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Original Research Article

Pre-Mortem Versus Post-Mortem Findings in Trauma Fatalities - An Autopsy Based Study

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Key words

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Discrepancies.

Abstract

Background: This study evaluated the discrepancies between pre-mortem and postmortem diagnoses of trauma fatalities in autopsied deaths at a tertiary care center. **Material & Method:** The autopsy reports of forensic deaths were analyzed in comparison to the clinical records for 300 trauma fatalities over a period of one year. **Results:** Trauma deaths with at least six hours of hospitalization were included in the study; consent taken an inclusion criteria, 3139 medico-legal autopsies were conducted at the study centre during the study period, amongst which 1769 were trauma fatalities. Out of these, randomly selected 300 cases were included in the present study on the basis of inclusion and exclusion criteria and clinical records and autopsy details were analyzed. Mean age of traumatic fatalities was 37.72 + 18.29 years; Road traffic accident being the commonest cause of trauma. Cases of trauma fatalities within 24 hrs of the incident were maximum (25%) and least number of fatalities occurred after 2 weeks (5.3%). 52 cases had discrepancies between pre and post mortem findings and there was no discrepancy in diagnoses in rest 82.7% cases. Majority of cases with discrepancies were of traffic accident casualties (84.6%) followed by falls (15.4%). When clinicians focused on the treatment according to their main diagnosis, they overlooked the fatal injuries in other parts of the body. **Conclusion:** This study shows that autopsy is the most reliable method for the confirmation of the clinical diagnosis in trauma patients. Therefore, clinicians particularly surgeons should compare the results of the autopsy diagnoses to their own diagnosis to monitor and modify diagnostic and treatment protocols.

1. Introduction

An Autopsy is a vital tool for assessing the precision of clinical diagnosis, investigating and determining unsuspected diseases, and identifying causes of death.¹ Autopsy not only instructs and confirms but also serves as a pathway of study and

source of investigation.^{2,3} However, in recent years, the rates of autopsy have decreased dramatically worldwide.⁴ This decrease is due to several factors, including progress in diagnosis of diseases, particularly the development of advanced medical

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imaging methods such as computer tomography and magnetic resonance imaging.¹ However, it has been stated that advances in medical technologies do not bring a considerable reduction in the incidence of misdiagnoses.⁵ Undoubtedly, the recent technologic advancements in medical areas have allowed more sensitive and reliable methods for clinical diagnosis during life; nevertheless, significant discrepancies between clinical diagnosis and autopsy findings for patients who died in the hospital have been reported.⁶⁻¹⁰

Studies comparing the accuracy of ante-mortem diagnosis to autopsy diagnosis in different times have not documented a substantial decline of errors in diagnoses despite the new diagnostic resources available.¹¹⁻¹⁵ Severe injury is the leading cause of death among children, adolescents, and young adults, and represents the third most common cause of death for all ages in the western countries, after cardiovascular diseases and cancer.¹⁶

In cases of trauma death, review of autopsy data is also used as part of the trauma quality assurance process, and autopsy rates are queried by the American College of Surgeons Committee on Trauma in their reviews.¹⁷ Especially in death after trauma, autopsy data can provide sufficient data to assist in determining the presence of missed injuries contributory to death¹⁸, and also confirming the clinical cause of death.¹⁹ This study was undertaken to identify the discrepancies, if any, between ante-mortem diagnoses and post-mortem findings in medico-legal autopsies of traumatic fatalities at S.M.S. Hospital, Jaipur during the year 2017-2018.

2. Objectives

1. To observe discrepancies, if any, in clinical and post-mortem findings in traumatic fatalities.
2. To observe discrepancies, if any, in clinical and forensic cause of death in traumatic fatalities.

1. Material & method

This descriptive observational study was carried out at the Department of Forensic Medicine, SMS Medical College and Hospital, Jaipur over a period of one year from 1st April, 2017 to 31st March, 2018 on cases of hospitalized traumatic deaths at the institute after obtaining clearance from the Institutional Ethics Committee. Hospitalized traumatic deaths with more than six hours of admission with at least one clinical diagnosis along with clinical certification of cause of death were kept as inclusion criteria. Written informed consent for participation in the study was also an inclusion

criterion. Brought dead cases of trauma, those with insufficient records, non-autopsied releases and undiagnosed traumatic mortalities were excluded from the study. All cases were subjected to post-mortem examination and the post mortem findings recorded and forensic cause of death concluded. These were compared to the ante-mortem diagnosis and clinical cause of death. Complete details of clinical findings, ante-mortem diagnosis and clinical cause of death were noted from the treatment papers. Clinical records were scrutinized separately and independently after conducting postmortem examination to avoid observation bias during the autopsy. Period of survival was divided into eight groups viz. within 24 hours, 24 to 48 hours, 48 to 72 hours, 72-96 hours, 4 to 7 days, 1 to 2 weeks, 2-4 weeks and more than 4 weeks. Comparative results of clinical and forensic cause of deaths were categorized as completely consistent, completely inconsistent and partly inconsistent.

- **Completely consistent-** if both clinically as well as medico-legally, same injury and similar mechanisms were attributed to cause death.
- **Completely inconsistent (CI)-** if clinical and post mortem cause of deaths were completely incoherent or inconsistent; where a misdiagnosed or undiagnosed injury resulted in death which was either missing or overlooked in the clinical records.
- **Partially consistent (PI)-** if clinical and post-mortem cause of deaths were from similar injuries but not exactly the same injury; if any other injury was additionally found to contribute towards mortality or if mechanism of mortality was variable although injuries responsible were same.

Discrepancies recorded if any between pre-mortem and postmortem findings as regards to external and internal injuries were categorized in two groups-obvious and marginal discrepancies.

- **Obvious discrepancies-** those autopsy findings which remained clinically unsuspected, incorrect or interpreted differently in clinical records and contributed to fatality either alone or in conjunction with attributed clinically fatal injuries or mechanisms.
- **Marginal discrepancies-** those autopsy findings unsuspected or incorrect findings at autopsy when compared to clinical records that did not directly contribute to the patient's death but likely had an impact on the patient's mortality.

Continuous variables were summarized as mean and standard deviation whereas descriptive analysis for nominal/ categorical variables was in form of percentages and proportions. Statistical

analysis was conducted using Medcalc 7.4 version software. Chi-Square test was used for analysis of significance of nominal categorical variables, and, P value < 0.05 was considered as significant.

Figure 1: Showing Distribution of cases with and without discrepancies according to survival period

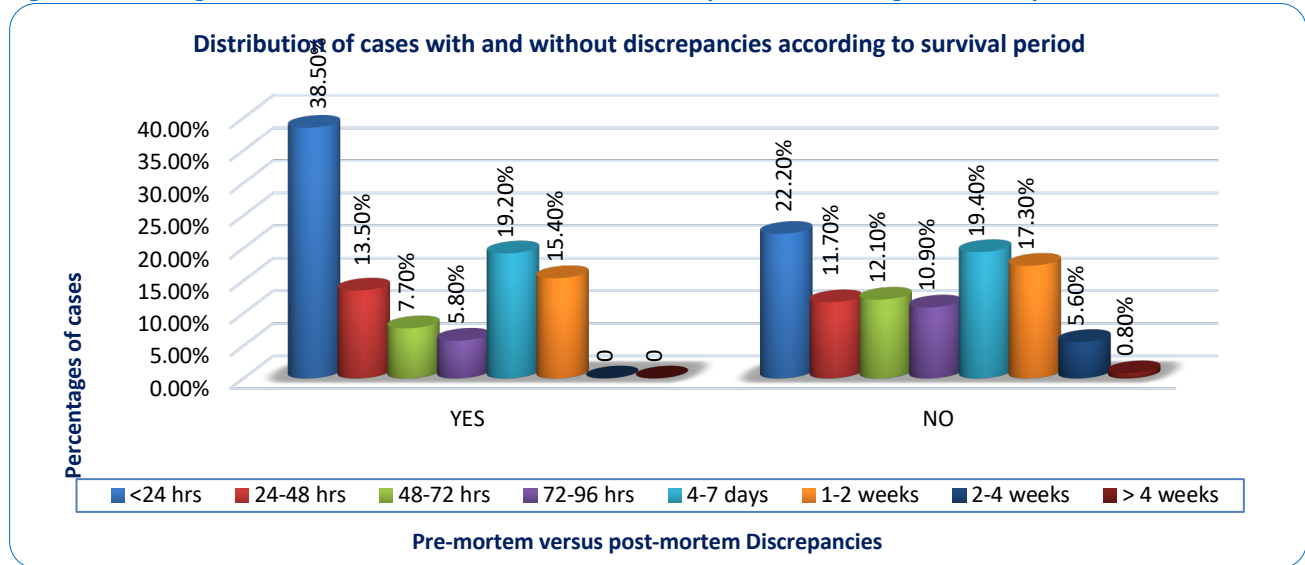


Figure 2: Proportion of missed injuries contributing to discrepancies between Clinical & Forensic cause of deaths

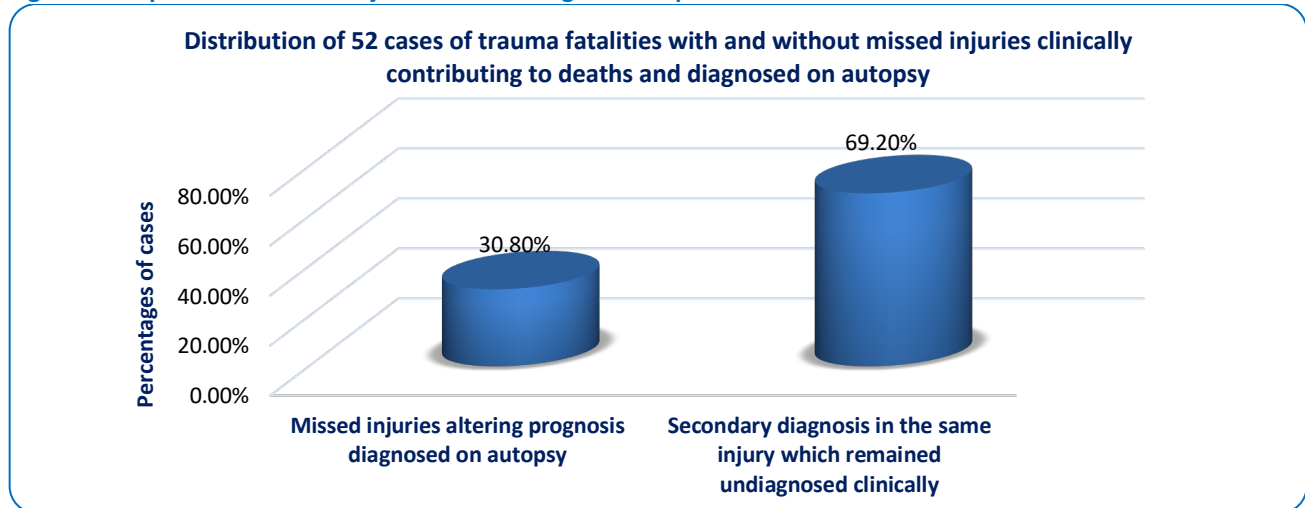


Figure 3: Showing sex wise distribution of cases with type of discrepancy in cause of death

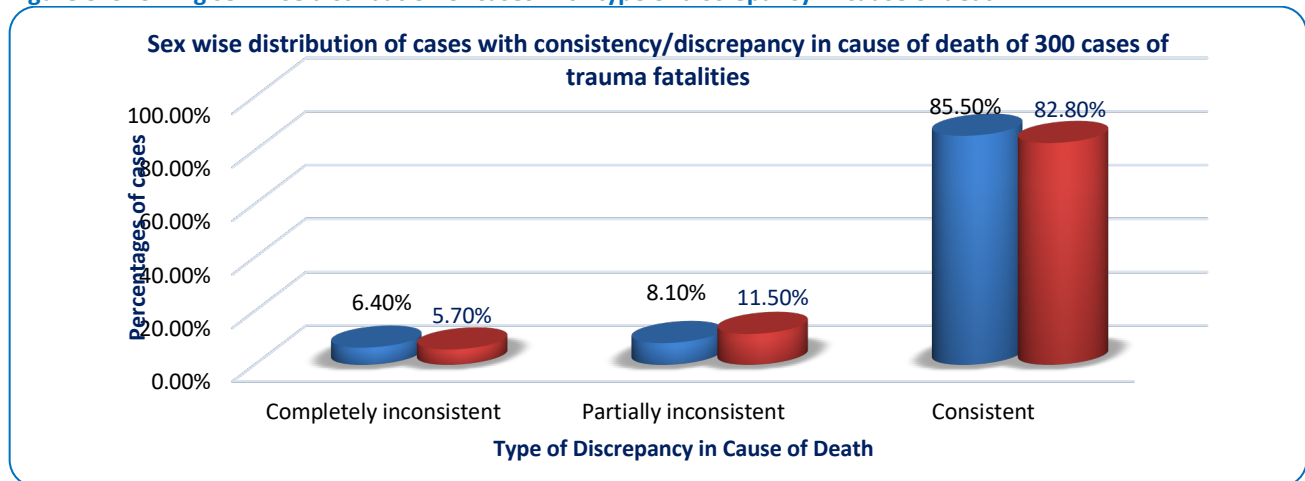
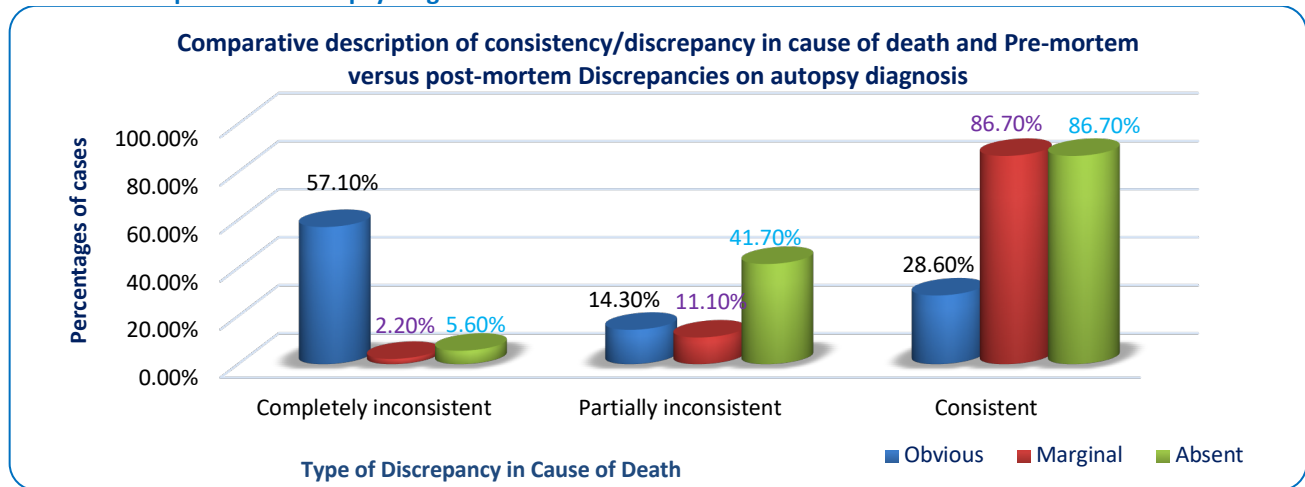


Figure 4: showing Comparative description of consistency/discrepancy in cause of death and Pre-mortem versus post-mortem Discrepancies on autopsy diagnosis



2. Results

A total of 1769 cases of traumatic fatalities were autopsied at the center between 1st April, 2017 and 31st March, 2018 out of which 300 cases satisfying the inclusion and exclusion criteria were included in the present study. The youngest traumatic fatality was 1.5 years old and oldest one was 95-year-old; mean age being 37.73 ± 17.57 years; and mean ages of cases with and without discrepancies in the present study were respectively 38.70 and 37.52 years. Amongst 300 fatalities, discrepancies between clinical and post mortem findings were observed in 52 cases (17.3%). 86.5% of these (45 cases out of 300 i.e. 15%) had marginal discrepancies and rest seven cases 13.5% of discrepant (2.33% of all cases) had obvious discrepancies. 13.5% cases with discrepancies were females (all with marginal discrepancies) and rest 86.5% cases with discrepancies were males with all obvious discrepancies seen in males. Discrepancies in clinical versus post mortem findings were most commonly observed in the senior citizen age group (20.5%) and least commonly observed in less than 10 years age group (12.5%). 17.75% discrepant cases were road accident fatalities. Majority of the cases with discrepancy survived for less than 24 hours. Discrepancies were observed in 18.2% cases of road accidents in comparison to 15.7% cases with falls. 80.8% of these discrepant cases were misdiagnosed despite availability of investigation reports, and in rest 19.2% cases, the requisite investigation to conclude diagnosis was not advised by the clinician. In 30.8% of these cases, the discrepancy contributed to the fatality, thus altering the prognosis of the case.

Discrepancy between clinical and forensic cause of death was observed in 15% (45 cases) of the

traumatic fatalities. The clinical versus forensic cause of death was completely inconsistent in 42.2% of these (19 cases) and partially inconsistent in rest 57.8% (26 cases). The discrepant cases were proportionately more in females and were most commonly observed in 21-30 years followed by 41-50 years. 11 cases with discrepancy in clinical versus forensic cause of death, also had discrepancies between pre and post mortem findings but in rest 34 cases, there were inconsistencies in clinical versus forensic causes of deaths without any mismatch in pre & post mortem findings. Premortem and postmortem findings were completely consistent in 157 cases (52.3%) including these 34 cases. Most cases of completely inconsistent cause of death (73.7%) had no discrepancies in pre versus post mortem findings. Discrepancies in cause of deaths were observed in 12% cases of road accidents and 21.6% cases of falls. Maximum discrepancies were seen in < 24 hour (26.6%) and in 4-7 days survival following trauma.

115 cases (38.3%) out of 300 had discrepancies in radiological findings in clinical assessment as compared to the relevant findings on autopsy. 46.2% of these were senior citizens and 45.5% were teenagers and 86.9% were males. 49 cases with discrepancies in radiological findings including 13 cases of missed injuries remained undiagnosed clinically too, thus simultaneously exhibiting discrepancies between pre and post mortem findings. There were co-existing discrepancies in cause of deaths in cases with radiological discrepancies in 16.5% cases (6.9% completely inconsistent and 09.6% partially inconsistent).

3. Discussion

Trauma, including injuries from accidents, violence, and other causes, is indeed a significant public health issue, particularly in developing countries.²⁰ The present study included 300 traumatic deaths ranging from 1.5 to 95 years of age including 82.7% males and 17.3% females owing to their predisposition to trauma being active members of every society. Reported proportion of males was slightly higher in another study conducted at Turkey in 2015 due to societal variations.²¹ Mean age in the present study was 37.73 ± 17.57 years higher than reported by another author.²¹ Married males of 21-50 years were the predominant population of traumatic fatalities in the present study. Road traffic accident was the commonest cause of trauma in the present study followed by falls (17%) and hit by heavy objects (2% with a single case of train accident which are similar to the results of a study from Berlin with high velocity traffic accidents as leading cause of polytrauma followed by fall from height which had a single case each of homicidal stab injury, accident at work place and train accident adding to the similarity in the two studies.¹⁹ However, these results are much variable from another study from Turkey whose predominant fatality resulted from canister shots (56%), gunshots (26.1%), traffic accidents (6.5%), falls from a high place (8.1%) and others in 3.3%.²¹

We observed that in 70% cases, the mode of death was coma brought about as a consequence of head injury; in 10.3% cases, it was spinal shock consequent to vertebral and/ or spinal injuries; in 10% cases, deaths occurred due to septicemia consequent to secondary/ nosocomial infections following trauma during treatment and death resulted from hemorrhage and shock in 9.7% cases. 25% fatalities occurred within 24 hours and rest 75% fatalities occurred after 24 hours of the traumatic episode which is similar to 37.8% deaths in within 24 hours and rest 62.2% deaths after 24 hours²¹ but variable to 47% deaths within 24 hours, 32% deaths after a week and 21% between 4 hours to one week¹⁹ in comparison to 25% deaths within 24 hours, 22.3% deaths after a week and 52.7% deaths between 24 hours to one week in this study.

The premortem and postmortem findings were completely consistent in 157 cases (52.3%) and in rest 143 (47.7%) cases, there was one or the more type of discrepancies. The discrepancies observed in pre mortem clinical records and findings on medico-legal autopsy were- in forensic versus clinical cause of

death; clinical versus post mortem findings; and, discrepancies in radiological findings of clinical records. There were 52 cases (17.3% of all cases and 33.9% cases out of the 143 discrepant cases) with discrepancies in pre-mortem versus post-mortem findings. Out of these 52 cases, there were obvious discrepancies (majorly contributing to fatality) in seven cases (13.5% of cases with discrepancies in findings and 04.9% of 143 discrepant cases) and marginal discrepancies (partially contributing to fatality) in remaining 45 cases (86.5% of cases with discrepancies in findings and 31.5% of 143 discrepant cases). Thus, overall pre-mortem versus post-mortem findings were consistent in 52.3% cases and no discrepancy in diagnoses was seen 82.7% cases, which is nearly same as 79.5% consistent cases of premortem versus postmortem diagnoses by another author.²¹ All seven cases of obvious discrepancies were males. Majority of discrepancies in findings were observed in 21–30-year age group males from rural regions suffering traffic accident casualties (84.6%) followed by falls (15.4%) who succumbed within twenty-four hours and least number less than 10 years age group (1.9%). 38.5% discrepant cases succumbed within 24 hours in comparison to 22.2% non-discrepant cases. which is similar to two other studies.^{19,21}

Out of 52 cases with clinical vs autopsy discrepancies, investigations for diagnosing the discrepant findings were carried out in 42 cases (80.8%) and could not be done in rest 10 cases, which is again a notable finding as in spite of the advancement in technology of non-interventional diagnostic procedures and their execution, still there were discrepancies in pre mortem i.e. clinical versus post mortem findings. Amongst these 42 cases, there were cases 16 cases (30.8%) with secondary diagnoses on autopsies which were injuries that had been missed altogether, either unsuspected or complaint overlooked during clinical workup and had contributed to the fatality in all these cases. There were additional findings observed during autopsy in clinically diagnosed injuries in the rest 68.2% cases (36 cases). Amongst these 16 cases, there were 05 cases (31.2%) of obvious and rest 11 cases (68.8%) of marginal discrepancies. There were co-existing discrepancies in cause of deaths in 08 cases (05 obvious and 03 marginal discrepancies). These results show that there were missed injuries in 5.3% cases. The results of the present study are much lower to 14.6%²¹ and 50%¹⁹ reported by other authors but

quite comparable to another study where evident clinical consequences were ascertained in 4% (n = 1) and marginal clinical consequences in 24% (6/25) and in 16% (4/25), marginal differences with minor forensic consequences were revealed.²²

A total of 45 cases (15%) were incongruent in clinical versus forensic cause of deaths in the present study which is quite lower in comparison to 32%¹⁹ the reason being the advancement in technology over the years owing to the eight-year variation in the study period of both studies. Further classifications of these cases revealed that in 19 cases (42.2%) it was completely inconsistent and was partially inconsistent in rest 26 cases (57.8%). Gender based comparison of cases with and discrepancies in cause of death revealed that, discrepancies in clinical versus autopsy cause of deaths were higher in males (80%) in comparison to females (20%). Also, more prominent inconsistencies were observed more commonly in males. The mean age of study population was 37.73 years and the mean ages for cases with and without discrepancies of cause of death was 37.18 year and 37.82 year respectively considering cases with and without secondary diagnosis with maximum discrepancies observed in patients of 51-60 years age group from rural regions. Discrepancies in cause of deaths were observed in 12% cases of road accidents and 21.6% cases of falls. Thus, cases with discrepancies in cause of deaths were more commonly observed in fatalities due to falls in comparison to those due to traffic accidents.

No case of discrepancy in cause of death was observed in cases surviving for more than four weeks after the trauma and maximum discrepancies were observed in those surviving for less than 96 hours. This pattern was different for cases with and without discrepancies in cause of death as 27% cases without discrepancy died within 24 hrs in comparison to 13% cases with discrepancy. However, in 24.4% with discrepancy injuries in 4-7 days, and 18% cases without discrepancy. This proportion still increased in cases who died in 1-2 weeks period 26% with discrepancy and 15% without discrepancy and the proportion still was on the rise in cases with >2-week survival being about 3.9% cases without discrepancy and 13.3% with discrepancy. The results for the survival period of cases with and without discrepancies in cause of deaths was statistically significant (p-value= 0.039). The results of present study are in congruence to another study which reports 83% of cases (790 patients) did not have an

unexpected change and 17% of cases (162 patients) exhibited a true change in their final diagnosis of cause of death.²³ There are many autopsy based studies related to trauma fatalities²⁴, road traffic accidents with head injury²⁵, fatal trauma in road traffic accidents (RTA) involving two-wheelers²⁶, death due to traumatic injuries following fall from heights²⁷, antemortem study involving traumatic injuries in RTA²⁸.

4. Conclusion

The rates of discrepancies and missed injuries were especially higher in deaths due to road accidents which are commonest offender of human life through the globe and not just its incidence needs to be checked but also there is a grave need to monitor the quality assurance of services rendered in trauma care centers to reduce the effective mortality in these cases. Although definite opinion can't be given on the proportion of preventability of the fatalities in the present study, yet there appears a clear need to enhance radiological services to minimize faulty diagnoses as well as to reduce undiagnosed cases. The need of the hour is to start evaluation of autopsy data for surveillance of polytrauma care intended towards reduction of mortality following traumatic incidents.

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Contributor ship of Author: All authors equally contributed.

Conflict of interest: None to declare.

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