Impairment of vision among commercial motorcyclists (*Bodaboda* riders) in Uganda

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ABSTRACT

Background: To determine the prevalence and factors associated with impaired vision among commercial motorcyclists (*bodaboda*) riders in Uganda.
Objective: To determine the prevalence and factors associated with impaired vision among commercial motocyclists (*bodaboda)* riders in Uganda.
Methods: This was a descriptive cross-sectional study done in Kawempe South division in Kampala district. Socio-demographic characteristics, relevant medical and riding history were recorded. All riders underwent a general medical examination and a detailed ocular examination which included vision, anterior and posterior segment assessment. A rider with impaired vision was defined as one whose presenting visual acuity was 6/12 or less in either eye.
Results: Seven hundred and twenty four male riders, aged between 17 to 56 years (mean 30.3 years, Standard deviation=7.2 years) were recruited. Thirty riders (4.1%, 95%CI: 2.7- 5.6) had impaired vision in either eye. Eight riders (1.1%) had visual impairment in both eyes. The ocular disorders associated with impaired vision included: refractive errors 12 (40%), uveitis 6 (20%) and anophthalmic socket 4 (13.3%), ptosis 2 (6.7%), amblyopia 2 (6.7%) corneal scar 2 (6.7%) and cataract 2 (6.7%).
Conclusion: A significant proportion of *bodaboda* riders in Kampala have impaired vision. The causes of impaired vision were ocular disorders that are treatable and reversible if diagnosed early.

Key words: Visual impairment, Commercial motocyclists

INTRODUCTION

Adequate vision is important for safe driving and any significant loss of visual function will diminish a driver's ability to operate a motor vehicle/cycle safely[1]. Globally, 285 million people are estimated to be visually impaired[2] and the majority are found in sub-Saharan Africa. The term *bodaboda* in this study refers to a two wheel commercial motorcycle commonly used as a mode of transport in East Africa.

Several studies have shown an association between visual impairment of motorists and road traffic accidents[1,3-5]. In sub-Saharan Africa, Uganda is among the seven countries contributing 64% of the fatality rate due to Road Traffic Accidents (RTAs) and according to the Uganda annual traffic report 2011, 33% of RTAs involved cars while 24.5% involved *bodabodas* [6-8]. Various studies have also shown that pedestrians, drivers, and persons travelling on *bodabodas* are at risk of death and injury on the roads[9].

Uganda has limited public transport systems and there is an increasing need for *bodabodas* as an alternative transport option[9-12]. The city's estimated number of *bodaboda* riders in 2010 was 300,000 and this is the fastest growing service industry in Kampala city[9].

There is no published data about the magnitude of impaired vision among *bodaboda* riders in Kampala, despite their frequent involvement in road traffic accidents. In this study, we sought to determine the magnitude of impaired vision among these riders in Kampala.

MATERIALS AND METHODS

This was a descriptive cross-sectional study conducted from August to October 2016.The study was conducted in Kawempe south division, one of the largest divisions of Kampala, Uganda's capital city. Figure 1 is a map that shows the geographical location of Kawempe division in Kampala city, Uganda.

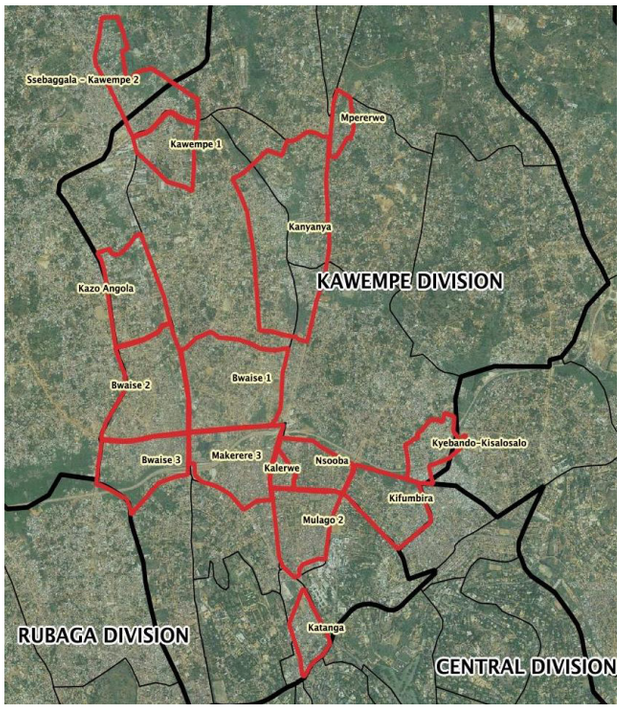

Figure 1: A map showing 5 divisions of Kampala city and Kawempe division

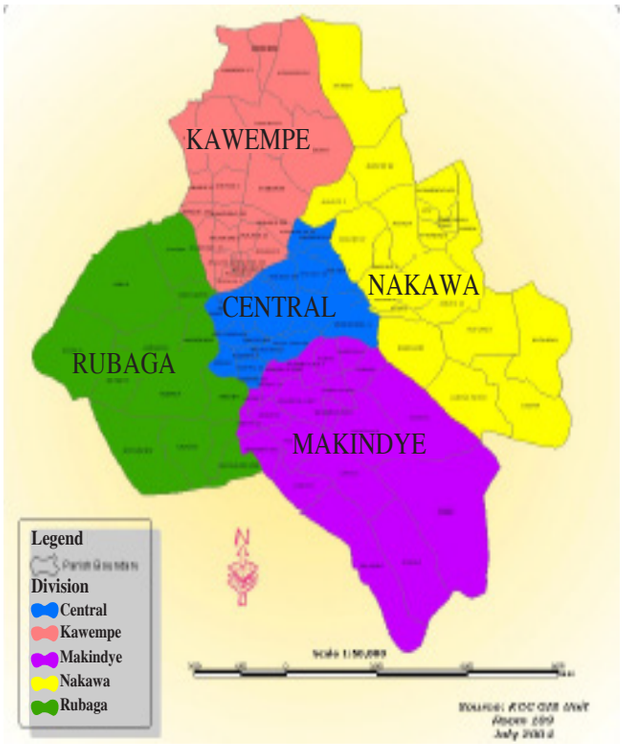

Figure 2: A map showing the 5 divisions of Kampala city.

Kawempe division has a total of 4200 *bodaboda* stages, and a typical *bodaboda* stage has an average of 15 to 30 riders. A minimum of 344 riders were statistically calculated to be enrolled in this study. Since the minimum number of *bodaboda* riders present at each stage was 15, we calculated a total of 23, (344/15), randomly selected *bodaboda* stages as recruitment points for riders for this study.

Participants in the study: Bodaboda riders aged 17 years and above at each stage were chosen randomly at the designated study stages. Riders picked numbers at random without replacement and those who picked odd numbers were included in the study. No number was repeated, to provide an equal chance to all riders. Riders with altered mental states, and/or those with known allergies to drugs used during assessment were excluded from this study.

Data collection: All riders that met the inclusion criteria were recruited and informed consent obtained. A pretested structured questionnaire was used to document socio-demographic characteristics and other variables including riding history, past medical history, past medical history. A full medical exam was done.

Ocular examination: Distance visual acuity was tested using an illuminated Snellen chart at 6 meters. Riders wearing refractive distance correction at the time of screening had their vision tested with the available correction. Objective and subjective refraction was done to determine the refractive status of each rider. Near vision assessment was done using a Jaeger chart. Visual fields were assessed by the confrontational method compared with the examiner in all riders (the examiner underwent perimetry to confirm normal visual field). Mono-ocular riders were regarded as having constricted visual fields. Eye movements were tested in all directions of gaze and pupillary function was assessed. An Ishahara chart was used to assess colour vision and a TNO test chart was used to examine for stereopsis in each rider. A portable slit lamp was used to evaluate the structures in the anterior and posterior segment of the eye. Tonometry was done using a hand-held Perkin's applanation tonometer. Fundoscopy was done using the Keelerdirect ophthalmoscope and indirect dilated fundoscopy was done where indicated (those with vision less than 6/12).

The end point was to determine the ocular disorder associated with impaired vision for each rider. If more than one disorder was present, the disorder most likely to have effect on vision was considered as the most likely associated factor to the impaired vision. All riders with ocular anomaly detected were managed appropriately. In order to minimize errors in the process of data collection, patient examination was done by the principal researcher. Data was processed entered and cleaned using Epi data version 3.1 and analysis done using Stata version 12.

Case definition: In this study, impaired vision was defined as visual acuity of 6/12 or less, or a corresponding visual field loss to less than 20 degrees in the either eye. This is because several studies have shown that a binocular visual acuity of at least 6/9 is safe for driving[13-15].

RESULTS

Impaired vision: In this study, impaired vision was defined as visual acuity of 6/12 or less, or a corresponding visual field loss to less than 20 degrees in the either eye. This is because the World Health Organization (WHO) recommends a visual acuity of at least 6/9 in both eyes for safe driving. A total of seven hundred and twenty four riders were recruited.

All recruited riders were males with a mean age of 30.3 years (standard deviation=7.2 years, range 17 to 56 years). The age distribution and education levels of the riders are summarized in Figures 2 and 3 respectively. The majority, 402 (55%) were healthy with no systemic disease while 84 (12%) had hypertension, 208 (29%) had diabetes and (4%) had both diabetes and hypertension. Table 1 summarizes the relevant riding history among the 724 *bodaboda* riders studied.

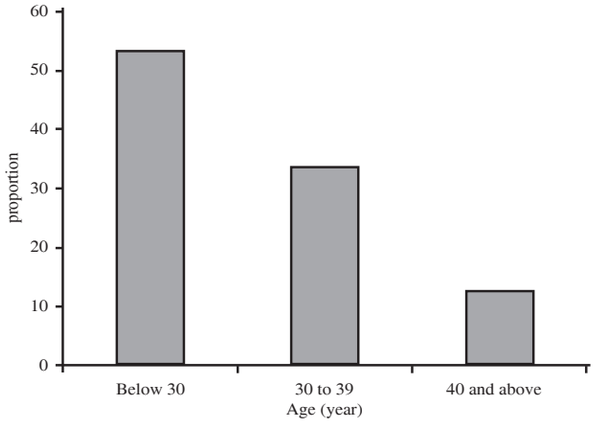

Figure 2: Age distribution of *bodaboda* riders with normal vision compared to those with impaired vision in Kawempe South

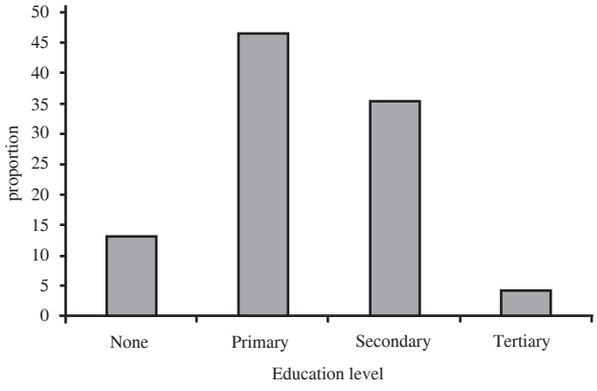

Figure 3: Education level among *bodaboda* riders with normal vision and the visually impaired in (n=724) Kawempe South

Table 1: Riding history of 724 *bodaboda* riders in Kawempe South (n= 724)

Variable	No. of riders (n=724)	(%)
Possess valid license	82	11.3
Formal trainning before riding	138	19.1
Had eye evaluation before riding	54	7.5
Involved in RTA	268	37.1

Prevalence of impaired vision among the bodaboda *riders:* Among the 724 *bodaboda* riders studied, 30 had impaired vision making the prevalence 4.1% (95% CI 2.7-5.6). Tables 2 and 3 summarizes the severity and laterality of impaired vision among the riders respectively.

Table 2: Severity of impaired vision among *bodaboda* riders in Kawempe South (n= 30)

Variable	No. of riders	(%)	95% CI
Visual impairment (categories)			
Mild (6/12-6/18)	16	53.3	1.1-3.3
Moderate (6/24- 6/60)	6	20	0.2-1.5
Severe (5/60 - NPL)	8	26.7	0.3 – 1.9
Total	30	100	

Table 3: Laterality of impaired vision among *bodaboda* riders in Kawempe South

Variable	No.(%)	
Visual impairment	Unilateral	Bilateral
Mild (6/12-6/18)	12(1.7)	4(0.55)
Moderate (6/24- 6/60)	2(0.3)	4(0.55)
Severe (5/60 - NPL)	8(1.1)	0
Total	22(3.1)	8(1.1)

Ocular disorders among bodaboda riders with impaired vision: The ocular disorders associated with impaired vision included: refractive errors 40% (n=12), 10 with myopia and 2 with hypermetropia, uveitis 20% (n=6) and an anophthalmic sockets 13.3% (n=4), ptosis 6.7% (n=2), amblyopia 6.7% (n=2) corneal scar 6.7% (n=2), cataracts 6.7% (n=2).The 4 patients with an anophthalmic socket had evisceration due to a ruptured globe following trauma. Amblyopia was due to uncorrected esotropia. This is summarized in Figure 4.

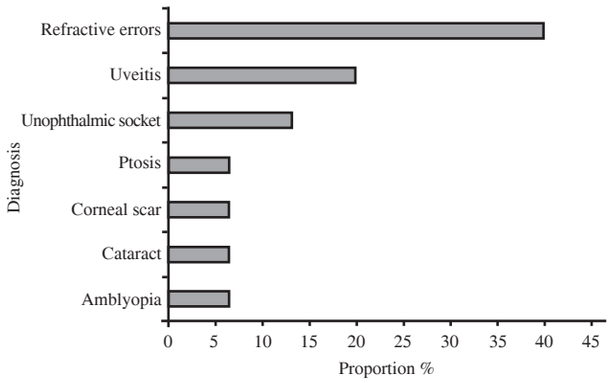

Figure 4: Ocular diseases associated with impaired vision among *bodaboda* riders in Kawempe South from August to October 2016. (N=30)

DISCUSSION

Our study recruited a total of 724 male riders with a mean age of 30.3 years. Like in many other studies[13,14], more than half of the riders 630 (87%) in our study were young adults below the age of 40 years and 53% below the age of 30 years. These findings are similar to other studies done in East Africa that indicate that *bodaboda* riding is a young male-dominated business[15-18].

Three hundred and thirty eight riders (46.69%) had achieved at least a primary level of education, while 258 (35.6%) had achieved a secondary education and 32 (4.4%), tertiary education. Ninety six (13.3%) riders reported not having gone to school (Figure 3). These findings are similar to other studies on riders of commercial motorcycles[16,19]. This is an industry that attracts unemployed youth since it has no regulations or requirements[10,20]. Impaired vision was significantly less frequent among those who had achieved a more advanced level of education ($p<0.001$). The more educated riders are more likely to be aware of their visual impairment and seek medical attention. They presented as corrected refractive errors in this study.

Of the 724 riders in this study, 82 (11.3%) of the riders had a valid riding permit and 138 (19.1%) had formal training for riding. Very few riders had licenses or had an eye exam before starting to ride. Findings from related studies in the region indicate that formal training is hardly available for these riders[19,21,22].There are no formal training schools for these riders in Uganda. This has also been observed in African and Asian countries where majority of the riders don't have licenses and no formal training schools exist[13,23].

This prevalence of impaired vision among the riders in this study was 4.1%. This is similar to other studies such as a study done among Kisumu *bodaboda* riders showed that 2.7% had inadequate visual acuity for riding[15]. The definition of impaired vision in our study varied from other studies however overall a prevalence of 4.1% is an expected finding for vision screening within this age group. The severity and laterality of impaired vision as shown above is similar to previous studies.

Uncorrected refractive errors were the commonest ocular diagnosis among the visually impaired riders affecting 12 (40%). Most of the errors were due to myopia(10) and only 2 had hyperopia. This is an expected finding in any similar vision screening assessment in an adult population of similar age group. Myopia is the commonest refractive error within this age group. Uncorrected refractive error is the most frequent cause of impaired vision among similar riders in previous studies[23-25].

Four (13.3%) riders had an anophthalmic socket following involvement in road traffic accidents, which was a common occurrence among *bodaboda* riders. Visually impaired riders are more likely to have eye trauma[26,27]. A study done in Kisumu in *bodaboda* riders reported that ocular injuries were associated with lowered visual acuity[14].

Other studies have also shown an association between eye trauma and reduced vision[15,28,29]. These riders with an anophthalmic socket are operating with a significantly reduced field of vision which predisposes them to further involvement in road traffic accidents.

Corneal opacity has also been associated with development impaired vision in motorists[34-35]. In this study, two of our riders had corneal scars which were secondary to a healed corneal ulcer and a traumatic corneal tear. Corneal tears are among the commonest ocular injuries affecting motor cycle riders with ocular trauma[36].

Several eye lid disorders can lead to impaired vision, however in this study, 6.7% of the riders with visual impairment was due to ptosis (2 riders). These all occurred secondary to accidents and trauma in these riders.

Other ocular disorders associated with impaired vision in these riders included 6 (20%) with uveitis, 2 (6.7%) with visually significant cataracts and 2 (6.7%) had amblyopia. The prevalence of uveitis and cataracts found is expected in the age group of the riders assessed.

CONCLUSION

We have shown that impaired vision affects a significant proportion of bodaboda riders in Kampala city. These riders are predominantly male and young (less than 40 years of age) with no formal training or license to ride.

The most frequent ocular disorders found to be associated with riders with impaired vision included uncorrected refractive errors, uveitis and ocular trauma related abnormalities that directly affect the quality of vision.

Conditions such as refractive errors and uveitis can be corrected if diagnosed and treated early. Other conditions that result in impaired vision are related to ocular trauma and accidents that are a common occurrence among bodaboda riders.

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