ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCE

DEPARTMENT OF EMERGRNCY MEDICINE

CLINICAL PROFILES AND OUTCOME OF PATIENTS ON MECHANICAL VENTILATION AMONG ADULT INTENSIV CARE UNIT OF TIKUR ANBESSA SPECIALIZED HOSPITAL ADDIS ABABA ETHIOPIA, 2020

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RESEARCH THESIS TO BE SUBMITTED TO ADDIS ABABA UNIVERSITY COLLEGE OF HEALTH SCIENCESE DEPARTMENT OF EMERGENCY MEDICINE IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR MASTERS OF SCIENCE DEGREE IN EMERGENCY MEDICINE AND CRITICAL CARE NURSING

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ADDIS ABABA, ETHIOPIA

Declaration

I am Kahsu Tsegay Meressa hereby declare that this MSc thesis on clinical profiles and outcome of patients on Mechanical Ventilation Among Adult Intensive Care Unit of Tikur Anbessa specialized hospital Addis Ababa, Ethiopia 2020 is a guanine and authentic work carried out by me. The content of this thesis, in full or in parts have not been submitted to any other institution or university.

Date_____Signature_____

Approval of primary Advisors

This thesis has been submitted for examination with our approval as university Advisors.

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Name of examiner

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LIST OF ACRONYMS

AICU=Adult Intensive Care Unit

AKI=Acute Kidney Injury

AOR=Adjusted Odds Ratio

ARDS=Acute respiratory distress syndrome

CI= Confidence Interval

COPD=Chronic obstructive pulmonary disease

COR= Crude Odds Ratio

CPR=Cardio pulmonary resuscitation

FIO2=Fraction of Inspired Oxygen

GCS=Glasgow coma scale

ICU=Intensive care unit

IMV=Invasive mechanical ventilation

LMICs=Low Middle Income countries

MODS=Multi organ dysfunction

MV=Mechanical ventilation

PaO2=Partial Arterial Oxygen

PSV=Positive support ventilation

SIMV=Synchronized intermittent mandatory ventilation

TASH=Tikur Anbessa Specialized Hospital

VAP=Ventilator Associated Pneumonia

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ABSTRACT

Background: Mechanical ventilation is a supportive treatment for patients who are unable to maintain adequate oxygenation and/or removal of carbon dioxide. One of the most common indications of admission to the intensive care unit is the need for the ventilator support. Patients admitted to intensive care units who need mechanical ventilation had been higher mortality rates than those who do not require respiratory support.

Objective: The objective of the study was to assess the clinical profile and outcomes of patients on mechanical ventilation among adult intensive care units of TASH, Addis Ababa, Ethiopia, 2020.

Methodology: Retrospective cross-sectional study was employed using a principal investigator developed (PI) data extraction form. We reviewed retrospectively a one-year medical record of ventilated patient from September 1, 2018- August 30, 2019. Data were analyzed using statistical package for social science (SPSS) version 25. Description of median frequency and standard deviation (SD) on each variable were calculated. Multivarte logistic regression was assessed to association between dependent and independent variable.

Result: There were 693 patients admitted to AICU over the one year and 348(50.2%) were mechanically ventilated. The main source for admission was Adult emergency and operation room with same percent (37.6%). The main reason for ICU admission was respiratory (55.2%). The predominant indication of mechanical ventilation was respiratory failure (41.9%), neurological failure (36.7%) and sepsis (11.4%). Volume control ventilation was the most common initial mode of ventilation used. In multivariable regression analysis being medical diagnosis patients, multi organ dysfunction syndrome and sedation used were statistically positively associated with mortality at p-value of less than 0.05 with CI 95%.

Conclusion and recommendation: The mortality rate of Adult patients on mechanical ventilation in Tikur Anbessa specialized hospital was high. This high mortality rate suggesting an urgent need for extensive improvement in protocols for ICU set up.

Key words: Clinical profile, Intensive Care Unit, mechanical ventilation, outcomes.

1. INTRODUCTION

1.1. Background

Mechanical ventilation is a supportive treatment for patients who are unable to maintain adequate oxygenation and/or remove carbon dioxide(1). One of the most common indications of admission to the intensive care unit (ICU) is the need for the ventilator support (2).

The first systematic use of ventilators in modern medicine was reported to have begun by Doctor Bjorn Ibsen in Copenhagen in 1953, whose use of mechanical ventilation helped to save thousands of lives of patients with polio who were dying of respiratory failure, reducing mortality from 87 percent to 25 percent (3).

Mechanical ventilation can be provided through non-invasive or invasive means and involves the delivery of positive airway pressure. Gas flow is delivered through a constant or decelerating pattern and the volume depends on inspiration time, gas flow and airway pressure. All are interrelated with pressure, flow, time and volume(4).

The main indications for mechanical ventilations are airway protection and respiratory failure, which are considered to be vital for survival of critically ill patients (5).

The goal of mechanical / artificial ventilation is to improve gas exchange, reduce work of breathing and prevent complications while ensuring optimum conditions for patients to recover from their underlying illness. Whatever should be the reason for respiratory assistance, the patient's underlying condition must be reversible; otherwise subsequent weaning may not be possible (6).

Mechanical ventilation can cause significant and often permanent mental, physical and behavioral impairments requiring long-term access to health care. However, predicting the health care service utilization and mortality rate associated with invasive mechanical ventilation is difficult because of its widely varying rate and extent of recovery. Although Invasive Mechanical Ventilation(IMV) patients consume significant medical resources, their outcomes tend to be poor, especially in the elderly population (7).

Mechanical ventilation is often a life-saving intervention, but carries potential complications including pneumothorax, airway injury, alveolar damage, ventilator-associated pneumonia, and ventilator-associated tracheobronchitis. Other complications include diaphragm atrophy, decreased cardiac output, and oxygen toxicity. One of the primary complications that presents in patients mechanically ventilated is acute lung injury (ALI)/acute respiratory distress syndrome (ARDS). Acute lung injury/ acute respiratory distress syndrome are recognized as significant contributors to patient morbidity and mortality (8).

Timely liberation from invasive mechanical ventilation is important to reduce the risk of ventilator-associated complications. Mechanical ventilation weaning is a major problem in intensive care units (9).

Failure in weaning patients from the ventilator increases morbidity, mortality, the duration of mechanical ventilation, and the length of the stay in the ICU. Prolonged use of the ventilator can result in numerous complications, including respiratory tract infections, instability of hemodynamic status, sleep disorders, psychological dependence on the ventilator, higher rate of mortality, lung damage, laryngeal injuries, tracheal stenosis, sinusitis, pneumothorax, decreased cardiac output, physiological problems, reduction in oxidative enzymes in the respiratory muscles, nervous myopathy, increase in taking sedatives, higher gastrointestinal stress, skin fragility, bed sores, muscle atrophy and weakness, and pulmonary barotrauma (10).

1.2. Statement of the problem

A study in Duke University stated that among the millions of patients admitted to intensive care units (ICUs) annually; approximately one in three will receive mechanical ventilation (11). The frequency of utilizing mechanical ventilation, according to previous studies, varies from 40-65% of all adult intensive care units (AICUs) (5). Recent epidemiological research in the United States showed that about 310 persons per 100,000 adult populations undergo invasive mechanical ventilation for non-surgical intervention. This situation has led to increased health care expenditures(12)

It is estimated that patients admitted to intensive care units(ICUs) who need mechanical ventilation(MV) will have higher mortality rates than those who do not require respiratory support (13). Many studies in developing countries showed that the mortality rate of patients on mechanical ventilation range from 26.6% to 67.2%. Age, comorbidities, number of days on ventilation, intensive care unit stay and total number of days in hospital were significantly associated with mortality (5,7,13–18).

While mechanical ventilation have crucial role in patients with acute respiratory failure, its use can also cause harm. The adverse consequences of mechanical ventilation include airway lesions by intubation, pneumonia/sinusitis associated with mechanical ventilator, volutrauma, and barotrauma. Mechanical ventilation regardless of its important role, it may aggravate, or even initiate, lung injury and inflammation and has therefore been identified as a risk factor for poor patient outcome(10).

A research conducted in Brazil, Malawi and India described that mechanical ventilation is associated with significant mortality and high rate of iatrogenic complications. The Crude mortality rates in LMICs ranges between 36 and 72 % for ventilated patients (19). In Africa, Egypt study showed that the mortality rate in mechanically ventilated patients was 64%. Moreover, for invasive ventilation mortality rate was higher than non-invasive ventilation while the higher mortality was reported in patients with inadequate weaning (14).

Another study conducted in Mekelle ayder comprehensive specialized hospital also reported that the use of a mechanical ventilator in ICU is high. Among 286 adult patients admitted to the ICU,

105 (35.2%) were mechanically ventilated from initial admission to discharge or death. The overall ICU mortality rate for patients under Invasive MV was 28.6 percent (15).

Despite significant advances in ventilator support, it remains with high mortality and significant impairment in the post-ICU setting of patients' quality of life (16). For patients requiring mechanical ventilation the basic characteristics and management have changed over time, but the effect of these improvements on patient outcomes is unclear (20). Therefore an awareness of the clinical demographics and outcomes of mechanically ventilated patients in the intensive care unit (ICU) is important because it allows for better use of resources and helps in clinical decision making(21).

Mechanical ventilation is one of the most common reasons for ICU admissions in Ethiopia too. Even though, there are few studies carried out to show clinical characteristics and outcomes of patient on mechanical ventilation in Ethiopia in which those few previous studies are not adequate to show the full picture of the phenomenon, and still more studies are required to show the outcome of patients on the mechanical ventilation. As to my knowledge, there is little to no study conducted particularly on the clinical profiles and outcome of patients on mechanically ventilation in my study area, which is most significant in planning training for its use, differentiating and preventing the factors associated with poor patients outcome. Thus, this study is intended to assess the clinical profiles and outcome of patients on mechanical ventilation and among adult intensive care unit of Tikur Anbessa specialized hospital, Addis Ababa, Ethiopia.

1.3. Significance of the Study

The study on clinical profile and outcomes of patients on mechanical ventilation are important for better use of resources and clinical decision making in the intensive care unit (6). Providing such information important to the patient's outcome on mechanical ventilation will help to draw up possible recommendations for patients on mechanical ventilation care and will be useful in various ways for the Ministry of Health Policymakers and stakeholders, health care professionals and the hospital society at large.

It may have a direct positive impact on the quality of patient care and may help the hospital's important role in improving patients on mechanical ventilation management protocol. This can improve the outcome of the patients and shorten the duration of hospital stay. This study will also serves as a literature for further researchers and health care providers for better quality care of patients on mechanical ventilation.

2. LITERATURE REVIEW

2.1. Clinical profiles

A 28-day international study performed in 361 ICUs of 20 countries showed that a total of 15,757 patients were admitted to the ICUs for more than 12 hours. Out of the total admitted patient 5,183 (33%) received MV for an average of 5.9 (7.2) days. From the total patients on mechanical ventilation 3428(66.1%) were medical patients and 1755(33.9%) patients were surgical patients. 61.3% were male and 38.7% were female. Mechanical ventilation was delivered through an orotracheal tube in 4614 (89.0%) patients, a nasotracheal tube in 211 (4.1%) patients, and a tracheostomy in 102 (2.0%) patients. The ICU stay average mean (SD) was 112 (13.7) days. 120 (52%) patients were received ventilation due to ARDS and 115(22%) patients were received ventilation due to COPD exacerbation (22).

A 1-d point-prevalence study conducted in North America, South America, Spain, and Portugal showed that 75% of patients used endotracheal tube for access to the airway for delivery of mechanical ventilation. 96 percent of endotracheal tube passed through the mouth and 4 percent through the nose. The most frequently used ventilator mode was assist/control (A/C) (47%) and synchronized intermittent mandatory ventilation (SIMV) (46%). The most common weaning approach was PS, which was used in 36 percent of patients, and 28 percent of patients used the combination of SIMV and PS(23)

A prospective cohort study conducted from 2004-2007 in southern Brazil showed that a total of 2,430 patients were admitted to ICU. 1,115 patients were needed mechanical ventilation for more than 24 hours. The sources of admission were from the hospital ward (56%), emergency department (25%) and other hospitals (19%) with a male majority (52%). The main indications for MV were sepsis (41.8%), shock (37.8%), pneumonia (37%) and ALI/ARDS (15%). The occurrence of multiple organ dysfunction syndromes (MODS) was reported in 45% especially among patients with ARDS (52%) and in COPD patients (15%). patients developed renal failure (290; 26%), cardiovascular failure (227; 20.4%), coagulopathy failure (201; 18%), neurological failure (115; 10%) and hepatic failure (86; 7.7%) during the course of MV (13).

Another study conducted in 45 Brazilian intensive care units indicated that 622(80 percent) of 773 patients were received mechanical ventilation. The source of admission for the entire admitted patients was emergency room, ward and operation room (47%, 31% and 22%) respectively. The main reasons for the ventilator support were Pneumonia (27 percent), neurologic disorders (19 percent) and non-pulmonary sepsis (12 percent). The most commonly used mechanical ventilation mode was pressure-controlled ventilation 371(60%) followed by volume-controlled ventilation 186(30%) and pressure-support ventilation 54(9%)(16).

A retrospective study in western Indian showed that a total of 500 patients were admitted to ICU in 1 year study period. Of these, 130 (26%) patients received MV for more than 6 hours. The duration of stay on mechanical ventilation was 4(3.4) days. The average stay in ICU and hospital was 4.49 (3.52) and 6.4 (3.6), respectively(17).

A retrospective study conducted in a rural hospital in India indicated that a total of 505 patients were admitted to ICU within 2 years. Out of the total admitted patients, 161(31.88%) were received mechanical ventilation. The ICU stay, days on ventilation and total hospital stay were 5(3–10) days, 2 (1–5) days and 6(3–10) days respectively. Acute kidney injury (36.6%), Sepsis (31.28%), neurological (26.34%), cardiac (16.23%), and respiratory (14.46%) were the primary cause of IMV. Chronic kidney disease (CKD) (17.23%) and coronary artery disease (CAD) (14.65%) were commonest comorbidities followed by hypertension (12.27%) and diabetes (11.68%)(7).

A study conducted in 138 patients in Maharashtra, India revealed that the most common etiology for MV was poisoning (53.6%). The mean age of patients was 43.22 years, ranging from 14 to 75 years with male predominance (73.91%). The average length of stay in ICU before MV, on MV and the cumulative length of stay in ICU were 0.78, 5.9 and 6.4 days in non-survivors. 17 patients were having bradycardia, 41 were having normal heart rate while 80 patients were having tachycardia. Out of 138 patients, 77 (55.7%) had normal B.P. 27 (19.5%) had hypertension and 34 (24.6%) had hypotension. 56 patients were having hyperthermia, 17 were having hypothermia and 65 were having normal temperature(24).

A prospective observational study conducted over 18 months in a Mumbai tertiary hospital indicated that a total of 1150 patients were admitted to ICU. Out of the 1150 patients 397

(34.5%) were needed mechanical ventilation and 3.91% (45) were needed prolonged mechanical ventilation. The average age of the mechanically ventilated patients was 32 years. The most common complication was ventilator-associated pneumonia (VAP) (53.33%), followed by decubitus ulcers (40%) and deep vein thrombosis (8.89%)(25).

A study conducted in Korean Intensive Care Units showed that 275 patients were received MV. The median (IQR) age was 69 (54-75) years. The common reasons for initiation of mechanical ventilation were pneumonia (23%), acute respiratory failure on chronic pulmonary disease (ARF-CPD, 16%), sepsis (10%), and ARDS (10%). Pressure control ventilation mode (40%) was the preferred mode used in the ICU. Sedatives medications were administered in 155 patients (56 percent), analgesics in 141 (51percent) patients, and neuromuscular blockers in 71 (26 percent) patients. Midazolam and fentanyl were the preferred sedative and analgesic drugs, used in the ICU respectively(21).

A 5-year retrospective study in Cairo, Egypt, indicated that over the 5-year period a total of 1081 patients were connected to MV. The ventilation duration was 6±10 days, and ICU stays length was 13±15 days. Heart diseases followed by respiratory diseases, neurological diseases, sepsis, and septic shock were the predominant indications of ventilation. The most common initial ventilation mode was volume-controlled ventilation (61.8%) followed by Continuous Positive Airway Pressure (CPAP) (15.4%), pressure controlled ventilation (PCV) (14.7%), and Pressure Support – Continuous Positive Airway Pressure (PS-CPAP) (8%) (14).

A research conducted in Egypt at EL-Mahalla Chest Hospital showed that 412 patient was admitted to the ICU. Of those, 130 received invasive and noninvasive MV. Out of 130 patients, only 52(40%) were received invasive mechanical ventilation. The commonest indication of MV was acute on top of chronic respiratory failure(77.7%) and COPD(48.5%)(5).

A prospective, case-control survey conducted in Nigeria Tertiary hospital indicated that a total of 128 patients were admitted into the ICU over the six months. Of those, 44(34.4%) patients were mechanically ventilated. The mechanical ventilation average duration was 12.30 ± 10.10 days. The mean age of patients ventilated was 37.7 ± 21.10 years with a ratio of 1:1.2 between males and females. The major indications for mechanical ventilation are respiratory distress (38.6%),

airway protection (27.3%), deteriorating Glasgow coma score (20.5%) and hyperventilation (13.6%)(26).

A prospective observational study carried out at Mekelle ayder comprehensive specialized hospital showed that 286 patients were admitted, and 105 (36.7%) of them received invasive mechanical ventilation. The surveyed patients ' median [IQR] age was 32 [24, 52] years and 16.2% was above 60 years of age. Acute respiratory failure (50.5 percent) was the leading indications followed by coma (35.2 percent). The median [IQR] duration of MV stay was eight [5, 14] days and 11.4 percent had prolonged MV use, and despite no contraindication, 21 percent had no DVT prophylaxis. Complications were observed in 63.8% including; stress induced gastric bleeding (28.6%), VAP (27.6%), AKI (22.9%) and new septic shock growth (20%). (15).

2.2. Outcomes

A prospective cohort study conducted in Brazilian intensive care units indicated that the mortality rate of patients on invasive mechanical ventilation was 215/622(34.5%). The overall mortality rates for ICU and hospital were 34% and 42%, respectively. Acute respiratory distress syndrome (ARDS) has been diagnosed in 31 percent with 52 percent hospital mortality(16)

A study conducted in western India showed that the mortality rate of adult patients on mechanical ventilation was 67.2%, while 76.1 percent for ARDS patients. The main factors independently associated with increased mortality were (i) pre-MV factors: age, heart failure (odds ratio [OR], 1.42; 95% confidence interval [CI], 0.54–3.73;P < 0.001); (ii) patient management factors: positive end-expiratory pressure(OR, 2.69; 95% CI, 0.84–8.61;P < 0.001); (iii) Factors occurring during MV: PaO2/FiO2 ratio < 100 (OR, 1.66; 95 percent CI, 0.67–4.11;P < 0.001) and renal failure development(OR, 2.33; 95% CI, 2.05–2.42;P < 0.001) and hepatic failure(OR, 2.07; 95% CI, 1.91–2.24;P < 0.001) following initiation of MV(17).

Another study conducted in Maharashtra India revealed that the mortality rate of patients on mechanical ventilation was 42.1%. A total of 77 patients required tracheostomy and 35 patients required inotropes support with mortality of 31.1% and 62.8 % respectively. Coronary artery disease (mortality-60%), hypertension (mortality- 56%) and CKD (mortality-80%) showed significant association with outcome(24). Similar study conducted in a rural hospital in India also indicated that the mortality rate of patients on mechanical ventilation was 87/505(17.2%), while

61/505(12%) left against medical advice. Age, comorbidities, number of days on ventilation, ICU stay and total number of days in hospital were significant factors associated with mortality(7)

A study in Cairo, Egypt indicated that the mortality rate among the mechanical ventilation patients was 696(64.4%). Mortality was significantly higher in patients ventilated because of heart disease (41.8%) followed by respiratory diseases (31.8%), central nervous system (13.8%), and septic shock (12.6%)(14). Another study conducted in Abbassia Chest Hospital, Egypt also reported that 223(54.79%) patients on mechanical ventilation were died. 184(45.2%) patients were survived. Out of the 184 patients, 111(27.27%) patients were transferred to the ward, 70(17.2%) were discharged without recommendation, and 3(0.74%) were discharged with home on O2 therapy(27).

An observational cohort study conducted in Philippines stated that out of 191 intubated patients 39% were died while, 54% were extubated from the mechanical ventilation. From the extubated patients 35% were planned extubation, and 19% were unplanned extubation. Of those, 191 intubated patients 7% left against medical advice. The main factors associated with the unplanned extubation were male sex (Crude OR: 2.25, 95%CI: 1.10 - 4.63) and age (Crude OR 0.976, 95%CI: 0.957 - 0.996)(28).

A prospective, case-control survey conducted in Nigeria Tertiary hospital found out that the mortality rate of mechanically ventilated patient was 31.8% as compared to the overall mortality rate of in intensive care unit was 63.6%(26).

A study conducted in ayder specialized hospital showed that the overall ICU mortality rate for patients under Invasive MV was 28.6 percent. Over 60 years of age and new septic shock development was associated with a significantly increased mortality risk(15).

2.3. Conceptual Frame Work for Mortality Associated Factor

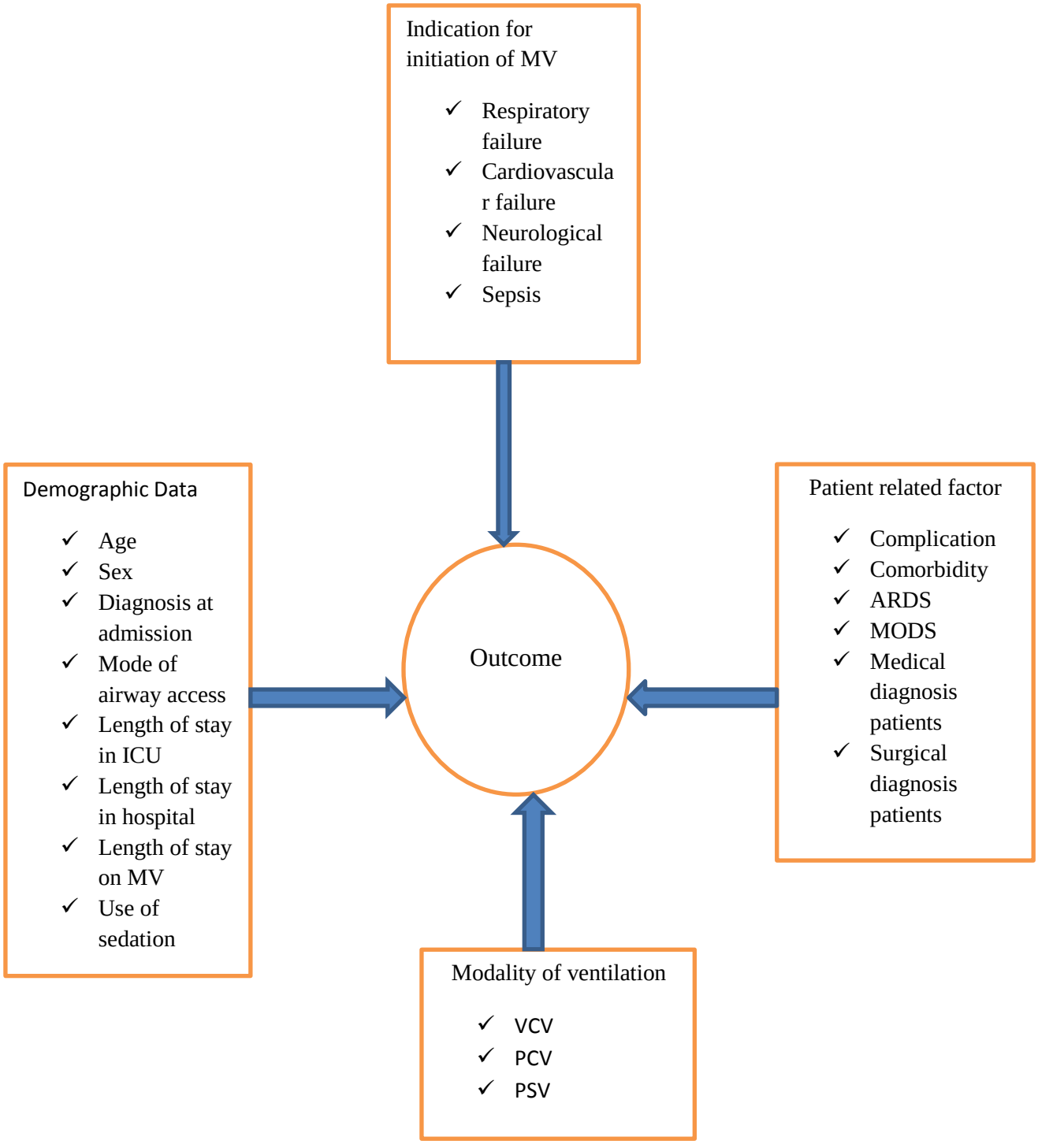

Figure 1: Conceptual framework diagram

3. OBJECTIVES

3.1. General Objective

To assess the clinical profiles and outcome of patients on mechanical ventilation among adult Intensive care unit of Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2020

3.2. Specific Objectives

1. To assess the outcomes of patients on mechanical ventilation in adult ICU of TASH

2. To assess the clinical profile of mechanically ventilated Adult patients in ICU of TASH

3. To identify factors which are associated with poor outcome of mechanically ventilated adult patients in AICU of TASH

4. METHODS AND MATERIALS

4.1. Study Area

This study was conducted in Tikur Anbessa specialized hospital (TASH). Tikur Anbessa specialized hospital (TASH) is the largest referral and teaching hospital in Addis Ababa, Ethiopia. This hospital offers diagnosis and treatment for approximately 370,000-400,000 patients per year. It has medical and surgical intensive care units. The intensive care units have a total of 12 beds (6 medical and 6 surgical) and it has 40 Nurses and a number of residents, specialists, and subspecialists who receive training in intensive care. The services offered include mechanical ventilation, postoperative care as well as inotropic support. About 180 – 200 patients receive invasive mechanical ventilation per year in the intensive care unit (personal communication).

The study site is selected because it serves as a referral center for critically ill patients from all of the country and it has well equipped large intensive care unit.

4.2. Study period:

The study was conducted from November 2019 – June 2020.

4.3. Study Design:

Retrospective cross sectional

4.4. Source Population

All patients admitted to the adult intensive care unit of Tikur Anbessa specialized hospital

4.5. Study population

All medical record of patients on mechanical ventilation at AICU of Tikur Anbessa specialized hospital who were on mechanical ventilation from September 01, 2018 to august 30, 2019

4.6. Inclusion and exclusion criteria

4.6.1. Inclusion criteria

Records of patients charts who were mechanically ventilated in adult ICU from September 01, 2018 to august 30, 2019

4.6.2. Exclusion criteria

- ✓ Incomplete charts
- ✓ Illegible hand writing

4.7. Variables

4.7.1 Dependent variable

- ✓ Outcomes

4.7.2. Independent variables:

Sex, age, admission source, cause for ICU admission, reason for initiation of MV, mode of airway access, Length of hospital stay, length of ICU stay, Length of stay on MV, mechanical ventilator mode, complications, Admission diagnosis, co morbidities, mode of weaning, sepsis, ARDS , MODS, and sedation used.

4.8. Operational definition:

Clinical Profile: In this study were interpreted as what was male to female ratio, what was the age of mechanically ventilated patients, what was the initial diagnosis while admission to AICU, what was their main indication for mechanical ventilation, what access to the airway was used, types of sedation used and for how long adult patients used the mechanical ventilator and what was the main complication they developed and also the method of weaning from mechanical ventilator.

Outcome: In this study outcome was interpreted as patients after mechanical ventilation whether they were survived or not survived.

MODS: Failure of 2 or more organs in adult intensive care unit.

4.9. Sample size and sampling procedures;

All patients who were admitted at adult ICU from September 01, 2018 to August 31, 2019 and met the criteria were included in study. A total of 210 patients were met the criteria and included in the study.

4.10. Data Collection tools and procedure

Data collection checklist was prepared from different literatures which are similar to the objective of the study(7,14,16,17,27,29) and the data was collected from the patient's medical record charts. Health professionals specifically 5 BSc nurses was employed for data collection and they were be given training on the process of data collection checklist and procedures. The principal investigator was providing orientation before the data collection begins to the data collectors on the objectives of the study and the overall stepwise retrieving of data collection. Moreover, the principal investigator was explained and clarifies vague points and other problems encounter about the data collection checklist prior to the data collection.

4.11. Data quality assurance

Properly designed and structured check list was used. To avoid redundancy, a unique mark was put on all charts. The consistency and completeness of the data was checked by the trained supervisor daily. The data collectors were mainly composed of health professionals (BSc nurses and MSc nurses) for better understanding and interpretation of the patients' medical chart. The collected data was checked for completeness, consistency and clarity.

4.12. Data analysis plan

Clean up and cross-checking of data was done before analysis. Data was checked for completeness and coded and entered in to Epi-Data manage version 4.6.0.2 and the Data was analyzed using the software SPSS version 25.0. All categorical data was displayed as numbers and percentages. Continuous data was presented as mean ± standard deviation and median, as appropriate. Tables were also used for data presentation. Bivariate and Multivariate logistic regression model was used to identify the associated factors. Variables having p-value less than

0.05 at 95% CI were considered as significant variables. AOR is going to be considered to see the strength of association between dependent and independent variables.

4.13. Ethical consideration

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Ethical approval was obtained from Addis Ababa University, collage of health science department of emergency medicine. Permission was obtained from hospital administration to conduct this study and to access the medical record. All the collected data were kept confidential and no one except the members of the research team were able to access them.

4.14. Dissemination of the result

The result of this study was submitted to Addis Ababa University College of Health sciences Department of Emergency medicine and critical care. The copy of this result was given to TASH AICU and hospital management. In addition effort made to publish on local or international journal.

5. RESULTS

5.1 Distribution of socio demographic, clinical profile study participants in TASH, ICU Addis Ababa

Over one year study period a total of 693 patients admitted in ICU. From these 210 medical records of ventilated patient were reviews in the study. 114(54.3%) of the participants are blew 40 years. The mean and standard deviation age of respondents was 40.3±17.7 years with minimum 14 years and maximum of 85 years old. More than half of the patients were male 123(58.6%). **See Table 1.**

Table 1: Distribution of socio demographic characteristics of patient on mechanical ventilator in TASH 2020

Variable		***Frequency***	***Percent (%)***
	≤40	114	54.3
Age	41-70	86	41
	>71	10	4.7
Sex	Male	123	58.6
	Female	87	41.8

5.2 Clinical profile of ventilated patients

5.2.1 Categories and source of admission to ICU

From the total of 210 ventilated patients' majority of them were medical diagnosis patients 118(56.2%) followed by 92(43.8%) surgical diagnosis patients. Respiratory failures were the main reason to put the patients on MV and nearly half of the patients stayed on MV for 1-3 days.

Source of ICU admission majority were from OR and ER 79(37.6%), followed by inpatient 44(21.0) and 8(3.8%) were from other hospital. Regarding the reason for admission more than half (55.2%) were respiratory problem followed by sepsis (18.1%), cardiac (8.6%), neuromuscular (8.1%), renal (5.2%) and others (4.8%). For the admission diagnoses and length of stay on MV, length of stay in ICU and hospital see **Table 2.** The predominant indication of mechanical ventilation was respiratory failure 88(41.9%) followed by neurological failure (coma) 77(36.7%), sepsis 24(11.4%), cardiovascular failure 19(9%) and other 2(1%). 89 (42.4%) patients had comorbidity. Among the patients with comorbidity hypertensive was the highest 30(14.3%) followed by malignancy 25(11.9%), DM 15(7.1%), renal 15(7.1%), CHF 9(4.3%), HIV/AIDS 8(3.8%), liver 7(3.3%) and other 6(2.9%).

Table 2: Reasons of admission and length of stay in MV and AICU, of TASH, 2020

Variable	***Sub variable***	***Frequency***	***Percent (%)***
Neurology	TBI	12	5.7
(57, 27.1%)	Uremic encephalopathy	7	3.3
	Stroke	5	2.4
	Meningitis	6	2.9
	ICH	5	2.4
	Variable	2	1
	Brain tumor	9	4.3
	DKA	7	3.3
	Epileptics	3	1.4
	Spinal cord injury	1	0.5
Respiratory (71, 33.8%)	COPD	23	11
	Bronchial Asthma	8	3.8
	Tuberculosis	10	4.8
	Aspiration pneumonia	4	1.9
	SCAP	4	1.9
	HAP	8	3.8
	PTE	2	1
	Pulmonary edema	6	2.9
	PCP	6	2.9
Cardiac (16, 7.6%)	CHF	8	3.8

	Post cardiac arrest	1	0.5
	MI	5	2.4
	Cardiogenic shock	2	1.0
Sepsis (41, 19.5%)		41	19.5
Renal (22, 10.5%)	Acute renal failure	17	8.1
	Chronic kidney injury	2	1.0
	Acute on chronic renal failure	3	1.4
Neuromuscular(3,1.4)	GBS	3	1.4
Malignancy (59, 28.1%)	Meningioma	15	7.1
	Posterior fossa mass	3	1,4
	CPA mass	9	4.3
	Tumorlysis syndrome	1	0.5
	Pituitary macro adenoma	4	1.9
	Mediastina mass	6	2.9
	Hematology malignancy	19	9
	Ovarian cancer	2	1
Others (12, 5.7%)	Post OP	8	3.8
	Poisoning	2	1
	Tracheal stenosis	2	1
Length of stay on MV in days	1-3	109	51.9
	4-7	46	21.9
	≥8	55	26.2
	Mean=6.83	SD=8.988	
Length of stay in ICU	1-3	78	37.1
	4-7	59	28.1
	≥8	73	34.8
	Mean=8.89	SD=13.816	
Length of stay in hospital in days(	1-3	28	13.3
	4-7	34	16.2
	≥8	148	70.5
	Mean=19.13	SD=19.504	

TBI: Traumatic brain injury, ICH: intracranial hemorrhage, DKA: diabetic ketone Acidosis, COPD: chronic obstructive pulmonary disease, SCAP: sever community acquired pneumonia, HAP: hospital acquired pneumonia, PTE: pulmonary thrombus embolism, PCP: pneumocystis carnii pneumonia, CHF: cardiac heart failure, MI: myocardial infraction and GBS: Gillian Barrie syndrome

5.2.2 GCS of ventilated patients, airway access, mode and weaning method

From physical examination the GCS of patients at admission was ≤ 8 in 97 (46.2%), 9-12 in 78 (37.1%) and the remaining 35 (16.7%) patients GCS was from 13-15. Access to airway used was ETT 208(99%) and tracheostomy 2(1%). Regarding to the modes of mechanical ventilation in our ICU different mode MV was used. A/C volume control ventilation 121(57.6%) was the most common initial mode of ventilation followed by A/C pressure control ventilation 81(38.6%) and others 8(3.8%). The weaning methods used for the improving patients were CPAP 71(33.8%), SIMV 27(12.9), T-tube trial 11(5.2%), PS with CPAP 25 (11.9%) and accidental extubation 3(1.4%). For more than half of ventilated patients (54.3%) was sedated using thiopental 38(18, 1%) followed by Propofol 37(17.6%), ketamine 35(16.7%), diazepam 4(1.9%) and other 1(0.5%).

5.3. Outcome

From the total of 210 ventilated patients more than half (51.4%) developed complication. Of this complication sepsis 39(18.6%), VAP 24(11.4%), HAP 23(11%), ARDS 23(11%) and bed sore 13(6.2%) are the most common. From the total study population 89(42.4%) patients had comorbidity and 68(32.4%) developed multi organ dysfunction syndrome (MODS). Hypertension 30(14.3%) and malignancy 25(11.9%) was the most common comorbidity followed by renal 15(7.1%), DM 15(7.1%), CHF 9(4.3%) and HIV 7(3.3%). Among organs failed cardiac took 49(23.3%) followed by renal 40(19%), CNS 36(17.1%), lung 18(8.6%), hepatic 16(7.6%) and hematology 14(6.7%). From the total study participants 115(54.8%) deceased and 95(45.2%) survived. From the non-survived patients on mechanical ventilation

73(34.8%) died in ICU and the remaining 42(20%) died after transfer to inpatient department or in the ward. 125(59.5%) transfer from ICU to ward and 12(5.7%) discharge directly from ICU. Cardiac was the leading cause of death 50(23.3%) followed by sepsis 39(18.6%). (**See table 3)**.

Table 3: Outcome of patients on mechanical ventilator who are admitted in TASH AICU (n=210) 2020.

Variable		***Frequency***	***Percent (%)***
Final Outcome	Survived	95	45.2
	Not survived	115	54.8
	Cardiac	50	23.3
Cause of death	Sepsis	39	18.6
	ARDS	16	7.6
	Other***	10	4.8

ARDS: Acute respiratory distress syndrome

*****Brain death, hepatic failure and renal**

5.4. Factors associated with outcome of ventilated patients admitted at AICU

In bivariate regression analysis age, GCS level, admission source, indication for ICU, length of stay on MV in days, comorbidity, complication, multi organ dysfunction syndrome (MODS) and sedation used were statistically associated with mortality at p-value of less than 0.25. In multivariable regression analysis being medical patients, multi organ dysfunction syndrome (MODS) and sedation used were statistically positively associated with mortality at p-value of less than 0.05 but the other variables were not found statistically significant.

Medical patient respondents were found 6.67[AOR=6.671, 95%CI: 1.482-30.035] times more likely not survived compared to their surgical counterparts. The odds of having non survived or death was 24[AOR=24.03, 95%CI: 8.072-71.522] times more among respondents who have developed multi organ dysfunction syndrome (MODS) compared to their counterpart.

Respondents who had used sedation were 0.42[AOR=0.420, 95%CI: 0.190-0.925] more likely to death than not used sedation (**Table 4**).

Table 4 : Logistic regression analysis of associated factors with outcome of mechanically ventilated patients among adult ICU of TASH, Addis Ababa, Ethiopia, 2020

Variable	*outcome*		*COR(95%CI)*	*AOR(95%CI)*	*P-Value*
	Survive	***Not survive***			
Age					
<40	60	54	0.386(0.095-1.567)	0.884(0.144-5.412)	0.894
41-70	32	54	0.723(0.175- 2.996)	1.819(0.287-11.522)	0.525
>71	3	7	1.00	1.00	
GCS					
3-8	32	65	1.711(0.778-3.763)	1.170(0.409-3.344)	0.770
9-12	47	31	0.555(0.248-1.242)	0.365(0,121-1.095)	0.072
13-15	16	19	1.00	1.00	
Admission source					
Adult emergency	32	47	2.448(0.546-10.973)	2.442(0.280-21.290)	0.419
Inpatient	9	35	6.481(1.298-32.358)	6.498(0.685-61.638)	0.103
Post op	49	30	1.020(0.227-4.581)	4.847(0.512-45.865)	0.169
Another hospital	5	3	1.00	1.00	
Indication for ICU					
Medical	34	84	4.861(2.701-8.752)	6.671(1.482-30.035)	0.013**
Surgical	61	31	1.00	1.00	
Length of stay on MV in days					
1-3	49	60	1.270(0.663-2.431)	1.951(0.760-5.010)	0.165
4-7	18	28	1.613(0.729-3.568)	1.200(0.404-3.567)	0.743

≥8	28	27	1.00	1.00	
Comorbidity					
Yes	35	54	1.518(0.871-2.643)	0.814(0.371-1.783)	0.606
No	60	61	1.00	1.00	
Complication					
Yes	41	67	1.838(1.061-3.186)	0.648(0.285-1.475)	0.302
No	54	48	1.00	1.00	
MODS					
Yes	7	61	14.201(6.055-33.305)	24.027(8.072-71.522)	0.000**
No	88	54	1.00	1.00	
Sedation used					
Yes	45	50	0.373(0.212-0.656)	0.420(0.190-0.925	0.031**
No	31	65	1.00	1.00	

NB *=p<0.05, and 1.00=reference

6. DISCUSSION

Mechanical ventilation is one of the commonest indications for ICU admission, more than half (50.2%) of our patients in this study received invasive mechanical ventilatory support which is in line with study done in southern brazil 45.9 received MV(13). A similar study done in Brazilian intensive care units reported that 80% patients were received ventilatory support which was higher than in our study(16). This low ventilatory rate in our ICU could be due to inadequate availability of ventilators, setup difference, the number of ICU and number of patients. In contrast our result is higher than from studies conducted in Mekelle, Egypt, Nigeria and Mumbai reported by 36.7%, 40%, 34.4%, and 34.5% respectively(5,13,15,25,26). This difference may be due to our study was conducted in tertiary hospital which served for variety of patients referred from different region of the country.

In this study the mean age of the study population was 40.3 and ranges from 14-85 years with majority of male (58.6%) which was similar with study conducted in Maharashtra, India and Nigeria which reported by a mean age 43.22 years, ranging from 14 to 75 years with male predominance (73.9%) (24, 26). But differs from study conducted in Korea and ayder which reported by mean age of 69(54-75) and 32 year respectively(15,21). This might be differing due to the life expectance of the population.

In this study the total patients on mechanical ventilation were medical patients 118(56.2%) and surgical patients 92(43.8%) which is in line with the research done in 361 ICU of 20 country with result of medical (66.1%) and surgical (33.9%) patients(22). The source for admission to AICU in this study were 79(37.6%) from Adult emergency, 79(37.6%) from operation room, 44(21.0%) from inpatient units and 8(3.8%) from another hospital which is differ from study conducted in southern Brazil. In southern Brazil the source for admission were from the hospital ward (56%), emergency department (25%) and other hospitals (19%)(13) but our study was similar with study conducted in 45 Brazilian intensive care units in which the admission source was emergency room, ward and operation room (47%, 31% and 22%) respectively(16).

Indications for mechanical ventilation in the Intensive Care Unit(ICU) are wide-ranging. In our study, we observed that respiratory failure and neurological failure or coma were the main indications for mechanical ventilation which was similar with study in ayder

comprehensive specialized hospital, Korean, Egypt El mahalla chest hospital and Nigeria(5,15,21,26). But it differs with study in Cairo, Egypt which reported that heart disease was the main indication for MV(14). This difference might be due to type of ICU specialization which means the ICU found in Cairo is general medical ICU but our hospital ICU is both medical and surgical.

In our study the most commonly used initial mode of mechanical ventilation were Volume control ventilation (VCV) 121(57.6%) followed by pressure control ventilation 81(38.6%) which was similar with studies in Cairo, Egypt. Volume control ventilation (61.8%) was the preferred mode of mechanical ventilation in Cairo(14). Our result was different from studies conducted in 45 Brazilian intensive care units and Korean which reported as pressure control ventilation was the preferred one(16,21). The selection of mode of mechanical ventilation can be varying based on the individual preference and need but the function of mode is the same. The airway access used to deliver mechanical ventilation in this study was almost all 99 % passed through an orotracheal tube which was the same with study in North America, South America, Spain, and Portugal in which reported by 96% of endotracheal tube passed through the mouth(23). Because it is the preferable and safe access than other.

Length of stay on mechanical ventilation in this study was ranged from (1-55) days with mean (6.83) SD (8.988) median 3 days. But a study by Chiwhane A. and Diwan S et al showed that average ventilator stay in India rural hospital was 2(1-5) days which is less than this study(7). This difference was due to chronic disease admission and being tertiary hospital. Our finding was similar with study conducted in 361 ICUs of 20 countries length of stay was 5.9(7.2) days and study conducted in Maharashtra, India which was 5.9 days(22,24). A study in Nigeria Tertiary hospital showed that the mechanical ventilation average duration was 12.3 days(26). This result was higher than our finding. The difference in ventilator stay among the other studies might be due to late admission of patients because of shortage of beds and other facility in our hospital which makes the patients vulnerable to poor outcome and shorter length of stay in life.

In the current study 89(42.4%) patients had various comorbidity. Among this comorbidity hypertension 30(14.3%) and malignancy 25(11.9%) was the most common comorbidity followed by renal 15(7.1%), DM 15(7.1%).This findings was different from study done by Chiwhane A, and Diwan S.et al (7). Which showed that the most common comorbidity were Chronic kidney

disease (CKD) (17.23%) and coronary artery disease (CAD) (14.65%). In our study they recorded high comorbidity because of our hospitals is referral hospital , most of complicated and severe cases are transferred to this hospital from all over the country so comorbidities might be common as worsening conditions for the patients.

In the present study the occurrence of multi organ dysfunction syndrome (MODS) was reported in 68(32.4%). Among organs failed cardiac represented 49(23.3%) followed by renal 40(19%), CNS 36(17.1%), lung 18(8.6%), hepatic 16(7.6%) and hematology 14(6.7%). Our result was differs from study conducted in southern Brazil which was reported as 45%. The organ failed was renal (26%), cardiovascular (20.4%), coagulopathy (18%), neurological (10%) and hepatic (7.7%) (13). Our result which is lower than this study the possible reason might be due to the setup and specialization of ICU.

Mechanical ventilation is an important instrument, with both negative and positive effects. In our study complication was reported in more than half patients 108(51.4%). The complications were sepsis 39 (18.6%), MOD 27(12.9%), VAP 24(11.4%), HAP 23(11%), ARDS 23(11%), Electrolyte imbalance 17(8.1%), bedsore 13(6.2%), tracheostomy 8(3.8%) and cardiogenic shock 5(2.4%). More than one complication occurred in 45(21.4%) patients. Our study was similar with study conducted by Berhe et al in this study Complications were observed in 63.8% including; stress induced gastric bleeding (28.6%), VAP (27.6%), AKI (22.9%) and new septic shock growth (20%) (15). Our result is differs from study conducted in Mumbai tertiary hospital(25) specifically the complication were VAP (53.3%) followed by decubitus ulcers(40%) and deep vein thrombosis(8.89%). which is higher than this study the possible reason might be the study design difference or there might be difference in the quality of care. even though the complication rate in our study is lower than the Mekelle and Mumbai study(15,25). Still there is high incidence of complications in our setting too. Therefore an effort must be to improve our infection prevention methods and on nursing care practices.

The decision of weaning a patient from the ventilator is influenced by the attending clinician clinical judgment. In this study, 65.2% of our patients were successfully weaned off ventilator. In this study the most commonly used mode of weaning were CPAP 71(33.8%), SIMV 27(12.9), T-tube trial 11(5.2%), PS with CPAP 25 (11.9%) and accidental extubation 3(1.4%). Our result differs from study conducted in North America, South America, Spain, and Portugal in which the

most common weaning approach was PS, which was used in 36 percent of patients and 28 percent of patients, used the combination of SIMV and PS (23). The difference could be due to the preference of the physicians and patients capacity of maintaining their saturation on both methods.

In the present study, the mortality rate was 54.8% .Studies done in different countries showed that the mortality rate of patients on mechanical ventilation were in Brazil ICU (34.5%), in western India 67.2%, Maharashtra India 42.1%, in rural hospital India 17.2%, Cairo 64.4%, Philippines 39%, in Nigeria tertiary hospital 31.8%, Abbassia chest hospital, Egypt 54.79% and in Ayder comprehensive specialized hospital 28.6% (2,7,14–17,26–28). Our result was the same with study conducted by Khalil MM et al which reported 54.79% (27). Our finding also higher than from studies done in Brazil ICU (34.5%), Maharashtra India (42.1), India rural hospital (17.2%), Philippines (39%), Nigeria(31.85) and Ayder (28.6) (2,7,15,16,26,28). The reasons for high mortality rate in our result could be due to late admission of patient's, low quality of emergency unit, poor referral system (delayed referral), transportation problem for the patients since there is low socioeconomic status of the country, admission problem which means admitting of patients with low survival rate (not using severity score), inadequate number of ventilators, inadequate bed makes the patients wait until they get more critical before admission to ICU. Our finding was lower than from studies conducted in western India (67.2%) and Cairo (64.4%) (14,17). This might be due to set up of the hospital ICU.

In this study the leading cause of death was cardiac and sepsis which reported by 23.3% and 18.6% respectively. This result is match with studies conducted by Nassar Y et al (14). Sepsis was one of the main causes for death in our finding but it is a preventable and potentially curable disease which shows there is a gap in infection prevention methods. The gap could be solving by positioning the patient frequently, giving adequate feeding, and timely administration of medication and follow infection prevention guidelines.

In this study the outcome of patients on mechanical ventilation were significantly associated with being medical patients, multi organ dysfunction syndrome (MODS) and sedation used. This result is in line with study done in India(17). The association could be because of patients who develop MODS had inability to fully recover from acute critical illness. However, this result finding is differs from study done in Maharashtra India(2) and Ayder(15) which reported that

age, comorbidity, new septic shock development, number of days on ventilation were significant associated with mortality. This difference might be due to study design, sample size and setup of the setting hospital.

7. LIMITATIONS

The results in this study are subjected to some limitations. Firstly the using secondary data is so hard in getting all the essential data which are vital for the study. Secondly the data were obtained from one hospital due to the pandemic corona virus, so the results may not be generalizable to other patients who require MV.

8. CONCLUSION AND RECOMMENDATIONS

8.1. Conclusion

In this study, the mortality rate of Adult patients on mechanical ventilation in Tikur Anbessa specialized hospital was high. Being medical patient, patients develop MODS and sedation used was significantly associated with the mortality. This high mortality rate suggesting an urgent need for extensive improvement in protocols for ICU set up. The main cause for ICU admission was respiratory followed by sepsis and cardiac. The predominant indications of mechanical ventilation were respiratory failure and Volume control ventilation (VCV) was the most common initial mode of ventilation.

8.2. Recommendation

For hospital management: It is better to arrange different trainings for the AICU staff about MV usage and complications related to it. And also it is better to increase the number of beds and mechanical ventilators in AICU.

For Tikur Anbessa specialized hospital AICU: Emphasis should be given to use severity indicator scores, to give special concern for the patients with organ failure and previous comorbidities, to give emphasis in cardiac patients, to strengthen their sepsis management protocol, and to improve the quality of care since the mortality is high.

For researchers: It is better when they conducted in prospective way in order to find out the prevalence and incidence of MV. In order to give better generalization it will be best if they add extra hospitals in their study.

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ANNEXES:

ANNEXES 1: INFORMATION SHEET

Name of the investigator: KAHSU TSEGAY (BSc)

Research Proposal title: Clinical profile and outcome of patient on mechanical ventilation among adult ICU of Tikur Anbessa specialized hospital Addis Ababa Ethiopia.

Research Proposal objective: The main object of this study is to assess the clinical profile and outcome of patient on mechanical ventilation among adult ICU of Tikur Anbessa specialized hospital Addis Ababa, Ethiopia, 2020.

Study procedure: to achieve the objective of the study which includes Socio- demographic factors (sex, age) reason for initiation of MV, Length of hospital stay, length of ICU stay, Length of stay on MV, mechanical ventilator mode, complications, Admission diagnosis, investigation, co morbidities, mode of weaning, sepsis, ARDS , MODS ,organ failed in ICU, sedation used, intubation and patient's outcome was collected from patients' medical record charts.

Confidentiality: the collected information was used only for study purpose and kept confidential in all possible circumstances. The patients' personal information like name and/or others was not collected. All records of the study were secured.

Contact Person: if there is any question or assumption or if data collectors, supervisors or other hospital administrative staffs have any question regarding the study feel free to contact the principal investigator personally or through the following addresses:

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ANNEXES 2: HOSPITAL CONSENT

This is a study that was conducted at ADULT ICU of TASH which is the major tertiary hospital of Addis Ababa. The main object of this study is to assess the clinical profiles and outcome of patient on mechanical ventilation among adult intensive care unit of Tikur Anbessa specialized hospital Addis Ababa, Ethiopia, 2019/2020. Studying and providing such information is relevant to assess the clinical profile and outcomes patient undergoing MV will help to draw up possible recommendation for better outcomes and management purposes.

Mechanical ventilation is a supportive treatment for patients unable to maintain adequate oxygenation and/or carbon dioxide. One of the most common indications of admission to the intensive care unit (ICU) is the need for ventilator support.

However, clinical profiles and outcome of mechanically ventilated patients are not well documented in Ethiopia. Therefore the overall hospital's participation and collaboration is helpful in generating the required information will be appreciated. In this study the patients' medical charts will be used to collect necessary data retrospectively. Any personal information of the patients like the name or others will not be collected and information generated will be disclosed in totality. In addition confidentiality of any personal information will be maintained throughout the study process and it will not be allowed for unauthorized access to the information. Finally, the hospital has all the right to accept or reject the study at any time. If there is any question or further information/elaboration is needed regarding the planned study and to get clarification from the principal investigator or from the institution contact the principal investigator in person or use Phone no: +251 914425124 (KAHSU TSEGAY, principal investigator). Therefore, if you would like to decide the study will be conducted at your hospital, please confirm it by signing.

The participant Hospital----------Principal Investigator ----------

Annex 3: Data collection check list for clinical profile and outcomes of patients on mechanical ventilator in Adult ICU.

1.1.Socio demographic		
1	Age	
2	Sex	
3	Date and time of admission to AICU	
1.2.Clinical profiles of mechanically ventilated patients		
4	GCS at Admission	
5	Admission Source	A. Adult emergency B. Inpatient C. Postop D. Another Hospital E. Other
6	Cause for ICU admission	A. Respiratory B. Cardiac C. Sepsis D. Renal E. Neuromuscular F. Other
7	Diagnosis at admission	
8	Indication for ICU	A. Medical B. Surgical
9	Date of initiation of MV	
10	Mode of airway access	A. Oro tracheal Intubation B. Naso tracheal intubation
11	Length of stay on MV in days	
12	Length of stay in ICU in days	

13	Length of stay on Hospital in days	
14	Indication for MV	A. Respiratory failure B. Cardiovascular failure (shock) C. Neurological (coma) D. Sepsis E. Other
15	Comorbidity	
16	Modes of mechanical ventilation initially used	A. VCV (volume control ventilation) B. PCV(pressure control ventilation) C. Other
17	Is complication occurred?	A. Yes B. No
18	If yes for question number 18 what type?	
19	ARDS develop?	A. Yes B. B. No
20	Weaning method	A. PS with CPAP B. CPAP C. T-TUBE D. Accidental Extubation E. SIMV
21	MODS	A. Yes B. No
22	If yes for question no.23 what type of organ failed	A. Renal B. Cardiac C. CNS D. Hematology E. Hepatic F. OTHER
23	Sepsis Developed?	A. Yes B. No
24	Sedation used?	A. Yes B. No

25	If yes, for question 26 what type?	A. Diazepam B. Ketamine C. Thiopental D. Propofol E. Other
26	Date of discharge from mechanical ventilation	
1.3.Outcomes of patients on mechanical ventilation		
27	Outcome in ICU	A. Death B. Discharge C. Transfer D. LAMA
28	Final outcome	A. Death B. Survived
29	Cause of death	A. Sepsis B. Heart C. Brain death D. ARDS E. Hepatic failure F. Other
30	Date of discharge from ICU	
31	Date of discharge from hospital	

ANNEXES 4: Definitions of 'severe organ system insufficiency' and 'immunocompromised'

Liver: Biopsy-proven cirrhosis with portal hypertension; episodes of past upper GI bleeding attributed to portal hypertension; or prior episodes of of hepatic failure, encephalopathy, or coma

Cardiovascular: New York Heart Association (NYHA) class IV heart failure

Respiratory: Chronic restrictive, obstructive, or vascular disease resulting in severe exercise restriction (i.e., unable to climb stairs or perform household duties); documented chronic hypoxia, hypercapnia, secondary polycythemia, severe pulmonary hypertension (>40 mmHg); or respirator dependency

Renal: Receiving chronic dialysis

Immunocompromised: The patient has received therapy that suppresses resistance to infection (e.g., immunosuppression, chemotherapy, radiation, long-term or high-dose steroids, or advanced leukemia, lymphoma, or AIDS).