



St. Paul's Hospital Millennium Medical College

Graduate Study Program

Emergency and Critical Care Medicine

Common postmortem examination finding of dead body on arrival at St. Paul

Forensic Medicine and Toxicology Department: A Cross Sectional Study

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Addis Ababa, Ethiopia

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List of Abbreviations and Acronyms

AaBET: Addis Ababa Burn, Emergency and Trauma hospital

ED: Emergency department

COD: Cause of Death

FMOH: Federal Ministry of Health

ICD: International Classification of Diseases

IRB: Institutional Review Board

MCCD: Medical Certification of Cause of Death

RTA: Road Traffic Accident

SPHMMC: Saint Paul's Hospital Millennium Medical College

SCD: sudden cause of death

SUND: Sudden and Unexpected Natural Death

WHO: World Health Organization

MI: - Myocardial Infarction

PE: - Pulmonary Embolism

SDH: - Subdural hematoma

EDH: - Epidural Hematoma

ICH: - Intracranial Hemorrhage

Abstract

Background: Dead body on arrival or brought in dead is a condition where the person is found clinically dead at the scene, up on arrival to emergency or up on the arrival of professional like medical assistant. Even though dead body on arrival have different risk factors, these can be prevented by strengthen prehospital care, providing first aid training and improving emergency referral system.

Objectives: The main aim of this study is to determine the pattern and modalities of postmortem finding of dead body on arrival at St. Paul Hospital Forensic medicine and Toxicology Department, from Jan 1, 2021- Dec 31, 2021 G.C.

Methods: This retrospective study was conducted in the Department of Forensic medicine of St. Paul's Hospital, Addis Ababa, Ethiopia. Data were collected from postmortem report April 1, May 30, 2022. The study population were all dead body on arrival at forensic department, for which postmortem examination done. After the data collection the data was cleared, coded and entered to computer by using epi info Version 3.5.3 and SPSS version 20.0.0 for analysis.

Results: During the one year interval of this study, 422 sample size was taken with 100% respondent rate. The mean age and standard deviations ($\pm$ SD) of the patients was 38.9 ± 15.6 years and two third of the patients are between 15 to 44 years of age. Three hundred thirty-two (78.7%) of the deceased were male patients. Around (82.9%) lived in urban areas. In General External causes of death accounts (41.1%) followed by communicable diseases (30.2%), and non-communicable diseases (28.7%), From specific causes of death pneumonia accounts 90 (21.3%) deaths and coronary artery disease was 45 (10.7%) from alleged manner of death Natural cause were 232(58.9%) followed by Unnatural 162 (41.1%)

Conclusions:- This study we conclude leading cause of death as External causes followed by communicable diseases and non-communicable diseases. The two most common specific cause of death were Pneumonia and coronary artery disease among adults in Ethiopia. From alleged manner of death Natural cause was leading followed by Unnatural cause. Rural residents were more likely to die due to external causes compared to Urban residents, and urban residents had a higher risk of death from Communicable diseases compared to rural residents

Keywords: Postmortem, Dead body on arrival, Forensic department, Addis Ababa, Ethiopia

1. Introduction

1.1. Background

Dead body on arrival also known as death in the field or brought in dead is the term used to indicate that the patient was found to be clinically dead up on arrival of professional medical assistance often in the form of first responder (1)

According to World Health Organization (WHO) and the International classification of diseases, version (ICD-11) sudden death is defined as unexpected fatal non-violent event occurring within 1hr from the onset of symptoms, in an apparently healthy subject, or with in 24 hrs in one whose disease was not so severe to predict such an abrupt outcome(2).

Death is a devastating in any form, at any time and in any way it comes. The death is natural when it is due to any pathology (disease) or ageing, and is unnatural when caused prematurely against order of the nature by injury, poison or other means of violence. Unnatural deaths can also be due to accidental, homicidal and suicidal types (3).

Postmortem examination, an autopsy, or an examination of a human body after death Also called a necropsy. An autopsy can include a physical examination, examination of internal organs, and specialized laboratory studies. Autopsies may be used to help determine the cause and manner of death (4).

The importance of an autopsy in establishing the cause of death accurately which important to know the event in both natural of unnatural manner of deaths. Often the cause of death looks quite obvious, especially in mechanical injuries. To determine the underlying or immediate cause of death, the manner of death and conditions contributing to death can be problematic. The cause of death is that which produces an effect. It is a combination of circumstances that must precede and that invariably result in an effect (4).

Causes of death is classified according to ICD-11 these are unintentional, intentional (violence) and undetermined. Unintentional injuries comprise most of the traffic injuries, fires, falls, poisonings and drowning. On the other hand intentional injuries or violence are classified as homicide and suicide (2).

1.2. Statement of the Problem

Dead body on arrival or sudden death a shocking experience for the medical community as well as the families left behind. Most of the time it occurs in healthy individuals due to medical or traumatic conditions.

Usually, sudden cause of death occurs at any time and at any place which have additional challenges due to their physical location which brings a delay or absence of recognition and treatment.

Patient's chance of survival, is not only a concern for health care professionals, but also a concern for the general public, who have the opportunity to act when witnessing the sudden death.

A death will be referred to the coroner if it is unexpected, such as the sudden death of a patient, if it is violent, unnatural or suspicious, such as a suicide or drug overdose, if it is the result of an accident or Injury, and the cause of death is unknown.

1.3. Significance of the problem

This study was not only aimed at finding out the magnitude of natural and unnatural deaths but also to provide information of the demographic profile, manners and modalities involved in dead body on arrival at St. Paul's forensic medicine department.

The post mortem external examination is the final service that a physician can render to a patient. Its purpose is not just to establish medical diagnoses, but to provide facts in the service of the judicial process and the public interest. Its main tasks are the definitive ascertainment of death, determination of the cause of death and assessment of the manner of death.

The finding of this study will create awareness among the people about deaths related to violence, suicidal attempt and other cause of sudden cardiac arrest causes. It will also help to decrease unnatural death by upgrade our pre hospital care and emergency referral system, which is the important public health concern in the society. It will also be helpful for law enforcement agencies to make the strategies for prevention of such incidences.

2. Literature Review

Death is unnatural when caused prematurely against the order of nature by injury, poison or other means of violence. Data on unnatural deaths may reflect the law-and-order situation in a particular area of jurisdiction. Cause of death is classified ICD-11 these are natural (medical, and age related), unnatural (unintentional, intentional, violence, homicide, unintentional, fall down accident, drawing and poisoning) and undetermined. Unintentional injuries comprise most of the traffic injuries, fires, falls, poisonings and drowning. On the other hand, intentional injuries or violence are classified as homicide and suicide. It also introduced “undermined” types as to suicidal or accidental (2).

In one study done in Netherlands which focus on the Incidence estimates and causes of death were determined using death certificate data of out-of-hospital sudden deaths recorded by Statistics Netherlands from 1996 to 2006 on persons younger than 40 years, the incidence of sudden death were 2.07 (2.06–2.07 per 100 000 person-years). The incidence was higher for men (2.86 per 100 000 person-years) than for women (1.24 per 100 000 person-years) and increased by age. The majority of sudden deaths was of cardiac origin. Sudden cardiac death incidence was 1.62 (1.61–1.62 per 100 000 person-years). In 9% the cause of death remained unexplained (5).

An Autopsy Study of Brought Dead Cases which was done at Tertiary Care GB Pant Hospital in Port Blair, Andaman and Nicobar Islands, from Jan 1 2019 up to Dec 31, 2019, from total deceased 223 cases, 58 were brought dead to GB Pant Hospital. Out of these in 57 cases the death was due to a Natural cause and in only one case it was due to an unnatural cause (6).

On another retrospective study, done on Causes of sudden natural death in Jamaica at the University Hospital of the West Indies which was a total number of 841 cases of sudden natural deaths comprising 51.3% over a period of 15 years. From which 459 were males and 382 were females (M:F ratio 1.2:1) and 35 patients (4.1%) were less than 1 year of age, and the mean age of the remainder was 53.7+₋21.8 years. The peak age group was the seventh decade accounting for 21.9% of cases. The 5 most common causes of death were cerebrovascular accidents (13.6%), pneumonia (9.4%), pulmonary embolism (7.4%), ischemic heart disease (7.0%) and diabetes mellitus (6.1%). (7).

On another study university hospital in eastern Saudi Arabia which also focus on Incidence and causes of sudden death it was conducted over a period of 6 yrs. By checking the medical files of 1273 consecutive deaths retrospectively investigated and which showed 223 (17.5%) cases of sudden death. From which males were 56.0% of cases. The incidence of sudden death was highest in the 2 age extremes infants were 32.2% and 31.4% were elderly. The seasonal variation shows the highest incidence were during spring (29.6%) followed by summer (25.1%). The most important direct causes of sudden death were cardiovascular diseases in 59.2% followed by respiratory disease in 24.7%, diabetes mellitus in 23.8%, liver disease in 23.3% and infectious disease in 20.2% (8).

A one-year July 2013 to July 2014 retrospective study of Sudden Death cases in Medical College and Hospital, Kolkata, south India, total 192 deaths autopsied during the study period, 37.5% SUNDs were in age group between 41 to 60 years and majority of deceased were males 176 (91.7%) males and 16 (8.3%) females. It was also showed that non cardiac causes slightly predominated (50.1%) over cardiac causes (49.1%). Non-cardiac causes included central nervous system diseases (4.2%), gastrointestinal diseases (4.2%) and respiratory system diseases (41.7%). But considering single most important system responsible for SUNDs CVS is still predominant (50.0% alone) among all the other causes in adults over 40 years of age and chiefly was due to coronary artery atherosclerosis (41.7%)(9).

A review of autopsies of sudden deaths performed between January 2018 to August 2018 in age group 15- 45 years at Department of Pathology, Government Medical College, South Gujrat south India, A total of 150 cases were studied for sudden deaths during the study. The age ranged from 15 to 45 years. Maximum deaths occurred in the age group between 35-45 years. 120 were Males and 30 were females. The cause of deaths in 84 cases (56%) were attributed to cardiac causes and the remaining cases (44%) were due to non cardiac causes like pulmonary diseases (17.3%) followed by hepatobiliary diseases (5.4%), cerebrovascular (2%) and others like suicide by ingestion of poisoning, hanging and asphyxia (9.3%). coronary artery disease which account 95.2% were the Major cardiac cause for sudden deaths(10).

Another study on Medicolegal profile of brought dead cases received at mortuary, around 200 brought dead cases were studied for 2years in different parameters at forensic medicine department, mahatma Gandhi institute of medical sciences, Sewagram, wardha, India. 154 (77 %)

cases. The highest age distribution group was 41 – 50 was 27.5%. Most of the incidences occurred in day time between 6 am to 1 pm. (42.5%). There were 129 (64.5%) deaths are unnatural, whereas 71 (35.5%) deaths are caused by some disease process. The maximum no. Of natural death occurs in the age group of 41 – 50 years and that of unnatural death in the age group of 21–30 years. Regarding specific cause of death, injury to different parts including head leading to hemorrhage due to road traffic accident or fall from height accounts a maximum no. Of unnatural death (30%). Diseases of respiratory system (19.5 %) and cardiovascular system (11.5%) attribute to most cases of natural deaths (11).

This retrospective study was carried out in the emergency department of Nepal Medical College Teaching Hospital from June 1st 2015 to November 30th 2016. The incidence of brought dead cases was 0.5%. Out of 113 cases, 62 cases (54.9%) were males and 51 cases (45.1%) were females. The most common age group was 31-45 years with 22.% cases. 46% of cases did not have any known illnesses before they died. Majority of cases in age group of 31-45 years did not have comorbidity. Among comorbidity, COPD was the commonest, and was more often seen in cases 61 years and older. Peak hour for presentation in most cases was 5am –9am and 5 pm- 9pm. Majority of cases were from inside the valley and most of them from within 5 km territory from hospital (12).

The study conducted at Bangladesh concerning with pattern of unnatural deaths in Dhaka Medical College mortuary during 1996. the total number 1772 cases were analyzed from which 1725 (97%) cases were unnatural deaths. On sex distribution 77.28% was males and 22.71% females. From which the frequency patterns of unnatural deaths RTAs were 68.92%, 11.69% homicide, 08.00% suicide and burn, electrocution and others comprise the rest 11.565 unnatural deaths. Males suffer 3.4X more unnatural deaths than females. But RTAs males were 5.31X, in homicide 11.40X, in suicide 1.70X respectively than females. In hanging, female was predominant (1.72X of male deaths). the age distribution 21-40 years is the age group showing peak frequencies on different types of unnatural deaths though hanging showed peak on 11-20 years. Besides, 95.47% of the unnatural deaths were the Muslims, 4.25% were Hindu and 0.14% was Christians. Firearms were used in 29.40% cases, blunt weapon in 38.46% cases and sharp cutting weapon in 31.60% cases of homicides respectively (13).

On other study conducted on Analysis of causes of death among brought-in-dead cases in a third-level Hospital in Lusaka, Republic of Zambia, which was a cross-sectional study around 1378, were 13 years and above and 209 cases were those aged 1 month to 13 years old (Child). The top CoD for Adults were infectious diseases followed by noncommunicable diseases and that for Child were infectious diseases, followed by accidents. The proportion of cases with a determined CoD was significantly higher when using the Smart VA (75% for adult and 67% for Child) than the death notification form (61%). A proportion (42.7% for Adult and 46% for Child) of the CoD-determined cases matched in both sources, with a low concordance rate for Adult (kappa coefficient = 0.1385) and a good for Child (kappa coefficient = 0.635) (14).

A Retrospective Review of Health Records review of health records was undertaken to see Patient Characteristics of Persons Dead on Arrival Received in a Danish Emergency Department, all consecutive dead-on arrival persons received in 1 Danish emergency department between January 2018 and December 2019, A total of 719 dead on arrival persons were included, 350 in 2018 and 369 in 2019. Males accounted for 64%. The mean age was 71 years with a range from 18 to 102 years. The place of death home accounts 80%, and more than half (54%) were found either dead or dying by a spouse, cohabitant, or son/daughter. In most cases, the cause of death was described as unknown (92%), whereas suicide and accidents accounted for 8% (15).

Retrospective descriptive study conducted at Cape Town, South Africa, 2001-2005 on Sudden and unexpected deaths in an adult population around a total no 816 adult cases of 'sudden' deaths were studied. The presumed manner of death was natural in 645 (79.0%) cases, unnatural in 99 (12.2%), and undetermined in 72 (8.8%). Diseases of the cardiovascular, respiratory and central nervous systems accounted for the majority of natural deaths. Infectious diseases accounted for most deaths in the youngest age group studied (18 - 29 years) (16).

A descriptive retrospective study at University of Benin Teaching Hospital, between January 2005 and December 2011, on causes of sudden natural death: a medico-legal autopsy study of medical cases in an African referral center, A total of 626 cases of SNDs were identified representing 30.3% of all autopsies performed within the period. There were 390 (62.3%) males and 236 (37.7%) females with a M:F ratio of 1.7:1. The age range of the cases was 19-105 years with a mean age of 51 ± 17 years. The modal age group was 40-49 years which accounted for 19.8% of the cases, and most of the cases (56.8%) were seen in the 30-59-year age groups. In majority of cases

(39.3%), the cause of death was related to the cardio-vascular system principally death due to complications of hypertension which was seen in 88.2% of the cardio-vascular system diseases. Immune/infectious diseases (mainly AIDS), gastro-intestinal/hepatic lesions and respiratory diseases were seen in 15.2, 14.1 and 12.5% of cases respectively. SNDs due to malignant neoplasms were not a common finding as they occurred in 5.1% of cases (17).

A retrospective descriptive study cases from Jan 2011 up to Dec 2013 of Brought in Dead Patients in the Accident and Emergency Unit of a Referral Hospital in the Western Region of Ghana, Total number of deceased were 574, age range from below 1 year to over 70 years. They were 58.5% male and 41.5% female with a ratio of 1.4:1. The majority of the BID cases (20.7%) were patients above 70 years and most cases (40.8%) have no known clinical condition associated with the death. The majority of the unexplained deaths were highest among young adults between the ages 30 and 40 years (22.6%). The highest cases of BID (20%) were seen in the month of December and majority of the cases (72.5%) lived within the metropolis (18).

Demographic Characteristics and Causes of Death for Persons Brought in Dead to Emergency Department of a Tertiary Health Facility in South-West Nigeria, which was a 5-year retrospective descriptive study of 253 autopsied-BID cases. The median age was 56. Almost half 110(43.5%) of the cases were in the age-group >60 years. The male-to-female ratio was 1.04:1, and their ages were comparable. Non-communicable diseases accounted for 216 (85.4%) of the underlying causes of death. Three major specialties contributing to death were medicine 117 (46.2%), oncology 45 (17.0%) and surgery/trauma 42 (16.6%). on system specific cardiovascular diseases 61 (52.1%), breast cancer 11 (24.4%) and road traffic RTAs 31 (73.8%), respectively. From Non-communicable diseases heart failure, occurred mainly in the elderly. Deaths from trauma and hemorrhage occurred predominantly in the young (19).

Road traffic injuries are a major but preventable global public health problem. Worldwide, the number of people killed in road traffic crashes each year which take the lives of nearly 1.3 million people every year, and injure 20–50 million more. Road traffic injuries have become the leading cause of death for people aged 15–29 years. Over 90% of road traffic deaths and injuries occurring low-income and middle-income countries, which have only 48% of the world's registered vehicles. Nearly half (46%) of those dying on the world's roads are “vulnerable road users”: pedestrians, cyclists and motorcyclists. In addition to the grief and suffering they cause, road traffic crashes

result in considerable economic losses to victims, their families, and nations as a whole, costing most countries 1–3% of their gross national product (20).

The WHO African Region had the highest mortality rate, with 28.3 deaths per 100 000 populations. This was followed closely by the low-income and middle-income countries of the WHO Eastern Mediterranean Region, at 26.4 per 100 000 populations. Countries in the WHO Western Pacific Region and the WHO South-East Asia Region accounted for more than half of all road traffic deaths in the world (21).

In Ethiopia, like other developing countries, injuries are common but little attention is being given to this problem. According to the 2015 world health statistics report, the cause specific mortality due to injury in Ethiopia is 94 per 100, 000 populations which is more than 8% of all deaths. Ethiopia is among the countries experiencing highest road RTAs in the world with 79% fatality rate of injuries related with the traffic accidents. Hospital visits related to injury cases account the highest number of emergency visits in many hospitals of the country (22).

Hospital studies in Ethiopia showed that the prevalence of injury in the emergency departments is more than 55%. Road traffic accidents are the leading causes of injury related deaths among Addis Ababa residents. Though deaths related to road traffic accident is one of the major health challenges in Ethiopia.

On another retrospective study which was conducted in Ethiopia at Department of Forensic Pathology Menelik II Hospital, Addis Ababa, Ethiopia. From January 1st, 2014 to December 31st, 2014. there was a total cases of 4206, the male to female ratio 3:1. The age group most commonly involved was 16-30 years (41,5%) followed by 31-55 years (38,3%). The commonest mode of death in all age groups put together was accident in 1615 (38.4%) followed by natural death in 1156 (27.5%), homicidal deaths accounted for 698 (16.6%) followed by suicide in 508 (12%). In 229 (5.4%) of the cases the manner of death remained undetermined. Among 698 homicidal deaths, blunt weapon injury accounted for 61.4% and bullet injury were in 15.4%. Among the accidental deaths, road traffic injuries were 1092 (67.6%), followed by fall accident in 170 (10.5%). Hanging was the preferred modality of suicide (88.4%), followed by poisoning 51 (10%). Natural death accounted for 1190 (27.5%) and cardiac disease was the most predominant 453 (38%), followed by 240 (20.2%) respiratory disease (23).

On other study done in Ethiopia on Pattern of Fatal Injuries in Addis Ababa, Ethiopia, A total of 2107 cases were analyzed. The victims were mostly male and the most vulnerable age group was found to be 15-44 years. Accidents versus homicide and accident versus suicide ratio was 1.8:1 and 5:1 respectively. Road traffic accidents were the most frequent causes of accident-related death. Main means of homicide was hit by blunt or sharp object or firearm. More than 90% of victims who committed suicide use hanging or poisoning. Ninety percent of deaths occur within 24 hours of the injury and only 105 (5%) died from the second day on wards. Eighty one percent of this patients had never received any medical care (either pre-hospital or hospital level) (24).

From 14 December 2019 to 29 February 2020 there was study which was done on Magnitude of death and associated factors among road traffic injury victims admitted to emergency departments of public and private hospitals at Adama Town, East Shewa Zone, Ethiopia, the magnitude of deaths among road traffic injury victims were 12.9%. Age (25–44years) (adjusted odds ratio=4.24, 95% confidence interval=1.70–10.61), rural resident (adjusted odds ratio=2.26, 95% confidence interval=1.11–4.55), pedestrian (adjusted odds ratio=3.72, 95% confidence interval=1.67–7.99), night-time injury (adjusted odds ratio=5.29, 95% confidence interval=2.52–11.10), injuries on weekends (adjusted odds ratio=2.32, 95% confidence interval=1.12–4.80), not getting first aid at injury site (adjusted odds ratio=2.64, 95% confidence interval=1.02–6.84), and known comorbidity conditions (adjusted odds ratio=3.01, 95% confidence interval=1.23–7.38) were significantly associated with road traffic injuries–related death (25).

On one retrospective study that was done on the magnitude and causes of out of hospital sudden death in autopsy studies, among selected governmental hospitals in Addis Ababa, Ethiopia from January 1, 2014 to October 31, 2017, 746 patients underwent autopsy for sudden cause of death, 80.2% were males and 19.8% were females. The mean age of the participants was 40 years. About 0.3% has risk factors. In 321 (43%), sudden death was attributable to noncardiac causes. 121 (16.2%) patients with uncertain pathology result and about 165 patient (22.1%) died due to disease unrelated to the heart (poisoning, intoxication and drowning). The rest of those who presented with sudden cause of death died due to cardiac causes, cardiomyopathy 102(13.7%) and MI 36(4.8%). About 154(20.6%) and 218(29.2%) were student and employees in occupation respectively (26).

3. Objectives of the study

3.1. General Objectives

The aim of this study was to evaluate the magnitude and patterns of common autopsy finding of dead body on arrival at forensic medicine department of St. Paul's Hospital Millennium Medical College in Addis Ababa, Ethiopia from 1 January 2021 to 31 December 2021 G.C.

3.2. Specific Objectives

- To determine the socio-demographic characteristics of the dead body on arrival at forensic medicine department of SPHMMC in Addis Ababa.
- To assess the common causes of dead body on arrival at forensic medicine department of SPHMMC in Addis Ababa.
- To determine the most predominant system of involvement of sudden unexpected death at forensic medicine department of SPMMC in Addis Ababa.
- To asses the Association between socio-demographic variables with communicable, non-communicable and external causes of death

4. Methods and Materials

4.1. Study Setting

This study was conducted at forensic department of SPHMMC, located in Addis Ababa which is a capital city of Ethiopia. St. Paul's hospital Millennium Medical College, as it is known today, was established through a decree of the Council of Ministers in 2010, although the medical school opened in 2007 and the hospital was established in 1968 by the late Emperor Haile Selassie. The inpatient capacity is more than 700 beds sees an annual average of 300,000 patients. It has a catchment population of more than 5 million. The College sees an average of 1200 emergency and outpatient clients daily. It is the second hospital in Ethiopia that started forensic medicine for post mortem examination which is located in Gulele sub city, Addis Ababa, Ethiopia. It is also among the first hospitals to start a post graduate training on Forensic medicine in Ethiopia.

4.2. Study design and Period

A hospital based cross-sectional study was conducted to assess the magnitude and patterns of common autopsy finding of dead body on arrival at forensic medicine department of SPHMMC in Addis Ababa by reviewing medical records archived from 1 January 2021 to 31 December 2021.

4.3. Population

Source population

All dead bodies presented at forensic medicine department of St. Paul's hospital Millennium Medical College were the source population.

Study Population

Selected dead bodies on arrival which presented at forensic medicine department of St. Paul's hospital Millennium Medical College during the study period were the study population.

4.4. Eligibility Criteria

Inclusion criteria

- All cases of dead body on arrival reported by police and Autopsies done.

- Those who died from natural cause, accident, other trauma and unknown causes.
- Out of hospital death confirmed.

Exclusion criteria

- Insufficient data e.g., incomplete records, no autopsy done
- Decomposed bodies with time since death greater than 24 hours and mutilated body
- Age less than 15years

4.5. Sample size Determination and Sampling Procedures

Sample size determination

The minimum sample size will be calculated as follows: Since the prevalence of the problem in the study area is not known, P value was taken as 50% and 95% confidence interval was used, with 5% margin of error tolerated; the sample size will be determined by using single population proportion formula.

$$n = \frac{Z_{\alpha/2}^2 p(1-p)}{d^2}$$

Where, n: Required Sample

Z: Standard normal value at 95% CI which is 1.96

P: Estimated population proportion which is 0.5

d: Possible margin of error tolerated which is 0.05

$$n = \frac{(1.96)^2 0.5(1-0.5)}{(0.05)^2} = 384$$

Adding the 10% for the non-responders the total sample size becomes **422**. Therefore, the final sample size becomes 422 dead bodies on arrival. In order to maximize the sample size, we didn't consider the population correction formula during the sample size calculation.

Sampling Technique and procedures

The total number of the deceased 3120 from which brought in dead or dead body on arrival for the past 1 year duration from 1 January 2021 to 31 December 2021 was 982. Simple random sampling technique was applied to get the required sample on the dead bodies on arrival for whom autopsy report were done and who fulfill inclusion criteria were included in the study.

4.6. Study variables

Dependent variables

- Causes of dead body on arrival

Independent variables

- Socio-demographic variables (Age, marital status, educational level, religion, occupation, income, Residence, Addiction)
- Season (Month wise distribution of sudden death), Time wise (diurnal) distribution of sudden death, Place wise distribution of occurrence of death,
- Presenting complaints

4.7. Operational definition

- **Brought in dead or dead body on arrival:** condition where the person is found clinically dead at the scene, up on arrival to emergency or up on the arrival of professional like medical assistant.

- **Sudden and unexpected natural death:** when a person not known to have been suffering from any dangerous disease, injury or poisoning is found dead or dies within 24 hours after the onset of terminal illness
- **Unnatural death:** the death that occur due to accidental, violence, homicide, and suicidal
- **Cause of death:** defined as the disease, condition or injury that leads directly or indirectly, immediately or subsequently to death.
- **Manner of death:** Refers to the circumstances of how the cause of death arose. The manner of death may be natural, accidental, homicidal, suicidal, iatrogenic or undetermined.
- **Mechanism of death:** Refers to the physiological derangement or biochemical disturbance produced by the cause of death (e.g. hypovolaemia due to a stab wound).

4.8. Data collection method, tools and procedures

Data collection process

Structured questionnaire was developed in English language which is adopted from a similar research and modified during literature reviews. Questionnaire was pre tested for validity. The study questionnaire consists of four sections. Section one: demographic data (age, sex) Section two: pattern of death, Section three; hospital was the death confirmed, Section four; autopsy findings. The data collectors were second year emergency medicine and critical care residents and the data were collected on working days. Training was given to data collectors for two days. Then necessary data was extracted by reviewing patient's chart. Completeness and accuracy were checked by the research conductor on daily basis.

4.9. Data quality control

The quality of data was controlled starting from the time of questionnaires preparations. The questionnaire is developed by reviewing relevant literatures on the subject to ensure reliability.

Data was collected by residents who received training for two days and supervision was done by the principal investigator on daily basis throughout the data collection period. After completion of the data collection, each questionnaire was checked for completeness.

4.10.Data Processing and Analysis

After the data collection the data was cleared, coded and enter to computer by using epi info Version 7.2. Then, the data were exported to SPSS version 25 for further analysis. Descriptive analysis was performed to describe number and percentage of sociodemographic characteristics of categorical variables. Continuous variables were expressed in median and interquartile range (IQR) or mean and standard deviation. Multivariable logistic regression is used to identify significant associated factors of the dependent variable. Microsoft Excel 2019 was used to make graphs and charts. A P-value of ≤ 0.05 was considered statistically significant. Tables, figures, charts and texts used for data presentation.

4.11.Ethical consideration

Ethical approval was sought from the Institutional Research Review Boards (IRBs) of St. Paul's Hospital Millennium Medical College and ethical clearance was obtained. Then, permission to carry out the study was sought from SPHMMC administration and a formal letter of support was obtained from the hospital. Confidentiality and privacy of the participant identity has been maintained throughout the process of data collection. The data collection teams were trained on how to handle sensitive issues and on the importance of keeping confidentiality.

4.12. Dissemination of results

The result of the study is going to be presented for research defense and a formal report will be submitted to department of Emergency and critical care and forensic department of St. Paul's Hospital Millennium Medical College. In addition, the final report will be archived in the SPHMMC library. Furthermore, the findings of this study will be disseminated for publication in a national or international peer reviewed reputable journal. The study will also be presented during various research symposiums, conferences or on seminars.

5. Results

5.1. Socio demographic Characteristics of the study participants

A total of 982 deceased patients' charts were found from the registry book, among this 422 fulfilled the inclusion criteria and got recruited in to the study and data were collected (100% respondent rate). The mean age and standard deviations ($\pm$ SD) of the patients was 38.9 ± 15.6 years and two third of the patients are between 15 to 44 years of age. Three hundred and thirty-two (78.7%) of the deceased were male patients. Majority of the patients 241(57.1%) were from Addis Ababa and 350 (82.9%) lived in urban areas (Table 1).

Table 1: Socio-demographic characteristic of cases who had Postmortem examination in the Forensic department of St. Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia.

Variable	Response	Frequency	Percent
Sex (N=422)	Male	332	78.7
	Female	90	21.3
Age in years (N=422)	Mean $\pm$ SD	38.9 ± 15.6	
	15-29	134	31.8
	30-44	141	33.4
	45-59	86	20.4
	60-74	49	11.6
	>75	12	2.8
Address (N=407)	Addis Ababa	241	59.2
	Oromia	117	28.7
	Amhara	13	3.2
	SNNP	23	5.7
	Sidama	13	3.2
Residence (N=407)	Urban	349	85.7
	Rural	58	14.3

5.2. Place and mechanism of death

Three hundred twenty-six (77.3%) of the deceased were found dead while the remaining 96 (22.7%) were dead on arrival. and the other one third occurred at home 140(33.2%) .More than one third of the deaths occurred outside/outdoor 145(34.4%) , Hanging 40(40.8%) and RTA 19(19.4%) were the most common mechanisms of trauma

Table 2: - the history, place and mechanism of death of cases is summarized

Variable	Response	Frequency	Percent
History (N=422)	Found dead	326	77.3
	Dead on arrival	96	22.7
Place of death (N=422)	Home	140	33.2
	Health institution	84	19.7
	Hotel	16	3.8
	Work place	26	6.2
	Outside/outdoor	145	34.4
	Church	7	1.7
	Prison	4	0.9
Mechanism of trauma (N=98)	Strangulation	2	2.0
	Hanging	40	40.8
	Bullet injury	3	3.1
	Electrocution	13	13.3
	Drowning	8	8.2
	RTA	19	19.4
	Stick injury	5	5.1
	Stab injury	5	5.1
	Axe injury	1	1.0
	Falling down accident	2	2.0

Table 3: Place where medical care given and time of presentation to health institution who had Postmortem examination in the Forensic department of St. Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia.

Variable	Response	Frequency	Percent
Place where medical help given (N=277)	Hospital	84	30.3
	None	193	69.7
Time of presentation to hospital/ health institutions (N=71)	12:00 AM to 5:59 AM	5	7.0
	6:00 AM to 11:59 AM	14	19.7
	12:00 PM to 5:59 PM	22	31.0
	6:00 PM to 11:59 PM	30	42.3
CPR Done (N=422)	Yes	84	19.9
	No	338	80.1
Nutritional status (N=422)	Normal	315	74.6
	Over nourished	68	16.1
	Not documented	39	9.2
Type of trauma (N=422)	Blunt trauma	127	30.1
	Sharp trauma	10	2.4
	Unknown/none	285	67.5

Majority of cases 52(73.3%) presented at the hospital between mid-day and mid-night. Blunt trauma was the most common type of trauma for 127 (30.1%) while the type of trauma was

unknown for 285 (67.5%) of cases. Medical help was given at a hospital for 84 (30.3%) of 277 deaths and CPR was given for 87.5% of them. Incident prior to death was known for only 74(17.5%) of the deceased and having nonspecific pain was the most common complaint

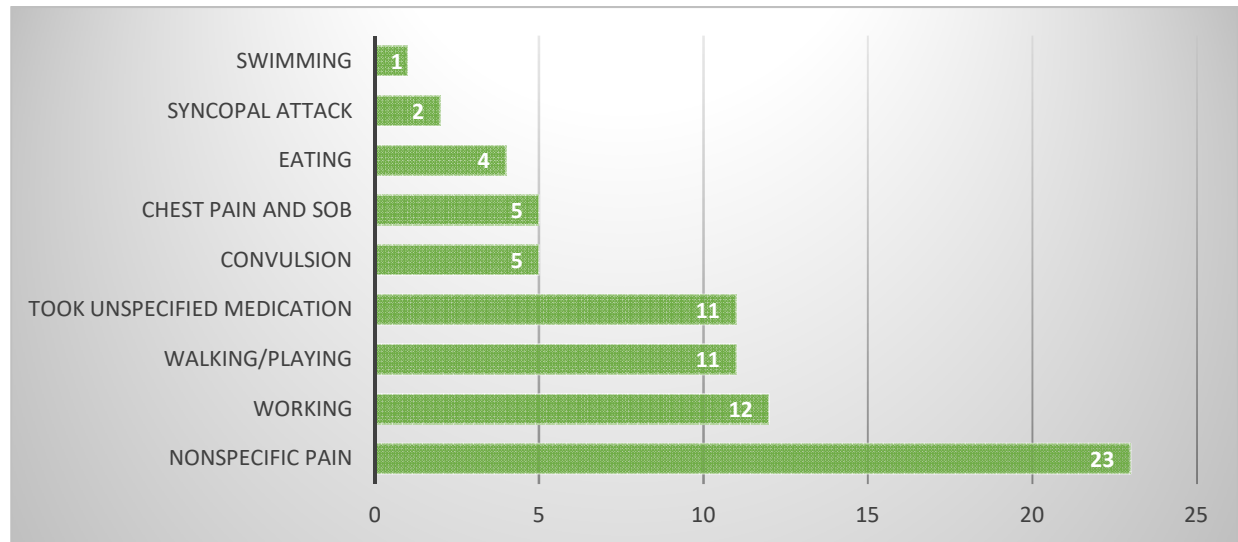


Figure 1: Incidence prior to death of cases who had Postmortem examination in the Forensic department of St. Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia.

5.3. Causes of death

After categorizing specific causes of death using international classification of disease (ICD) 11th version, the most common attributes of death were non-cardiac disease categories of Injury, poisoning or certain other consequences of external causes and Diseases of the respiratory system. Disease of circulatory system were attributable for 58 (13.7%) of deaths.

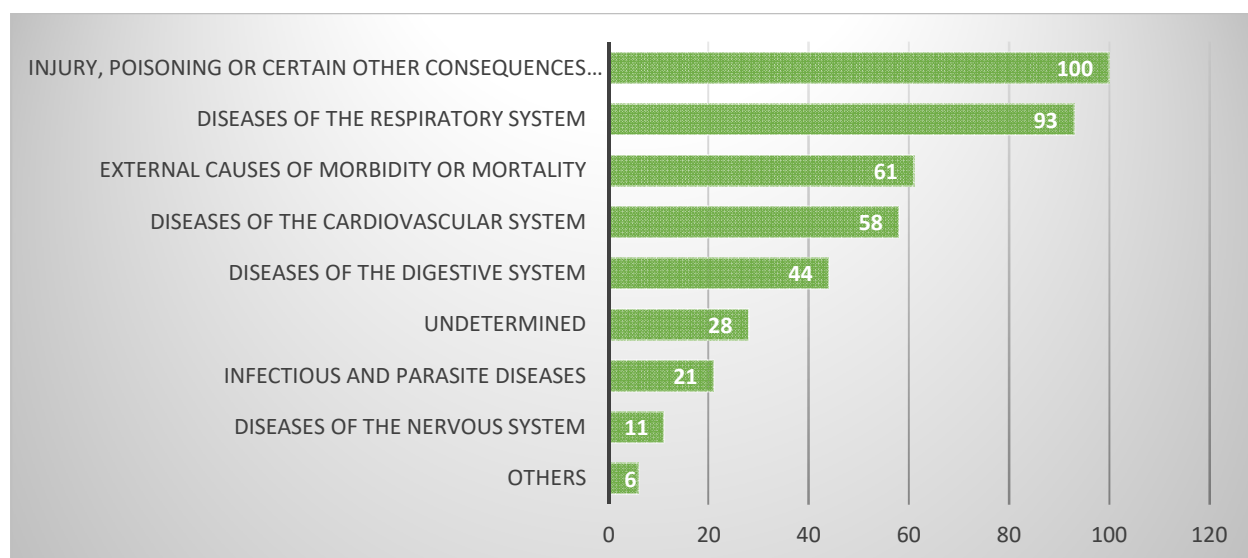


Figure 2: International classification of disease categorized causes of deaths of cases who had Postmortem examination in the Forensic department of St. Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia.

From all the deaths Pneumonia accounts for the single most common cause of death with 90 (21.3%) deaths and Coronary heart disease was the second most common with 45 (10.7%) cases. Twenty-eight (6.6%) of patients' deaths were not determined.

Table 4: International classification of disease specific causes of deaths of cases who had Postmortem examination in the Forensic department of St. Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia.

Variable	Response	ICD 11 0ode	Frequency	Percent
Infectious and parasite diseases	Tuberculosis	1B1Z	8	1.9
	Abscess of Brain	1D03.3Z	2	0.5
	Meningitis	1D01.Y	3	0.7
	Sepsis	1G40	8	1.9
Neoplasm	Brain tumour	2A00.5	3	0.7
Diseases of the immune system	Anaphylaxis	4A84.Z	1	0.2
Mental, behavioral or neurodevelopmental disorders	Alcohol Intoxication	6C40.3	1	0.2
Diseases of the nervous system	Intracranial hemorrhage	8B0Z	11	2.6
Diseases of the cardiovascular system	Dilated cardiomyopathy	BC43.0Z	3	0.7
	Hypertrophic cardiomyopathy	BC43.1Z	3	0.7
	Aortic dissection	BD50.Z	3	0.7
	Coronary artery disease	BA8Z	45	10.7

Variable	Response	ICD 11 0ode	Frequency	Percent
	Myocarditis	BC42.Z	2	0.5
	Pulmonary thromboembolism	BB00.Z	2	0.5
Diseases of the respiratory system	Chronic obstructive pulmonary disease	CA22.Z	1	0.2
	Abscess of lung	CA43.2	2	0.5
	Pneumonia	CA40.Z	90	21.3
Diseases of the digestive system	Chronic Liver Disease	DB99.0	24	5.7
	Acute Pancreatitis	DC31.Z	16	3.8
	Peritonitis	DC50.Z	4	0.9
Diseases of the genitourinary system	Pyelonephritis	GB51	1	0.2
Injury, poisoning or certain other consequences of external causes	Poly trauma	ND56.Z	14	3.3
	Unspecified poisoning	NE6Z	4	0.9
	Carbon monoxide Poisoning	NE61	8	1.9
	Drowning	NF08.1	14	3.3
	Electrocution	NF08.4	11	2.6
	Chest injury	NB32	5	1.1
	Asphyxia	NF05	4	0.9
	Traumatic brain injury	NA07.Z	40	9.5
External causes of morbidity or mortality	Choking	PB07	12	2.8
	Drug overdose	PC13.0	1	0.2
	Hanging	PH2Z	43	10.2
	Strangulation	PB02	4	0.9
	Hemorrhage	MG27	1	0.2
Undetermined			28	6.6

From determined cause of deaths external causes were the causes, Communicable diseases, and non-communicable disease were 162(41.1%) , 119 (30.2%), 113(28.7%) cases, respectively. Alleged manner of death was determined for 394 (93.4%) patients and majority of the deaths were due to natural causes (58.9%) and (41.1%) were unnatural causes.

Figure 3 shows the manner of death.

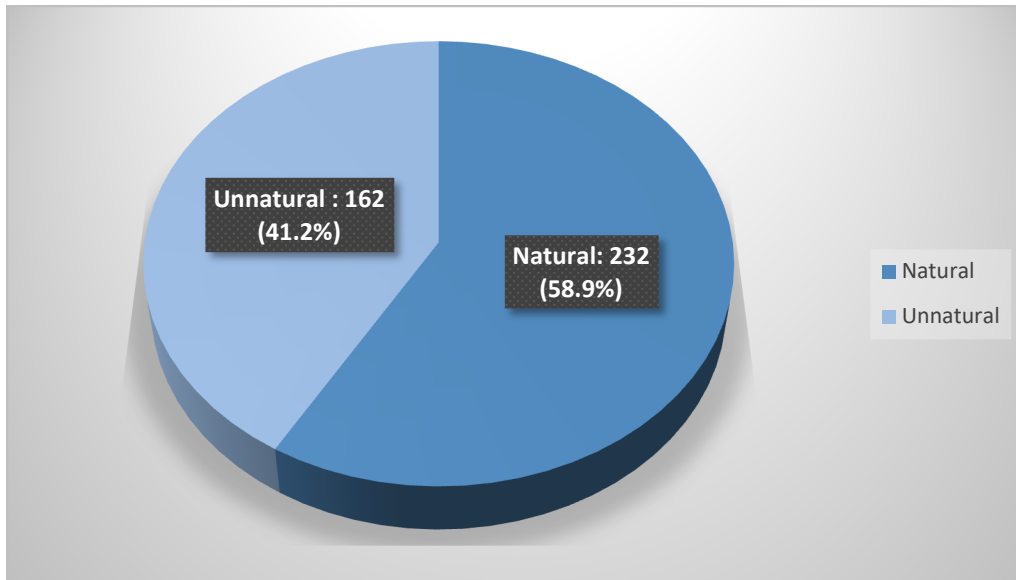


Figure 3: Alleged manner of death of cases who had Postmortem examination in the Forensic department of St. Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia.

5.4. Clinical examination findings

The autopsy findings of the study showed that injuries to the heart and pericardium were found to be laceration/hemorrhage/bruising 57 (13.5%) followed by atherosclerosis 39(9.2%) and congestion of the lungs were accounted in 73 (17.3%) followed by consolidations 64 (15.2%) of the cases (Table 4). The most common finding during examination was found in cardiovascular and respiratory systems. Enlargement of Liver was the most common clinical finding of the digestive system which was found in 45 (10.7%) cases.

Table 5: Clinical examination findings of cases who had Postmortem examination in the Forensic department of St. Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia.

Variable	Response	Frequency	Percent
Scalp	Intact	342	81.0
	Wounded	75	17.8
	Congested	4	0.9
	Mummified	1	0.2
Skull	Intact	390	92.4
	Fracture	28	6.6
	Other	4	0.9
Brain, meninges and vessels	Intact	278	65.9
	SAH	62	14.7
	SDH/EDH	27	6.4
	Brain mass	3	0.7

Variable	Response	Frequency	Percent
	Petechial hemorrhage	23	5.5
	Abscess	7	1.7
	ICH	22	5.2
Chest wall and ribs	Intact	394	93.4
	Fracture	21	5.0
	Wounded	7	1.7
Pleural cavity	Intact	388	91.9
	Effusion	21	5.0
	Puss	13	3.1
Lung	Intact	223	52.8
	Consolidation	64	15.2
	Puss	26	6.2
	Fibrosis	33	7.8
	GI content	3	0.7
	Congested	73	17.3
Heart and pericardium	Intact	292	69.2
	Atherosclerosis	39	9.2
	Laceration/hemorrhage/bruising	57	13.5
	Hypertrophy	24	5.7
	Other	10	2.3
Large blood vessels	Intact	409	96.9
	Aortic contusion/ laceration/ bruising/ rupture	6	1.4
	Aortic dilatation	1	0.2
	Aortic narrowing/atherosclerosis	6	1.4
Peritoneal cavity	Intact	397	94.1
	Fluid	16	3.8
	Hemoperitoneum	8	1.9
	Evisceration	1	0.2
Stomach and its contents	Intact	411	97.4
	Alcohol smell	6	1.4
	Eviscerated	5	1.2
Small intestine	Intact	413	97.9
	Gangrenous and contused	4	0.9
	Other	5	1.1
Liver	Intact	342	81.0
	Enlarged/congested	45	10.7
	Mass	15	3.6
	Shattered/Ruptured	11	2.6
	Shrunken	9	2.1
Pancreas	Intact	383	90.8
	Hemorrhage	28	6.6
	Enlarged/congested	10	2.4
	Eviscerated	1	0.2
Spleen	Intact	398	94.3

Variable	Response	Frequency	Percent
	Enlarged	18	4.3
	Lacerated/rupture	4	0.9
	Others	2	0.5
Pelvic wall	Intact	417	98.8
	Contusion	3	0.7
	Puss collection over the pelvic cavity	2	0.4
Spine	Intact	416	98.6
	Cervical Spine Injury	4	0.9
	Thoracic spine injury	1	0.2
	Crushed	1	0.2
Musculoskeletal	Intact	419	99.3
	Lt. Femoral fracture	1	0.2
	Closed fracture over their forearm and open left femur left leg	1	0.2
	Crushed	1	0.2

5.5. Association of socio-demographic variables with communicable, non-communicable and external causes of death

In the logistic regression model, sex, age, and residence were considered. In bivariate logistic regression, residence was significantly associated with communicable, and external causes of death. Also, Age was associated with non-communicable, and external causes of death.

In multivariate analysis, Urban residence had 2.9 times (AOR: 2.846 [95% CI: 1.286,6.296]) higher odds of dying due to communicable disease compared to rural residences.

The odds of dying due to non-communicable diseases significantly decreased as the age of person was less than 30 years of age compared to those in the age group of above 75 and above years (Table 4).

The odds of dying due to external causes were higher among 15-29 years of age (AOR: 5.091 [95% CI: 1.097,29.628]) compared to 75 and above years. Also, urban residences had 71% (AOR: 0.293 [95% CI: 1.286,6.296]) lower odds of dying due to external causes compared to rural residents (Table 4).

Table 2: Factors associated with communicable diseases, non-communicable diseases and external causes of deaths in Forensic department of St. Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia.

Variable	Communicable disease	COR (95% CI)	AOR (95% CI)	P-value
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	Yes (%)	No (%)			
Sex					
Male	94 (79.0)	222 (80.7)	0.898(0.527,1.530)	0.842 (0.474,1.494)	0.556
Female	25 (21.0)	53 (19.3)	1	1	
Age in years					
15-29	89 (31.7)	36 (30.)	0.944 (0.231,3.854)	0.871 (0.206,3.676)	0.851
30-44	100(33)	30 (25.2)	0.700 (0.170,2.875)	0.687 (0.164,2.882)	0.608
45-59	53(20.8)	29 (24.3)	1.277 (0.307,5.315)	1.157 (0.272,4.914)	0.844
60-74	26 (11.9)	21 (17.5)	1.885 (0.433,8.194)	1.737 (0.391,7.713)	0.468
>75	7 (2.5)	3(3.0)	1	1	
Residence					
Urban	47 (17.7)	219 (82.3)	2.897 (1.323,6.347)	2.846 (1.286,6.296)	0.010*
Rural	8 (6.9)	108 (93.1)	1	1	
Variable	Non-communicable disease		COR (95% CI)	AOR (95% CI)	P-value
	Yes (%)	No (%)			
Sex					
Male	95 (84.1)	221 (78.6)	1.433 (0.803,2.557)	1.067 (0.574,1.981)	0.838
Female	18 (15.9)	60 (21.4)	1	1	
Age in years					
15-29	19 (16.8)	106 (37.7)	0.179 (0.047,0.679)	0.194 (0.050,0.748)	0.017*
30-44	41 (36.3)	89 (31.7)	0.461 (0.126,1.680)	0.417 (0.113,1.541)	0.190
45-59	29 (25.7)	53 (18.9)	0.547 (0.146,2.048)	0.512 (0.135,1.938)	0.324
60-74	19 (16.8)	28 (10.0)	0.679 (0.172,2.670)	0.645 (0.162,2.565)	0.534
>75	5 (4.4)	5 (1.8)	1	1	
Residence					
Urban	100 (90.9)	227 (83.5)	0.504 (0.244,1.041)	1.750 (0.831,3.683)	0.141
Rural	10 (9.1)	45 (16.5)	1	1	
Variable	External causes		COR (95% CI)	AOR (95% CI)	P-value
	Yes (%)	No (%)			
Sex					
Male	127 (78.4)	189 (81.5)	0.826 (0.501,1.361)	1.114 (0.636,1.954)	0.705
Female	35 (21.6)	43 (18.5)	1	1	
Age in years					
15-29	70 (43.2)	55 (23.7)	5.091 (1.039,24.945)	5.700 (1.097,29.628)	0.038*
30-44	59 (36.4)	71 (30.6)	3.324 (0.680,16.259)	3.966 (0.771,20.412)	0.099
45-59	24 (14.8)	58 (25.0)	1.655 (0.327,8.371)	2.020 (0.380,10.732)	0.409
60-74	7 (4.3)	40 (17.2)	0.700 (0.122,4.009)	0.807 (0.134,4.843)	0.814
>75	2 (1.2)	8 (3.4)	1	1	
Residence					
Urban	119 (76.3)	208 (92.0)	0.278 (0.152,0.511)	0.293 (1.286,6.296)	<0.001*

Rural	37 (23.7)	18 (8.0)	1	1	
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6. Discussion

In this study, the External causes of death (41.1%) were the leading causes of death followed by communicable diseases (30.2%), and non-communicable diseases (28.7%). Pneumonia accounts for the single most common cause of death with 90 (21.3%) deaths and Coronary heart disease was the second most common with 45 (10.7%) cases

The striking finding on these research is more than 40.8% of deaths were due to external causes which on contrary to a study done in northern Ethiopia where external causes were responsible for only 12.3% of the deaths. The odds of dying due to external causes were 5.7 times higher in the 15-29 years of age group compared to 75 years and above. Also, external causes were more common in rural areas than urban residents. These findings were in consistent with a study done in Ethiopia (27-29). The reason for external causes being high might be due to the fact that poisonous substances are easily available and due to the topography of the country falling down accidents are common. Also, most cases that gets evaluated in forensic facilities are medicolegal conditions and sustain trauma is the main External Causes of death.

Although studies showed being male to have higher odds of dying due to external causes compared to females, this study had no association between being external causes and sex (27). The sex indifference of deaths from external causes can be attributed to the small sample size proportion of females as compared to males.

Communicable diseases were the second leading causes of death (30.2%) among adults, age greater than 15 years, which was similar to other studies in Ethiopia and other parts of the world (27, 28)(1,3-5). Yet, the contribution of Cause of deaths to the overall deaths in our study was lower than the 35% reported from north western Ethiopia (31) and much lower than the 58% found in Kenya (27). Despite the variation in the estimates, studies have shown that the burden of Causes of deaths has declined in Ethiopia (28). This could be explained by the improvements in health and socio-economic status of the population. High coverage of primary health care service is among the factors. The national health care program, which focuses on health promotion and prevention of Cause of deaths has also played a significant role. The odds of dying due to cause of deaths among urban residents were 2.9 times higher than in rural residents.

When we see the Alleged manner of death from which manner of death determine was 394 (93.4%), Natural cause is the leading which account 232(58.9%) followed by Unnatural cause which account 162 (41.1%). when we compare to the study done on mahatma Gandhi institute of medical sciences, Sewagram, wardha, India from May 2010 to April 2012, a total of 200 cases from which the unnatural were higher 129 (64.5%) whereas 71 (35.5%) deaths was natural which were caused by some disease process (11). An increasing surge in burden of natural cause is due to rapid urbanization which result in behavioral factors such as unhealthy diet, lack of physical activity and substance use.

From Unnatural manner of death sex distribution was 125 (77.6%) male and 36(22.4%) female which is similar with the study done Bangladesh concerning with pattern of unnatural deaths 77.28% was males and 22.71% females. In both study it shows Males suffer 3.4X more unnatural deaths than females. Hanging 40(40.8%), RTA 19(19.4%) and electrocution 13(13.3%) were the most common mechanisms of trauma when we compare to the Bangladesh study concerning with pattern of unnatural deaths, RTAs were 68.92%, 11.69% homicide, 08.00% suicide and burn, electrocution and others comprise the rest 11.565 unnatural deaths (13).The reason for this finding could be due to an increase in tendency of self-harming in adolescent and middle age group people than in extreme of life.

From the natural cause of death the majority of deaths were occur due to respiratory system which account 93 (39.9%) followed by cardiovascular 58 (24.8%) and gastro-intestinal and hepatic lesions (18.8%), while in the other study which was done in Benin Teaching Hospital, between January 2005 and December 2011, on causes of sudden natural death the majority Immune/infectious diseases (mainly AIDS), (15.2%) gastro-intestinal/hepatic lesions (14.1%) and respiratory diseases were seen in 12.5% of cases (17). this could be due to low economic status, leaving condition which make it easy to transmit , sedentary life style and poor health follow up

In our study the from natural cause of death communicable cause of death where 119(51.3%) and non-communicable cause of death where 113(48.7%) of the underlying causes of death, in contrary to these study, in South-West Nigeria,5-year retrospective descriptive study of 253 autopsied-BID cases shows Non-communicable diseases accounted for 216 (85.4%) and the communicable disease accounted for 33(13%) and undefined were 4(1.6%) of the underlying causes of death (19).

this may be explained by our low economic status, leaving condition which make it easy to transmit , poor nutritional support and poor health follow up.

From all the deaths Pneumonia accounts for the single most common cause of death with 90 (21.3%) deaths and coronary artery disease was the second most common with 45 (10.7%) Twenty-eight (6.6%) of patient's deaths were not determined. While we compare from study done in Ethiopia on the magnitude and causes of out of hospital sudden death in autopsy studies, 425 (56.9%) of causes were cardiac and 321 (43.1%), Sudden death was attributable to non-cardiac causes such as infection, cerebrovascular accident and pulmonary embolism. Hundred twenty one patients (16.2%) had uncertain pathology result and about 165 patient (26). The finding is also in line with studies in sub-Sahara African countries and South Africa(32).This magnitude of mortality from pneumonia could be related to high incidence, transmittable and low detection rate.

In this study one third of the deaths occurred outside/outdoor 145(34.4%) , and the other one third occurred at home 140(33.2%) when compare this study with the study done characteristics of Persons Dead on Arrival Received in a Danish Emergency Department The place of death home accounts 80%, and more than half (54%) were found either dead or dying by a spouse, cohabitant, or son/daughter (15).this could be due to an increase burden of suicide, homicide and accident.

In the current study, we also found being at age >75 years was 1.8 times higher to develop natural causes of deaths than those between age 15-29 years at death. This finding was consistent with other studies done. A survey in rural south western Ethiopia showed that 80% the >75 years of age population surveyed had at least one risk factor for natural causes of deaths(30). Non-communicable diseases are thought to be common among urban population. Despite this, they were also important causes of death in rural population having no significant lifestyle change. This study has found no association of living residence with natural causes of deaths as a cause of death.

7. Strengths and Limitations of the study

As a strength, the study was conducted in such a way that it involved maximum sample without using a correctional formula in order to increase representativeness. Causes of death and death patterns were assessed using structured tool. Both the detail and the summary results were reported which will help to avoid the information loss that could have been occurred in reporting only the summary results.

It is important to acknowledge the limitations of this study, primarily with regard to the high proportion of cases with undetermined causes that were known for more than 5% of the deaths. Unable to trace and report signs and symptoms of deceased individual correctly prior to death were factors for high rate of undetermined causes of death. It was also difficult to know the comorbidity of deceased that may relate with the death. Since the study was done in institutions, it might not be generalized to the general population. Moreover, medical record reports were secondary data.

8. Conclusions and Recommendations

8.1. Conclusions

this study conclude The leading cause of death were External causes followed by communicable diseases and non-communicable diseases. From the specific causes, Pneumonia and coronary artery disease were the two most common cause of death among adults in Ethiopia. From alleged manner of death Natural cause was leading followed by Unnatural cause and undetermined.

Broad causes of death have shown Injury, poisoning or certain other consequences of external causes and Diseases of the respiratory system being the two most common categories. Overall, Deaths due to External causes were highest among adults between 15-44 years of age. Rural residents were more likely to die due to external causes compared to Urban residents, and urban residents had a higher risk of death from Communicable diseases compared to rural residents. External causes of death decreased when age increased. compared to rural residents.

8.2. Recommendations

From the study findings, the following are recommended.

For health care providers: Understanding the causes of death for specific group and early care and treatment for those specific risk population is important. It is also important to improve referral system and appropriate care and treatment during transporting patients and also early initiation of advance life support for those specific risk population is important.

For SPHMMC: The hospital should pay necessary attention providing training ALS/ACLS for emergency medical service providers and Not only for health providers but Also, providing first aid training and health education is necessary for the general population. The hospital should also focus on preservation and management of data.

For fellow researchers: To conduct more researches in such a way that it represents broader population and use more sound statistics methods.

9. References

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10. Annexes

10.1. Annex I: Data collection sheet

St. Paul Hospital Millennium Medical College, Department of emergency medicine.

This questionnaire is very important to develop magnitude and Cause of sudden death in autopsy studies of St. Paul hospital forensic medicine department in Addis Ababa, Ethiopia. All questions are to be filled from already recorded patients' data found on logbook, name of patient is not needed. A structured questioner designed to assess to develop the magnitude and cause of sudden death in autopsy studies of public hospitals in Addis Ababa, Ethiopia.

S.N.	Variables	Response	Remark
Sociodemographic characteristics			
101.	Age		
102.	Sex	1. Male 2. Female	
103.	Address	1. Addis Ababa 2. Amhara 3. Oromia 4. SNNP 5. Sidama	
104.	Residence	1. Urban 2. Rural	
Place and mechanism of death			
201.	History	1. Found dead 2. Dead on arrival	
201.	Place of death	1. Home 2. Health institution 3. Hotel 4. Work place 5. Outside/outdoor 6. Church 7. Prison	
202.	Place where medical help given	1. Hospital 2. None	
201.	Time of presentation to hospital/ health institutions	1. 12:00 AM to 5:59 AM 2. 6:00 AM to 11:59 AM 3. 12:00 PM to 5:59 PM 4. 6:00 PM to 11:59 PM	
202.	CPR Done	1. Yes 2. No	

203.	Nutritional status	1. Normal 2. Over nourished 3. Not documented	
204.	Type of trauma	1. Blunt trauma 2. Sharp trauma 3. Unknown/none	
205.	Mechanism of trauma	1. Strangulation 2. Hanging 3. Bullet injury 4. Burn 5. Drowning 6. RTA 7. Stick injury 8. Stab injury 9. Axe injury 10. Falling down accident	
A. INTERNAL EXAMINATION			
301. Scalp		1.Intact 2.Wounded 3.Congested 4.Mummified	
302. Skull		1.Intact 2. Fracture 3. Other	
303. Brain, Meninges & Vessels		1. Intact 2. SAH 3. SDH 4. Brain mass 5. Petechial hemorrhage 6. Abscess 7. ICH	
304. Chest wall and ribs		1. Intact	
		2. Fracture	
		3. Wounded	
305. Pleural cavity		1. Intact	
		2. Effusion	
		3. Puss	
306. Lung		1. Intact	
		2. Consolidation	
		3. Puss	
		4. Fibrosis	
		5. GI content	
		6. Congested	

307. Heart and pericardium	1. Intact	
	2. Atherosclerosis	
	3. Laceration/hemorrhage/bruising	
	4. Hypertrophy	
	5. Other	
308. Large blood vessels	1. Intact	
	2. Aortic contusion/ laceration/ bruising/ rupture	
	3. Aortic dilatation	
309. Stomach and its contents	1. Intact	
	2. Alcohol smell	
	3. Eviscerated	
310. Small intestine	1. Intact	
	2. Gangrenous and contused	
	3. Other	
311. Liver	1. Intact	
	2. Enlarged/congested	
	3. Mass	
	4. Shattered/Ruptured	
	5. Shrunk	
312. Pancreas	1. Intact	
	2. Hemorrhage	
	3. Enlarged/congested	
	4. Eviscerated	
313. Spleen	1. Intact	
	2. Enlarged	
	3. Lacerated/rupture	
	4. Others	
314. Pelvic wall	1. Intact	
	2. Contusion	
	3. Puss collection over the pelvic cavity	
315. Spine	1. Intact	
	2. Cervical Spine Injury	
	3. Thoracic spine injury	
	4. Crushed	
316. Musculoskeletal	1. Intact	
	2. Lt. Femoral fracture	
	3. Closed fracture over their forearm and open left femur left leg	
	4. Crushed	

B. Opinion

401 The approximate time of death is hours / days prior to autopsy.

402 The mode and cause of death to the best of my knowledge and belief is due to

10.2. Annex II: Dummy tables

Table 7: Socio-demographic characteristic, place and mechanism of death of cases who had Postmortem examination in the Forensic department of St. Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia disaggregated by sex

Variable	Response	Male (N= 332)		Female (N= 90)	
		Frequency	Percent	Frequency	Percent
Age in years	15-29	84	25.3	50	55.6
	30-44	124	37.3	17	18.9
	45-59	75	22.6	11	12.2
	60-74	39	11.7	10	11.1
	>75	10	3.0	2	2.2
Address	Addis Ababa	197	61.8	44	50.0
	Oromia	87	27.3	30	34.1
	Amhara	9	2.8	4	4.5
	SNNP	18	5.6	5	5.7
	Sidama	6	1.9	4	4.5
	Hadiya	2	0.6	1	1.1
Residence	Urban	277	86.8	72	81.8
	Rural	42	13.2	16	18.2
History	Found dead	263	79.2	63	70.0
	Dead on arrival	69	20.8	27	30.0
Place of death	Home	105	31.6	35	38.9
	Health institution	57	17.2	26	28.9
	Hotel	14	4.2	2	2.2
	Work place	24	7.2	2	2.2
	Outside/outdoor	121	36.4	24	26.7
	Church	7	2.1	1	1.1
	Prison	4	1.2	0	0
Place where medical help given	Hospital	58	30.0	26	41.9
	None	157	70.0	36	58.1
Nutritional status	Normal	247	74.4	68	75.6
	Over nourished	56	16.9	12	13.3
	Not documented	29	8.7	10	11.1

Type of trauma	Blunt trauma	103	31.0	24	26.7
	Sharp trauma	8	2.4	2	2.2
	Unknown/none	221	66.6	64	71.1
Mechanism of trauma	Strangulation	0	0	2	2.2
	Hanging	30	9.0	10	11.1
	Bullet injury	3	0.9	0	0
	Burn	10	3.0	3	3.3
	Drowning	8	2.4	0	0
	RTA	13	3.9	6	6.7
	Stick injury	5	1.5	0	0
	Stab injury	4	1.2	1	1.1
	Axe injury	0	0	1	1.1
	Falling down accident	2	0.6	0	0

Assurance of Principal Investigator

I agree to accept all responsibilities for the scientific and ethical conduct of the research project. I will provide timely progress report to my advisor and seek the necessary advice and approval from my primary advisors in the course of the research. I will communicate timely to my advisors all stakeholders involved in the study including any source of funding for this research.

Name of the student: Dr. Nadiya Beyan

Signature: _____

Date: _____

Approval of the Advisor

Name of the primary advisor: Dr. Esubalew Gobigenew

Signature: _____

Date: _____

Name of the primary advisor: Dr. Haimanot Tessema

Signature: _____

Date: _____

Name of the primary advisor Dr. Alemayehu Shiferaw

Signature: _____

Date: _____