

Medico-Legal Study of All Autopsied Cases During 2021 to 2022 in Asyut and the New Valley Governorates: A Retrospective and Prospective Evaluation

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Abstract

Background: Medico-legal autopsies are crucial in determining the cause and manner of death in cases of sudden, suspicious, or unnatural fatalities.

Aim: This study aims to evaluate the patterns and trends of all autopsied cases conducted during 2021–2022 in Asyut and the New Valley Governorates, Egypt.

Methods: A retrospective and prospective review was conducted on 506 medico-legal autopsies. Cases were categorized based on cause, manner of death, age, sex, seasonal distribution, and year-wise trends. Statistical comparisons were made between the two years to detect significant variations.

Results: Traumatic deaths accounted for 51.2% (n = 259) and poisoning for 37.6% (n = 190) of all cases, with both showing an upward trend from 2021 to 2022. Other causes (11.3%) included natural deaths, medical negligence, and negative autopsies. Young adults (20–29 years) were the most affected age group, and males outnumbered females consistently. Notably, firearm-related deaths declined (p = 0.038), while blunt force injuries (p = 0.028) and deaths due to medical negligence (p = 0.043) significantly increased. Seasonal peaks occurred in December and January. Urban areas showed higher firearm-related deaths, while rural areas were more associated with poisoning and RTAs.

Conclusion: The findings underscore trauma and poisoning as leading causes of death, with males in early adulthood being the most vulnerable group. Rising trends in medical negligence and seasonal mortality spikes highlight the need for enhanced forensic surveillance, improved healthcare accountability, and targeted prevention strategies to reduce preventable deaths.

Keywords: Violent deaths; Postmortem examination; Mortality trends

1. Introduction

Medico-legal autopsies form a fundamental part of forensic pathology, providing essential insights into the causes of sudden, violent, or suspicious deaths. They play a vital role in supporting legal investigations and are instrumental in monitoring public health trends and guiding epidemiological research.¹ These postmortem examinations are especially critical in cases of unnatural death—such as those

resulting from accidents or deliberate harm—as they offer accurate forensic conclusions regarding the cause and mechanism of death.² Typically requested by law enforcement, medico-legal autopsies aim to determine both the cause and manner of death, which is commonly classified as natural, accidental, suicidal, homicidal, or undetermined.³ Identifying the manner of death has significant implications for the deceased's family, authorities, researchers, public health officials, and insurers.⁴

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This study aims to analyze and compare the patterns and causes of medico-legal deaths in Asyut and New Valley Governorates during 2021 and 2022, to identify demographic and temporal trends in unnatural deaths across different age groups and sexes, to evaluate changes in specific causes of death, including trauma, poisoning, and medical negligence, over the two-year period, To investigate seasonal variations in death incidence and their possible contributing factors and provide data that can support improved medico-legal investigation.

2. Patients and methods

Study design: This study was a retrospective, descriptive, and analytical comparative investigation conducted in two phases: a retrospective review of 2021 cases and a prospective study throughout 2022. It was carried out at the Medico-Legal Departments of the Egyptian Forensic Medicine Authority in Asyut and the New Valley Governorates.

Subjects: Included were all medico-legal autopsy cases during the study period that met specific criteria.

Inclusion criteria: Cases legally mandated for autopsy (unnatural, sudden, suspicious deaths), covering all ages, including homicide, suicide, accidental deaths, and unclear circumstances, with complete autopsy and police reports.

Exclusion criteria: Natural deaths without suspicion and cases lacking complete autopsy or investigation data.

Methods: Data were collected by forensic specialists from autopsy registers, case files, police requisitions, and postmortem reports. Variables analyzed included demographics (age, sex), examination findings, manner and cause of death, seasonal and yearly trends, incident location (urban/rural, home/public), toxicology results, and perpetrator-related socio-demographic information when available.

Ethical considerations: The study was approved by the Research Ethics Committee of Al Azhar Faculty of Medicine (approval number 0000011, 2024). Consent was not required as autopsies are legally mandated. Data confidentiality was ensured by anonymizing all personal identifiers and analyzing data anonymously, following the Declaration of Helsinki and national guidelines.

Statistical study: Data were analyzed using SPSS version 26. Descriptive statistics summarized frequencies and percentages. Chi-square and Fisher's exact tests assessed associations between categorical variables. Independent t-tests compared means where appropriate. A p-value < 0.05 was considered

statistically significant.

3. Results

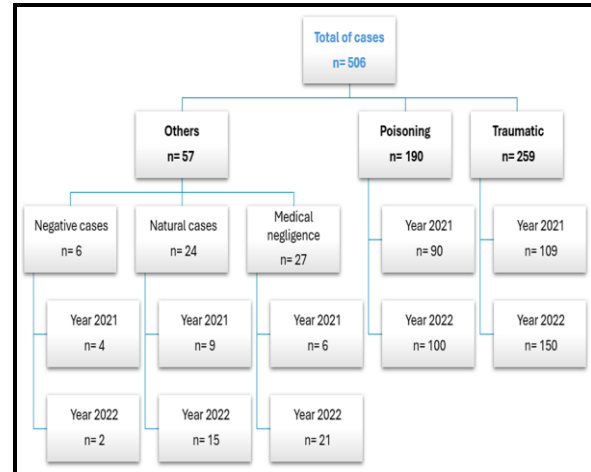


Figure 1. flowchart of all autopsied cases 2021 and 2022

Figure 1: The Flowchart categorizes the total 506 cases examined in 2021 and 2022 by the type of death. The cases fall into three main groups: traumatic deaths (51.2%, n = 259), poisoning (37.6%, n = 190), and others (11.3%, n = 57). Traumatic deaths were the most common, increasing from 109 cases in 2021 to 150 in 2022. Poisoning also made up a large share, rising from 90 cases in 2021 to 100 in 2022. The “Others” group included natural deaths (24 cases), medical negligence (27 cases), and negative autopsies (6 cases). Notably, medical negligence cases increased significantly from 6 in 2021 to 21 in 2022. This data highlights trauma and poisoning as the leading causes of death, with both categories showing upward trends, while the rise in medical negligence and natural deaths in the “Others” category deserves further investigation.

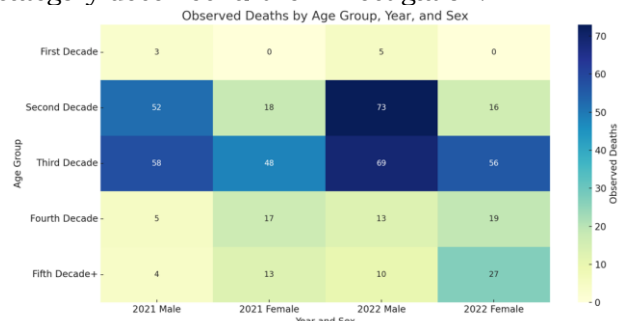


Figure 2. heat map of deaths across different age groups, years, and sexes, 2021 and 2022

Figure 2 illustrates the heat map of the number of deaths across different age groups, years, and sexes, with darker shades representing higher counts. It reveals key patterns, including the highest death rates in the third decade of life (ages 20–29) for both males and females in 2021 and 2022, highlighting young adults as the most

affected group. Males in the second decade (ages 10–19) also experienced a notable increase in deaths from 52 in 2021 to 73 in 2022, while female deaths in this group remained low. Deaths in the 30–39 age group and those aged 40 and above were generally lower, although there was a marked rise in female deaths in the 40+ age group in 2022, nearly doubling from 13 to 27 cases. Figure 2 visually depicts these age and sex distributions across both years.

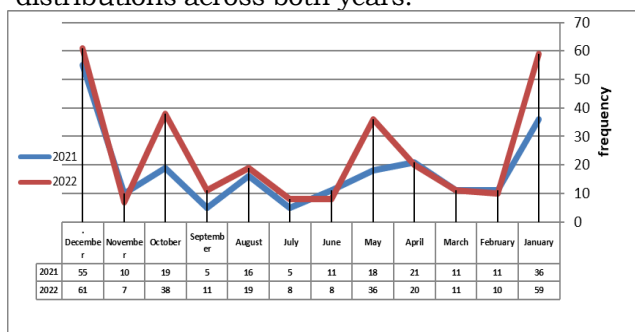


Figure 3. Monthly Distribution of Deaths

Figure 3 elucidates that the greatest number of deaths occurred in December for both 2021 and 2022, with 55 and 61 cases, respectively. January also had high death counts, rising from 36 in 2021 to 59 in 2022. Other months showing notable increases in 2022 compared to 2021 include May (36 vs. 18) and October (38 vs. 19). The lowest death counts were recorded in July 2021 (5 cases) and February 2022 (10 cases). Death numbers in February, March, April, and August remained relatively steady over the two years. A clear seasonal pattern emerges, with peak deaths during the colder months of January and December, and a reduction during the summer months. Additionally, 2022 displayed greater variability and higher peaks in some months, possibly indicating changes in environmental or social factors influencing mortality or differences in case reporting.

Table 1. cause of death in studied cases

CAUSE OF DEATH	TOTAL (N=506)		TOTAL	P. VALUE
	2021 (n=218)	2022 (n=288)		
FIREARM	40 (19%)	36 (13%)	76 (15%)	0.038*
BLUNT	14 (6%)	32 (11%)	46 (9%)	0.028*
CUT	9 (4%)	18 (6%)	27 (5%)	0.395
PENETRATION	17 (8%)	21 (7%)	38 (7%)	0.964
INJURY				
BURN	5 (2%)	3 (1%)	8 (2%)	0.264
ELECTRIC SHOCK	4 (2%)	1 (1%)	5 (1%)	0.094
ASPHYXIA	20 (9%)	39 (13%)	59 (12%)	0.696
POISONING	90 (41%)	100 (35%)	190 (38%)	0.157
MEDICAL	6 (3%)	21 (7%)	27 (5%)	0.043*
NEGLIGENCE				
NATURAL CASES	9 (4%)	15 (5%)	24 (5%)	0.723
NEGATIVE CASES	4 (2%)	2 (1%)	6 (1%)	0.447

Table 1 shows that poisoning was the leading cause of death in both years, accounting for 38% of cases, followed by firearm injuries at 15% and asphyxia at 12%. Significant changes between 2021 and 2022 included a decrease in firearm-related deaths from 19% to 13% ($p = 0.038$), an increase in blunt force injuries from 6% to 11% (p

$= 0.028$), and a rise in deaths due to medical negligence from 3% to 7% ($p = 0.043$). Other causes, such as cut injuries, penetration injuries, burns, electric shocks, asphyxia, poisoning, natural deaths, and negative cases, showed no significant differences across the two years ($p > 0.05$).

Table 2. Demographic data distribution according to poisoning & trauma cases (n=449)

	TOTAL (N=449)	POISONING (N=190)	TRAUMA (N=259)
AGE			
FIRST DECADE	7 (1.6%)	0 (0%)	7 (2.7%)
SECOND DECADE	152 (33.9%)	60 (31.6%)	92 (35.5%)
THIRD DECADE	213 (47.4%)	101 (53.2%)	112 (43.2%)
FOURTH DECADE	37 (8.2%)	17 (8.9%)	20 (7.7%)
FIFTH DECADE AND MORE	40 (8.9%)	12 (6.3%)	28 (10.8%)
SEX			
MALE	256 (57%)	85 (44.7%)	171 (66%)
FEMALE	193 (43%)	105 (55.3%)	88 (34%)
RESIDENCE			
RURAL	276 (61.5%)	128 (67.4%)	148 (57.1%)
URBAN	173 (38.5%)	62 (32.6%)	111 (42.9%)
INCOME			
LOW	303 (67.5%)	137 (72.1%)	166 (64.1%)
HIGH	146 (32.5%)	53 (27.9%)	93 (35.9%)

Table 2 presents the socio-demographic distribution of 449 cases, subdivided into poisoning ($n = 190$) and trauma ($n = 259$) groups. The majority of cases fell within the third decade of life (47.4%), with trauma cases showing a slightly higher representation in the second and third decades. Females constituted a higher percentage of poisoning cases (55.3%), while males predominated in trauma cases (66%). Most cases originated from rural areas (61.5%) and belonged to low-income backgrounds (67.5%).

4. Discussion

A total of 506 medico-legal autopsies were examined during 2021 and 2022, divided into traumatic deaths (51.2%, $n = 259$), poisoning cases (37.6%, $n = 190$), and others (11.3%, $n = 57$). Traumatic deaths increased from 109 in 2021 to 150 in 2022, while poisoning cases rose from 90 to 100. The “Others” category included natural deaths ($n = 24$), medical negligence ($n = 27$), and negative autopsies ($n = 6$). Notably, medical negligence cases sharply increased from 6 in 2021 to 21 in 2022. These findings reflect previous studies identifying trauma and poisoning as primary causes of unnatural death.⁵⁻⁷

Sex and age distribution indicated a consistent male predominance.⁸⁻¹¹ The highest number of deaths occurred in the third decade of life (20–29 years), confirming the vulnerability of young adults, as previously reported.¹²⁻¹⁴ An increase in male deaths during the second decade (10–19 years) was noted, rising from 52 in 2021 to 73 in 2022. Female deaths in the same age group remained low, while deaths among females aged 40+ doubled from 13 to 27 cases in 2022.

The leading causes of death in both years were

poisoning (38%), firearm injuries (15%), and asphyxia (12%). Firearm-related deaths declined significantly from 19% to 13% ($p = 0.038$), whereas blunt force trauma increased from 6% to 11% ($p = 0.028$), and medical negligence rose from 3% to 7% ($p = 0.043$). These shifts are consistent with regional data highlighting the prevalence of firearm-related homicides^{11, 15}, blunt trauma injuries⁸, and poisoning among females.^{13, 14} Hanging continues to be a common suicidal method^{11, 16}, with poisoning more frequent in female suicides.^{13, 14}

Seasonal analysis revealed peaks in December (55 deaths in 2021, 61 in 2022) and January (36 to 59 deaths), while the lowest counts were in July 2021 ($n = 5$) and February 2022 ($n = 10$). Other notable increases occurred in May (36 vs. 18) and October (38 vs. 19) in 2022. These trends are similar to findings from Pakistan, where winter peaks in mortality were noted¹⁷, and from international data showing reduced mortality in late summer.¹⁸ However, some regions, like Finland, showed no significant seasonal variation in autopsies.¹⁹

Urban and rural distribution patterns also emerged, with both settings represented. Urban males were more frequently affected by firearm injuries,¹⁰ whereas other studies found more deaths in rural populations.¹² These findings suggest that residence and associated environmental and socioeconomic factors may influence risk exposure to various types of death.

4. Conclusion

The analysis of 506 medico-legal autopsy cases from 2021 and 2022 reveals that traumatic injuries and poisoning remain the leading causes of unnatural deaths, with both showing increasing trends. Young adult males, particularly those in the third decade of life, were the most affected demographic, consistent with regional and international patterns of unnatural mortality. A significant rise in medical negligence cases underscores the growing importance of forensic oversight in healthcare-related deaths. Seasonal peaks during colder months suggest environmental or behavioral factors influencing mortality, although such patterns may vary geographically. These findings reinforce the critical role of medico-legal autopsies in informing public health strategies, legal investigations, and preventive measures aimed at reducing avoidable deaths, especially among high-risk populations.

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