

An Autopsy-Based Retrospective Analysis of Asphyxia-Related Deaths

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Abstract:

Background: In forensic medicine, autopsy is done to find out the cause of death. Among them one of the most important cause of death is asphyxia. Asphyxia is a condition in which the level of oxygen is decreased and ultimately carbon dioxide increased in the body. Prevalence of asphyxia related deaths were studied in relation to different variables like age, gender, region (urban and rural) along with different types of asphyxia.

Objective: To find the frequency of asphyxial deaths in relation to age and gender as well as to investigate the cause and manner of such deaths.

Material and Methods: Retrospective Cross-sectional study carried out in the Department of Forensic Medicine Mekran Medical College Turbat, from July 1, 2019 to June 30, 2023. All the subjects who died due to asphyxia presented for autopsy at the mortuary were included in the study. There were no age or gender restrictions, but participants whose deaths were caused by other causes were not included in the study. Incomplete cases and referrals from other districts were excluded. The pre-designed Performa had a demographic component and closed-ended questions regarding autopsy cases. SPSS v.20 was used for analysis. Categorical variables were analyzed descriptively in the form of frequency and percentages.

Results: Our study included 120 subjects; 29.16% were female and 70.83% were male. In the 16–30 age group, 67 cases were reported, while 29 were reported in the 31–45 age group. Urban regions accounted for 61.66% (n=74), while rural areas accounted for 38.33% (n=46). 73 cases were from mechanical asphyxia followed by 33 cases of traumatic asphyxia. Regarding the manner of death, hanging is more prevalent than drowning and strangulation.

Conclusion: Asphyxia was the leading cause of death for middle-aged men. The number of deaths caused by asphyxia was higher in urban regions compared to rural ones. Mechanical asphyxia was the most prevalent form of the condition. Hanging was the most common pattern of asphyxia death than drowning and strangulation.

Keywords: Asphyxia, Hanging, Drowning, Strangulation, manner of death.

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Introduction:

When tissues do not receive enough oxygen to maintain metabolic function, a condition known as asphyxia sets in.¹ The four physiological factors that contribute to asphyxia include low oxygen levels in the air, decreased blood oxygenation, impaired oxygen transport in the cardiovascular system, and disruption of oxygen absorption by cells.² When it comes to forensics, asphyxia is typically characterized by an obstructive kind, wherein a Physical barrier blocks the passage of

air to the lungs. While some forms of airway blockage can affect cells directly, others can affect the entire respiratory system, from the nasal passages to the alveolar membranes. It has recently come that numerous forms of hypoxia exhibit a wide range of clinical and pathological characteristics.³ When breathing is violently interrupted mechanically, the result is a lack of oxygen in the blood. This condition is known as mechanical asphyxia.⁴ The classic symptoms of asphyxia include trouble breathing and a narrowed

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airway due to pressure on the chest or neck.⁵ In recent years, there has been a remarkable increase in both the number and variety of medicolegal deaths, which is directly correlated with the rise in crime. Medical professionals

conducting investigations into medicolegal fatalities must conduct thorough autopsies to answer questions about the manner, cause, and time since death.⁶

Oxygen deprivation first impacts neurological tissues and even a slight deficit disrupts their normal functions. A lack of adequate oxygen in the brain's bloodstream quickly renders a person unconscious. Even after breathing stops, the heart may keep beating in any kind of hypoxia. There are several different kinds of asphyxia, including mechanical, pathological, poisonous, environmental, traumatic, postural/positional, and iatrogenic. In mechanical asphyxia, the airflow is stopped mechanically. Pathological hypoxia occurs when an illness affecting the upper respiratory tract or the lungs blocks air from entering the lungs. Similar to carbon monoxide and cyanide poisoning, toxic asphyxia occurs when harmful substances block the body's ability to use oxygen. Environmental hypoxia occurs when the amount of oxygen in the air is inadequate in confined spaces, such as a closet or an unattended car. Traumatic asphyxia occurs when the abdominal and chest walls are compressed from the outside, making it difficult for the patient to breathe. Permanent damage to the central neurological and circulatory systems can lead to death in asphyxia deaths, which occurs when oxygen deprivation lasts 5 to 10 minutes. Maintaining artificial breathing restriction for 15-30 seconds causes the cardinal indications of asphyxia, which include cyanosis, increased capillary permeability, and petechial hemorrhage. The presence of deoxygenated blood in the crowded veins and, perhaps, the arteries cause cyanosis, a blue discoloration of the skin. In the 1800s, Professor Ambrose Tardieu classified petechial hemorrhages as small, pinpoint bleeding holes that typically manifest on the face and head, particularly in the delicate tissues surrounding the eyes, such as the lax eyelids, conjunctivae, and sclera. Blood seepage from tiny venules caused by increased pressure in the veins causes these. Their rapid appearance in the eyes and face after a powerful coughing or sneezing fit makes them not a diagnostic of hypoxia.⁷

The five most common ways that people die from asphyxia are by hanging, drowning, strangulation, suffocation, or traumatic asphyxia. Suicidal people often hang or drown themselves, while homicidal people often strangle their victims, sometimes to death. Traumatic asphyxia, often known as a crush injury, is another cause of violent asphyxial death; it involves inadvertent compression or trauma to the chest that prevents respiratory movement.⁸ Deaths caused by suffocation occur when air is forced out of the lungs through methods other than compressing the neck. Overlapping, which occurs accidentally in newborns breastfed by mothers, and ethanol intoxication are the only two

exceptions to the rule that the victims are mostly infants or the elderly, and it is virtually always murderous. Proof of drowning as a cause of death is notoriously difficult to get after the fact, particularly in cases when the body is not examined while it is still fresh. The most prevalent causes of unintentional drowning include things like children, people who are bathing, fishermen, dockworkers, people who fall into wells, people who are intoxicated or have epilepsy, and excessive labor. Suicide by drowning occurs frequently among females. Among the most popular means of infanticide, particularly with newborns, is the relatively rare practice of murder by drowning.⁹

Among those aged 45-59 years, the suicide rate increased by 104% due to suffocation, and it increased gradually in all age groups except those aged ≥ 70 years, accounting for 52% of the total rise. Suicide by poisoning accounted for 19% of the increase.¹⁰ Suicide, homicide, and accidental deaths are all too common in today's society as a result of the ever-increasing poverty, overcrowding, and stress. Though all sexes experience these pressures to some degree, it appears that men are more likely to suffer from them due to our male-dominated society and increased exposure to the outside world. As the number of such cases from rural areas rises, it is clear that urbanization is impacting even these regions¹¹. According to Canadian data, suffocation is still the leading cause of suicide, but hanging is the second most popular method.¹² When oxygen deprivation lasts 5–10 minutes, asphyxia fatalities can cause permanent cardiovascular and central neurological damage. After 15–30 seconds of artificial breathing obstruction, cyanosis, capillary permeability, and petechial hemorrhage occur. Asphyxial deaths appear with general conjunctival and facial petechiae. It is believed that petechiae signify asphyxia, even though they are rare in non-asphyxial deaths¹³. Suicides and homicides have become more common as a result of the growing population, widespread poverty, and the mounting pressures of everyday life. Although both sexes experience this type of stress, males are more likely to be exposed to the outside world, which may lead to an increased number of recorded suicides.¹⁴

This study was carried out to find out the frequency of reported asphyxial deaths in relation to age, and gender as well as to investigate the cause and manner of such deaths.

Materials and Methods:

The forensic department of Mekran Medical College Turbat conducted an autopsy-based retrospective analysis from July 1, 2019 to June 30, 2023. All the subjects who died due to asphyxia presented for autopsy at the mortuary were included in the study. There were no age or gender restrictions, but participants whose deaths were caused by other causes were not included in the study. Cases with incomplete documentation and Cases referred from other districts

were not included. The data was collected after taking Ethical approval for the said study. A pre-designed Performa was used to extract the data. In the present study various types of asphyxial deaths, their age-wise distribution, sex-wise distribution, manner of death, and causes of death are studied. The pre-designed Performa had a demographic component and closed-ended questions regarding autopsy cases presented at the Department of Forensic Medicine. SPSS v.20 was used for analysis. Categorical variables were analyzed descriptively in the form of frequency and percentages.

Results:

Of the total 120 subjects, 70.83% (n=85) were males and 29.16% (n=35) were females.

Sex	Frequency	Percentage
Male	85	70.83%
Female	35	29.16%
Total	120	100%

In the data, 61.66% (n=74) were related to urban areas and 38.33% (n=46) were to rural areas. In total subjects, 89.16% (n=107) had immediate deaths, and 6.66% (n=08) had delayed ones, however, 4.18% (n=05) are undetermined.

The mean age of the subjects was 29.0+/- 14.1 years ranging from 0 to 70 years.

Age in groups	Frequency (n=120)	Percentage (%)
0-15 years	12	10
16-30 years	67	55.86
31-45 years	29	24.1
46-60 years	8	6.66
more than 60 years	4	3.37

Causes	Frequency (n=120)	Percentage (%)
Mechanical	73	60.83
Traumatic	33	27.52
Chemical	5	4.16
Pathological	4	3.33
Iatrogenic	3	2.50
Perinatal	2	1.66

Table 3 shows that 60.83% of asphyxial deaths were caused by a mechanical type of asphyxia followed by Traumatic (27.52%), Chemical (4.16%), Pathological (3.33%), Iatrogenic (2.50%), Perinatal (1.66%) respectively.

Cause of Death	Suicidal	Homicidal	Accidental	Total
Hanging	92(76.66%)	00	04(4.1%)	96(80%)
strangulation	00	06(5%)	00	06(5%)
Drowning	01(0.83%)	00	17(14.16%)	18(15%)

Table 4 shows that 80% of asphyxia deaths were due to hanging, 5% were due to strangulation, and 15% were due to drowning.

Discussion:

Victims of asphyxial deaths can be identified by looking for exterior injuries and a specific pattern of ligature marks on their necks. To drain the body of blood, eviscerations were performed on the cranial, thoracic, and abdominal viscera. This drainage eliminates the need to inject blood into the neck's soft tissues, creating a blood-free environment that is ideal for studying the neck's structures.¹⁵

The demographic detail of our study showed that 70.83% were males and 29.16% were females similar found in a study.¹⁶ Another study reported that 69.1% of male and female cases were 30.9% which also supports the findings of our study.¹⁷ Deprivation of oxygen to cells, notably the brain, which regulates human physiology, causes asphyxial deaths. Thus, the autopsy-based study shows a 2:1 male-to-female death ratio. According to research in Brazil¹⁸, Germany¹⁹, and Pakistan²⁰, male frequency is higher. When men are the only earners in the household, they often experience higher levels of stress and aggression. The ages which had more lies between 16 to 45 years, like other studies^{21,22}.

Hanging was the most common cause of death in the study, preceding drowning and strangulation, respectively, comprehensible to a study in Pakistan^{18,20}. All cases of strangulation were homicidal, while all cases of hanging were either accidental or suicide, according to our study. However, one study demonstrated homicidal hanging cases²³. In all 120 cases of violent asphyxial death under the present study, decomposition has not advanced to mask the cardinal signs of asphyxia as shown by other studies²³. A four-year research conducted by the Human Rights Commission also discovered an increase in strangulation incidents among victims of honor killings²². The random cases of asphyxia due to pathological lung infection, suffocation due to congested inhabiting areas or carbon monoxide poisoning because of burning or indoor gas appliances are utmost causes. Smothering another type of homicidal manner by asphyxia²⁴ in which the nose or mouth is occluded with hands or materials like plastic bags or pillows existing in the study. Clinical autopsies also contribute to medical advancements by supplying evidence-based discoveries and serving as a springboard for further biomedical study, such as accurately capturing the appearance of healthy and diseased organs.²⁵ In all circumstances, the majority of studies found that men were more involved. Extreme physical exertion and accidents on the job may be to blame for the disproportionate number of males involved.²⁶

Conclusion:

Our study concluded that asphyxia deaths were found more prevalent in males in the middle age group. Asphyxia deaths were found more in urban areas than in rural areas. Mechanical asphyxia was the most

common type of asphyxia. Hanging was the most common pattern of asphyxia death than drowning and strangulation.

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