

# Pattern and predictors of mortality in emergency department of Saint Paul Hospital millennium medical college Addis Ababa, Ethiopia: Hospital based cross-sectional study

Woldesenbet Waganew Dode<sup>1</sup>, Girma Alemayehu Beyene<sup>2</sup>, Bethlehem Tebebe Dessie<sup>1</sup>, Tesfaye Getachew Shawul<sup>1</sup>, Selamawit Tigistu Mulat<sup>1</sup>, Etsigent Aklog Afework<sup>1</sup>, Rediat Teklewold Sahle<sup>1</sup>, Zelalem Getahun Demessie<sup>1</sup>, Belyou Enyew Kefale<sup>1</sup>

## Affiliations:

<sup>1</sup> St Paul hospital Millenium Medical Collage,

<sup>2</sup> Wolkite university

## Correspondence \*:

Woldesenbet Waganew Dode

woldegessam@gmail.com

St. Paul's Hospital Millennium Medical College

## Publication information

Received: 23-Jun-2023

Accepted: 21-Nov-2023

Published: 30-Jan-2024

**Citation:** Dode W, Beyene G, Dessie B, Shawul T, Mulat S, Afework E, Sahle R, Demessie Z, Kefale B. Pattern and predictors of mortality in emergency department of Saint Paul Hospital millennium medical college Addis Ababa, Ethiopia: Hospital based cross-sectional study. MJH, 2024, Volume 3 (2): eISSN: 2790-1378.

## Abstract

**Background:** The declared goal of creating an exceptional acute care system demands regressive administrative monitoring and evidence-based action. The goal of this study was to look at the pattern and determinants of all-cause mortality at St. Paul Hospital's Millennium Medical College's Emergency Department.

**Methods:** A total of 388 emergency department patient charts were included. Quota sampling using standardized questioner from previous study was employed. Single proportion formula was used to determine sample size. The data was analyzed using SPSS Version 25. The association between relevant characteristics with early emergency mortality was examined using the, binary and multinomial logistic regression analysis. Statistical significance was determined at p-values < 0.05

**Results:** From Jan 1, 2020-June 30, 2022, a total of 22,982 adult acutely sick patients visited the Emergency Department (ED). There were 693 (3.02%) deaths registered in ED. Three hundred eighty-eight charts fulfilled the inclusion criteria were analyzed. In the multinomial logistic regression, orange triage category (AOR=10.2 95% CI:1.3-76.3), Duration of Chief complaint < 24 hours, respiratory illness (AOR = 12.5, 95% CI: 1.3-120.5), liver diseases (AOR = 20.5, 95% CI: 1.9-210.4), Upper GI bleeding (AOR = 14.5, 95% CI: 1.0-194.9), Diabetic mellitus and its complication (AOR = 34.4, 95% CI: 2.5-472.3), severe anemia (AOR = 29.5, 95% CI:2.1-413.2), and sepsis/ septic shock (AOR = 9.4, 95% CI:1.0-87.0) as principal diseases, are associated with high likelihood of early ED mortality.

**Conclusion;** Orange triage category, duration of chief complaint less than 24 hours and principal diagnosis being respiratory, liver, UGIB, severe anemia, DM and its complications and sepsis has association with early ED mortality.

**Keywords:** Medical Emergency, Early deaths, Mortality predictors, Ethiopia

## Background

Literature suggesting that morbidity and mortality burden of LMIC is unacceptably high due to measurable limitations in health system resources, leadership as well as awareness of responsible bodies. Much of the disease load is preventable or curable through using low-cost technology (1).

Emergency care is critical in preventing deaths and disabilities. The results of patients presenting at any hospital's emergency service is a recognized important quality indicator of the facility's level of care. The literature suggests that the health outcome of patients is determined by factors like health literacy, access to quality emergency services, pre-hospital related factors, method of transportation, time delay between onset of disease and presentation, and magnitude of illness or injury (2-4).

Ethiopia, one of the world's oldest countries, has less than 100 emergency medicine and critical care physicians and less than 250 emergency nurses. In addition to low human resources, the country has sparse and insufficient acute care infrastructure, even though the ministry of health and allies are working hard towards improvement (5).

Death statistics are vital scientific information that should be available for continual evaluation of health services and quality improvement (1-2,7,8). However, evidence on cause of death in Ethiopia is limited. Except few scanty literatures, there hasn't been any all-cause emergency mortality research data published from SPHMMC.

Thus, this retrospective cross-sectional study aimed to characterize socio-demography, patterns, and determinants of early all-cause mortalities between Jan 1, 2020 to June 30, 2022 at ED of SPHMMC. The data could also be used to assess the impact of ED care in reversing fatal conditions as an input for evidence-based Medicine.

## Methods and materials

### Study setting, design, period, and population

Retrospective cross-sectional study was conducted at adult emergency department of SPHMMC to assess the pattern and predictors for early death. SPHMMC is a specialized teaching tertiary level hospital located in Addis Ababa, the nation's capital. It's one of the biggest referral centers in the nation, its catchment area is thought to contain approximately 7 million. Clients of SPHMMC come from all across the country. The hospital is a research center and a teaching facility for medical students

at the undergraduate and post-graduate levels. SPHMMC has two separate emergency facilities, Addis Ababa Burn, Emergency & Trauma Hospital (AABET Hospital) focused on trauma and burn related emergency cares (6) and Emergency Department at the main SPHMMC hospital that focused on Medical, Surgical and other emergencies.

Source Population; all patients who visits SPHMMC main compound ED from Jan 1,2020- June 30, 2022. Study Population; Registered deaths of ED in the study period.

Sample size and sampling technique; Quota sampling has been implemented and the following assumptions were considered in calculating the sample size. proportion of ED death is taken as 50% (0.5), and 95% confidence level with 5% margin of error using single population proportion formula.

$$n = (Z\alpha/2)^2 p (1 - p)$$

$d^2$

Were,

n- Required Sample

z- Standard normal value at 95% CI which is 1.96

p- Estimated population proportion which is 0.5 which is taken a mortality in similar study in similar city

d- Possible margin of error tolerated which is 0.05

$$n = (1.96)^2 0.5(1-0.5) = 384$$

$$(0.05)^2$$

### Variables

Outcome variables; ED death,

Predictor variables; Age, Sex, Duration of Chief complaint (c/c), Triage category, mode of arrival, referring region, prior ED visit, Length of stay (LOS), principal diagnosis, comorbid conditions.

Data collection: Chart review of every participant who died from January 1/2020 to June 30/2022 in the emergency room was conducted using a standardized questioner from previous study. To examine death statistics, data from patient medical records, including the ED triage record, HIMS, clinical care notes, and the hospital death certificate, were used.

The SPHMMC triage system, classifies patients into five sub-groups,

based on target time to treat, red (immediate), orange (within <10 minutes), yellow (within <30 minutes), green (within <60 minutes), and black (dead or dying), using mechanism of injury and severity illness at presentation.

Six data collectors who are having good experience in emergency nursing, clinical emergency and public health were trained to collect data using a standardized data collecting instrument. The collected data were cross-checked for completeness. The data collectors were overseen and monitored by the PI during the data gathering period.

**Statistical Analysis:** All participants under the age of 15 years were disregarded in order to represent the subgroup of patients who would have benefitted from adult ED treatment.

To facilitate study, the causes of death were divided into groups that were clinically pertinent. The length of stay in the ED was then divided into two categories: 24 hours and less, and more than 24 hours. The goal of dichotomization is to identify the patient population that is critically ill and most injured would most likely benefit from effective early ED intervention. The investigation was targeted to this 24-hours and less period. Binary and multinomial logistic regression analysis was used to assess the adjusted impact on the risk of dying within 24 hours after ED presentation for age, gender, principal diagnosis, time of presentation to the ED, mode of transportation to the ED, time of deaths, and duration chief complaint. Descriptive and analytical statistics were obtained using SPSS Version 25. Summary statistics for all variables were calculated.

#### **Operational definition:**

Early death: death within ED within 24 hours of stay.

Early mortality: those death within 72 hours of length of stay in ED.

Cause of death: an assumed principal diagnosis which resulted death of the patient in ED.

Co-morbidity: underlying illness the patient has precipitated the main causes of death.

#### **Ethical considerations:**

The St. Paul Hospital Millennium Medical College- institutional review board has given its approval for the ethical use of the data. This is not experimental study and stating experiments on humans and/or the use of human tissue samples is not applicable to this study. Since we used secondary data having consent of participant was not applicable to our

study. However, there is no information presented that could be linked with specific subject or group. Furthermore, we presented an aggregate data that could not be inferred to specific subjects.

Data were not collected directly from patients. No vulnerable populations were directly participated in the study. Paper forms used to collect study data, collected data were stored in secure locked cabinets. Data from questionnaires and study materials were entered into electronic databases. Both paper study forms and electronic database data had no identifying information. Electronic databases were stored on encrypted and password protected endpoint devices in accordance with guidelines.

## **Results**

Over the two and half year's study period, a total of 22,982 adult acutely sick patients visited the ED. There were 693 (3.02%) deaths registered in ED, among these, 53 charts were lost, 388 charts qualified the criteria for analysis while the remaining 252 (36.36%) charts were excluded because of incomplete records.

#### **Socio-demographic characteristics of study participants**

The Study participants' age ranges from 15 to 100 with a mean age of  $49.84 \pm 18.21$  years. More deaths occur in males (57%), with male to female ratio of 1.3:1.

Table 1 shows the socio-demographic characteristics of the study participants. The majority of the participants came from Addis Ababa region (52.8%) followed by Oromia (31.4%). Most participants were self-referred (31.4%) and died within 24 hours of presentation to ED followed by public hospitals referred 87 (22.42%) and unknown source of referrals were 52 (13.40%).

Patient flow and death over course of time were dynamic and being high in working day, day shift hours (Figure 1). More than three fourth of study participants (92.5%) had no previous ED visits within the last 30 days before death.

#### **Clinical characteristics of study participants**

Among reviewed charts, dead on arrival 22(6%), death on arrival were 35 (9%), deaths within 24 hours were 173(45%). Deaths after 24 hours were 149 (38%), and 9 (2%) death cases lengths of stay in ED were unknown. Most dying cases were transported by taxi (23.2%) followed by ambulance (19.07%), private car (17.5%), public transport (11.59%) walking (8.5%) other (4.38%) and unknown (15.72%).

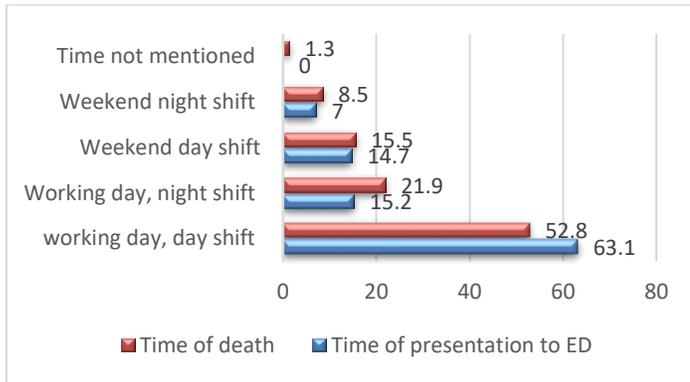


Figure 1 A bar graph representing percentage of ED deaths at different work shift from January 1 2020 to June 30 2022 SPHMMC Addis Ababa; Ethiopia.

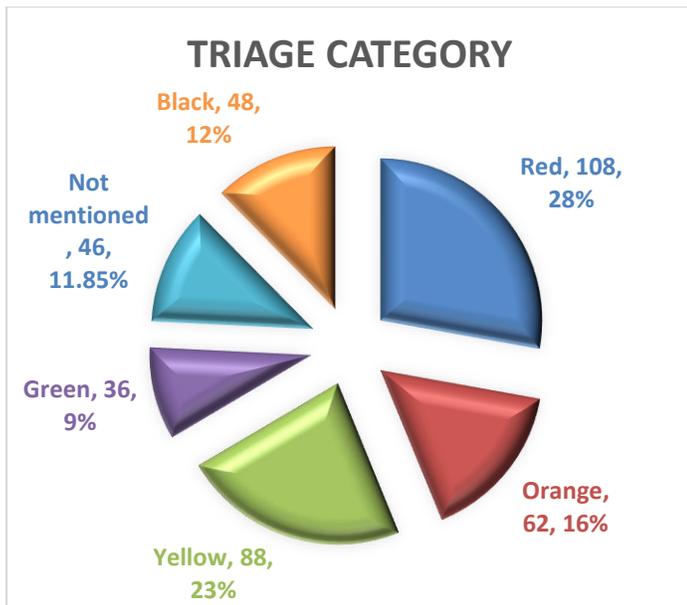


Figure 2 Triage category of died patients within ED from January 1 2020 to June 30 2022 SPHMMC Addis Ababa; Ethiopia.

Of all the deaths analyzed for this study, (99.48%) (Fig 2) were due to non-traumatic causes and mostly triaged red 108 (27.8%) followed by yellow (22.7%) and orange (16%) (table 1).

Table 1 Socio-demographic and clinical characteristics of patients who died in ED from

January 1 2020 to June 30 2022 SPHMMC Addis Ababa; Ethiopia.

Variables		Death on arrival N=22(6%)	Dead body on arrival N=35(9%)	≤24 hours N=17 3(45%)	≥24 hours N=14 9(38%)	Unk now n N= 9(2 %)	To tal N= 38 8
Address region	Addis Ababa	14	19	95	75	2	205
	Oromia	4	8	57	48	5	122
	Amhara	1	1	5	7	1	15
	SNNPR	1	1	7	6	0	15
	Benishangul Gumuz	0	0	3	2	0	5

	Gambela	0	0	0	1	0	1
	Dire Dawa	0	1	0	0	1	2
	Afar	0	0	1	3	0	4
	Tigray	0	0	0	2	0	2
	Sidama	1	0	0	1	0	2
	Other	1	5	4	3	0	13
	unknown	0	0	1	1	0	2
Referring institution	Public Hospital	2	1	39	43	2	87
	Health center	3	1	27	23	0	54
	Private Hospital	0	3	9	13	0	25
	Private clinic	0	0	2	0	0	2
	Self-referred	9	19	54	33	3	118
	Unknown	7	10	20	12	3	52
	SPHMMC-OPD	0	1	20	20	1	42
	Other	1	0	2	5	0	8
Mode of arrival	Ambulance	3	2	32	36	1	74
	Taxi	6	2	47	31	4	90
	private car	4	14	28	22	0	68
	Other	1	1	5	10	0	17
	Unknown	8	11	24	15	3	61
	public transport	0	5	24	16	0	45
	Walking	0	0	13	19	1	33
Duration of chief complaint	<3hours	4	14	22	3	1	44
	3-6 hours	0	0	15	2	0	17
	6-12 hours	0	0	25	5	0	30
	12-24 hours	1	0	65	11	3	80
	24-72 hours	1	0	18	35	1	55
	3-4 days	0	1	5	30	2	38
	≥5 days	1	0	16	57	0	74
	Unknown	15	20	7	6	2	50

Most of chief complaint duration were within 24 hours 44.1% of participants (table1). The principal top four causes of deaths were, sepsis/shock 65 (16.8%), respiratory disease 47 (12.1%), and renal diseases 44 (11.3%) followed by cardiovascular diseases 41(11.1%) (table 2).

Of all deaths (388), most frequently mentioned immediate cause of death was hypoxia 193(49.7%), followed by hypovolemia 82(21.1%), unspecified immediate causes of death 58(14.9%), acidosis 39 (10.1%), hypo/hyperkalemia 7(1.8%), Pulmonary thromboembolism 5 (1.3%),

Cardiac tamponade 2 (0.5%), tension pneumothorax and toxin each caused 1 (0.3%).

Table 2: Principal diagnosis caused deaths in ED from January 1 2020 to June 30 2022 SPHMMC Addis Ababa; Ethiopia

Category illness	Frequency	Percent
CNS	41	10.6
CVD	43	11.1
Respiratory	47	12.1
Renal	44	11.3
liver disease	27	7.0
UGIB	12	3.1
DM/complications	10	2.6
Malignancy	24	6.2
Sever Anamia	10	2.6
Sepsis/septic shock	65	16.8
other infection	2	0.5
psychotic/epilepsy	2	0.5
HIV/AIDS	1	0.3
Asthma/COPD	3	0.8
other non-trauma	6	1.5
unknown non-trauma	14	3.6
Total	388	100.0

### Multinomial logistic regression analysis for early ED mortality prediction

Table 3 displays the output of crude and adjusted odds ratio following logistic regression. In binary logistic regression analysis, triage category, duration of symptom, principal diagnosis, and comorbid illness fulfilled the criteria of p-values < 0.2 and transferred to multinomial logistic regression.

Table 3 Binary and Multinomial logistic regression of factors associated with early SPHMMC-ED mortality from January 1 2020–June 30 2022, Addis Ababa, Ethiopia.

Variables	P vale	COR 95%CI	P-value	AOR 95% CI
Orange triage category	0.023	10.2(1.36-76.3)	0.023	10.2(1.3-76.3)
Duration of chief complaint <3h	0.001	10.4(2.4-43.9)	0.001	10.4(2.4-43.9)
Duration of chief complaint 3-6h	0.001	21.5(3.4-134.0)	0.001	21.5(3.4-134.0)
Duration of chief complaint 6-12h	0.001	15.3(3.2-72.9)	0.001	15.3(3.2-72.9)
Duration of chief complaint 12-24	0.000	14.7(3.9-54.6)	0.000	14.7(3.9-54.6)
Respiratory diseases	0.028	12.5(1.3-120.5)	0.028	12.5(1.3-120.5)
Liver diseases	0.011	20.5(1.9-210.4)	0.011	20.5(1.9-210.4)
UGIB	0.043	14.5(1.1-194.9)	0.043	14.5(1.1-194.9)
DM/Complication	0.008	34.4(2.5-472.3)	0.008	34.4(2.5-472.3)
Severe anemia	0.012	29.5(2.1-413.2)	0.012	29.5(2.1-413.2)
Sepsis/septic shock	0.04	9.4(1.0-87.1)	0.04	9.4(1.0-87.1)

In the multinomial logistic regression, orange triage category, duration of C/C, principal disease being respiratory illness, liver diseases, UGIB DM and its complication, severe anemia and sepsis/ septic shock are associated with high odds of early ED mortality (Table 3).

### Discussion

SPHMMC- ED provided services to 22,982 acutely sick clients of which there were 693 registered deaths (3.02% crude mortality). Crude mortality rate is almost similar with the study done at Tikur Anbessa and other private hospitals, Addis Ababa (7, 8,9), In comparison with a cross sectional study done in one of urban Nigerian hospital (10) which is having a comparable patients flow amount (22,791), the crude mortality rate observed in this study is relatively higher, this difference could be explained by a difference in medical emergencies and the infrastructures of the hospitals.

The participant age ranges in between 15 to and 100, with mean age being  $49.84 \pm 18.21$  and in comparison, the average age of death increased by almost 5 years in relation to 3 years retrospective study in Tikur Anbessa Hospital (7), this discrepancy could be explained by the study time difference which directly related with an increase in mean life expectancy of the country.

The results regarding participant gender showed, male predominance (57%), with male to female ratio of 1.3:1. This finding is consistent with most studies finding at national as well as international level (9-15).

Most of dying patients' chief complaint was within a duration range of less than 24 hours, which implicated acutely sick patients seeking for medical care. This could also indirectly indicate a limited capacity of the hospital in managing acutely sick emergency patients and level of critical care provision.

This study showed that 99.48% of primary causes of death were medical emergencies. Of these, around half of the deaths were resulted from septic shock, respiratory failure, renal and cardiac diseases. In another study, prospective eight month study the most common causes of death being traumatic brain injury 21.5% followed by sepsis accounting about 18.8% followed by respiratory failure 15.1% (7) which is more or less consistent except brain injury. This could be explained by the difference in the focus of Emergency Departments of the two hospitals.

Underlying comorbidities of participants were mostly malignancy and renal disease being 12.6% each.

Most dying patients' length of stay is within 24 hours 173(45%) and those who stay longer than 24 hours accounts for 149 cases (38%) of all registered deaths. This implies that the early death pattern is significant in SPHMMC.

#### Multiple logistic regression analysis for early ED mortality

As per this study finding, orange triage category, duration of chief complaint with in the range of less than 24-hour, respiratory disease, liver disease, UGIB, DM and its complications, severe anemia, sepsis/septic shock are predictive for high likely deaths to happen within 24 hours of emergency stay in SPHMMC ED.

In the prospective 8 months study at Tikur Anbesa Hospital, positive predictive for early ED mortality were duration of symptoms in range of 4-48 hours and greater than 48 hours (7). In another retrospective three years study patient's residency in Addis Ababa and Oromia were highly likely to die within 72 hours and triage being red is negative predictive of early mortality (8). The difference in predictive factors cannot be explained and further multicenter large-scale study shall be done.

Despite the fact that this is a retrospective cross-sectional single-center study, which makes generalization difficult, it provides data on patterns and causes of death at SPHMMC Emergency Department. We believe this study clearly indicated the gap in managing critical cases within the first 24 hours of hospital stay.

## Conclusion

The majority of patients with orange category, sepsis/septic shock, pulmonary, UGIB, hepatic, respiratory and DM and its complication died within 24 hours of presentation. Because ED mortality is particularly high in SPHMMC-ED. Thus, the current functioning emergency and critical care infrastructure, and early medical intervention should be assessed to identify the gap in managing critical patients within 24 hours of hospital stay. As both client flow and death are higher at week day, day-shift, special attention should be paid to hospital staff shifts during working days and daytime shifts. The prospective potential strategy to reduce high early death at emergency department of SPHMMC should also consider addressing septic shock, respiratory failure, renal and cardiac diseases.

## Abbreviations

AOR	Adjusted odds ratio
BLH	Black lion Hospital

C/C	Chief complaint
COR	Crude odds ratio
DOA	Dead on arrival
DM	Diabetes mellitus
ED	Emergency department
HIMS	Health information management system
LMIC	Low-and middle-income country
LOS	Length of stay
SPHMMC	St. Paul hospital millennium medical college
UGIB	Upper gastrointestinal bleeding

## Declarations

### Consent for publication

Participants consented for unanimous sharing of compiled data as approved by the IRB of the college at SPHMMC

### Ethical declaration

The St. Paul Hospital Millennium Medical College- institutional review committee has given its approval for the ethical use of the data. All-study methods, and protocols, were carried out in accordance with SPHMMC, Ethiopian national and regional regulations and Guidelines. This is not experimental study and stating experiments on humans and/or the use of human tissue samples is not applicable to this study. Since we used secondary data having consent of participant was not applicable to our study.

### Acknowledgments

Special thanks to data collectors, SPHMMC and research directorate for providing permission as well institutional review board fast response for data collection, SPHMMC-ED, and all involved.

### Authors' contributions

WD conceptualized the research problem, designed the study, SM, BK, RS, EA conducted fieldwork collected and data analyzed, and drafted the manuscript. BD, TS, GB, ZD was involved in conceptualization, preparing the research proposal, and revising the final manuscript. All authors of the manuscript have read and agreed to its content.

### Funding

We have no any funder

### Competing interest

All authors read and approved the final manuscript. We have no any conflict of interest.

## Availability of Data and Materials

The datasets used in the current study or data collection tool are available from the corresponding author with a reasonable request.

## References

1. Everybody's business: strengthening health systems to improve health outcomes: WHO's framework for action. World Health Organization; 2007. p. 1–56. ([http://www.who.int/healthsystems/strategy/everybodys\\_business.pdf?ua=1](http://www.who.int/healthsystems/strategy/everybodys_business.pdf?ua=1))
2. Hirshon JM, Risko N, Calvillo EJ, Stewart de Ramirez S, Narayan M, Theodosios C, O'Neill J; Acute Care Research Collaborative at the University of Maryland Global Health Initiative. Health systems and services: the role of acute care. *Bull World Health Organ*. 2013 May 1;91(5):386-8. doi: 10.2471/BLT.12.112664. Epub 2013 Jan 31. PMID: 23678202; PMCID: PMC3646345.
3. Hsia R, Razzak J, Tsai AC, Hirshon JM. Placing emergency care on the global agenda. *Ann Emerg Med*. 2010 Aug;56(2):142-9. doi: 10.1016/j.annemergmed.2010.01.013. Epub 2010 Feb 6. PMID: 20138398.
4. Razzak JA, Kellermann AL. Emergency medical care in developing countries: is it worthwhile? *Bull World Health Organ*. 2002;80(11):900-5. Epub 2002 Dec 3. PMID: 12481213; PMCID: PMC2567674.
5. Germa, F., Bayleyegn, T., Kebede, T., Ducharme, J., and Bartolomeos, K. (2013). Emergency medicine development in Ethiopia: Challenges, progress and possibilities. *African Journal of Emergency Medicine*, 3(1), 3–9. <https://doi.org/10.1016/j.afjem.2012.08.005>
6. SPMMC. (2022). St. Paul's Hospital millennium medical college strategic plan 2018/19-2022/23 (1<sup>st</sup> ed. Vol1) (E-book). St. Paul Hospital millennium medical college.
7. Hunchak, C., Teklu, S., Meshkat, N. *et al*. Patterns and predictors of early mortality among emergency department patients in Addis Ababa, Ethiopia. *BMC Res Notes* 8, 605 (2015). <https://doi.org/10.1186/s13104-015-1592-z>
8. Yosha, H.D., Tadele, A., Teklu, S. *et al*. A two-year review of adult emergency department mortality at Tikur Anbesa specialized tertiary hospital, Addis Ababa, Ethiopia. *BMC Emerg Med* 21, 33 (2021). <https://doi.org/10.1186/s12873-021-00429-z>
9. Misganaw A, Mariam DH, Araya T, Ayele K. Patterns of mortality in public and private hospitals of Addis Ababa, Ethiopia. *BMC Public Health*. 2012 Nov 20; 12:1007. doi: 10.1186/1471-2458-12-1007. PMID: 23167315; PMCID: PMC3520706.
10. Ekere AU, Yellowe BE, Umune S. Mortality patterns in the accident and emergency department of an urban hospital in Nigeria. *Niger J Clin Pract*. 2005 Jun;8(1):14-8. PMID: 16392450.
11. A.B. Chukuezi and J.N. Nwosu, Pattern of Deaths in the Adult Accident and Emergency Department of a Sub-Urban Teaching Hospital in Nigeria, *Asian Journal of Medical Sciences* 2010,2(2): 66-69
12. Onwuchekwa AC, Asekomeh EG, Iyagba AM, Onung SI. Medical mortality in the Accident and Emergency Unit of the University of Port Harcourt Teaching Hospital. *Niger J Med*. 2008 Apr-Jun;17(2):182-5. doi: 10.4314/njm.v17i2.37380. PMID: 18686836.
13. Osime OC, Ighedosa SU, Oludiran OO, Iribhogbe PE, Eikhamenor E, Elusoji SO. Patterns of trauma deaths in an accident and emergency unit. *Prehosp Disaster Med*. 2007 Jan-Feb;22(1):75-8. doi: 10.1017/s1049023x00004374. PMID: 17484367.
14. Afuwape OO, Ogunlade SO, Alonge T, Ayorinde OR. An audit of deaths in the emergency room in the University College Hospital Ibadan. *Niger J Clin Pract*. 2009 Jun;12(2):138-40. PMID: 19764660.
15. Ugare GU, Ndifon W, Bassey IA, Oyo-lta AE, Egba RN, Asuquo M, Udosen AM. Epidemiology of death in the emergency department of a tertiary health center south south of Nigeria. *Afr Health Sci*. 2012 Dec;12(4):530-7. doi: 10.4314/ahs.v12i4.21. PMID: 23515365; PMCID: PMC3598296.