



Original Article

Pattern of Mechanical Asphyxia Deaths in Forensic Autopsies at Medicolegal Section of Liaquat University Hospital, Hyderabad

Nadia Aslam¹, Ishrat Bibi¹, Muhammad Rafique Shaikh², Ummara Munir³, Mobin Inam Pal⁴ and Abdul Samad*¹Department of Forensic Medicine and Toxicology, Liaquat University of Medical and Health Sciences, Jamshoro, Pakistan²Department of Forensic Medicine and Toxicology, Chandka Medical College, Shaheed Mohtarma Benazir Bhutto Medical University, Larkana, Pakistan³Department of Forensic Medicine and Toxicology, Sheikh Zayed Medical College, Rahim Yar Khan, Pakistan⁴Faisalabad Medical University, Faisalabad, Pakistan

ARTICLE INFO

Keywords:

Asphyxia, Forensic Autopsy, Strangulation, Drowning, Suicidal Deaths

How to Cite:

Aslam, N., Bibi, I., Shaikh, M. R., Munir, U., Pal, M. I., & Samad, A. (2024). Pattern of Mechanical Asphyxia Deaths in Forensic Autopsies at Medicolegal Section of Liaquat University Hospital, Hyderabad: Mechanical Asphyxia Deaths in Forensic Autopsies. *Pakistan Journal of Health Sciences*, 5(04). <https://doi.org/10.54393/pjhs.v5i04.1391>

*Corresponding Author:

Abdul Samad

Department of Forensic Medicine and Toxicology,
Liaquat University of Medical and Health Sciences,
Jamshoro, Pakistan
drmemonmpk1970@gmail.com

Received Date: 28th March, 2024Acceptance Date: 28th April, 2024Published Date: 30th April, 2024

ABSTRACT

Asphyxia is characterized by oxygen deprivation in cells resulting from insufficient or altered oxygen supply. Mechanical asphyxia refers to inadequate breathing caused by external forces. This study assessed the pattern of mechanical asphyxia-related autopsies carried out at a medico-legal section of Liaquat University Hospital, Hyderabad. **Objective:** To assess the pattern of mechanical asphyxia-related autopsies carried out at a medico-legal section of a tertiary care teaching hospital. **Methods:** This prospective observational study was performed to analyze the forensic autopsy reports from January 2021 to December 2022 at Liaquat University Hospital, Hyderabad and 103 medico-legal cases of mechanical asphyxia were enrolled. All autopsy reports related to mechanical asphyxia were included. The data were collected on a pre-designed pro forma. Autopsies of non-medico-legal nature and related to unnatural deaths apart from mechanical asphyxia were excluded. **Results:** Most of the cases (n=51) were identified as caused by the drowning. The hanging and strangulation occurred in an equal number of mechanical asphyxia-related autopsies (n=26 each). The male gender dominated the frequency of drowning and strangulation while hanging was more prevalent in females. **Conclusions:** Drowning was observed as the most prevalent mechanism of mechanical asphyxia in medico-legal autopsies conducted over a period of two years.

INTRODUCTION

Postmortem examination research of the corpse is crucial in determining the cause of death. In order to ascertain the cause of death, a medical professional will conduct an autopsy, which involves a thorough inspection of the body's internal and external organs and cavities [1]. Conducting a clinical autopsy with the goal of clinical investigation allows for the identification of the underlying cause of death and is a crucial tool for assessing healthcare quality [2]. On the other hand, the goal of a medi-colegal autopsy is to positively identify the corpse and determine the cause of death in relation to any possible criminal actions [1]. In order to gather data for population-level healthcare

planning and use as evidence in court processes, both kinds of autopsy are essential. The autopsy can also provide light on whether the death was accidental, homicidal, or suicide-related [3]. There are many facets to medical practice, including dealing with legal issues. Claims for personal injuries, medical malpractice, criminal charges, and workers' compensation are only a few examples of the many situations in which legal matters could emerge [4]. The term "asphyxia" encompasses the state of cells lacking oxygen as well as any and all consequences of an insufficient or changed oxygen supply [5]. When the airways are blocked or compressed from the

outside, a condition known as mechanical asphyxia develops. Drowning, hanging, or strangling are some of the ways this might occur [6]. Death occurs when the respiratory system is unable to take up enough oxygen and release enough carbon dioxide, a condition known as mechanical asphyxia [7]. Mechanical hypoxia typically results in mortality because critical organs, including the brain, do not receive enough oxygen [8]. The word "drowning" is used in forensic asphyxia to describe a person's demise due to submersion in water. Most of the time, water is used as the immersion liquid [8, 9]. When submerged in water, oxygen is less available for respiration. The terms "strangulation" and "hanging" describe the same thing: the application of external pressure with a lead bullet that seals up the airways or the blood vessels in the neck, which blocks the airways and causes death [7]. When looking into unexpected suspicious deaths, medico-legal autopsies play an important and vital role. In order to make sense of regional mortality data attributed to non-natural causes, it is crucial to profile and appreciate the profile of cases that undergo medico-legal autopsy. Based on region-specific mortality rates, this information also helps in addressing demographic requirements. It is also crucial for studying local crime rates and avoiding needless fatalities in the future [10]. Legal and medical experts in Pakistan have documented instances of causes of death other than natural causes, such as gunshot wounds, but mechanical asphyxiation has gotten less research and attention [11].

Therefore, the current study aimed to report the two-year frequency of mechanical asphyxia deaths in the medico-legal department of Liaquat University Hospital Hyderabad.

METHODS

This two-year observational and prospective study analyzed forensic autopsy reports from the medico-legal section at Liaquat University Hospital, Hyderabad after approval ref no. LUMHS/FM/68/20 dated 10-11-2020. The study included the autopsies related to mechanical asphyxia. The deaths due to mechanical asphyxia were categorized as drowning, hanging, and strangulation. Autopsies of non-medico-legal nature and related to unnatural deaths apart from mechanical asphyxia were excluded. A proforma was designed to collect data, including the cause of death. Proximate family members of the decedent gave their approval. Descriptive statistics were performed using IBM SPSS Statistics for Windows, version 24.0.

RESULTS

The predominant portion of the autopsies revealed drowning as the primary cause of death across both years under review. Notably, hanging and strangulation emerged as equally prevalent factors contributing to mechanical asphyxia, with each identified in 26 autopsies. Moreover, it is noteworthy that March exhibited the highest frequency of mechanical asphyxia-related autopsies, indicative of potential seasonal variations or heightened risk factors during that time period. Conversely, December recorded the lowest number of such cases, suggesting potential fluctuations in risk factors or external influences impacting mortality rates during this month. This comprehensive analysis underscores the significant burden of mechanical asphyxia-related fatalities within the studied population and highlights the need for targeted interventions and preventive measures to mitigate the associated risks and enhance public safety (Table 1).

Table 1: Month-Wise Frequency of Deaths due to Mechanical Asphyxia

Month	Drowning		Hanging		Strangulation		Total
	2021	2022	2021	2022	2021	2022	
January	0	1	3	2	3	1	10 (9.7%)
February	0	1	2	1	0	1	5 (4.85%)
March	6	0	3	0	2	2	13 (12.62%)
April	2	1	2	1	0	1	7 (6.79%)
May	2	2	1	3	1	0	9 (8.73%)
June	5	3	0	1	1	2	12 (11.65%)
July	5	2	1	1	0	1	10 (9.7%)
August	3	3	0	2	0	3	11 (10.67%)
September	2	6	0	1	3	0	12 (11.65%)
October	1	0	1	0	1	2	5 (4.85%)
November	3	2	0	0	1	1	7 (6.79%)
December	0	1	1	0	0	0	2 (1.94%)
Total	29	22	14	12	12	14	103

Figure 1 shows that out of all the cases of mechanical asphyxia-related autopsies, around half were caused by drowning. But half of the people who died from mechanical asphyxia were strangled or hanged. When looking at the gender breakdown of asphyxia-related fatalities, it was found that males had a far greater rate of drowning and strangling cases than females.

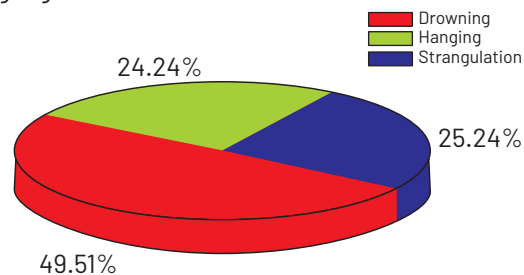


Figure 1: The Proportion of Drowning, Hanging, and Strangulation in Mechanical Asphyxia

On the other hand, autopsy performed on males showed a lower frequency of hangings than on females, although the latter still had a considerable incidence (Figure 2). This gender-specific disparity in the manifestation of different modes of mechanical asphyxia underscores the importance of considering gender-sensitive approaches in designing preventive strategies and interventions aimed at reducing the incidence of such fatalities.

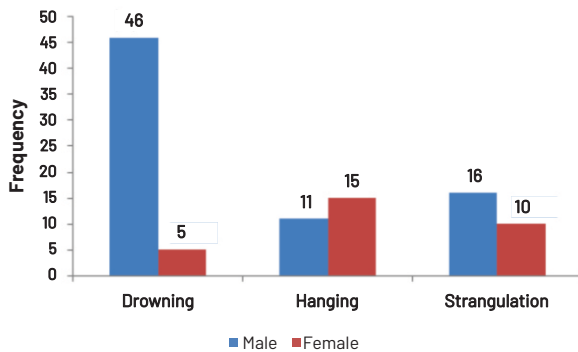


Figure 2: Gender Distribution across Different Causes of Mechanical Asphyxia

DISCUSSION

We found that asphyxial deaths were more common in males which is consistent with other studies from Pakistan [11,12], India [3], Germany [13] and Brazil [14]. This may be accredited to certain factors such as the higher likelihood of males being the primary breadwinners and being exposed to accidents, violence, and stress. Additionally, males are more prone to addiction and risky behaviour [15]. The study also revealed that the asphyxial deaths occurred in adults, which is in line with previous studies. More adults died from suffocation than younger or older people, according to a three-year retrospective research [15] and a four-year prospective research [11]. One possible explanation is because adults are more likely to be involved in a wide range of activities, which leaves them more exposed to hazards [15]. This study found that drowning was the primary cause of fatality related to mechanical asphyxia. The act of strangulation or hanging was the second most common cause of death due to asphyxiation. There were ninety percent male participants who drowned. This finding is in line with global figures from the World Health Organization [16] and the Centers for Disease Control and Prevention drowning information page [17]. On the other hand, the present study looked at more girls being hanged than males. Other research have shown a larger frequency of hangings in autopsy for men compared to females [18, 19], however our result contradicts that. Additional research is needed to determine if these variations reflect regional disparities in hanging-caused asphyxia. In Azad Jammu and Kashmir, Mehmood et al., also found results that were comparable to those of the

current study. In this study, there was an increased risk of fatal asphyxiation occurrences among men and young people (ages 19–49). According to forensic investigations, the leading cause of death from asphyxiation was drowning, although hanging was also a major factor in many cases. A study aimed at identifying the various forms of mechanical asphyxia found that hanging was the most common (61.91%), followed by drowning (33.33%) and strangulation (4.76%) in medico-legal autopsies [14]. In another study of 320 medico-legal autopsies, hanging was found as the mechanism of asphyxia in more than 75% of cases, while drowning and strangulation followed the frequency of hanging [21]. Nonetheless, strangling was shown to be the most prevalent mode of asphyxial fatalities in Peshawar, Pakistan, according to a four-year prospective analysis [11]. According to a study that looked back over 20 years of data on violent deaths, accidents, and suicides in Hamburg, Germany, the most common cause of asphyxia was drowning [22]. Similarly, drowning was ranked as the second most common cause of death in India, after only automobile accidents [23]. Another research in India found that drowning and hanging were the leading causes of asphyxial mortality as determined by postmortem results [24]. These findings suggest that patterns of asphyxial deaths may vary on a national and international scale.

CONCLUSIONS

Drowning was the leading cause of mechanical asphyxia-related deaths, followed by hanging and strangulation.

Authors Contribution

Conceptualization: NA

Methodology: NA, MIP

Formal analysis: IB

Writing-review and editing: MRS, AS

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

Source of Funding

The authors received no financial support for the research, authorship and/or publication of this article.

REFERENCES

- [1] Dedi Afandi MD. Profile of medicolegal autopsies in Pekanbaru, Indonesia 2007–2011. *The Malaysian Journal of Pathology*. 2012 Dec; 34(2): 123.
- [2] Friberg N, Ljungberg O, Berglund E, Berglund D, Ljungberg R, Alafuzoff I et al. Cause of death and significant disease found at autopsy. *Virchows Archiv*. 2019 Dec; 475: 781–8. doi: 10.1007/s00428-019

- 02672-z.
- [3] Radhakrishna KV, Makhani CS, Sisodiya N, Chourasia S, Sarala M, Khan RN. Profile of medicolegal autopsies conducted at tertiary medicolegal centre in southwestern India. *International Journal of Healthcare and Biomedical Research*. 2015 Jan; 3: 70-5.
- [4] Treglia M, Pallocci M, Passalacqua P, Sabatelli G, De Luca L, Zanovello C et al. Medico-legal aspects of hospital-acquired infections: 5-years of judgements of the civil court of Rome. *Healthcare*. 2022 Jul; 10(7): 1336. doi: 10.3390/healthcare10071336.
- [5] Aquila I, Falcone C, Di Nunzio C, Tamburrini O, Boca S, Ricci P. Virtopsy versus autopsy in unusual case of asphyxia: Case report. *Forensic Science International*. 2013 Jun; 229(1-3): e1-5. doi: 10.1016/j.forsciint.2013.03.004.
- [6] Shkrum MJ and Ramsay DA. *Forensic pathology of trauma*: Springer Science & Business Media; United States: 2007. doi: 10.1007/978-1-59745-138-3.
- [7] Gentilomo A, Tambuzzi S, Boracchi M, Gentile G, Zoja R. Mechanical asphyxia by hanging and gunshot to the head: a series of rare planned complex suicides. *Medico-Legal Journal*. 2024 Mar; 92(1): 15-9. doi: 10.1177/00258172221102755.
- [8] Sauvageau A and Boghossian E. Classification of asphyxia: the need for standardization. *Journal of Forensic Sciences*. 2010 Sep; 55(5): 1259-67. doi: 10.1111/j.1556-4029.2010.01459.x.
- [9] Szpilman D, Bierens JJ, Handley AJ, Orlowski JP. Drowning. *New England Journal of Medicine*. 2012 May; 366(22): 2102-10. doi: 10.1056/NEJMra1013317.
- [10] Vijapura MT, Momin SG, Patani K. Epidemiological Profile of Medico-Legal Autopsy Cases Reported at a Tertiary Care Center. *Medico Legal Update*. 2023 April-June; 23(2): 24-8. doi: 10.37506/mlu.v23i2.3386.
- [11] Khalil ZH, Naeem M, Gul S, Adil M, Abbas SH, Alam N. Asphyxial deaths: a four year retrospective study in Peshawar. *Journal of Postgraduate Medical Institute*. 2014 Jan; 28(1).
- [12] Qasim AP, Tariq SA, Makhdoom PA. Profile of negative autopsy cases at Punjab Medical College, Faisalabad. *Journal of University Medical and Dental College*. 2015 Mar; 6(1): 6-11.
- [13] Mosek DP, Sperhake JP, Edler C, Püschel K, Schröder AS. Cases of asphyxia in children and adolescents: a retrospective analysis of fatal accidents, suicides, and homicides from 1998 to 2017 in Hamburg, Germany. *International Journal of Legal Medicine*. 2020 May; 134: 1073-81. doi: 10.1007/s00414-020-02248-6.
- [14] Brites AN, Machado AL, Franco A, Silva RH. Revisiting autopsies of death by mechanical asphyxia in the search for post-mortem pink teeth. *The Journal of Forensic Odonto-stomatology*. 2020 May; 38(1): 34.
- [15] Prasad KJ, Venkatesulu B, Khalid MA. Pattern of medicolegal autopsies conducted at Tirupati, Andhra Pradesh: A 3-year retrospective study. *Asian Journal of Pharmaceutical and Clinical Research*. 2021; 14(12): 3. doi: 10.22159/ajpcr.2021.v14i12.43304.
- [16] World Health Organization. Drowning fact sheet Geneva. 2021 [Last cited 25th Feb 2022]. Available at: <https://www.who.int/en/news-room/fact-sheets/detail/drowning>.
- [17] Centers for Disease Control and Prevention. Drowning Facts United States. 2021 [Last cited: 25th Feb 2022]. Available at: <https://www.cdc.gov/drowning/facts/index.html>.
- [18] Ilic M and Ilic I. Trends in suicide by hanging, strangulation, and suffocation in Serbia, 1991-2020: A joinpoint regression and age-period-cohort analysis. *World Journal of Psychiatry*. 2022 Mar; 12(3): 505. doi: 10.5498/wjp.v12.i3.505.
- [19] Goceoglu UU and Balci Y. Gender differences in completed suicidal hangings from 2013 to 2018 in Muğla, Turkey. *Annals of Saudi Medicine*. 2021 Jan; 41(1): 43-50. doi: 10.5144/0256-4947.2021.43.
- [20] Mehmood I, Saleem K, Azeem MT, Suhail S, Khan MA, Nadir S. Autopsy based pattern of asphyxial deaths in forensic: a retrospective study. *Annals of Punjab Medical College (APMC)*. 2023 Sep; 17(3): 289-92.
- [21] Gupta VP and Mahanta P. A study of asphyxial death cases in medico-legal autopsy. *International Journal of Health Research and Medico Legal Practice*. 2016 Jul: 86-9.
- [22] Meyer FS, Trübner K, Schöpfer J, Zimmer G, Schmidt E, Püschel K et al. Asphyxia Study Group. Accidental mechanical asphyxia of children in Germany between 2000 and 2008. *International Journal of Legal Medicine*. 2012 Sep; 126: 765-71. doi: 10.1007/s00414-012-0737-z.
- [23] Phad LG and Dhawane SG. Epidemiological profile of drowning deaths: a cross sectional study. *Egyptian Journal of Forensic Sciences*. 2018 Dec; 8: 1-6. doi: 10.1186/s41935-018-0056-8.
- [24] Singh B, Ghosh M, Sangal A, Srivastava AK. A Postmortem medicolegal study of violent asphyxial deaths-An autopsy based study. *International Archives of BioMed Clinical Research*. 2017 Apr; 3(2): 104-7. doi: 10.21276/iabcr.2017.3.2.23.