Original Contributions

Effectiveness of road safety education in Nigeria using a quasi-experimental trial: Findings from the Road Safety Intervention Project

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ABSTRACT

Road traffic injuries pose a serious public health problem worldwide, especially in low-income countries. The aim of this study was to determine the effectiveness of a post-license road safety education intervention programme in terms of increased knowledge and self-reported behaviour among commercial minibus drivers in Lagos, Nigeria. This was a quasi-experimental study conducted in three phases. Participating motor parks (selected by simple random sampling) were assigned to either the intervention or control group. All eligible minibus drivers were included with no matching. Data analysis was done with Epi-info version 3.5.1. Comparison was done in terms of group driver education versus no education, and pre- versus post-intervention. Out of an estimated 500 male drivers, 407 participated in the study. Most had some form of formal education. For both groups, pre-intervention knowledge scores were poor but improved significantly post-intervention in the intervention group. None of the drivers in the intervention group had good scores but this increased to 66,1% post-intervention. Their mean score

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increased from 34,4 ± 9,1 to 72,3 ± 10,2. Adherence to speed limits did not improve. The control group showed no significant changes. Post-license road safety education significantly improved knowledge but not self-reported adherence to speed limits. Similar, sustainable programmes should be offered to improve commercial drivers' poor knowledge. Further studies are needed to determine deterrent factors to behaviour change.

Keywords: *road safety, intervention, commercial drivers, Nigeria*

INTRODUCTION

Road traffic injury (RTI) is a world-wide problem with millions of injuries and deaths reported. It is projected that by 2020, RTIs will become the third leading cause of disability-adjusted life years (DALYs) lost, up from its ninth position in 1990, and by 2030 will be the fifth leading cause of death (WHO, 2011). Globally, low and middle income countries (LMICs) account for 91,8% of DALYs lost to RTIs (Peden et al., 2004). The morbidity and mortality from RTIs in sub-Saharan Africa is rising steadily with equally devastating economic implications (Federal Road Safety Commission, FRSC, 2011; Tarimo, 2012). The risk of dying as a result of a road traffic collision is highest in the African region at 24,1/100 000 population (the global rate is 18/100 000). Nigeria and South Africa have the highest road traffic death rates (33,7 and 31,9/100 000 respectively). No countries have comprehensive road safety laws on five key risk factors: drinking and driving, speeding, and failing to use motorcycle helmets, seat-belts, and child restraints (WHO, 2013). Africa's roads have therefore been dubbed the "deadliest" in the world and in order to make substantial road safety gains, the focus over this decade should be on providing safe public transportation (Peden, Kobusingye & Monono, 2013).

According to FRSC 2011 reports, between 2007 and 2010 there was a yearly average of 1,457 cases and a monthly average of 121 crashes involving buses on Nigerian roads. The figure increased each year by between 5–37%. In the same period, 33,374 people were killed or injured. Lagos State contributed significantly to these figures (FRSC, 2011). Disobeying road signals was one of the risk-taking actions reported among vehicle (motorcycle) users (Clarke, Ward, Bartle & Truman, 2004) and several researchers in Nigeria recommend safety education interventions following observations of poor knowledge and compliance among motorcyclists (Adogu & Ilika, 2006; Amoran, Eme, Giwa & Gbolahan, 2006; Oginni, Ugboko & Adewole, 2007). In Zaria (Northeast Nigeria), almost 42% of commercial motorcyclists were not even aware of the existence of the Highway Code (Arosanyin, Olowosulu & Oyeyemi, 2013). Other areas of road safety such as child car safety practices were equally observed to be poor (Olufunlayo, Odeyemi, Ogunnowo, Onajole & Oyediran, 2011).

Over three decades ago, the "systems approach" (the Haddon matrix) to road safety was developed by William Haddon Jr. and has been successfully applied (Haddon, 1968). He defined three phases of the time sequence of a crash event: pre-crash, crash and post-crash also taking into consideration the epidemiological triad. In the pre-crash/crash prevention phase, human factors such as information, attitudes, impairment and police enforcement play a major role. Enrichment of the Haddon model has become necessary in order to successfully control the RTI problem (Sleet & Lonero, 2002).

An emphasis on ecological models in public health is now advocated. The use of passive or structural strategies and active or behavioural strategies in the control of RTIs have been recognised. The active strategies applied in this study were to educate commercial bus drivers on road safety measures and encourage them to comply for the benefit of all road users. This may then result in increasing the social and political will, and other actions necessary to address structural barriers to maintaining the desired behaviour change (Gielen & Girasek, 2001). Road safety education is not expected to solve all RTI problems but forms an important component of the health promotion framework for injury prevention. This is especially useful at the personal level (Glanz & Rimer, 1995; Green & Kreuter, 1999).

RTIs, like other types of injuries, are largely preventable thus making them amenable to behaviour change. The application of behaviour-change methods to injury prevention and other behaviour has been extensively discussed by many researchers (Gielen & Sleet, 2003; Rosenstock, Strecher & Becker, 1988) and the efficacy of various methods of injury prevention have been reported (Collard, Chinapaw, Verhagen, Bakker & van Mechelen, 2010; Eime, Finch, Wolfe, Owen & McCarty, 2005; Erkoboni, Cao Rouxiang & Winston, 2010).

Minibus driver improvement programmes exist in some high-income countries (HICs). In Australia, MiDAS is the Minibus Driver Awareness Scheme organised by the Community Transport Association which promotes a nationally recognised standard for the assessment and training of minibus drivers. It is a membership-based scheme that has been designed to enhance minibus driving standards and promote the safer operation of minibuses (Wundersitz & Hutchinson, 2006). In the United Kingdom, there is also a minibus driver awareness scheme (Walsall Council, 2009). In continued efforts to improve driving safety through education, several educational programmes include video programmes (van Ranst, Silverstein & Gottlieb, 2005), classroom modules (Marottoli et al., 2007), individual counselling (Stalvey & Owsley, 2003) and home-based CD-ROMs or workbooks (Dickerson et al., 2007). Much attention is also paid to younger and older drivers in high income countries. Not much has been reported from LMICs countries regarding commercial drivers. In a systematic review of post-license driver education for the reduction of RTCs,

only studies from HICs were included (Ker et al., 2005) Similarly, in a systematic review of safety education of pedestrians for injury prevention, none of the RCTs reviewed were conducted in LMICs (Duperrex, Bunn & Roberts, 2002).

There is no evidence that post-license driver education is effective in preventing road traffic injuries or crashes (Ker et al., 2005). For younger people, school-based driver education in schools and colleges leads to earlier licensing but not to a reduction in RTI involvement (Roberts, Kwan & Cochrane Injuries Group Driver Education Reviewers, 2001). Among older drivers, there is strong evidence that education combined with on-road training improves driving performance and moderate evidence that it improves knowledge, although educational intervention curricula alone are not effective in reducing crashes. The reviewers conclude that the effectiveness of retraining aimed at older drivers is sufficiently encouraging to merit assertive health promotion actions regarding intervention and programme planning (Korner-Bitensky, Kua, von Zweck & Van Benthem, 2009).

In Nigeria, there is a paucity of data on drivers' educational intervention programmes. A similar programme to the current project was conducted among motorcyclists in Uyo (South-South Nigeria) and it was found to improve their knowledge and self-reported compliance with traffic signs (Johnson et al., 2011). Some NGOs in the country such as the Prompt Assistance to Victims of Road Accidents (PATVORA) and the Arrive Alive Road Safety Initiative (AARSI) also conduct safety education. The effect on driver behaviour and the impact on RTI prevention are not being assessed and therefore there is no available information in this regard in the literature. The general quality of evidence on the effectiveness of these programmes is quite poor but can nevertheless be considered worthwhile when compared with the costs of deaths and injuries. Given the background of very poor road safety knowledge and practices, coupled with the fact that the FRSC does not have adequate resources and facilities to monitor speed levels of vehicles, it is important that drivers know and adhere to these limits.

In this decade of road safety, country-specific problems should be identified and specific interventions implemented to achieve set goals. Interventions like health education programmes, health campaigns on road safety practices amidst other measures will go a long way in the control of RTIs (Johnston, 1992). Commercial bus drivers constitute a key group in injury prevention and will benefit from post-license safety education. This study was therefore conducted to quantify the effectiveness of an educational intervention in terms of increased knowledge and self-reported behaviour among commercial minibus drivers in Lagos, Nigeria. Improving the knowledge of drivers serves as a valuable first step in improving their driving habits.

METHODS

STUDY AREA

Lagos is a densely populated state with over 10 million inhabitants. As the financial, commercial and industrial hub of the country, it has a high intercity traffic flow. Commercial motorcycles are very common as transport means within the metropolis, but for inter-city transportation, buses and minibuses are most often used. These vehicle types are highly implicated in RTIs in LMICs (Nantulya & Reich, 2002). These vehicles are usually re-structured to accommodate more passengers than what they were originally designed for. Moreover, in order to make more money, the drivers of these vehicles are more likely to exceed speed limits so as to shorten their transit time and carry more passengers, thereby increasing their daily income. There are 20 local government areas (LGAs) in the state.

STUDY DESIGN AND SAMPLING PROCEDURE

This was a quasi-experimental study conducted over eight months. Randomisation took place only in the group (motor park). The study was carried out in inter-city motor parks located within two predetermined LGAs of Lagos State, namely Kosofe and Mainland. Both are urban LGAs with a considerable number of large inter-city motor parks and busy markets which attract high inter-city traffic flow. Both were chosen so as to have a large pool of minibus drivers in one location because of the interventional nature of the study. From the list obtained from the Lagos state ministry of transportation, it was established that there were 12 registered motor parks in Kosofe, four of which were big inter-city parks. In Mainland, there were 19 registered motor parks, four of which were also big inter-city parks. The two LGAs were more than 300 km apart and thus the risk of cross-interference was minimised. Simple random sampling (simple ballot) was done to determine which LGA would be the experimental group receiving the intervention while the other served as a control. Kosofe was selected to be the intervention LGA while Lagos Mainland served as the control group. By simple random sampling (ballot), one of the major inter-city motor parks from each LGA was selected. This process was conducted by the principal researcher. The minimum sample size (per group) of 77 (Béderd et al., 2008) was estimated using the formula for the comparison of two independent groups (pre- and post-intervention). Since an estimated 250 registered minibus drivers operated from each park, there was no sampling and all of them were included in the study. There was no matching and outcome assessors were not blinded to group assignment. The results are generalisable to Lagos State.

INCLUSION AND EXCLUSION CRITERIA

Motor parks/garage: These were listed for selection if they were registered with the Lagos state ministry of transportation and had a minimum of 120 inter-city minibuses in operation.

Drivers: Consenting drivers were enlisted for inclusion if they were registered members of the motor park and used a 14–18 seater minibus as passenger-carrying vehicle.

DATA COLLECTION

Pre-tested, structured, interviewer-administered questionnaires were used for data collection. Information was collected on the drivers' sociodemography, their knowledge of road signs, maximum speed limits on various road categories in Nigeria and adherence to speed limits. The road sign test was obtained from the office of the chief vehicle inspection officer (VIO), Alausa, Lagos State. The face-to-face interviews were conducted in the motor parks.

The study was conducted in three phases. During the first phase the pre-intervention (baseline) questionnaire was administered to respondents in their various parks. This was done simultaneously with both the intervention and control groups. Next the intervention was applied to the drivers in the experimental group. The intervention consisted of health and safety education talks on the following: Health burden of RTIs and the need for their prevention and control, the importance of VA testing and driving tests as prerequisites for a driver's license; road signs and maximum speed limits (on various roads). The health talks were given at the hall within the park using enlarged pictures of the road signs and speed limits. The health education sessions were held on designated dates and times corresponding to their weekly meetings. There was one session per day and this was repeated every two weeks for two months thus providing a total of four sessions, each lasting for about one hour. Large posters were placed at strategic points in the park. Leaflets containing information on the need for VA testing every six months, road signs and maximum speed limits were also distributed to the drivers to reinforce the message. Finally, the post-intervention questionnaire survey was administered three months after the conclusion of the intervention. This was done in both the intervention and control groups. This period was determined in order to test recall and allow for changes in practice. The drivers analysed post-intervention would have attended at least two sessions. The trial ended after completion of the post-intervention questionnaires. The control group was provided with the health education talks after completion of the questionnaires, using the same methods as in the intervention group. This was to ensure that all participants in the study would benefit from the information provided on road safety measures.

DATA ANALYSIS

Data was analysed with Epi-info 2008 version 3.5.1 and WinPepi statistical software. In the analysis the two groups were compared in terms of the education they received. Descriptive and inferential statistics viz chi square, Fisher's exact tests were carried out at a significance

level of 5% ($p \leq 0,05$). The respondents scored 1 point for each correct answer. The sum of the scores was equated to 100%. A score of 0–33,3% was considered poor, > 33,3 - ≤ 66,6% was fair, and > 66% was good. Due to the significant differences between the two groups, a stratified analysis was carried out to control for possible confounders on their knowledge such as age, educational level, professional driving experience and distance travelled daily. Odds ratio (OR) and overall estimate of OR, and the Mantel Haenszel chi square test (OR_{MH}) were calculated and showed no confounders. Ethical approval was obtained from the Health Research and Ethics Committee of the Lagos University Teaching Hospital. Formal consent was duly obtained from the drivers prior to the interviews. Confidentiality was assured.

OUTCOME INDICATORS (PRE- AND POST-INTERVENTION)

- Proportion of drivers who had correct knowledge of the prerequisites for a driver's license (minimum age of 18 years, visual acuity and driving tests).
- Proportion of drivers who had adequate knowledge of road signs.
- Proportion of drivers who had adequate knowledge of maximum speed limits.
- Proportion of drivers who adhered to speed limits.

RESULTS

A total of 407 respondents were interviewed at baseline, 199 in the intervention group and 208 in the control group. Post-intervention, 377 respondents were interviewed, 186 in the intervention group and 199 in the control group. There was thus an overall attrition rate of 7,4%. In the intervention group, most of the drivers were between 40–49 years, followed by the 50–59 age groups. The lowest proportion was found in the age group 20–29 years. The mean age was 45,6 ± 10.1 years. For the control group, most of the drivers were also between the ages of 40–49 years (43,1%), followed by the 30–39 age group (31,3%). The lowest proportion was 60 years and above. The mean age for this group was 41,4 ± 11,1 years. The control group was significantly younger.

The majority of the drivers in both groups were married; 194 (97,5%) in the intervention group and 173 (83,2%) in the control group. A large proportion, 72 (36,2%) of the drivers in the intervention group had completed secondary school education, 46 (23,1%) primary school education, followed by 35 (17,6%) who had not completed their primary school education. For the control group, the largest proportion, 74 (34,6%) of the drivers also completed secondary school, 44 (21,2%) primary school, while 24 (11,5%) had no formal education. Nearly 60% (59,3%) of the drivers in the intervention group had been driving professionally for at least 16 years. For the control group, almost 40% had been driving

professionally for that long. The largest proportion of them (control) had 6–10 years professional driving experience. The mean duration of professional driving was 19,18 ± 9,98 years for the intervention group and 15,86 ± 9,62 years for the control group.

After the stratified analysis, drivers' age, educational level, professional driving experience and distance travelled daily were not found to be confounding variables. Drivers in the intervention group showed an improvement in their knowledge of pre-license requirements viz ≥ 18 years, visual acuity and driving tests. Pre-intervention, 58,3% of the drivers in the intervention group knew that a VA test should be done before licensing and 50,3% knew that the test needed to be repeated every six months thereafter. Post-intervention, their knowledge improved significantly by 21,7% and 40,6% respectively. Pre-intervention, only 24,6% of drivers in the intervention group correctly interpreted the road sign "Dangerous bend right". This proportion increased significantly by nearly 40% post-intervention. Pre-intervention, only 4% of them knew their speed limit on expressways, but this significantly increased to 91,7% after the health education. The control group did not show significant changes in their knowledge of road signs and speed limits.

For the intervention group, 99% of the drivers had poor knowledge scores for maximum speed limits pre-intervention, but post-intervention, only 8,1% achieved poor scores. On their overall knowledge scores, none of the drivers in the intervention group had good scores but this increased to 66.1% post-intervention. Their mean score increased from 34,4 ± 9,1 to 72,3 ± 10,2 (38% increase). The improvements in knowledge scores on vision screening, road signs, speed limits and overall knowledge scores were statistically significant. For the control group, their mean score decreased from 36,0 ± 0,2 to 35,6 ± 0,4.

Overall, almost all the drivers in both the intervention (98,5%) and control (96,2%) groups demonstrated a positive attitude to road safety. They agreed that mandatory knowledge and adherence to all road signs and speed limits by all drivers were vital in injury prevention. For their practice (adherence to speed limit), 74,9% post-intervention as against 98.4% pre-intervention adhered to maximum speed limits in the intervention group.

DISCUSSION

The health education programme for these commercial drivers was effective in increasing their knowledge but had no effect on their self-reported behaviour. The extent to which the education improved road safety is unknown. It would take a larger health promotion framework to reduce road traffic injuries and death.

This can in part be compared to other documented driver education interventions among younger and older drivers. Higher crash rates observed in young newly licensed drivers informed a risk awareness and perception training programme. A computer-based program designed to teach these novice drivers to recognise risks early on was found to have a substantial effect on improving their awareness of hazards, both under simulator conditions and on the road, thus reducing their likelihood of RTIs (Fisher, Pollatsek & Pradhan, 2006).

Bédard et al. (2008) reported on a multisite, randomised controlled trial where participants in the intervention group received both in-class and on-road education. Knowledge of safe driving practices before and after the in-class education and on-road driving skills before and after the whole programme was measured. It was shown that participants' knowledge improved significantly by 20% (from 61% of correct answers before the in-class education component to 81% afterwards, $p < 0{,}001$). Those in the control group were offered the education afterwards. This was a method also adapted in this study to ensure that the drivers in the control group would also benefit from the education (Bédard et al., 2008).

An educational curriculum was used by Owsley, Stalvey and Phillips (2003) on post-licence older drivers. Post-tests conducted six months later showed that visually-impaired older drivers at higher risk for crash involvement benefited from the educational intervention by reducing their driving exposure and increasing their avoidance of visually challenging driving situations (Owsley et al., 2003). In contrast to the current study, in Owsley's study the time interval was longer and the participants were older and visually impaired, thereby causing a higher perception of risk. This situation would thus more likely motivate positive behaviour change. In yet another study among older drivers, an education programme consisting of classroom and on-road training aimed at common errors made was found to significantly enhance performance on knowledge (including road signs) and on-road tests. Similar to our study, road signs were part of the educational content in terms of which their knowledge improved (Marottoli et al., 2007).

A group of researchers recently published a proposal on the adaptation of the Knowledge Enhances Your Safety (KEYS) programme in Australia. They hypothesised that self-regulation could be optimised and have proposed an integrated programme consisting of a customised education programme about safe driving and alternative transportation which will then be evaluated in terms of its effectiveness on driving exposure and safety. Participants will be followed up for up to a year (Keay et al., 2013). The study is based on an individual intervention whereas our study was group-based. It has been found that no one form of education whether individual, correspondence or group, is substantially more effective than the other (Ker et al., 2003).

The Nigerian study on drivers' educational intervention carried out in Uyo (South-Nigeria) compares well with the current study but differs in certain aspects. The safety education was group-based, presented through lectures, visual aids and interactive sessions. It was also evaluated three months later and found to be significantly effective in improving participants' knowledge and self-reported compliance with traffic signs. Effect on subsequent accidents was not measured. They also used the intervention with motorcyclists in a smaller sample size and offered less content in the educational package. The study was conducted in a smaller and much less populated town with less busy roads than Lagos (Johnson & Adebayo, 2011).

Currently, road safety issues are not as well supported as other health issues of comparable magnitude. With better funding more studies such as these could be conducted to further determine participants' involvement in RTIs and overall effect on road safety. Their improved knowledge and behaviour should also stimulate debate at political level and lead to positive policy changes. Other road safety issues include the fact that road maintenance is often limited to the repair of potholes and clearing drain pipes. Missing traffic signs and guard-rails are usually not replaced. Moreover, strategic locations in the Southwest region lack important traffic signs (Sangowawa, Adebiyi, Faseru & Popoola, 2012).

Presently in Lagos state, traffic offenders apprehended by FRSC officials are given in-class lectures for an hour in addition to a fine to serve as a deterrent to further traffic violations. There is also the drivers' re-certification programme for commercial drivers which takes place at the various centres of the Lagos state driving institutes. The effects of these measures are yet to be evaluated.

The drivers' improved knowledge did not necessarily translate into following the speed limits. Thus, although the drivers have a better knowledge of speed limits, they still find it difficult to slow down to the legal limits. Pre-intervention, they thought the speed limits were higher, for example 120 km/h on the expressway. Besides this, changing individuals' road behaviour will not easily be achieved with a few sessions of in-class contact. Interactive sessions revealed that they believed that driving at a speed of 90 km/h on the expressways would only make them easy targets for armed robbers and lengthen transit time to their destinations. This would negatively affect their daily income. In addition, they knew that their speed levels were not being monitored and so could get away with speeding.

Traffic regulations such as using seat belts are easily observed on the road and so drivers usually comply. Unfortunately, speeding is more difficult to monitor without special equipment. In Nigeria, sustained political will and commitment is required to regulate traffic speeds and achieve adherence to the speed limits. In the meantime, it may be worthwhile

to educate drivers by means of behavioural change programmes in order to get them to follow best practices.

STRENGTHS AND LIMITATIONS

This road safety intervention is one of the few studies in Nigeria which has contributed to the body of knowledge on a key group in road safety matters. Minibuses are used commonly in passenger transport and yet the drivers and their habits are insufficiently researched. A multi-method approach was employed in the education. The road sign test was obtained from the driving testing authority, the Vehicle Inspection Office in Lagos state. This is thus a standardised test. Judging by the educational content, the intervention was successful in significantly improving the drivers' initial poor knowledge of safety measures in the intervention group. At the conclusion of the project, the control group was also provided with this driver education, thus all the drivers benefitted from it. The intervention did not appear to have the desired effect on the drivers' self-reported behaviour. Repeated sessions and other social, political and policy changes may be required to achieve this.

Due to cost issues and an inefficient reporting system, the outcome sought (adherence to speed limits) was self-reported and not verified. The study also did not measure outcomes in terms of traffic offences, accidents and accident injuries among respondents. The final impact on road safety is therefore unknown. It is noteworthy that in a systematic review of randomised controlled trials to quantify the effectiveness of post-license driver education in reducing road accidents, none of the trials were carried out in developing countries. Furthermore, funnel plots have indicated the presence of publication bias affecting the traffic offence and crash outcomes. This selection bias may have affected the results of the trials (Ker et al., 2003). The results of the study need to be interpreted with caution as there was no true randomisation of subjects. The interval between pre- and post-test was short, and should have been longer, say 6–12 months. Commercial drivers represent a highly mobile occupational group and so the original cohort used for the study was likely to change considerably after some time, and thus it was decided to conduct the post-intervention assessment after only three months.

CONCLUSION

The ROSI project had a significant effect on post-license commercial drivers' knowledge of road safety measures. However, it failed to have the same effect on their adherence to speed limits. The subsequent effect of the project on injury prevention is unknown. Continuous education is advocated due to the low knowledge base among drivers who are already certified. Further, larger-scale studies should be conducted to measure offences, crashes and injury outcomes.

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Table 1: Socio-demographic Characteristics of Respondents

Variable	Intervention (N = 199)		Control (N = 208)				
	n	%	N	%	X^2	df	p
Age (years)							
20–29	13	6,5	31	14,9	28,12	4	< 0,001
30–39	36	18,2	65	31,3			
40–49	81	40,7	71	34,1			
50–59	53	26,6	23	11,1			
≥ 60	16	8,0	18	8,6			
Total	**199**	**100**	**208**	**100**			
Mean ± SD	45,6 ± 10,1		41,4 ± 11,1				
Student's t statistic = 4,07, df = 405, p = < 0,001							
Marital Status							
Single	4	2,0	31	14,9	23,64	2	< 0,001*
Married	194	97,5	173	83,2			
Separated/Divorced/ Widowed	1	0,5	4	1,9			
Total	**199**	**100**	**208**	**100**			
Education							
No formal	5	2,5	24	11,5	23,85	6	< 0,001
Non-formal	0	0	8	3,8			
Prim. Sch. uncompleted	35	17,6	22	10,6			
Prim. Sch. completed	46	23,1	44	21,2			
Sec. Sch. uncompleted	25	12,6	20	9,6			
Sec. Sch. completed	72	36,2	74	35,6			
Post Secondary	16	8,0	16	7,7			
Total	**199**	**100**	**208**	**100**			

*Fisher's exact p

Table 2: Effect of health education on drivers' knowledge of safety measures

Knowledge	Intervention			Control		
	Post (n = 186)	Pre (n = 199)	p	Post (n = 191)	Pre (n = 208)	p
Minimum age for license, vision screening and driving test						
Minimum age for obtaining DL	178(95,7)	91(45,7)	< 0.001	120(62,8)	128(61,5)	0,79
VA should be done before DL	148(80,0)	116(58,3)	< 0.001	133(69,6)	145(69,7)	0,99
VA test should be done every 6 months	169(90,9)	100(50,3)	< 0.001	131(68,6)	143(68,8)	0,97
DT should be done before DL	186(100)	192(96,5)	< 0.001	185(96,9)	202(97,1)	0,88
Road signs						
Narrow bridge	125(67,2)	70(35,2)	< 0,001	115(60,2)	127(61,1)	0,86
Dangerous bend right	120(64,5)	49(24,6)	< 0,001	53(27,8)	58(27,9)	0,98
Double dangerous bend first to right	117(62,9)	93(46,7)	< 0,001	100(52,4)	104(50,0)	0,64
Railway crossing without gate	131(70,4)	85(42,7)	< 0,001	41(21,5)	47(22,6)	0,79
Long grade dangerous hill	145(78,0)	55(27,6)	< 0,001	74(38,7)	79(38,0)	0,88
Carriage way narrows	128(68,8)	54(27,1)	< 0,001	17(8,9)	19(9,1)	0,94
Speed limit 80 km	179(96,2)	168(84,4)	< 0,001	159(83,3)	161(77,4)	0,14
Stop at intersection	165(88,7)	138(69,3)	< 0,001	163(85,3)	178(85,6)	0,95
Hospital	173(93,0)	167(83,9)	< 0,001	155(81,2)	169(81,3)	0,98
Advance direction	96(51,6)	47(23,6)	< 0,001	51(26,7)	55(26,4)	0,95
Speed limits						
Maximum speed limit in built-up areas	162(87,1)	9(4.5)	< 0,001	8(4,2)	9(4,3)	0,95
Maximum speed limit on highways	142(76,3)	29(14.6)	< 0,001	53(27,8)	54(26,0)	0,69
Maximum speed limit on expressways	178(95,7)	8(4.0)	< 0,001	3(1,6)	5(2,4)	0,73

VA – visual acuity, DT – driving test, DL – driver's licence

Table 3: Effect of health education on respondents' overall knowledge and practice

Knowledge score	Intervention			Control		
	Post (n = 186)	Pre (n = 199)	p	Post (n = 191)	Pre (n = 208)	p
Minimum age/ pre-requisites for licensure (VA, DT)						
Poor	3(1,6)	10(5,0)	< 0,001	6(3,1)	8(3,8)	0,920
Fair	28(15,1)	86(43,2)		53(27,8)	56(26,9)	
Good	155(83,3)	103(51,8)		132(69,1)	144(69,2)	
Road signs						
Poor	17(9,1)	125(62,8)	< 0,001	115(60,2)	113(54,3)	0,494
Fair	55(29,6)	50(25,1)		54(28,3)	68(32,7)	
Good	114(61,3)	24(12,1)		22(11,5)	27(13,0)	
Maximum speed limits						
Poor	8(8,1)	197(99,0)	< 0,001	185(96,9)	203(97,6)	0,653
Fair	66(35,5)	2(1,0)		6(3,1)	5(2,4)	
Good	112(56,4)	0(0,0)		0(0,0)	0(0,0)	
Overall knowledge						
Poor	19(10,2)	87(43,7)	< 0,001	82(42,9)	68(32,7)	0,020*
Fair	44(23,7)	112(56,3)		107(56,0)	140(67,3)	
Good	123(66,1)	0(0,0)		2(1,1)	0(0,0)	
Mean ± SD	72,3 ± 10,2	34,4 ± 9,1		35,6 ± 0,4	36,0 ± 0,2	
Student's t statistic		38,37			1,25	
P		< 0,01			> 0,05	
Practice Adheres to maximum speed limits						
Yes	149(74,9)	183(98.4)	< 0,001	186(97,4)	182(87,5)	0.001
No	3(1,6)	50(25.1)		5(2,6)	26(12,5)	

* Fisher's exact p