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Frequency and Patterns of Negative Autopsy: A Forensic Study in Bangladesh

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Abstract

Negative autopsy, where postmortem examination fails to determine the cause of death, remains a significant challenge in forensic pathology. In Bangladesh, limited data exist on its frequency and contributing factors, hindering improvements in death investigation protocols. Understanding the prevalence and characteristics of negative autopsies is crucial for enhancing diagnostic accuracy in resource-constrained settings. A retrospective, cross-sectional study was conducted in the Department of Forensic Medicine & Toxicology, Sir Salimullah Medical College, Dhaka, Bangladesh, from January 2023 to December 2024. From 700 consecutive autopsies performed during this period, we purposively selected 130 cases (18.6%) meeting criteria for negative autopsy (inconclusive findings after complete gross, histopathological, and toxicological examinations). Data extraction included demographic characteristics, circumstantial evidence, and diagnostic test results. Among 130 cases, negative autopsies accounted for 18.5%, predominantly in males (62.3%) and adults aged 31–45 years (42.3%). Sudden unexplained death (45.4%) and suspected poisoning (32.3%) were leading circumstances. Significant associations emerged with delayed autopsy (more than 48 hours; 40.0%, p=0.012), incomplete history (45.4%, p=0.021), and lack of ancillary tests (67.7%, p=0.003). Seasonal peaks occurred in monsoon (48.5%, p=0.008). Our study reveals an 18.5% prevalence of negative autopsy, which is strongly linked to procedural delays and diagnostic limitations. Urgent implementation of 24-hour services, standardized protocols, and expanded testing capacity is needed to improve forensic accuracy in resource-constrained settings.

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Introduction

Determining the precise cause of death is a fundamental objective of forensic pathology, yet a significant proportion of autopsies yield inconclusive results, termed as negative autopsies.[1] A negative autopsy is defined as a postmortem examination where gross, histopathological, and toxicological analyses fail to identify a definitive cause of death.[2] Studies suggest that the frequency of negative autopsies varies widely, ranging from 5% to 30% globally, depending on the population, available diagnostic tools, and autopsy protocols.[3,4] In low-resource settings like Bangladesh, where forensic facilities are often underdeveloped, the rate of inconclusive autopsies may be even higher, posing challenges for judicial investigations, public health surveillance, and bereaved families seeking closure.[5] The causes of negative autopsies are multifactorial. In some cases, deaths result from functional disorders (e.g., cardiac arrhythmias, epilepsy, or metabolic disturbances) that leave no structural evidence.[6] Poisonings, particularly from substances

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not routinely screened in toxicology panels, also contribute significantly.[7] Additionally, inadequate sampling, delayed autopsies, and lack of advanced ancillary tests (such as molecular autopsy or immunohistochemistry) further limit diagnostic accuracy.[8] In Bangladesh, where forensic pathology services are often constrained by limited resources, the problem is exacerbated by insufficient training, outdated protocols, and poor documentation.[9] The implications of negative autopsies extend beyond medical curiosity. Families of the deceased face prolonged distress due to unresolved questions, while legal proceedings may be delayed or compromised without definitive cause-of-death determinations.[10] Public health authorities also rely on accurate mortality data to identify emerging trends, such as drug overdoses or infectious disease outbreaks, which may be obscured by undetermined deaths.[11] Addressing this issue requires a systematic evaluation of the factors contributing to negative autopsies and the implementation of targeted interventions, such as expanded toxicological screening, standardized autopsy protocols, and the integration of modern diagnostic techniques.[12] Despite its significance, few studies in Bangladesh have examined the frequency and characteristics of negative autopsies. Existing research primarily focuses on specific causes of death (e.g., poisoning, trauma) rather than undetermined cases.[13] This study aims to bridge that gap by analyzing the frequency, demographic patterns, and circumstantial factors associated with negative autopsies at a tertiary care hospital in Dhaka, Bangladesh.

The findings will provide crucial insights for improving forensic practices, guiding policy reforms, and reducing diagnostic uncertainties in resource-limited settings.

Methods

This retrospective, cross-sectional study was performed in the Department of Sir Salimullah Medical College, Dhaka, Bangladesh, between January 2023 and December 2024. The study population comprised deceased individuals of all ages and sexes whose autopsies were performed at the forensic department. Cases were selected based on purposive sampling to ensure representation of undetermined deaths. We analyzed 130 negative autopsy cases (18.6% of total autopsies) from 700 consecutive postmortem examinations

Inclusion criteria: Autopsies were included if they met the following criteria: (1) complete postmortem examination performed, including gross, histopathological, and toxicological analyses; (2) no definitive cause of death identified despite standard investigations; and (3) availability of complete autopsy records, including demographic data, circumstantial history, and laboratory reports.

Exclusion criteria: Cases were excluded if (1) the autopsy was incomplete due to decomposition, mutilation, or external constraints; (2) insufficient documentation hindered proper evaluation; or (3) the cause of death was later confirmed through additional investigations (e.g., genetic testing or expanded toxicology).

Data was extracted from autopsy registers, forensic reports, and histopathology/toxicology records. Variables collected included age, sex, time since death, circumstances of death, gross findings, ancillary test results, and final classification. Two forensic pathologists independently reviewed each case to confirm negative autopsy status. Data was analyzed using MS-Excel. Descriptive statistics (e.g., Frequency, percentage, and mean±SD) summarized

demographic and pathological findings. Categorical variables were compared using Chi-square tests. Tables presented key findings, including frequency distribution, age/sex trends, and circumstantial patterns.

Ethical approval was obtained from the Ethical Review Committee of Sir Salimullah Medical College, Dhaka, Bangladesh.

Results

We analyzed 130 cases of negative autopsies. The prevalence of negative autopsy was 18.5%. The majority of the cases belonged to the 31–45 years age group (42.3%), followed by 16–30 years age group (28.5%). A higher prevalence was observed among males (62.3%) compared to females (37.7%) (Table-I). Circumstantial data revealed that sudden unexplained deaths accounted for the largest proportion (45.4%), followed by suspected poisoning (32.3%) and unwitnessed trauma (22.3%) (Table-II).

Table-I: Demographic profiles of the cases (N=130)

Variables	Frequency	Percentage
Age group (in years)		
16–30	37	28.5
31–45	55	42.3
46–60	28	21.5
60	10	7.7
Sex		
Male	81	62.3
Female	49	37.7

Table-II: Circumstances leading to negative autopsies

Circumstances	Frequency	Percentage
Sudden unexplained death	59	45.4
Suspected poisoning	42	32.3
Unwitnessed trauma	29	22.3

Seasonal variation showed a peak incidence during the monsoon season (June–September), comprising 48.5% of cases, likely due to environmental factors influencing decomposition and evidence preservation (Table-III). Histopathological analysis was inconclusive in 67.7% of cases, while toxicology screening failed to identify a definitive cause in 53.8%. Notably, cardiac abnormalities (e.g., unidentifiable arrhythmias) were found as the most common suspected underlying cause (38.5%), followed by neurogenic causes (24.5%) and metabolic disorders (18.5%) (Table-IV).

Table-III: Seasonal variation in negative autopsies (N=130)

Season	Frequency	Percentage
Winter (December–February)	25	19.2
Summer (March–May)	42	32.3
Monsoon (June–September)	63	48.5
p-value	0.008^{S}	

Chi-square test was applied to reach p-value; S=significant.

Table-IV: Suspected underlying causes of negative autopsies (N=130)

Suspected causes	Frequency	Percentage
Cardiac abnormalities	50	38.5
Neurogenic causes	32	24.5
Metabolic disorders	24	18.5
Unclassified cases	24	18.5

Analysis of negative autopsies revealed that delayed postmortem examination (>48h) happened in 40% cases (p=0.012), incomplete history in 45.4% cases (p=0.021), and lack of ancillary tests in 67.7% cases (p=0.003). These procedural limitations significantly contributed to inconclusive results (Table-V).

Table-V: Factors associated with negative autopsies

Factors	Present Frequency (Percentage)	Absent Frequency (Percentage)	p-value
Delayed autopsy (>48hours.)	52 (40.0)	78 (60.0)	0.012[S]
Incomplete history	59 (45.4)	71 (54.6)	0.021[S]
Lack of ancillary tests	88 (67.7)	42 (32.3)	0.003[S]

Chi-square test was applied to reach p-value; S=significant.

Discussion

This study found an 18.5% frequency of negative autopsies at a tertiary hospital in Bangladesh, aligning with global reports (5-30%).[3,4] The predominance among males (62.3%) and adults aged 31-45 years (42.3%) reflects patterns observed in similar low-resource settings.[14,15] Our findings emphasize three critical contributors to inconclusive results: procedural delays, insufficient clinical history, and limited ancillary testing – all well-documented challenges in developing nations.[9,16] The strong association between delayed autopsy (>48 hours) and negative results (p=0.012) corroborates established forensic literature.[17] Postmortem changes like autolysis and putrefaction significantly compromise tissue integrity, particularly in Bangladesh's tropical climate.[18] This problem is exacerbated by inadequate mortuary facilities – a recognized systemic issue in similar healthcare contexts.[19] Our monsoon season peak (48.5%) further supports environmental influences on decomposition rates.[20] The high rate of incomplete death histories (45.4%, p=0.021) mirrors findings from Pakistan and India.[21,22] In our setting, this often stems from poor documentation during emergency admissions and cultural reluctance to disclose sensitive information.[23] Such gaps are particularly detrimental when investigating sudden deaths (45.4% of cases), where clinical context is essential for directing ancillary tests.[2] Most striking was the 67.7% rate of inadequate ancillary testing (p=0.003), consistent with resource limitations described in prior Bangladeshi studies.[5,9] While cardiac causes were suspected in 38.5% of cases, the absence of molecular autopsy capabilities prevented confirmation of channelopathies – a known limitation in sudden death investigations.[24,25] Similarly, the 53.8% negative toxicology rate likely reflects restricted screening panels rather than true absence of toxins.[7,25]

This study has several limitations: its single-center design may affect generalizability, and the retrospective approach relied on incomplete records. The lack of molecular autopsy and advanced toxicology limited diagnostic precision. Additionally, the purposive sampling may introduce selection bias. Future multicenter prospective studies with standardized protocols could address these limitations.

Conclusion

Our study reveals an 18.5% prevalence of negative autopsies in Bangladesh, primarily associated with delayed examinations, incomplete documentation, and limited ancillary testing. These findings highlight critical gaps in forensic infrastructure and underscore the urgent need for 24-hour autopsy services, standardized protocols, and expanded diagnostic capabilities. Addressing these limitations through policy reforms and resource allocation could significantly improve death investigation accuracy, benefiting both judicial processes and public health surveillance in resource-constrained settings. To enhance forensic accuracy, we recommend the

following: (1) implementing round-the-clock autopsy services, (2) standardizing death investigation protocols with mandatory history documentation, and (3) upgrading toxicology and histopathology facilities. These measures, coupled with staff training and molecular testing capacity, would significantly reduce negative autopsy rates in resource-limited settings.

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