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Prevalence and barriers to screening for refractive errors among commercial motorcyclists in kamukuzi ward-mbarara city north division

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Abstract

Background: Refractive errors significantly affect commercial motorcyclists with fatal and disability consequences related to road traffic injuries sustained due to poor vision, this risk is exacerbated by low screening rates among commercial motorcyclists before licensing. **Objectives:** The objective of the study was to determine the Prevalence and types of refractive errors, describe barriers to refractive error screening and determine the proportion of corrective spectacle use among commercial motorcyclists in Kamukuzi ward- Mbarara city North Division. **Design:** A descriptive quantitative cross-sectional community-based study. **Methods:** Study was conducted in Kamukuzi ward-Mbarara city North division on commercial motorcyclists between April to June 2025. Used multi-stage sampling technique to randomly select participants from 6 main stages. All participants underwent visual acuity testing, refraction and physical eye examination, used pre-tested questionnaire to collect data, entered in Epi-info and exported to Excel and STATA 17 for quantitative analysis. Fisher's Exact test was used to compare distributions of refractive errors between groups, with statistical significance considered at $p<0.05$. Previous eye examination, awareness of the need for eye screening before riding and riding licence possession were also captured using the questionnaire. **Results:** A total of 415 male commercial motorcyclists with median age 35 years, age range 20-64 years were enrolled, 158 (38.1%) had distance refractive errors. Of these, 99(62.7%) had astigmatism, 43(27.2%) myopia and 16(10.1%) hyperopia. Participants with presbyopia were 63 (15.2%). Majority 324 (78.1%) of participants had never screened and the most common barriers to screening were unfelt need (66.98%), unawareness (60.80%), costs (50.31%) and no time (38.27%). Only 2.5% were found to use appropriate corrective spectacles. Only 78 (18.8%) held a valid riding licence and 251 (60.5%) were not aware that they were supposed to undergo eye screening before riding. **Conclusions:** The high prevalence of refractive errors, low screening uptake and low corrective spectacle use identified in this study suggest a need for targeted interventions, including general public awareness, outreach activities to commercial motorcyclists, enforcement of existing regulations on mandatory eye examination and making corrective services more affordable, which may help address these gaps among commercial motorcyclists in Kamukuzi ward, Mbarara city North Division.

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Plain language Summary

Good vision is essential for safe motorcycle riding, yet many commercial motorcyclists do not routinely have their eyes checked. This study looked at how common refractive errors (problems with focusing that cause blurred vision) are among commercial motorcyclists in Kamukuzi Ward, Mbarara City, and explored why many riders do not seek eye screening or use corrective spectacles. We conducted a community-based study among 415 commercial motorcyclists between April and June 2025. All participants underwent vision testing and eye examinations, and they also completed a questionnaire about eye screening practices and possible barriers to accessing eye care services. We found that more than one in three motorcyclists (38.1%) had distance vision problems, while 15.2% had near vision problems related to age. Astigmatism was the most common vision problem identified. Despite this high burden, only about one in five riders had ever undergone an eye examination, and only 2.5% of those who needed spectacles were using appropriate corrective glasses. The most common reasons for not seeking eye screening included the belief that there was no problem with their eyes, lack of knowledge about where to get eye care services, cost of services, and lack of time. Notably, most riders worked close to an eye care facility, suggesting that awareness and affordability, rather than distance, were the main barriers. These findings highlight the need for increased awareness, affordable eye care services, and enforcement of mandatory eye examinations for commercial motorcyclists to improve vision, increase spectacle use, and enhance road safety.

Keywords

refractive errors, screening, barriers, corrective spectacles, commercial motorcyclists, astigmatism, myopia, hyperopia, presbyopia

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Introduction

Refractive errors (RE) also known as ametropia refers to an eye condition where rays of light from an object at infinity are not brought to a point on the retina resulting into blurring of vision.[1] These errors include myopia (nearsightedness), hyperopia (far-sightedness), astigmatism (asymmetrical corneal or lens surface) and presbyopia associated with age related loss of accommodative power of the crystalline lens.

In 2021, the Lancet commission report on vision noted that uncorrected refractive errors (URE) were the leading cause of moderate to severe visual impairment and second leading cause of correctable blindness worldwide affecting all age groups.[2] Currently there are about 3.7 million people who have completely lost vision and approximately 157 million are living with moderate to severe visual impairment due to uncorrected refractive errors.[2] In sub-Saharan Africa, the prevalence of refractive errors is 12.6%,[3] while in Uganda the prevalence varies by population, gender and age group studied.[4,5]

Commercial motorcyclists commonly known as "Boda-Boda" in Uganda and East Africa at large, "Okada" in Nigeria, SafeBoda/Uber Boda in Rwanda is a popular and flexible means of transportation in East, West and central Africa as well as South east Asia, informally employing a substantial number of people mainly youth and men.[6]

Uncorrected refractive errors substantially impact on health well-being of affected individuals based on the age group with 32% improvement in productivity after correction.[7] Among commercial motorist this can be associated with increasing road traffic accidents. Riders with uncorrected refractive errors may experience blurred vision, eye strain, headaches and difficulty recognising road signs, pedestrians and approaching vehicles, especially in low light and at night, which delays hazard detection and reaction time.[8,9] A study among commercial motorcyclists in Kampala attributed 55.6% of boda-boda related road traffic accidents to vision challenges.[10] Beyond the safety risk, injury or loss of vision directly threatens the rider's income and that of his dependants, since commercial riding is often the family's main source of livelihood.

Clinically, refractive error is suspected when there is visual acuity (VA) improvement of at least two lines with pinhole testing from the initial visual acuity at presentation, it is confirmed after refraction and comprehensive eye examination.[11,12] Early detection of refractive errors and appropriate correction through screening, health promotion, and increased public awareness, improved access to corrective services such as use of corrective spectacles, contact lenses and corneal refractive surgeries help to improve quality of life of people with refractive errors.[13,14]

Barriers to refractive error screening among commercial motorists in general include: lack of awareness about screening services, high screening costs, limited time to undertake eye screening, poor attitude towards corrective interventions, fear of being denied riding licenses and unfelt need to do eye screening.[15–17] Similarly, a descriptive cross-sectional study assessing knowledge and attitude towards preventive eye practices among 235 commercial motorcyclists in Ibadan, west Nigeria, reported having no eye problem (22.6%) and not knowing where to go for testing (0.4%) as other perceived barriers to screening.[18]

Corrective spectacle use among commercial motorcyclists is generally low across the region, reported at 1.3% in Kinshasa-DRC[19] and 3.08% in Nigeria,[20] while a study in Uganda reported that none of the commercial motorcyclists surveyed wore corrective spectacles.[10]

A cross-sectional study conducted among 75 commercial motorcyclists with a history of road traffic accident in Kinshasa-Democratic Republic of Congo reported prevalence of refractive errors at 43%, the most common types were hyperopia 10.6%, myopia 9.3% and astigmatism 1.3%.[19] In a similar study conducted in Kampala on 382 commercial motorcyclists reported a prevalence of 6.02% among only those with visual impairment.[10] However, the overall prevalence and types of refractive errors among commercial motorcyclist in Uganda and specifically Mbarara remain unknown due to paucity of data.

The aim of the study was to determine the prevalence and types of refractive errors, describe barriers to refractive error screening and also determine the proportion of corrective spectacle use among commercial motorcyclists in Kamukuzi-Ward Mbarara city North Division. This would Increase our knowledge on the general prevalence and types of refractive errors among commercial motorcyclists, Help eye care workers, the Police traffic department, motor vehicle and motorcycle licensing bodies in developing and executing comprehensive eye screening programs for commercial motorcyclists and also address the barriers to accessing corrective services for motorcyclists with refractive errors hence help in reducing the burden of road traffic accidents that can be attributed to refractive errors in Uganda.

Methods

The reporting of this study conforms to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for observational studies[21]

Study design

This was a descriptive quantitative cross-sectional community-based study.

Study area

The study was conducted in Kamukuzi ward- Mbarara North Division located in the northern part of Mbarara city-western Uganda.

It occupies 1,601 hectares with a population of about 23,161 people according to the 2024 population census Uganda Bureau of statistics report. It has an organized boda-boda leadership under the umbrella "Mbarara city Boda-Boda operators Association with about 2,400 members (within Kamukuzi) and 80 stages. On average each stage has 30 commercial motorcyclists/boda-boda riders. The most common means of transport in Kamukuzi ward is the use of commercial motorcycles.

Mbarara University and Referral Hospital Eye Centre (MURHEC) is the main public eye hospital within Kamukuzi ward. The facility offers comprehensive and specialized eye care services including eye screening and correction of refractive errors among others that are required prior to licensing.

The facility also offers training to both undergraduate and postgraduate students, clinical care services, research, community health promotion with support from partners such as college of ophthalmology of Eastern, Central and southern Africa (COECSA), Lions Club.

Study period

The study was conducted from April 2025 to June 2025.

Target population

The target population were the commercial motor cyclists in Kamukuzi ward.

Study population

The study population were commercial motorcyclists/boda-boda riders operating in Kamukuzi ward.

Inclusion criteria

The commercial motorcyclists enrolled in the study met all the following criteria for enrollment.

— The commercial motorcyclist found parked at one of the commercial motorcycle stages within Kamukuzi ward
— Commercial motorcyclist above 18 years of age.

Exclusion criteria

We excluded the following commercial motorcyclists though found at any of the study stages.

— Non stage members. This also applied to motorcyclists who worked within Kamukuzi ward but were found parked in a different stage from their registered stage within Kamukuzi ward.

Sample size estimation

The sample size was calculated using the formulae by Kish Leslie for cross-sectional studies for sample estimation for single population.[22]

$$\frac{n = z^2 * P\ (1 - P)}{r^2}$$

Where: Z = Standard deviation for two tailed tests based on alpha (relates to the confidence Interval level) assumed at 95% = 1.96.

P = estimated prevalence of refractive errors among commercial motorcyclist based on a study in Kinshasa-DRC was 43%.[19]
r = the estimated margin of error assumed at 5% (0.05)

Therefore:

$$\frac{n = 1.96^2 * 0.43\ (1 - 0.43)}{0.05^2}$$

This provided a minimum sample size of 377 participants. To account for a 10% predicted non – response, the final minimum sample size was **415 participants.**

Study variables

The dependent (outcome) variable was the presence of a distance refractive error (yes/no), with type (myopia, hyperopia or astigmatism) and severity (mild, moderate or severe) further assessed among those affected. The independent variables included socio-demographics (age, education level, marital status, average daily income), screening-related factors (number of screening points, cost of screening, accessibility), knowledge/perceptions, spectacle use and work-related factors (duration of riding, possession of license, previous history of vision screening), as summarized on the conceptual framework.

All study variables were included in the data collection tool for its validity. Age, duration of riding and average daily income were captured as numerical (continuous) variables, while refractive error status, education level, marital status, screening-related factors, knowledge/perceptions, spectacle use, license possession and previous screening history were captured as categorical variables. For descriptive and comparative analysis, numerical variables were subsequently collapsed into categories (age groups, duration of riding $\leq$10 versus >10 years, and income brackets).

Recruitment of the commercial motorcyclist/boda-boda stages

Prior to data collection permission was sought from the chairman of the boda-boda operators Association in Kamukuzi ward and also requested for permission to conduct the study among members. Current data on the number of commercial motorcyclists operating within Kamukuzi ward was obtained from the chairman of the Boda-Boda Association, this also

included the number of both gazetted and non-gazetted stages in the various parishes and villages, number of registered commercial motorcyclists. Contacts and details of various stage leaders were obtained for proper coordination.

We used a multi-stage sampling method to randomly select stages where each stage was regarded as a stratum with a given number of commercial motorcyclists. Stage1 involved zoning Kamukuzi ward into 6 as per the Table 1 below and determined number of commercial motorcycle stages in each. Stage 2 involved proportionate determination of the stages to include in the study based on rider numbers and number of motorcyclists in each using updated registration lists. In Stage 3, we determined the proportionate contribution of each stage and then used simple random sampling to select the actual study participants.

To determine the proportionate contribution/allocation from each stage, the total number of commercial motorcyclists in a stage (a) was divided by the total number of commercial motorcyclists in the stages to be studied (N=1402, obtained by adding the number of motorcyclists in all the 6 main stages), then multiplied by the study sample size (n=415).

Recruitment of study participants

The study team composed of the principal investigator, senior optometrist and research assistant reached the selected stages on the specific days. They introduced themselves and explained to all boda-boda motorcyclists found at the respective stages the purpose and procedure of the study.

Using the updated lists of commercial motorcyclists obtained from the chairpersons of the respective stages, the team randomly selected the participants that took part in the study according to the number required per stage.

We then obtained written informed consent from the selected commercial motorcyclists who were found eligible to participate in the study.

Data collection procedure

The translated study tool/questionnaire used was first pre-tested on 20 (5%) commercial motorcyclists from 2 stages that were not included during analysis to ensure reliability of the tool.

The sampled study participants went through distance vision testing with the use of standard E distance vision charts (to cater for both literate and illiterate study participants) held at 6 meters in a well-lit area. Near vision (for presbyopia) was tested binocularly with N notation charts at a working distance of 33 cm and pin hole testing done to identify participants presumed to have refractive errors. These were then subjected to both objective non cycloplegic refraction using a retinoscope and subjective refraction conducted by optometrist to confirm and grade the severity of the error. In this study, the magnitude of refractive error considered to be significant was +/- 0.5D and above[23]

The distance refractive errors were categorized as myopia, hyperopia or astigmatism, with severity classified as mild, moderate or severe, according to the classification system used by Flitcroft and Ore et al.[23,24] Myopia mild <-3D, moderate -3 to -6D and >-6D severe, Hyperopia <+2D mild, +3 to +5D moderate and >+5D severe. Astigmatism <1D mild, 1-2D mild, 2-3D severe and >3D extreme.

All eligible study participants including those with normal visual acuity (better than 6/12) completed a pre-tested semi structured questionnaire independently and those who could not read and write were assisted by an impartial witness identified from the stage. The study questionnaire captured all the possible barriers to eye screening as previously reported from similar studies[15,17,24] and also catered for divergent views under others. A participant was required to tick all barriers that could have hindered him from undertaking an eye examination from the list and for responses that were not on the list, the participant specified his opinion clearly under others. All responses were later categorized or grouped into 1) lack of awareness, 2) unfelt need 3) lack of affordability 4) lack of accessibility 5) personal barriers.

Table 1. Showing the proportionate contribution from each stage.

Stage	Number of commercial motorcyclists (a)	Proportion (a/N*n)	Percentage (%)
Rwebikoona	395	117	28.2
Kiyanja	304	90	21.7
Ntare	105	31	7.5
Taso village	213	63	15.2
Makan sigh	277	82	19.8
Stanbic bank	108	32	7.7

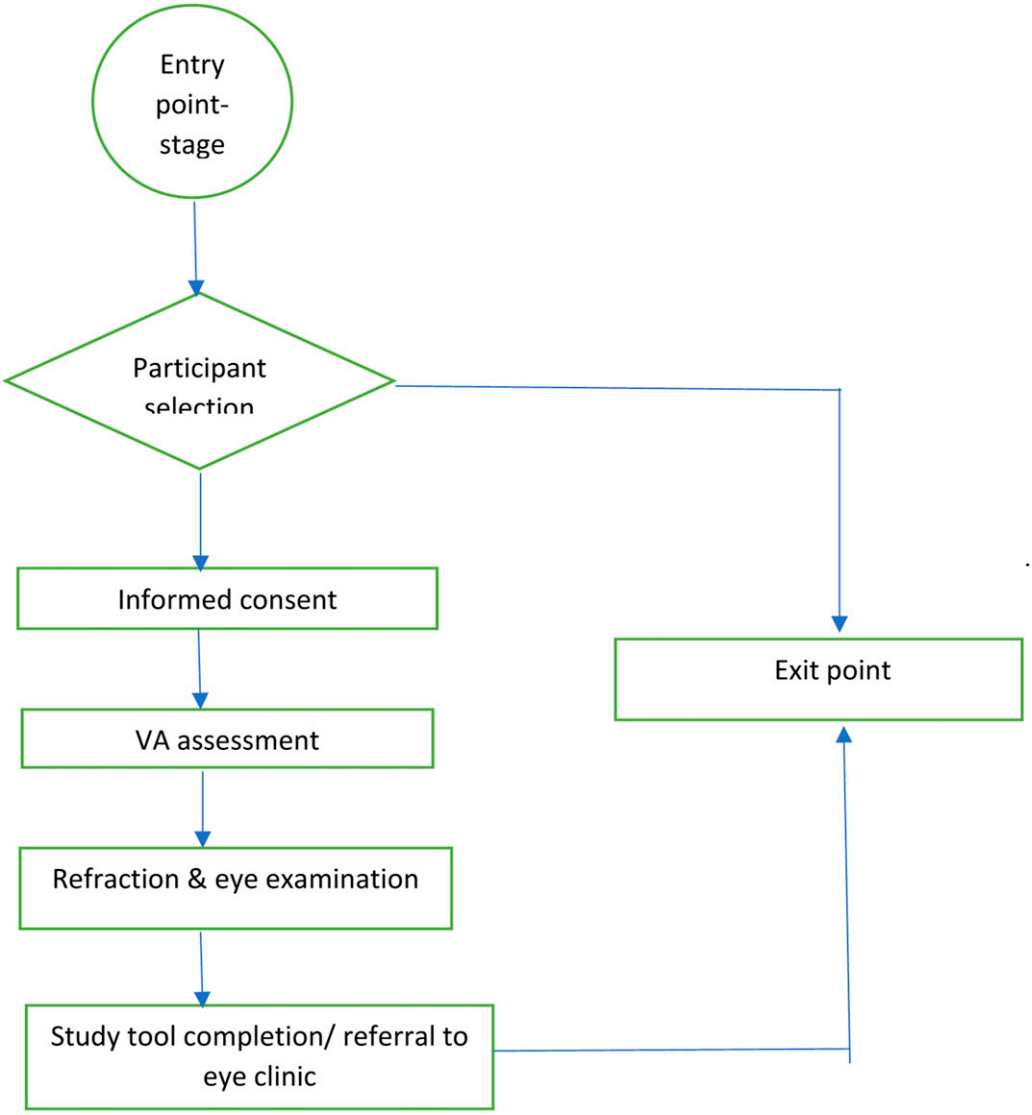
Those found to wear corrective spectacles were also refracted to determine effective spectacle use and proportion of corrective wear.

A medium sized portable screening tent was used throughout the data collection process to provide privacy and an ideal semi-dark screening environment for objective refraction. The tent was assembled conveniently at the respective stages where several nearby stages in the study or commercial motorcyclists could access the eye examination.

After visual acuity testing, those with no pin hole improvement went through comprehensive anterior and posterior segment examination conducted by a principal investigator who's an ophthalmologist to identify any other vision impairing eye conditions. Intra-ocular pressure was also measured for all participants using Icare 200. Other diagnostic and clinical examination items that were used on some participants for detailed eye examination included; direct ophthalmoscope, pen torch, fluorescein sodium strips, amethocaine and short acting mydriatic eye drops. Commercial motorcyclists who were found with serious eye problems during the study were given free health education about their eye conditions, possible effects on their vision and riding profession, treatment options including medical and surgical interventions available, costs and also where these services are offered within our catchment area. About 10 participants were referred from the field to the eye hospitals for further eye assessment.

Participants with significant refractive errors or serious vision impairing ocular conditions were referred to facilities where they could access affordable and corrective services. Furthermore, our contacts were availed to the stage chairpersons to quicken access to eye hospitals and more guidance.

Participant Flow



Data entry

Raw data from the questionnaires was entered in Epi info using personal computers and later exported to MS Excel for cleaning and STATA version 17 for analysis.

Data analysis

During analysis we excluded data from the 20 motorcyclists collected during study tool pre-testing and also participants who had undergone eye screening in any recognized eye hospitals when assessing for barriers to screening.

Data were categorized under different sections during collection and analysis. Numerical variables (age, duration of riding and average daily income) were summarized using medians and interquartile ranges, as the data were not normally distributed, while categorical variables (including refractive error status, education level, marital status, screening-related factors, license possession and previous screening history) were summarized as frequencies and percentages. Assessment of current refractive status and history of refractive error screening were analyzed and presented in tables.

Prevalence of refractive errors (x) was determined as a percentage of participants found to have refractive errors (a) divided by the total number of participants recruited in the study (b). These were further categorized by the type of refractive error and severity of error. Fisher's exact test was used to assess associations between refractive error status and independent variables when more than 20% of the expected cell counts were below 5, particularly in the older age categories. Statistical significance was considered at $p<0.05$.

$$X = (a \ / \ b) \ 100$$

The proportion of spectacle use (c) was computed from the number of commercial motorcyclists with refractive errors who received the prescribed corrective spectacles at the time of the study (d) divided by the total number of motorcyclists with refractive errors (e) and this was presented as a pie-chart.

$$C = d \ / e$$

The barriers to eye screening among study participants who had never screened in any recognized eye hospital were summarized quantitatively in a frequency table according to number of responses.

Quality control

The study was conducted by trained and skilled research personnel, used a pre-tested semi structured questionnaire that was translated into the local language (Runyankole) for some participant who preferred the local language. The team checked all questionnaires instantly in the field for completeness and also used standard generally acceptable research tools mentioned above.

Ethical consideration

The study was conducted with clearance Research Ethics Committee of Mbarara University of Science and Technology on the 28/3/2025 reference number MUST-2024-2024.

Written consent and Permission were sought from Mbarara city boda-boda operators association and the boda-boda stage leadership. The purpose of the study was clearly explained to all study participants and also informed written consent obtained from each study participant.

The team ensured that all shared screening tools were properly sanitized and safe to be reused on another study participant in line with the Monkey pox, Covid-19 and Ebola risk management and prevention protocol.

All participant's data was kept confidential, safe and secure by using pass worded computers.

All study participants voluntarily chose to participate in the study without coercion and were free to opt out at any stage during the study and all compensated for their valuable time.

Results

Socio-demographic characteristics of study participants

The study enrolled 415 commercial motorcyclists. Table1 shows the socio-demographic characteristics of study participants.

The participants were exclusively male between 20-64 years, majority in the age group 30–39 years (34.2%) and median age 35 years. In terms of education, 234(56.4%) had completed primary education and 22(5.3%) had never attended school.

Most riders 294(70.8%) had been in the occupation for 10 years or less, notably, 286(68.9%) had never registered for a riding license and only 78(18.8%) held a valid license. Majority of riders 316(76.1%) earned between 10,000 and 20,000 Uganda shillings (UGX) everyday.

In terms of proximity to eye screening facilities, all the riders worked less than 5km away from the eye hospital although 251(60.5%) were not aware about eye screening. Only 96(23.1%) of participants were always using protective goggles and 213(51.3%) reported history of a road traffic accident. (Table 2).

Prevalence and types of Refractive errors among commercial motorcyclists

Out of 415 participants, 158 had distance refractive errors giving an overall prevalence of 38.1% while the prevalence of presbyopia among study participants was 15.2%. The types of distance refractive errors among the study participants were; Simple myopic astigmatism (51.9%), myopia (27.2%) and hyperopia (10.1%). (Table 3)

Association between age group and distance refractive errors among commercial motorcyclists

There was no statistically significant association between age and distance refractive errors (p=0.30) as shown in (Table 4).

Relatedly, among these 158 participants with distance refractive errors, the majority had mild forms of their respective conditions. For astigmatism, 76(76.8%) were mild, while 23(23.2%) had moderate astigmatism; no severe cases were found. In participants with myopia, 42(97.7%) had mild myopia and only 1(2.3%) had moderate myopia, with no severe cases observed. All 16 participants with hyperopia were mild, with no moderate or severe cases found as indicated in Figure 1.

Barriers to eye screening among commercial motorcyclists

Of the 415 participants, only 91(21.9%) had ever undergone eye screening. Among the 324(78.1%) participants who had never undergone eye screening, a total of 942 responses were recorded, highlighting various barriers to service uptake.

Table 3 below shows the reasons cited by the commercial motorcyclists who had never undergone an eye examination as the barriers from seeking eye screening services.

The most cited reason was the perception of having no eye problems 217(66.98%), followed by lack of knowledge about where to go for an eye examination 197(60.80%), lack of money 163(50.31%).

Additionally, 124(38.27%) reported not having time for screening. A smaller proportion mentioned lack of information 83(25.62%) and delays at health facilities 8(2.47%) as reasons why they have never undergone an eye examination. Only 1(0.31%) cited poor quality of hospital services Table 5.

Proportion of corrective spectacle use among commercial motorcyclists

Among the 158 study participants we diagnosed with distance refractive errors, only 4 were using appropriate corrective spectacles giving a prevalence of corrective spectacle coverage of **2.5%** (95% CI: 1.0 – 6.6) as indicated in Figure 2.

Discussion

Prevalence and types of refractive errors among commercial motorcyclists

Our study enrolled 415 commercial motorcyclists; of whom 158 were found to have various types of distance refractive errors and 63(15.2%) had near vision errors. The prevalence of distance refractive errors among the motorcyclists was 38.1%. This prevalence is significantly higher than that reported in a study by Ademola et al. which found a prevalence of distance refractive errors of 24.5% among commercial motorcyclists working in Ilorin west Nigeria[25] and also higher than that reported by Lusobya et al. that reported a prevalence of refractive errors of 1.7% among commercial motorcyclists in Kawempe, Uganda.[26] This difference can be attributed to the level of refractive error considered significant and also the difference in sampling procedures used, while our study also recruited riders who had visual acuity of 6/6 but with symptoms of refractive errors, the study by Ademola et al. only recruited riders who had vision worse than 6/9 in the better eye,[25] in a study by Lusobya et al. only enrolled riders who had vision of worse than 6/12.

Studies have shown that a person (especially those with astigmatism and hyperopia) can have vision of 6/5 or 6/6 but with a refractive error and in our study 55.1% of the riders with refractive errors had vision of either 6/5 or 6/6 but had symptoms of

Table 2. Socio-demographic characteristics of commercial motorcyclists in Kamukuzi Ward-Mbarara city North Division.

Variable	N	%
Age (Median=35, IQR 28-43) yrs		
Age groups		
20-29	126	30.4
30-39	142	34.2
40-49	112	27.0
50-59	31	7.5
≥60	4	1.0
Sex		
Male	415	100
Education level		
Never gone to school	22	5.3
Primary	234	56.4
Secondary	137	33.0
Tertiary	22	5.3
Marital status		
Divorced	6	1.5
Married	337	81.2
Single	72	17.3
Religion		
Anglican	183	44.1
Catholic	127	30.6
Muslim	39	9.4
Pentecostal	55	13.3
Others	11	2.6
Duration of riding (Years)		
≤10	294	70.8
>10	121	29.2
Average daily income (Ugx)		
<10000	11	2.7
10000-20000	316	76.1
>20000	88	21.2
Riding Licence		
Have one but expired	51	12.3
Never registered	286	68.9
Yes, have a valid licence	78	18.8
History of Road traffic accident		
Yes	213	51.3
No	202	48.7
Distance from screening facility		
≤ 5km	415	100
>5km	-	-
Previous eye examination		
Yes	91	21.9
No	324	78.1
Use of protective goggles		
Always	96	23.1
Rarely	127	30.6
Never use them	192	46.3
Awareness on screening		
Yes	164	39.5
No	251	60.5

Table 3. Prevalence of Refractive errors among commercial motorcyclists.

Prevalence type	Frequency (n)	%	95% CI
Overall prevalence distance RE	158	38.1	(33.5 - 42.9)
Prevalence of Presbyopia	63	15.2	(12.0 -19.0)
Types of distance RE			
Simple myopic astigmatism	82	51.9	
Mixed astigmatism	6	3.8	
Compound myopic astigmatism	11	7.0	
Simple Hyperopic astigmatism	-	-	
Compound hyperopic astigmatism	-	-	
Myopia	43	27.2	
Hyperopia	16	10.1	
Age specific distribution of distance RE			
20-29	44	34.9	
30-39	60	42.3	
40-49	38	33.9	
50-59	13	41.9	
≥60	3	75.0	

refractive errors such as eye straining and persistent headaches. The findings from our study were also higher than findings in a study by Mutombo et al. among 75 riders who presented at a university eye clinic in Kinshasa following a road traffic accident that reported a prevalence of refractive errors of 21.2%.[19] This difference can be attributed to the difference in number of participants recruited in the studies.

The prevalence of distance refractive errors did not differ significantly across the age groups of the riders (p=0.30). It ranged from 33.9% among riders aged 40-49 years to 42.3% among those aged 30-39 years, with no consistent rise with increasing age. This finding partly agrees with evidence from commercial taxi drivers in Shillong, India, where myopia with or without astigmatism, excluding presbyopia, did not vary significantly across age groups.[27] Conversely, commercial drivers with distance refractive errors in northern India were significantly older than those without these errors.[28] Type-specific age associations were also reported in the UK Biobank study, where myopia was more common among younger adults and hyperopia among older adults,[29] and among institutional drivers in Ibadan, Nigeria, where hyperopia was associated with increasing age.[30] Several explanations may account for the absence of an age effect on distance refractive errors in our study. First, most of the distance errors were mild astigmatism and myopia, which usually start earlier in life and tend to persist through adulthood, whereas the age-related change in the eye mainly affects accommodation and therefore near vision. High burdens of myopia have also been reported in younger populations such as university students,[31] suggesting that these errors are already established by early adulthood and are therefore carried across all the working-age groups of riders. Second, the age range of our participants was narrow and young, with 91.6% (380/415) aged below 50 years and only 4 riders aged 60 years and above, so the older age categories had very small numbers. The 75.0% prevalence in the 60 years and above group is based on 3 of 4 riders and cannot be interpreted reliably, and the study may have had limited power to detect age differences. The finding should therefore be read as no evidence of an association with age rather than as proof that age is unimportant. Third, riders with significant uncorrected visual problems may be less likely to continue riding into older age,

Table 4. Association between age group and distance refractive errors among commercial motorcyclists.

Age group (years)	With RE n(%)	Without RE n(%)	Total n	P-value
20-29	44 (34.9)	82 (65.1)	126	0.30
30-39	60 (42.3)	82 (57.7)	142	
40-49	38 (33.9)	74 (66.1)	112	
50-59	13 (41.9)	18 (58.1)	31	
≥60	3 (75.0)	1 (25.0)	4	
Total	158 (38.1)	257 (61.9)	415	

RE=refractive error. χ^2=4.91, df=4, p=0.30 (Fisher's Exact test of association between age group and presence of distance refractive error).

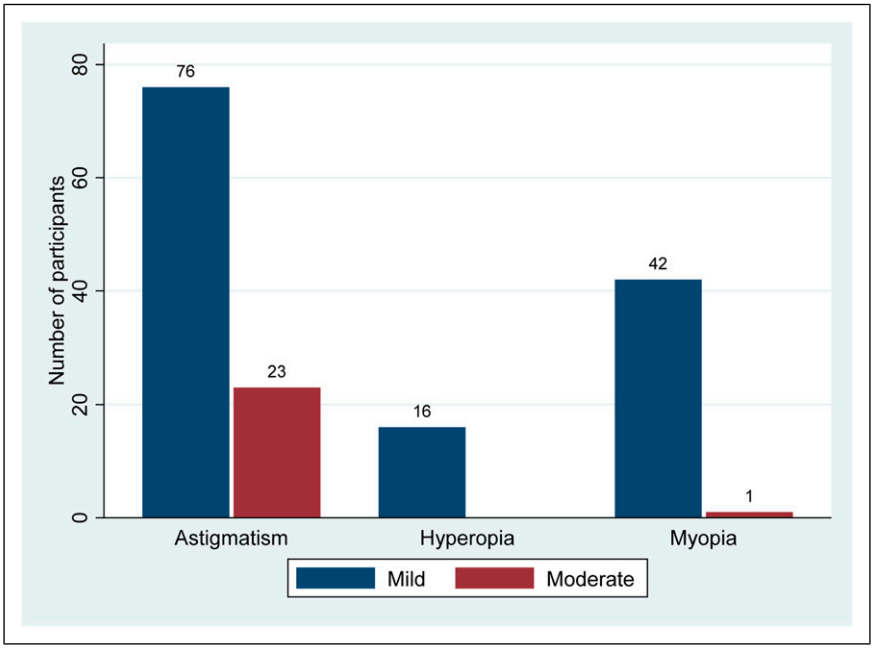


Figure 1. Severity of distance refractive errors.

which could attenuate any age gradient. In practice, our findings suggest that eye screening for commercial motorcyclists should target riders of all ages and not only the older riders.

The most common types of refractive error among the motorcyclist were astigmatism (62.7%), myopia (27.2%) and presbyopia (15.2%). Among the participants with astigmatism, most either had simple myopic astigmatism or compound myopic astigmatism. Both types of refractive errors could significantly affect far vision of riders. These findings significantly differ from other findings among commercial motorcyclists that have reported higher prevalences of hyperopia[19] and myopia.[26] This difference can be attributed to difference in study methodologies. High prevalences of myopia have mainly been reported among populations that mainly engage in near activities like university students.[31] Most (74.7%) of the riders had mild distance refractive errors and none of the participants had a severe form. Astigmatism though mild should be corrected as it is associated with significant blurring of vision and image distortion.

Furthermore, this study reported a lower prevalence of near vision RE or presbyopia at 15.2% among commercial motorcyclists compared to 21.3% reported by Mutombo et al. in a comparative study in Kinshasa among 75 commercial motorcyclists[19] This is because in our study we had fewer participants (35.4%) aged 40 years and above. Presbyopia is a physiological age-related process affecting the crystalline lens most commonly after 40 years.

Barriers to refractive error screening among commercial motorcyclist

In our study only 21.9% of the riders had ever undergone eye screening examination. The barriers identified that lead to low vision screening rates among commercial motorcyclists working in Kamukuzi ward in Mbarara city included; the rider's

Table 5. Barriers listed by participants who never screened N=324.

Barrier	n(responses)	Percentage %
Have no problem with my eyes	217	66.98
I don't know where I am supposed to go	197	60.80
I don't have money	163	50.31
I think services are expensive	149	45.99
I don't have time	124	38.27
No one told me about it	83	25.62
Delay at the health facility	8	2.47
Services at hospital are of low quality	1	0.31

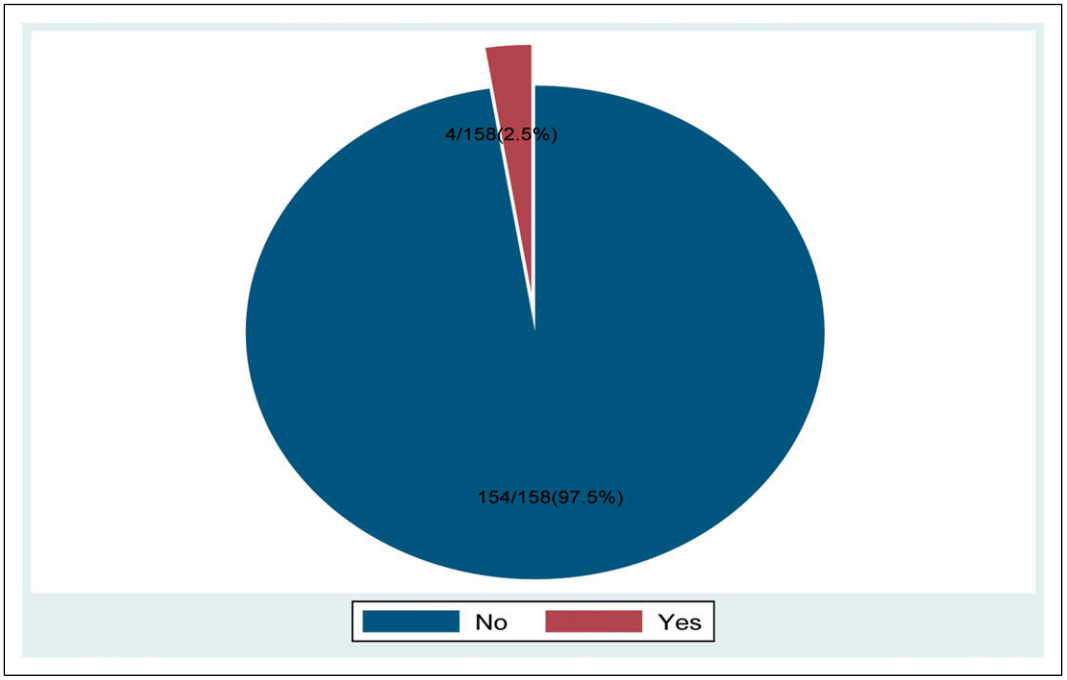


Figure 2. A pie chart showing corrective spectacle coverage.

perception that they do not need to go for eye screening services as they think they do not have any problem with their eyes, lack of information where to seek eye screening services and the perception that eye screening services are very expensive. There were also riders who reported that they had never screened because no one had ever informed them about the importance of eye screening services while others had never screened because they cannot find time to visit eye hospitals.

Despite the low screening rates in our study, they are significantly higher (3 times) than that was reported by Lusobya et al. among commercial riders in Kawempe Division.[26] This can perhaps be attributed to proximity and accessibility to the main eye hospitals within Kamukuzi ward. Majority (92.2%) of the riders in our study worked within 2km from the main public eye screening hospital compared to Mulago Hospital eye clinic which is about 7km from Kawempe. Similar findings were also reported in the study conducted in Ibadan city – Nigeria that found only 26.8% of the riders had ever undergone eye screening services. The most significant perceived barriers to eye screening reported included; high costs (34.9%), lack of time (26.4%) and unfelt need to go for eye screening services (22.6%).[18] Furthermore, in our study 60.5% of the riders reported that they were not aware they were supposed to undergo eye screening before riding. A study by Idhugwe et al. in Ibadan city-Nigeria reported knowledge as a significant factor associated with low uptake of preventive eye care (p=0.000).[18]

Improved awareness about the need to screen, where to go for screening services and subsidizing screening costs could significantly increase uptake to eye screening services among the commercial motorcyclists.

Proportion of corrective spectacle use among commercial motorcyclists

In our study we found a very low prevalence (2.5%) of corrective spectacle use among the riders with refractive errors. This low uptake is similar to that noted among riders in Kinshasa-DRC (1.3%)[19] and in Ilorin city- Nigeria (3.08%).[20] Generally, low spectacle coverage among different populations has been noted in low and middle income countries, with most studies reporting spectacle coverage ranging from 7% -23%.[32] In Uganda a population based study in Kamuli district reported a spectacle coverage of 5.96% among those with refractive errors.[33] Despite this, some studies in other populations in low- and middle-income countries have reported higher prevalences of corrective spectacle use. For example, a cross-sectional study among university students in Western Uganda reported that up to 28% of the students with refractive errors wore corrective spectacles.[31] This can possibly be attributed to better awareness and intensive near work that requires good vision. In higher income countries like Colombia-Latin America a higher spectacle coverage of up-to 50.9% for distance refractive errors and 33.9% for Presbyopia have been reported[34] due to improved access to corrective services.

Low uptake of corrective spectacles in some countries has been attributed to affordability, accessibility and availability of refractive services as highlighted in a recent population-based study in Kakamega town – Kenya.[35]

Strength, weakness and limitation of the study

This was one of the few studies to give us the overall prevalence and types of refractive errors among commercial motorcyclists with a larger sample size, it also highlights the key barriers that could be addressed to improve eye screening in this population. However, the study may not have explicitly explored all the likely barriers from the study participants which required qualitative analysis through focused group discussions. The study population was also highly mobile and challenging to engage some study participants for longer than 45 minutes especially those who required additional tests about their vision and those who work at night. However, through working with the stage leaders and conducting health education about the purpose of the research, majority of the participants were motivated to participant and have their eyes screened at the respective stages.

This study also has some limitations. Its cross-sectional design allowed us to describe the prevalence, types and barriers to screening for refractive errors, but does not allow conclusions about causality or directionality of any of the observed associations. The sample was exclusively male, in keeping with the composition of the local commercial motorcycling workforce, which limits the generalizability of the findings to female riders elsewhere. The study was also restricted to a single ward, which may limit generalizability to commercial motorcyclists in other settings with different access to eye care services. Barriers to screening were self-reported and may be subject to recall and social desirability bias. Finally, of the independent variables examined, only age group was formally tested for association with the presence of distance refractive errors; other socio-demographic and work-related factors were described but not statistically tested for association with refractive error status, and this could be explored in future studies with a larger sample.

Conclusions

The overall prevalence of distance and near vision refractive errors was high at 38.1% and 15.2% respectively among commercial motorcyclists in Kamukuzi ward- Mbarara city North Division.

The most common barriers to eye screening were; having no eye problem (66.98%), not knowing where to screen from (60.80%), not having money (50.31%), perception that screening services are expensive (45.99%) and not having time to screen (38.27%) among others.

Only 2.5% of our study participants who had refractive errors were using effective corrective spectacles.

Recommendations

To reduce on the burden of refractive errors among commercial motorcyclists and improve road safety, we recommend the following

1) Conduct community outreach activities to create demand for refractive error corrective eye care services available at the eye hospitals.
2) Increase awareness in the general population about eye screening before acquiring riding licenses, for those already engaged in commercial riding, this can be done through planned stakeholder meetings with their leadership. This would help address some of the barriers highlighted in the study among commercial motorcyclists.
3) There is need to make corrective spectacles more accessible and affordable at the main referral eye hospital in terms of costs to achieve the SPECS 2030 recommended 40% increase in coverage 2030.

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Ethical considerations

The study was conducted with clearance from Mbarara University of Science and Technology Research Ethics Committee on the 28/3/2025 reference number MUST-2024-2024.

Consent to participate

Written consent and Permission were sought from Mbarara city boda-boda operators association and the boda-boda stage leadership. The purpose of the study was clearly explained to all study participants and also informed written consent obtained from each study participant.

Author contributions

P.L participated in the conceptualization of the study. A.E, P.L, J.O performed data analysis and results interpretation. P.L, R.A, M.J.M, C.N.B, C.N, J.M, M.M contributed to writing the first draft of the manuscript with C.N.B, M.J.M, C.N, J.M, M.M providing critical revisions. All authors read and approved the final manuscript.

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Declaration of conflicting interests

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Data Availability Statement

The datasets used in this study are available from the corresponding author upon reasonable request.

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