

**Original Article****PROFILE OF MEDICOLEGAL AUTOPSIES AT A PROVINCIAL HOSPITAL IN NEPAL****\*Sharmila Gurung<sup>1</sup>, Ahana Shrestha<sup>2</sup>, Sugam Shrestha<sup>3</sup>**<sup>1</sup>Department of Forensic Medicine, Devdaha Medical College & Research Institute, Butwal, Nepal, <sup>2</sup>Department of Forensic Medicine, Kathmandu Medical College, Kathmandu, Nepal, <sup>3</sup>Department of Forensic Medicine, Kist Medical College, Kathmandu, Nepal**Submitted: 27<sup>th</sup> - February - 2025 Revised: 27<sup>th</sup> - April - 2025 Accepted: 20<sup>th</sup> - April - 2025****ABSTRACT****Background**

Autopsies provide crucial insight into the lives of the deceased. Recording and reporting their findings contribute to the health information management system, which helps to develop or reform health policies or priorities. We aim to study the frequency of deceased by age and sex, determine if there is a sex difference as well as age in the autopsies, and its relation to the manner of death.

**Methods**

This cross-sectional observational study was conducted on the medicolegal autopsies from Lumbini Provincial Hospital within a one-year duration. The data was collected from the mortuary register and entered into Microsoft Excel and analysed. Statistical analyses included a Chi-square test.


**Results**

469 cases were autopsied, of which males and females comprised 75% and 25%, respectively. Adults (67%) were the highest among the deceased. Statistical difference was observed between age and sex, similarly, between manner and sex, but not with manner and age. Most deaths were unnatural (83%), followed by natural (6%), and in 53 (11%), the manner could not be determined. Maximum deaths were due to road traffic accidents (43%) and accidents (28.3%), being the most common manner of death.

**Conclusion**

Young adult males died from road traffic accidents. There was a difference in the proportion of the gender and grouped age. The deceased's gender varied with age and manner of death.

**Keywords:** Autopsy, Cause of death, Medicolegal, Post-mortem examination.

	<p>©Authors retain copyright and grant the journal right of first publication. Licensed under Creative Commons Attribution License CC - BY 4.0 which permits others to use, distribute and reproduce in any medium, provided the original work is properly cited.</p>	<p><b>*Corresponding Author</b>            Sharmila Gurung            Email: thesharmilagurung@gmail.com            ORCID: <a href="https://orcid.org/0000-0001-9285-0288">https://orcid.org/0000-0001-9285-0288</a></p>
---	---	--

**Citation**

Gurung S, Shrestha A, Shrestha S, Profile of Medicolegal Autopsies at A Provincial Hospital in Nepal, MJEN. 2025 June; 4(1):28-32.

## INTRODUCTION

Autopsy, also known as post-mortem examination is systemic examination of a dead body. A few of its many objectives are: identifying the cause of death, determining the manner of death, estimating the time since death, and establishing the deceased's identity etc. In Nepal, medicolegal autopsies are mandatory in cases of unnatural, sudden, unexpected, unidentified or death suspected due to foul play.<sup>1,2</sup>

Studies abroad and Nepal recorded a minimum of hundred to over thousands of medicolegal autopsies being conducted, documented<sup>3-12,13-18</sup>. This trend shows a steady or even an increase in the number of unnatural deaths, and if not, then at least in the number of medicolegal autopsies. So, it becomes necessary to keep updating the recent pattern it follows so that proper attention can be provided to identify and prevent the factors associated with mortality. Studying the autopsy profile of a particular area or region can help us understand the epidemiology and prioritize health interventions. It can also help in reforming the policies in health care management and enhancing the outcomes of health care.<sup>19</sup>

Regarding the demography of autopsies, the majority of the studies are found to have varying results, and only a few have tested their relationship to varying aspects of mortality; furthermore, information related to it, in areas surrounding Butwal is limited. Since, it provides insight to the social and economic profile of the victims which forms the basis to information regarding the nature of their death, we are conducting this study with an objective first, to determine: the distribution of the deceased by age and sex, second: age and sexual difference in the autopsies and third, their relation with manner of death.

## METHODS

This cross-sectional descriptive study was conducted in Lumbini Provincial Hospital, Rupandehi. The data was collected in a predefined proforma from the mortuary register. The study was conducted after obtaining ethical approval from Devdaha Medical College and permission from the Lumbini Provincial Hospital. All the autopsies were performed by a Forensic Consultant. All the autopsies performed during the period (May 2021- April 2022) were included in the study, whereas cases with incomplete or missing information were excluded. The data was coded, entered into Microsoft excel, and analyzed by SPSS (statistical package for social sciences) version 21. The age was grouped and merged into three categories as children or adolescents (18 years of age but rounded up to 20), adults and the elderly (60 and above) so that the outcome could target health

recommendations. Sample size calculated as (Cochran's sample size calculator)  $n = (Z^2 \times p \times (1-p)) / e^2$ , where: **n** = sample size, **Z** = the z-score corresponding to the desired confidence level, **p** = the estimated population proportion (50%), **e** = the margin of error. Confidence Level: 95% Margin of Error: 5%

$$n = (1.96^2 \times 0.5(1-0.5)) / 0.05^2 = 385$$

However, since the size was met, we included all the cases for that fiscal year.

## RESULTS

The total number of autopsies conducted were 469; out of which, 351 (75%) and 118 (25%) were males and females respectively. Male: female= 2.97:1. The single sample proportion test for male was <0.0001 at 95% Confidence interval of observed population (70.82% to 78.86%). The mean age was 35.6. most common age group of the victims were 21-30 (22%), serially followed by 31-40 (21.3%), 11-20 (16.8%), 41-50 (13.7%), 51-60 (10%), 61-70 (7.2%), 1-10 (5.3%), 71-80 (2.8%) and 81-90 (0.9%). The most and least common age groups for males were 21-30 (22.8%) and 81-90 (1.1%); while for females, they were 11-20 (32.2%) and 81-90 (0%) respectively. The *p*-value was 0.00001 for age and sex of the victims.

**Table 1: Distribution of sex according to the merged age group**

S. No	Age group (years)	Males No (%)	Females No (%)	Total No (%)	Chi-square test (P value)
1	0-20	59 (16.8)	45 (38.1)	104 (22.1)	
2	21-60	248 (70.7)	66 (55.9)	314 (67)	0.00001
3	61- above	44 (12.5)	7 (6)	51 (10.9)	
		351 (100)	118 (100)	469 (100)	

Majorities of the death were unnatural 389 (83%) in nature. Only 27 (6%) were natural and in 53 (11%) the manner could not be determined. In the descending order, the most common manner was found to be Accident 201 (43%), Suicide 174 (37%), Undetermined 53 (11%) Natural 27 (6%), Homicide 14 (3%). Most common manner of death among males, females were accident and suicide while the least was natural. For majorities of age group, majorities of death were due to accident. The chi square test *p* value was 0.00001 for sex Vs. various manner of death and 0.054716 for age Vs. manner of death.

Table 2: Age and Sex distribution according manners of death

Variables		Unnatural			Natural No (%)	Undetermined No (%)	Total No (%)	Chi-square test (P value)
		Accident No (%)	Suicide No (%)	Homicide No (%)				
Sex	Male	174 (86.6)	99 (56.9)	10 (71.43)	23 (95.8)	45 (85)	351 (75)	0.00001
	Female	27 (13.4)	75 (43.1)	4 (28.57)	4 (14.48)	8 (15)	118 (25)	
Age group		201 (100)	174 (100)	14 (100)	27 (100)	53 (100)	469 (100)	0.054716
	0-20	37	51	4	11	1	104 (22.2)	
	21-60	141	105	8	39	21	314 (67)	
	61 and above	23	18	2	3	5	51 (10.8)	
		201	174	14	53	27	469 (100)	

The most and least common cause of death was (RTA) Road Traffic Accidents (28.3%) and (SFI) Sharp Force Injuries (5%) and others (5%) respectively.

Table 3: Cause of Death

Cause of Death	Total No	(%)
RTA (Road Traffic Accident)	133	28.3
Hanging	118	25
Unknown	53	11.3
Poisoning	45	9.6
Drowning	36	7.7
BFI (blunt force injury)	30	6.4
Disease	27	6
Burn	10	2
Electrocution	7	1.5
SFI (sharp force injury)	5	1
Others	5	1
	469	100

## DISCUSSION

The total number of cases autopsied for the year was 469. In Nepal, the number of annual autopsies conducted were 258 in Dhulikhel for the year 2020/2021, 184 in Palpa for 2017/2018, 217 in Janakpur for 2016, 479 in Dharan for 2010/2011.<sup>14,20-22</sup>

Whereas, it was 775 in a two-year study conducted in Pokhara, 2102 in a three-year study in Chitwan.<sup>17-18</sup>

The annual number of cases in various parts of India was 330 for 2018, 2326 for 2022, 236 for 2024/2015, 2197 for 2017/2018, 1390 for 2017/2018, 159 for 2017, Karnataka 64 for 2016/2017, 3306 for 2013/2014.<sup>4,23-29</sup> Internationally, Addis Ababa observed 4206 for 2014, 26054, 1470, 1344, 412, 105, in a multiyear study from Kuala Lumpur, Ghana, Estonia, France, Benin respectively.<sup>12,30-34</sup> Our findings align with findings from other tertiary referral centres, which are governmental. Autopsies across India and abroad also vary according to the type of organization,

where the average numbers exceed 1000s annually.

In our study, there were 351 (75%) males and 118 (25%) females. Male: female was 2.97:1 compared to 1.5:1, 3.6:1.<sup>22,34</sup> The single sample proportion test; significance was  $p < 0.05$ , which meant there was a difference in sex proportion. Similar results were seen in studies from other parts of Nepal; Dhulikhel - 70.54% male and 29.46% female, Dharan - 74.14% male and female 25.85%.<sup>14,22</sup> However, a slight reduction in the male percentage was observed in the studies from Dhanusha, which also showed the male (62.67%) preponderance over female (37.32%), Pokhara- 60% male and 40% female, Palpa - 55.4% male and 44.6% female.<sup>18,20-21</sup> Studies from various parts of India also showed high male preponderance; 92%, 77.22%, 74.84%, 74.2%, 63.23%.<sup>4,12,23,27-26</sup> Even in Ghana and Estonia, the majority were males (75.37%, 77.1%) respectively.<sup>32-33</sup> It was reported even higher for males, reaching 90.9%.<sup>6</sup> Our study site was Butwal, which is one of the major cities of Nepal. Due to migration and males being mostly the ones migrating for work or working outdoors, this could cause males to outnumber females.

The most common age group of the victims were 21-30 (22%), serially followed by 31-40 (21.3%), 11-20 (16.8%), 41-50 (13.7%), 51-60 (10%), 61-70 (7.2%), 1-10 (5.3%), 71-80 (2.8%) and 81-90 (0.9%). We have merged those groups into three categories: children or adolescents, adults, and elderly, so that the outcome could target health interventions.<sup>35</sup> The age of the victims was found to be dependent on sex. Similarly, studies from other parts of Nepal also had the 20-39 (43.8%) age group as the most common, which is similar to ours when combined.<sup>14</sup> The same was seen where, 21-30 years of age group consisted 39.35% of total cases, followed by 31-40 (31.61%).<sup>18</sup> Study conducted abroad also revealed it to be the most common age group 21-30 (34.6%), 20-29 (29.74%) followed by 30-39 (18.95%), 20-39 (37%), in contrast to 15-24 years (62.6%).<sup>5,10-11,23,27</sup> Adults are active, physically, mentally, and socially, which is of maximum productivity and requires them to move and work indoors as well. This makes them prone to accidents or unnatural events, or even stressors. Hence, it could cause more involvement of this age group.

Of the total 469 deaths, the most common manner of death was unnatural 83%, followed by natural 53 (11%). In 30 (6%) of the deaths the manner could not be determined. Among the unnatural deaths, the most common was accident 203 (43%) followed by suicide 174 (37%) and homicide 14 (3%). Similar studies on autopsies in Nepal found out suicide to be the most common manner of death followed by accident and homicide.<sup>13-18,20-22</sup> Suicide and accident ranged from 29.16% - 59.09% and 27.48% - 44.2% respectively.<sup>15,17-18</sup> Homicide, natural death and deaths due to



undetermined manner were found to be constant with slight variation all over Nepal. A study from India also had accident 43%, 69.2% as the leading manner of death by a huge percentage, followed by suicide 37(23.3%).<sup>4,27</sup> Although, homicide (0.6%) was recorded lowest compared to other studies, natural deaths (6.9%) were found to be similar.<sup>27</sup> The same was found in studies from India and abroad; accident (87.93%, 83%, 64.4%, 61.8%) led suicide (7.54%, 12%, 15.2%, 20.5%) respectively by a huge gap.<sup>10,11,29,33</sup> In Saudi Arabia, the least was homicide (10.9%).<sup>10</sup> On the contrary, Nigerian studies had homicide outnumbering others by 69.1%, 40% natural 30.48%, accident 23.80%, suicide 1.90% and undetermined 3.81%.<sup>9,12</sup>

Regarding the sex, age, and manner, adult young males were found to be more prone to unnatural deaths, and most deaths were suicidal in females as in others.<sup>29</sup> This directs the increasing trend of suicidal deaths among the female population. However, males also dominated suicidal death over females, similar to a study on suicidal autopsy (64.11%, 60.7%).<sup>17,29</sup> There was a significant difference between the sex and manner of death, but not between age and death. There was found a significant difference was found between the autopsy rates for age groups 1–4 and 25–34.<sup>5</sup>

A major number of death were because of road traffic accident 134 (28.6%) followed by hanging 118 (25.2%) Unknown 52 (11.1%) poisoning 45 (9.6%) drowning 37 (7.9%) BFI 29 (6.2%) Disease 14 /21 (4.5%) Burn 10 (2.1%) electrocution 7 (1.5%) Fall from height 6 (1.3%) SFI 5 (1%) Others (1%)

Regarding the cause of death, the majority of deaths were caused by RTA and hanging. Similar results were observed in studies from Nepal and abroad, where accident was the primary cause.<sup>4,11,20,22,29,32</sup> Road in the

Terai belt is wide, pitched, but neither well-lit nor demarcated from cycle lanes or other crossroads. Hence, accidents are prone to occur due to speeding, or unattended dogs or cows. Although hanging was the second and primary cause in some, it was reported as 33.72%, 23.4%, and 21.75%.<sup>14,20,32</sup> Falls from height were included in the BFI. In blunt trauma cases in particular, and overall, head injury emerged as the primary cause of death. We found a lower number of thermal injuries and SFI, whereas we did not come across gunshot or railway injuries as reported otherwise.<sup>33</sup> This could be due to inaccessibility to modern firearms, which are lethal, or limited access to country guns likely to cause only morbidity.

## CONCLUSIONS

A total of 469 autopsies were concluded for the year of which male and female comprised 75% and 25% respectively. Adults (67%) were maximum involved age group. The age of the deceased did vary with their sex. Most deaths were unnatural (83%) followed by natural (6%), and in 53 (11%) the manner could not be determined. Maximum deaths were due to road traffic accidents (43%) and accidents (28.3%) being the most common manner of death.

## ACKNOWLEDGMENTS

We would like to acknowledge our colleague Dr. Biplab Manandhar, Lumbini Provincial Hospital and Devdaha Medical College, for their kind cooperation and coordination to successfully conduct this study.

**Funding:** None

**Conflict of interest:** None

**Ethical approval:** Yes

## REFERENCES

- Standard Operating Procedure on Autopsy Examination (n.d.). Retrieved May 1, 2025, from <https://www.meleson.org/resources/guidelines/>
- Atreya, A., Menezes, R. G., Subedi, N., & Shakya, A. (2022). Forensic medicine in Nepal: Past, present, and future. *Journal of Forensic and Legal Medicine*, 86, 102304. <https://doi.org/10.1016/J.JFLM.2022.102304>
- Advenier, A.-S., Guillard, N., Alvarez, J.-C., Martrille, L., & Grandmaison, G. L. de la. (2016). Undetermined Manner of Death: An Autopsy Series. *Journal of Forensic Sciences*, 61(S1), S154-158. <https://doi.org/10.1111/1556-4029.12924>
- Choudhary, N., Singh, N., Nigam, M., Gour, V., Yadav, V., & Dohre, S. (2021). Profile and pattern of post-mortem cases in mortuary of district hospital (associated with government medical college, Vidisha). - A cross-sectional study. *IP International Journal of Forensic Medicine and Toxicological Sciences*, 6(2), 40-42. <https://doi.org/10.18231/J.IJFMTS.2021.010>
- Hoyert, D. L. (2023). Autopsies in the United States in 2020. *National Vital Statistics Reports*, 72(5). <https://www.cdc.gov/nchs/products/index.htm>
- Issa, S. Y., El Dossary, M., Abdel Salam, M., Al-Mazroua, M. K., Hamd, M. A., & Kharoshah, M. (2016). Spectrum of unnatural deaths associated with positive toxicology findings in Eastern Province, KSA: An autopsy based study. *Egyptian Journal of Forensic Sciences*, 6(4), 381-387. <https://doi.org/10.1016/J.EJFS.2016.05.005>
- Kumar, V., Li, A. K. M., Zaniyal, A. Z., Lee, D. A., & Salleh, S. A. (2005). A study of homicidal deaths in medico-legal autopsies at UMMC, Kuala Lumpur. *Journal of Clinical Forensic Medicine*, 12(5), 254-257. <https://doi.org/10.1016/j.jcfm.2005.02.007>
- Macharia, B. N., Iddah, M. A., Ndiangui, F. M., & Keter, A. (2015). Pattern of Suicide: A Review of Autopsies Conducted at Moi Teaching and Referral Hospital in Eldoret Kenya. *The Open Access Journal of Science and Technology*, 3. <https://doi.org/10.11131/2015/101112>
- Nwachokor, N. F., Uchendu, O. J., & Ijomone, E. A. (2019). An Autopsy Study of Pattern and Yearly Trend of Homicide in Warri, Nigeria. *Nigerian Medical Journal?: Journal of the Nigeria Medical Association*, 60(3), 122-125. [https://doi.org/10.4103/nmj.NMJ\\_142\\_18](https://doi.org/10.4103/nmj.NMJ_142_18)



10. Bhupinder S, Kumara TK, Syed AM. Pattern of homicidal deaths autopsied at Penang Hospital, Malaysia, 2007-2009: a preliminary study. *Malays J Pathol*. 2010 Dec;32(2):81-6. PMID: 21329178.
11. Deepak M, Shetty B, Monteiro F N.P, Castelino KP, Xavier AP, Shetty T. Spectrum of unnatural deaths: autopsies conducted at A. J. Institute of medical sciences & research centre, mangalore. *Int J Forensic Med Toxicol Sci* 2019; 4(4):111-7.
12. Uchendu, O. J. (2015). A two year review of autopsies performed in the two major secondary health centers in Benin City. *International Journal of Forensic Medical Investigation*, 1(1), 10. <https://doi.org/10.21816/IJFMI.V1I1.7>
13. Hagaman, A. K., Khadka, S., Wutich, A., Lohani, S., & Kohrt, B. A. (2018). Suicide in Nepal: Qualitative Findings from a Modified Case-Series Psychological Autopsy Investigation of Suicide Deaths. *Culture, Medicine and Psychiatry*, 42(3), 704-734. <https://doi.org/10.1007/S11013-018-9585-8>
14. Khan, A. S., Bichha, N., & N, R. (2022). An epidemiological retrospective profile of medico-legal autopsy cases reported at a tertiary care center in Dhulikhel, Nepal. *Indian Journal of Forensic and Community Medicine*, 9(1), 20-24. <https://doi.org/10.18231/IJFCM.2022.004>
15. Koirala, S., Subedi, K., & Subedi, N. (2021). Unnatural Deaths among Autopsy Cases Brought at Tertiary Care Hospital of Western Nepal during COVID-19 Pandemic Period: A Descriptive Cross-sectional Study. *JNMA; Journal of the Nepal Medical Association*, 59(244), 1293-1296. <https://doi.org/10.31729/JNMA.6484>
16. Khan, A. S., Pandey, A., & Pandey, A. . (2023). Poisoning among Autopsies Conducted in the Department of Forensic Medicine and Toxicology in a Tertiary Care Centre. *Journal of Nepal Medical Association*, 61(264), 639-642. <https://doi.org/10.31729/jnma.8142>
17. Shrestha, K., Upreti, A., Gurung, P., Shah, D., Shrestha, N., & Upadhyay, H. P. (2024). Prevalence and Epidemiological Profile of Medico-legal Cases of Suicidal Autopsy at a Tertiary Care Hospital of Central Nepal. *Journal of College of Medical Sciences-Nepal*, 20(1), 12-17. <https://doi.org/10.3126/JCMSN.V20I1.63851>
18. Baral, M. P. (2020). Profile of autopsy cases in central level hospital of Nepal. A retrospective study of two years. *Asian Journal of Medical Sciences*, 11(3), 47-50. <https://doi.org/10.3126/AJMS.V11I3.27560>
19. Menezes, R. G., & Monteiro, F. N. (2023). Forensic Autopsy. *StatPearls*. <https://www.ncbi.nlm.nih.gov/books/NBK539901/>
20. Atreya A, Nepal S, G. P. (n.d.). Spectrum of Unnatural Deaths in Palpa, Nepal: Autopsy Based Study. <https://nepjol.info/index.php/Bjhs/article/view/25458#:~:Text=Results%3A%20Of%20total%20184%20medico,7.1%25%20of%20obscure%20autopsy.> <https://doi.org/10.3126/bjhs.v4i2.25458>
21. Prakash, S. (2017). Scenario of Cause of Death at Government Hospital of Dhanusha District, Nepal. *Current Trends in Biomedical Engineering & Biosciences*, 2(5). <https://doi.org/10.19080/ctbeb.2017.02.555600>
22. Subedi, N., Yadav, B. N., Jha, S., Gurung, S., & Pradhan, A. (2013). An Autopsy Study of Liver Injuries in a Tertiary Referral Centre of Eastern Nepal. *Journal of Clinical and Diagnostic Research?: JCDR*, 7(8), 1686. <https://doi.org/10.7860/JCDR/2013/5913.3220>
23. Verma, S. (2024). Profile of Autopsy Cases at Government Medical College Kanpur: A Retrospective Study. *MLU [Internet]*. 2024 Feb. 14 [cited 2025 May 2];24(1):18-23. Available from: <https://ijop.net/index.php/mlu/article/view/3488>
24. TC, A., NM, V., V, V., Athari, P. (2016). A Study of Unnatural death at MVJ Medical College and Research Hospital. *Indian Journal of Forensic and Community Medicine*, 3(2):138-141. <https://www.ijfcm.org/article-details/2146>
25. Shrivastava, M., Agrawal, R., S. Thakur, P., K. Singh, B., & S. Pendro, T. (2018). Demographic profile of autopsy in Indore region - One year prospective study. *Indian Journal of Forensic and Community Medicine*, 5(4), 245-249. <https://doi.org/10.18231/2394-6776.2018.0056>
26. RV, B., & PG, D. (2020). Autopsy Profile of Unidentified Bodies: A Two Year Retrospective Study. *JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW*, 29(1), 16-19. <https://journals.indexcopernicus.com/api/file/viewByFileId/1030215.pdf>
27. Junaidi, K. A., Pujar, S. S., Honnunar, R. S., Jirli, P. S., Koulapur, V. V., Ali, K., & Pushpa, M. G. (2020). Profile of Medicolegal autopsy cases at tertiary care centre in Belagavi, Karnataka. A one year retrospective study. *Medico-Legal Update*, 20(1), 170-174. <https://doi.org/10.37506/V20/I1/2020/MLU/194318>
28. Mugadlimath, A., Kadagoudar, S., Sheelvant, S., & Bambeshwa, K. (2017). Profile of medicolegal autopsy cases at tertiary care centre in Bagalkot, Karnataka. *Indian Journal of Forensic Medicine and Pathology*, 10(2), 63-66. <https://doi.org/10.21088/ijfmp.0974.3383.10217.1>
29. Sharma, D. K., Meena, P. R., Punia, R. K., & Pathak, D. (2018). Comparative trends of accidental to intentional mortalities over a one-year period at a tertiary care centre. *International Journal of Research in Medical Sciences*, 6(5), 1574-1578. <https://doi.org/10.18203/2320-6012.IJRMS20181453>
30. Solano, E. E., Mayedo, Y. O., & Seyoumk, M. (2017). A one-year retrospective study on the pattern of death found at autopsy at Forensic Pathology Department, Menelik II Hospital in Addis Ababa, Ethiopia. *East and Central African Journal of Surgery*, 22(1), 98-106. <https://doi.org/10.4314/ECAJS.V22I1.13>
31. Galante, N., Gentile, G., Tambuzzi, S., Zoja, R. (2022). Suicide pacts in the Milan district (Italy): A retrospective autopsy-based study with literature review. *Journal of Forensic and Legal Medicine*, 86,102319. <https://doi.org/10.1016/j.jflm.2022.102319>
32. Ossei, P. P. S., Ayibor, W. G., Agagli, B. M., Aninkora, O. K., Fuseini, G., Oduro-Manu, G., & Ka-Chungu, S. (2019). Profile of unnatural mortalities in Northern part of Ghana; a forensic-based autopsy study. *Journal of Forensic and Legal Medicine*, 65, 137-142. <https://doi.org/10.1016/j.jflm.2019.05.012>
33. Saar, S., Lomp, A., Laos, J., Mihnovits, V., Šalkauskas, R., Lustenberger, T., Väli, M., Lepner, U., & Talving, P. (2017). Population-Based Autopsy Study of Traumatic Fatalities. *World journal of surgery*, 41(7), 1790-1795. <https://doi.org/10.1007/s00268-017-3929-3>
34. Humez, S., Delteil, C., Maurage, C. A., Torrents, J., Capuani, C., Tuchtan, L., & Piercecchi, M. D. (2019). Does the medical autopsy still have a place in the current diagnostic process? A 6-year retrospective study in two French University hospitals. *Forensic Science, Medicine, and Pathology*, 15(4), 564-569. <https://doi.org/10.1007/S12024-019-00170-X/METRICS>