

## An autopsy-based study of death due to road traffic accidents in metropolis of Karachi

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### Abstract

**Objective:** To study the demographic distribution of the victims of road traffic accidents that were presented for medico-legal autopsy in Karachi, identify fatal injuries, the identity of road users autopsied and the month-wise variation in performing autopsies.

**Methods:** Descriptive cross-sectional study of autopsies conducted at the mortuaries of Civil Hospital Karachi, Jinnah Postgraduate Medical Centre and Abbasi Shaheed Hospital between March 1, 2008 and February 28, 2009. Bodies brought in by police for partial/external autopsy were excluded. Data was collected on pre-designed proformas and was statistically analysed using SPSS 15.

**Results:** Of the total 2090 autopsies performed in Karachi, 581 (27.8%) cases were victims of RTA. Of these RTA victims, 324 (55.8%) autopsies were of those between the ages of 19 and 40 years. There were 510 (87.8%) males and 71 (12.2%) females with a ratio of male: female being 7:1. This ratio was 4.2:1 for those aged 0-18 years and 11:1 for those aged 19-40 years ( $p=0.05$ ). Death was due to injury to the head in 386 (66.4%) victims, to the chest in 84 (14.5%) cases, multiple traumatic injuries in 50 (8.6%) and pelvis in 17 (2.9%) cases. The majority of the victims on whom autopsy was performed were pedestrians ( $n=389$ , 67%) followed by motorcyclists ( $n=122$ , 21%). On an average  $48.4 \pm 7.46$  autopsies were performed every month, and there was no statistically significant variation in autopsies on this count.

**Conclusion:** There was a male preponderance, but the significant differences in two age groups need to be correlated with the incidence of RTAs in each sex in that age group and the compliance levels of getting females autopsied.

**Keywords:** Pakistan, Epidemiology, Autopsy, Road traffic, Karachi, Accidents, Statistics, Numerical data. (JPMA 63: 156; 2013)

### Introduction

According to the World Health Organization (WHO) 2011 fact sheet, "over 90% of the world's fatalities on the roads occur in low-income and middle-income countries, even though these countries have less than half of the world's vehicles."<sup>1</sup> In a 2009 report, WHO estimated that in Pakistan road traffic injuries result in 25.3 deaths per 100,000,<sup>2</sup> which is high by the international organisation's standards.

In the last 15 years, extensive efforts have been made to collate data about road traffic injuries and mortalities at the city and national levels in Pakistan. Traditionally, the data sources for epidemiological assessments of RTAs in Pakistan have been records from accident and emergency departments, surgical and intensive care units of specific hospitals and, more commonly, the local police.<sup>3,4</sup>

However, internationally, an important tool in assessing RTAs has been the autopsy. Medico-legal autopsies help answer a number of questions that assist in resolving a case, such as the cause of death, the time between injury and death, and the time since death,<sup>5</sup> and these findings are admissible evidence in the court of law. Besides resolving legal issues, autopsy studies allow planners to determine logistics such as the number of beds, and ambulances, and staff required for dealing with trauma efficiently; devise strategies for future training; and add to public health research.<sup>6,7</sup>

In developed and developing countries, post-mortem audits have been carried out over extensive periods. A study in South Africa reviewed RTA-related autopsies over a 12-year period (1993-2004) and concluded that "RTA-related deaths in the Mthatha area are 3 times higher than the global average."<sup>8</sup> In Manipal, India, a 16-year retrospective study from 1994 to 2009 concluded that RTAs comprised 38.6% of the autopsied cases and 37.8% unnatural deaths.<sup>9</sup>

Another study in Norway looked into data from two

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districts from 1996 to 2005 to assess whether the police was following instructions to ensure an autopsy for prosecution. It found that while forensic autopsies were performed in 63 % of cases, one county registered a decline (from 62% to 38%) between the first and second 5-year periods.[10] This study highlighted that the decline could be attributed to the difference in "understanding the importance of forensic autopsies and different interpretation of the instruction for prosecution."<sup>10</sup>

As in Norway and India, the legal procedure in Pakistan requires all unnatural deaths to be investigated by the police and magistrate: Section 174 of the Criminal Procedure Code of Pakistan (CrPC) 1898 makes it binding upon the police to investigate all unnatural deaths (suicidal, homicidal and accidental) while section 176 of the CrPC sanctions a judicial inquiry and exhumation.<sup>11</sup> Autopsies are performed on the directive of the police or magistrate by an Authorised Medical Officer in a government hospital of an institution authorised to perform autopsies by the provincial Health Department.<sup>12</sup> An exception is only possible under Police Rules 25.34, Clause 2, which states that the police can release the body if the relatives do not agree to an autopsy.<sup>13</sup>

However, two studies separated by eight years show that fatal road accidents are grossly under-reported with the police in Pakistan. The first study in 1999 estimated that less than 10% of RTAs were reported to the police, while the second in 2006 estimated that police data barely covered 6% of the fatal and serious injury crash data.<sup>14,15</sup> Overall, across Pakistan, the fatalities are reported 4.5 times less than in any other Asian countries.<sup>16</sup> In Karachi, specifically, a study estimated police records are able to identify only 56% of the total fatalities.<sup>17</sup>

This under-reporting is of significance because if RTA cases are not brought under the "purview of the law, (victims) are deprived of third party insurance claims... (since it is a) mandatory requirement of the Motor Vehicle Ordinance."<sup>18</sup> A medico-legal examination and autopsy are essential to ascertain the facts.

Despite the high frequency of RTAs leading to unnatural deaths,<sup>2</sup> no study has been conducted in Karachi to determine the autopsy findings in cases of deaths due to RTAs in the last decade. The objectives of this study were to determine the demographic distribution of cases of RTAs that presented for autopsy, the location of fatal injuries, the identity of those autopsied and the year-round variation in these cases. Based on these

findings, we wanted to determine if there was any significant difference between the number of reported deaths in RTAs and the number of autopsies conducted.

## Subjects and Methods

This is a descriptive cross-sectional study conducted between March 1, 2008 and February 28, 2009. The sampling technique was non-probability convenience sampling. The inclusion criteria were any medico-legal autopsy in which the cause of death was identified as an RTA and was carried out at the Civil Hospital Karachi (CHK), Jinnah Postgraduate Medical Centre (JPMC) and the Abbasi Shaheed Hospital (ASH). Dead bodies that were submitted by the police for partial/external post-mortem examination were excluded from the study sample.

A proforma was designed to record the age, sex, physical location of injuries, the frequency of autopsies conducted every month, road user group (pedestrian versus passenger versus driver versus rider), the manner of death and the identity of cases brought in. Age was categorised into four groups: Group 1 had children and teenagers (0-18 years), Group 2 comprised of legal adults (19-40 years), Group 3 had middle-aged adults (41-60 years), and Group 4 had senior citizens (60 years and more). Fatal injuries were classified on the basis of body regions: head, chest, abdomen, pelvis and any combination of the four.

Statistical analysis was done on SPSS version 15. The frequency and percentages were calculated for all categorical variables — age, sex, identity, location of fatal injuries and monthly frequency - were further analysed with chi-square test. Test of proportions was applied for comparing percentages and ratios. A p-value of <0.05 was considered to be of statistical significance.

Ethical approval was obtained from the Ethical Review Committee of the Dow University of Health Sciences.

## Results

A total of 2090 cases were autopsied at the three mortuaries. The manner of death was accidental in 822 cases. Of these, 581 autopsy cases were due to RTA: 249 were autopsied at JPMC, 208 at ASH and 124 at CHK.

Age group 19-40 years had the maximum number of casualties recorded (n= 324, 55.7%), and a further analysis revealed that 235 (40%) of these casualties were between 19-32 years of age. The least number of casualties were recorded in the age group 60 years and above.

Table-1: Autopsies conducted after road traffic accident - age and gender distribution.

	Male	Female	M:Fratio	Total autopsies
Group (0-18 years)	88 (80.7%)	21 (19.3%)	4.2: 1	109 (18.8%)
Group (19-40 years)	297 (91.7%)	27 (8.3%)	11: 1	324 (55.8%)
Group (41-60 years)	101 (87.1%)	15 (12.9%)	6.7: 1	116 (20%)
Group (60 and above)	24 (75%)	8 (25%)	3: 1	32 (5.4%)

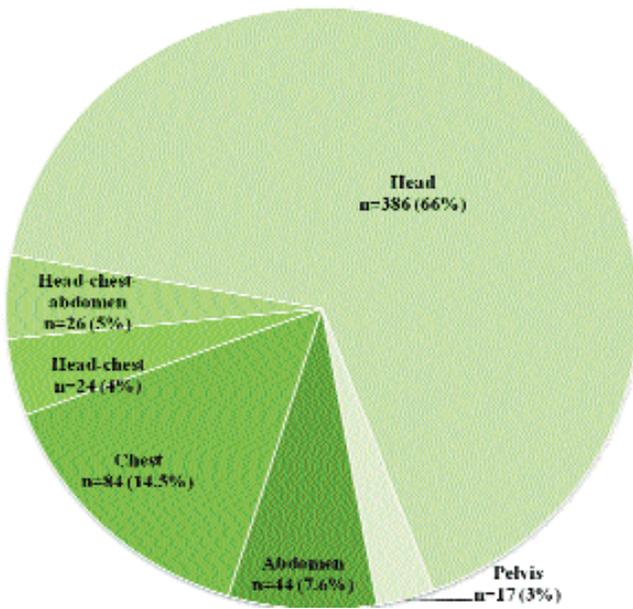


Figure-2: Site of fatal injuries.

The male to female autopsy ratio was 7.18:1, that is 510 (87.8%) males and 71 (12.25%) females for the overall sample (Table-1). When the test of proportions was applied to the rate of conducting autopsies with respect to sex in various age groups the variation was statistically significant: The ratio was very similar in extremes of age: 4.2:1 in 0-18 years and 3:1 in 60years and above. On the other hand, the frequency of women being autopsied dipped in age group 19-40 years where the ratio was 11:1 (p=0.05).

Death was due to head injury in 386 (66.4%) victims, to the chest in 84 (14.5%) cases, multiple traumatic injuries in 50 (8.6%) cases, and pelvis in 17 (2.9%) cases (Figure).

The majority of the victims on whom autopsy was performed were pedestrians (n=389, 67%) followed by motorcyclists (n=122, 21%).The identities of 64 (90%) females and 427 (84%) males were known. On an average  $48.4 \pm 7.46$  autopsies were performed every month, and there was no statistically significant

variation in autopsies per month.

### Discussion

The study attempted to derive a better understanding of the severity of fatal trauma due to RTA in Karachi. The first task was to determine whether there was a significant disproportion in the number of cases coming for autopsies due to RTAs. Comparing data from this study to that from two studies conducted in 2008 in Karachi — "Police Reforms: Road Safety Karachi Report 2008" and "Estimation of Fatalities Due to Road Traffic Crashes in Karachi, Pakistan, Using Capture-Recapture Method."<sup>18,19</sup> The results revealed that of the total fatalities due to RTA (reported and unreported to the police), less than 50% were autopsied (Table-2). However, of the fatalities recorded with the police between 88.7% and 94.3% were autopsied.

The authors postulate that most deaths due to RTAs were not brought to the three centres nor referred for post-mortem examination, based on the fact that in Pakistan, when the cause of death has been ascertained, the families do not opt for FIRs and avoid court proceedings. Even hospitals avoid reporting such incidents to the local police for fear of being drawn into prolonged legal proceedings. Many people in Pakistan desist from post-mortem examination of their relatives and opt for early burial because of religious reasons as well as fears of inappropriate handling of the body.

Table-2: Comparison of fatalities due to road traffic accidents in Karachi.

	Data from police road safety report <sup>27</sup>	Data from capture-recapture method <sup>28</sup>
Fatalities recorded in that particular study	1185	1375
Fatalities reported to the police in that particular study	655	616
Percentage of total fatalities reported to the police	55.2%	44.8%
Total autopsies conducted in the year as per our data	581	581
Percentage of total fatalities autopsied	49.03%	42.25%
Percentage of police recorded		

Other reasons well-documented for low autopsy rates are "the lack of knowledge when an autopsy is permitted and failure to use culturally sensitive and culturally competent discussions about the reasons a post-mortem examination is important and permissible."<sup>20</sup>

The next parameter was age, which was in line with national findings of 73% deaths in RTA victims aged 15 and 44 years.<sup>21</sup> In this study the highest frequency of RTA autopsies was in the adult Group 2 (19-40 years).

The over-all male: female autopsy ratio was 7.18:1. In Karachi, it has been estimated that 89% victims of fatal RTAs are males.<sup>21</sup> In Delhi, a four-year study (2001-2005) of 2472 autopsies put the male:female RTA autopsy ratio at 7.49:1.<sup>22</sup> Studies in developed countries such as Singapore have also shown a male preponderance — males comprise 82.8% of all cases of fatal RTAs.<sup>23</sup>

However, within our study sample we found two significant differences from available data: when decided to select the minor and pre-teen group of 1-14 years, the male: female autopsy ratio was 3.3:1 (test of proportions applied,  $p=0.05$ ). The second difference we found from established literature and our own sample average was that the ratio rose to 11:1 in the age group 19-31 years and 16:1 in the age group 26-32 years ( $p=0.05$ ). There are two possible reasons: either there is a higher incidence of RTA in one gender in each age group or there is a difference in compliance of getting females autopsied. No independent data was available to make a conclusive statement.

It is estimated that 45% of road traffic fatalities in low-income countries are among pedestrians, whereas an estimated 29% in middle-income and 18% in high-income countries are among pedestrians.<sup>24</sup> In Hong Kong, pedestrians accounted for 70% of RTA fatalities. On the other hand, in China, Malaysia and Thailand, pedestrian deaths are between 10-15% but over 50% of deaths due to RTA involved motorcyclists.<sup>25</sup>

When compared to data from Karachi for the same period,<sup>18</sup> which estimated that pedestrians accounted for 37.8% of fatalities and riders 42.8%. In this study we found that pedestrians accounted for 67% autopsies and motorcyclists for 21%. Clearly, a greater percentage of pedestrians were autopsied as compared to motorcyclists. The authors have not been able to identify any specific reason for this inversed discrepancy. Meanwhile, the high rate of motorcyclists in this study can be substantiated by the fact that number of motorcycles on the road have seen the

highest growth, increasing from 120,000 to 750,000 units/year.<sup>21</sup>

Unsurprisingly, the non-compliance of motorcyclists to wear helmets and the vulnerability of pedestrians accounts for head injuries proving fatal in 66.4% of the cases. Injuries to pelvis (2.9%) were the most infrequent cause of death. This holds true for both developed and developing countries: In a study in Nigeria, the most common cause of death was head injury 48.3%<sup>26</sup> while in Singapore the second most common cause of death was head injuries 30.9%.<sup>23</sup>

There are various factors that limited our study: first, only those cases that presented for medico-legal exam in urban city were included. No comment can be made about the trend in rural areas. There was also no way of ascertaining vehicular safety. We could not ascertain pre-hospital or in-hospital mortality.

## Conclusion

An autopsy is an essential component of establishing cause and manner of death. In Pakistan, fatalities due to RTAs are under-reported and the number of autopsies performed is also disproportionately low. There was a male predominance in autopsies; however, it needs to be ascertained whether the high ratio between 26 and 32 years was because of higher incidence of deaths of males in RTAs or due to lower autopsy rates of females. The same needs to be investigated for the 0-14 age group. Further studies are warranted to investigate the actual cause of death, that is instantaneous death versus delay in primary treatment.

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## References

1. World Health Organization. WHO: Road traffic injuries. Fact sheet N°358. (Online). September 2011 (Cited 2012 Feb 28). Available from URL: <http://www.who.int/mediacentre/factsheets/fs358/en/index.html>.
2. World Health Organization. Global status report on road safety: Time for action. (Online). 2010 (Cited 2012 Feb 28). Available from URL: [http://whqlibdoc.who.int/publications/2009/9789241563840\\_eng.pdf](http://whqlibdoc.who.int/publications/2009/9789241563840_eng.pdf).
3. Hassan Q, Bashir RM, Shah M. Physical trauma: A leading cause of medico-legal cases at DHQ Hospital Abbottabad. *J Ayub Med Coll Abbottabad* 2010; 22: 156-8.
4. Khan MH, Ahmed RM, Zia NU. Road traffic accidents, study of risk factors. *Professional Med J* 2007; 14: 323-7.
5. Joseph HD. Medicolegal death investigation. In: Dolinak D, Matshes E, Lew E's *Forensic pathology: principles and practice*. Oxford: Elsevier Academic Press, 2005; pp 1-64.
6. Moharamzad Y, Taghipour H, Hodjati Firoozabadi N, et al. Mortality pattern according to autopsy findings among traffic

- accident victims in Yazd, Iran. *Chin J Traumatol* 2008; 11: 329-34.
7. Hull MJ, Nazarian RM, Wheeler AE. Resident physician opinions on autopsy importance and procurement. *Hum Pathol* 2007; 38: 342-50.
  8. Meel BL. Fatal road traffic accidents in the Mthatha area of South Africa, 1993-2004. *S Afr Med J* 2008; 98: 716-9.
  9. Kanchan T, Menezes RG, Bakkannavar SM. Age and gender variations in trend of road traffic fatalities in Manipal, India. *Med Sci Law* 2010; 50: 192-6.
  10. Igeltjorn M, Nordrum IS. [Frequency of forensic autopsies after deaths in road traffic accidents] [Article in Norwegian]. *Tidsskr Nor Laegeforen* 2009; 129: 1850-2.
  11. Asghar A. Information to the police and their powers to investigate. *The Code of Criminal Procedures 1898*. 4 ed. Karachi: Pioneer Book House, 2004; pp 84-7.
  12. Awan NR. Autopsy and exhumation, In: Awan NR's principles and practice of forensic medicine. Lahore: M Ishtiaq Printers, 2009; pp 130.
  13. Police Rules Vol III, Police Act 1881. Police Order 2002 (with Amendment Ordinance 2006). (Online) 2006 (Cited 2012 Mar 3). Available from URL: National Reconstruction Bureau, Web site: [http://www.nrb.gov.pk/publications/Police\\_order\\_2002\\_with\\_amendment\\_ordinance\\_2006.pdf](http://www.nrb.gov.pk/publications/Police_order_2002_with_amendment_ordinance_2006.pdf).
  14. Ahmed A. Road Safety in Pakistan. Islamabad: National Road Safety Secretariat; 2007.
  15. National Transport Research Centre, National Highway Authority & Finnroad OY Manual of road safety improvement by the use of low cost engineering countermeasures. Islamabad: National Transport Research Centre; 1999.
  16. Ghaffar A, Rajput AM, Masud TI, et al. Road traffic injuries in Pakistan: trends, causes, and policy implications. National Injury Research Center (NIRC). Health Services Academy, Ministry of Health, Government of Pakistan, Islamabad, 2001.
  17. Nishtar S. National action plan for prevention and control of non-communicable diseases and health promotion in Pakistan. Islamabad, Pakistan: tripartite collaboration of the Ministry of Health, Government of Pakistan; WHO, Pakistan office, and Heartfile. (Online) 2004 (Cited 2012 Mar 2). Available from URL: <http://www.heartfile.org/pdf/NAPmain.pdf>.
  18. Lateef MU, Estimation of fatalities due to road traffic crashes in Karachi, Pakistan, using capture-recapture method. *Asia Pac J Public Health* 2010; 22: 332-41.
  19. Khan AR. Police reforms: road safety Karachi report 2008. (Online) 2012 (Cited 2012 Mar 2). Available from URL: <http://forumpolice reforms.blogspot.com/2012/02/72-normal-0-false-false-false-en-gb-x.html>.
  20. Chichester M. Requesting perinatal autopsy: multicultural considerations. *MCN Am J Matern Child Nurs* 2007; 32: 81-6.
  21. Shahzad S, Razzak JA, Rashid J, et al. Initial results of Pakistan's first road traffic injury surveillance project. *Int J Inj Contr Saf Promot* 2011; 18: 213-7.
  22. Singh YN, Bairagi KK, Das KC. An epidemiological study of road traffic accident victims in medicolegal autopsies. *JIAFM* 2005; 27: 166-9.
  23. Wong ZH, Chong CK, Tai BC, Lau G. A review of fatal road traffic accidents in Singapore from 2000 to 2004. *Ann Acad Med Singapore* 2009; 38: 594-9.
  24. Naci H, Chisholm D, Baker TD. Distribution of road traffic deaths by road user group: a global comparison. *Inj Prev* 2009; 15: 55-9.
  25. Jacobs GD, Thomas AA. A review of global road accident fatalities. (Online) 2000 (Cited 2012 March 2). Available from URL: [http://www.transport-links.org/transport\\_links/filearea/publications/1\\_771\\_Pa3568.pdf](http://www.transport-links.org/transport_links/filearea/publications/1_771_Pa3568.pdf).
  26. Osime OC, Elusoji SO, Eboreime O. Pattern and outcome of road traffic accidents in a suburban community in Nigeria. *Annals of Biomedical Sci* 2009; 8(1).
  27. Khan AR. Police Reforms: Road safety Karachi report 2008. (Online) 2012 (Cited 2012 Mar 2). Available from URL: <http://forumpolice reforms.blogspot.com/2012/02/72-normal-0-false-false-false-en-gb-x.html>.
  28. Lateef MU, Estimation of fatalities due to road traffic crashes in Karachi, Pakistan, Using capture-recapture method. *Asia Pac J Public Health* 2010; 22: 332-41.
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