

## Original Research

# A Comprehensive Study of Road Traffic Accidents and Asphyxial deaths in Medico-Legal Autopsies conducted at Tertiary Care Centre: A Three-Year Retrospective Study

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### Abstract:

A retrospective study was conducted at Department of Forensic Medicine & Toxicology at Goa Medical College Bambolim-Goa from Month of 1<sup>st</sup> January 2023 to 31<sup>st</sup> December 2025 {3 years} to study the profile, distribution and types of medicolegal autopsies. Basically, natural diseases were studied in detail as regards system wise distribution and unnatural cases as regards violent asphyxia and Motor-vehicular accident cases with respect to cause of death/ body cavity affected. It was observed that sample size was 3565 cases. Motor vehicular accident cases accounted for on an average of 17.9 % out of 3565 autopsies. Head injury alone accounted for highest number of deaths {55.95%}. Among violent asphyxia cases, hanging accounted for highest number of cases 65.52%. Among natural cases cardiovascular system accounted for majority of cases and coronary artery diseases pathology accounted for 83.94%. Among respiratory system lobar pneumonia 67.64% & among hepatobiliary system cirrhosis of liver was seen in majority of cases amounting to 73.25%.

**Key Words:**Autopsy; natural diseases; violent asphyxia; Motor-vehicular accident

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### Introduction:

Goa Medical College and Hospital situated in Bambolim caters to entire Goa and every year thousands of autopsies are conducted at Department of Forensic Medicine & Toxicology which comprises of natural & unnatural cases. Accidental deaths are rising day by day. An accident is an unplanned event that results in injury, deaths, damage to property or some other losses<sup>1</sup>. Road Traffic Accident (RTA) can be defined as, 'An event that occurs on a way or street open to public traffic; resulting in one or more person's being injured or killed, where at least one moving vehicle is involved<sup>2</sup>. The number of forensic autopsies depends on the

legislation of the country<sup>3</sup>. Sudden cardiac death is commonly defined as an unexpected natural death due to cardiac cause within a short period (usually within one hour) with or without onset of symptoms and without any prior conditions that would appear fatal.<sup>4</sup>

### Objectives

1. To study the pattern of natural disease pathologies among the natural deaths.
2. To study the incidence of fatal motor-vehicular accident cases in Goa.
3. To study the cause of death among MVA cases.
4. To study profile of violent asphyxial deaths.

### Materials and Methods:

The sample {continuous sampling} consisted of all cases subjected to autopsy examination at Department of Forensic Medicine & Toxicology at Goa Medical

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College Bambolim-Goa from month of 1<sup>st</sup> January 2023 to 31<sup>st</sup> December 2025 {3 years}. Data was collected from request letter, police report, inquest panchanama, postmortem register and autopsy reports. The data was collected as per the predesigned proforma which was compiled and analysed.

It is descriptive, retrospective, record-based study. Permission was not taken from Ethical Committee as it was a record-based study without involving live subjects or experimentations. A total of 3565 cases were subjected to autopsy in 3years time frame the results of which are described below in various forms such as charts, tables, etc. The data was analysed by using SPSS Statistics for Windows. Statistical tests: Descriptive statistics with percentile strengths is calculated.

Inclusion criteria – all cases autopsied in between 2023-2025.

#### **Results:**

Table no.1 showing percentage of motor vehicular accident in comparison to total autopsies. On an average MVA accounted for 17. 9% of total autopsies. Also, percentage of motor vehicular accident in comparison to total unnatural autopsies. On an average MVA accounted for 29.5% of total unnatural autopsies.

Head injury alone accounted for highest number of deaths {55. 95%}, followed by head injury associated with blunt chest trauma {11.59%}, followed by head injury + blunt chest trauma + blunt abdominal trauma {6.89%} as shown in Table no. 2.

| Year         | Motor Vehicular Accidents | Total Autopsies | Percentage   | Total Unnatural Deaths | Percentage   |
|--------------|---------------------------|-----------------|--------------|------------------------|--------------|
| <b>2023</b>  | 204                       | 1198            | 17.02        | 726                    | 28.09        |
| <b>2024</b>  | 220                       | 1229            | 17.90        | 731                    | 30.09        |
| <b>2025</b>  | 214                       | 1138            | 18.80        | 704                    | 30.03        |
| <b>Total</b> | <b>638</b>                | <b>3565</b>     | Average 17.9 | <b>2161</b>            | Average 29.5 |

**Table No.01. Showing % of motor vehicular accident in comparison to total autopsies**

| CAUSE OF DEATH                                                   | 2023       | 2024       | 2025       | TOTAL      | %          |
|------------------------------------------------------------------|------------|------------|------------|------------|------------|
| <b>Head Injury</b>                                               | 119        | 120        | 118        | 357        | 55. 95     |
| <b>Blunt Chest Trauma</b>                                        | 8          | 8          | 14         | 30         | 4.7        |
| <b>Blunt Abdominal Trauma</b>                                    | 4          | 14         | 9          | 27         | 4.23       |
| <b>Head Injury + Blunt Chest Trauma</b>                          | 28         | 26         | 20         | 74         | 11.59      |
| <b>Head Injury + Blunt Abdominal Trauma</b>                      | 2          | 4          | 8          | 14         | 2.19       |
| <b>Head Injury + Blunt Chest Trauma + Blunt Abdominal Trauma</b> | 10         | 18         | 16         | 44         | 6.89       |
| <b>Blunt Chest + Blunt Abdominal Trauma</b>                      | 18         | 8          | 9          | 35         | 5.48       |
| <b>Head Injury + Cervical Spine</b>                              | 5          | 14         | 7          | 26         | 4.07       |
| <b>Only Cervical Spine</b>                                       | 7          | 4          | 3          | 14         | 2.19       |
| <b>Polytrauma / Crushing</b>                                     | 1          | 1          | 4          | 6          | 0. 9       |
| <b>Fracture Long Bones</b>                                       | 1          | 2          | 4          | 7          | 1.09       |
| <b>Fracture Pelvis</b>                                           | 1          | 1          | 2          | 4          | 0.6        |
| <b>Total</b>                                                     | <b>204</b> | <b>220</b> | <b>214</b> | <b>638</b> | <b>100</b> |

**Table No. 2: Showing Cause of Deaths in Motor Vehicular Accident Cases**

Table no. 3 shows cause of death. It was observed that hanging accounted for highest number of cases 65.52%, followed by drowning 32.68% and least was strangulation 0.40%. It was observed that coronary artery disease resulting myocardial infarction was

seen in majority of cases amounting to 83.94 % cases followed by cardiomyopathy {5.91%}, followed by valvular heart diseases in 3.31% of cases. Least were seen in atrial septal defect category. Table no. 4

| <b>Cause of Death</b> | <b>2023</b> | <b>2024</b> | <b>2025</b> | <b>Total</b> | <b>%</b>   |
|-----------------------|-------------|-------------|-------------|--------------|------------|
| <b>Hanging</b>        | 148         | 160         | 162         | 470          | 65.52      |
| <b>Drowning</b>       | 99          | 78          | 57          | 234          | 32.68      |
| <b>Smothering</b>     | 2           | 3           | 1           | 6            | 0.80       |
| <b>Strangulation</b>  | 1           | 1           | 1           | 3            | 0.40       |
| <b>Choking</b>        | 3           | 0           | 1           | 4            | 0.50       |
| <b>Total</b>          | <b>253</b>  | <b>242</b>  | <b>222</b>  | <b>717</b>   | <b>100</b> |

**Table No 3: Showing Distribution of Cases of Violent Asphyxia.**

| <b>Parameter</b>                 | <b>2023</b> | <b>2024</b> | <b>2025</b> | <b>Total</b> | <b>Percentage</b> |
|----------------------------------|-------------|-------------|-------------|--------------|-------------------|
| <b>Coronary Artery Disease</b>   | 119         | 132         | 104         | 355          | 83.94             |
| <b>Valvular</b>                  | 4           | 4           | 6           | 14           | 3.31              |
| <b>Atrial Septal Defect</b>      | 1           | 1           | 1           | 3            | 0.71              |
| <b>Ventricular Septal Defect</b> | 1           | 4           | 3           | 7            | 1.61              |
| <b>Cardiomyopathy</b>            | 7           | 10          | 8           | 25           | 5.91              |
| <b>Cardiac Tamponade</b>         | 4           | 6           | 4           | 14           | 3.31              |
| <b>Infective Endocarditis</b>    | 1           | 1           | 2           | 4            | 0.94              |
| <b>Total</b>                     | <b>137</b>  | <b>158</b>  | <b>128</b>  | <b>423</b>   | <b>100</b>        |

**Table No 4: Showing Distribution of Various Types of Cardiovascular Diseases.**

| <b>Parameter</b>          | <b>2023</b> | <b>2024</b> | <b>2025</b> | <b>Total</b> | <b>Percentage</b> |
|---------------------------|-------------|-------------|-------------|--------------|-------------------|
| <b>Pneumonia</b>          | 97          | 158         | 115         | 370          | 67.64             |
| <b>Tuberculosis</b>       | 29          | 8           | 24          | 61           | 11.15             |
| <b>Pneumonitis</b>        | 11          | 6           | 8           | 25           | 4.5               |
| <b>Empyema</b>            | 1           | 2           | 1           | 4            | 0.7               |
| <b>Fibrosis</b>           | 0           | 0           | 0           | 0            | 0                 |
| <b>Pulmonary Edema</b>    | 41          | 20          | 22          | 83           | 15.17             |
| <b>Pulmonary Embolism</b> | 1           | 2           | 1           | 4            | 0.7               |
| <b>Total</b>              | <b>180</b>  | <b>196</b>  | <b>171</b>  | <b>547</b>   | <b>100</b>        |

**Table No 5: Showing Distribution of Various Types of Respiratory Diseases.**

| <b>Parameter</b>   | <b>2023</b> | <b>2024</b> | <b>2025</b> | <b>Total</b> | <b>Percentage</b> |
|--------------------|-------------|-------------|-------------|--------------|-------------------|
| <b>Cirrhosis</b>   | 46          | 44          | 36          | 126          | 73.25             |
| <b>Fatty Liver</b> | 10          | 15          | 12          | 37           | 21.51             |
| <b>Hepatitis</b>   | 3           | 1           | 2           | 6            | 3.48              |
| <b>Abscess</b>     | 0           | 0           | 1           | 1            | 0.5               |
| <b>Carcinoma</b>   | 1           | 0           | 1           | 2            | 1.1               |
| <b>Total</b>       | <b>60</b>   | <b>60</b>   | <b>52</b>   | <b>172</b>   | <b>100</b>        |

**Table No 6: Showing Distribution of Various Types of Hepatobiliary Diseases.**

It was observed that lobar pneumonia was seen in majority of cases amounting to 67.64% cases, followed by pulmonary edema in 15.17% followed by tuberculosis {11.15%}. Least were seen in pulmonary embolism {0.7%} & empyema {0.7%} category as shown in Table No. 5.

It was observed that cirrhosis of liver was seen in majority of cases amounting to 73.25% cases, followed by fatty liver in 21.51% followed by hepatitis {3.48%}. Least were seen in liver abscess {0.5%} category (Table No. 6).

### Discussion

In this study over a span of 3 years at Goa Medical college, total of 3565 autopsies was studied out of which 1404 {39.39%} cases were natural and 2161 {60.61%} were unnatural. Overall, 83.36% were males & 16.63% female subjects. Quite significant number of natural death cases were subjected to autopsy because they were made MLC by the treating physician and cause of death not certified.

As shown in Table no.1 which depicts year wise cases distribution it was observed that motor-vehicular accidents {MVA} accounted on an average for 17.9% of all total autopsies and on an average for 29.5% of total unnatural autopsies. MVA accounted for significant number of autopsies. The higher number of MVA's may be due to Goa being a busy state, people travel in relation to their jobs, etc. Also being heavy tourist attraction state lot of tourists travel recklessly by rented bikes or rent a car on unfamiliar road under influence of alcohol and often losing control and causing fatal accidents. Also, the roadways being predominant mode of transport since local railways network is not developed majority of motor-vehicular accidents take place. Also, use of google maps on phones causing loss of attention while driving by the driver, night travel, craze to over-speed in joy of

exploring new places often lead to accidents.

As regards comparison of MVA to total autopsies, finding of our study were similar to *Fremington Marak et al* & *Jatinder Pal Singh et al* study wherein they observed 10.52% & 13.7% respectively of RTA of total cases.<sup>5,6</sup> Findings were also like *Laila Yesmin et al*, *Dr. Awdhesh Kumar et al*, *MZ Rahman et al*.<sup>7-9</sup> Findings were in contradiction to *Mukesh Prasad et al* & *Jyoti Prasad et al* wherein they observed RTA accounted for 54.43% & 48% of total cases.<sup>2,10</sup>

As seen in table no 2 which reveals study of MVA cases with respect to cause of deaths, we observed that head injury as cause of death was seen in 55.95% of cases. Second common was head injury + blunt chest trauma in 11.59%, third common was head injury + blunt chest trauma + blunt abdominal trauma in 6.89%. The reason being when the person is occupant of car, commonly the head, chest and abdominal cavities are at an increased risk of damage then rest of body parts. Commonly head get impacted against windshield, roof of vehicle or any parts of interior of vehicle. Chest & abdomen gets impacted against steering and resultant damage to internal organs. If the deceased is pedestrian, then again, the back, abdomen & chest are at an increased risk of being damaged. Hence, chest and abdominal regions sustain maximal number of injuries in MVA.

Finding of this study were similar to *S. Janani et al* & *Mukesh Prasad et al* wherein they observed 59% & 40.7% of cases of head injury as regards cause of death respectively.<sup>1,2</sup> *Fremington Marak et al* observed 46.43% cases.<sup>5</sup> Also, *Jatinder P Singh et al*, *Dipak Kumar Das et al*, *Bhaskar Chowdhury et al* observed similar findings.<sup>6,11,12</sup>

With respect to blunt chest trauma as cause of death, similar findings {8.15%} & {11%} were observed by *Mukesh Prasad et al* & *Bhaskar*

*Chowdhury et al* respectively.<sup>2,12</sup> With respect to blunt abdominal trauma as cause of death, similar findings {3.70%} & {9.5%} were observed by *Mukesh Prasad et al* & *Bhaskar Chowdhury et al* respectively.<sup>2,12</sup> With respect to blunt chest + blunt abdominal trauma findings of our study were in contradiction to *Jatinder P Singh et al* wherein they observed 20% of cases.<sup>6</sup>

As regards cervical spine injury as cause of death, similar findings were observed by *Fremington Marak et al* amounting to 2.86%.<sup>5</sup> Findings were in contradiction to *Shahla Imran et al* where they observed 11.6% cases.<sup>13</sup> With respect to polytrauma findings of our study were in contradiction to *Jatinder P Singh et al* & *Dipak Kumar Das et al* wherein they observed 33.88% & 19.78% of cases respectively.<sup>6,11</sup> Also, in contradiction to *Bhaskar Chowdhury et al*.<sup>12</sup>

As seen in table no 3 which shows violent asphyxia deaths, hanging cases accounted for maximum number of cases i.e 65.52% followed by drowning in 32.68%. Both combined resulted in 98% of all violent accidental deaths. All hanging and some of drowning cases were suicidal in nature. The common reason was mental stress, mental disease, financial losses, love failure, exam failure, unemployment, etc. Poor stress management and capacity to have make proper rational decisions and in the situation of suicidal ideation failure to control suicidal impulse often triggers the stimulus to commit hanging or drowning. Also, Goa being all of beaches, locals and tourist often visit beach for bath gets drowned accidentally. Consumption and influence of alcohol also add to the insult. Very few cases of strangulation, smothering, choking were seen.

Finding of this study were similar to *Jigneshkumar B Patel et al* where they observed 53.97% cases of hanging and 38.49% cases of drowning {14}. Also, *Soni*

*Verma et al* {50.72%} & drowning {24.54%}.<sup>15</sup>

As shown in table no 4, we observed that among cardiovascular diseases 83.94 % cases were of myocardial infarction due to occlusive coronary artery disease followed by cardiomyopathy 5.91%. It has been observed that sedentary lifestyle, alcoholism, smoking, obesity, tobacco exposure, drug abuse like cocaine, amphetamine, designer drugs, etc, chronic hypertension, diabetes mellitus, familial dyslipidaemia is commonly seen among Goan population which accounts for higher number of sudden deaths due to myocardial infarction. Alcohol and cigarettes, drugs being commonly available in Goa may be implicated in causation. Second common cause of sudden death was Cardiomyopathy which commonly was hypertrophic type and commonly seen in young population. Valvular heart diseases involving mitral, aortic valve & septal defects were also seen in few numbers of subjects.

Findings of this study were similar to *Dr. Narsireddy R et al* wherein they observed 40% of cases of occlusive coronary artery disease, valvular heart disease {1.7%}, hypertrophic cardiomyopathy {3.3%} and cardiac tamponade in 1.7% cases.<sup>16</sup> Also, *Prakash Jakhar et al* observed occlusive coronary artery disease in 70.7% cases similar to our study but as regards hypertrophic cardiomyopathy {29.3%} findings were in contradiction to our study.<sup>17</sup> Similar findings also observed by *Sarkar R et al*, *Mumtaz Ahmad et al*, *Kasthuri AS et al*.<sup>18-20</sup>

As shown in table no 5, among the respiratory system diseases pneumonia's accounted for 67.64% of cases followed by pulmonary edema. 15.17% cases. Pneumonia's were commonly seen among unknown subjects may be due to poor hygiene, associated starvation, etc. lobar pneumonia is a very common disease pathology diagnosed grossly at autopsy. Clear dis-colouration from normal due to

different stage wise changes and firm liver like consistency make it easy to diagnose grossly. Low immunity, poor hygiene, immunocompromised state, co-existing diseases like diabetes mellitus, chronic bedridden state increases the chances of such cases. Tuberculosis accounted for quite a significant i.e 11.15% of cases since India is Endemic country for TB and same risk factors as described above are often implicated in causation. Only few cases of pulmonary embolism were seen {0.7%}. The lower incidence may be due to difficulty in diagnosing at autopsy.

Findings of this study were similar to *Dr. Narsireddy R et al* where bronchopneumonia accounted for 15% & TB for 5%, *Sarkar R et al* wherein lobar pneumonia accounted for 42%, TB for 46% and carcinoma for 5% {only three parameters studied}, *M.G. Muazzam et al* wherein lobar pneumonia accounted for 10%, pulmonary TB for 4.47% of cases.<sup>16,18,21</sup>

As shown in table no 6 which shows distribution of cases as regards Hepatobiliary system which revealed liver cirrhosis in 73.25% followed by fatty liver in 21.51%. The common reason being alcohol consumption & being easily available, comparatively cheap as compared to other states is implicated in causation. Lower incidence amounting to 1.1% of hepatic carcinoma was seen in Goan subjects. Hepatic carcinoma is often associated with exposure to hydrocarbons, carbon tetrachloride, benzene which is common in use in industrial sector. Since in Goa there very few industries which work/ deal with these chemicals hence it accounts for lower Hepatocellular carcinoma cases. Also, better detection of such cancers by imaging modalities and treatment options doesn't commonly contribute to sudden deaths.

As regards hepatoma findings of this study were in correlation to *M.G. Muazzam et al* wherein hepatoma accounted for 2% cases. Findings of this

study were in contradiction to *M.G. Muazzam et al* wherein they observed cirrhosis in 3% cases.<sup>21</sup>

#### Conclusion:

1. Motor vehicular accident cases accounted for on an average of 29.5% out of 3565 autopsies.
2. Motor vehicular accident cases accounted for on an average of 29.5% out of 3565 autopsies.
3. Head injury alone accounted for highest number of deaths {55.95%}.
4. Among violent asphyxia cases, hanging accounted for highest number of cases 65.52%.
5. Among natural cases cardiovascular system accounted for majority of cases and coronary artery diseases accounted for 83.94%.
6. Among respiratory system lobar pneumonia was seen in majority of cases amounting to 67.64%.
7. Among hepatobiliary system cirrhosis of liver was seen in majority of cases amounting to 73.25%.

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**Source Of Funding** –Nil

**Ethical Clearance** – Not obtained since retrospective study.

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