 460 by adding the 25% contingency for incomplete data. However, the researcher retrieved 563 enumerated study participants during data collection, which were then included for data analysis. Adults aged ≥ 35 years were considered for this study because the majority of patients visiting the Phelophepa Train eye clinic were adults. Furthermore, the researcher wanted to understand the prevalence and common causes of VI among patients from early middle age until late adulthood.

Study site

Data were collected from the Phelophepa Train eye clinic, which is part of the Transnet Foundation, a non-profit division of the Transnet company in South Africa. The eye clinic is situated on a train travelling across South Africa, rendering comprehensive primary health services to most disadvantaged communities. The Phelophepa Train eye clinic's mission is to assist impoverished, primarily rural individuals who cannot afford high-priced private eye care. Experienced optometrists and dispensing opticians are actively working full-time at the clinic to provide the comprehensive eye care services that patients and their communities need.

This study was conducted from the disadvantaged areas of the Eastern Cape province of South Africa, one of the most

deprived regions in the country, where unemployment, poverty and diseases are prevalent, and there is a significant gap between the population's health needs and the services available.[29]

Data collection process and tools

The information gathered from the participants' clinical record cards included age, gender, area of residence, socioeconomic status, unaided visual acuities (UVA), aided visual acuities (AVA), ocular diseases, refractive status and systemic conditions. The principal investigator gathered sociodemographic information using a separate, unstandardised, self-developed data collection sheet. The criteria for determining the prevalence of VI in this study were based on the presenting vision or UVA in the better-seeing eye.[1,8,9]

The following procedures were carried out during the standard Phelophepa Train eye examinations before data collection and were not part of the research, which was conducted retrospectively. The principal investigator was part of a team of eye health professionals conducting eye examinations. Before data collection, all patients underwent VA assessment and refraction measurements. The VA measurement was performed using the conventional Snellen tumbling *E* charts at a distance of 6 m. As the standard procedure, the right eye was examined first and then the left. Ocular examinations, including the determination of the objective refractive status using autorefraction (Nidek, AR-310A) and subjective refraction (trial frame and lenses), were performed by experienced optometrists. After the assessment of VA as above, direct ophthalmoscopy was performed to evaluate the presence of any possible ocular diseases such as cataracts, glaucoma, corneal opacities, ARMD, hypertensive retinopathy and DR. The VA of 6/6 was considered optimum vision. Those who did not have 6/6 vision were deemed to have a refractive error if the VA improved with a pinhole.

For the purpose of this study, refractive error was defined using spherical equivalents (SE) as myopia (< –0.50 D) and hyperopia (> +0.50 D). Astigmatism was described as a cylinder equal to or greater than –0.50 D in either eye.[30,31] Visual impairment was determined based on the WHO definition,[1,8] which is classified as the presenting distance VA worse than 6/18 to NLP in the better-seeing eye.[9]

Data analysis

The data collected were statistically analysed using the SPSS software, version 29.0.1.0 for Windows, to determine the relationships between the measured constructs. All participants' baseline characteristics and prevalence rates were descriptively analysed. A *P*-value of less than 0.05 was considered statistically significant.

Descriptive statistics, such as the mean, standard deviation (s.d.), median and percentages, were employed to analyse the collected data. The prevalence of VI was determined based on age and gender. In addition, a chi-squared test was used to compare the prevalence of VI between different genders and age groups. The chi-squared test was also used to compare groups for categorical factors (such as socioeconomic and demographic data). The study's independent variables included sociodemographic variables (age group, gender, occupation and residence), medical-related factors (diabetes mellitus [DM], HTN) and a history of ocular disease. The dependent variable to determine VI was the presenting or unaided VA.[7] The non-parametric statistics, bivariate Pearson correlation and linear logistic regression analysis were conducted to compare associations of VI. Data were carefully organised before being analysed. This procedure entailed issuing a unique identification number to each participant's file, correctly defining the variables and entering the data into SPSS. Frequency tables were created, and the results were displayed using appropriate graphs and figures.

Ethical considerations

Before clinical consultations, all patients attending the Transnet Phelophepa Train eye clinic were required to sign a consent form in accordance with the *Protection of Personal Information Act*, 2013 (Act no. 4 of 2013).[32] This allowed for the processing of their personal information and clinical data for various purposes, including future research. However, those who were unable to sign because of illiteracy were able to use a thumbprint ink pad device as their consent.

Administrative approval to conduct this research study was first sought by the management of the Transnet Foundation. The study used readily available secondary data while ensuring participants' anonymity. Ethical approval was obtained from the Research Ethics Committee (REC) of the University of Johannesburg (UJ) to conduct the study (reference no.: REC-2075-2023). Data collected were de-identified to ensure anonymity and confidentiality by using a password known only to the researcher and supervisor. Paper-based clinical record cards were stored safely in locked cabinets within a closed office under the care of the eye clinic manager. Electronic records were not utilised for this study as the digital system was still being piloted, and the system had limited functionality, with difficulty accessing data that were needed; hence, the study focussed on paper-based record files. Personal information was de-identified by assigning code names to participants. The study adhered to the tenets of the Declaration of Helsinki by ensuring anonymity and confidentiality of participants, thus protecting the research subjects.[33,34,35]

Results

A total of 563 patients' record files were selected in this study, comprising 23.60% (*n* = 133) males and 76.40%

(n = 430) females. The median age of selected participants was 59 years, with the majority (73.10%, n = 412) of the individuals in the 45–74 years age groups (Table 1). The minimum age was 35, and the maximum was 93 years, with a mean of 59.17 ± 12.95 years. The common ocular diseases from the retrieved clinical records were cataracts, glaucoma, DR, corneal opacities and others. The commonly reported systemic chronic conditions retrieved were HTN), concomitant HTN and DM, HIV or AIDS, DM and others (Table 1).

The majority of participants studied resided in rural areas (89%; n = 502), which includes villages and townships, and 11% (n = 61) resided in urban areas (Table 1). Of the 89% (n = 502) participants residing in rural areas, 51.70% (n = 291) of them presented with VI and blindness, and of the 11% (n = 61) participants residing in urban areas, 5.70% (n = 32) had VI and blindness. The Pearson chi-squared test for VI and place of residence was 0.68, p = 0.41 and an AOR was 0.80 (95% confidence interval [CI]: 0.47 – 1.36).

The socioeconomic status evaluation indicated that the majority (47.80%, n = 269) of study participants were unemployed, followed by pensioners (47.20%, n =266), and only 5% (n = 28) of the study participants reported having some form of employment (Table 1). The Pearson chi-squared test statistic for socioeconomic status was 17.26 (X^2 = 17.26, P < 0.001). The frequency distribution for the prevalence of VI and blindness for the gender of participants was also determined. The adjusted odds ratio (AOR) for gender (male/female) was 1.19 (95% CI: 0.80 – 1.76); P = 0.39. The Pearson chi-squared test was 0.75 for gender and VI (X^2 = 0.75, P = 0.39). Of the 563 study participants, 12.79% (n = 72) males and 44.58% (n = 251) females presented with VI and blindness.

TABLE 1: Study participants' sociodemographic and vision-related characteristics at Eastern Cape, South Africa, 2023 (N = 563).

Variables	Frequency (n)	%
Age groups (years)		
35–44	84	14.9
45–54	123	21.8
55–64	161	28.6
65–74	128	22.7
75+	67	11.9
Gender		
Male	133	23.6
Female	430	76.4
Socioeconomic status		
Unemployed	269	47.8
Employed	28	5.0
Pensioner	266	47.2
Place of residence		
Rural	502	89.2
Urban	61	10.8
Ocular diseases		
None	268	47.6
Cataract	112	19.9
Glaucoma	13	2.3
DR	9	1.6
Corneal opacity	3	0.5
Others	158	28.1
Systemic conditions		
None	211	37.5
HTN	160	28.4
DM	29	5.2
HTN and DM	101	17.9
HIV or AIDS	44	7.8
Others	18	3.2

DR, diabetic retinopathy; HTN, hypertension; DM, diabetes mellitus.

The overall study participants' age distribution was normally distributed, symmetrical around the mean of 59.17 ± 12.95 years. It was found that there was a variation in the spread distribution of participants according to age groups. The majority of participants fell within the age groups ranging from 45 years to 74 years (Table 1). The Pearson chi-squared test statistic value for age was 20.61 (X^2 = 20.61, P < 0.001).

The VI in this study was classified into 1 (mild or no VI), 2 (moderate VI), 3 (severe VI) and 4 (blindness). The study found that 42.10% of participants had moderate VI, followed by 8.90% with severe VI and 6.60% had blindness (Table 2). The Pearson chi-squared test statistic value for the VA variable was 550.82 (X^2 = 550.82, P < 0.001). In the frequency distribution of the URE status among the 563 participants, 42.27% (n = 238) had myopia, 45.65% (n = 257) with hyperopia and 6.04% (n = 34) had astigmatism. However, during crosstab descriptive analysis, the study showed that 25% of myopia cases contributed largely towards the development of VI and blindness, followed by 22% of hyperopia. The category labelled none, referred to the absence of refractive errors (6.04%, n = 34) (Table 2). The Pearson chi-squared test statistic value for the URE variable to VI was 36.99 (X^2 = 36.99, P < 0.001).

Overall, the study presented the leading causes of VI and blindness as URE (38%), followed by cataracts (19.9%), glaucoma (2.3%), DR (1.6%) and corneal opacities (0.5%). Other ocular diseases that were reported from the clinical records included ARMD, post-surgical complications, optic atrophy, amblyopia, corneal dystrophy, strabismus, cytomegalovirus (CMV) retinitis and phthisis bulbi, which combined contributed (28.1%). The Pearson chi-squared test statistic for these common ocular diseases to VI was 35.91 (X^2 = 35.91, P < 0.001), and the AOR for the presence of the ocular

TABLE 2: Forms of visual impairment categories among study participants in the Eastern Cape, 2023 (N = 563).

VI Category	Frequency (n)	%
Moderate VI	237	42.10
Severe VI	50	8.90
Blindness	37	6.60
Total	324	57.50
Refractive status		
Myopia	238	42.27
Hyperopia	257	45.65
Astigmatism	34	6.00
None	34	6.00

Note: Moderate VI = ≤ 6/18 – ≥ 6/60; Severe VI = ≤ 6/60 – ≥ 3/60; Blindness = ≤ 3/60 – NLP; Myopia = < -0.50 D; Hyperopia = > +0.50 D; Astigmatism = > -0.50 DC.

NLP, no light perception; VI, visual impairment; D, dioptres; DC, dioptre cyls.

diseases was 1.61 (95% CI: 1.15–2.25). In addition, the Pearson chi-squared test statistic for the reported systemic conditions and VI in this study was 15.80 (X^2 = 15.80, P = 0.01).

Discussion

Gender of study participants

In the examination of 563 clinical record files, it was observed that 76.40% (n = 430) of the participants were females representing three-fourths of the study population. This percentage exceeded those reported in other studies, which indicated a higher prevalence of vision loss among women of approximately 55%.[15,17] In contrast, 23.60% (n = 133) were males in this study, representing just below a quarter of the population. Additionally, the study found that 44.58% (n = 251) of females were affected by VI and blindness, compared to 12.79% (n = 72) of males. However, on analysis, this was not statistically significant (P = 0.39). Although the study population was not randomly selected, there may have been a gender imbalance, possibly because women are more likely to seek out free eye care services because of financial constraints, particularly if they are unemployed.[36] Therefore, the findings of this study were consistent with other recent studies, showing a higher prevalence of VI and blindness among females.[2,6,10,37,38,39,40,41] However, these findings highlight the relevance of gender in understanding eye health, shedding light on potential gender-specific implications in this domain.

Place of residence

In this study, the place of residence was categorised into rural and urban areas. The study's main findings indicated that nearly 9 out of 10 participants lived in rural areas, such as villages and townships. Most participants (51.70%) presenting with VI and blindness reported residing in rural areas. However, this finding was not statistically significant (P = 0.41). The analysis of this study's findings showed a noticeable, albeit nonsignificant association of VI with the place of residence. These findings might have been influenced by the rural location of the Phelophepa Train during the period of visits. Poor residential dwellings as the social determinants of health are reported in the literature to be associated with higher VI, and findings from the current study were consistent with reports from previous studies.[38] According to the WHO,[42] the prevalence of VI in low-middle-income regions was estimated to be four times higher than in high-income regions. Therefore, the findings from this study from the Eastern Cape did not confirm a significant association between residential areas with substandard housing infrastructure that are poorly serviced or overcrowded and the development of VI and blindness. However, the literature has a strong consensus that VI is associated with poor community dwellings.[43,44]

Age of study participants

Age was one of the statistically significant variables (P < 0.001) and a major contributing factor towards VI and blindness in this study. The significant findings correspond with results from a study by Assefa et al.,[9] which found that adults aged 40–60 years were three times more likely to present with VI compared to those aged 18–39 years, adults aged > 64 years were found to be even 12 times more likely to develop VI.[9] The association between age groups for participants and VI in this study was indicated (P < 0.001). Moreover, the findings of this study showed a significant rise in the prevalence of VI aligned with age, which is consistent with recent research.[6,11,13,40,41] This trend was also supported by Aljied et al.,[45] who found that VI increased from 2.7% in individuals aged 45–54 years to 15.6% in those aged 75–84 years. Consequently, age emerged as a predictor of VI and blindness in this study.[6]

The socioeconomic status of study participants

In this study, socioeconomic status was categorised into three groups: unemployed, employed and pensioners. The analysis revealed, in line with previous research, that unemployed individuals are at a higher risk of developing VIs and blindness compared to those who are employed.[13,46] This finding highlights how employment status can significantly affect visual health and points to the need for further research to explore the underlying factors contributing to this disparity. A statistically significant association (P < 0.000) was found between participants' socioeconomic status and VIs. This study's findings suggest that individuals with lower socioeconomic status may experience a higher prevalence of VIs. Consistent with the findings of the study conducted by Bizuneh et al. in Gish Abay Town, Northwest Ethiopia, 46.3% of participants with VIs had no formal education and were unemployed.[47]

Visual acuities

The criteria used in determining the prevalence of VI in this study was based on the presenting or UVA in the better-seeing eye.[1,8,9] However, the study found that moderate VI was the most common, while severe VI was much less prevalent, and a small proportion of participants were blind. The study found that 42.10% of participants had moderate VI, followed by 8.90% with severe VI, and 6.60% had blindness. Thus, VI has been observed to reduce the functionality of the eyes, resulting in decreased VA.[6]

Most patients in this study were found to have presented with VA worse than 6/18, which significantly improved with the best spectacle correction. After the provision of vision corrections, 9 out of 10 participants showed significant improvement in their VA. In this study, only cases of bilateral VI were included. If only one eye was impaired while the other was unaffected, it was not classified as VI. This approach may have led to an underestimation of the actual magnitude and burden of VI in the current study population.[9] Thus, this led to the conclusion that reduced VA was associated with a high prevalence of VI and blindness.

Refractive status

This study revealed that 42% of participants had myopia and 46% had hyperopia. However, after conducting a crosstab descriptive analysis, the study showed that 25% of myopia cases contributed largely towards the development of VI and blindness, followed by 22% of hyperopia. These findings were in alignment with reports from other previous studies asserting that myopia is one of the leading causes of VI.[48,49] Uncorrected refractive errors themselves typically do not lead directly to blindness. However, they can cause significant VI and discomfort when not corrected and impact daily activities and quality of life. This research found that URE at 38% was the primary cause of the prevalence of VI from the study population in the Eastern Cape province of South Africa. There was a significant ($P < 0.001$) association between URE and a high prevalence of VI. While UREs are a significant cause of VI, blindness generally arises from more severe or untreated eye conditions or complications.

Our study findings are in agreement with results from other recent studies displaying URE as the significant global and leading cause of VI.[9,46,50] Additionally, Hudu et al.[11] assert that URE was the major global and leading cause of VI, reported to be 43%. Therefore, the URE was associated with a high prevalence of VI in this study ($P < 0.001$). These findings underscore the critical importance of addressing UREs and promoting accessible eye care services to improve overall eye health.

Ocular diseases

Other common causes, besides refractive error, leading to VI and blindness in this study were cataracts (19.9%), glaucoma (2.3%), DR (1.6%) and corneal opacities (0.5%). A study conducted in Nigeria by Adigun et al.[19] reported glaucoma at 2.9%. Other reported ocular diseases (28.1%) that were found to impact vision in this study included ARMD, post-surgical complications, optic atrophy, amblyopia, corneal dystrophy, strabismus and phthisis bulbi. The study found that more than half of the participants had some form of these reported common ocular diseases. The findings of this study were consistent with other recent studies conducted elsewhere.[11,46,47]

Similar to this study, cataracts were reported to be the second major global cause of VI.[11] Other studies reported cataracts as the leading cause of bilateral VI and blindness.[46,47] Glaucoma has been reported to be the third most common global cause of VI, at around 2%,[11] which was consistent with the findings of the current study. Other global causes of VI reported in the literature included ARMD, DR, trachoma and corneal opacities, which were also in alignment with the findings of this study.[9,11] This study revealed a significant association ($P < 0.00$) between ocular diseases and VI, showing a 1.6 times higher likelihood of developing VI in the presence of cataracts, glaucoma and corneal opacities. Cataracts were particularly notable, affecting 20% of the sampled population. These findings are consistent with research conducted in high-income countries, including Russia, among individuals aged 40 and older. Bikbov et al.[51] in their study reported that cataract was by far the most frequent cause for MSVI (59.9%) and blindness (27.3%).

Systemic conditions

Upon taking the case history during the examination, patients revealed the presence of chronic systemic conditions. These records and information were then included as vital components of the data collected for this study, offering valuable insight into patients' health status. The findings of this study established that HTN was the most common chronic disease among the study participants (28.42%), followed by the comorbidities of HTN and DM (17.94%), HIV or AIDS (7.82%), DM (5.20%) and any other health conditions that were reported, including tuberculosis, systemic lupus erythematosus and cholesterol accounted for 3.20%. These findings were consistent with the report by Abdianwall et al. in a study conducted in Afghanistan, where 20.8% of participants had HTN and 4.6% had DM.[46]

Other previous studies reported that systemic comorbidities such as HTN and DM played a critical role in the high prevalence of VI.[9,52] A significant association between the documented systemic conditions and the prevalence of VI was also reported.[9,52] Diabetic retinopathy also emerged as a cause of VI, consistent with findings reported in previous studies that align with the results of the current research.[2,6] Additionally, HIV or AIDS complications and HTN were also reported as systemic conditions or diseases leading towards devastating visual consequences of VI.[5]

In the research conducted, it was found that over two-thirds of the participants had a medical history of systemic chronic conditions, such as HTN, coexistence of HTN and DM and HIV or AIDS. This finding has significant implications for eye health, suggesting that individuals with systemic chronic conditions may be at higher risk for developing eye-related complications or diseases. Understanding these associations can help in developing targeted interventions or preventive measures to safeguard eye health in at-risk populations.

The prevalence of visual impairment

This study found that the prevalence of VI and blindness among adults aged 35 years and above in the Eastern Cape province of South Africa was high. The prevalence of VI was 51%, while blindness was 6.6%. The combined frequency of VI and blindness was 57.6% (95% CI: 53.0%–61.0%). The majority of participants with VI (42.10%) had a moderate impairment, followed by 8.90% with severe impairment and 6.60% with blindness. A considerable number of participants with VI were 45 years and above. The study identified URE as the leading cause of VI and blindness, followed by cataracts, glaucoma, DR and corneal opacities.

The prevalence of VI and blindness in this study was consistent with the findings from a study conducted by Mashige et al. in Durban, South Africa.[53] The study employed a cross-sectional design to assess the prevalence and underlying causes of VI among older individuals in low-income nursing homes, finding a combined prevalence of VI and blindness at 63.6%. The prevalence of VI in the current study was higher compared to previous studies with similar study designs conducted elsewhere as in Ethiopia (16.8%),[9] Nepal (45.57%),[24] Owerri, Imo State, Nigeria (35.3%),[25] Iran (6.43%),[54] Limpopo, South Africa (28%),[55] eThekwini district of KwaZulu-Natal, South Africa (42%),[56] India (20.1%),[13] Afghanistan (22.6%),[46] India (24.5%),[57] Sri Lanka (21.3%),[58] Uganda (32.1%)[12] and Limpopo, South Africa (26.4%).[59]

Previous studies may have varied in their designs, such as being community based, hospital based or institutional based. Other factors that could have contributed to differences in results include differences in study areas and population demographics, age groups studied, socioeconomic status, case definition, primary data sources, access to eye care services and review of patient records. In contrast, this hospital-based study may have led to a higher prevalence of VI and blindness because of the likelihood of a specific portion of the population presenting to the free eye clinic facility with known eye conditions and chronic systemic conditions leading to VI. Our study results provided an approximate proportion of individuals with VI in the Eastern Cape province who attended the Phelophepa Train eye clinic. Although we could not confirm the total number of participants relative to the entire population, our findings shed light on the prevalence of VI in the region.

Limitations of the study and possible suggestions for future research

The study may be limited in its generalisation as it has only been conducted among patients from communities in the Eastern Cape, predominantly rural, who visited the Phelophepa Train.

Most of these patients forming part of the sample did not have access to adequate eye care services from their local community healthcare centres. They could not afford expensive private healthcare services; therefore, there may be an unusually high turnout for free eye care services within this Train setting. As a result of this limitation, the findings may not fully represent the true prevalence of VI of the entire population in other regions with different sociodemographic characteristics, which should be considered when results are applied.

Retrospective quantitative data used is also one of the limitations of this study. Because of the retrospective data providing the researchers with data recorded for reasons other than the research, its collection depended on a review of archived clinical data originally collected using preexisting secondary research data. Thus, incorporating primary data collection methods would provide more relevant information on the topic and yield different results. Integrating a qualitative design (forming a mixed method) may provide a better understanding of the associated factors and causes of the prevalence of VI and blindness among the measured variables and improve the generalisability of the findings.

The current study considered the better-seeing eye presenting distance VA. This indicates presenting with a VA of worse than or equal to 6/18 in the better eye was considered as VI, and this was the cut-off VA used for this study. However, if one eye was visually impaired and the other was not impaired, the researcher considered that case as no VI, which might have underestimated the magnitude and burden of VI. Those individuals categorised as mild to no VI (an eye with VA better than 6/18) were not included in the determination of the prevalence of VI, which also might have underestimated the magnitude and prevalence of VI in this study.

The study utilised a self-developed, non-standardised data collection tool, which may have contributed to some study variables showing statistically nonsignificant results or could be attributed to random sampling error. The study could not explore other demographic characteristics such as household or individual income and marital status. Unhealthy behaviours such as smoking status, alcohol intake, low diet quality and low physical activity could not be assessed by the current study, which may be associated with the development of VI.[12,60] This offers the potential for a more extensive longitudinal population-based research study.

Conclusion

The primary causes of VI were URE, cataracts, glaucoma, DR and corneal opacities. The study found that myopia largely contributed towards the development of VI and blindness. The most common chronic diseases found among participants were HTN, followed by comorbidities of HTN and DM, HIV or AIDS and DM. Increasing age and low socioeconomic status were positively associated with VI and blindness. Overall, the study discovered that the prevalence of VI was high, with a combined prevalence of 57.6% among adults aged 35 years and older.

This includes VI at 51% and blindness at 6.6%. These findings could have significant implications for shaping eye health policies, prompting a need for further research and potential adjustments to existing policies.

To achieve universal health coverage, it is imperative to ensure the availability of vision screening facilities for individuals of all ages and demographics. Early detection of systemic conditions, such as DM or HTN, and comprehensive eye examinations can significantly contribute to positive overall health outcomes. Timely referral to specialists and access to affordable, high-quality eye care services are crucial components in addressing vision-related issues and promoting general well-being within communities.

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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

S.M.M. conceptualised the project, including the design, data collection, analysis and write-up, while T.I.M. supervised the overall project. S.M.M. and T.I.M. both contributed to the preparation of the article.

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Data availability

Data supporting the findings of this study are available from the corresponding author, T.I.M., upon reasonable request.

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