

**JIMMA UNIVERSITY INSTITUTE OF HEALTH FACULTY OF  
MEDICAL SCIENCE DEPARTMENT OF PEDIATRICS AND CHILD  
HEALTH**



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**A THESIS TO BE SUBMITTED TO THE DEPARTMENT OF PEDIATRICS  
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THE REQUIREMENTS FOR SPECIALTY CERTIFICATE IN  
PEDIATRICS AND CHILD HEALTH.**

**ASSESSMENT OF ADMISSION PATTERN AND OUTCOME OF  
PEDIATRIC INTENSIVE CARE UNIT AT JIMMA UNIVERSITY  
MEDICAL CENTER, SOUTH WEST ETHIOPIA**

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## DECLARATION

### Assurance of principal investigator

I, agree to accept responsibility for the scientific, ethical and technical Conduct of the research project & for provision of required progress report as per terms and condition of the college of health sciences in effect at the time grant is forwarded as the result of this application.

| Name of principal investigator | Signature | Date  |
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Approval of the advisor

This thesis has been submitted with my approval as university advisor

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## Abstract

**Background:** In developing countries there is high burden of pediatric critical illness that requires pediatric intensive care unit admission and there is significant number of death due to variety of factors including lack of financial resources, lack of available technology and well-trained staff. Knowledge of the characteristics and outcomes of critically ill children admitted to pediatric intensive care unit may help to improve the care, prioritize the patient for better utilization of resource and decrease mortalities of critically ill pediatric patients, however, published data on the practice of critical care and patient outcomes in these settings are scant.

**Objective:** To assess the pattern of admission, outcome and associated factors of patients who admitted to Pediatric intensive care unit, Jimma University Medical Center

**Method:** Institutional based prospective longitudinal study was conducted. Consecutive sampling technique was used to include a total sample of 71 study participant's. Data was collected using structured questionnaire and data extraction check list. The data obtained was cleaned and entered into a computer software EpiData version 3.0 and SPSS version 26.0 for data entry and analysis respectively. Descriptive statistics was carried out to see the patterns of admission whereas bivariate and multivariate logistic regression analysis were performed to identify the factors associated with treatment outcome. During bivariate analysis p-value of less than 0.25 at a confidence interval of 95% was considered a candidate for multivariate logistic regression. A p-value of less than 0.05 at a confidence interval of 95% was considered as significant. Cross tabulation was used to assess exposure and non-exposure effect on dependent variable. Crude odd ratio (COR) and adjusted odd ratio (AOR) were used to explain strength of association between independent and dependent variable.

**Results:** A total of 71 study participants were included of whom 52.1% were female with female to male ratio of 1.1:1. The age between 25 and 60 months old holds the majority (40.8 %) of the admissions with mean age of  $51 \pm 44$  months old. The major admission diagnosis identified were Upper air way obstruction 11.3% and severe sepsis 11.3%, followed by septic shock 9.9%, complicated meningitis 9.9% and post-operative patients 9.9%. The proportion of death was 31%. In multi-variable logistic regression analysis having admission diagnosis of severe sepsis (AOR=8.97, 95% CI 1.34-59.96, P=0.024), severe acute malnutrition (AOR=15.22, 95% CI 2.76-

83.99, P=0.002) and being a candidate for mechanical ventilator (AOR=9.82, 95% CI 1.97-48.76, P=0.005) were found to have a significant association with patient outcome which is death.

**Conclusions and Recommendation:** Having admission diagnosis of severe sepsis, severe acute malnutrition, being a candidate for mechanical ventilator and were factors associated with mortalities. Prevention, early identification and proper treatment of sepsis, severe acute malnutrition and related complications are strongly recommended.

**Keywords:** Pediatric intensive care unit, critical care, Death, Outcome, Jimma, Ethiopia

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## ACRONYMS AND ABBREVIATION

|                   |   |
|-------------------|---|
| AAP               | American Academy of pediatrics              |
| AKI               | Acute Kidney Injury                         |
| AOR               | Adjusted odd ratio                          |
| CKD               | Chronic Kidney Disease                      |
| COR               | Crude odd ratio                             |
| FOUR              | Full Outline of Unresponsiveness            |
| GCS               | Glasgow Coma Scale                          |
| HIC               | High income country                         |
| ICU               | Intensive Care Unit                         |
| JUMC              | Jimma University Medical Center             |
| LIC               | Low Income country                          |
| PICU              | Pediatric Intensive Care Unit               |
| PIM2              | Pediatric Index of Mortality 2              |
| WH                | World Health Organization                   |
| MV                | Mechanical Ventilator                       |
| SPSS              | Statistical Package for the Social Sciences |
| EOP               | Emergency Out Patient Department            |
| CP                | Cerebral Palsy                              |
| DM                | Diabetes Mellitus                           |
| SAM               | Severe Acute Malnutrition                   |
| MAM               | Moderate Acute Malnutrition                 |
| CNS               | Central Nervous system                      |
| CHF               | Congestive Heart Failure                    |
| MgSO <sub>4</sub> | Magnesium sulfite                           |
| LAMA              | Leave against Medical advice                |
| SSI               | Surgical Site Infection                     |

## **CHAPTER 1: INTRODUCTION**

### **1.1 Background**

A pediatric intensive care unit (ICU) is an organized system for the provision of care to critically ill children that provides intensive and specialized medical and nursing care, an enhanced capacity for monitoring, and multiple modalities of physiologic organ support to sustain life during a period of acute organ system insufficiency(1)

A patient having one or more failing vital function or with a reasonable chance of meaningful recovery and postoperative patients requiring frequent monitoring is candidate for care in the PICU. Children having acute neurological deterioration, respiratory distress, cardiovascular compromise, severe infection, and accidental poisoning constitute the major admission in a pediatric intensive care unit(2)

In low and middle income countries the most common causes of morbidity and mortalities are preventable and treatable causes. According to WHO 2010 and 2011 estimate greater than 95% of children death is in developing countries where critical care service limited. Well organized critical care service in such setting had significant effect in prevention and reduction of child mortality(3).

Outcome of a patient admitted to PICU depends on different factors like disease characteristics and severity during admission, pediatric index of mortality 2(PIM2) score, level of PICU care, and therapeutic interventions. For instance PICU mortality rates of pediatric cancer patients are by far higher when compared to current mortality rates of the general PICU population. Severe sepsis with presence of comorbid condition like hematological disorder and presence of shock at presentation associated with poor PICU outcome(4–6)

Advances in pediatric sub-specialties including the Pediatric critical care medicine have improved the survival of sick children(7). An evaluation of the outcomes and hospital morbidity pattern is an important measure to guide improvements in patient care. In PICU, the success of care can best be measured by the out- comes such as survival or death among those admitted to the unit by using indicators such as the proportion of deaths(8)

Despite the disproportionately high burden of critically ill children in low income countries data on critical care is scant. More than 50% of those countries lack any published data on PICU

capacity(9). In Ethiopia, data on children admitted and treated in PICU is limited. There are few studies done in tertiary Hospital PICU which shows variable disease epidemiology and outcome, and most of the studies were retrospective studies which likely miss some important variables like sociodemographic data. Previous retrospective study done in JUMC was in General ICU which might be different in disease epidemiology and care and patient outcome(10)

So the aim of this study is to analyze diagnosis and the associated mortality rates of patients admitted to JUMC, PICU and to use this data for improvement of care.

## 1.2 Statement of the problem

Though PICUs are essential areas of service to save the lives of children with critical illness, there is still significant number of mortality. In developed countries majority of the death occurs due to brain death while on ICU care, unsuccessful cardiopulmonary resuscitation, and withholding or withdrawal of life-sustaining treatment in anticipation of death. Studies conducted in 5 U.S teaching hospitals shows overall mortality rate of 2.39%(11)

In low income countries in general, particularly in sub-Saharan Africa the majority PICU deaths are due to low level of care, severely limited infrastructure, low number of trained personnel, and resources making it difficult or impossible to provide optimum care to critically ill patients and likely contributing to the high mortality rates. Studies done in Tanzania shows overall mortality rate of 41.7% and studies from South Africa indicates mortality rate of 27.1%(12,13)

In Ethiopia the common causes of PICU admission and deaths identified were infectious and neurologic disorders which contributes to 30% of death from study in University of Gondar and 8.5% from studies in Ayder specialized hospital(14,15). In contrast to this the leading causes of admission and death from previous Studies in JUMC general ICU was trauma. The overall mortality rate was 40% of which majority of the cases are shared by head injury 69.5%.(10)

Studies showed that intensivists model PICU and isolating for pediatric population only has significant reduction in mortality(15,16). So this study will identify the characteristics of admission and treatment outcome as well as factors associated with outcome of isolated PICU.

### 1.3 Significance of the study

There is limited studies done on pattern of admission and outcome of PICU in Ethiopia in general and JUMC in particular. So the current study will be used as a base line for future studies. It can also help to know disease epidemiology, and to improve patient care. In addition it can also be used to identify the factors associated with poor outcome which will be used to improve service, based on the gap identified.

## **CHAPTER 2: LITERATURE REVIEW**

Patients requiring PICU admissions are those with severe illness like impending respiratory failure, patient with neurologic deterioration, decompensate cardiac disease and post-operative patients. Different study shows that PICU outcome in HIC countries are better than LIC countries

According to retrospective study done on morbidity and mortality pattern of patients admitted to Tertiary Level Hospital, PICU in Nepal, over period of 7 months (January 2017-August 2017). The patients most commonly requiring PICU admissions were due to respiratory disease (27.7%), followed by CNS disorder (19.6%), infectious disease (13.3%), cardiovascular disease (16.5%), haemato-oncological diseases (7.3). Of the 358 patients, (65.7%) improved, the condition of (12%) patients was static. Overall mortality was 22.7%(17)

A retrospective study done to assess morbidity pattern and outcome in BSTR hospital and MIMER Medical College Talegaon Pune, India, during 30 month study period from January 2016 to July 2018. A total of 417 patients was included in the study. The most common diagnosis was LRTI which was observed in 61(14.7%) cases. The most common system involved was the respiratory system which was observed in 101(21.8%) cases. Of total cases studied, 357(85.6%) were discharged, 36(8.6%) had DAMA (discharge against medical advice) and 24(5.8%) expired(18)

A study conducted in Mozambique Central de Maputo tertiary hospital PICU on Epidemiology of Disease and Mortality, over 12 months period from January- December 2013, showed that the most common primary diagnoses were malaria (22%), sepsis (18%), respiratory tract infections (12%), and trauma (6%). The mortality rate was 25%. Mortality rates were highest among patients with sepsis (59%), encephalopathy (56%), non-infectious CNS pathologies (33%), neoplastic diseases (33%), meningitis/encephalitis (29%), burns (26%) and cardiovascular pathologies (26%)(19)

A prospective studies done at Kigali University Teaching Hospital (KUTH) in Rwanda on Predictors of mortality in a pediatric intensive care unit from 2012 to 2014 found that from a total of 213 children admitted to the PICU during the study period the overall mortality rate was 50%. The majority was admitted with diagnosis of respiratory failure (54%), gastrointestinal (GI) syndromes (11%) and septic shock (9.4%)(20)

According to retrospective studies done to describe the pattern of admission and outcome of patients in Gondar University Comprehensive Specialized Hospital PICU, a total of 330 patient

charts were analyzed, The three most common reasons for admission were neurologic 104 (31.1%), infectious 44 (13.3%) and renal 37 (11.2%) disorders. Among the neurologic disorders the commonest diseases were complicated acute bacterial meningitis (37.5%), Guillain-Barre syndrome (17.3%), followed by cerebral malaria and status epilepticus (15.4%). Most of the infectious causes were complicated meningitis (12.1%), and severe sepsis with shock (9.4%). Infectious diseases, severe diabetic ketoacidosis (DKA) (8.2%), congestive heart failure (7.6%), and acute glomerulonephritis (AGN) with complications (6.7%) constituted the highest number of admissions. Overall, 30.9% of the admitted patients died in hospital. The commonest cause of death was sepsis 16 (18.6%), followed by complicated meningitis and congestive heart failure, each accounting for 11 (10.7%) of the deaths. The number of deaths was highest in the older age groups; 53(52%) of patients who died were above the age of 5 years(14).

There is another prospective observational cohort study done at Gondar University Comprehensive Specialized Hospital PICU to see Incidence and predictors of mortality, from 1 February 2018 to 30 July 2019, a total of 276 patients was admitted during the study period, of which 41% had sepsis, 47% septic shock, and the remaining (12%) had acute respiratory distress syndrome. Nearly one- third of patients (32.6%) died in the PICU. Severe sepsis or multi organ failure (41.2%) was the leading immediate cause of death in the PICU followed by respiratory failure (23.5%), brain herniation (21.6%) and cardiac arrest (12.7%)(8)

Retrospective study conducted at Ayder Referral Hospital, PICU Tigray, Ethiopia, to assess pattern of admission and treatment outcome in 2015 over period of two years (from September 2012 to August 2014). From a total of 400 patients analyzed, the vast majority of patients admitted to PICU were due to medical problems (85.2%) and non-infectious disease (66.5%). Most were admitted due to meningitis (44/400 pts., 11%), post-operative (43/400 pts., 10.8%). Thirty-four patients died, given a mortality rate of 8.5% and the immediate cause of death in most patients was multi-organ failure (MOF) (42.9%). meningitis (8/34 pts., 23.6%), cardiogenic shock (7/34 pts., 20.6%) followed by pneumonia (3/34, 8.8%) were the major causes of death. Mortality was higher in those patients with comorbid illness, 14.8% vs. 3.2%(15)

A previous retrospective study done on pediatric patient admitted to general ICU of JUMC, from September 2009 to September 2013, from the total of 170 patients 40% was died. Among the study subjects, 34.7% were trauma cases, of whom 45.8% died after admission. The highest numbers of trauma patients were admitted (69.5%) due to head injuries. Burns and poly-traumas were the

second and third leading causes of admission in 15.3% of the cases. Postoperative patients and medical patients made up the rest of the admissions (28.2% and 27.6% of the cases respectively). Shock is the leading cause of medical admission (17%), followed by Guillain–Barré Syndrome (14.8%), pneumonia (10.6%), tuberculosis (4.3%), asthma (4.3%), and renal failure (8.5%)(10)

## CONCEPTUAL FRAME WORK

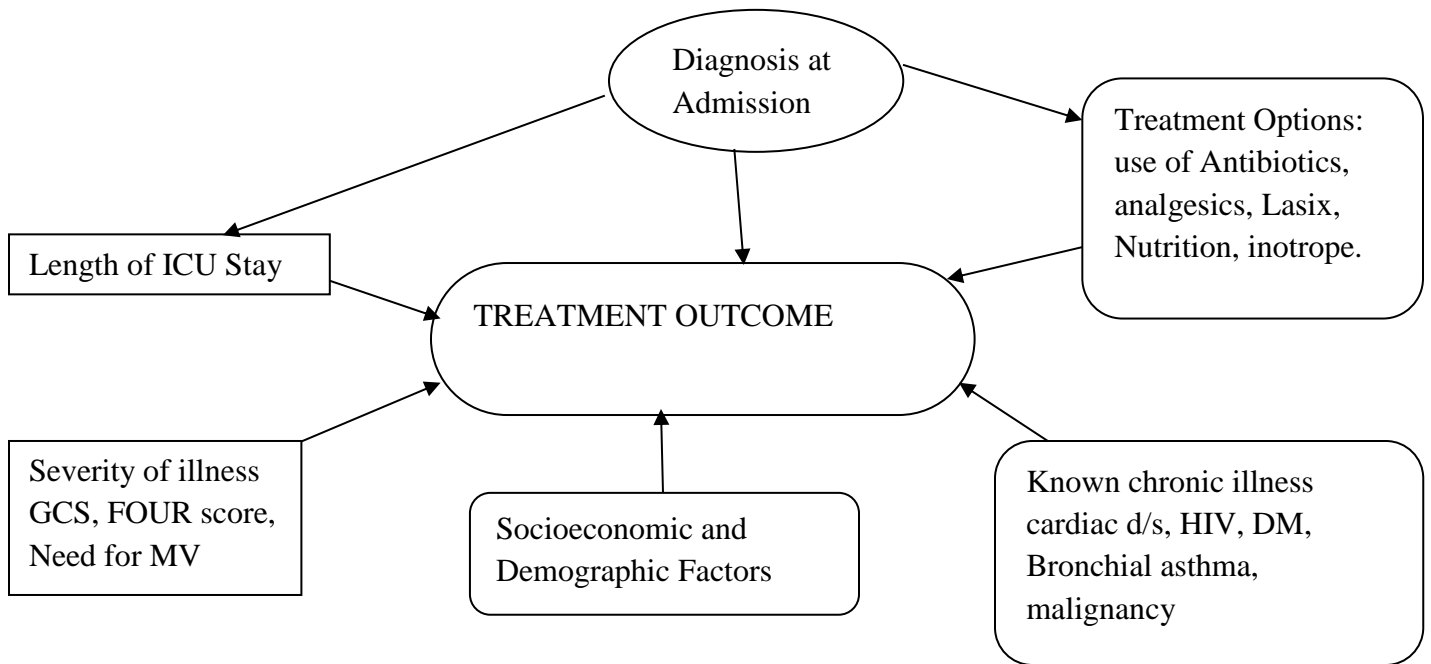


Figure 1: Conceptual frame work for this study

In conceptualization of this study, the concept is that, different factors like Diagnosis at admission, socioeconomic and demographic factors, and treatment provided, comorbid illness, and disease severity at admission had direct impact on outcome. On the other hand diagnosis at admission determines length of PICU stay and treatment.



## **CHAPTER 3: OBJECTIVES**

### **3.1 General Objectives**

- To determine admission pattern, clinical outcomes and associated factors among pediatric patients admitted to pediatric ICU, JUMC, south west Ethiopia from March 1, 2021 to October 30, 2021

### **3.2 Specific Objectives**

- To assess admission pattern of Pediatric patients admitted to pediatric intensive care unit of JUMC.
- To assess treatment outcome of pediatric patients admitted to Pediatric intensive care unit of JUMC
- To identify factors associated with treatment outcome among patients admitted to PICU of JUMC

## **CHAPTER 4: METHODOLOGIES**

### **4.1 Study area**

The study was conducted in Jimma University Medical Center (JUMC) pediatric intensive care unit. The center is one of the oldest public hospitals in the country located in Jimma Town of Oromia Regional State, Ethiopia. The town is located 353km far away from Addis Ababa and JUMC is the referral center for over 15 million people in the south western part of Ethiopia. Besides providing clinical services for patients, the center hosts several undergraduate and post graduate programs in the field of basic sciences as well as clinical medicine. JUMC, PICU was established in 2018 and has a capacity of four beds with four mechanical ventilators, and equipped with patient hemodynamic monitoring systems. The Unit is run by pediatric Intensivist, Anesthesia and pediatric residents who rotate Monthly, and general nurses. The nurse to patient ratio was 1:1.

### **4.2 Study period**

The study was conducted over the period of eight months, from March 1, 2021 to October 30, 2021

### **4.3 Study design**

Institution based prospective longitudinal study design was used.

### **4.4 Population**

#### **4.4.1 Source population**

All children admitted to PICU unit during the study period

#### **4.4.2 Study population**

All children admitted to PICU during the study period who fulfill the inclusion criteria

### **4.5 Inclusion and exclusion criteria**

#### **4.5.1 Inclusion criteria**

All pediatric patients from birth to 14 years who were admitted to pediatric intensive care unit during the study period

#### 4.5.2 Exclusion criteria

Children who died on arrival (within one hour of admission) to PICU(21,22) were excluded from final analysis

#### 4.6 Sampling

##### 4.6.1 Sample size determination

The sample size was calculated by sample size determination formula for a single population proportion

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

Sample size was calculated with the following assumption:

- n = minimum sample size,
- $Z_{1-\alpha/2}$  = significance level at  $\alpha = 0.05$
- d = margin of error (5%)
- P = prevalence of 8.5% (15)
- 10% non-response rate

The sample size = 132

##### 4.6.2 Sampling method

Consecutive sampling method was used.

#### 4.7 Study Variables

##### 4.7.1 Dependent variable

- Treatment Outcome

##### 4.7.2 Independent variables

- Sociodemographic factors of the patient (Age, sex, educational status, residency)

- Socioeconomic and demographic factors of the family/care takers which includes, educational level, income, residency, number of household members, relation of care taker with the patient, caregiver's educational status and occupation.
- Vaccination status.
- Admission sources,
- Diagnosis at admission,
- Glasgow Coma Scale (GCS) and FOUR score at admission,
- Known chronic illness(DM, HIV/AIDS, Malignancy, Bronchial asthma, Congenital heart disease, Rheumatic heart disease )
- Need for a mechanical ventilator,
- length of stay on mechanical ventilator,
- Length of stay in PICU.
- Treatment given(inotropes, antibiotics, analgesics, Furosemide, Oxygen, Nutritional treatment)

#### 4.8 Data collection tool and technique

Data was collected by using questionnaire and data extraction check list. The questionnaire was completed during face-to-face interviews with the parent/ care taker and chart review was done after an hour of admission as well as at the end of PICU care. The questionnaire was adapted after reviewing different literatures(8,10,14,15).

#### 4.9 Data quality Assurance

To assure data quality, questionnaire was first prepared in English and then translated into the local language, Afan Oromo, and Amharic by language expert and fluent speakers of both languages, and it is translated back into English to check its consistency. This questionnaire was tested on 5% of eligible parent/care taker as a pre-test to check the consistence of the questions and the time needed to conduct an interview with a parent/care taker. Then, proper corrections and adjustment was done. One day training was given for the PICU assigned residents monthly. The data collection was supervised by the principal investigator. Every day the computed questionnaires were reviewed and checked for completeness and relevance by principal

investigator and the necessary feedback was offered to data collectors in the next morning before the actual procedure. The data collection was started after the first hour of admission to PICU

#### 4.10 Data Processing and Analysis

Data was entered into EPI data version 3.1, and then it was exported to SPSS (Version 26.0) for statistical analysis. The univariate analysis such as proportions, percentages, ratios, frequency distributions and appropriate graphic presentations as well as measures of central tendency and measures of dispersion was used for describing data. Continuous variables was expressed as mean and standard deviation values. Bivariate analyses was done and all covariates which had association with the outcome variables at p-value of  $<0.25$  was selected for multivariable analyses. Then multivariate logistic regression was carried out to identify an independent effect of the predictors that showed significant association with dependent variable. Cross tabulation was used to assess exposure and non-exposure effect on dependent variable. To evaluate the association between dependent and independent variables, both crude odds ratio (COR) and adjusted odds ratio (AOR) with 95% confidence interval and P-value  $<0.05$  was considered significant. Goodness-of-fit the models was assessed using the Hosmer–Lemeshow goodness-of-fit test (P=0.98).

#### 4.11 Ethical assurance

The study was reviewed and approved by the Institutional Review Board (IRB) of Institute of Health, Jimma University. Permission letter was obtained from parents/care taker. Confidentiality of information collected from each study participant was maintained. All the participants in this study were consented either by them self or their parents/caretakers voluntarily. If the parent/care taker wants to withdraw from the study, they had full right to leave at any time without any effect on clinical management of their children

During face to face interview with the parent/care taker both data collector and parent/care taker were performed all the COVID 19 prevention strategies by providing face mask, sanitizer, and keeping the distance of one meter.

#### 4.12 Plan dissemination of results

The finding of this study will be submitted to Jimma University Faculty of Medical Sciences, Department of Pediatrics and Child Health, and other relevant stake holders. Attempts will also be made to publish it on peer reviewed scientific journal.

#### 4.13 Operational definition

**Treatment outcome:** the outcome of the patient upon he or she leaves the PICU either discharged alive or death

**Discharged alive:** Those patients who discharged to home or transferred to main ward or left against medical advice

**Death:** patient who died in the PICU during treatment after an hour of admission

**Length of stay (LOS):** duration of stay in days from the date of admission to the date of discharge from PICU

**Death on arrival:** Death in the first an hour of PICU admission(21,22)

## CHAPTER 5: RESULT

### 5.1 Sociodemographic characteristics of the patients

A total of 71 study participants were included; out of this more than half (37, 52.1%) of the study participants were females. The majority of them (29, 40.8%) were between the ages of 25-60 months. 32(45%) of the respondents were not reached school age and 20(28.2%) of participants started education. Two third (48, 67.6%) of the participants were fully vaccinated the remaining 12(16.9%) were partially vaccinated, and 11(15.5%) were not vaccinated at all. The majority 45(63.4%) of the respondents live in a rural area (**Table 1**).

**Table 1:** Sociodemographic characteristics of the patient admitted to pediatric intensive care unit, Jimma University Medical center (N=71)

| Variables          | Category | Frequency | Percent (%) |
|--------------------|----------|-----------|-------------|
| Sex                | Female   | 37        | 52.1        |
|                    | Male     | 34        | 47.9        |
| Age in Month       | ≤1       | 10        | 14.1        |
|                    | 2-12     | 5         | 7.0         |
|                    | 13-24    | 7         | 9.9         |
|                    | 25-60    | 29        | 40.8        |
|                    | 61-132   | 18        | 25.4        |
|                    | 133-168  | 2         | 2.8         |
| Place of residence | Urban    | 26        | 36.6        |
|                    | Rural    | 45        | 63.40       |

### 5.2 Socioeconomic and demographic characteristics of the parent/care taker of patients

Almost all (69, 97.2%) care givers were the parent, either father or mother or both and the majority 67(94.4%) of the parents were living together. The median age of the care takers were 32 years. Around one third (27, 38%) of the father and almost half (35, 49.3%) of the mother had no formal education. More than half (41, 57.7%) of the respondent had six and more family size. Half (37, 52.1%) of the participants father and 28(39.4%) of mothers income depend on farming. When we see the employment status, 29(40.8%) of the mothers and 4(5.6%) of the father were unemployed.

One third of participant's family (23, 32%) average monthly income were between 1001 and 2000 birr (**Table 2**).

**Table 2:** Socioeconomic and demographic characteristics of the parent/care taker of patients admitted to pediatric intensive care unit, Jimma University Medical center (N=71)

| Variables                            | Category                        | Frequency | Percent (%) |
|--------------------------------------|---------------------------------|-----------|-------------|
| Care takers                          | Parents, Mother/Father          | 69        | 97.2        |
|                                      | Relatives                       | 2         | 2.8         |
| Marital Status                       | Single                          | 2         | 2.8         |
|                                      | Live together                   | 67        | 94.4        |
|                                      | divorced                        | 1         | 1.4         |
|                                      | Widow                           | 1         | 1.4         |
| Age of primary care giver            | Median                          | 32.00     |             |
|                                      | Minimum                         | 20        |             |
|                                      | Maximum                         | 50        |             |
| Educational status Father            | No formal education             | 27        | 38          |
|                                      | Elementary school               | 23        | 32.4        |
|                                      | Secondary school                | 12        | 16.9        |
|                                      | Higher education                | 9         | 12.7        |
| Educational status mother            | No formal education             | 35        | 49.3        |
|                                      | Elementary school               | 17        | 23.9        |
|                                      | Secondary school                | 9         | 12.7        |
|                                      | Higher education                | 10        | 14.1        |
| Family size                          | ≤5                              | 30        | 42.3        |
|                                      | ≥6                              | 41        | 57.7        |
| Occupation of the father/ care taker | Merchant                        | 15        | 21.1        |
|                                      | Farmer                          | 37        | 52.1        |
|                                      | Government/private organization | 12        | 16.9        |
|                                      | Daily laborer                   | 2         | 2.8         |
|                                      | Unemployed                      | 4         | 5.6         |



|                                     |                                 |    |      |
|-------------------------------------|---------------------------------|----|------|
| Occupation of the mother/care taker | Merchant                        | 6  | 8.5  |
|                                     | Farmer                          | 28 | 39.4 |
|                                     | Government/private organization | 7  | 9.9  |
|                                     | Daily laborer                   | 1  | 1.4  |
|                                     | Unemployed                      | 29 | 40.8 |
| Average house hold income per month | ≤1000                           | 16 | 22.5 |
|                                     | 1001-2000                       | 23 | 32.4 |
|                                     | 2001-3000                       | 12 | 16.9 |
|                                     | >3000                           | 20 | 28.2 |

### 5.3 Clinical characteristics of the patients

Few study participants 9(12.7%) have a known chronic illnesses like RHD 2(22.2%), DM 2(22.2%), Bronchial asthma 2(22.2%), CHD 1(11.1%), malignancy 1(11.1%) and Cerebral palsy 1(11.1%). Majority of the admission were due to Upper air way obstruction (8, 11.3%) and severe sepsis (8, 11) followed by septic shock (7, 9.9%), complicated Meningitis (7, 9.9%), congestive heart failure (7, 9.9%) and post-operative patients (7, 9.9%). There were 26(36.9%) patients who were developed complications after admission. Those complications are Hospital acquired infection 7(9.9%), aspiration pneumonia 7(9.9%) and others 12(16.9). The primary source of admission for nearly half (33, 46.5%) of the patients were transfer from main ward, followed by Emergency OPD (28, 39.4) and OR recovery (10, 14.1%). More than half (57.7) of patients GCS at admission were between 12 and 15 and FOUR score after admission were between 12 and 15. Two third (43, 60.6%) of the patient were candidate for MV from whom 39(88.9%) were intubated and the rest 5(11.1%) were not intubated due to absence of MV. The mean duration of ventilator support was 8.67 with minimum of 1 day and maximum of 30 days. Nearly one third 21(29.6%) of patients were given inotropic support and 64(90.1%) of the study subject was given antibiotics. Regarding the duration of PICU stay the mean time of stay was 9 days with minimum duration of stay of 6 hours and maximum of 60 days. From the study participants more than half (38, 53.5%) were improved and transferred to ward, 22(31%) were died in the PICU, 8(11.3%) were discharged to home and 3(4.2%) were left against medical advice (**Table 3**).

**Table 3:** Clinical characteristics of the patients admitted to pediatric intensive care unit, Jimma University Medical Center

| Variable                                    | Category                                     | Frequency | Percent (%) |      |
|---|--|-----------|-------------|------|
| Known chronic illness                       | Yes  | 9         | 12.7        |      |
|   | No   | 62        | 87.3        |      |
| If yes for chronic illness which type (n=9) | Congenital heart disease                     | 1         | 11.1        |      |
|   | Rheumatic heart disease                      | 2         | 22.2        |      |
|   | DM   | 2         | 22.2        |      |
|   | Malignancy                                   | 1         | 11.1        |      |
|   | Bronchial asthma                             | 2         | 22.2        |      |
|   | CP   | 1         | 11.1        |      |
| Vaccination status                          | Fully vaccinated                             | 48        | 67.6        |      |
|   | Not vaccinated                               | 11        | 15.5        |      |
|   | partially vaccinated                         | 12        | 16.9        |      |
| Nutritional status                          | Normal                                       | 47        | 66.2        |      |
|   | Moderate acute malnutrition                  | 8         | 11.3        |      |
|   | Severe acute malnutrition                    | 16        | 22.5        |      |
| Admission Diagnosis †                       | Upper airway obstruction                     | 8         | 11.3        |      |
|   | Croup  | 3         | 4.2         |      |
|   | Pneumonia with Impending respiratory failure | 5         | 7           |      |
|   | Complicated meningitis                       | 7         | 9.9         |      |
|   | Septic shock                                 | 7         | 9.9         |      |
|   | Cardiogenic shock                            | 1         | 1.4         |      |
|   | Severe sepsis                                | 8         | 11.3        |      |
|   | Tetanus                                      | 2         | 2.8         |      |
|   | Severe DKA                                   | 4         | 5.6         |      |
|   | Guillain-Barre syndrome                      | 2         | 2.8         |      |
|   | Congestive heart failure                     | 7         | 9.9         |      |
|   | Complicated AGN                              | 4         | 5.6         |      |
|   | TBI  | 5         | 7           |      |
|   | Post-operative patient                       | 7         | 9.9         |      |
|   | Electrolyte imbalance                        | 3         | 4.2         |      |
|   | Status epilepticus                           | 3         | 4.2         |      |
|   | Others                                       | N=        | 15          | 21.1 |
|   |  | MAS       | 2           | 2.8  |

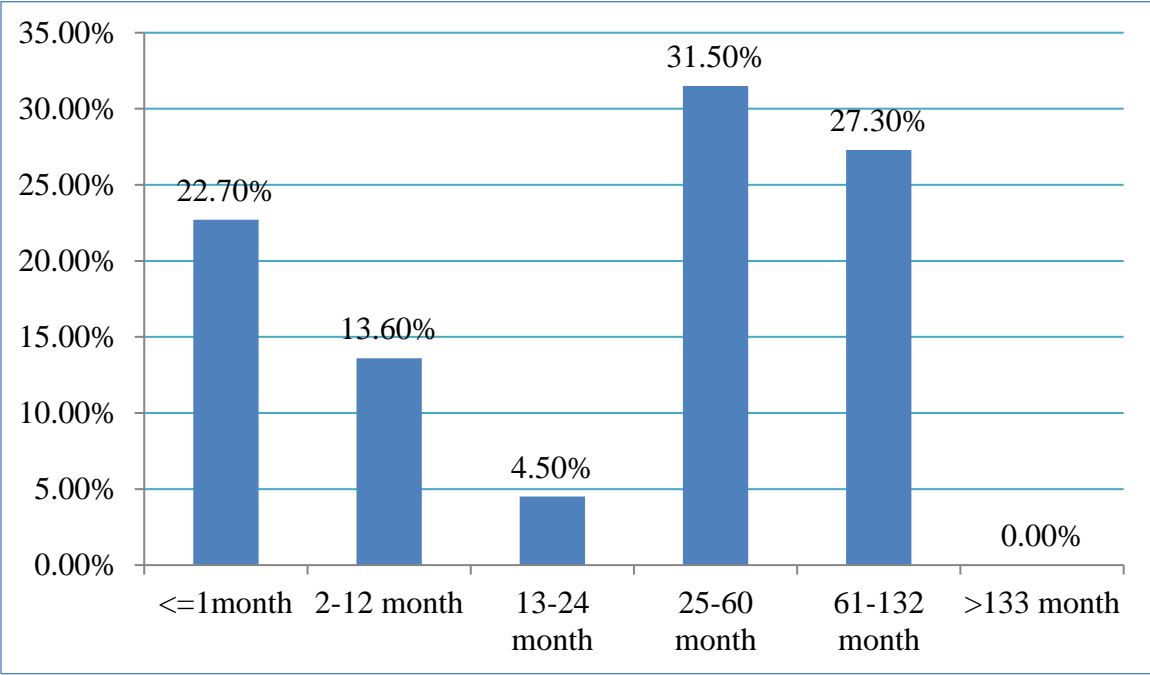
|  |                             |    |      |
|--|-----------------------------|----|------|
|  | poisoning                   | 3  | 4.2  |
|  | Pericardial effusion        | 2  | 2.8  |
|  | Aspiration pneumonia        | 2  | 2.8  |
|  | Anaphylactic shock          | 1  | 1.4  |
|  | Cerebral edema              | 1  | 1.4  |
|  | Retropharyngeal mass        | 1  | 1.4  |
|  | Spontaneous pneumothorax    | 1  | 1.4  |
|  | CKD                         | 1  | 1.4  |
|  | FBA                         | 1  | 1.4  |
| Additional diagnosis after admission(complication) | Hospital acquired infection | 7  | 9.9  |
|  | Aspiration Pneumonia        | 7  | 9.9  |
|  | Other*                      | 12 | 16.9 |
| Admission source                                   | EOPD                        | 28 | 39.4 |
|  | Transferred from ward       | 33 | 46.5 |
|  | Transferred from recovery   | 10 | 14.1 |
| GCS of the patient at admission                    | Less than 8                 | 13 | 18.3 |
|  | 9-12                        | 17 | 23.9 |
|  | 12-15                       | 41 | 57.7 |
| FOUR score of the patient at admission             | Less than 8                 | 13 | 18.3 |
|  | 9-12                        | 17 | 23.9 |
|  | 12-15                       | 41 | 57.7 |
| Candidate for Mechanical ventilator                | Yes                         | 43 | 60.6 |
|  | No                          | 28 | 39.4 |
| Intubated?   | yes                         | 39 | 90.1 |
|  | No                          | 4  | 8.9  |
| Duration of stay on MV in days(N=39)               | ≤1                          | 6  | 15.4 |
|  | 2-3                         | 7  | 18   |
|  | 4-7                         | 11 | 28   |
|  | ≥8                          | 15 | 38.5 |
| Treatment given                                    | Inotropes                   | 21 | 29.6 |
|  | Antibiotics                 | 64 | 90.1 |
|  | Analgesics                  | 46 | 64.8 |
|  | Furosemide                  | 11 | 15.5 |
|  | Oxygen                      | 54 | 76   |
|  | Nutritional treatment       | 23 | 32.4 |

|                       |                                    |    |      |
|-----------------------|------------------------------------|----|------|
|                       | Other**                            | 11 | 15.5 |
| Duration Of PICU stay | ≤1                                 | 9  | 12.7 |
|                       | 2-3                                | 13 | 18.3 |
|                       | 4-7                                | 25 | 35.2 |
|                       | ≥8                                 | 24 | 33.8 |
| Outcome               | Discharged improved                | 8  | 11.3 |
|                       | Died in the ICU                    | 22 | 31.0 |
|                       | Transferred to ward                | 38 | 53.5 |
|                       | Leave against medical advice(LAMA) | 3  | 4.2  |

Key: \* AKI, Dysglycemia, abscess, SSI, Stress ulcer, Autonomic dysfunction

\*\* KCL, MgSO4, Mannitol, Insulin, steroid, anti-hypertensive, muscle relaxant, N/S, DNS, 10%DW

† More than one answer is possible



**Figure 2:** Distribution of deaths by age of patient died in the PICU of JUMC

**5.4 Factors associated with treatment outcome of the patients**

To identify the predictors of outcome variables multivariable logistic regression analysis was performed after selected the candidate variables through bivariate logistic regression. The variable with P-value ≤0.25 on bivariate analysis which include upper airway obstruction, septic shock,

severe sepsis, CHF, nutritional status, admission source, FOUR score at admission, being a candidate for mechanical ventilator, and use of analgesic were subjected for multivariate logistic regression. Out of these severe sepsis, nutritional status and being a candidate for mechanical ventilator were found to have positive association with treatment outcome which is death in the PICU by multivariate logistic regression at p-value <0.05 with 95% CI of AOR.

In this study the odds of dying was 8.9 times higher among children who had severe sepsis as compared to children who didn't have severe sepsis (AOR=8.97, 95% CI 1.34-59.96, P=0.024). Similarly children who had severe acute malnutrition was 15 times more likely to die as compared to children who had normal nutritional status (AOR=15.22, 95% CI 2.76-83.99, P=0.002). In addition the odds of dying was 9.8 times higher among those children who were candidate for mechanical ventilator (AOR=9.82, 95% CI 1.97-48.76, P=0.005) compared with those who were not.

**Table 4:** Binary and Multivariable logistic regression model to identify factors associated with outcome of the patients admitted to pediatric intensive care unit, Jimma University Medical Center

| Variables                | Category   | Outcome Variables |                | COR 95%CI               | AOR 95%CI                 |
|--------------------------|------------|-------------------|----------------|-------------------------|---------------------------|
|                          |            | Dead (%)          | Improved (%)   |                         |                           |
| Upper airway obstruction | Yes        | 1(12.5)           | 7(87.5)        | 0.27(0.03,2.36)         | 0.13(0.08,2.25)           |
|                          | No         | 21(34.4)          | 42(65.6)       | 1                       | 1                         |
| Septic shock             | Yes        | 6(85.7)           | 1(14.3)        | 16.87(1.88,151)         | 14.73(0.87,248.7)         |
|                          | No         | 16(26.2)          | 48(73.8)       | 1                       | 1                         |
| Severe sepsis            | <b>Yes</b> | <b>5(62.5)</b>    | <b>3(37.5)</b> | <b>4.21(0.90,19.6)</b>  | <b>8.97(1.34,59.96)*</b>  |
|                          | No         | 17(28.3)          | 46(71.7)       | 1                       | 1                         |
| CHF                      | Yes        | 4(57.1)           | 3(42.9)        | 3.18(0.65,15.69)        | 3.08(0.23,40.13)          |
|                          | No         | 18(29.5)          | 46(70.5)       | 1                       | 1                         |
| Nutritional status       | Normal     | 10(21.3)          | 37(78.7)       | 1                       | 1                         |
|                          | Moderate   | 2(25.0)           | 6(75.0)        | 1.23(0.21,7.07)         | 3.68(0.42,31.73)          |
|                          | <b>SAM</b> | <b>10(62.5)</b>   | <b>6(37.5)</b> | <b>6.16(1.80,21.09)</b> | <b>15.22(2.76,83.93)*</b> |
|                          | EOPD       | 5(17.9)           | 23(82.1)       | 0.87(0.14,5.40)         | 0.20(0.09,4.97)           |

|                  |                           |                 |                 |                         |                          |
|------------------|---------------------------|-----------------|-----------------|-------------------------|--------------------------|
| Admission source | Transferred from ward     | 15(45.5)        | 18(55.5)        | 3.33(0.61,18.14)        | 2.25(0.16,31.43)         |
|                  | Transferred from recovery | 2(20.0)         | 8(80.0)         | 1                       | 1                        |
| FOUR score       | Less than 8               | 7(53.8)         | 6(46.2)         | 2.51(0.70,8.97)         | 2.06(0.32,13.07)         |
|                  | 9-12                      | 2(11.8)         | 15(88.2)        | 0.28(0.5,1.44)          | 0.44(0.05,4.01)          |
|                  | 12-16                     | 13(31.7)        | 28(68.3)        | 1                       | 1                        |
| Candidate for MV | <b>Yes</b>                | <b>19(44.2)</b> | <b>24(55.8)</b> | <b>6.59(1.27,25.20)</b> | <b>9.82(1.97,48.76)*</b> |
|                  | No                        | 3(10.7)         | 25(89.3)        | 1                       | 1                        |
| Analgesic Use    | Yes                       | 17(30.7)        | 29(63.0)        | 2.34(0.74,7.39)         | 0.99(0.13,7.43)          |
|                  | No                        | 5(20.0)         | 20(80.0)        | 1                       | 1                        |

Key; \* Indicates statically significant variables in multivariate logistic regression at  $p < 0.05$  with 95% CI of AOR.

## CHAPTER 6: DISCUSSION

Good quality health care has a profound effect on the reduction of childhood mortality in developing countries. Advances in pediatric sub-specialties including critical care medicine have improved the survival of critically ill children. However, in Ethiopia and other developing countries, this is one of the fragile components of the health care system. The challenge is related to low infrastructure, well-trained human power, and also rapid identification, prioritization, and urgent treatment(23).

This study revealed that Upper airway obstruction, severe sepsis, Septic shock, complicated meningitis, Congestive heart failure constitute the major causes of admission which is in line with prospective studies done in Gondar and retrospective studies done in India and Nepal showing cardiovascular, respiratory tract, neurologic disorder, and infectious/sepsis as a major cause of admission(8,17,24), however, this finding is different from a previous retrospective study done at Jimma university general ICU and Mozambique which shows the trauma and Malaria respectively were the major cause of admission(10,19). The study in Jimma can be explained by the setting which was mixed use for both pediatrics and adult patients in previous studies. The study in Mozambique shows higher proportion of admission was due to malarial disease which might be explained by the high malaria prevalence in Mozambique as compared to Ethiopia in that year of study. According to WHO 2019 report malaria prevalence was 308.4/1000 and 34.3/1000 in Mozambique and Ethiopia respectively.

The mortality rate in this study was 31% which is in the range of WHO recommendation for developing countries(25). This finding was consistent with the prospective cohort study done in Gondar (32%), and another retrospective cross-sectional study done in the same setting (30.9%)(8,14). Other studies which were done in Mozambique (25%) and Nepal (22.7%) were also in line with our findings (17,19). However, it is lower than the finding of a previous retrospective cross-sectional study done in Jimma (40%) which might be due to isolated PICU for pediatric patients and improvement in well-trained human power in pediatrics critical care. Other studies in low income countries like Rwanda (50%), Egypt (50.49%), and Tanzania (41.1%) show a higher mortality rate. This might be due to inadequate staffing, experience, and low resources in those settings(9,10,20).

The mortality rate from our study is higher when we compare it with retrospective cross sectional studies done in Ethiopia, Ayder Hospital (8.5%)(15). The possible explanation for this discrepancy might be due to a low number of patients (4%) who were required intubation compared to our findings (62%), which might be due to less critical patients were admitted compared to our PICU. Similarly, other retrospective studies done in India show a lower mortality rate(5.8% ) (18). These discrepancies might be due to suboptimal care, the inadequacy of diagnostic and interventional facilities in our PICU.

The most common age of PICU admission in this study is between the ages 25 to 60 months old with mean age of  $51 \pm 44$  months old. This finding is different from the previous study in JUMC which indicates the common age of admission between 10 to 14 year and other studies in Ayder, Gondar, India, and Rwanda all shows less than one year of age was the commonest cause of admission. This indicates that there is variation in patient characteristics in different geographical areas. It might be also due to the small sample size in this study(8,10,15,20,24).

This study highlight that Children admitted with the diagnosis of severe sepsis had a higher risk of dying compared to children who have not which is consistent with prospective studies done in Gondar and Mozambique which was found that the highest mortality was related to sepsis(8,19). This could be due to delayed diagnosis of sepsis, absence of proper investigation modalities like blood culture and suboptimal treatment.

According to this study having severe acute malnutrition has a higher risk of death as compared to nutritionally normal children. There were no studies supporting this finding; however, it can increase the risk of death due to compromised organ function, immunocompromisation, and increased risk of treatment related complications.

Patients who are a candidate for MV had an increased risk of mortality than those who did not have indications for MV. This finding is consistent with the findings of studies from Ayder Hospital and other studies from Netherland(4,15). Patients who need MV tend to have advanced disease stages. This finding can also be attributed to a limited number of mechanical ventilators in our PICU for which some patients were not intubated even though they have indications. There might also be unrecognized ventilator-associated complications in those who were placed on a mechanical ventilator.



## **Strength and Limitation**

The strength of this study is that since it is a prospective study detail on sociodemographic factors and clinical data of the patient was well assessed. Nutritional status was assessed only at admission even though later development was possible. Duration of illness before admission was not assessed. Death at other ward after discharge from PICU was not assessed due to logistic issue. Inability to use a severity scoring system like PIM2 due to the absence of arterial blood gas analyzer in our PICU during the study period.

## **CHAPTER 7: CONCLUSION AND RECOMMENDATION**

### **7.1 Conclusion**

The top causes of admission to PICU during the study period were upper airway obstruction, severe sepsis, complicated meningitis, septic shock, congestive heart failure, and post-operative patients. The proportion of death was in the range with WHO recommendation of ICU mortality rate for developing country. Having a diagnosis of severe sepsis, severe acute malnutrition, and being a candidate for a mechanical ventilator were factors positively associated with mortalities.

### **7.2 Recommendation**

Early identification and proper treatment of sepsis, severe acute malnutrition, and its complication. Since all candidate patients for MV was not intubated for absence of MV improving the availability of PICU infrastructures like MV and other hemodynamic monitoring equipment is recommended.

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## 9. Annex

### 9.1 Information sheet and parent/care taker Consent form (English)

#### Information sheet

Good morning? / Good afternoon? My name is\_\_\_\_\_. I am here to collect data for a study being done to assess admission pattern and outcome of pediatric intensive care unit at JUMC. The questionnaire requires a maximum of 5 minutes to complete. Your participation is entirely voluntarily, and you can quite from the study any time you want. Your name and other personal identity will not be used, and hence the personal information we collect from you will completely be kept confidential and will not be disclosed to any third person other than the people conducting this study. Your participation will help as to know morbidity pattern and level of our care for better improvement in the future.

Do you agree to be interviewed?

Yes  No

If yes, continue interviewing

If no, thank and stop interviewing

To be signed by interviewer: I certify that I have read the above consent procedure to the participant.

Signed: \_\_\_\_\_

**የፈቃደኝነት መጠየቂያና የመረጃ ገጽ**

የመረጃ ገጽ

ጤና ይስጥልኝ። ስሜ \_\_\_\_\_ ይባላል። እኔ ዛሬ የመጣሁት ዋና ምክንያት በጅማ ዩኒቨርሲቲ የሀፃናት ጽኑ ህክምና ክፍል ውስጥ የሚተኙ ህጻናት ላይ የበሽታ ስርጭት፤ የህክምና ውጤት እና ተያያዥ ጉዳዮች ላይ ለሚደረገው ጥናት መረጃ ለመሰብሰብ ነው። መጠይቁን ለማጠናቀቅ ቢበዛ ከ 5 ደቂቃ በላይ አይወስድም ። የእርሶ በጥናቱ ላይ ተሳትፎ በፈቃደኝነት ላይ የተመሰረተ ነው። መሳተፍ ካልፈለጉ በማንኛውም ሰዓት መተው ይቻላል። የእርሶ ስምና ግለሰባዊ መረጃ ሚስጥራዊነቱ የተጠበቀ ነው። ስለእርሶ መረጃ ጥናቱን ከሚያካሂደው ሰው ውጭ ሌላ ሰው አያውቅም። የእርሶ ተሳትፎ የበሽታውን ስርጭት የህክምና ውጤት እና ተያያዥ ጉዳዮችን ለማወቅና ወደፊት አገልግሎቱን ለማሻሻል ይረዳናል።

በጥናቱ ለመሳተፍ ተስማምተዋል?

አዎ

አይ

መልስ አዎ ከሆነ መጠይቁን ይቀጥሉ

መልስ አይ ከሆነ አመሰግነው መጠይቁን ያቁሙ

በመጠይቁ ሞዴል የሚፈረም። ከላይ በመረጃ ገጽ ላይ ያለውን ለጥናቱ ተሳታፊ በተገቢ ሁኔታ አንብቤ ማስረዳቱን በፈርማዬ አረጋግጣለሁ።

የጤያቂው ስም \_\_\_\_\_ ፊርማ \_\_\_\_\_.

## **Fullaa oddefannoo fi fedhii Haadholii**

### **Fullaa oddefannoo**

Nagaa, Maqaan koo \_\_\_\_\_ jedhama. Amma sababnin isin barbaadeef daa'imman kutaa kana ciisaan irratti haala faca'iinsa dhukkubaa, bu'aa wal'aansa godhamuu fi haala kanaan walqabatan irratti qorannoo gaggeeffamaa jiruuf odeeffannoo sassaabuuf yemmuu ta'u gaffiilee odeeffannoo kanneen xumuruuf yoo bay'ate daqiiqa shan qofa barbaada. Hirmaannaan keessan fedhii keessan irratti kan hundaaye dha. Yoo hirmaachuu hin barbaanne yeroo kamiyyuu dhaabuu dandessu. Maqaafi enyummaan keessan qorannoo kana kessattii hin eeramu. Odeeffannoon isin nuuf kennitan, nama qorannoo kana hojjetuun ala kan beeku hin jiraatu. Bu'aan qorannoo kanaa haala faca'iinsa dhukkubaa, bu'aa yaalii fi haala kanaan walqabatan beekuufi tajaajila keenya fooyyessuuf nu gargaara.

Irraati hirmaachuuf walii galtanii?

Eeyyee\_\_\_\_\_. Lakkii\_\_\_\_\_.

Deebiin yeroo Eyyee ta'e gaaffilee ittii fufaa

Yeroo lakkii ta'e galateeffadhaa dhaabaa

Nama gaaffilee gaggeessuun kan mallatteeffamu. Armaan ol fuula odeeffannoorratti kan barreeffame hirmaataa qorannootif dubbisefi hubachiisukoo mallattoo koon nan mirkaneessa.

Maqaa nama gaffii gafatuu\_\_\_\_\_mallattoo\_\_\_\_\_guyyaa\_\_\_\_\_.

## 8.2 Questionnaire

| Pediatric ICU questionnaire   |   |   |  |
|---|---|---|--|
| Socio-demographic characteristics of the patient admitted to PICU, JUMC |   |   |  |
| Code  | Question  | Response  |  |
| 1   | Card number                                     | _ _ _ _ _ _ _   |  |
| 2   | Study number                                    | _ _ _ _ _ _ _   |  |
| 3   | Date of admission                               | _ _ - _ _ - _ _ _ _  (DD-MM-YY)   |  |
| 4   | Previous admission                              | 1. Yes 2. No  |  |
| 5   | If yes to Q no. 4 how many times                | _ _   |  |
| 6   | Child has known chronic illness                 | 1. Yes 2. No  |  |
| 7   | If yes to Q no 6 specify                        | 1. Congenital heart disease<br>2. Rheumatic heart disease<br>3. DM<br>4. HIV<br>5. Malignancy<br>6. Bronchial asthma<br>7. CLD<br>8. Renal disease<br>9. Other<br>specify.....<br>----- |  |
| 8   | Age in years(for those< 5years of age in month) | _ _   |  |
| 9   | Sex   | 1. Male 2. Female   |  |
| 10  | Birth Order                                     | _ _   |  |
| 11  | Total number of siblings                        | _ _   |  |
| 12  | Total number of siblings alive                  | _ _   |  |
| 13  | Is he/she attending school                      | 1. Yes 2. No  |  |
| 14  | If he/she is attending school specify grade     | _ _   |  |
| 15  | Child vaccination status                        | 1. Fully vaccinated<br>2. Not vaccinated<br>3. Partially vaccinated   |  |

|    |  |  |  |
|----|--|--|--|
| 16 | Who is the care taker?   | 1, Parents, Mother/Father 3. Other specify_____  |  |
|    |  | 3, Relatives_____  |  |
|    | <b>Socioeconomic and demographic characteristics of the parent/care taker of patients admitted to PICU, JUMC</b> |  |  |
| 17 | Marital status of the primary care taker   | 1. Single 2. Live together 3. Divorced<br>4, Widow 5. Widower  |  |
| 18 | Place of residence   | 1. Urban 2. Rural  |  |
| 19 | Age of primary care giver in years   | _ _  |  |
| 20 | Educational status of father   | 1. No formal education 2. Elementary school<br>3, Secondary school 4. Higher education                 |  |
| 21 | Educational status of mother   | 1. No formal education 2. Elementary school<br>3, Secondary school 4. Higher education                 |  |
| 22 | Family size  | _ _  |  |
| 23 | Occupation of the father/care taker  | 1, Merchant 2, Farmer<br>3, Government/private organization employee<br>4, Daily laborer 5, Unemployed |  |
| 24 | Occupation of the mother/care taker  | 1, Merchant 2, Farmer<br>3, Government/private organization employee<br>4, Daily laborer 5, Unemployed |  |
| 25 | House hold income per month  | _ _ _ _ _  |  |



| Data extraction check list of admitted patients to PICU, JUMC |  |  |
|---|--|--|
| 1   | Admission diagnosis                                | <ol style="list-style-type: none"> <li>1. Upper airway obstruction</li> <li>2. Asthma</li> <li>3. Croup</li> <li>4. Pneumonia with impending respiratory failure</li> <li>5. Complicated meningitis</li> <li>6. Septic Shock</li> <li>7. Cardiogenic shock</li> <li>8. Severe sepsis</li> <li>9. Tetanus</li> <li>10. Severe DKA</li> <li>11. Gullian-Barre syndrome(AFP)</li> <li>12. Congestive heart failure</li> <li>13. Complicated AGN</li> <li>14. TBI</li> <li>15. Post-operative patient</li> <li>16. Electrolyte imbalances</li> <li>17. Status epilepticus</li> <li>18. Others(Poisoning, Malignancy, Foreign body aspiration, Near drowning_____)</li> </ol> |
| 2   | Total duration of illness in days                  | _ _  |
| 3   | Additional diagnosis after admission(complication) | 1, Yes 2, No   |
| 4   | If yes to Q no. 28, what complications?            | <ol style="list-style-type: none"> <li>1. Hospital acquired infection</li> <li>2. Aspiration pneumonia</li> <li>3. DVT</li> <li>4. Air leak syndrome</li> <li>5. Other specify_____</li> </ol>   |
| 5   | Nutritional status of the child on admission       | 1, Normal 2, Mild SAM, 3, Moderate SAM, 4, Severe SAM  |
| 6   | Admission source                                   | 1, EOPD 2, Transferred from ward 3, Transferred from recovery  |
| 7   | GCS of the patient at admission                    | 1, less than 8 2, 9-12 3, 12-15  |
| 8   | FOUR score for intubated patient at admission      | 1, less than 8 2, 9-12 3, 12-16  |

|    |   |   |  |
|----|---|---|--|
| 9  | Is the child candidate for mechanical ventilation | 1, Yes 2, No  |  |
| 10 | If yes for Q 34, is he/she intubated?             | 1, Yes 2, No  |  |
| 11 | If yes for Q35, for how long?                     | _ _   |  |
| 12 | If no for Q35, what is the reason?                | 1, Absence of MV, 2, Not indicated<br>3, Other specify_____   |  |
| 23 | Is there need for Inotropes?                      | 1, Yes 2, No  |  |
| 24 | What other treatment offered?                     | 1, Antibiotics 2, Opoird Analgesics, 3, Frusemide,<br>4, Oxygen 5, Nutritional treatment<br>6, Other specify_____   |  |
| 25 | Duration of PICU stay in days                     | _ _   |  |
| 26 | Outcome   | 1. Discharged improved<br>2. Died in the ICU<br>3. Transferred to ward<br>4. Referred out to another facility to complete treatment<br>5. Referred for better management<br>6. Leave against medical advise/disappearance |  |