

## Prevalence of Visual Impairment among Heavy Vehicle Drivers in Nagpur City

Authors

**Dr Vikas Mahatme, Dr. Pallavi Alsi, Dr. Yogesh Jibhakate**

Mahatme Eye Hospital, 16 Central Excise Colony, Ring Road, Chhatrapati Square, Nagpur,

Maharashtra 440015 India

Email: [sm@mahatmehospital.com](mailto:sm@mahatmehospital.com)

### Abstract

*The study was conducted in Nagpur city, India. 200 drivers of mass transport and heavy vehicles including 115 truck drivers and 85 bus drivers participated in this study. This was a cross sectional, non-comparative type of study. These drivers were tested at the outdoor campsite for distant vision, near vision and color vision. For those suspected of having problems underwent detailed checkup at base hospital. Prevalence of visual impairment in this study was found to be 64% (n=128). Refractive error was the commonest ailment amongst these drivers. Above the age of 40 years, cataract was the commonest cause (10%; n=20). The incidence of glaucoma was 3.5%, corneal lesions 5%, macular disorder 7%, while 5.5% had diminished vision due to retinopathies due to Diabetes, Hypertension and HIV etc. Driving is a job involving lot of responsibility concerning safety of the civilians. Impaired vision can be extremely dangerous and can cause major road traffic accidents. The study emphasizes the need of periodic checkup of drivers for visual problems and setting up of legal norms.*

**Key Words:** Heavy vehicle drivers, Vision, Visual impairment, truck drivers, bus drivers, road safety, ophthalmic injuries, road traffic accidents, cataract, glaucoma, corneal disorders, retinopathies, refractive errors.

### INTRODUCTION

Driving on road and good Vision goes hand in hand. Visual impairment is one of the leading causes of major accidents. Not only the drivers' life is at risk but civilians too are the sufferers.

Therefore it has become important to consider the vision screening needs of the drivers for traffic safety policy. Also the color vision and glare sensitivity along with poor depth perception<sup>1</sup> are associated with poor driving performance.

Unfortunately Visual Acuity (VA)<sup>2</sup> and Visual field (VF)<sup>3</sup> have been studied in general population but very few studies have been conducted for drivers – especially the heavy vehicle drivers. Mass transport and heavy vehicles comprises vehicles carrying the goods (Trucks) and vehicles used for general public transportation (Buses). Hence truck and bus drivers were chosen

for this study. The current definition of a heavy vehicle is a road vehicle having a net mass over 3000 kg. the new definition will be based on the gross vehicle weight rating (GVWR). The GVWR represents the weight of a vehicle to which maximum authorized load must be added.<sup>4</sup> (GVWR = net weight + maximum authorized load)

The World Health Organization, 1977 has classified defective vision into various grades.<sup>5</sup>

Category of visual impairment	Best corrected visual acuity (BCVA) in the better eye
0. Normal	6/6 to 6/18; can see 6/18 or better
1. Visual Impairment	Less than 6/18 to 6/60; cannot see 6/18, can see 6/60
2. Severe visual impairment (economical blind)	Less than 6/60 to 3/60; cannot see 6/60, can see 3/60
3. Blind (social blind)	Less than 3/60 to 1/60; cannot see 3/60, can see 1/60
4. Blind (Legal blind)	Less than 1/60 to only light perception; cannot see 1/60, can see light
5. Blind (irrecoverable blindness)	No light perception; cannot see light
6. Undetermined or Unspecified	Less than 3/60 to 1/60; cannot see 3/60, can see 1/60

On this background 200 drivers underwent screening for vision checkup and those requiring further evaluation were referred to the base hospital. The objective of study was to find out the prevalence of visual impairment due to various visual problems like refractive errors, cataract, glaucoma, corneal disorders, macular disorders, retinopathies and other causes among drivers of mass transport and heavy vehicles. The aim was to promote, improve and maintain the visual health of drivers and to recommend drivers as well as licensing authority to take up steps to ensure safe vision and safe driving.

## METHODS

This was a cross sectional, non-comparative type of study. 200 drivers of mass transport and heavy vehicle drivers participated in this study.

Inclusion criteria: Drivers of mass transport and heavy vehicles who were willing to participate

Exclusion criteria: Non-public transport and small vehicle drivers were excluded from the study.

The study was conducted at Mahatme Eye Bank Eye Hospital, Nagpur, Maharashtra; India, between Feb 2009 and March 2010 after approval from the ethical committee. Initially a pilot

study was conducted on 100 drivers to decide about the sample sizing. In the pilot study , refractive error was the major problem. 37 out of 100 drivers had uncorrected refractive error. Sample size was calculated by applying the formula considering 37 as a p factor.<sup>6</sup> Thus sample size turned out to be 170. We studied 200 drivers including 115 truck drivers and 85 bus drivers. Drivers were selected randomly on voluntary basis. Four groups – A,B,C,and D were formed according to their age. Group A – age less than or equal to 25 years; Group B – 26 to 40 years; Group C – 41 to 55 years and Group D – more than 55 years. Initial screening was done at camps arranged at check posts and bus station. Field investigators obtained a detailed history about present and past ocular disorders, history of medical or surgical treatment. Vision of the drivers was recorded and included distant vision, near vision and color vision. Torch light examination and direct ophthalmoscopy was performed to evaluate the anterior and the posterior segment. Those with major problems were brought to base hospital for detailed examination.

Table 1 shows Age distribution of the study subjects.

**Table 1: AGE DISTRIBUTION OF THE STUDY SUBJECTS**

Group	Age in years	N=200	Percentage
A	Less than or equal to 25 years	17	8.5
B	26 to 40 years	67	33.5
C	41 to 55 years	93	46.5
D	Over 55 years	23	11.5

Group A had 17 drivers, group B 67, Group C had maximum that is 93 and Group D had 23 drivers.

Comprehensive eye examination at the base hospital included visual acuity using Snellen's chart, refraction, tonometry, slit lamp bio-microscopy and dilated fundus examination. Special tests like gonioscopy, automated Humphrey perimetry, central 24-2 full threshold perimetry, fundus photography and fundus fluorescein angiography were performed in indicated individuals. Detailed examination was done for cataract, glaucoma, ARMD and Retinopathy due to different causes. All drivers with uncorrected refractive error were given spectacles. Those needing further treatment were treated at base hospital. The results were tabulated and evaluated.

## RESULTS

200 truck and bus drivers were studied. Study subjects were classified into four groups according to their age as follows.

Group A – less than or equal to 25 years

Group B – 26 to 40 years

Group C – 41 to 55 years

Group D – more than 55 years

Table 2 shows the ocular complaints these drivers presented with.

**Table 2: GROUPWISE OCULAR COMPLAINTS OF THE DRIVERS**

Complaints	Group A	Group B	Group C	Group D	Total N= 200
Diminished vision	07 (41.18%)	19 (28.3%)	86 (92.47%)	23 (100%)	135 (67.5%)
Pain	01 (5.88%)	01 (1.49%)	0	0	02 (1%)
Watering	2 (11.76%)	11 (16.42%)	05 (5.38%)	06 (27.27%)	24 (12%)
Foreign Body Sensation	03 (17.64%)	09 (13.43%)	10 (10.75%)	04 (18.18%)	26 (13%)
Redness	02 (11.76%)	08 (11.94%)	14 (15.05%)	07 (31.82%)	31 (15.5%)
Others	0	01 (1.49%)	4 (4.3%)	3 (13.63%)	08 (2.0%)
No complaints	08 (47.06%)	23 (34.33%)	14 (15.05%)	0	43 (21.5%)

Diminution of vision was the most common complaint (67.5%) addressed by these drivers especially in the group C and D i.e. above the age of 41 years. Redness of eyes was the second most common complaint.

Table 3 shows Visual acuity in the better eye in all four groups.

**Table 3 : AGE GROUPWISE VISUAL ACUITY IN BETTER EYE**

Visual Acuity	Group A	Group B	Group C	Group D	Number of drivers n= 200
More than or equal to 6/12	17 (100%)	66 (98.5%)	86 (92.47%)	19 (86.36%)	188 (94%)
Less than 6/12 to 6/60	0	1 (1.5%)	7 (7.53%)	4 (17.39%)	12 (6%)
Less than 6/60	0	0	0	0	0

12 (6%) drivers had vision between less than 6/12 to 6/60; out of this 7 drivers belonged to group C and 4 drivers belonged to group D.

Table 4 shows visual acuity in worse eye.

**Table 4 : AGE GROUPWISE VISUAL ACUITY IN WORSE EYE**

Visual Acuity	Group A	Group B	Group C	Group D	Number of drivers n= 200
More than or equal to 6/12	13 (76.47%)	58 (86.56%)	77 (82.80%)	08 (36.36%)	166 (83%)
Less than 6/12 to 6/60	04 (23.53%)	09 (13.43%)	13 (13.58%)	11 (50%)	37 (18.5%)
Less than 6/60	0	0	03 (3.23%)	04 (17.39%)	07 (3.5%)

7 drivers had vision less than 6/60 in worse eye whereas 37 had vision between less than 6/12 to 6/60 in worse eye.

Table 5 shows causes of diminution of vision in the study group.

**Table 5: AGE GROUPWISE CAUSES OF DIMINUTION OF VISION**

Causes of diminution of vision	Group A	Group B	Group C	Group D	Number of drivers n=200
Uncorrected refractive error and presbyopia	08 (47.06%)	24 (35.82%)	31 (33.33%)	03 (13.64%)	66 (33%)
Corneal disorders	03 (17.64%)	02 (2.98%)	02 (2.15%)	03 (13.64%)	10 (5%)
Cataract	0	01 (1.49%)	07 (7.52%)	12 (54.55%)	20 (10%)
Glaucoma	0	01 (1.49%)	03 (3.23%)	03 (13.64%)	07 (3.5%)
Retinopathies due to various causes	0	03 (4.48%)	03 (3.23%)	05 (22.73%)	11 (5.5%)
Macular disorder	0	02 (2.98%)	05 (5.38%)	07 (31.82%)	14 (07%)

64% drivers had some or the other visual problem that included refractive errors, cataract, corneal disorders, glaucoma, retinopathies and maculopathies.

Table 6 shows problems faced by drivers while driving the vehicles

**Table 6: PROBLEMS FACED BY DRIVERS WHILE DRIVING THE VEHICLES**

Problem faced	Group A	Group B	Group C	Group D	Total n=200
Diminution of vision	05 (29.41%)	19 (28.36%)	32 (34.41%)	11 (47.83%)	67 (33.5%)
Glare	0	10 (1.49%)	07 (7.53%)	03 (13.64%)	20 (10%)
Other	2 (11.76%)	0	0	0	2 (1%)

89 out of 200 drivers (44.5%) had difficulty in driving owing to these visual complaints.

Table 7 shows frequency of eye checkup among these drivers

**Table 7: FREQUENCY OF EYE CHECK UP**

Frequency of eye checkup	Group A N=17	Group B N=67	Group C N=93	Group D N=23	Total number of Drivers N=200
Never	11	53	76	12	152
Single visit	6	10	11	7	34
More than 1 visit	0	4	06	4	14
Regular	0	0	0	0	0

76% drivers had never visited a specialist for eye care in their lifetime while 17% had single visit. None of them went for a regular checkup. These facts are quite alarming.

Table 8 shows the treatment modalities required for these drivers according to the groups.

**Table 8: AGE GROUPWISE TREATMENT MODALITIES REQUIRED FOR THE DRIVERS**

Treatment modality required	Group A	Group B	Group C	Group D	Total n=200
No treatment required	06 (35.29%)	35 (52.24%)	29 (31.18%)	02 (9.09%)	72 (36%)
Refraction	08 (47.05%)	24 (35.82%)	37 (39.78%)	06 (30.43%)	75 (37.5%)
Surgery	00	02 (2.98%)	03 (3.22%)	06 (27.27%)	11 (5.5%)
Eye drops	03 (17.65%)	16 (23.88%)	08 (8.0%)	02 (9.09%)	29 (14.5%)
Specialty referral	02 (11.76%)	03 (4.47%)	06 (6.44%)	10 (4.54%)	21 (10.5%)

37.5% required refraction and most of them (39.78%) belonged to Group C i.e. 41 to 55 years. out of 11 cataract patients 4 were operated; 7 were not willing for surgery immediately. 11% required a referral for glaucoma, cornea, retina etc.

Table 9 depicts the fact about how many underwent an eye checkup before getting the license.

**Table 9: EYE CHECKUP BEFORE GETTING LICENSE**

	<b>Group A N=17</b>	<b>Group B N=67</b>	<b>Group C N=93</b>	<b>Group D N=23</b>	<b>Total number of Drivers N=200</b>
<b>Eye checkup done</b>	4 (23.53%)	9 (13.43%)	0	4 (18.18%)	17 (8.5%)
<b>Eye checkup not done</b>	13 (76.47%)	58 (86.57%)	93 (100%)	19 (82.60%)	183 (91.5%)

Only 8.5% had undergone eye checkup prior to getting license – this is a serious matter of concern.

## DISCUSSION

This study was undertaken to know the prevalence of visual impairment in the drivers of mass transport and heavy vehicles. Although all the drivers held a valid license, only 8.5% had undergone eye checkup before getting the license. 76% drivers had never visited an eye specialist for eye care in their life time and none had a regular eye checkup. This indicates apathy of these drivers towards visual health and also the apathy of licensing authorities about the importance of vision for safe driving. This is in contrast to the UK, where DVLA – Driver and Vehicle Licensing Authority has laid down the mandatory minimum level for driving and driving with uncorrected defective eyesight is an offence.<sup>7</sup> According to International Council of Ophthalmology<sup>3</sup> the visual examination and proper treatment should be mandatory to them and should be permitted to drive only if vision improved after treatment.<sup>8</sup>

According to study of visual function survey of commercial intercity vehicle drivers in Ilorin, Nigeria, the prevalence of drivers with inadequate visual acuity was determined to be 11.5% and 3.3% had monocular blindness.<sup>9</sup> In the study of prevalence of impairment of visual function in European drivers, percentage of increased glare sensitivity was found in 29.5% drivers<sup>10</sup> as against 10% in the present study.

In Royal Victoria Teaching Hospital, Banjul, Gambia study, out of 149 truck drivers, 81.9% were visually fit to drive and 18.1% were not; the causes of failing vision being refractive error, cataracts, glaucoma, corneal leucoma and pterygia.<sup>11</sup> In the present study the prevalence of visual impairment due to such causes was found to be 64%. Examination of color vision in our study revealed that 3 out of 200 drivers (1.5%) were color blind but surprisingly no one had complained about any difficulty in driving due to

this. In a Nigerian study the same kind of study showed abnormal color vision in 4.3 %.<sup>12</sup>

In the present study, refractive error was the leading cause of visual impairment. 66 drivers (33%) had uncorrected refractive error; 21 had myopia, 8 had myopic astigmatism, 12 had hypermetropia, 9 had hypermetropic astigmatism, 3 were having mixed astigmatism, 13 had presbyopia. According to study conducted in Nigeria the prevalence of refractive error among commercial drivers was 8.4%.<sup>13</sup>

Cataract was the second leading cause of diminution of vision in our study. The incidence was 10% and group D showed highest prevalence (54.55%). In a Nigerian study mentioned earlier the prevalence of cataract was 14.4% among the commercial vehicle drivers. In our study 4 drivers were operated for cataract, 7 were not willing for immediate surgery and 9 were given refraction for the time being.

7 drivers (3.5%) in our study had visual impairment due to glaucoma. None of them complained of any difficulty during driving. All of them were treated conservatively using antiglaucoma medications and were explained the importance and need for regular follow up. Glaucoma has been associated with increased risk of involvement in motor vehicle collisions.<sup>14, 15</sup>

Retinopathies were responsible for diminution of vision in 11 (5.5%) drivers in our group; most of them were above the age of 55 years. similarly Macula disorders were noticed in 14 (7%) drivers. Corneal lesions were observed in 10 (5%) drivers in this study. They included corneal dystrophy, healed corneal ulcer with opacity, suspected

keratoconus, progressive nasal pterygium and pseudophakikeratopathy.

It is a matter of concern that 152 (76%) respondents had never visited a specialist for eye care in their life time while 34(17%) had a single visit to the eye specialist. No one among them had regular eye checkup. Prevalence of visual impairment in these drivers was alarmingly high. 128 drivers (64%) had some kind of visual problem.

## CONCLUSION

Visual impairment among heavy vehicle drivers affects three groups – the driver as a person, his occupation and the common man in the society who might become the victim of road accident occurring due to visually impaired driver. Creating awareness about the importance of regular eye checkup, legal binding by the licensing authorities at the time of issuing a new license or at the time of renewal and its strict implementation can save many mishaps leading to loss of lives and morbidity.

## REFERENCES

1. Anuradha S, Potter C, Fernquest G; Department of Health Systems Policy and Practice, University of Queensland, Brisbane, 4067, Australia Vision and drivers – a South Wales survey, *Journal of Public Health* 2007, 29(3):230-235
2. Tielsch JM, Sommer A, Witt K, Katz & Royall RM: Blindness and visual impairment in an American urban

- population. The Baltimore Eye Survey. Arch Ophthalmol 1990, 108: 286-290
3. Klein BE, Klein R, Sponsel WE, Franke T, Cantor LB, Martone J & Manage MJ : Prevalence of glaucoma. The Beaver Dam Eye Study Ophthalmology 99:1992, 1499-1504
  4. SAAQ, Definition of “Heavy Vehicle”, Last modification; 2009; 09-11
  5. Sihota R, Tandon R; Parson’s diseases of the eye. 20<sup>th</sup> Edition. Butterworth-Heiemann; Elsevier, 2007; 523-524
  6. Mahajan B.K. Methods in Biostatistics: 7<sup>th</sup> edition:2010; 84-85
  7. Drivers and Vehicle Licensing Agency. At a glance guide to the current medical standards of fitness to drive. DVLA Annual Report & Accounts 2008-09
  8. International council of ophthalmology, International standards – Vision requirements for Driving Safety – Section 5 – suggested criteria and rules
  9. Anuradha S, Potter C, Fernquest G; Vision and drivers – a South Wales survey, Department of Health Systems, Policy and Practice, University of Queensland, Brisbane, Australia National Public Health Service for Wales, UK. Road Policing Unit, Gwent Police Headquarters, Croesyceiliog NP44 2XJ, UK, Journal of Public Health; (ISSN 1741 -3842) 2007, 29, 230-235
  10. Van Rijn LJ, Nischler C, Michael R, Heine C, Coeckelbergh T, Wilhelm H, Grabner G, Barraquer RI, van den Berg TJ. Prevalence of impairment of visual function in European drivers. ACTA Ophthalmol. 2009 Oct : 13
  11. Onabolu OO, Otulana TO, Awodein OG,: Assessing the visual status of truck drivers in a developing country; Department of Ophthalmology, Olabisi Onabanjo University Teaching Hospital; Sagamu, gun state, Nigeria: Trop Doct 2008: 38: 54-55
  12. Adekoya BJ, Owoeye JF, Adepoju FG, Ajaiyeoba AI: Visual function survey of commercial intercity vehicle drivers in Ilorin, Nigeria: Can J Ophthalmology 2009: June :44(3):261-4
  13. Oladehinde MK, Adeoye AO, Adegbehingbe BO, Onakoya AO: Ophthalmology unit, Department of surgery, College of health sciences, Obafemi Awolowo University, lie life, Nigeria: Visual functions of commercial drivers in relation to road accidents in Nigeria Year : 2007; 11(2):71-75
  14. McGwin G, Jr, Xie A, Mays A, et al: Visual field defects and risk of motor vehicle collisions among patients with glaucoma: Invest Ophthalmol Vis Sci.2005:46:4437-4441
  15. Haymes SA, Leblanc RP, Nicoleta MT, Chiasson LA, Chauhan BC: Risk of falls and motor vehicle collisions in Glaucoma: Invest Ophthalmol Vis Sci.2007: 1149-1155