
A Prospective Study Of Motorbike-Related Neurotrauma At a Neurosurgical Unit

RTAs are reported to cause 30-90% of trauma admissions in LMICs¹⁰ and 92% of the annual-traffic-fatalities occur in these countries. In line with this in Pakistan nearly 1/3 of all A&E visits are documented to be TRI-related and rates as high as 48-85% are reported. Most of these are a result of 2 wheeled-motorized-vehicles. In LMICs motorcycles account for less than half of the registered vehicles but comprise more than half of the road-fatalities and as per 2009, Pakistan was the 8th biggest market of 2 and 3-wheeled vehicles in Asia. In this context we included only motorcycle-related RTAs as a relative increase in their number and disproportionate literary representation coupled with their higher fatality via miles-per-vehicle travelled makes them a pertinent cohort in our locality.

In this study male predominance is noted. This has been reflected in previous national and international studies. This can be attributed to preset gender-roles as well as the patriarchal setup of our country where females have restricted mobility. They also constituted none of the 1st riders. This also reaffirms that TBI is more common in males.

Mean-age of patients in this study was 28.89 ± 15.17 years and our majority-age-group was 14-28 years. This mirrors previous local studies reporting mean age as 36.1 and 29.2 years for males and females respectively and also the majority age-group was reported as 15-44 years in Rawalpindi and 18-32 years in Karachi. Similarly 15-29 majority age-group was reported in China. Thus a recurrent age-distribution pattern can be observed world-over and similar age-disposition is noted in many other LMICs.^{9,22,25-28,13} Economic-cost, increased availability, lax & ineffective traffic legislation and easy accessibility are all culminating factors. In a third-world country like ours buying a motorbike as opposed to a car is more convenient to a younger employed sector. More over unsafe tendencies such as lack of helmet, over-speeding, one-wheeling, increased impulsivity and violation of traffic laws also contribute to increased representation of this age group^{30,6}. Hence further reiterates RTAs as a leading cause of death in children aged 14-19 yrs.

In-addition to driver-related causes urban-rural profile is also a pivotal point in incidence & outcome of RTAs, each carrying its own risk-factors. Over-speeding, Ignorance of road-safety and bad-roads are a daunting challenge in rural setup. Increased congestion and ineffective legislation is contributory to the former. In this study, Increased referrals were noted from rural set-ups this highlights the previously documented problem of lack of definitive-care in rural areas. In consistency with this, higher expiry-rate as well as higher operative-rate in rural residents is noteworthy. In TBI the outcome is greatly time-dependent and prognosis is determined by immediate first-aid measures. Hence higher mortality in transfer patients is a clinical implication and immediate access to medical services should be expedited.

Helmet-use has recurrently been reported to be a safety hazard in Pakistan and our study consolidates further dismal results. In-contrast to a 65.2% helmet-use-rate in US. Our rate is significantly lower (p-value 0.00) but this mirrors the previous rates nation-wide which denotes no improvement. 37, 17, 7, 12, 18 this low rate is further concurred as a LMIC phenomenon as similar rates are seen in numerous other countries such as China, India, Nigeria

etc19-22,27,38,39. It is noteworthy that 0% rate was observed in females and rural residents. Lower helmet-use-rate is credited to physical discomfort, reduced visibility, cost of the helmet and laxity of legislation. Previously concerns were raised about helmets increasing the chances of cervical-spine injury, this misconception has now been dismissed. Helmets are 37% effective in preventing fatal injuries to motorcycle riders and 41% to 2nd riders.⁵ Un-helmeted riders also have longer hospitalization, greater-disability and economic-costs.

In our study it is noted that 60% of operated patients were un-helmeted. Awareness needs to be spread about the cost of the head-injury vs cost of the helmet. TBIs are among the most costly injuries and extend beyond the individual and his family to the community at large through potential economic losses and declining work-force. As in third-world countries like ours dependency ratio is very high, hence, the loss of a male member affects the entire family unit. In the US in 2015 around 19 billion USD were saved by the use of helmets. Thus helmet use is imperative in ensuring quality of life in our set-up. Better legislation, strict implementation and awareness-programs focused especially on females, 2nd riders and young adults should be put into effect.

As opposed to 4-wheel-vehicles, the lesser protection and more exposure offered by the vehicular design of motorbikes leads to increase chances of bone-fractures, head-trauma and thoracic injuries. Orthopedic-injuries are most commonly associated with RTIs following head-trauma and this was also seen in our study. This entails the need for better extremity protection as the healing time and the physical restraint placed by the orthopedic injuries are particularly taxing. This urges attention from automobile industry in addition to medical community. 1st riders overall in our study had worse outcome in terms of multiple injuries, associated injuries and higher expiry-rate consolidating similar results have been noted.

TBI are a cornerstone of motorcycle-related fatality. Bleeds (SAH,EDH,SDH) at 50% outnumbered cranial-fractures at 20% in our study. It is to be noted that 19% had both injuries concurrently. This has previously been noted 47, 42 however contrary to these the most common bleed in our study was SAH followed by EDH (46%). Helmet-use had no significant impact on type of injury or outcome however both were noted in less frequency in helmet-wearers.SDH are reported to be more deadly and have a higher mortality-rate similarly in our study recovery rate was lowest with SDH and highest with SAH. The higher impact required to produce a SDH along with more parenchymal toll has been merited for the negative outcome. Additionally,The force resulting in SDH also causes concomitant severe injuries. EDH has been linked with a positive outcome as high as 100% if treated properly. We also noted a favorable outcome for EDH with recovery-rate of 92%.

Our operative-rate mirrored that of US being 11% exactly as well as that of other countries that is within the same range. The duration of hospitalization of these patients was significantly increased and it was maximal in case of EDH and SDH.

The high mortality-rate of this mode of transport spans over both High-Income-countries & LMICs. While this rate for other vehicles has decreased it has contributed to motorcycles making up a bigger share. A number of factors including head-on collisions, pre-hospital care, delay in reaching definitive-care, treatment protocols as well as governmental policies and expenditures on health sector can be held responsible and this rate calls for imminent interest to counteract the multi-tiered aspects associated with motorcycle-associated TBI-management and care. Helmet-safety standards in addition to use-rate also pose a questionable dilemma. As

seen in our study with permanent disability noted in 3 patients of a young age group, the personal and economic burden of these injuries is undeniable.

It is important to weigh the problem keeping in mind the long-term impact and far reaching implications. In a study employment rate decreased from 80% to 15% in 3 months after sustaining a TBI and 3yrs after injury this had only increased to 55%.⁸ Thus, all-round effort should be directed to tackling and countering the plight of these cases which pose both a medical and economic challenge. Interventional measure at public, political and grassroot level need to be devised and mobilized to minimize the present toll.

A limitation of our study is that DHQH-Rawalpindi caters mostly to lower and middle-class sector and given helmet-use rate is associated with socioeconomic-status thus our rate might have been under-estimated. Secondly, Motorcycle-accident patients that were received dead on admission were not included in the study as no imaging was done. Lastly, the study was conducted in only 1 hospital, However cases from both Benazir-Bhutto-hospital and Holy-family-hospital (major tertiary level govt hospitals in the city) are referred to DHQ-rawalpindi as it is a neurosurgical reference-point. Moreover, cases from all over Punjab, Kashmir and Northern-areas are also received here. Thus keeping this in view we believe our results can be generalized.

Effective legislation and involvement at all levels is required to reduce the toll of Motorbike-associated TBI. Mandatory licensing and increasing helmet-use-rate need urgent attention especially among rural residents and females. Higher expiry rates from bleeds and inefficient immediate care in these patients are also in need of due medical attention.