

Pattern and Burden of Road Traffic Accidents in Tertiary Care Public Hospital, District Central, Karachi from 2016 to 2018

Rehan Ahmed Mughal¹, Muhammad Zafar Iqbal Hydrie², Sana Adeeba Islam³,
Syed Imtiaz Ali Jafry⁴, Munir Ahmed Shaikh⁵, Syed Muhammad Zulfiqar Hyder Naqvi⁶

Abstract

Objective: To assess the burden of trauma during last three years (2016-18) caused by road traffic accidents presenting to the trauma centre of tertiary care public hospital in district central, Karachi.

Methods: All the accident cases presenting in the trauma center of the hospital in last three years who were defined as accidents occurring on a public road and involving at least one moving vehicle were included in the study. Those with incomplete medical records were excluded. This was a cross-sectional study where records of a total of 2857 individuals were retrospectively collected and their socio-demographic information, history of road traffic crashes, clinical history and examination was noted. Data was analyzed through SPSS while descriptive statistical analysis of continuous and categorical variables was performed.

Results: The mean age of patients admitted to the trauma centre was 29.3 ± 16.7 years with no significant difference between both gender. Out of 2857 patients with road traffic accident injuries, around 80.9% were males. The most prevalent age group was 16-30 years of age, which was over 40.2%, followed by subjects of 31 - 45 years age group which was 21%. The study results further showed that over 51.3% of the road traffic accident patients were discharged normally, followed by 46.7% subjects who left against medical advice. Overall death rate was 2% (n=57).

Conclusion: This study helps to identify the latest accident burden and pattern of injuries to develop plans aimed at prevention of road traffic accidents. Looking at the burden, the most affected was the younger subjects (16-30 years) highlighting the need for targeting this population for educational programs and policies about safe driving. Among the road traffic accidents cases the subjects who left against medical advice cases was gradually decreasing from 2016 to 2018 suggesting better healthcare facilities at the tertiary care hospital and corresponding increasing patient's confidence in them.

Keywords: Accidents, Road Traffic, Trauma Centre, Emergency Ward.

IRB: Approved by Baqai Medical University, Ref#FHM-63-2019/MPH/RP/07. Dated: 1st March 2019.

Citation: Mughal RA, Hydrie MZI, Islam SA, Jafry SIA, Shaikh MA, Naqvi SMZH. Pattern and burden of Road Traffic Accidents in tertiary care public hospital, District Central, Karachi from 2016 to 2018 [Online] Annals ASH KMDC 2021; 26.

(ASH & KMDC 26(1):272;2021)

Introduction

Development of the transportation system is a key factor to assess the economic growth of a country and serves as an important indicator show-

ing the growth of the industry of the country. As industry grows and expands it puts pressure on the transport system especially the road network for the need to distribute and transport products to different places across the country and beyond. This adds to the already strained transport network especially in the developing countries due to the rapidly increasing population growth and modernization process. Lessons learned from the developed countries shows that industrialization leading to economic growth results in an increased transport fleet needed to keep up with the demand of the industry and this initially causes increasing traffic chaos with subsequent increased mortality. Fortunately, the mortality rates were stabilized due to extensive

¹Department of Pathology,
Abbasi Shaheed Hospital

²School of Public Health,
Dow University of Health Sciences

³Department of Community Dentistry,
Karachi Medical and Dental College

^{4,5,6}Department of Community Medicine,
Baqai Medical University

Correspondence: Dr. Sana Adeeba Islam
Department of Community Dentistry,
Karachi Medical and Dental College
Email: sanadeeba12@hotmail.com

Date of Submission: 29th October 2020

Date of Acceptance: 14th June 2021

road network structure and proper implementation of traffic rules and regulations despite the increased numbers of vehicles on the road in those countries. Unfortunately, the detrimental impact due to rising road traffic seen in developing countries due to the double burden of increasing population and industrial growth has serious negative statistics of road traffic accidents, which shows increasing mortality and morbidity which is much higher than was seen in the developed countries. Around 10% of the global burden of disease is due to injury, resulting in nearly 5 million deaths annually and of this 90% occurs in low-middle income countries^{1,2}. Pakistan is a developing country with a population of nearly 20 crore people and ranked 150 out of 189 countries in the Human Development Index with a life expectancy of 66 years³. Thus Pakistan is a low middle income country undergoing industrial growth which is a major workforce of the Eastern Mediterranean region with an expanding road transport network with central asia especially china and over 90% of passengers and goods are transported by road in Pakistan⁴.

The 2017 World Health Organization data on road traffic deaths shows that road traffic accidents unfortunately reached 27,081 or 2.22% of total deaths in Pakistan⁵. The World Health Assembly resolution 60.22 highlighted the requirement for strengthening emergency care systems to reduce the burden of disease from acute injury and illness⁶. Also recent World Health Organization reports stated that traffic fatalities could be 4 to 10 times higher than the officially reported statistical figures in Pakistan due to non or under reporting of accidents.⁶ In addition road traffic accidents not only causes human life loss but also results in extensive economic losses to subjects as well as their families, who also suffer due to the financial burden of direct job loss as well as due to the added burden of taking care of the injured working class population or long term disability consequences on the family resources. These losses arise not only from the deaths but also from the cost of treatment as well as lost productivity for those disabled by their injuries as mentioned above, and also for the

family members who need to take time off work leading to lost revenue or school to take care for the injured individuals. Thus road traffic accidents also impact most countries economically and one of the aims of the Sustainable Development Goals is to reduce the number of global deaths, fatalities and injuries to around half from road traffic accidents by 2020 which will reduce the burden on the community since prolonged treatment leads to financial and emotional burden, and if consequent permanent disability occurs it will add to the human burden which is compounded by already poor health facilities⁷. Since trauma and other medical emergencies are a considerable essential component of the public health services, there can be preventable morbidity and mortality in developing countries if proper public health awareness programs regarding road safety and proper traffic rules and regulations are implemented. Over the passage of time road traffic accidents have emerged as an important public health issue which needs to be tackled by a multi-disciplinary team working in partnership with different agencies such as creating awareness via the public services department, traffic police department and road and planning departments, all working together to ensure that policies are developed and implemented for prevention of road traffic accidents which are constantly monitored and frequently evaluated⁸. Some of the known factors that may contribute to road traffic injuries such as person, vehicle and environment can be controlled by relating to legislation and policies that will have to be addressed at different levels as mentioned above such as polices and traffic regulations etc.

The aim of the study was to update and determine the magnitude and volume of trauma caused by road traffic accidents presenting in subjects visiting a trauma centre to estimate the burden and pattern of traffic accidents. A few studies have been done previously in provinces of Khyber Pakhtunkhwa (KPK) and Punjab as well as in City of Karachi with very small sample size^{7,9}, Karachi is the only metropolitan city of Pakistan with a population of 16.62 million, hence more vehicles are

on the road at all times compared to other areas of the country^{9,10}. Although data from one public sector hospital might not be representative of the megacity, but this is one of the major tertiary care public hospital with a trauma centre situated in one of the busiest district, the Central District of Karachi where most of the patients from District Central are admitted and thus latest road traffic accidents hospital based data from here would highlight important information on the changing trend within the last three years and help to engage the stakeholders to play a more dynamic role in policy development as well as implementation of the regulations. Such data can also be useful for healthcare planners to identify and understand where is the need to utilize resources and which expertise are required in a trauma centre while also addressing the preventable causes of morbidity and mortality through public awareness programs and legislations needed to reduce road traffic accidents. Similar studies done on road traffic accidents looking at the burden have resulted in focusing on minimizing resources, direct utilization of funds and policy development and evaluation in many western countries leading towards decreasing road traffic accidents. This study was therefore conducted with the objective of assessing the pattern and burden of injuries from road traffic accidents in trauma centre of tertiary care public hospital in Karachi for three years from 2016 to 2018.

Materials and Methods

A cross-sectional study was conducted using retrospective data for the last three years starting from 2016 to find out the number of cases of road traffic accidents coming to the trauma centre of Abbasi Shaheed Hospital, a major public sector hospital in district central, Karachi from 2016 to 2018. All information regarding history of road traffic crashes, clinical history, examination, nature of injury and outcome as well as socio-demographic data were taken into account from the hospital records. In inclusion criteria, all road traffic accident cases defined as accidents that may or may not lead to injury, occurring on a public road and involving at least one moving vehicle, all such cases

coming to the hospital were included. For exclusion, all subjects who did not meet the criteria for an accident case or those with incomplete medical records were excluded.

Data of 2857 individuals from 1st January 2016 to 31st December 2018 was retrospectively collected by the principal investigator after taking permission from the relevant hospital authority. Ethical approval to carry out the study was taken, as part of the Master's thesis before starting the study, approval was also taken from the hospital collaborating with the study to record the details of the patients (Letter: Ref. NoFHM-63-2019/MPH/RP/07). Confidentiality was assured and medical record numbers were represented by a special tag which was already available as MR in hospital and only the primary investigator had access to them. All data was kept confidential and anonymous. Data were analyzed through SPSS version 20. A descriptive statistical analysis of continuous and categorical variables was performed.

Results

A total of 2857 cases of road traffic accidents whose medical records from the public hospital database were found to be complete from 2016 to 2018 were included in the study. From the records for the last three years in the study, around 699 cases were from 2016, 989 cases were from 2017 and 1169 cases were from 2018. Out of 2857 cases, 57 subjects died which represents around 2% of the total cases while the rest survived with injuries due to road traffic accidents. The mean age of the patients was 29.3 ± 16.7 years (range 1 to 88 years). Out of total 2857 persons, 2310 (80.9%) were males while 547 (19.1%) were females. The male to female ratio observed was approximately 4:1. The ages of all patients with road traffic accidents were divided into five age-groups and the age group most affected in all three years was the 16-30 years' age group followed by the 31-45 years' age group. With regards to gender, males were overwhelmingly involved in road traffic accidents in all three years as compared to females as shown in table 1. The most frequent times in which road traffic accidents occurred due to motor vehicle were

found to be between 1 pm to 4 pm (School Timings) followed by 7 am to 12 pm (Morning Office Timings) while the most frequent times in which road traffic accidents resulted in deaths were found to be between 5 pm to 8 pm (Evening Office timings or Rush Hours) followed by 12 am to 6 am (After midnight Hours) as shown in table 2.

Among the departments where road traffic accident patients were admitted from the emergency or trauma centre, the highest proportionate percentage of deaths was reported from medical care (4.6%, n=6) followed by neurosurgery (3.7%, n=42) and gynecology (3.1%, n=1). In terms of absolute numbers neurosurgery reported the highest mortality with 42 deaths. The highest percentage of subjects who left against medical advice cases were reported from pediatrics (87.5%, n=49) followed by orthopedics (85.5%, n=658) and surgical care (82.8%, n=366), Looking at the subjects normally discharged from the hospital, the highest percentage of subjects with normal discharge was reported from burns (88.5%, n=69) followed by faciomaxillary (81.9%, n=163) and gynecology (81.2%, n=26) as shown in table 3. The study results further indicated that overall a little over half of the patients were normally discharged (n=1465, 51.3%) followed by those who left against medical advice (n=1335, 46.7%) and finally deaths (n=57, 2%). Furthermore, among the road traffic accidents cases the highest percentage of deaths was reported in 2018 (2.6%, n=30), the highest percentage of those who left against medical advice cases was reported in 2016 (54.5%, n=381) while the highest percentage of normal discharge cases was also reported in 2018 (59.1%, n=691) as shown in table 4.

Discussion

This study assessed patterns and burden of road traffic accidents reported in one major public hospital in Karachi city in the three years from 2016 to 2018. This study revealed that road traffic accidents burden significantly increased with a p value of 0.004, within the three years observed as the numbers of cases reported were 699 (24.5%) in 2016, 989 (34.6%) in 2017 and 1169 (40.9%) in 2018 respectively. The increasing number of ve-

hicles on the roads with each passing year results in more vehicles with every passing year and this may lead to more traffic due to more vehicles leads to more accidents occurring on the roads. The increasing numbers of road traffic accidents poses an additional burden on the economy of the country in terms of resources utilized for treatment and rehabilitation of disability resulting from the accidents and this need to be reduced according to the sustainable development goal. Another significant finding in this study was that overall the most affected age group was the 16-30 years old which is a comparative younger age group accounting for 40.2% of the road traffic accidents, something which is similar to seen in other studies done¹¹. Different national and international studies are consistent with similar reports that state road traffic accidents are the leading cause of death among young people aged between 15-30 years, probably due to impulsive and risky behaviours¹²⁻¹⁴. What is alarming in our study is that over the three years studies more and more younger subjects (15 years or less) are getting involved in road traffic accidents with each passing year as shown in table 1. Since young people tend to be more impulsive and have aggressive attitudes, thus leading to riskier behaviour such as tending to accelerate with greater speeds hence taking risks resulting in more severe injuries in this young age group leading to fatal injuries.

It has been observed that majority of vehicle drivers tend to be males and especially male motorcyclists are predominantly more on the roads compared to females in our country, thus males have a higher chance to be involved in road traffic accidents. Due to the overwhelming increased number of male drivers on the roads and resultant more males involved in road traffic accidents lead them to be more injured resulting in bodily harm as well as more financial burden to the family as males are usually the main bread earners of the family in our society. The gender distribution in the present study is consistent with that observed by others,

Table 1. Year wise distribution of socio demographic variables

Variables (n=2857)	2016 (n=699)		2017 (n=989)		2018 (n=1169)	
	n	(%)	n	(%)	n	(%)
Age Groups (years)						
15	91	13.0	127	12.8	346	29.6
16-30	297	42.5	418	42.2	433	39.9
31-45	168	24.0	230	23.2	202	17.3
46-60	106	15.2	138	13.9	126	10.7
> 61	37	5.3	76	7.7	62	5.3
Gender						
Male	588	84.1	809	81.8	913	78.1
Female	111	15.9	180	18.2	256	21.9

Table 2. Motor Vehicular Injuries and Deaths in relation to timing of Road Traffic Accidents

Variable (n=2857)	Died (n=57)		Injured (n=2800)	
	N	(%)	n	(%)
Time of Accident				
7 am to 12 pm	12	21.1	653	23.3
1 pm to 4 pm	6	10.5	719	25.6
5 pm to 8 pm	18	31.6	623	22.2
9 pm to 11 am	8	14.0	502	17.9
12 am to 6 am	13	22.8	303	10.8

Table 3. Relationship of Outcome of Road traffic accidents with Departments of the Hospital

Variable (n=2857)	Died		Left Against Medical Advice		Normal Discharge	
	n	(%)	n	(%)	n	(%)
Departments						
Surgical Care (n=442)	1	0.2	366	82.8	75	17.0
Burns (n=78)	1	1.3	8	10.3	69	88.5
Medical Care (n=130)	6	4.6	27	20.8	97	74.6
FacioMaxillary (n=199)	2	1.0	34	17.1	163	81.9
Gynaecology (n=32)	1	3.1	5	15.6	26	81.2
NeuroSurgery (n=1150)	42	3.7	188	16.3	920	80.0
Pediatrics (n=56)	1	1.8	49	87.5	6	10.7
Orthopedics (n=770)	3	0.4	658	85.5	109	14.2

Table 4. Motor vehicular injuries and deaths in relation to Years of Road Traffic Accidents

Variable (n=2857)	Died		Left Against Medical Advice		Normal Discharge	
	n	(%)	n	(%)	n	(%)
Year of Accident						
2016 (n=699)	13	1.9	381	54.5	305	43.6
2017 (n=989)	14	1.4	506	51.2	469	47.4
2018 (n=1169)	30	2.6	448	38.3	691	59.1

with a higher frequency of injuries in males compared with females since males are more on the road compared to females^{15,16}. Thus, risky behaviours is a strategy to reaffirm masculinity seen in males and especially in the younger age group as mentioned above, where the defiance of the law is considered norm and rules are constantly assumed as something to challenge and speed as somewhat to boost about. All of this combined together leads to more fatal injuries in young male drivers. Faced with this finding in various studies, authors have suggested education in the adoption of safe behaviours that have to be gender specific and culturally sensitive¹⁷.

In this study, in terms of absolute numbers, the neurosurgery department of the hospital was found to have the most subjects who died from road traffic accidents compared to other departments, although in terms of mortality rate the medical care department had highest percentage of mortality as compared to other departments in the hospital. High number of fatalities in neurosurgery department is in accordance with what has been observed in previous studies which suggested that worldwide head injury is the single largest root cause of death and disability following accidents^{18,19}. The World Health Organization estimates that almost 90% of deaths due to injuries happen in neurosurgery department¹⁸. Head injury is the main cause of disability in people under 40 years of age and severely disables 150-200 people per million annually^{19,20}. This reflects on the huge burden and pressure as well as high stress placed on the staff of the neurosurgical department and emphasizes the fact that

urgent treatment, aggressive monitoring and management of neurological injuries is needed for the prevention of any disability through timely delivery of required treatment and surgical interventions. This highlights the fact that not only medical workforce alertness in neurosurgical departments is needed but also a well established neurosurgical facility and team is needed to be in place at every major trauma centre for dealing with such acute emergencies as head injuries etc. The need for public awareness programs with regards to head injuries and how to manage them on accident site as well as the importance of using helmets for motorcyclist as precaution is another preventable aspect that needs to be implemented and as such public awareness strategies are required.

The highest percentage of subjects who left against medical advice cases were reported from pediatrics (87.5%, n=49) which might be due to the concern of the parents, since they prefer a second expert opinion or may want to consult their family physician when it concerns their children. Road traffic accidents may result in physical injuries and fractures which involves the orthopedics department frequently and around 85.5% of the subjects left the hospital after getting emergency treatment against medical advise since they might want to be treated in a private hospital or were seeking a second opinion.

Looking at the subjects normally discharged from the hospital, the burns ward had the highest percentage of subjects with normal discharge which was 88.5% or a total of 69 subjects. This is probably since burns treatment is a specialized ward and not every hospital especially private hospitals do not has expertise to carter to such patients care. Another reason could be that unless properly treated such patients may have serious consequences of reinfection and complications and patients were afraid to move to another health care facility. This is also true of the faciomaxillary department where 81.9% or around 163 subjects were normally discharged after treatment was given.

The study results further showed that among the road traffic accidents cases the highest percentage of those who left against medical advice cases was reported in 2016 (54.5%, n=381) as compared to the corresponding 2017 and 2018 year which indicates that probably people's confidence in the services at the hospital is rising gradually. This was also somewhat evident with the highest percentage of normal discharge cases being reported in 2018 (59.1%, n=691) of all three years suggesting better healthcare facilities at the hospital and corresponding increasing patient's confidence in them.

The study also looked at timings as, what time the most accidents occurred and it showed that the most frequent time in which accidents occurred was early afternoon between 1 pm to 4 pm (25.4%) i.e. in the afternoon corresponding to school leaving timings followed by early morning 7 am to 12 pm (23.3%) i.e. in the morning shift which corresponds to school and office timings and is due to increase number of van and school buses on the road as well as people rushing to offices to reach destinations at the same time. In the evening it is also around 22.4%, probably due to heavy traffic load because people are going home from work after office and rushing to reach their homes. Another reason for high accidents at this hour could be that people are usually tired and exhausted in the evening and with daylight diminishing, thus more accident prone due to the night traffic lights. Other studies have reported evening rush hours to be the highest followed by afternoon school timings²¹.

Hence injuries due to road traffic accidents can be a global public health problem if measures to prevent, control and treat them are not in place as seen in studies²². This excessively affects low-middle-income countries (LMICs) which account for more than 90% of road mortalities with a double burden on the society due to financial loss due to injury and loss of the main breadwinner of the family either temporarily or unfortunately permanently²³. The previous literature has also identified road traffic accidents as one of the leading causes of inju-

ries in Pakistan as seen in our study and studies have reported a death rate of 2.2% which is nearly as much as was observed in our study^{7,12,24,25}.

It is recommended to use such recent studies looking at updated socio-demographic data and profile of victims of road traffic accidents in Karachi to help stakeholders to evolve plans which would be aimed at prevention of accidents and provision of immediate care for victims of road traffic accidents. These results also suggest the need for better road traffic accident surveillance in order to identify preventive and control measures for the latest prevalent road accident burden in this city and recommends a multi-disciplinary approach through working in partnership with different agencies such as education and health department for public awareness programs. Also the traffic police department and road and planning departments need to work together to ensure that policies and regulations for prevention of road traffic accidents are established, implemented, monitored and evaluated.

Regarding the limitation of the study as this was a retrospective data, the information available was on a limited number of demographic characteristics and variables in the original data which was taken from the hospital records. It is also acknowledged that being a single centre study, the generalizability of the study findings is limited and thus we suggest a large-scale prospective study should be done involving multiple tertiary care hospitals around the city.

Conclusion

Overall, the study outcome indicated that the mortality rate was observed to be 2%, similar to what was found elsewhere. In conclusion, looking at the accident burden the study showed that the most accident prone was the younger age group (16-30 years) with pattern of most injuries relating to the neurosurgical department compared to the other departments. Among the road traffic accidents cases the subjects who left against medical advice cases gradually decreased from 2016 (54.5%, n=381) to 2018 (38.3%, n= 448) suggesting better

healthcare facilities at the tertiary care hospital and corresponding increasing patient's confidence in them.

References

1. Murray CJ, Vos T, Lozano R, Naghavi M, Flaxman AD, Michaud C, et al. Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet*. 2012;380(9859):2197-223.
2. Gosselin RA, Spiegel DA, Coughlin R, Zirkle LG. Injuries: the neglected burden in developing countries. *Bull World Health Organ* 2009;87:246-a.
3. Adeloye D, Thompson JY, Akanbi MA, Azuh D, Samuel V, Omeregbe N, et al. The burden of road traffic crashes, injuries and deaths in Africa: a systematic review and meta-analysis. *Bull World Health Organ* 2016;94(7):510.
4. Irshad MS. One belt and one road: dose China-Pakistan economic corridor benefit for Pakistan's economy? *J Econ Sustain Dev* 2015;6(24).
5. World Health Organization 2017. Pakistan: Road Traffic Accidents <https://www.worldlifeexpectancy.com/pakistan-road-traffic-accidents> accessed 22 th November, 2019.
6. Anderson PD, Suter RE, Mulligan T, Bodiwala G, Razzak JA, Mock C, et al. World Health Assembly Resolution 60.22 and its impact on road traffic accidents as a health care policy tool for improving emergency care access and availability globally. *Ann Emerg Med* 2012;60:35-44.
7. Jooma R, Shaikh MA. Road traffic crash related injured and fatal victims in Karachi from 2007 to 2014: A time-series analysis. *J Pak Med Assoc* 2017;67:622.
8. Bundu I, Patel A, Mansaray A, Kamara T, Hunt L. Surgery in the time of Ebola: how events impacted on a single surgical institution in Sierra Leone. *J R Army Med Corps* 2016;162:212-6.
9. Rahman A. The burden of road traffic injuries in South Asia: a commentary. *J Coll Physicians Surg Pak* 2004;14:707-8.
10. Madhu S, Saboo B, Makkar BM, Reddy GC, Jana J, Panda JK, et al. RISSDI clinical practice recommendations for management of type 2 diabetes mellitus, 2015. *Int J Diabetes Dev Ctries* 2015;35:1-71.
11. World Health Organization. Violence and injury prevention. https://www.who.int/violence_injury_prevention/en/ Accessed 22 th November, 2019.

12. Shamim S, Razzak JA, Jooma R, Khan U. Initial results of Pakistan's first road traffic injury surveillance project. *Int J Inj Contr Safe Promot* 2011;18:213-7.
13. Seid M, Azazh A, Enquesselassie F, Yisma E. Injury characteristics and outcome of road traffic accident among victims at Adult Emergency Department of Tikur Anbessa specialized hospital, Addis Ababa, Ethiopia: a prospective hospital based study. *BMC Emerg Med* 2015;15:10.
14. Masoumi K, Forouzan A, Barzegari H, Darian AA, Rahim F, Zohrevandi B, et al. Effective factors in severity of traffic accident-related traumas; an epidemiologic study based on the Haddon matrix. *Emergency* 2016;4:78.
15. Hofman K, Primack A, Keusch G, Hrynkow S. Addressing the growing burden of trauma and injury in low-and middle-income countries. *Am J Public Health* 2005;95:13-7.
16. Mansuri FA, Al-Zalabani AH, Zalat MM, Qabshawi RI. Road safety and road traffic accidents in Saudi Arabia: A systematic review of existing evidence. *Saudi Med J* 2015;36:418.
17. Montoya Sanabria SM, Rodríguez Hernández JM, Albavera Hernández C, Valero Alvarado OM. Evidence for the prevention and control of injuries in motorcyclists. *Rev Cub Salud Pública* 2016;42:1-18.
18. Murray CJ, Lopez AD. Global moroad traffic accidentslity, disability, and the contribution of risk factors: Global Burden of Disease Study. *Lancet* 1997;349:1436-42.
19. Fleminger S, Ponsford J. Long term outcome after traumatic brain injury. *BMJ* 2005;331:1419-20.
20. Bruns J Jr, Hauser WA. The epidemiology of traumatic brain injury: A review. *Epilepsia* 2003;44:2-10.
21. Gupta SC, Dabral SB, Nandan D, Mehrotra AK, Shrotriya VP, Maheshwari BB. Psycho-Social Behavioural Problems In Urban Primary School Children. *Indian J Community Health* 1997 Aug 31;9(2):18-21.
22. Peden M, Scurfield R, Sleet D, Mohan D, Hyder AA, Jarawan E et al. World report on road traffic injury prevention. World Health Organization Geneva 2004. <https://apps.who.int/iris/bitstream/handle/10665/42871/9241562609.pdf?sequence=1>. Accessed 22nd, 2019.
23. Jacobs G, Aeron-Thomas A, Astrop A. Estimating global road fatalities. Transport Research Laboratory 2000 <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.174.5207&rep=rep1&type=pdf>. Accessed 22nd November, 2019.
24. Ghaffar A, Hyder AA, Masud TI. The burden of road traffic injuries in developing countries: the 1st national injury survey of Pakistan. *Public Health* 2004;118:211-7.
25. Fatmi Z, Hadden WC, Razzak JA, Qureshi HI, Hyder AA, Pappas G. Incidence, patterns and severity of reported unintentional injuries in Pakistan for persons five years and older: results of the National Health Survey of Pakistan 1990-94. *BMC Public Health* 2007;7:152.