

Addis Ababa
University
(Since 1950)



**ADDIS ABABA UNIVERSITY COLLEGE OF HEALTH SCIENCES, SCHOOL OF
MEDICINE DEPARTMENT OF EMERGENCY MEDICINE**

**AN AUDIT OF PEDIATRIC MORTALITY PATTERNS IN PEDIATRIC EMERGENCY
UNIT OF TIKUR-ANBESSA SPECIALIZED HOSPITAL IN ADDIS ABABA CITY,
ETHIOPIA, 2017G.C**

BY: -GEMECHU JOFIRO (BSC NURSE)

**A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES OF ADDIS ABABA
UNIVERSITY, COLLEGE OF HEALTH SCIENCE SCHOOL, OF MEDICINE,
DEPARTMENT OF EMERGENCY MEDICINE IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN EMERGENCY
MEDICINE AND CRITICAL CARE NURSING**

JUNE 2017G.C

ADDIS ABABA, ETHIOPIA

**ADDIS ABABA UNIVERSITY COLLEGE OF HEALTH SCIENCES, SCHOOL OF
MEDICINE DEPARTMENT OF EMERGENCY MEDICINE**

**AN AUDIT OF PEDIATRIC MORTALITY PATTERNS IN PEDIATRIC EMERGENCY
UNIT OF TIKUR-ANBESSA SPECIALIZED HOSPITAL IN ADDIS ABABA CITY,
ETHIOPIA, 2017G.C**

BY: -GEMECHU JOFIRO (BSC NURSE)

ADDRESS:-Tel. -0922-51-84-47

-Mail:-gimechujofiro12@gmail.com

**ADVISORS -TIGIST BACHA (MD, MPH, PEDIATRIC EMERGENCY &
CRITICAL CARE)**

-LEMLEM BEZA (BSC, MSc EMCC)

**A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES OF ADDIS ABABA
UNIVERSITY, COLLEGE OF HEALTH SCIENCE, SCHOOL OF MEDICINE,
DEPARTMENT OF EMERGENCY MEDICINE IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN EMERGENCY
MEDICINE AND CRITICAL CARE NURSING**

JUNE, 2017G.C

ADDIS ABABA, ETHIOPIA

Addis Ababa University School of Graduate Studies

Approval by the board of examiners

This is to certify that the thesis by Gemechu Jofiro accepted by the board of examiners to partial fulfillment of the requirement for the degree of Master of Science in Emergency medicine and critical care nursing.

Research Advisors

Full Name _____ Dr.Tigist Bacha

Rank _____ MD, MPH, Pediatric Emergency & critical care

Signature _____

Date _____

Full Name _____ Lemlem Beza

Rank _____ BSC, MSc EMCC

Signature _____

Date _____

Examiner

Full Name _____

Rank _____

Signature _____

Date _____

Chair of Department

Full Name _____

Rank _____

Signature _____

Date _____

ACKNOWLEDGEMENT

I would like to thank my advisors, Dr.Tigist Bacha and instructor Lemlem Beza for their friendly approach, assistant, and support starting from proposal development until final result submission.

I am also grateful to Addis Ababa University, college of health science, School of medicine, Department of emergency medicine for providing such an opportunity of studying on my interest and financial sponsor for this project.

I would also like to thank pediatric emergency department coordinators and card room staff of TASH, data collectors and supervisor for their commitment during data collection.

The last but not least my deepest gratitude also goes to Nifas Silk Lafto Sub-city woreda 12 Health Center staffs for assisting and helped me by providing different support for the accomplishment of this study.

ABSTRACT

Background: Globally and Sub-Saharan Africa country still now childhood mortality rates remain high. In Ethiopia, child mortality rates dropped 71% from 1990 to 2015, however it is still around 184,000 Ethiopian children die each year. More deaths of children in hospital often occur within the first 24hrs of admission. Many of these deaths occur from preventable causes. The most causes are pneumonia, diarrhea, circulatory impairment, severely mental function altered and sepsis.

Objective: To assess causes and associated factors of pediatric emergency mortality in pediatric emergency unit at Tikur-Anbessa Specialized Hospital in Addis Ababa city, Ethiopia.

Methodology: A five years retrospective study review of pediatric mortality from neonate to 13 years was conducted at the pediatric emergency unit. The data was entered to epi-data version 3.1 software and the data was exported to Statistical Package for Social Science Version 20, then result analyzed by using descriptive statistics, Pearson chi-square, and logistic regression. Final result was displaced by graph, tabulation, texts and pie-chart.

Result: This study found that from 12,240 pediatric patients that entered to admitted pediatric emergency unit only about 449(4.1%) documented as death outcome with 107(31.7%) of early mortality rate. The average mean of study participant age was 37.46 months and more mortality rate found among neonate age group 69(6.5%). A 298(88.2%) of pediatric emergency mortality was due to medical emergency cases that more consists cardiovascular diseases and respiratory diseases. About 146(43.2) primary cause of death was concomitant with secondary causes of deaths. Malnutrition 60(41.1%) was the most leading causes of co morbidity with primary causes. Early mortality was strongly significant association with late come to ED (AOR=1.865, CI=1.103-3.152, P= 0.020) and diarrheal diseases (COR=0.221, CI=0.054-0.903, P=0.036).

Conclusion and recommendation: In this study Pneumonia 60(17.8%), Congestive heart failure 46(13.6%) and sepsis 40(11.8%) were the top causes of pediatric emergency mortality in pediatric emergency unit. So that early identifying and intervention is very important to decrease pediatric emergency mortality.

ACRONYMS AND ABBREVIATIONS

- AAUAddis Ababa University
- ABC.....Airway Breathing Circulation
- AIDS.....Aquarid Immune Deficiency Syndrome
- AOR.....Adjusted Odd Ratio
- ARDS.....Acute Respiratory Distress Syndrome
- CDC.....Communicable Disease Control
- CHD.....Congenital Heart Defect
- CHF.....Congestive Heart Failure
- CI.....Confidence Interval
- CNSCentral Nerve System
- COR.....Crude Odd Ratio
- ED.....Emergency Department
- EDHS.....Ethiopia Demographic and Health Survey
- GBS.....Guillain-Barre Syndrome
- GC.....Gregorian Calendar
- HEP.....Health Extension Programs
- HIV.....Human Immune Deficiency virus
- HTN.....Hypertension
- IQ.....Inter quarter
- MDG.....Millennium Development Goals
- PED.....Pediatric Emergency Department
- SD.....Standard Deviation
- SPSSStatistical Package for Social Science
- SOB.....Shortness Of Breathing
- TASHTikur-Anbessa Specialist Hospital
- TB.....Tuberculosis
- WHO.....World Health Organization
- U5MR.....Under Five Mortal Rate
- USA.....Unite State of America
- ZMH.....Zewditu Memory Hospital

TABTLE OF CONTENT

Content	page
ACKNOWLEDGEMENT	i
ABSTRACT	ii
ACRONYMS AND ABBREVIATIONS	ii
TABTLE OF CONTENT	iv
LIST OF TABLES	vi
LIST OF FIGURES	vii
1. INTRODUCTION	1
1.1. Back ground	1
1.2. Statement of the Problem	3
1.3. Significance of study	4
2. LITERATURE REVIEW	5
2.1. Literature review on pediatric mortality over globally	6
2.2. Literature review on pediatric mortality over Africa	8
2.3. Literature review on pediatric mortality over Ethiopia	11
2.4. Conceptual framework	13
3. OBJECTIVES	14
3.1. Generally Objective	14
3.2. Specific Objectives	14
4. METHODOLOGY	15
4.1. Study area	15
4.2. Study period	15
4.3. Study design	15
4.4. Source & Study population	15
4.4.1. Source Population	15
4.4.2. Study Population	16
4.5. Eligibility Criteria	16
4.5.1. Inclusion criteria	16
4.5.2. Exclusion criteria	16
4.6. Sample technique and sample size determination	16
4.7. Variables	16

4.7.1. Dependent variable.....	16
4.7.2. Independent variable	16
4.8. Operational definitions.....	16
4.9. Data collection tools and procedures	18
4.11. Data quality assurances	18
4.12. Data processing and analysis	19
4.13. Ethical consideration	19
4.14. Dissemination of results.....	19
5. RESULT	20
6. DISCUSSION.....	32
7. STRENGTH AND LIMITATION THE STUDY	36
8. CONCLUSION AND RECOMMENDATION.....	37
8.1. CONCLUSION.....	37
8.2. RECOMMENDATION.....	38
REFERENCE	39
ANNEX	44

LIST OF TABLES

Table	page
Table 1: Distribution of socio-demographic characteristics and clinical presenting features of study participants in pediatric emergency unit at TASH between 2012-2016G.C.....	22
Table 2: Primary causes of death at pediatric emergency unit at TASH between 2012-2016 G.C.....	24
Table 3: Co morbidity with top ten causes of death in pediatric emergency unit at TASH.....	27
Table 4: Distribution of age category groups with top ten causes of mortality in PE unit.....	28
Table 5: Distribution of relationship between socio-demographic characteristics, clinical presenting features and causes of death of study participants with time to death by chi-square test. ...	29
Table 6: Distribution of association between socio-demographic characteristic, causes of death & clinical presenting features of study participants with time to death by logistic regression	31
Table 7: primary causes of pediatric emergency mortality questioner.....	47
Table 8: Secondary causes of pediatric emergency mortality questioner.....	48
Table 9: Socio-demographic characteristic for pediatric patients admitted into pediatric emergency unit between 2012-2016G.C at TASH dummy table.....	49
Table 10: Sex identification among pediatric age division group patients admitted in pediatric emergency unit between 2012-2016G.C at TASH dummy table	49
Table 11: Socio-demographic characteristic and clinical presenting feature variables of pediatric emergency mortality between 2012-2016G.C at TASH dummy table.....	50
Table 12: Common presenting sign and symptoms, duration of sign and symptoms of pediatric emergency mortality patients when came to pediatric emergency unit at TASH dummy table ...	51
Table 13: Months of pediatric age mortality in pediatric emergency unit at TASH dummy table.....	51
Table 14: Underline primary causes of pediatric emergency mortality at TASH dummy table ...	52
Table 15: Underline secondary causes of pediatric emergency mortality concomitant with primary causes at TASH dummy table	53

LIST OF FIGURES

Figure	page
Figure 1: Conceptual framework causes of pediatric emergency mortality	13
Figure 2: Sex identification among pediatric age division group patients admitted in pediatric emergency unit between 2012-2016G.C at TASH	20
Figure 3: Age categories with mortality rate and number of admitted into pediatric emergency unit between 2012-2016G.C at TASH.....	21
Figure 4: Monthly mortality patterns occurred in pediatric emergency unit at TASH between 2012-2016G.C.	21
Figure 5: Clinical common presenting symptoms of study participants in pediatric emergency unit at TASH between 2012-2016G.C.....	23
Figure 6: Concomitant causes for pediatric emergency death at TASH between 2012-2016 G.C.....	26

1. Introduction

1.1. Back ground

Pediatric emergency medicine is well developed and organized discipline in developed regions [1]. However it is still immature in many regions of the world [1]. In China, emergency medicine has undergone great changes since the 1980s; however, it is an area that needs specialty and formal training, particularly in pediatric emergency medicine. Because of the large population and its distribution, access to emergency care and its quality remain a significant challenge to the healthcare system in China. Hence, the quality of emergency care for critical ill children varies widely in different tertiary hospitals that result from serious overcrowding around pediatric emergency departments [2].

According to UNICEF ,World Bank in 2014 report that in African region still has a child mortality rate of 92/1,000 live births which is more than 15 times the average mortality of developed regions. Globally nearly all the death about 99% of 7.7 million recordable deaths of children in 2010 occurred in developing countries including Nigeria [3].

For effective intervention and care of children in complex emergency health system plan from individual to the national level required effort and coordination is very important to address critical clinical issue that result mortality [4]. As a guideline recommendation to effectively managing complex emergency cases to require properly trained and supervised health care workers, adequate and appropriate drug supplies, knowledge of local epidemiology and appropriate health-seeking behavior, accessible health care facilities, functioning referral systems and sufficient funding [4].

In resource-poor countries proportions of under-5 mortality mainly caused by Pneumonia and Diarrhea, which account about 20% and slightly followed by Malaria, AIDS, Acute respiratory tract infection, Measles, and malnutrition [4].

On the other hand the mortality of complex emergency cases, severity and magnitude of these diseases are exacerbated by different factors like conflict or disasters, late assessment, late treatment, diarrhea and nutritional status of individual have great roles to contribute substantially to child morbidity and mortality [5].

In Africa most children die from preventable communicable diseases and malnutrition disorders [6]. These challenges have been attributed to poor environmental health conditions, poverty and ignorance as mainly responsible for the high mortality rates [6].

Most of children presenting PE unit with different emergency signs like obstructed or absent of breathing, severe respiratory distress, central cyanosis, signs of shock, coma, seizures and diarrhea. Out of these emergency signs respiratory distress and hypoxemia, severely impaired circulation or shock and seizures with altered consciousness more dominant [7].

Immediate treatment and management is begun when any emergency sign is identified by assessment of ABC until the end of the algorithm by following WHO integrated pediatric emergency management guideline recommendation [8]. This approach has been reducing pediatric mortality but implementation and consistency varies, which result deaths of children within the first 24hrs hospital admission by preventable disease like pneumonia, sepsis, malaria, anemic heart failure, acute respiratory tract infections and diarrheal diseases [9, 10, 11, 12].

In previous many studies on pediatric hospital mortality in sub-Saharan Africa have shown that poor in pediatric triage system, infrequent assessment, and poor emergency treatment, which result high pediatric mortality with early death after hospitalization admission [13]. Study conducted in Malawi at Lilongwe referral hospital shown that there were high volumes pediatric age mortality rates experience in pediatric emergency unit. Despite, introducing triage system in pediatric emergency unites for children presenting with acute illness with early intervention, early mortality decreased from 47.6 to 37.9 deaths per 1000 admissions by using simple and inexpensive interventions to improve pediatric emergency mortality [14].

Today they are many public health sector built in Ethiopia, however no more well-organized pediatric emergency unit, so that there is limited information about pediatric mortality patterns, cause and associated factors [15]. General it is better to understand determinant causes and associated factors of pediatric emergency mortality in pediatric emergency unit. So that this study will be to assess causes and associated factors of pediatric emergency mortality in pediatric emergency unit at TASH in AA, Ethiopia.

1.2. Statement of the Problem

The death of a child in the ED is one of the most challenging problems facing emergency health care providers with carry out many complex tasks and treat a patient experiencing an acute and evolving medical situation like encompassing acute unanticipated trauma, stillbirth or extreme preterm birth, dead on arrival, dead shortly after passing through the ED, and even the child with a known life span-limiting condition for whom the ED becomes the location of end-of-life care [16].

Addition to the above challenge the basic equipment and supplies needed to care for children of all ages is another problems in pediatric emergency room. Even in USA as National Hospital Ambulatory Medical Care Survey, reported that only 6% of PEDs have all of the recommended pediatric supplies and equipment as outlined in previously published national guidelines [16].

On the other hand relative lack of pediatric experience, lack of awareness and trained staff to care for children, and policies and procedures that ensure early transfer to definitive care, limited exposure to critical ill or injured pediatric patients were the main challenge of health care provider in pediatric emergency unit of USA [16]. So that majority of pediatric mortality in hospital often occurs within 24 hours of admission from preventable disease [17]. Globally, high child mortality rate still now. Further improvements in the quality and timeliness of child-mortality measurements should be possible by more fully using existing datasets and applying standard analytical strategies [18].

In Sub-Saharan Africa the main challenge facing health services at a clinical and community level how to identify those who are at greatest risk with modifiable risk factors, depend on clinical evaluation, early intervention and managing of emergency situation [19, 20]. Those modifiable risk factors refer to events, actions or omissions to contribute on pediatric mortality by address easily locally a viable intervention. The main risk factors are related with family, caregiver, resource and health care providers [21, 22].

To improve pediatric emergency care it is important to identify factors associated with mortality in admitted children in the hospital periodically [23]. In developing countries every year about 10–20% most severely sick children are admitted into hospital due related risk factors. Specially, in Africa pediatric mortality in hospitals remains unacceptably high that related with risk factors [24, 25, 26].

Ethiopia is one of the poorest and second most populous countries in sub Saharan Africa. As one of the least developed countries that faced with many social and economic problems, lack of basic needs of life such as food, clothing, housing, and health care, education, safe and healthy environment as consequences of the uncontrolled and rapid increase of population growth [27].

In fact that in Ethiopia there was no well-structured emergency care system because of lack of resource, lack of emergency trained human power, inadequate emergency medical equipment's, poor coordinated emergency medical care system, lacks the basic infrastructure for delivering emergency care, lack of a proper triage system and the lack of a designated emergency center make it difficult to provide emergency care service with appropriate triage protocols, rapid diagnosis and timely intervention [28].

Addis Ababa is largest capital city of Ethiopia and its highly urbanized activity and daily changes life style of their residents, which enhance multiple factors like accidental injuries and communicable disease those, require high quality of emergency care. In AA some of hospitals provide Pediatric emergency service and even, not well-equipped, lack of trained human power and lack of material resources. Due to the above problems still now high early mortality in Addis Ababa, Ethiopia [29].

Since there is no published study conducted in AA to assess causes and associated factors of pediatric emergency mortality in pediatric emergency unit. Therefore this study will be aimed to determine the causes and associated factors of pediatric emergency mortality in pediatric emergency unit by review of retrospective method for five years documents at TASH in Addis Ababa, Ethiopia.

1.3. Significance of study

The death of children in the emergency department is one of the most challenging problems facing Emergency department clinicians and very painfully issue at community and family level. So that to know the basic determinant causes and risk factors that enhance pediatric age mortality is mandatory for health policy maker and show the correct direction for decision making toward causes of pediatric emergency mortality at nation and international level, on the other hand this study inform that increasing quality of pediatric emergency care is very important because of still now high early mortality after hospital admission in our country is similar with others low income countries.

In addition to that understanding the main causes of pediatric mortality and identifying associated factors that aggravated severity of illness to make health care provider conscious to early intervention for the pediatric patients and change an attitude of the staff's traditional handling of pediatric patient and relatives, way of triaging prioritization according to severity of problems and early managing without delay and serve as to fill gap among health care provider.

Also a better understanding of this information on admitted children in all age categories, may aid in efforts to improve pediatric hospital triage system, hospital resource allocation, and overall care by available data that is limited on pediatric age and does not include a complete analysis of demographics variables, mortality patterns, and determinant causes of mortality and associated factors in many pediatric emergency department of hospitals.

Finally as researcher knowledge still now no published study conducted in Ethiopian to address causes and associated factors of pediatric emergency mortality in pediatric emergency unit, So that this study will be give better information on causes and associated factors of pediatric emergency mortality for other study researcher as a baseline.

2. LITERATURE REVIEW

2.1. Literature review on pediatric mortality over globally

Worldwide mortality in children younger than 5 years has dropped from 11.9 million deaths in 1990 to 7.7 million deaths in 2010, consisting of 3.1 million neonatal, 2.3 million infant, and 2.3 million childhood deaths. Out of total death of children younger than five about 33.0% of deaths occur in south Asia, 50% in sub-Saharan Africa and less than 1% of deaths occurring in high-income countries [30].

However, Globally across 21 regions the rate pediatric mortality decline from 1990 to 2010 with 2.1% per year for a neonatal, 2.3% for infant and 2.2% for childhood mortality. In 13 regions of the world, including all regions in sub-Saharan Africa, there is evidence of accelerating declines from 2000 to 2010 compared with 1990 to 2000. Within sub-Saharan Africa, rates of decline have increased by more than 1% in Angola, Botswana, Cameroon, Congo, Democratic Republic of the Congo, Kenya, Lesotho, Liberia, Rwanda, Senegal, Sierra Leone, Swaziland, and Gambia [30].

Also in industrialized countries in 2002, 7/1,000 children died before they were 5 year. In South Asia, 97/1,000 children died before they were five. Among deaths in children, South-central Asia has the highest number of neonatal deaths, while sub-Saharan Africa has the highest rates. And in sub-Saharan Africa, that number is 174/1,000 children. The admission burden to pediatric wards or the emergency room in African hospitals is very high, with many children presenting with complications of common infectious diseases such as sepsis and malaria. Life threatening complications, including shock, are frequently present and mortality rate is high, at 15–30% [31].

One of the main factors that increase pediatric mortality was mode of transportation. So that, The early careful evaluation ,anticipate any complication during transportation with well-equipped and trained health care provide to save the live as pre-hospital care by using modern transportation system that enhance good communication between referring and receiving [32].

However study at Bellevue Hospital and Harlem Hospital in 2007 about 2633 patients between neonate to 18 years of age enter pediatric emergency unite only 7% and 5% of ED visits arrived by ambulance respectively [33]. Other study shown that more than half or around (56.2%) were willing to consider transportation by taxi or car, the rest may use ambulance as alternative, this mighty result high early mortality [34]. Emergency ill infants and children are often inadequately recognized and stabilized by health care facilities in the developing world. This deficiency contributes to high pediatric mortality rates, particularly early during hospitalization [34].

The study conducted in India from 2003 to 2012 extracted retrospectively totally there were 5815 admissions 1 month-18yrs. Out of 487 deaths occurred around 237 (48.6%) infant, 138 (28.3%) 1-5

years and 112 (23%) children >5 years causes by Pneumonia, CNS infections and Diarrhea. Severe Malnutrition (42%) was the major contributing cause of mortality [35].

In 2015 Study conducted in China shown that from 2011-2013, 466,919 Patients treated in the Pediatric ED. Among this 230 patients died with a mortality rate of 0.5 cases per 1 000 visits out of this 89.1% deaths occurred less than 3 years old, this consisted neonate(29.1%), infant (40%) and childhood (20%). The number of boys was greater than that of girls, with a ratio of 1.4:1. From total numbers of death only 32 (13.9%) patients who were transported by the emergency transportation system out of these 104(45.2 %) patients died on arrival, 40% patients died within 24 hours after their admission and 9.6% patients died over 48 hours upon admission [36].

The main causes of the deaths was medical emergency diseases that consists respiratory diseases (Severe pneumonia (82.4%), neuromuscular disorders (intracranial infection 45.5%), and cardiovascular diseases (congenital heart disease 62.1%) and the other causes for the deaths included the hematological diseases, malignant tumors (mainly leukemia), or digestive diseases including congenital biliary atresia and diarrheal disease, surgery diseases accounts 2.6% including intestinal perforation and obstruction, accidents or unintentional injuries was 5.7% (drowning, trauma, asphyxia caused by foreign body aspiration or infant asphyxia, and poisoning) and uncertain causes about 21.7% were responsible for the deaths [36].

On the other hand Global non-communicable diseases like pediatric oncology are causes of death and disability over pediatric age groups [37]. In each day more than 522 children are diagnosed with cancer around the world. Of this more prevalence about 85% children diagnosed for cancer are virtually given a death sentence in developing countries. So that for children with cancer who live in resource-poor countries, access to information, early detection, accurate diagnosis and effective, affordable treatment are all major barriers to survival on life [38].

Congenital heart disease is the most common major birth defect, affecting millions of children with every 120 newborns; one is affected by CHD [38]. In developing countries high number children affected by congenital and acquired heart diseases, particularly due to lack of access to skilled medical professionals and appropriate treatment that related with absence of pediatric cardiac programs in low and middle-income countries. Much of acquired heart disease could be prevented by the systematic implementation and cost-effective interventions. Failure to implements this systematically intervention is increase to fatal heart damage that requires complex surgery and life-long medical follow-up [38].

2.2. Literature review on pediatric mortality over Africa

In developing world about 11 million every year, 29,000 every day and 21 each minute children deaths, mainly from preventable causes that account more than 70% which attributable to six causes like diarrhea, malaria, neonatal infection, pneumonia, preterm delivery, or lack of oxygen at birth as well as some of the deaths occur from illnesses like measles, tetanus, HIV/AIDS, trauma and malnutrition [39]. Also two-thirds of deaths occur in just about 10 low income countries that involve around four million babies per year die in the first week of life [39].

A retrospective study conducted in Benin-city at University of Benin Teaching Hospital about 3,261 patients aged between 29 days and 16 years were admitted into the pediatric emergency room. Out of these, 56.3% were males while 43.7% were females. Only about 4.4% patients were died, of this over 80% being children less five years and about 20% above 5 years. Severe malaria accounted for the largest number of deaths (29.4%) followed by meningitis (16.9%) and septicemia (15.4%) with over 80% of the deaths being from infectious diseases [40].

A study conducted at Federal teaching hospital Abakaliki in Nigeria indicated that a total of 1022 patients aged from birth to 18 years were seen with a mean age of 1.9 ± 2.6 years and Males were (58.8%) greater than females (41.2%). The most common diagnosis was diarrheal disease (36.1%) followed by malaria (16.2%), pneumonias (11.7%), Anemic heart failure (9.5%), septicemia (8.0%), meningitis (6.0%), and others (12.5%). Majority of the mortality was in infancy (52.9%) followed by other under-fives (38.2%), 5-10 years age range (1%) while 3 (2.9%) amongst adolescents, those deaths occurred more in January and November (20.6%) followed by deaths in December (15.7%) and then in September (10.8%). Newborn age group majority of mortality accounted by male (70%) while remain (30%) is female with the most causes of mortality by bacterial sepsis followed by prematurity [41].

Amongst the infant diarrhea (51.9%) was the most common cause for deaths followed by pneumonia (16.7%), sepsis (11.1%), anemic heart failure (7.4%), and malaria (5.6%). In per-school age patients again diarrhea (38.5%) was the most common cause of death followed by malaria (17.9%), anemic heart failure (12.8%), and meningitis (7.7%). The death in the school age group was due to diarrhea while deaths in adolescence were due to chronic liver disease. Deaths occurred most frequently within 24 hours, and this was statistically significant causes of mortality [41].

Another study conducted the same year with the above study about 12,442 children with age from birth to 17 years admitted in Nigerian teaching hospital. Out of this, a total of 17.5% pediatric mortalities were documented. Among this 402 deaths occurred in males while 290 deaths occurred in females.

Neonatal deaths accounted for the most common cause of death constituting (48.4%) of all deaths. This was followed by deaths occurring among under-5 children and infants constituting (20.0%) and (18.0%) respectively and least by age between 5-17yrs (15.5%). In neonatal age group deaths occurring in the first week of life is more frequent than those occurring after the first week of life [42]. Among the neonatal mortality patterns the most common causes of early neonatal mortality were severe birth asphyxia and prematurity accounting (28.2%) and (27.3%) respectively. This again is closely followed by septicemia constituting (26.7%). Of the 128 infant mortality, septicemia was the most frequent cause of infant mortality accounting (21.8%), Bronchopneumonia and severe Malaria constituted (18.7%) and (15.6%) respectively. The mortality of under 5 years account about 142 affected by severe malaria (36.6%) followed by Septicemia, Viral hemorrhagic fever and Pneumonia that accounts about (13.4%), (12%) and (7.1) respectively. A total of 97 deaths were recorded between the ages of 5 to 17 years by malignancy (15.4%) and septicemia (15.4%) as top killer followed by meningitis, severe malaria and severe anemia [42].

A study conducted in Malawi and Kilifi in Kenya found that malnutrition and diarrheal was associated factors that increase co morbidity of pediatric mortality upon hospital admission [43, 44, 45].

The study conducted in Ghana shown that the death of pediatric age in pediatric emergency unit by assessing nutritional status with weight for age who were malnourished (z-score SD < -2 about is (67.0%)) when compared with well-nourished (z-score SD $\geq$ -2 was about (33.05%)) and a previous episode of diarrhea within the last one year that account about 40.5 % compared with children with no previous episode of diarrhea within the last one year highly significantly associated with pediatric mortality in pediatric emergency unit. The most source of referral was from self-referral (75.8%) whereas from health institution which account about (24.2%) and indicated that no association between pediatric mortality in pediatric emergency unit [46].

Fever was the most frequent presenting feature in cases (83.3%) followed by shortness of breathing, pallor, fever with complaint of duration sign and symptoms before presentation PED, $\leq$ 2 days (25.7%), >2 days (74.3%) but no any association between sign and symptoms of duration before presentation ED and mortality of pediatric emergency in pediatric emergency unit. The main causes of pediatric mortality found that around 84.2 % involve that pneumonia, gastroenteritis, malaria, septicemia, malnutrition, HIV infection and meningitis. From total number of pediatric mortality around (35.8%) and (15.0%) Previous hospital visits and admission within the last year in pediatric emergency unit respectively [46].

In 2015 study conducted South East Nigeria found that total admitted in pediatric emergency about 12.6% recorded as mortality rate. From total death of ED slightly more number of female (52.2%) than male (47.8%) was reported. The greater percentage of mortalities (74.1%) occurred within 24hrs of presentation to ED with least mortality for school age children (6%) than the remains pediatric age groups. The most common signs and symptoms preceding presentation in the children that died are fever, fast breathing and loss of consciousness with only 15.1% of the patients presented within less than two days of onset of symptoms while the remains come to after 2days onset of signs and symptoms to ED and more complicated [47].

In Nigerian enactment of the 4th millennium goals efforts have been geared towards creating awareness on childhood diseases and the control of communicable diseases, improving infrastructures and provide vaccines have preventing the occurrence of tetanus and supports the low death rates recorded for tetanus and other vaccine preventable diseases [48].

From any referral area, even prayer houses and traditional medical centers it is better to early identify critical ill children because of unable to facilitate early transfer to health facility and late in the disease process to result unsuccessful treatments and early mortality. Poor health care seeking behavior, often causes by poverty and ignorance, is thus a likely contributing factor to late presentation during transfer patients from place to place [49].

The fact that loss of consciousness was the major symptom preceding presentation in the patients that died, delayed seeking of medical attention by the caregivers or lack of prompt referral and loss of consciousness was also found risk factor for death within 24hrs of admission [50].

Diarrhea is a major cause of morbidity and mortality among children 5yrs old in sub-Saharan Africa [51]. In 2008 around 4.2 million deaths in 5yrs old children by diarrhea caused the largest proportion (19%) followed by pneumonia (18%), and malaria (16%) [52]. The number of childhood deaths only decreased by 4% in Africa from 2000 to 2008, suggesting that interventions for these diseases are lacking in Africa [53, 54].

Similarly another different study shown that diarrhea is more risk factors for infant and childhood mortality with high malaria and HIV prevalence [55]. Sepsis bacteria was the main causes of neonate death as study conducted in University college hospital of Ibadan due to contaminations from unhygienic cord care practices, unhealthy traditional practices like abdominal scarifications, delivery conducted by unqualified health personnel, unhygienic environment and poor health education among parents [56].

2.3. Literature review on pediatric mortality over Ethiopia

In Ethiopia child mortality is 30 times more likely to die by his or her fifth birthday than a child in Western Europe. Out of ninety countries, 53 of them from developing nations should be able to meet the 2015 Goal of reducing child mortality by two-thirds and maintain their current annual reduction rate. Among eight developing and low-income countries Ethiopia is one of country that actually achieved MDG 4 with a childhood mortality rate decrease of 71%, from 205/1000 live births in 1990 to 59/1000 live births in 2015. This goal was achieved through a combination of changes on technology, policy and the delivery of health services to the rural population, largely through the HEP [37, 57].

Childhood mortality in Ethiopia's has continued to decline although at a swift pace. Ethiopian demographic and health surveys 2000 and 2005 shown that in urban pediatric mortality decline by 35%, infant mortality declined by 21 % and under-five mortality decline by 26% during the same period. Nevertheless, mortality rates are still high. In addition, the crude death rates have substantially declined over the past fifty years. One out of ten newborns (97/1000) did not survive to celebrate their first birthday and one out of six children (166/1000) died before their fifth birthday. Given the slow pace of improvement in infant and child mortality to reach the child survival millennium development goal target by 2015 [58].

According to 2011 EDHS, the country is experiencing a high neonatal mortality rate at 37/1000 live births, comparable to the average rate of 35.9/1000 live births for the African region overall. The causes of neonatal mortality are not well documented in Ethiopia, but previous studies report causes such as sepsis, asphyxia, birth injury, tetanus, preterm birth, congenital malformations and unknown causes [59].

In all age groups pneumonia and severe acute malnutrition were the two main recorded causes of pediatric mortality in Gondar general hospital [60]. Similarly, Ethiopia is one of a country several which suffers the largest burden of childhood mortality by pneumonia [61]. However, from six countries in Sub-Saharan Africa with high pneumonia mortality was an analyzed to assess care-seeking behaviors related to respiratory illness, only 30 % of Ethiopian children with suspected pneumonia were taken to a health care provider and graded as the lowest of all six analyzed countries in African [62].

Despite of this result as other study shown that different multiple factors influence care-seeking behaviors in Ethiopian like lack of knowledge, delay in recognition of illness severity and household income [63]. On the other hand HEP packages which focuses on disease prevention and health

education while providing antibiotic treatment for childhood pneumonia. However, some challenges influenced as barrier to address this HEP package such as miss-diagnosis, mismanagement and inappropriate referral system remain problems to further need improvement because of still now contributes to high early mortality rates on pediatric age groups [64].

The recent study conducted one of the regional hospital in AA city at ZMH shown that around 44% of mortality occur early during hospital admission in pediatric emergency room and pediatric ward which dominated by pneumonia (25.3%) and severe acute malnutrition (22.2%). A total 6,866 entries patient between 2011 and 2014, overall mortality rate for all reviewed records was 4.2%. Still now there was high early mortality rate among neonate and infant age groups in Ethiopia [65].

The younger than five years of age was more admitted than the rest with mean of 74.7%. On sex identification male (57.5%) admissions were significantly higher than female admissions in all age groups. This study show that the mortality pediatric age group more occurred as early deaths of male than female in pediatric ED and pediatric ward at ZMH in Addis Ababa [65].

2.4. Conceptual framework

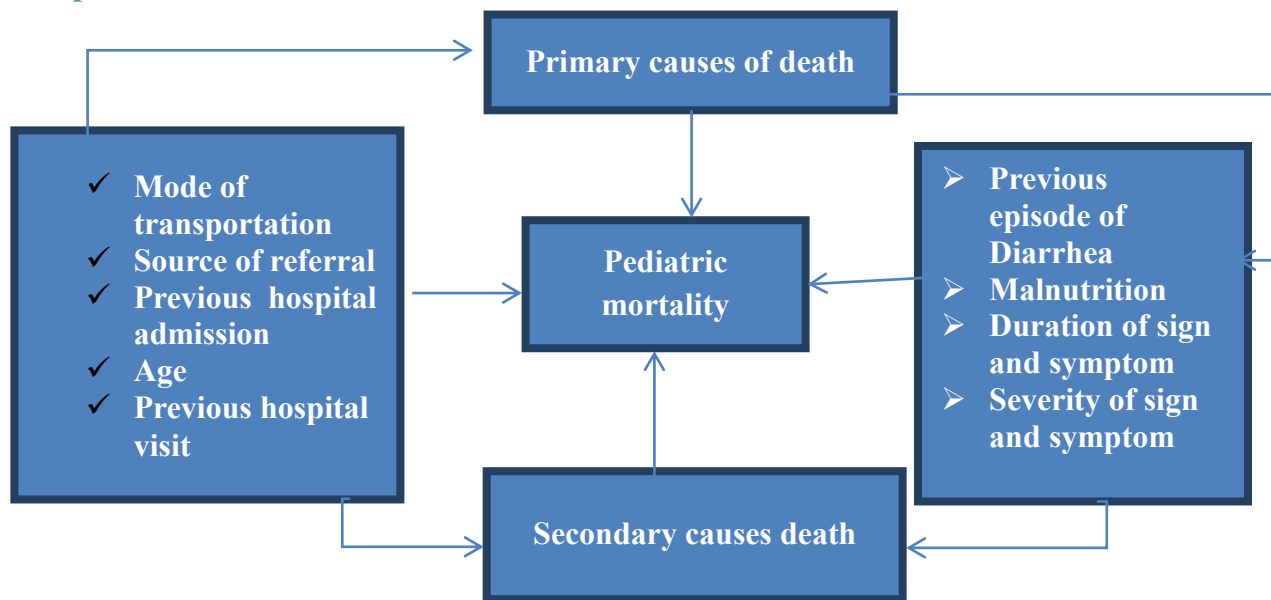


Figure 1: Conceptual framework causes of pediatric emergency mortality

As the above Conceptual framework model figure show that they are a number of primary causes to result pediatric mortality in pediatric emergency department. The main categories of those causes were related with infectious disease, non-infectious disease, severity sign and symptom like vomiting, fever, diarrhea, and soon have high significant of mortality that affect early triage and prioritizing. So that late for resuscitation and intervention to result pediatric emergency death within minute.

According to age related division the cause of mortality is also different. The most of newborn mortality hold by severe sepsis, birth-asphyxia, prematurity and congenital heart defect while infant mortality result more from diarrhea, pneumonia, malaria and sepsis. The pre-school children death more occurred through severe malaria, septicemia, viral hemorrhagic fever, bronchopneumonia, human immune deficiency virus, childhood malignancy, anemia, severe meningitis, tuberculosis and gastroenteritis. The School age children affected by malignancy, septicemia, meningitis, severe malaria, and severe anemia. The rest of the list are renal failure, sickle cell disease, viral hemorrhagic fever, Road traffic accident, HIV/AIDS, poisoning, hepatitis, tuberculosis another causes of mortality of this age group [35, 36, 39, 41]. As others studies shown that causes of the mortality of all age group of pediatric population significantly associated with diarrhea and malnutrition [43, 44, 45] and mode of transportation also contribute early pediatric mortality [33, 34].

3. OBJECTIVES

3.1. Generally Objective

To assess the causes and associated factors of pediatric emergency mortality in Pediatric Emergency Unit at Tikur-Anbessa Specialist Teaching Hospital from December 1, 2016 – June 14, 2017 G.C, in Addis Ababa, Ethiopia.

3.2. Specific Objectives

To determines prevalence of pediatric emergency mortality in pediatric emergency unit at Tikur-Anbessa Specialist Teaching Hospital from December 1, 2016 – June 14, 2017G.C in Addis Ababa.

To identifies the determinant causes of pediatric emergency mortality in pediatric emergency unit at Tikur-Anbessa Specialist Teaching Hospital from December 1, 2016 – June 14, 2017G.C in Addis Ababa.

To describes relate associated factors of pediatric emergency mortality in pediatric emergency unit at Black Lion Specialist Teaching Hospital from December 1, 2016 – June 14, 2017G.C.in Addis Ababa.

4. METHODOLOGY

4.1. Study area

The study was conducted at the pediatric Emergency Department of Tikur-Anbessa Specialized Hospital which found in Addis Ababa city. Addis Ababa is the capital city of Ethiopia. It is a rapidly growing, densely populated, urban city with a population of over three million people [66].

Tikur-Anbessa Specialized Hospital was launched in 1972; The largest Federal referral hospital in the country and it has since become a University teaching hospital for both clinical and preclinical training of most disciplines. It is also an institution where specialized clinical services that are not available in other public or private institutions are rendered to the whole nation with various departments and faculties under specialty training in the School of Medicine provide patient care in the hospital [67].

Tikur-Anbessa Specialized Hospital is a largest teaching and referral hospital associated with Addis Ababa University. It serves as a referral federal hospital for pediatric Patients those referred from different clinics, health centers, others hospitals and from corner of a country. It provides as pediatric emergency department, pediatric emergency unit daily serve approximately for more than 20 new pediatric cases admitted per a day, most of them require critical care or emergent resuscitative care in pediatric emergency unit, it has pediatric emergency triage, Outpatient department, resuscitation area and critical area, procedure area, isolation area, pharmacy and 42 pediatric emergency beds.

4.2. Study period

The study was conducted from December 1, 2016 to June 14, 2017G.C.

4.3. Study design

Cross-sectional institutional based study was conducted by assessing of different socio-demographic characteristic, clinical feature parameter and medical causes of death variables through retrospective review of pediatric HMIS registration books, hospital death certificate and patients medical charts from January 1, 2012–December 30, 2016G.C to address determinant causes and associated factors of pediatric emergency mortality at TASH in Addis Ababa, Ethiopia.

4.4. Source & Study population

4.4.1. Source Population

All number of pediatric patients mortality in pediatric department from January 1, 2012–December 30, 2016G.C at TASH

4.4.2. Study Population

All number of pediatric patients mortality in pediatric emergency unit from January 1, 2012– December 30, 2016G.C at TASH

4.5. Eligibility Criteria

4.5.1. Inclusion criteria

The study included all number of pediatric emergency mortality in pediatric emergency unit with well documented medical history (<20% of incompleteness of data) from January 1, 2012– December 30, 2016G.C at TASH.

4.5.2. Exclusion criteria

The study excluded pediatric mortality in pediatric ICU, in pediatric ward, those the medical histories were improperly documented (>20% of incompleteness of data) and lost of medical charts during data collection.

4.6. Sample technique and sample size determination

The estimation of sample size calculation for this study was not important because of a limit number of pediatric emergency mortality in PE unit from January 1, 2012– December 30, 2016G.C. So that this study was carry out non-probability sampling techniques as convenient methods. Then all numbers of pediatric emergency deaths from January 1, 2012– December 30, 2016G.C, that is about 499 pediatric emergency deaths included for this study. Although only about 338 pediatric deaths analyzed because of to fulfill inclusion criteria's and principles of investigator. The remaining around 161 study participant not involved in this study because of unable to fit inclusion eligibility.

4.7. Variables

4.7.1. Dependent variable

Time to death occurred in ED

4.7.2. Independent variable

Socio-demographic characteristic of study participant

Clinical presenting feature of study patients

Causes of pediatric emergency mortality diagnosis

4.8. Operational definitions

Accident injuries;- any types of injuries except road traffic injuries and head or brain injuries, but involve any injuries of the whole part of body.

Early ED mortality;- Defined as death within ≤ 24 hrs of ED presentation based on previously published definitions and clinical rationale.

Concomitant;- is comorbidity associated with primary causes of mortality as secondary causes.

Health institution;- Any health service delivery institution for pediatric patients like hospitals, health centers, private clinics, health post and private hospitals.

Infants;- children between 1 month to 1 year old of age.

Malnourished;- involved both moderate and severe acute malnutrition with SD of z-score < -2 from growth monitoring pediatric chart.

Neonate;- new born start from 7th day of birth to less than 1 month old of age group while less than 7th day of birth newborn follow up at neonate unit.

Pediatric Mortality;- number of death of pediatric patients in Pediatric Emergency Department.

Pediatric Emergency unit;- one of pediatric emergency department that to provide emergency service for only pediatric age group.

Pediatric patients;-beginning at newborn up to 13years old age group of children as HMIS age classification.

Pre-school age;- children between 1 year to 5years old of age group.

Previous admission;- admission to in any ward of health institution for purpose of intervention and treatment within last year.

Previous episode of diarrhea;- more than three times loose of stool per day within the last year before present emergency department.

Previous visit;- Having history of visit at any health institution for purpose of intervention and management within last year.

School age children;- children between 5years to 13year old of age group.

Well nourished;-according to WHO weight for age classification Z-score SD ≥ -2 when read from growth monitoring chart.

4.9. Data collection tools and procedure

Retrospective review study was conducted through well-structured checklist that adopted by English language with some modification from different previous studies [36, 41, 42, 46] to assess causes and associated factors of pediatric emergency mortality in pediatric emergency unit. The study tools containing socio-demographic characteristics, clinical presenting features and main medical cause of mortality. Socio-demographic characteristics included age, sex, source of referral, region from come, months of mortality and mode of transportation. Age categorized into four group such as neonate, infant, pre-school age and school age [36, 41]. Source of referral is break down into health institution and self-referral as previous study. Also health institution referral included external and internal facility [46].

Another part of study instrument was clinical presenting feature parameter which included nutrition status, episode of diarrhea within last year, time to death occurred, previous hospital visit and admission within last year, clinical presenting symptoms and duration of sign and symptoms. Nutritional status of study participant was group into well-nourished and malnourished [46]. Time to death was classified based previous study death within ≤ 24 hrs (early mortality) and death within >24 hrs (late death) [36, 41].

Finally the causes of mortality were prepared based as HMIS international disease classification at hospital level of the country with related with different previous study depend on different pediatric age division [42]. So that to address causes and associated factors of pediatric emergency mortality the raw data was reviewed from secondary data source like HMIS registration books, medical chart or patient folder sheet, clinical care notes and the hospital death certificate.

The data was collected by five collectors with three BSc nursing qualifications (two for data collection and one for supervisor those who had pediatric emergency experience) and (one data assist from card room work staff and one for data encoder with qualification of diploma). For data assistance, collectors and supervisor at least for one day short training was given because of to ensure, all the data collectors, supervisor and data assistances should have been the same information about the study instruments and tools. The collection of data was completed within one month through only working days.

4.11. Data quality assurances

To assure quality of data the following measures was undertaken; during the actual data collection process, supervisor was cross checked the data collectors every day for checklist consistency, completeness and well filled. The data was cleaned for inconsistencies and missing values and amendment was done as needed before data analysis.

4.12. Data processing and analysis

The data was collated and analyzed by descriptive statistical methods using epi-data version 3.1 and SPSS version 20. Simple frequencies were used to see the overall distribution of the study subject like socio-demographic characteristics (age, sex, source of referral, region from come, and months of mortality), clinical presenting parameter (nutrition status, episode of diarrhea within last year, time to death occurred, previous hospital visit and admission within last year, common presenting symptoms and duration of sign and symptoms) and disease classification or medical diagnosis was analyzed. Pearson chi-square and binary logistic regression was assessed significant relationship and association between dependent and independent variables at a value of $P < 0.05$ was taken as significant. Crude odds ratios from bivariate logistic regression and adjusted odds ration from multi-variety logistic regression were calculated before or after adjustment for potential confounding factors for between two independent variables. The finally result was presented by text, Pie-chart, table and Graph.

4.13. Ethical consideration

Ethical clearance and approval was obtained from the Ethical Committee of department of Emergency medicine, College of health science, School of medicine, Addis-Ababa University. Official letters was obtained from department of Emergency medicine to clinical director of TASH. After explain about the purpose and possible benefit of the study, oral permission was obtained from hospital staff, especially PED and Card room staff before joining the study. The confidentiality was maintained in each level of the response.

4.14. Dissemination of results

The study result will be presented to Addis Ababa University, Faculty of Medicine, Department of emergency medicine and documents will be disseminated to all responsible bodies, Furthermore the manuscript will be submitted to national or international peer review journals for possible publication. It will be also communicated to Federal ministry of health and TASH. Hard and soft copies will be made available in the library of AAU, for graduate students as well as for other researchers and reader as baseline.

5. RESULT

5.1. Demographic characteristics of pediatric patients admitted into pediatric emergency unit of TASH between January 1, 2012-December 30, 2016G.C

Overall about 12,240 pediatric age groups (7th days of birth to 13years old) patients admitted in pediatric emergency unit between January 1, 2012- December 30, 2016G.C. From total admitted in PED, around 499 (4.1%) or 41death per 1000 alive admission at PED were recorded as death outcome.

From 499(4.1%) death outcomes, 338(67.7%) pediatric patient deaths were analyzed for this study whiles the remains 161(32.3%) were excluded from analysis. During this admission period greater number of males 7017(57.3%) admitted with male to female ratio of 1.3:1. As age categories school age group more dominated 4262(34.8%) than another age groups among admitted patients in PED.

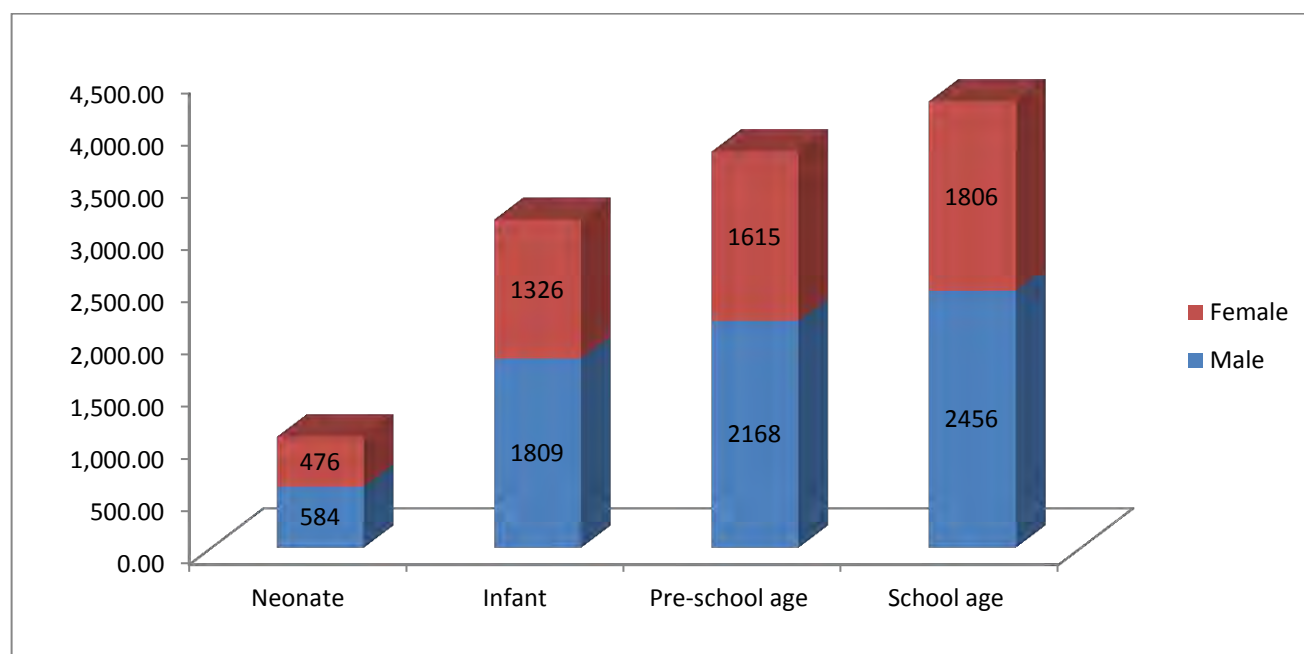


Figure 2: Sex identification among pediatric age division group patients admitted in pediatric emergency unit between 2012-2016G.C at TASH.

The above Figure 2 indicated that in all age group males were admitted as more numbers than females in pediatric emergency unit between study periods.

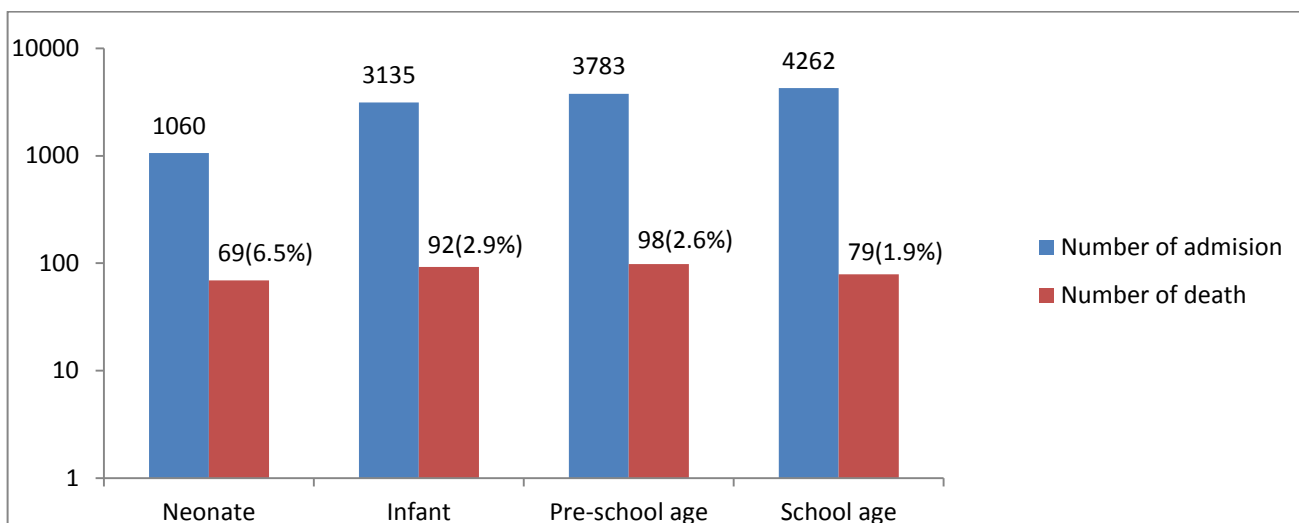


Figure 3: Age categories with mortality rate and number of admitted into pediatric unit between 2012-2016G.C at TASH

Figure 3 shows that high number of deaths occurred on pre-school age and infants age groups. However from pediatric age categories neonate age group offered more (6.5%) of mortality rate that followed by infant (2.9%) than other age groups.

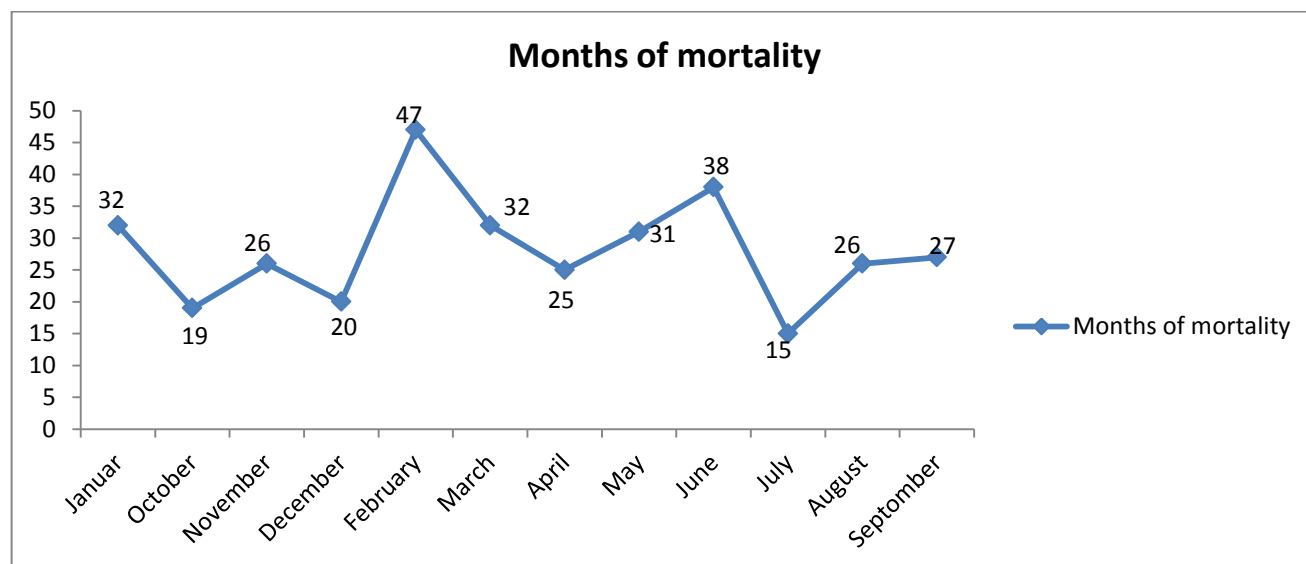


Figure 4: Monthly pattern of pediatric emergency mortality occurred in pediatric emergency unit at TASH between 2012-2016G.C.

As the above graph indicated that high mortality rate was reported in February (47) and June (38) months while least mortality occurred in July (15) month.

Table 1: Distribution of socio-demographic characteristics and clinical presenting features of study participants in pediatric emergency unit at TASH between 2012-2016G.C

Variables	Categories	N (%)
Sex (male to female ratio 1.3:1)	Male	191(56.5)
	Female	147(43.5)
Age by month (Mean=37.46 months, Std. Deviation =43.138, IQ=15)	Neonate	69(20.4)
	Infant	92(27.2)
	Pre-school age	98(29.0)
	School age	79(23.4)
Respondent place	From Addis Ababa	164(48.5)
	Out of Addis Ababa	174(51.5)
Patients source of referral	From health institution	313(92.6)
	Self-referral	25(7.4)
Previous hospital visits within last year	Yes	165(48.8)
	No	173(51.2)
Previous hospital admission within last year	Yes	152(92.1)
	No	13(7.9)
Previous episode of diarrhea within last year	Yes	60(17.8)
	No	278(82.2)
Previous Nutritional status	Normal	247(73.1)
	Malnourished	91(26.9)
Time to death (0-672hrs) Media=48.00, Range= 672, IQ=48.000		
	≤ 24hrs	107(31.7)
	> 24hrs	231(68.3)
Duration of sign & symptom during ED presentation (6-1440hrs) Media=72.0, Range=1434hrs		
	0 - 48hrs	134(39.6)
	49 - 168hrs	146(43.2)
	169 - 1440hrs	58(17.2)
N=Frequency %=Present		

This Table 1 indicated that greater number of male (56.5%) documented as death with male to female ratio of 1.3:1 and the mean average of ages (37.46 months) with Std. Deviation (43.138). As this study 164(48.5%) study participant came from Addis Ababa region and more than 92.6% referred from different health institution. Half of study respondents had history of previous hospital visit. From previous hospital visit more than 90% patients had history of hospital admitted with different medical problems.

Of all death analyzed in this study only 60(17.8%) patients had history of previous diarrhea within last year and around 91(26.9%) had history of malnourished status. About 107(31.7%) death documented as early death within ≤ 24 hrs in ED and the media of time to death was 48.00hrs, range= 672, IQ=48.0. More of them about 204(60.4%) patients came for treatment after two days episode of sign and symptoms occurred with (media=72.0, range=1434, IQ=72.0 hours) duration.

The most five common presenting symptoms of this study were fast breathing 66(19.5%), fever 48(14.2%), vomiting 41(12.1%), cough 38(11.2%) and SOB 31(9.2%).

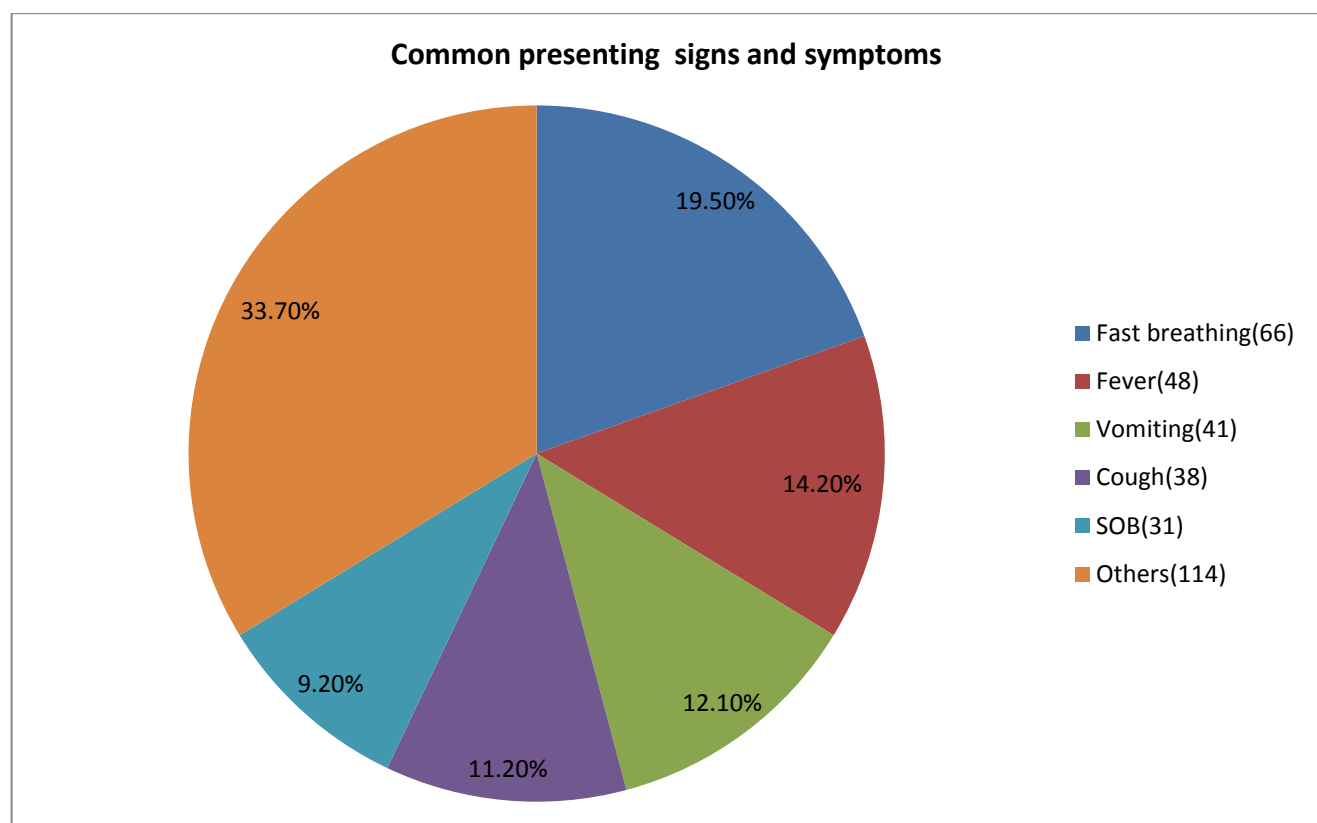


Figure 5: Clinical common presenting symptoms of study participants in pediatric emergency unit of TASH between 2012-2016G.C.

Others: Respiratory distress, General body swelling, Coma, Convulsion, Grunting, Abdominal pain and distension, Headache, Failure to suck and Cold extremities.

5.2. Underlining primary and secondary causes of death for study participant

Table 2: Primary causes of death in pediatric emergency unit at TASH between 2012-2016G.C

Variables	Categories	N (%)
Medical emergency diseases		298(88.2)
Respiratory diseases(N=78(26.2))	Severe pneumonia	60(76.9)
	TB	13(16.7)
	Others	5(6.4)
Infectious diseases (N=76(25.5))	Sepsis	40(52.6)
	Meningitis	34(44.7)
	Malaria	2(2.6)
Cardiovascular diseases (N=83(27.8))	CHF	46(59.0)
	Hypovolemic shock	20(24.1)
	Septic shock	6(7.2)
	Pulmonary HTN	6(7.2)
	Cardiogenic shock	3(3.6)
	Anaphylactic shock	2(2.4)
Hematological diseases (N=32(10.7))		
	Hematological malignancy	15(46.9)
	Severe Anemia	14(43.8)
	Hemophilia	3(9.4)
Digestive diseases (N=12(4.0))	Diarrheal diseases	7(58.3)
	Hepatic encephalopathy	5(41.7)

Renal diseases (N=9(3.0))	Renal failure	8(88.9)
	Nephrotic syndrome	1(11.1)
Neuromuscular diseases (N=8(2.7))	Seizure disorder	5(62.5)
	GBS	2(25.0)
	Intra cranial pressure	1(12.5)
Surgical cases(N=25(7.4))	Abdominal mass	9(36.0)
	Small bowel obstruction	6(24.0)
	Large bowel obstruction	4(16.0)
	Intussusceptions	3(12.0)
	Others	3(12.0)
Accidental/unintentional injuries (N=15(4.4))		
	Accident injuries	5(33.3)
	Severe traumatic brain injury	5(33.3)
	Road traffic accident	3(20.0)
	Burn	2(13.3)

Note: -Others: -For surgical cases (Hydrocephaly 2(8%), Abdominal hernia 1(4%)), for respiratory diseases (ARDS 4(5.1%), Asthma 2(2.5%)). Abdominal mass: more of patients of this abdominal mass were malignancy related mass 6(66.7%) and some were wilms-tumors related mass 3(33.3%). Renal failure included both acute and chronic renal failure. Severe TBI was more related due to epidural & subdural hematoma. ICP results due to secondary brain traumatic injuries. Mortality related abdominal hernia was occurred after abdominal surgery performance. Any mortality result due to RTA grouped as RTA cases. Others injuries classified as accident injuries except head or brain injuries.

The primary causes of death about 298 (88.25%) from medical emergency diseases, which consists more were cardiovascular diseases 83(27.8%), respiratory diseases 78(26.2%), infectious diseases 76(25.5%) and hematological diseases 32(10.7%) while 25(7.4%) and 15(4.4%) responsible from surgical cases and accidental or unintentional injuries respectively. The top five killers were pneumonia, CHF secondary to CHD, Late onset sepsis, Meningitis and Hypovolemic shock while Abdominal mass the most causes of death outcome from surgical cases in pediatric emergency unit.

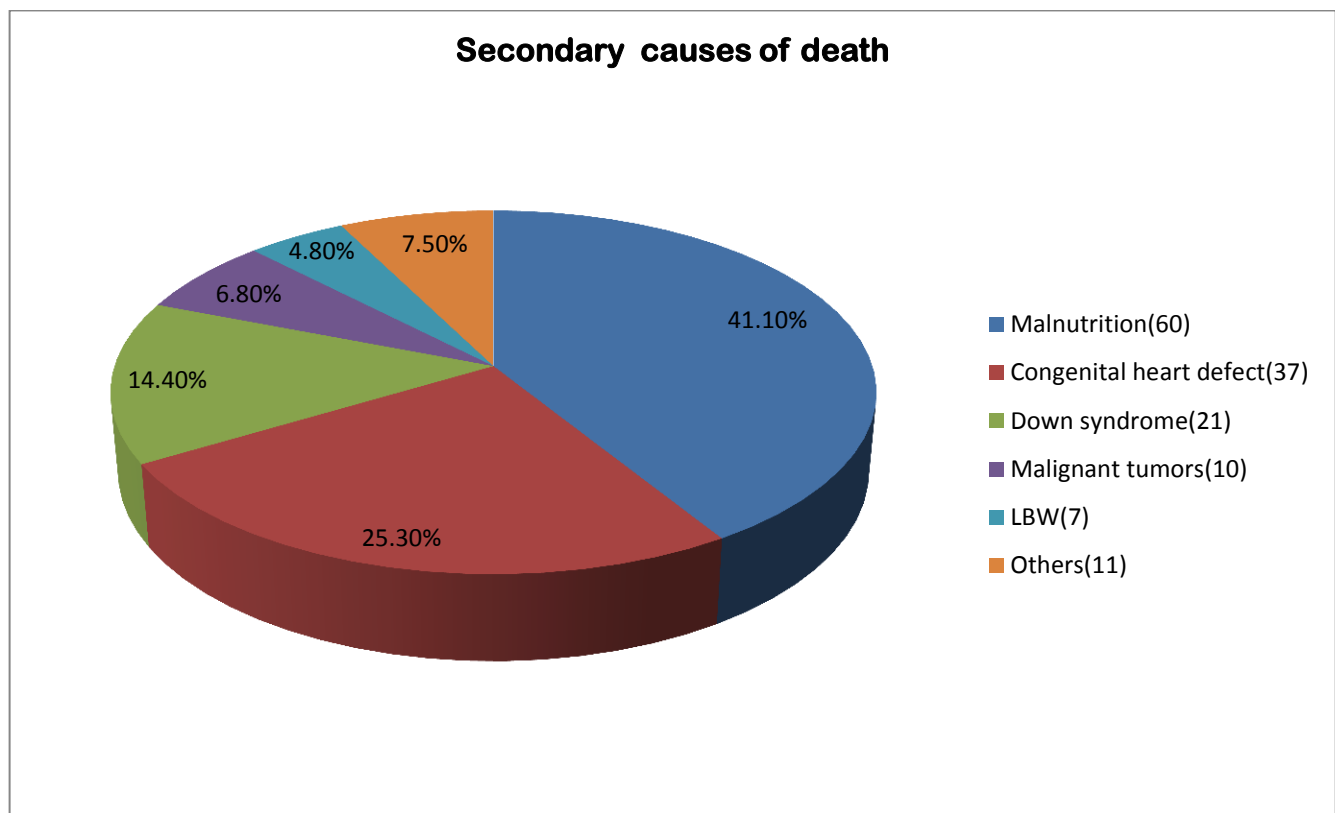


Figure 6: Concomitant causes for pediatric emergency death at TASH between 2012-2016G.C

The above Figure 6 shown that Malnutrition and CHD were the most concomitant with primary causes of death while prematurity 5(3.4%), HIV 4(2.7%) and DM 2(1.4%) documented as others with least responsibility with co morbidity in pediatric emergency department of TASH. Overall about 146(43.2%) primary causes of death were concomitant or co morbidity with secondary causes of mortality.

Table 3 found that malnutrition was co morbidity with almost all top ten causes of death in pediatric emergency as a dominant and congenital heart defect more concomitant with congestive heart failure and pneumonia. HIV more related and co morbidity with TB and pneumonia while LBW more concomitant with late onset of sepsis and meningitis.

Table 3: Co morbidity with top ten causes of death in pediatric emergency unit at TASH

Top ten causes	Co morbidity causes	N (%)
Pneumonia (N=30)	Malnutrition	17(56.7)
	CHD	7(23.3)
	Down syndrome	2(6.7)
	HIV	2(6.7)
	Others(malignancy tumor, prematurity	2(6.0)
CHF (N=43)	CHD	21(48.8)
	Down syndrome	10(23.3)
	Malnutrition	9(20.9)
	Others (prematurity, malignancy tumor)	3(7.0)
Sepsis (N=11)	Malnutrition	4(36.4)
	LBW	4(36.4)
Meningitis (N=8)	Other(Down syndrome, Prematurity, DM)	3(27.3)
	Down syndrome	3(37.5)
	LBW	2(25.0)
	Others(prematurity, Malnutrition)	3(37.5)
Hypovolemic shock (N=8)	Malnutrition	3(37.5)
	Down syndrome	3(37.5)
	CHD	2(25.0)
Hematological malignancy (N=11)	Malnutrition	7(63.6)
	Malignancy tumor	4(36.4)
Anemia (N=4)	Malnutrition	3(75.0)
	LBW	1(25.0)
TB	Malnutrition	4(80.0)
	HIV	1(20.0)
Abdominal mass (N=1)	Malignancy tumor	1(100.0)
Renal failure (N=1)	Malnutrition	1(100.0)

Table 4: Distribution of age category groups with top ten causes of mortality in PE unit of TASH

Top ten causes of death	Age category group			
	Neonate	Infant	Pre-school age	School age
Pneumonia (N=60)	6(10.5)	26(35.6)	20(26.7)	8(14.8)
CHF (N=46)	4(7.0)	17(23.3)	12(16.0)	13(24.1)
Sepsis (N=40)	29(50.9)	3(4.1)	7(9.3)	1(1.9)
Meningitis (N=34)	14(24.6)	13(17.8)	5(6.7)	2(3.7)
Hypovolemic shock(N=20)	3(5.3)	5(6.8)	6(8.0)	6(11.1)
Hematological malignancy(N=15)	-	-	8(10.7)	7(13.0)
Anemia (N=14)	1(1.8)	5(6.8)	1(1.3)	7(13.0)
TB (N=13)	-	-	6(8.0)	7(13.0)
Abdominal mass (N=9)	-	1(1.4)	7(9.3)	1(1.9)
Renal failure (N=8)	-	3(4.1)	3(4.0)	2(3.7)

The top ten cause of mortality were pneumonia 60(17.8%), congestive heart failure 46(13.6%), sepsis 40(11.8%), meningitis 34(10.1%), hypovolemic shock 20(6%), hematological malignancy 15(4.4%), anemia 14(4.1%), TB 13(3.9%), abdominal mass 9(2.7%) and renal failure 8(2.4%).

The top causes for neonate deaths were late onset sepsis 29(50.9%) and Meningitis 14(24.6%). Pneumonia 26(35.6%) & 20(26.7%) and CHF 17(23.3%) & 12(16%) were the top killer for the infant and pre-school age groups respectively. On the other hand CHF the most causes of death on school age group that followed by pneumonia and hematological malignancy. TB, renal failure, abdominal mass and hematological malignancy have not responsibility for death on neonate age group as study conducted at TASH. In this study neonatal tetanus and poisoning were not causes of pediatric emergency mortality at PE unit.

5.3. Association factors of death for study participants

Table 5: Distribution of relationship between socio-demographic characteristics, clinical presenting features and causes of death of study participants with time to death by χ^2

Variables	Categories	Time to death N(%)		χ^2	P-Value
		time <24hrs	time >24hrs		
Sex	Male	58(30.4)	133(69.6)	0.338	0.561
	Female	49(33.3)	98(66.7)		
Age	Neonate	24(34.8)	45(65.2)	2.785	0.426
	Infant	31(33.7)	61(66.3)		
	Preschool age	33(33.7)	65(66.3)		
	School age	19(24.1)	60(75.9)		
Previous hospital visits	Yes	44(26.7)	121(73.3)	3.710	0.054**
	No	63(36.4)	231(68.3)		
Duration of sign & symptoms	0-48hrs	56(41.8)	78(58.2)	10.790	0.005**
	49-168hrs	38(26.0)	108(74.0)		
	169-1440hrs	13(22.4)	45(77.6)		
Pneumonia	Yes	18(30.0)	42(70.0)	0.093	0.769
	No	89(32.0)	189(68.0)		
Hematological malignancy	Yes	1(6.7)	14(93.3)	4.474	0.034**
	No	105(32.5)	217(67.4)		
Diarrheal disease	Yes	6(66.7)	3(33.3)	5.238	0.022**
	No	101(30.7)	228(69.3)		
Common presenting - Fast breathing		26(39.4)	40(60.6)	12.811	0.025**
symptoms	-Fever	19(39.6)	29(60.4)		
	-Vomiting	10(24.4)	31(75.6)		
	-Cough	7(18.4)	31(81.6)		
	-SOB	15(48.4)	16(51.6)		

Table 5 shown that there were strong evidence of relationship between common clinical symptoms during ED presentation ($X^2=12.811$, $d=5$, $P=0.025$) and duration of sign and symptom before ED presentation ($X^2 =10.790$, $d=2$, $P=0.005$) with time to death which dichotomized into early(≤ 2 hrs) and late (>2 hrs) while previous hospital visit ($X^2=3.710$, $d=1$, $P=0.054$) has slightly evidence of relationship at $P<0.05$ by chi-square test.

Also this Table indicated that there were strong evidence of relationship between diarrheal disease ($X^2=5.238$, $d=1$, $P=0.022$) and hematological diseases ($X^2=4.474$, $d=1$, $P=0.034$) with time to death.

Table 6 revealed there were strong association between SOB ($COR=0.381$, $CI=(0.168-0.864)$ $P=0.020$), late come or after two days of signs and symptoms developed to ED ($COR=2.040$, $CI=(1.232-3.379)$, $P=0.006$) & previous hospital visits ($COR=1.575$, $CI=(0.991-2.504)$ $P=0.050$) by bivariate analysis with time to death. Diarrheal disease ($COR=0.221$, $CI=0.054-0.903$, $P=0.036$) has also significant association with early mortality by bivariate logistic regression analysis. Similar multivariate logistic regression analysis SOB ($AOR=0.167$ $CI=(0.306-0.721)$ $P=0.007$ and late come to ED after signs and symptoms developed ($AOR=1.865$ $CI=(1.103-3.152)$ $P= 0.020$)) strongly associated with early mortality.

Table 6: Distribution of association between socio-demographic characteristic, causes of death & clinical presenting features of study participants with time to death by binary logistic regression

Variables	Categories	COR (CI, 95%)	P-value	AOR (CI, 95%)	P-value
Sex (Male)	Yes	1.147(0.723-1.818)	0.561	-	-
Neonate	Yes	0.594(0.290-1.214)	0.15	-	-
Infant	Yes	0.623(0.318-1.222)	0.168	-	-
Preschool age	Yes	0.624(0.321-1.212)	0.164	-	-
Place (Out of A.A)	Yes	1.475(0.931-2.338)	0.097	-	-
Previous hospital visits	Yes	1.575(0.991-2.504)	0.055**	-	-
49-168hrs duration of symptoms		2.040(1.232-3.379)	0.006**	1.865(1.103-3.152)	0.020**
169-1440hrs duration of symptoms		2.485(1.226-5.036)	0.012**	2.047(0.972-4.311)	0.060**
Fast breathing	Yes	0.549(0.288-1.048)	0.069	-	-
Fever	Yes	0.545(0.267-1.112)	0.095	-	-
Vomiting	Yes	1.107(0.485-2.528)	0.809	-	-
Cough	Yes	1.582(0.630-3.969)	0.329	-	-
SOB	Yes	0.381(0.168-0.864)	0.020**	0.167(0.306-0.721)	0.007**
Pneumonia	Yes	1.099(0.599-2.016)	0.761	-	-
CHF	Yes	0.760(0.398-1.453)	0.407	-	-
Hypovolemic shock	Yes	0.992(0.392-2.509)	0.987	-	-
Hematological malignancy	Yes	6.839(0.887-52.699)	0.06	-	-
Diarrheal disease	Yes	0.221(0.054-0.903)	0.036**	-	-
Sepsis	Yes	0.843(0.421-1.687)	0.629	-	-
Abdominal mass	Yes	3.803(0.470-30.796)	0.211	-	-
Malnutrition	Yes	1.847(0.952-3.583)	0.070	-	-

6. DISCUSSION

This study was carry out institutional based retrospective study to assess prevalence, primary and secondary causes and associated factors of pediatric emergency mortality in pediatric emergency unit of Tikur-Anbessa Specialized tertiary Hospital. In this study, epidemiological characteristics from the total mortality 499, only about 338 deaths to fulfill investigator principles was described from January 1, 2012 to December 30, 2016G.C in the PED of TASH.

Mortality rate reflects both the severity of illness and the quality of treatment for children in pediatric emergency departments. The risk factors associated with the mortality of pediatric age groups in developing countries are largely unknown. This study may provide clues for the future studies on the mortality in PEDs and serve as baseline information essential to the development of interventions to address common causes of pediatric emergency mortality with co morbidity at pediatric emergency unit in Ethiopia.

This study revealed a lower hospital mortality rate 4.1% or 41 deaths per 1000 hospital admission than has been previously reported by different study in Ethiopia, even recently reported in ZMH (4.2%). Similarly as many study conducted in sub-Saharan Africa and Asian [30, 42, 47, 58, 59] found that more mortality rate than study in the TASH. However as globally still now high pediatric emergency mortality was reported. Further improvements in the quality and timeliness of child-mortality measurements should be possible by more fully using existing as standardized guideline recommended [18].

Despite of this low mortality rate, still now high number of death 107(31.7%) occurred as early death within ≤ 24 hrs after admission, which highly significantly association with come to ED after two days of duration to develop episode of signs and symptoms. This result less than study found in previous [15, 36, 47, 65]. General majority of pediatric emergency mortality in hospitals often occurred within 24hours of admission from preventable diseases [17]. This was mainly due to multiple factors like late came from referral area and even prayer houses and traditional medical centers, unable early identify critical ill children and late in the disease process, this results unsuccessful treatments and early mortality. Poor health care seeking behavior often causes by poverty and ignorance result factor to late presentation during transfer patients from place to place [49].

Pre-hospital care with mode of transportation is crucial one for reduction of early mortality even in developed countries like USA [32, 33, 34, 36, 46]. Although during this study no access of documented data on patient folders concerning about mode of transportation to ED at TASH, even more than 90% referred from health institution.

A more number of male (55.9%) found as death than female (44.1%) with male to female ratio of 1.3;1. This is the same with the different previous studies [36, 40, 41, 42, 65]. This disparity may be due to national phenomena.

A lot of literature review [44, 45, 48, 49, 50, 65] shown that large number of mortality rate on neonate followed infant age group. Similarly in Ethiopia's, As EDHS 2000 and 2005 report that in urban infant mortality declined by 21 %. Nevertheless, mortality rates are still high. This indicated that one out of ten newborns (97/1000) did not survive to celebrate their first birthday and one out of six children (166/1000) died before their fifth birthday. Slowly improvement in infant and child mortality to reach the child survival millennium development goal that target by 2015 [58], However, still now high neonate and infant mortality rate in the country. The same to previous studies this study found that more mortality rate 6.5 and 2.9 account among neonate and infant age groups respectively than other pediatric age groups in TASH.

The main causes of neonate were late onset sepsis 29(50.9%) and meningitis 14(24.6%) which followed by pneumonia 6(10.5%). This is in line with in previous study [40, 41, 42]. Sepsis the top causes of neonate in this study. Similarly different study researcher's reports that sepsis was as seriously affect neonate age group [40, 41, 42]. This may be related with due to contaminations from unhygienic cord care practices and other traditional practices like abdominal scarifications, unhealthy practices, delivery conducted by unqualified health personnel, unhygienic environment and poor health education among parents [56].

Controversial from the previous study no any neonate tetanus cases reported as causes of neonate mortality in this study that the same with study at ZMH but still now in many African countries neonate tetanus reported as the causes of neonate mortality [39, 42]. Even in Ethiopia 2011 as EDHS [59] reported neonate tetanus one of cause of neonate mortality. This good progress change may be related with expanded immunization program coverage across a country. Similarly one study in Nigerian shown that to address 4th millennium goals efforts have been geared towards creating awareness on childhood diseases, control of communicable diseases, improving infrastructures and provide vaccine for preventable diseases supports the low death rates recorded for neonate tetanus [48].

Pneumonia was the top killer for the infant and pre-school age groups that followed by congestive heart failure, meningitis, sepsis and hypovolemic shock at TASH. This is consistent with other pediatric mortality studies in different settings [35, 36, 41, 52, 46]. In addition to the above in Ethiopia different study found that pneumonia was the public important killer of all pediatric age groups and

largest burden of childhood mortality [60, 61]. However, from six countries in Sub-Saharan Africa with high pneumonia mortality was analyzed to assess care-seeking behaviors related to respiratory illness, only 30 % of Ethiopian children with suspected pneumonia were taken to a health care provider and graded as the lowest of all six analyzed countries in Africa [62]. Despite of this result as other study shown that different multiple factors influence care-seeking behaviors in Ethiopia like lack of knowledge, delay in recognition of illness severity and household income [63]. On the other hand HEP packages which focuses on disease prevention and health education while providing antibiotic treatment for childhood pneumonia. However, some challenges influenced as barrier to address this HEP package such as miss-diagnosis, mismanagement and inappropriate referral system remain problems to further need improvement because of still now contributes to high early mortality rates on pediatric age groups [64].

In this study found that congestive heart failure and hematological malignancy main top primary causes of school age groups mortality. This slightly the same with other studies [36, 41, 42]. Although, other study in AA at ZHM and some study in African countries congestive heart failure and hematological malignancy not reported as main top causes of pediatric age groups mortality. This disparity may be due to no cardiac and pediatric oncology patients refer to ZMH and some African countries as TASH.

General as world-wide non-communicable diseases like cancer are to causes death and disability to seem over pediatric age groups [37]. Also each day more than 522 children are diagnosed with cancer around the world. Of this more prevalence about 85% children diagnosed for cancer in developing countries and unlucky enough to be diagnosed with cancer will die. In worldwide Congenital heart disease (CHD) is the most common major birth defect, affecting millions of children with every 120 newborn, one is affected by CHD. Much of acquired heart disease could be prevented by the systematic implementation of proven and cost-effective interventions. Failure to implement these systematically intervention and lack of awareness increase fatal heart damage that requires complex surgery and life-long medical follow-up. Due to the lack of pediatric cardiac programs in low- and middle-income countries, many of children were affected by congenital heart diseases [38]. This the same with our setup that scale up number of mortality in PED, may be require well-organized, well equipped and isolated pediatric emergency unit for cardiac clinic and oncology clinic as standard protocol with well trained and specialized health care provider.

The most five common presenting symptoms of study participant were fast breathing, fever, vomiting, cough and SOB. SOB was more strongly associated with early mortality than the remains. Fortunately,

the study conducted in Ghana and South East Nigerian consistently with this study. This common present signs and symptoms categorized under emergency sign and priority sign of pediatric assessment that recommended by WHO guideline. So that, Immediate treatment and manage is begun when any emergency sign is identified by assessment of ABC until the end of the algorithm by following WHO integrated management guideline of emergency triage assessment and treatment recommendation that early rapid triage for all sick children presenting to identify and priority those needing immediate resuscitation and emergency care for life-threatening. This approach has been shown to reduce pediatric mortality in Malawi at Lilongwe referral hospital from 47.6 to 37.9 deaths per 1000 admissions. This is good scenario for other African countries by simple and inexpensive resource to start early interventions to improve pediatric emergency care and decreased hospital mortality rates [8, 9, 10, 11, 12, 14].

From concomitant problems malnutrition was reported as more leading causes of co morbidity with primary causes of death in this study. Different study in Malawi, Kenya and Ghana also reported Malnutrition and diarrheal was associated factors that increase co morbidity of pediatric mortality upon hospital admission. Similarly other study conducted in Ethiopian [60, 65] shown that malnutrition to contribute great role on pediatric mortality with different diseases as co morbidity of hospital admission. In addition to that diarrheal disease was significantly associated with early mortality in TASH. In Africa [39, 41, 43-46, 51-55] many study reported that diarrheal disease was the top killer of pediatric age group at different time that consistent with Ethiopian.

At the time of this study, the TASH-ED was the only hospital in Ethiopia, and introduces postgraduate Emergency Medicine training, that result of a successful postgraduate Emergency Medicine training program at the Addis Ababa University School of medicine. Therefore, this was likely that in this study through five years pediatric emergency mortality rate was 4.1% which less than other studies in Africa that represents as 'best-case scenario' for another hospital in Ethiopia. As Emergency Medicine specialty scale-up in Ethiopian early pediatric emergency mortality rates should be expected to decline from this study with improved quality of clinical care, organization of pediatric emergency care and enhancing trained human resources to address quality of emergence medical service. This study find inform that to apply pediatric emergency clinical care protocols and standard to target high mortality, potentially reversible conditions that account high number of mortality like pneumonia, sepsis and other easily preventable causes of death with inexpensive resource.

7. STRENGTH AND LIMITATION THE STUDY

The primary strength of this study is provides vital baseline epidemiologic data for assessing primary and secondary causes of mortality from patient chart through different challenges during data collection. The analysis result provides key information to guide the development of policy and interventions to improve early intervention and change pediatric patient handling toward emergency care service to decline pediatric emergency mortality in this setting.

This study has several limitations, primarily as a result of challenges to obtain accurate mortality data from hospital patient records.

- ✓ As a first due to time limitation this study carries out retrospective study design, which based on secondary data observation that difficult to obtain adequate study information.
- ✓ Repeat documentation of controversial idea on a patient files.
- ✓ Absence of death certificate inside patient's folder.
- ✓ Lost of the patient chart from placement area during study period.
- ✓ Incomplete documentation of patient medical history with invisible handwriting.
- ✓ Poor handling of HMIS registration books and patient charts.
- ✓ Inadequate computerized patient data software.
- ✓ Presence of more than two medical diagnosed of one patient with different diseases classification difficult to identify primary and secondary causes of mortality.
- ✓ General improper documentation from triaging sheets to death summary on death certificates records accounting high rates of missing important variables. However, this inherently limits more medical record data was available. This limitation is certainly not unique to Ethiopia, and is a common limitation in mortality research.

8. CONCLUSION AND RECOMMENDATION

8.1. CONCLUSION

This study revealed that more numbers of male 191(56.5%) documented as death outcome. Neonate age group 69(6.5%) constitute high mortality rate than the remains age groups. The total mortality rate 449(4.1%) of this study was less than expected in previous studies in Ethiopian and African countries. However, still now high number early mortality 107(31.7%) in country, even less than other studies. A298 (88.2%) of pediatric emergency mortality due to medical emergency disease that consists more were cardiovascular diseases 83(27.8%), respiratory diseases 78(26.2%) and infectious diseases 76(25.5%). About 146(43.2) primary cause of death in pediatric emergency unit was concomitant with secondary causes of deaths.

Malnutrition 60(41.1%) was the most leading causes of co morbidity with primary causes of death. Pneumonia 60(17.8%) was the top killer as this study followed by CHF 46(13.6%) and Sepsis 40(11.8%). Late onset sepsis 40(50%) and Meningitis 34(24.6%) more killer on neonate age group while pneumonia dominate over on infant and pre-school age groups and school age group more affected by CHF and hematological diseases.

Early mortality was strongly significant association with later come to ED with after two days episode of duration of develop signs and symptoms. SOB was significantly highly associated with early death than others signs and symptoms of complaints. In addition to that diarrheal diseases highly associated with early mortality than other causes of death in pediatric emergency unit. Finally almost all mortality was result from easily preventable causes of diseases and controlled by inexpensive resource.

8.2. RECOMMENDATION

The studies highlight show that most of mortality causes to require primary prevention and early intervention. Our recommendation is goes to for all concern body:-

- Better to facilitate early triaging and identify emergency sign and priority sign as clinical founding of individual by using triage protocol tools.
- It is better to healthy environment creation and avoids malpractice that facilitates infectious disease around us.
- Biological neonate age group very immature than other pediatric age groups which result poor outcome after sick, so that special consideration and precaution is better to under taken at all any level of health service delivery.
- Creation of more awareness at community level through health extension program and mass media early intervention is better for any sick child before develop more complication.
- It is better to encourage referral linkage system and pre-hospital care system during transportation.
- Mult-sector collaboration on micronutrient initiative program with health sector more needed as our study because of more than one third of deaths were co morbidity with Malnutrition.
- Chronic and non-communicable diseases like CHF secondary to CHD and pediatric oncology also founds under top ten causes of mortality in this study. Those causes of death may require its specialty and more advanced medical equipment from other medical pediatric emergency, then to isolate pediatric emergency for cardiac clinic and oncology clinic may be to decline pediatric mortality prevalence at hospital level.
- Final pre-hospital care during transportation patients from place to place is one of factors that increase early pediatric emergency mortality even in developed counties, which not addressed by this study due to limitation of documented data on patient file, So that it is better to assess what looks like per-hospital care on pediatric age group during transportation from place to place.

9. REFERENCE

1. Pei YV, Xiao F. Emergency medicine in China: World J Em. Med. 2011;2:245–252.
2. Kissoon N, Goldman RD. Pediatric emergency medicine: W. of potential. CJEM. 2007;9:453–458.
3. UNICEF W, World Bank, UN-DESA Pop Division. Levels and trends in child mortality. 2014.
4. Rajaratnam JK, Marcus JR, Flaxman AD, Wang H, Levin-Rector A, Dwyer L, et al. Neonatal, postnatal, childhood and under-5 mortality for 187 countries, 1970-2010: A systematic analysis of progress towards millennium development goal 4. 2010;375:1988-2008.
5. Child health in complex emergencies. Washington DC; The National Academies Press .2006.
6. Fajolu IB, Egri-Okwaji MTC. Childhood mortality in children emergency centre of the Lagos University Teaching Hospital. Nig J Pediatric 2011;38:131-135.
7. Updated guideline: pediatric emergency triage, assessment and treatment. Geneva: World Health Organization; 2016.
8. World Health Organization. Serious childhood problems in countries with limited resources. Geneva: WHO; 2004.
9. Molyneux E, Ahmad S, Robertson A. Improved triage and emergency care for children reduces inpatient mortality in a resource-constrained setting. Bull World Health Organ. 2006;84:314–319.
10. Li M, Kelly J, Subhi R, Were W, Duke T. Global use of the WHO pocket book of hospital care for children. Paediatr Int Child Health. 2013;33:4–17.
11. Iloh GU, Ofoedu JN, Njoku PU, Amadi AN, Godswill-Uko EU. The Magnitude of Under-five Emergencies in a Resource-poor Environment of a Rural Hospital in Eastern Nigeria: North Am J Med Sci. 2012;4:344-349.
12. Okechukwu AA, Nwalozi C. Morbidity and mortality pattern of admissions into the emergency pediatric unit of University of Abuja Teaching Hospital, Gwagwalada. Ni. J Med 2011; 20:109-113.
13. Abebe T, Girmay M, G Michael G, Tesfaye M. The epidemiological profile of pediatric patients admitted to intensive care unit in an Ethiopian. Int J Gen Med. 2015; 8: 63-67.
14. Robison JA, Ahmad ZP, Nosek CA, Durand C, Namathanga A, Milazi R, Thomas A, Soprano JV, Mwansambo C, Kazembe PN, et al. Decreased pediatric hospital mortality after an intervention to improve emergency care in Lilongwe, Malawi. Pediatr. 2012; 130(3):676–682.
15. Gordon DM, Frenning S, Draper HR, Kokeb M. Prevalence and burden of diseases presenting to a general pediatrics ward in Gondar, Ethiopia. J Trop Pediatrics. 2013;59(5):350–357.

16. American Academy of Pediatrics Board of Directors, and the Emergency Nurses Association, Guidelines for Care of Children in the Emergency Department, April 2009.
17. World Health Organization, Maternal, newborn, child and adolescent health, Emergency triage assessment and treatment course, 2005,81-84
18. Murray CJ, Laakso T, Shibuya K, Hill K, Lopez AD, New analysis of country trends and forecasts of under-5 mortality to 2015 Achieve Millennium Development Goal4, U.S. National Library of Medicine, PubMed Literature, 2007;370(9592):1040-1054.
19. Moons K, Royston P, Vergouwe Y, Grobbee D, Altman D. Prognosis and prognostic research: what, why, and how? *BMJ*. 2009;338-375.
20. Duke T, Michael A, Mgone J, Frank D, Wal T, Sehuko R. Etiology of child mortality in Goroka, Papua New Guinea: a prospective two-year study. *Bull World Health Organ*. 2002;80(1):16–25.
21. Krug A, Pattinson RC, Power DJ. Saving children—an audit system to assess under-5 health care. *S Afr Med J*. 2004;94(3):198–202.
22. Mahajan V, Kaur A, Sharma A, Azad C, Guglani V. Modifiable factors for prevention of childhood mortality. *Indian Pediatr*. 2014;51(1):45–47.
23. Nasi T, Vince JD, Mokela D. Mortality in children admitted to Port Moresby General Hospital: how can we improve our hospital outcomes? *P N G Med J*. 2003;46(3-4):113–124.
24. Hochstadt NJ. Child death review teams: a vital component of child protection. *Child Welfare*. 2006;85(4):653–670.
25. Campbell H, Duke T, Weber M, English M, Carai S, Tamburlini G. Global initiatives for improving hospital care for children: state of the art and future prospects. *Pediatrics*. 2008;121(4):984–992.
26. Duke T, Kelly J, Weber M, English M, Campbell H. Hospital care for children in developing countries: clinical guidelines and the need for evidence. *J Trop Pediatr*. 2006;52(1):1–2.
27. Pozner CN, Bayleygne TM, Davis MA, et al. Emergency medical services capacities in the developing world: preliminary evaluation and training in AA, Ethiopia. *Pre-hosp Emerg Care*. 2003;7(3):392–396.
28. Germa, F. Bayleyegn, T. Kebede, T., Ducharme, J., & States, U. Emergency medicine development in Ethiopia: Challenges, progress and possibilities 'veloppement de la me 'decined 'urgence en Ethiopi *African Journal of Emergency Medicine*, <http://doi.org/10.1016/j.afjem.2012.08.005>. 2013.3.3-9
29. Ayele Tilahun. Assessment of knowledge and skills of triage and associated factors among nurses working in Emergency Department of governmental hospitals. *Ethiop. Med. J*. 2016.3-30.

30. Rajaratnama KJ, Marcus JR, Flaxman AD, Wang H, Levin-Rector A, Dwyer L, Costa M, Lopez AD, Murray CJ, Neonatal, post-neonatal, childhood, and under-5 mortality for 187 countries, 1970-2010: a systematic analysis of progress towards Millennium Development Goal 4, PubMed, 2010 Aug 28;376(9742):686.
31. Mulholland K, Adegbola R. Bacterial infections—a major cause of death among children in Africa. N Eng. J Med. 2005;352:75–77.
32. Foltin GL, Pon S, Tunik M, Fierman A, Dreyer B, Cooper A, Welborne C, Trieber M; Pediatric ambulance utilization in a large American city: a systems analysis approach, Bellevue Hospital Center and Harlem Hospital Center in New York City, Pediatric Emergency Care. 1998 Aug;14(4):254-258
33. Hjalte L, Suserud BO, Herlitz J, Karlberg I; why are people without medical needs transported by ambulance? A study of indications for pre-hospital care. Eur J Emergency Med. 2007 Jun;14(3):151
34. Gerlach GR, Sirbaugh PE, Macias CG. Prehospital evaluation of non-transported pediatric patients by a large emergency medical services system. Pediatr Emerg Care. 2001 Dec;17(6):421-424
35. Vidushi Mahajan, Amarpreet Kaur, Amit Sharma, Chandrika Azad and Vishal Guglani, Modifiable Factors for Prevention of Childhood Mortality, Indian Pediatr 2014;51: 45-47.
36. Cui-Ping Zhu, Xiao-hui Wu, Yu-ting Liang, Wen-cheng Ma, Lu Ren, The mortality of patients in a pediatric emergency department at a tertiary medical center, China, World Journal of Emergency Medicine, 2015, 6(3), 212-216.
37. Moon BK, Jonathan GE, Lake A, Osotimehin B, Stoltenberg J, Radi A, et al. The Global Campaign for the Health Millennium Development Goals-Report 2013.
38. United Nations Headquarters Convention on the Rights of the Child, Focus on Children and Non-Communicable Diseases (NCDs), in New York in September 2011.
39. UNICEF, Reduce child mortality, millennium development goals, PubMed Literature, 2015
40. BI Abhulimhen-Iyoha, AA Okolo, Morbidity and mortality of childhood illnesses at the emergency paediatric unit of the University of Benin Teaching Hospital, Benin City, Nigerian Journal of Paediatrics, 2012, 39(2)

41. Anyanwu OU, Ezeanosike OB, Ezeonu CT. Pattern and outcome of admissions at the children emergency room at the Federal Teaching Hospital Abakaliki. Nigeria, Afr J Med Health Sci; 2014;13:6-10
42. Gerald DafeForae, Obiora Jude Uchendu, Alex PayimIgbe, An audit of paediatric mortality patterns in a Nigerian teaching hospital, Nigeria Med J, 2014 ,Mar.31, 55(2),130-133
43. Caulfield LE, de Onis M, Blossner M, Black RE. Undernutrition as an underlying cause of child deaths associated with diarrhea, pneumonia, malaria, and measles. Am J C.Nutr. 2004; 80(1):193–198
44. Moisi JC, Gatakaa H, Berkley JA, Maitland K, Mturi N, Newton CR, NjugunaP, Nokes J, Ojal J, Bauni E, et al. Excess child mortality after discharge from hospital in Kilifi, Kenya: a retrospective cohort analysis. Bull World Health Organ. 2011;89(10):725–732.
45. Gupta A, Sarker G, Rout AJ, Mondal T, Pal R. Risk correlates of diarrhea in children under 5 years of age in slums of Bankura, West Bengal. J Global Infect Dis. 2015;7(1):23–29.
46. Edem M. A Tette1,2*, Mame Y. Nyarko2, Edmund T. Nartey3, Margaret L. Neizer2, Adolph Egbefome4, Fredua Akosa2 and Richard B. Biritwum1 Under-five mortality pattern and associated risk factors: a case-control study at the Princess Marie Louise Children's Hospital in Accra, Ghana, BMC Pediatrics (2016) 16:148.
47. CI Ndukwu, SK Onah ;Pattern and outcome of post-neonatal pediatric emergencies in NnamdiAzikiwe University Teaching Hospital, Nnewi, South East Nigeria Nigerian Journal of Clinical Practice • May-Jun 2015; 18(3).
48. Nte AR, Ekanem EE, Gbaraba PV, Orumabo RS, Odu N. Social and environmental influences on the occurrence of neonatal tetanus in some riverine communities in Nigeria. Trop 1997;27: 734-735.
49. Okposio MM, Unior MO, Ukpeteru FO. Sociodemographic determinants of mortality in hospitalized under five children at a 2° health care center in the Niger Delta. Int J Trop Dis Health 2012 ;2(3)173-181.
50. Adeboye MA, Ojuawo A, Ernest SK, Fadeyi A, Salisu OT. Mortality pattern within twentyfour hours of emergency paediatric admission .West Afr J Med 2010;29:249-252.
51. Boschi-PintoC, YoungM, Black RE T Child Health Epidemiology Reference reviews effectiveness of interventions to reduce maternal, neonatal and child mortality. In J Epi 2010.39(1):3–6.

52. UNICEF/WHO Diarrhea: Why children are still dying and what can be done. Geneva: The United Nations Children's Fund/World Health Organization. 2009; 1–58
53. Black RE, Cousens S, Johnson HL, Lawn JE, Rudan I, et al. Global, regional, and national causes of child mortality in 2008: a systematic analysis. 2010;375: 1969–1987.
54. Bryce J, Boschi-Pinto C, Shibuya K, Black RE WHO estimates of the causes of death in children. 2005; 365: 1147–1152.
55. O'Reilly CE, Jaron P, Ochieng B, Nyaguara A, Tate JE, et al. (2012) Risk Factors for Death among Children Less than 5 Years Old Hospitalized with Diarrhea in Rural Western Kenya, 2012.
56. Ayoola OO, Orimadegun AE, Akinsola AK, Osinusi K. A five-year review of childhood mortality at the university college hospital, Ibadan. West Afr J Med 2005;24:175-179.
57. UNICEF. Ethiopia meets MDG 4 by cutting under 5 mortality by two-thirds since. 2013
58. A SathiyaSusuman ,Child Mortality Rate in Ethiopia,Iran J Public Health Mar 31,2012,41(3):9–19
59. Yared Mekonnen, Biruk Tensou,Daniel S Telake, Tedbabe Degefie, Abeba Bekele, Neonatal mortality in Ethiopia: trends and determinants ,BMC Public Health,17 May 2013.
60. Gordon DM, Frenning S, Draper HR, Kokeb M. Prevalence and burden of diseases presenting to a general pediatrics ward in Gondar, Ethiopia. J Trop Pediatr. 2013;59(5):350–357.
61. Walker CL, Rudan I, Liu L, Nair H, Theodoratou E, Bhutta ZA, O'Brien KL, Campbell H, Black RE. Global burden of childhood pneumonia and diarrhoea.Lancet. 2013;381(9875):1405–1416.
62. Noordam AC, Carvajal-Velez L, Sharkey AB, Young M, Cals JW. Care seeking behaviour for children with suspected pneumonia in countries in sub-Saharan Africa with high pneumonia mortality. PLoS One. 2015;10(2).
63. Awoke W. Prevalence of childhood illness and mothers' care seeking behavior in Bahir Dar, Ethiopia: a descriptive community based cross sectional study. Open J Prev Med. 2013;3(2):155–159.
64. Miller NP, Amouzou A, Tafesse M, Hazel E, Legesse H, Degefie T, Victora CG, Black RE, Bryce J. Integrated community case management of childhood illness in Ethiopia: implementation strength and quality of care. Am J Trop Med Hyg. 2014;91(2):424–434
65. J. A. Bohn ,B. M. Kassaye ,D. Record,B. C. Chou,I. L. Kraft,J. C. Purdy, K. A. Hilton, D. A. Miller, S. Getachew, A. Addissie and J. A. Robison, Demographic and mortality analysis of hospitalized children at Addis Ababa, Ethiopia, BMC Pediatrics BMC , 21 October, 2016.
66. CIA,The world facebook,Ethiopia,2016.
67. aau.edu.et/chs/tikur-anbessa-specialized-hospital/background-of-tikur-anbessa-hospital/

10. Annex

ADDIS ABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCE, SCHOOL OF MEDICINE, DEPARTMENT OF EMERGENCY MEDICINE.

10.1. Questioner checklist format

10.1.1. Information Sheet

Objectives of the study: To assess determinant causes and associated factors of pediatric emergency mortality in PED at TAHS in Addis Ababa from December 1, 2016 to June 14, 2017G.C.

Confidentiality: All information obtains from documents and records will be kept confidential and won't be accessible to any third party; the patients name won't be registered on the checklist sheet so that the patients will not be identified for any reason.

Benefits of the study: The obtain data from document give good information toward pediatric emergency mortality and to provide great input to bring change in quality of health service and decrease mortality in pediatric age by early recognition and treat as underline determinant causes with emergency situation in pediatric emergency department.

10.1.2. Informed consent

Name of Project Investigators: Gemechu Jofiro

Address: Tell 09 22-51-84-47

E-mail gemechujofiro12@gmail.com

Signature _____

Date of data collection-----Time started----- Time completed-----

Result of observed questionnaire checklist:

1. Completed 2. Partially completed 3.not completed

Checked by: Supervisor Name-----signature-----Date-----

10.1.3. Questionnaire or checklist

Instruction;- please answer by putting marking circle on the listed choose available as that is appropriate for you and/or fill in the blank space what you observe from documents.

Part I. Socio-demographic characteristic of study participants

001. Gender

- A. Male
- B. Female

002. Age by months -----

003. Place from come

- A. Addis Ababa
- B. Out of Addis Ababa

004. Mode of transportation to ED

- A. Ambulance
- B. Non-ambulance

005. Source of referral

- A. Self-referral
- B. From health institution

006. Months of mortality

- A. January
- B. February
- C. March
- D. April
- E. May
- F. June
- G. July
- H. August,
- I. September
- J. October
- K. November
- L. December

Part II. Presenting clinical feature parameter

008. Occurs of death in ED within-----hrs

009. Previous hospital visits within the last year?

A. Yes

B. No

0010. If Yes for question no 009, have history of hospital admission within the last year?

A. Yes

B. No

0011. Common presenting sign and symptoms /can select more than one answers/

A. Fever

B. Vomiting

C. Fast breathing

D. SOB

E. Cough

F. Others/specify...../

0012. Duration of symptoms before presentation to ED-----hrs

0013. Previous episodes of diarrhea within the last year? A. Yes B. No

0014. Nutritional status of child (according to WHO Weight-for-age classification)

A. Well-nourished

B. Malnourished

Part III. Underline primary causes of pediatric emergency mortality

Table 7: primary causes of pediatric emergency mortality questioner

Primary causes	Categories		Tick correct one under this column
Medical emergency disease	Respiratory diseases	Severe pneumonia	
		TB	
		Asthma	
		ARDS	
	Infectious diseases	Sepsis	
		Meningitis	
		Malaria	
		Neonate tetanus	
	Cardiovascular diseases	Congestive heart failure	
		Pulmonary HTN	
		Hypovolemic shock	
		Septic shock	
		Cardiogenic shock	
		Anaphylactic shock	
	Hematological diseases	Hematological malignancy	
		Anemia	
		Hemophilia	
	Digestive diseases	Diarrheal disease	
		Hepatic encephalopathy	
		Hepatitis	
	Renal diseases	Renal failure	
		Nephrotic syndrome	
	Neuromuscular diseases	Seizure disorder	
		GBS	
		ICP	

Surgical cases	Abdominal mass	
	Small bowel obstruction	
	Large bowel obstruction	
	Intussusceptions	
	Hydrocephaly	
	Abdominal hernia	
Accidental/unintentional injuries	Accident injuries	
	Severe TBI	
	Road traffic accident	
	Burn	
	Poisoning	

Part III. Underline secondary causes of pediatric emergency mortality concomitant with primary causes.

Table 8: Secondary causes of pediatric emergency mortality questioner.

Secondary causes	Tick correct one under this column
Malnutrition	
Congenital heart defect	
Down syndrome	
Malignant tumor	
Low birth weight	
prematurity	
HIV	
DM	
Birth asphyxia	
Others (specify-----)	

10.2. Dummy Tables

Table 9: Socio-demographic characteristic for pediatric patients admitted into pediatric emergency unit between 2012-2016G.C at TASH dummy table

S.no	Variable	Categories	Frequency	%
1	Sex	Male Female		
2	Age	Birth - <1month >1month - <1year >1year - <5years >5years - 14years		

Table 10: Sex identification among pediatric age division group patients admitted in pediatric emergency unit between 2012-2016G.C at TASH dummy table

Variables	Age							
	Birth-28days		28days-1yrs		1yrs-5yrs		5yrs-14yrs	
	N	%	N	%	N	%	N	%
Sex								
Male								
Female								

Table 11: Socio-demographic characteristic and clinical presenting feature variables of pediatric emergency mortality between 2012-2016G.C in TASH dummy table

S.no	Variables	Categories	N	%
1	Sex	Male Female		
2	Age	Birth - <1month ≥1month - <1year ≥1year - <5years ≥5years - 14years		
3	place from come	Addis Ababa Out of Addis Ababa		
4	Mode of transportation	Ambulance		
5		Non- Ambulance		
6	Source of referral	From health institution Self-referral		
7	Time to death occurred	≤2h >2h		
8	Previous episode of diarrhea	Yes No		
9	Nutrition status	Well-nourished Malnourished		
10	Previous hospital visit	Yes No		
11	Previous hospital visit	Yes No		

Table 12: Common presenting sign and symptoms, duration of sign and symptoms of pediatric emergency mortality patients when came to pediatric emergency unit in TASH dummy table

S.no	Variables	Categories	N	%
1	Common presenting symptoms	Fever Vomiting Fast breathing SOB Cough Others/specify...../		
2	Duration of sign and symptom	≤2hrs >2hrs		

Table 13: Months of pediatric age mortality in pediatric emergency unit in TASH dummy table

S.no	Months of mortality	Frequency	Percentage
1	September October November December January February March April May June July August		

Table 14: Underline primary causes of pediatric emergency mortality at TASH dummy table

Primary causes	Categories		N	%
Medical emergency diseases	Respiratory diseases	Severe pneumonia		
		TB		
		Asthma		
		ARDS		
	Infectious diseases	Sepsis		
		Meningitis		
		Malaria		
		Neonate tetanus		
	Cardiovascular diseases	Congestive heart failure		
		Pulmonary HTN		
		Hypovolemic shock		
		Septic shock		
		Cardiogenic shock		
		Anaphylactic shock		
	Hematological diseases	Hematological malignancy		
		Anemia		
		Hemophilia		
	Digestive diseases	Diarrheal disease		
		Hepatic encephalopathy		
		Hepatitis		
	Renal diseases	Renal failure		
		Nephrotic syndrome		
		UTI		
	Neuromuscular diseases	Seizure disorder		

		GBS		
		ICP		
Surgical cases		Abdominal mass		
		Small bowel obstruction		
		Large bowel obstruction		
		Intussusceptions		
		Hydrocephaly		
		Abdominal hernia		
Accidental/unintentional injuries		Accident injuries		
		Severe TBI		
		Road traffic accident		
		Burn		
		Poising		

Table 15: Underline secondary causes of pediatric emergency mortality concomitant with primary causes at TASH dummy table

Secondary causes	frequency	present
Malnutrition		
Cardiac heart defect		
Down syndrome		
Malignant tumor		
Low birth weight		
prematurity		
HIV		
DM		
Birth asphyxia		
Others (specify-----)		

10.3. Ethical clearance paper from department research committee

ADDIS ABABA UNIVERSITY
School of Medicine
Dept, Emergency Medicine



አዲስ አበባ ዩኒቨርሲቲ
ሕክምና ትምህርት ቤት
የድንገተኛ ሕክምና ትምህርት ክፍል

ቀን: መጋቢት 20 ቀን 2009 ዓ.ም
ቁጥር: /ድህረት/ 166 2009 ዓ.ም

ለ: ጥቁር አንበሳ ሴፔንታጂዝድ ሆስፒታል
ሀፃናት ህክምና ክፍል

ከ: ዶ/ር ፍናት ደበበ
የድንገተኛ ህክምና ት/ህ ክፍል ሀላፊ



ጉዳዩ:- ትብብር ስለመጠየቅ

በአዲስ አበባ ዩኒቨርሲቲ በጥቁር አንበሳ ሆስፒታል ውስጥ በድንገተኛ ህክምና ትምህርት ክፍል ውስጥ የማስተርስ ነርስ ተማሪ የሆነው ተማሪ ገመቹ ጆፍሮ በ A study on causes of pediatric emergency mortality and association factors in pediatric emergency unite at Tikur anbessa specialized hospital ላይ ጥናት እያካሄደ ስለሆነ ለጥናት የሚደረዱትን አስፋላጊ መረጃዎች እንዲሰጠው የዘወትር ትብብራችሁን እንጠይቃለን፡፡

ከሰላምታ ጋር