

MOTORCYCLE RIDERS' RISKY BEHAVIORS AND SAFETY MEASURES: A HOSPITAL-BASED STUDY

By

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Abstract

Introduction: Motorcycles are one of the widely used means of transportation in Egypt nowadays especially three-wheeled motorcycle “Tok-Tok” and there is an increased frequency of crash injuries among motorcycle riders. **Aim of work:** To assess the risky behaviors and the safety measures in a group of Egyptian motorcycle riders who experienced road traffic accidents, and to study the possible underlying causes of crash accidents. **Materials and Methods:** A cross-sectional study was conducted on 319 motorcycle riders admitted to Zagazig University Hospitals due to crash accident. A questionnaire was used to gather information about rider’s risky behaviors and safety issues along with other socio-demographic data. **Results:** The study showed that the majority of motorcyclists (87.1 %) don’t have a driving license, only (1.9 %) wear helmets and more than half of them (54.5 %) usually use the cell phone while riding and this was noticed more among “Tok-Tok” (3 wheels) riders. About 58.0% of riders don’t respect traffic rules as traffic lights or road signs, and the majority ride on highways. Poor riding technique (73.4 %) was the main cause of accidents. Stunting acts were more common among the two wheels riders with riding experience less than 10 years. **Conclusion:** the results of this study attract the attention to the main causes of crash accidents which relates to human risky behaviour. This raises the need for proper safety education and training of motorcycle riders with traffic law enforcement, especially driving license and safe riding practices which can definitely help in reducing the incidence of road accidents and save human lives.

Keywords: Motorcycle riders, Road accidents, Driver Behaviour, Crush injuries, Traffic accidents, Road safety and Zagazig.

Introduction

The quick rate of urbanization with insufficient methods for transportation was one of the main causes for increased utilization of motorcycles (Olubomehin, 2012). Motorcycles are widely used all over the world, powered two- and three-wheelers (PTW) represent half of registered vehicles in low- and middle-income countries (49.6% and 45.8%) and 6.8% in high-income countries in 2010 (Ivers et al., 2016). World Health Organization reported that between 2010 and 2013 there was a 27% increase in the number of motorcycles globally (WHO, 2015).

Motorcycles are widely used as one of the best means of transportation for being affordable to the common man and can easily reach the inaccessible city parts through narrow and poorly paved roads (Sufiyan and Ahmed, 2012).

Traffic stream in Egypt is overcrowded with trucks, motor vehicles, two- and three-wheelers, buses, and pedestrians all moving in the same roads (Shaker et al., 2014). In fact, motorcycle and motorcycle taxis as “Tok-Tok” are filling the

gap in the transport system in Egypt with their economic and physical feasibility compared to other means of transportation. Furthermore, the high level of unemployment also made a lot of people to join the business of commercial motorcycling (Salako et al., 2013). Majority of motorcycle riders are young, having no driving license, do not wear helmets and accordingly do not follow safety measures (El-Fiki and El Falaky, 2016).

Motorcycle injuries constitute a major but neglected emerging public health problem in developing countries and contribute significantly to the overall road traffic injuries (Shaker et al., 2014). Nearly a quarter (23%) of the world’s road traffic deaths occurs among motorcyclists. Per vehicle mile travelled, motorcycle riders have a 34-fold higher risk of death in a crash than people driving other types of motor vehicles (Lin and Kraus, 2009; Tumwesigye et al., 2016).

The death rates are higher among males and teenagers (Williams, 2003). Both WHO and World Bank data show that these injuries will significantly rise without appropriate intervention by

the year 2020, especially in rapidly-motorizing countries (Cameron, 2004).

Motorcyclists are among the most vulnerable road users (WHO, 2017). In high-income countries, motorcycle deaths account for 12% of overall traffic deaths, in middle-income countries it reaches about 26% (WHO, 2015). Head and neck injuries are the principal cause of death and injury among motorcyclists (Solagberu et al., 2006). A community-based study done in Egypt on the impact of traffic injuries showed that traffic injuries cause 62.9 % deaths and 34 % non-fatal injuries resulting in long-term disabilities and considerable financial costs (EMRO, 2011). The present study was conducted for future suggesting counter measures that may contribute in decreasing the incidence rates and the severity of the crashes and injuries among motorcycle riders.

Aim of work

This study was conducted to assess the risky behaviour and safety measures in a group of Egyptian motorcycle riders who experienced crash accidents, also to study the possible underlying cause of crash accidents.

Materials and Methods

Study design: It is a cross-sectional hospital-based study.

Place and duration of the study: It was conducted at the Emergency Department of Zagazig University Hospitals, Sharkia Governorate, Egypt during the period from May1st to August 30th, 2017. Zagazig University Hospitals receive the greatest load of traumatized patients as being the biggest hospital in Sharkia Governorate in eastern Egypt with a total capacity of over 320 beds. Emergency Department visits and hospitalizations due to motorcycle crashes reach 100-150 cases monthly as revealed from reviewing medical records of Zagazig Hospital Statistics Unit.

Study sample:

All injured conscious commercial motorcyclists (two and three-wheeler "Tok-Tok" riders) admitted to the Emergency Department at Zagazig University Hospitals over a four-month study period were involved in the study; all other accidents' cases of motorcycle crash were excluded. Those who arrived dead and those who did not consent were excluded.

Study method:

Data were collected through face to face interview with the consenting injured conscious motorcyclists using a **semi-structured questionnaire** adapted from a standardized questionnaire which has been designed and regulated by the Department of Transport, School of Psychology, University of Nottingham, London (Clarke et al., 2004). The questionnaire included five main sections; socio-demographic information, data about the rider's experience and training, risky behaviors, safety issues and history of crashes the motorcyclists involved in the last year.

The questionnaire was translated from English to Arabic by expert translator, then back-translated by another expert translator, and finally, the original and translated versions were compared by another bilingual expert to ensure validity. The reliability coefficient test (Cronbach's alpha) was > 0.72 for all questions.

Pilot Study: The study questionnaire was piloted on fifteen motorcycle riders and some minor adjustments were made on the basis of the feedback received. The results of the pilot study were not

included in this study.

Consent

An informed consent was obtained from all the participants after clarification of the aim of the study. Collected data was kept strictly confidential and for the sole purpose of the study.

Ethical considerations

The necessary official permissions were obtained before data collection. Approval to conduct the research was obtained from the Zagazig University' Institutional Review Board (IRB #4063). No identifying data was collected from the participants.

Data management

The collected data was computerized and statistically analysed using the SPSS program version 19.0 (SPSS, Chicago, IL, USA). Data were expressed as frequencies and percentage. Chi-square test was used to compare proportions as appropriate. The test results were considered significant when $p\text{-value} \leq 0.05$.

Results

Socio-demographic characteristics

of the study participants: A total of 319 male motorcyclists participated in this study and (50.8 %) of them aged 25 to <35 years. As for the educational level, the majority of them had a primary and secondary education (49.2 % and 45.8 % respectively). Most of motorcyclists were single (57.1 %) and workers (77.7

Table 1: Riding characteristics of the study participants.

Characteristics	Frequency (No:319)	%
Type of motorcycle		
2 wheels	231	72.4
3 wheels "Tok-Tok"	88	27.6
Riding Experience		
< 10 years	130	40.8
≥ 10 years	189	59.2
Daily riding hours		
< 5	102	32.0
5-10	124	38.9
>10	93	29.1
Do you have driver's license?		
Yes	41	12.9
NO	278	87.1
What are your reasons for using a motorcycle?		
Commuting to work	105	32.9
As part of your job	153	48.0
Personal reasons	61	19.1
Did you have training on motorcycle riding?		
Yes	14	4.4
NO (self-taught/friends & family)	305	95.6

Table 1 showed that the majority of the participants ride a 2 wheels motorcycle (72.4 %), while (27.6 %) ride "Tok-Tok" (3 wheels). More than half of the motorcyclists' ride for 10 years or more and most of them (70.0%) ride for less than 10 hours/day. Majority of motorcyclists (87.1 %) don't have a driving license. About half of the participants (48.0 %) use the motorcycle as a part of their job and they learned how to ride by themselves, family of friends.

Table 2: Safety measures among motorcyclists while riding.

Characteristics	Frequency (No:319)	%
Properly maintaining your motorcycle	297	93.1
Observing the speed	123	38.5
Not riding while under the influence of drink or drugs	291	91.2
Not riding while tired	216	67.7
Wearing protective clothing/ helmets/boots	6	1.9

Table 2 showed that concerning safety measures, while riding; almost all of the participants maintain their motorcycle (93.1 %) while only (38.5 %) observe their speed limit. Majority of the riders (91.2 %) denied riding under the influence of drink or drugs, similarly (67.7 %) of them refuse to ride while being tired. Only very few riders wear helmets (1.9 %).

Table 3: Risky behaviors among motorcyclists while riding.

Characteristics	Frequency	%
Do you leave a safety gap with other vehicles?		
Yes	223	69.9
NO	96	30.1
What is the number of passengers you ride with?		
1	170	53.3
≥2	149	46.7
Do you have phone call while riding?		
Yes	174	54.5
NO	145	45.5
Do you do stunting acts while riding?		
Yes	112	35.1
NO	207	64.9
Do you respect traffic lights & road signs?		
Yes	134	42.0
NO	185	58.0
Do you ride on the highways?		
Yes	270	84.6
NO	49	15.4

Table 3 showed that a large number of motorcyclists (69.9 %) left a safety gap with other vehicles while riding. Riders prefer riding with only one passenger (53.3 %) and half of them usually use the cell phone while riding (54.5 %). Few of them do stunting acts while riding (35.1 %). More than half of the riders don't respect traffic lights or road signs (58.0 %) and majority of the participants ride on the highways (84.6 %).

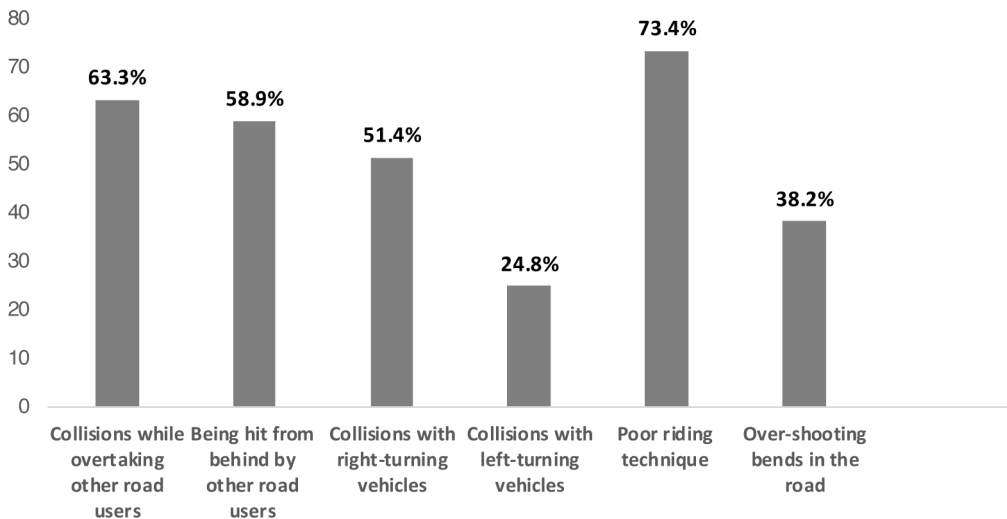


Figure 1: Common causes of accidents that involve motorcyclists.

Figure 1 showed that loss of control of motorcycle as poor riding technique had the highest frequency (73.4 %) of causes of accidents that involve motorcyclists followed by collision while overtaking other road users (63.3 %). The least causes of accidents were collision with left turning vehicles (24.8 %) and over-shooting bends in the road (38.2 %).

Table 4: The relation between riding experience, motorcycle type and risky behaviors.

Characteristics	Riding experience		Type of motorcycle			p- value
	< 10 year (No:130) No (%)	≥ 10 years (No:189) No (%)	2 wheels		3 wheels	
			No (%)	No (%)	No (%)	
Do you leave a safety gap with other vehicles?						
Yes (No: 223)	95 (42.6)	128 (57.4)	0.306	166 (74.4)	57 (25.6)	0.217
NO (No:96)	35 (36.5)	61 (63.5)		65 (67.7)	31 (32.3)	
What is the number of passengers you ride with?						
1 (No:170)	77 (45.3)	93 (54.7)	0.078	157 (92.4)	13 (7.6)	0.000*
≥2 (No:149)	53 (35.6)	96 (64.4)		74 (49.7)	75 (50.3)	
Do you Have a phone call while riding?						
Yes (No: 174)	79 (45.4)	95 (54.6)	0.064	106 (60.9)	68 (39.1)	0.000*
NO (No: 145)	51 (35.2)	94 (64.8)		125 (86.2)	20 (13.8)	
Do you do stunting acts while riding?						
Yes (No:112)	77 (68.8)	35 (31.2)	0.000*	110 (98.2)	2 (1.8)	0.000*
NO (No:207)	53 (25.6)	154 (74.4)		121 (58.5)	86 (41.5)	
Do you respect traffic lights & road signs?						
Yes (No:134)	62 (46.3)	72 (53.7)	0.088	98 (73.1)	36 (26.9)	0.806
NO (No:185)	68 (36.8)	117 (63.2)		133 (71.9)	52 (28.1)	
Do you ride on highways?						
Yes (No:270)	95 (35.2)	175 (64.8)	0.000*	218 (80.7)	52 (19.3)	0.000*
NO (No:49)	35 (71.4)	14 (28.6)		13 (26.5)	36 (73.5)	

*Statistically significant

%).

Table 4 showed that motorcyclists with riding experience less than 10 years perform stunting act while riding in relation to other riders with more riding experience, while motorcyclists with riding experience 10 years or more tend to ride more on highways (all differences were statistically significant p -value <0.001). Results also showed that 2 wheels motorcycle riders do stunting acts and ride on highways more frequently than 3 wheels motorcycle with a statistically significant difference (p -value >0.001). Tok-Tok (3 wheels motorcycle) riders use cell phones and ride with more than one passenger more frequently than 2 wheels motorcycle with a statistically significant difference (p -value <0.001).

Discussion

In Egypt, the burden of motorcycle crash injury continues to rise especially with the recent increase in number and usage of motorcycle taxis "Tok-Tok" with increasing the number of injuries attributed to them. The current study revealed that motorcycle and motorcycle taxis injuries contributed to 57.0 % of road traffic injuries admitted

to the emergency department at the time of the study (results are not tabulated). This finding was within the range of the previously reported prevalence of motorcycle injuries around the world, which varies from 22 % up to 62% (Nzegwu et al., 2008; Kigera and Nguku 2010).

The potential hazards from the aging driver population represent a public concern; however, little attention has been given to the age difference. Results of this study revealed that majority of the injured motorcyclists were aged less than 35 years (results are not tabulated) which is consistent with previous findings of similar studies in other countries that teenage and young age drivers posed the highest risks of death and non-fatal injury to themselves, their passengers, occupants of other passenger vehicles, and non-occupants compared with older drivers (Braver and Trempe, 2004; National Highway Traffic Safety Administration, 2009 and Mansuri et al., 2015). Also, this finding seems logical as the job of riding motorcycles for commercial purposes as demonstrated largely in this study seems to be very

demanding. Moreover, overestimation of driving skill and capability of hazard recognition as well as underestimation of crash consequences increase the risk of crash injuries among younger than older drivers. Indeed, the recklessness and risk-taking behaviors during driving is a fact among youth not only motorcyclists but even car drivers (Rhodes and Pivik K, 2011). On the other hand, the protective effect of higher age was established in other studies (Oxley et al., 2013 and Ali et al., 2015).

In agreement with previous findings (Salako et al., 2013 and Olusayo et al., 2015), this study showed that all the injured were males. One of the reasons for this is that commercial motorcycling is regarded as a male job in most provinces and especially in Egypt, where this study was carried out in Zagazig city, Al Sharquia region. In addition, most females will not be able to meet up with the energy demanded this occupation which is so strenuous and requiring high risk ventures (Olusayo et al., 2015). However, Egyptian females recently involved but as taxi drivers but

as motorcyclists yet.

In this study, it was detected that the majority of injured riders did not receive higher than secondary school education (results are not tabulated). A similar observation was noted in Nigeria where the majority of the commercial motorcyclists (52.8 %) had primary education or no formal education (Iribhogbe and Odai, 2009). Similarly, a study conducted in Egypt by Shaker et al. (2014) reported that 61.7% of the injured motorcyclists achieved primary education or less. This finding is expected because majority of the riders are workers (77.7%) engaging in commercial motorcycling as part of their job or as a transportation to their work which can be explained by the fact that their low level of education cannot enable them to compete for better job opportunities (Shaker et al., 2014). Furthermore, motorcycles and 3 wheeled "Tok-Tok" became a popular mean of transportation in Egypt especially with the financial burden of other means of transportation and over crowdedness.

It is usually known that inexperience or low experience riders' are at greater

risk of getting involved in crashes during riding their motorcycles than those with long experiences (Fagnant and Kockelman, 2015). However, in contrast to this documented finding, this study showed that the majority of injured motorcyclists (59.2%) had long riding experience for 10 or more years (Table 1). This finding could be attributed to the fact that most of the riders illegally engaged in riding at very young age due to their low socio-economic conditions and are usually willing to take any risk in order to meet the needs of their families.

Concerning training on motorcycle riding, this study illustrated that the majority (95.6%) of the injured motorcyclists had learnt how to ride by their own or from their friends, which may explain their lack of compliance to safety rules especially on the road. Moreover, it is not surprising why just 12.9% only of them have a driver's license (Table 1) which could reflect the resilience of traffic laws that do not enforce training in driving schools as a pre-requisite for driving licences issuing. Also financial burden may hinder from getting training in special

driving schools.

As regard safety measures, the current study showed that the most important safety measures used was maintaining the motorcycle, denying riding under the influence of drink or drugs (93.1 %, 91.2 % respectively) (Table 2). However; despite estimating that proper helmet use reduced the death rate of motorcyclists and passengers involved in road traffic crashes by approximately 40.0% and the severity of head injury by 72.0% as reported by Branäs and Knudson (2001); it was noticed from this study that only very few (1.9 %) riders committed to wear helmet or protective clothing while riding (Table 2) though being relatively cheap and not costly. This could be explained by their negative attributes of helmet use such as inconvenience, discomfort in hot weather and lack of awareness toward importance of helmet in reducing risk and occurrence of head injuries and death due to motorcycle accidents. Also, poor helmet use has been recorded in several studies, especially in developing countries (Shaker et al., 2014 and Nzegwu et al., 2008). Actually, one of the important

means of increasing the wearing of helmets in developed countries was implementation of stringent legislative measures as documented by Macpherson and Spinks (2008), who revealed that motorcycle helmet legislation was effective in increasing helmet use and decreasing head injury rates.

On the contrary, other studies reported that high speed and driving under the influence of alcohol represent the least important safety measures reported by the motorcyclists (Lardelli-Claret et al., 2005 and Aetukumana et al., 2010). These differences may be due to attitude, awareness and cultural differences between studied populations, especially that these were subjective answers. Behavioral factors have been recognized as a major contributor to 95.0% of traffic accidents (Ulleberg and Rundmo, 2003). Riding on highway, non-respecting traffic light and road signs, having a phone call while riding and carrying two or more passengers at a time (84.6%, 58.0%, 54.5% and 46.7% respectively) were identified as the most frequent risky behaviors reported by the injured motorcyclists in this study (Table

3). These findings go a long way to confirm the fact that there is still poor enforcement of traffic laws. Also, may be explained by their intention of getting more money within shortest possible time without considering the safety of themselves and that of the passengers.

As regard the types of motorcyclists' accident, the current study revealed that loss of control of motorcycle as result of poor riding technique, a collision while overtaking other road users and being hit from behind represented the majority of crashes among injured motorcyclists (Figure 1). These results consistent with the fact that the majority of the injured riders' in our study hadn't professional training on motorcycle riding. Moreover, this is probably explained by the fact that cars and motorcycles share the same driving space and this favours the car versus motorcycle collision.

On studying the relation between risky behaviors and riding experience, there was a significant relation between performing stunting acts and riders with low experience and taking into consideration that most of the injured motorcyclists were of a young age with more energy, irresponsibility,

and tendency to make unsafe acts especially in front of their fellow riders. While riding more on highway was significantly related to those with longer riding experience than those with lower experience (Table 4) which may be explained by the fact that riders with long riding experience are likely to have more courage, rigidity, and readiness to take risk that arises from their accumulated riding experience.

Stunts acts and riding on the highway were significantly higher among two wheels motorcycle than three wheels (Table 4). This finding goes with the Egyptian inherited traditions of doing stunts by their motorcycle in many situations more specifically in wedding parade despite frequent recording of negative consequences. On contrary, using a cell phone and riding more than one passenger was more significantly higher among motorized three wheels than two wheels (Table 4). These findings are consistent with the design and capacity of each motorcycle type.

Study limitations: Our Study was not a community-based study but a cross-sectional study conducted at a single city in Egypt and therefore

the results may not be generalized to the rest of the country. Also, data collected was self-reported hence the results may have been biased since the accuracy of respondents' description of circumstances of the crashes could not be independently verified. However, it contributes to the literature concerning Egyptian motorcyclists' traffic risk behaviors and safety measures especially with scarcity regarding researches on the motorcycle population in Egypt.

Conclusion and Recommendations

This study is one of the few studies conducted to assess the increasing motorcycle accidents problem; the results raise the attention to the main cause of crash accidents which relates to human risky behaviour such as riding on the highway, unrespecting traffic signs, and having a phone call while riding with lacking many safety measures. This raises the need for proper safety education and training of motorcycle riders. Also, the need for traffic law enforcement, especially driving licence and safe riding practices which can definitely help in reducing the incidence of road accidents and save

human lives.

Conflict of Interests

The authors declare that they have no conflict of interests.

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References

1. Aetukumana I, Onumbu LC, John I and Valenti M (2010): Possible causes of motorcycle (Okada) accidents in Karu, Nigeria. *Inj Prev* [Internet], [cited 2017 Nov 24]; 16(Supplement1): A88–A88. Available at: <http://injuryprevention.bmj.com/cgi/doi/10.1136/ip.2010.029215.319>
2. Ali S, Ali SA, Kanpurwala MA, Aslam M, Siddiqui S, et al. (2015): Association of Motorbike Accidents with Behavior related Factors in Karachi. *J Stud Manag Plan* [Internet], [cited 2017 Nov 23]; 1(3):532–39. Available at: http://www.academia.edu/12663576/Association_of_Motorbike_Accidents_with_Behavior_related_Factors_in_Karachi_Pakistan
3. Branas CC and Knudson MM (2001): Helmet Laws and Motorcycle Rider Death Rates. *Public Heal Resour Accid Anal Prev* [Internet], [cited 2017 Nov 24]; 33:641–48. Available at: <http://digitalcommons.unl.edu/publichealthresources>
4. Braver ER and Trempe RE (2004): Are older drivers actually at higher risk of involvement in collisions resulting in deaths or non-fatal injuries among their passengers and other road users? *Inj Prev* ; 10(1):27–32. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/14760023>
5. Cameron M (2004): World Report on Road Traffic Injury Prevention. *Inj Prev*; 10(4):255–56.
6. Clarke DD, Ward P, Bartle C and Truman W (2004): In Depth Study of Motorcycle Accidents In-depth Study of Motorcycle Accidents. *Psychology*; (54):1–67.
7. El-Fiki A and El Falaky O (2016): Evaluation of neurotrauma in motorcycle-related accidents at a tertiary hospital in Egypt. *Egypt J Neurol Psychiatry Neurosurg* [Internet]; 53(4):244. Available at: <http://www.ejnpn.eg.net/text.asp?2016/53/4/244/202385>.
8. EMRO (Eastern Mediterranean Regional Office) (2011): Egypt: A national decade of action for road safety 2011 - 2020. *Popul* (English Ed [Internet]; Available at: <http://www.emro.who.int/publications/Year.asp?PubYear=2011>
9. Fagnant DJ and Kockelman KM (2015): Motorcycle Use in the United States: Crash Experiences, Safety Perspectives, and Countermeasures. *J Transp Saf Secur* [Internet], [cited 2017 Nov 24]; 7(1):20–39. Available at: <http://www.tandfonline.com/doi/abs/10.1080/19439962.2014.894164>
10. Iribhogbe PE and Odai ED (2009): Driver-related risk factors in commercial motorcycle (okada) crashes in Benin City, Nigeria. *Prehosp Disaster Med* [Internet], [cited 2017 Nov 24]; 24(4):356–59. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/19806561>
11. Ivers RQ, Sakashita C, Senserrick T, Elkington J, Lo S, et al. (2016): Does an on-road motorcycle coaching program reduce crashes in novice riders? A randomised control trial. *Accid Anal Prev* [Internet]; 86:40–46. Available at: <http://dx.doi.org/10.1016/j.aap.2015.10.015>
12. Kigera L and Nguku EKN (2010): The Impact of Bodaboda Motor Crashes on the Budget for

- Clinical Services at Mulago. East Cent African J Surg [Internet], Jun 10 [cited 2017 Nov 23]; 15(1):57–61. Available at: <https://tspace.library.utoronto.ca/handle/1807/52812>.
13. Lardelli-Claret P, Jiménez-Moleón JJ, de Dios Luna-del-Castillo J, García-Martín, M, Bueno-Cavanillas A et al. (2005): Driver dependent factors and the risk of causing a collision for two wheeled motor vehicles. *Inj Prev* [Internet], [cited 2017 Nov 24]; 11(4):225–31. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/16081752>
 14. Lin MR and Kraus JF (2009): A review of risk factors and patterns of motorcycle injuries. *Accid Anal Prev* [Internet], Jul 1 [cited 2017 Nov 23]; 41(4):710–22. Available at: <http://www.sciencedirect.com/science/article/pii/S0001457509000578?via%3Dihub>
 15. Macpherson A and Spinks A (2008): Bicycle helmet legislation for the uptake of helmet use and prevention of head injuries [Internet], Spinks A, editor. *Cochrane Database of Systematic Reviews*. Chichester, UK: John Wiley & Sons, Ltd; [cited 2017 Nov 25]; Available at: <http://doi.wiley.com/10.1002/14651858.CD005401.pub3>
 16. Mansuri FA, Al-Zalabani AH, Zalat MM and Qabshawi RI (2015): Road safety and road traffic accidents in Saudi Arabia: A systematic review of existing evidence. *Saudi Med J* [Internet], Apr 1 [cited 2017 Nov 23]; 36(4):418–24. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/25828277>.
 17. National Highway Traffic Safety Administration (2009): *Traffic Safety Facts 2008*. *Ann Emerg Med*; 53(6):214.
 18. Nzegwu MA, Aligbe JU, Banjo AA, Akhiwui W and Nzegwu CO (2008): Patterns of morbidity and mortality amongst motorcycle riders and their passengers in Benin-City Nigeria: one-year review. *Ann Afr Med* [Internet], Jun [cited 2017 Nov 23]; 7(2):82–85. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/19143165>.
 19. Olubomehin OO (2012): The Development and Impact of Motorcycles as Means of Commercial Transportation in Nigeria. *Res Humanit Soc Sci* [Internet]; 2(6):231–39. Available at: <http://www.iiste.org/Journals/index.php/RHSS/article/view/2395>
 20. Olusayo AI, Oyetunde OB, SundayAdedokun O, Adedeji AS, Okeibunor OL et al. (2015): Risky behaviors among commercial motorcycle riders in Ogbomoso, Nigeria. *Int J Adv Res*; 3:506–11.
 21. Oxley J, Yuen J, Ravi MD, Hoareau E, Mohammed MAA, et al. (2013): Commuter motorcycle crashes in Malaysia: An understanding of contributing factors. *Ann Adv Automot Med* [Internet], [cited 2017 Nov 23]; 57:45–54. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/24406945>.
 22. Rhodes N and Pivik K (2011): Age and gender differences in risky driving: The roles of positive affect and risk perception. *Accid Anal Prev* [Internet], [cited 2017 Nov 23]; 43(3):923–31. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/21376884>
 23. Salako A, Abiodun O and Sholeye O (2013): Risk behaviors for road traffic accidents and severe crash injuries among commercial motorcyclists in Sagamu, South West, Nigeria. *Online J Med Med Sci Res* [Internet], [cited 2017 Nov 23]; 2(2):2277–879. Available at: http://www.academia.edu/21044253/Risk_behaviors_for_road_traffic_accidents_and_severe_crash_injuries_among_commercial_motorcyclists_in_Sagamu_South_West_Nigeria.
 24. Shaker RH, Eldesouky RS, Hasan OM and Bayomy H (2014): Motorcycle Crashes: Attitudes of the Motorcyclists Regarding Riders??? Experience and Safety Measures. *J Community Health*; 39(6):1222–30.
 25. Solagberu BA, Ofoegbu CKP, Nasir AA, Ogundipe OK, Adekanye AO, et al. (2006): Motorcycle injuries in a developing country and the vulnerability of riders, passengers, and pedestrians. *Inj Prev* [Internet]; 12(4):266–68. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/16887951%5Cnhttp://>

- www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC2586788.
26. Sufiyan M and Ahmad S: (2012): Knowledge, attitude and compliance with safety protective devices among commercial motorcyclists in Tudun-Wada Zaria, North-Western Nigeria. *Ann Niger Med* [Internet]; 6(2):80. Available at: <http://www.anmjournals.com/text.asp?2012/6/2/80/108126>
 27. Tumwesigye NM, Atuyambe LM and Kobusingye OK (2016): Factors Associated with Injuries among Commercial Motorcyclists: Evidence from a Matched Case Control Study in Kampala City, Uganda. Tang T, editor. *PLoS One* [Internet], Feb 26 [cited 2017 Nov 23]; 11(2):e0148511. Available at: <http://dx.plos.org/10.1371/journal.pone.0148511>.
 28. Ulleberg P and Rundmo T(2003)): Personality, attitudes and risk perception as predictors of risky driving behavior among young drivers. *Saf Sci* [Internet], [cited 2017 Nov 24]; 41(5):427–43. Available at: <http://www.sciencedirect.com/science/article/pii/S092575350>.
 29. Williams AF (2003): Teenage drivers: Patterns of risk. *J Safety Res*; 34(1):5–15.
 30. WHO (World Health Organization) (2015): *Global Status Report on Road Safety*. WHO. *Libr Cat Data Glob* [Internet]; 340. Available at: http://www.who.int/violence_injury_prevention/road_safety_status/2015/en/
 31. WHO (World Health Organization) (2017): *Road traffic injuries* [Internet]. WHO. World Health Organization, [cited 2017 Nov 23]; Available at: <http://www.who.int/mediacentre/>