ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCE

DEPARTMENT OF ANESTHESIA

MAGNITUDEAND ASSOCIATED FACTORS OF UNPLANNED EXTUBATION IN INTENSIVE CARE UNIT AT ADDIS ABABA GOVERMENTAL HOSPITALS .ADDISS ABABA, ETHIOPIA 2021

A thesis submitted to Addis Ababa University College of health science department of anesthesia for partial fulfillment of the requirement of degree master in clinical anesthesia.

Prepared by: Zewdu Minda(BSC) in anesthesia

Advisor: Mr. Hirbo Samuel (MSC) in anesthesia

Mrs. Senayit Aweke (MSC) in anesthesia

August 2021

Addis Ababa, Ethiopia

Master thesis research submission form

Name of principal investigator	Zewdu Minda(BSC) in anesthesia
Name of advisor	Mr.Hirbo Samuel(MSC) in anesthesia E-mail samuelhirbo1@gmail.com Mrs.Senayit Aweke(MSC)in anesthesia E-mail senaweke@gmail.com
Full tile of thesis research	Assessment of the magnitude and associated factors of unplanned extubation in intensive care unit at Addis Ababa governmental hospitals. Addis Ababa, Ethiopia 2021
Project time duration	January 8,2021-May 9,2021
Study area	Selected Addis Ababa governmental hospitals
Total cost of the project	34646
Address of the investigator	**E -mail zeduminda21@gmail.com** **Cell phone 0989811867**

Abstract

Background: *Unplanned extubation is the premature removal of an endotracheal tube accidentally during procedural activities or by the action of the patient. It is one of the commonly reported complications among mechanically ventilated patients in the intensive care unit.*

Objectives: *Assess the magnitude and associated factors of unplanned extubation in intensive care unit at Addis Ababa governmental hospitals, Addis Ababa Ethiopia January8, 2021-May9, 2021*

Methods: *Hospital based cross-sectional study conducted on 317intubated patients in the intensive care unit which fulfilled the inclusion criteria at the selected Addis Ababa governmental hospitals, Addis Ababa Ethiopia from January8, 2021-May9, 2021.Data collection method was includes patients chart review, direct observation and by asking the physician. Collected data was entered to Epi-data version 4.6.0.2 and was analyzed by SPSS version 26 statistical software .All independent variables with the dependent variable was analyzed using binary logistic regression to determine the variables independently predictive of unplanned extubation. Odd ratio .P-value and 95% confidence interval was calculated to differentiate risk factors and to assess association strength. Variables with P-value<0.25 on bivariate analysis were going to multivariable analysis and P-value less than 0.05 was cut point to test the statistical significance.*

Result: *The prevalence of unplanned extubation in this study was 19.74 %.Being male (AOR=3.132, 95%CI: 1.276-7.69), duration of intubation <5days (AOR=2.475, 95% CI: 1.039-5.894), managed by junior resident (AOR=5.25, 95% CI: 2.125-12.969), being physically restrained (AOR=4.356, 95%CI: 1.786-10.624**)**, night shift (AOR=3.282, 95%CI:1.451-7.424)and agitation (AOR=4.934,95%CI:1.934-12.586**)** were significantly contribute to the occurrence of unplanned extubation.*

Conclusion and recommendation: *This study showed that the prevalence of unplanned extubation was high in ICU at Addis Ababa governmental hospitals. We suggest to ICU staffs in Addis Ababa governmental hospitals to give special attention to early intubated patients especially for male individuals and the stakeholders of hospitals should rearrange the time of shift and physician schedule in ICU.*

Key words: Unplanned extubation, risk factors

Certification

Under signed certify the research title assessment of magnitude and associated factors of unplanned extubation in intensive care unit at Addis Ababa governmental hospitals, Addis Ababa Ethiopia, hospitals based cross-sectional study is my original work. All literatures cited in this article were listed in reference part and all supporters during the study period were acknowledged.

Investigator

Name _____ signature_____ date_____

Board examiner of approval

My advisors

Name _____signature_____date_____

Name_____signature_____date_____

Examiners

Internal

Name_____signature_____date_____

Eternal

Name_____signature_____date_____

Acknowledgement

I would like to thanks to Addis Ababa University College of health science department of anesthesia for providing the opportunity to prepare this research thesis.

My deepest gratitude will go to my advisors Mr. Hirbo Samuel and Mrs. Senayit Aweke for their valuable commitment, support and guidance during overall the process of developing this thesis. Next to this, I would like to thanks anesthetists and nurses that play a great role in the process of data collection. Last but not least I would like to thanks my friends who help me during data entry.

ACRONYM

UE: Unplanned extubation

ICU: Intensive care unit

OT: Operation Theater

ED: Emergency department

TT: Tracheal tube

ETT: Endotracheal tube

MV: Mechanical ventilation

AE: Accidental extubation

SE: Self extubation

GCS: Glasgow comma scale

RASS: Richmond –Agitation-Sedation score

AC: Assisted control ventilation.

SIMV: Synchronized intermittent mandatory ventilation

PRVCV: Pressure regulated volume control ventilation

VCV: Volume control ventilation

PCV: Pressure control ventilation

SPSS: Statistical package for social science

TASH: Tikur anbesa specialized hospital

SPMH: Saint Paul millennium hospital

ZMH: Zewditu memorial hospital

ABET: Addis Ababa emergency trauma center

Table of Contents

Contents **Page**

List of Table

List of Figure

CHAPTER ONE: INTRODUCTION

1.1Background

Endotracheal tube (ETT) intubation is one of the lifesaving procedures performed in intensive care units (ICU)when the patient required respiratory support(1). Maintaining of endotracheal intubation is the first most priority important factors in mechanically ventilated patients in order to save their lives and maintaining ventilation through artificial airway (ETT and tracheostomy tube) is the most intensive care (2). Intubation and ventilation in ICU are needed for a number of reasons (3).

Controlling the airway in the ICU with artificial airway devices ETT or tracheostomy tube (TT) is an essential part of cares. However, use of tracheal tube associated with many complications, like unplanned extubation (UE), malposition of the tube (movement), blockage of both ETT and TT, endobronchial intubation, kinking of tube, and leaking cuffs. These airway management related complications end up with life-threating conditions like, hypoventilation and hypoxia. Among these complications, unplanned extubations are the most frequent events(4). An ETT is removed intentionally when the underline cause is resolved. On the other hand, the ETT is removed when the underline cause that leads to intubation is not resolved, accidentally due to procedural activities or deliberately by the action of the patient. This premature removal of ETT is defined as unplanned extubation (5). UE, which is an important factor of the quality of care, might result in serious complications such as upper respiratory tract injuries, stomach contents aspiration, hypoxia, respiratory insufficiency, upper respiratory tract trauma, hypotension, arrhythmia, the necessity of reintubation, cardiac arrest, and death(6,7) . It is the major event that occurs after endotracheal intubation in ICU (8). Most cases of unplanned extubations are not accidental extubation is due to a frequent and preventable adverse event during mechanical ventilation in ICU by patient actions. Because of this unplanned extubation is considered a marker of quality assurance of mechanical ventilation in ICU(2). Many actions must be implemented to reduce the duration of mechanical ventilation through ETT or ensuring of safe implementation of the therapy .Among these actions taking all necessary precautions to effective mechanical ventilation(9).

Unplanned extubation has multi factorial causes; patient related associated factors being male,

trauma, being physically restrained, agitation, anxiety, positively related with self- extubation. Research done on staff related factors associated with UE was had mixed results (6).

Several measures have been proposed to reduce the risk of unplanned extubation as the introduction in ICU, like of the ABCDE Bundle (Awakening and Breathing Coordination, Delirium Monitoring and Management, and Early Mobility) and proper identification of risk factors, these leads most of the unplanned extubations can be avoided(10).

1.2Statement of the Problem

Among critically ill patients who are admitted to ICU one half to two thirds of them require endotracheal intubation and mechanical ventilation either as a lifesaving intervention in those with respiratory failure or as an organ support in those with hemodynamic instability or decreased levels of consciousness(11,12).There are many complications related to this intervention. Unplanned extubation, which occurred either accidentally during nursing care or deliberately by patient's own self, is one of the most concerned complications. Prevention of unplanned extubation is important since it may lead to a serious complication, like airway trauma ,compromised hemodynamic and respiration(13), nosocomial pneumonia(14), prolonged duration of mechanical ventilation and prolonged hospital stay(14,15),these leads to high mortality ,morbidity and inefficient use of resource(16). The incidence of reintuation and cardiovascular accident after unplanned extubation were 61.1% and 8.33% respectively in Philippines general hospitals(17).Among patients experienced unplanned extubation in Kota Kinabalu ,Sabah Malaysia recorded 60.5% required reintubation , 65% developed acute respiratory distress ,21.1% of them were traumatized of their mouth and trachea ,2.6% of them developed aspiration pneumonia and 63.2% of unplanned extubation stays more than 14 days in hospital(1).

The incidences of unplanned extubation in developed countries vary with different ICU settings and have remained unchanged with rate ranges from 0.5%-38.5% (18).But there is limited resources in developing countries about the incidence of unplanned extubation. The incidence of UE in South Africa in 2004 in the academic intensive care unit and Egypt Zigzag University respiratory ICU in 2019 was 10.3%(19) and 11.02%(20) respectively.

Factors predisposing for the occurrence of unplanned extubation can be patient related, ICU staff

related, activity related and time of shift related factors. The incidence of UE is highest in male individuals(1,8,15,17,18). Intubated patients who are physically restrained and less sedated are at high risk for the occurrence of unplanned extubation(20–22).The night shifting time and high level of consciousness(GCS>9T) also the risk factors for UE(17,18,20).

Different studies showed different incidences of UE but there is no evidence about the magnitude of UE and factors that contribute to it in our country. This study assessed the magnitude of UE and associated factors of UE in ICU at Addis Ababa governmental hospitals.

1.3 Significance of the Study

Data on the magnitude and risk factors of unplanned extubation comes from developed countries. Diversity in health professional distribution and ICU setup of different countries tends to challenge these comparisons. It is important to review data from developing countries to review the incidence of unplanned extubation. Scarcity of literature made it difficult to find research on the incidence and risk factors of unplanned extubation in ICU patients in developing countries. There is no adequate published literature about it in Africa except the two which was done in South Africa and one in Egypt.

The ICU setup and the health professional working in South Africa ICU and Egypt differ from our country in material and clinical skills. In ICU at Addis Ababa government hospitals unplanned extubation is not considered as major problem due to this there is no recording separate sheet and organized data about the problem. But I see so many patients who experienced unplanned extubation in different hospitals.

Knowing the magnitude and associated factors of unplanned extubation in ICU at Addis Ababa governmental hospitals helps to recognize how much the magnitude of the problem and the risk factors which leads to unplanned extubation that helps to reduce the occurrence of it. This research helps for future researcher as a base line by indicating the magnitude of unplanned extubation and associated factors in the study area. For health care providers this study will also increase their knowledge about magnitude and risk factors of unplanned extubation in ICU patients and, helps to promote health research and education.

CHAPTER TWO: LITERATURE REVIEW

2.1 Unplanned Extubation

Different literatures defined unplanned extubation (UE) as the premature removal of endotracheal tube accidentally or by the action of the patient and associated with high morbidity and mortality(17,18,23). Unplanned extubation is the most commonly known example potentially complications and catastrophic events in ICU which causes bronchospasm pneumonia, hypotension, cardiac arrhythmia, cardiorespiratory arrest and death. It is also a marker of poor quality of cares (18). Most of unplanned extubations are caused by the action of the patients which are preventable adverse events during mechanical ventilation(2).

2.2 Incidence of unplanned extubations

A research done by Maged Tanios in America (2014)among intubated patients in ICU 92 episode of unplanned extubation occurred (7.5unplanned extubation/100 days of mechanical ventilation)(9). Another observational prospective cohort study was done in Philippines on 191 intubated 19% were experienced unplanned extubation(17).Another research was done by Claudia N. Meregalli.in Argentina showed a relatively low incidence of unplanned extubation 6%was a reported value which was done with quality improvement throughout the study period(24) .Research done in Taiwan(2004) experiencing UE were 225/1176 (22.5%) intubated patients. Among UE 91.7% of were self extubations and 8.3% were accidental extubations(25)and another case- control study was done in the country in 2008 ,among 1455 patients receiving mechanical ventilation 126 episode of unplanned extubation with incidence rate of 8.7%(21).In another research done in British (2008) 256 patients were included during the study eight episode of unplanned extubations occurred with incidence rate of 4.47%,this corresponded with 0.57unlanned extubation/100days of mechanical ventilation. Five of eight extubations were deliberate self-extubations, and three were accidental extubations(22). A nested case-control study was done in Belgium (2004) showed that the incidence rate of unplanned extubation was 4.2 %(0.68 events/100days of mechanical ventilation). The incidence was lower at surgical ICUs (2.6%) compared with that at medical ICU/ (9.5%)(26). Another prospective cohort study was done in Spain (2007) on 344 orally intubated patients. The episodes of unplanned extubations were 34 occurring in 34 patients (10%). The incidence density of UE was 0.92 of 100 ventilated days(15).Retrospective cross-sectional was done in South Korea showed

that the incidence of UE was 0.78 per 100 days of mechanical ventilation .Among UE 97.2% was self-extubation ,the remaining 2.8% was accidental extubation(27).

Prospective multi center observational cohort was done in Thailand (2016) on 2,890 intubated patients in ICU and mechanically ventilated patients 54 (1.9%) of them experienced UE during ICU stay(28).A prospective observational study was done in South Africa academic intensive care unit in 2004, total of 233 patients were received ventilator support in ICU with an endotracheal tube during the study period. Twenty-four patients (10.3%) experienced an unplanned extubation(19)and another prospective observational study was done in this country in 2018 in level one trauma unit, among 420 patients were intubated in ICU 40 episode of UE with incidence of 9.4%(0.89 per 100 days of mechanical ventilation) occurring in 33 patients. Twenty-eight of UE were self-extubation by the action of the patient and 12 were accidental extubation. From patients experienced UE five of them had two episodes and one patient had three episodes of UE(5). Another prospective cohort study was done in Egypt (2019) a total of 245 mechanically ventilated patients, 11.02%of patients were experienced UE(20).

2.3 Associated factors of unplanned extubations

A research done by Maged Tanios in America (2014) indicates that patients on intermittent sedative dose were at higher risks of UE(9) and another retrospective study done in this country a disproportionally large percentage (44%) of unplanned extubation events occurred during overnight when compared to the morning and afternoon shifts. Of the 120 unplanned extubations, 40 occurred during weaning trails(29).

Observational prospective cohort was done in Philippines show that unplanned extubations were associated with male sex and younger age; the night shift was also associated with an increased risk of unplanned extubation(17).Another prospective cohort study was done in Spain(2007) indicates that UE was significantly more common in men, in patients with chronic obstructive pulmonary disease, during weaning trials, during night shift and without caregivers at bedside(15). A case control study was done in Taiwan in 2008 show that the use of physical restraints, nosocomial infections and score of GCS greater than 9 on admission to the unit was associated with increased risk for unplanned extubation(21).Another case control study was done in Belgium in 2004 indicates that deliberate self-extubations are determined by a lower level of

sedation and a higher level of consciousness(26).A prospective case control study was done in Netherland ,the result of the study indicates that being male, agitated and use of midazolam were associated with the occurrence of UE (8).Another retrospective cross-sectional study was done in Malaysia the results of this study found that factors associated with increased risk for unplanned extubation included earlier day of intubation ,weaning process , males , afternoon shift , and when the patient appears agitated(1) .

Prospective cohort study was done in Africa, Egypt in 2019 UE showed that physically restrained, agitation, less sedation with lower RASS score and staff loaded with unsatisfied nurses and junior residents(20).

2.4 Consequence of unplanned extubation

A case control study was done in America in 2005 and the result showed that patients with UE were resulted in longer ICU and hospital stay and also had longer duration of mechanical ventilation(30). Another retrospective study was done in South Korea in 2015 showed that two case of cardiorespiratory arrest after UE were documented .Among 214 of patients' experienced unplanned extubation, 54.7%need invasive management in ICU. Long duration of mechanical ventilation in ICU and high mortality highly related to invasive management in ICU after UE(27).A research in Spain in 2007 show that reintubation was required in 41% of patients experienced an episode of unplanned extubation and this episode of unplanned extubation was highly related to accidental type of unplanned extubation(15).Prospective cohort was done in Philippines and the result shows among post- extubation outcomes the reintubation rate was 61.1% in unplanned extubation and 25.4% in planned extubation. The others post-extubation out comes explained in this study were acute respiratory failure and cardiovascular events. Among patients experienced unplanned extubation 38.9% of patients developed acute respiratory failure and 8.33% of them were develop cardiovascular accidents(17).Another retrospective study was done in South Korea in 2015 during the study 30 patients were experienced unplanned extubation. Of 30 patients four of them developed delirium. Another two patients were developed ventilator related pneumonia. Patients were died due to progressive respiratory failure secondary to pneumonia in five patients, one patient due to cardiac tamponed, one patient due to underlying interstitial lung disease and two patients due to unidentifiable causes(31).Prospective cross-sectional study was done in South Africa in 2018 and the result showed that reintubation

was required in 78% of unplanned extubated patients and was highly related to accidental type of unplanned extubation which 100%of patients were reintubated(5).Another prospective cohort was done in Egypt in 2019 the result indicates that patients which experienced unplanned extubations had prolonged length of hospital and ICU stay , increase reintubation rate and higher mortality rate(20) .

Conceptual frame work

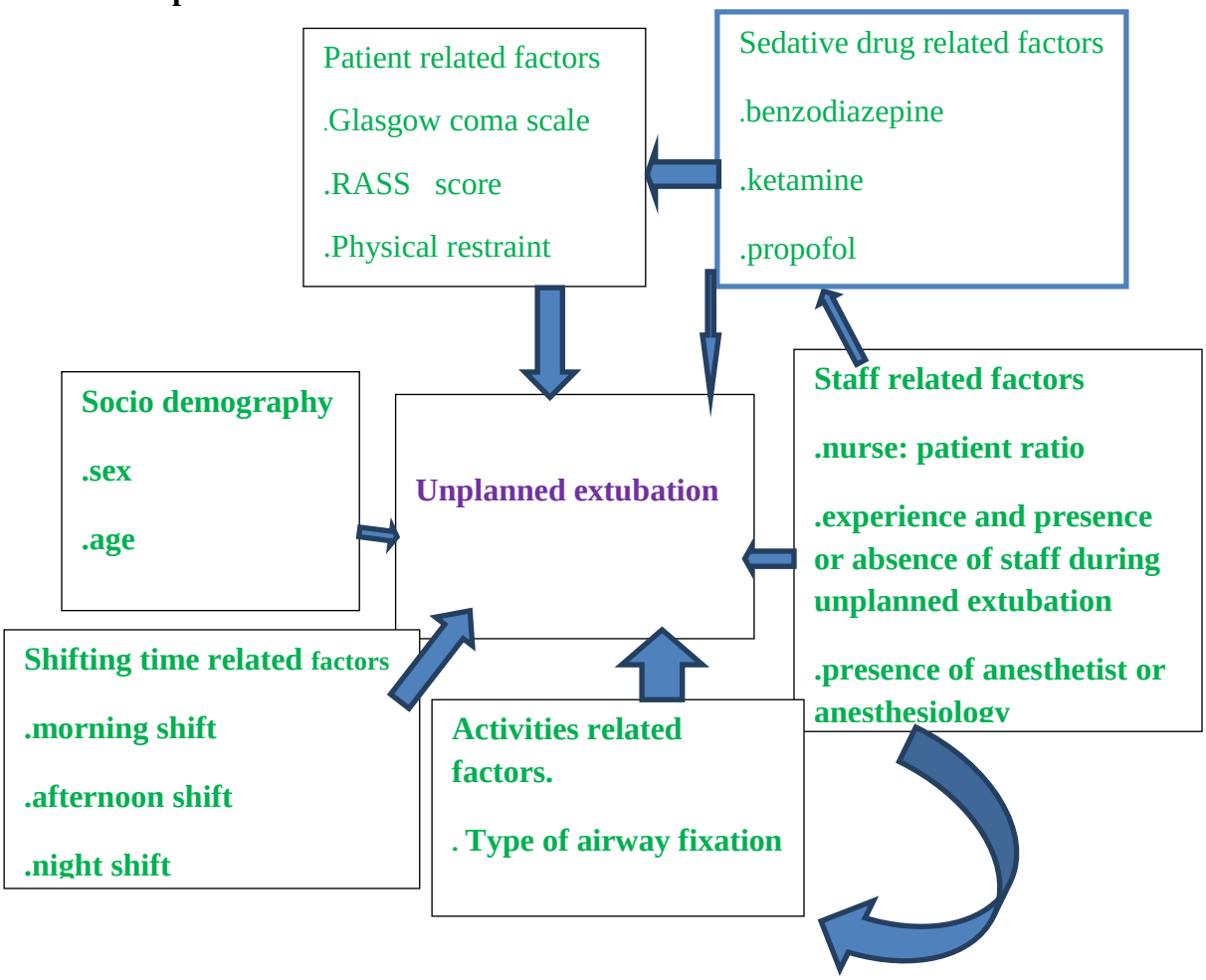

Figure 1: Conceptual frame works

CHAPTER THREE: OBJECTIVE

3.1 General objectives

To assess the magnitude and associated factors of unplanned extubation in ICU at Addis Ababa governmental hospitals, Addis Ababa Ethiopia from January8,2021-May9,2021.

3.2 Specific objectives

- To assess the magnitude of unplanned extubation in ICU at selected Addis Ababa government hospitals.
- To identify factors associated with unplanned extubation in ICU at selected Addis Ababa government hospitals.

CHAPTER FOUR: METHODOLOGY

4.1 Study Design And Period

Institutional based cross-sectional study was conducted in intensive care unit at Addis Ababa governmental hospitals, Addis Ababa, Ethiopia from January8, 2021-May9, 2021.

4.2 Study Area

The study was conducted in Addis Ababa city which is the capital city of Ethiopia located at the center of the country with an area 210km2 of covering and a population of 3,384,569 according to 2007 census(32) . Addis Ababa has 11 sub cites in which the city lies at an altitude of 2,300 meters each sub city has 10-12 woredas. The study was done in selected governmental hospitals in the city which gives ICU services. There are 13 public hospitals and around 98 health centers in this city. Among 13 hospitals 9of those give normal ICU service, one hospital serves as covid -19 centers since March 2020.

4.3 source population and study population

4.3.1 Source population

All intubated patients in ICU at Addis Ababa government hospitals.

4.3.2 Study population

All intubated ICU patients during the study period at selected Addis Ababa government hospitals.

4.4 Eligibility criteria

4.4.1 Inclusion criteria

- All intubated patients in ICU at the time of study period.

4.4.2 Exclusion criteria

- All intubated patients in I CU with covid- 19

4.5 Study variables

4.5.1 Dependent variable

- Unplanned extubation

4.5.2 Independent variables

- Socio demographic characteristics: Age, sex
- Patient factors: GCS,RASS, physical restraint, previous history of unplanned extubation
- Staff related factors :nurse: patient ratio, experience , presence or absence of staff during extubation
- Activities related factors: Type of airway securing,
- Shifting time related factors: morning , afternoon, night
- Sedative related factors: benzodiazepine ,ketamine ,propofol

4.6 Operational definition

- Unplanned extubation: premature removal of ETT accidentally or by the action of the patient.
- Glasgow coma scale: Assessment tools of neurological function.
- Richmond Agitation sedation scale: A medical scale used to measure the agitation or sedation level of person.
- Accidental extubation: Extubation occurred during a medical procedure or patient transport.
- Self extubation: Extubation occurred by the action of patients
- Junior resident physician: physician that has not completed half of their training year (residency) or physician with (BSC) only.
- Senior resident : physician complete at least half of their residency

4.7 Sample size and sampling technique

The simple random sampling technique was used to select the hospitals by using lottery method. Five hospitals were selected among 9 hospitals which were Tikur anbesa specialized hospital (TASH), Saint Paul millennium hospital (SPMH) under this hospital one trauma center hospital which is Addis Ababa emergency trauma center hospital (AaBET),Zewditu memorial hospital(ZMH),Yekatit 12 hospital and Minillik second hospital . All 317 patients in these selected governmental hospitals intubated in ICU from January8, 2021-May9, 2021 were included in the study.

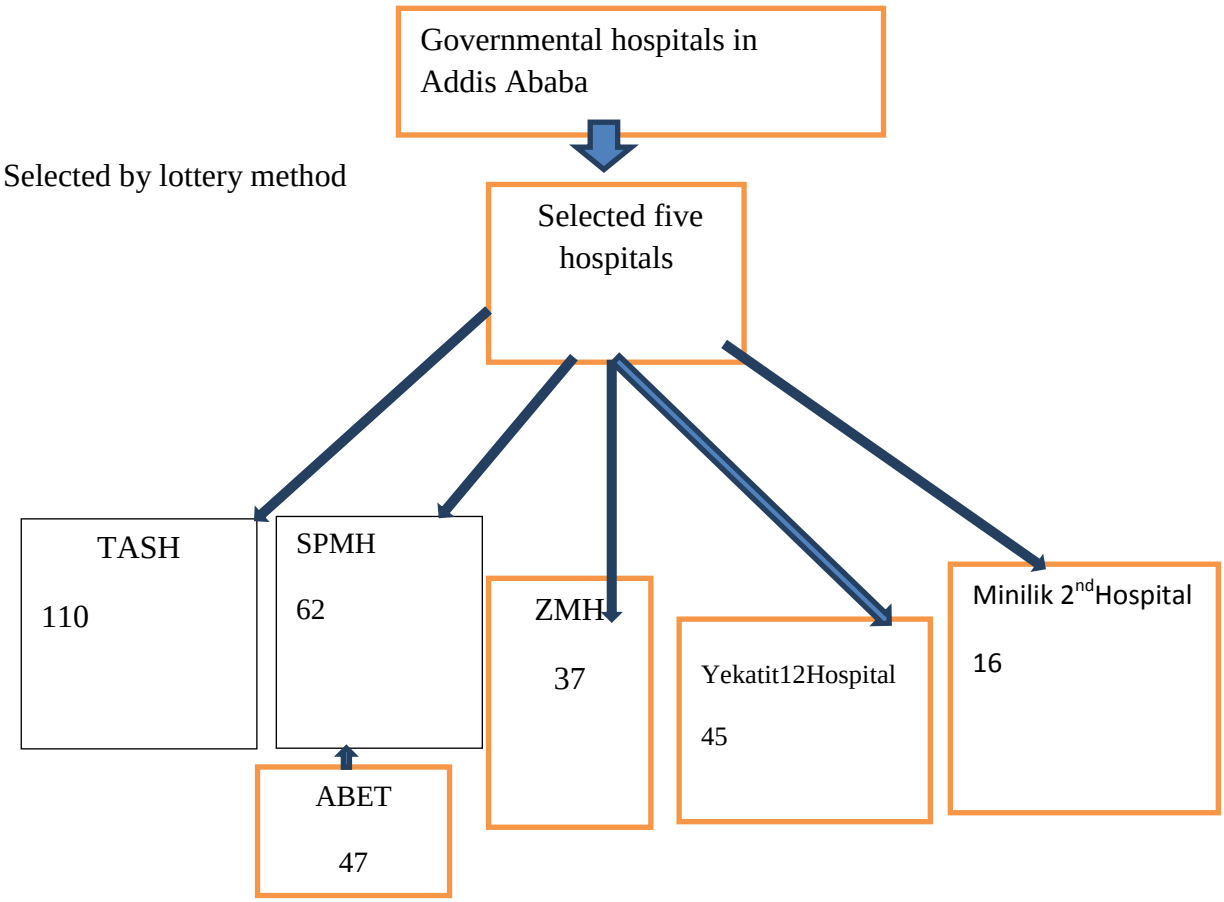

Figure 2: Distribution of patients included in the study intubated in ICU at selected Addis Ababa governmental hospitals, Addis Ababa. Ethiopia from January8, 2021-May9, 2021

4.8 Data Collection Techniques

The data collection was done by trained data collectors and they were used questioner as data collection tools. The process of data collection was monitored by the principal investigator. During the process the principal investigator also stay close with the data collectors to help when they face get any problem or faces difficulties.

Demographic data collected was age and sex. Under intubation state of the patient route of admission to ICU, reason of intubation, route of intubation and the type of securing material to fix the ETT were collected. When the patients were extubatubated , RASS before extubation, GCS before extubation, the drugs used within 24hrs before extubation occurred, experience of

care givers physician ,whether the patient physically restrained or not before extubation ,nurse to patient ratio and time of extubation were collected ,additionally if the extubation was unplanned extubation; location of patient during extubation, situation when extubation occurred, staff at bed side or not during extubation, were immediately collected by the responsible data collector.

4.9 Data Quality Control

Two days training was given for data collectors within an academic background of BSC degree in nursing, BSC anesthetist and one coordinator working outside the study hospital and principal investigator in each hospital. Regarding the data collection tools before the actual data collection period pretest was done at Saint Pitter specialized hospital on 15 patients intubated in ICU which was 5%of patients was intubated during situational analysis to check the questionnaire.

4.10 Data analysis and interpretation

The collected data was coded and entered into Epi data 4.6.0.2 and exported to SPSS version 26 statistical software for further analysis. Before starting analysis recoding was done on some of the variables. All independent variables with the dependent variable were analyzed by using binary logistic regression to identify variables that were the predictive of the dependent variable. Odd ratio, 95% confidence interval and P-value were computed to differentiate the risk factors and to assess the strength of association.Variables with P-value less than0.25 on binary logistic regression analysis were going to multivariable logistic regression analysis and the cutting point to test the statistical significance was P-value less than 0.05.

4.11 Data management

The activity of data management was controlled and monitored by the principal investigator. All form of data collection was checked, examined for completeness and consistency during data storage, management and analysis .Then the data was entered in to Epi data statistical software and exported to SPSS further checked and cleaned by the principal investigator before starting of analysis. The collected data was categorized, grouped and adjusted according to the appropriate statistical model.

4.12 Ethical consideration

The study was done after obtaining ethical clearance from Addis Ababa University College of health science department of anesthesia ethical committee. A formal letter was submitted to each selected hospitals from the department of anesthesia and permission was assured to keep the confidentiality. Verbal consent was obtained from a family member or attendant of intubated patients' .The data collection process was held within the selected hospital and the study participants family or attendant was informed before starting the data collection about the whole thing the benefit and risks of participating in the study.

4.13 Dissemination plan

The final result of the study will be presented and submitted to Addis Ababa University College of health science department of anesthesia. In addition to this, the findings will be disseminated to ministry of health (MOH), Addis Ababa health bureau and to the hospitals which was selected as a study area. The research will be also presented at the annual conference of anesthesia association and will be submitted to journal publication.

CHAPTER FIVE: RESULT

5.1 Socio-demographic characteristics of 314 patients intubated in ICU at selected Addis Ababa governmental hospitals from Junuary8, 2021-June7, 2021

A total of 317patients were intubated in ICU during the study period. Three patients were excluded from the study due to incomplete data. Out of 317 intubated patients in ICU 314 were included in the study with response rate of 99.05%and the median age of the patients were 40. Majority of the patients intubated in the ICU included in the study were male (55.7%).

Table -1 Socio-demographic characteristics of 314 patients intubated in ICU at selected Addis Ababa governmental hospitals, Addis Ababa Ethiopia from Junuary8, 2021-June7, 2021

variables	Variable category	frequency	percent
Sex	female	139	44.3
	male	175	55.7
Age	0-14	37	11.8
	15-47	145	46.2
	48-63	66	21.0
	>64	66	21.0

5.2 Intubation states of 314 patients intubated in ICU at selected Addis Ababa governmental hospitals, Addis Ababa, Ethiopia January 8, 2021-May9, 2021

The majority of patients intubated in ICU were admitted from emergency 102 (32.5%), 127(40.4%) intubated for the indication of respiratory problem, 312(99.4%) patients were intubated orally and 306(97.5%) intubated with cuffed ETT.

Table 2 Intubation states of 314 patients intubated in ICU at selected Addis Ababa governmental hospitals, Addis Ababa, Ethiopia January 8, 2021-May9, 2021

Variable	Category variable	frequency	percent
	from ED	102	32.5
	from ward	97	30.9
Route of admission	from OT	67	21.3
	from other hospital	48	15.3
	respiratory distress(air way protection)	127	40.4
	septic shock	59	18.8
Cause of intubation	neurovascular	16	5.1
	trauma	76	24.2
	cardio vascular	20	6.4
	endocrine	7	2.2
	kidney	9	2.9
Route of intubation	oral	312	99.4
	nasal	2	.6
Type of ETT	cuffed	306	97.5
	Un cuffed	8	2.5
Plaster ETT Fixation	no	247	78.7
	yes	67	21.3
Roll bandage ETT fixation	no	191	60.8
	yes	123	39.2
Roll bandage +plaster ETT fixation	no	177	56.4
	yes	137	43.6

5.3 Risk factors for unplanned extubation for 314 patients intubated in ICU at selected Addis Ababa governmental hospitals, Addis Ababa, Ethiopia from January8, 2021-May9, 2021.

Majority of patients 96.5% had no previous history of intubation, 127(40.4%) were with GCS 9T, 108(34.4%) patients were sedated with ketamine, 127(40.4%) had 5-10 days duration of intubation, 138(43.9%) patients were physically restrained and 138(38.5%) patients were extubated at night shift.

Table 3 Risk factor s for unplanned extubation for 314 patients intubated in ICU at selected Addis Ababa governmental hospitals, Addis Ababa, Ethiopia from January8, 2021-May9, 2021.

Variables	Category	Frequency	Percent
History of intubation	no	303	96.5
	yes	11	3.5
	10T	54	17.2
GCS	9T	127	40.4
	8T	60	19.1
	<8T	73	23.2
Nurse :patient ratio	1:1	155	49.4
	1:2	159	50.6
Drug	benzodiazepine	104	33.1
	ketamine	108	34.4
	propofol	51	16.2
	ketamine+ benzodiazepine	51	16.2
Physician	junior resident	152	48.4
	senior resident	162	51.6
Agitation	no	236	75.2
	yes	78	24.8
Very agitated	no	304	96.8
	yes	10	3.2
Drowsy agitated	no	291	92.7
	yes	23	7.3
Restless	no	266	84.7
	yes	48	15.3
Lightly sedated	no	274	87.3
	yes	40	12.7
Alert& calm	no	185	58.9
	yes	129	41.1
<5 days of intubation	no	209	66.6
	yes	105	33.4
	no	187	59.6
5-10 days of intubation	yes	127	40.4
>10days of intubation	no	222	70.7
	yes	92	29.3
Physically restrained	no	176	56.1
	yes	138	43.9
Anesthetist (anesthesiologist)	no	156	49.7
	yes	158	50.3
Extubation at morning	no	210	66.9
	yes	104	33.1
Extubation at afternoon	no	224	71.3
	yes	90	28.7
Extubation at night	no	193	61.5
	yes	121	38.5

5.4 The magnitude of unplanned extubation in 314 intubated patients in ICU at selected Addis Ababa governmental hospitals, Addis Ababa, Ethiopia from January8, 2021-May 9, 2021

In this study 62(19.74%) patients were experienced unplanned extubation. Five (1.6%) patients were experienced unplanned extubation twice. There was 67 episode of unplanned extubation. From of these 49(15.6%) were self -extubation and (15) 4.8% was accidental extubation. Fifty six patients experienced unplanned extubation in ICU which was 90.3% of unplanned extubation occurred in ICU and the remaining 6(9.7%) patients' experienced unplanned extubation outside ICU.

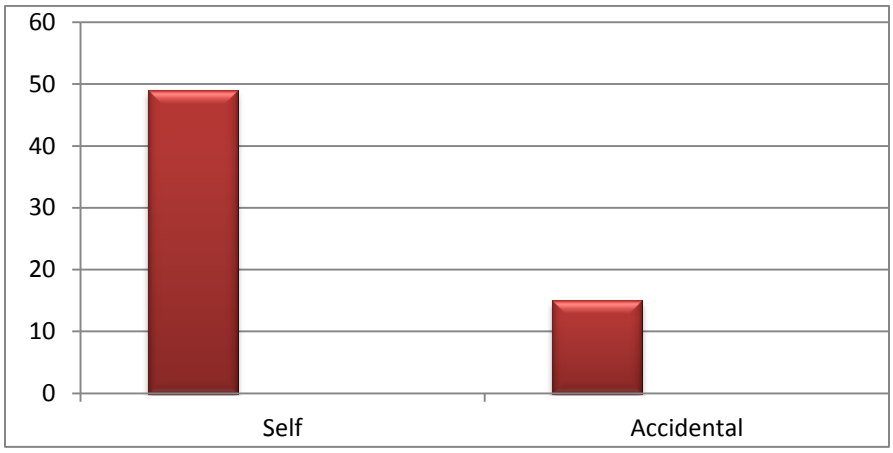

Figure: 3Types of unplanned extubations occurred in ICU at selected Addis Ababa governmental hospitals, Addis Ababa, Ethiopia from January8, 2021-May9, 2021

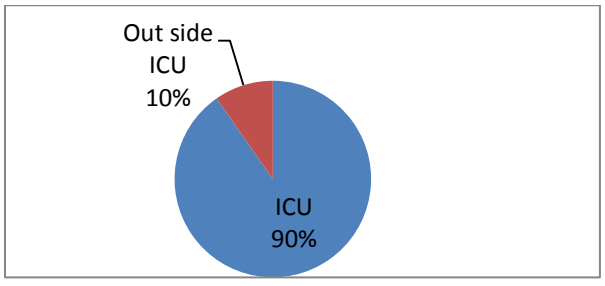

Figure: 4 Place of unplanned extubation occurrence among patients intubated in ICU at selected Addis Ababa governmental hospitals, Addis Ababa, Ethiopia from January 8, 2021-May9, 2021.

On the other hand 47(15%) unplanned extubations were occurred when clinical staff at bed and 15(4.7%) were occurred in the absence of staff. Thirty two (10.2%) unplanned extubations occurred during weaning, nineteen (6.1%) during procedural activities, sixteen (5.1%) during mechanical ventilation with assisted control volume control ventilation (ACVCV) mode and two (0.6%) were during mechanical with synchronized intermittent mechanical ventilation volume control ventilation (SIMV VCV) mode.

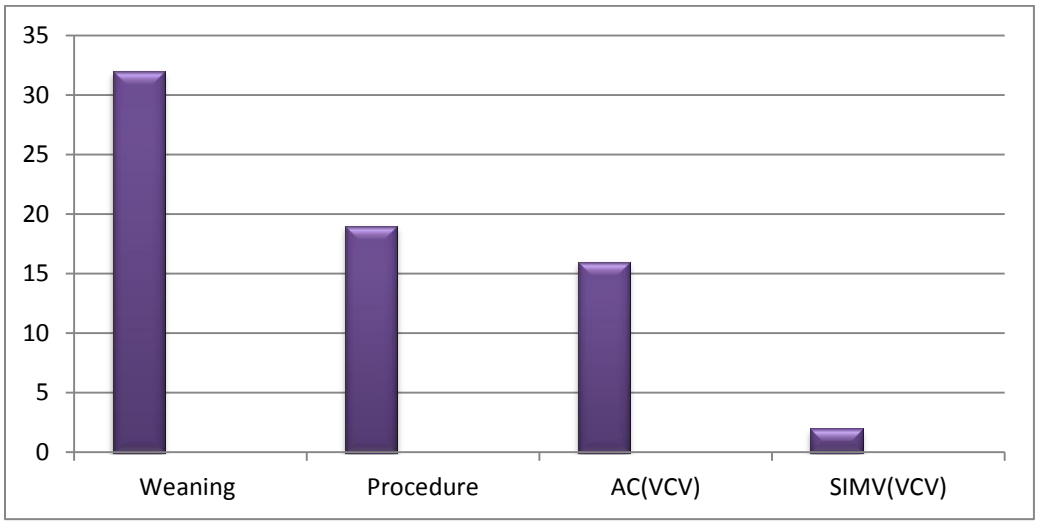

Figure 5 Distribution of unplanned extubation occurred at selected Addis Ababa governmental hospitals depending on situation and mode of ventilation, Addis Ababa, Ethiopia from January8, 2021-May9, 2021

5.5 Factors associated with unplanned extubation in ICU patients intubated at selected Addis Ababa governmental hospital, Addis Ababa, Ethiopia from January 8, 2021- May9,2021

With adjustment to other variables, being male, intubation duration <5days, patients managed by junior resident, agitation, being physically restrained and night shift were significantly associated with unplanned extubation**(Table -4).**

In the study patients who were male three times more likely experience unplanned extubation than female **(Table-4).**

Patients managed by junior resident more than five times more likely experience unplanned extubation than senior resident **(Table-4)** and patients intubated for less than five days more than two times more likely experience unplanned extubation**(Table-4).**

On other occasions patients who were physically restrained more than four times likely increase the occurrence of unplanned extubation(**Table-4).**

The result of this study suggested that patients who were agitated more than four times increase the occurrence of unplanned extubation**(Table-4).**

This study showed that the odd of night shift was 3.28 times more likely associated with the occurrence of unplanned extubation **(Table-4).**

Table 4: factors associated with unplanned extubation in ICU intubated patients at selected Addis Ababa governmental hospitals, Addis Ababa, Ethiopia from January 8, 2021-May9, 2021.

Variables	Category	Unplanned extubation		COR(95%CI)	AOR (95%)	P-Value
		Yes n (%)	No n(%)			
Sex	Female	17(5.41)	122(38.85)	1	1	0.013
	Male	45(14.33)	130(41.40)	2.484(1.349-4.573)	3.132(1.276-7.691)*	
Age	0-14	3(1)	34(10.82)	0.360(0.095-1.356)	0.605(0.095-3.844)	0.594
	15-47	37(11.78)	108(34.39)	1.397(0 .685-2.847)	1.84(0.67-5.091)	0.239
	48-63	9(2.9)	57(18.15)	0.644(0.254-1.629)	0.765(0.216-2.706)	0.677
	>64	13(4.14)	53(16.9)	1	1	
Route admission	From ED	28(8.92)	74(23.6)	1.829(0.767-4.36)	0.1.215(0.378-3.904)	0.743
	From ward	14(4.46)	84(26.4)	0.512(0.86-1.408)	0.552(0.142-2.152)	0.392
	From OT	11(3.5)	56(17.83)	0.759(0.273-2.110)	0.81(0.208-3.145)	0.76
	From other hospital	9(2.9)	39(12.42)	1	1	
GCS	10T	12(3.8)	42(13.4)	1.800(0.713-4.542)	1.269(0.34-4.73)	0.722
	9T	38(12.1)	89(28.3)	2.69(1.248-5.796)	1.86(0.62-5.585)	0.27
	8T	2(0.6)	58(18.5)	0.217(0.046-1.033)	0.41(0.059-2.83)	0.366
	>8T	10(3.2)	63(20)	1		
Drug	Benzodiazepine	43(10.83)	70(22.3)	1.991(0.892-4.448)	1.447(0.451-4.641)	0.534
	Ketamine	9(2.9)	98(31.2)	0.373(0.141-0.985)	0.338(0.090-1.276)	0.109
	Propofol	7(2.2)	43(13.7)	0.879(0.324-2.384)	0.667(0.153-2.921)	0.591

	Ketamine benzodiazepine	12(3.8)	41(13.05)	1	1	
Physician	Junior resident	49(15.6)	95(30.25)	5.544(1.638-5.38)	5.890(2.344-14.800)*	0.000
	Senior resident	13(4.1)	157(50)	1	1	
Previous intubation	No	56(17.83)	247(78.7)	1	1	0.148
	Yes	6(1.9)	5(1.6)	1.926(0.796-4.66)	2.551(0.717-9.085)	
<5days intubation	No	24(7.6)	185(58.9)	1	1	0.028
	Yes	38(12.1)	67(21.3)	4.372(2.44-7.82)	2.659(1.110-6.370)*	
>10days intubation	No	53(16.9)	169(53.82)	1	1	0.938
	Yes	9(2.8)	83(26.43)	0.346(0.163-0.735)	0.957(0.322-2.843)	
Agitation	No	28(8.9)	208(66.24)	1	1	0.001
	Yes	34(10.82)	44(14)	5.740(3.161-10.42)	5.014(1.992-12.621)*	
Restless	No	48(15.3)	218(69.42)	1	1	0.159
	Yes	14(4.41)	34(10.82)	1.870(0.932-3.753)	2.130(0.744-6.094)	
Anesthetist (anesthesiologist)	No	40(12.74)	102(32.48)	1	1	0.414
	Yes	22(7)	150(47.8)	1.654(0.941-2.909)	0.715(0.320-1.598)	
Physically restrained	No	15(4.7)	161(51.27)	1	1	0.001
	Yes	47(15)	91(29)	5.544(2.936-10.47)	4.352(1.788-10.596)*	
Night shift	No	23(7.32)	170(54.14)	1	1	0.004
	Yes	39(12.42)	82(26.1)	3.515(1.97-6.27)	3.307(1.461-7.487)*	
Roll bandage EET fixation	No	46(14.6)	145(46.17)	1	1	0.218
	Yes	16(5.1)	107(34.07)	0.471(0.253-0.88)	0.580(0.244-1.380)	

Note: 1=Reference group COR=Crude odd ratio

n=number of patient AOR=Adjusted odd ratio

%=percent CI=Confident interval

CHAPTER SIX: DISCUSSION

Unplanned extubation was premature removal of an endotracheal tube accidental or by the action of the patient(17,18,23).In this study the magnitude of unplanned extubation was 19.74% which was in the range of 0.5%-35.8% reported in the systematic literature review(18).The result we found on magnitude of unplanned extubation was in line with the study which was done in Philippines ,unplanned extubation rate of 19%(17)and the research done in Taiwan with an incidence rate of 22.5%(25). On the other hand the result was inconsistent with research done in British (4.47%)(22), Belgium (4.2%)(26) and Spain (10%) (15) .Also in this study the magnitude of unplanned extubation was higher than a study reported by most studies(2,5,8,20,31).The possible reason for this Addis Ababa governmental hospitals are area of trainee and was loaded with junior resident which has significant contribution for the incidence of unplanned extubation evidenced by our data .This was supported by the research done in Egypt in 2019 patients managed by junior residents more likely to increase the probability of unplanned extubation(20).The other reason most of them was used case control study design ,cross-sectional study design ,they were get secondary data from previous records which has the chance of losing the case. This high value in this study may be due to the study area, most of them were done in single study area.

In our study the majority of unplanned extubation were self- extubation (88.05%) which was inline a study done in Malaysia(1) and South Africa(5).Also most, of the unplanned extubation was occurred when clinical staffs at bedside in ICU which was the same as the research done in Malaysia(1).From a total of unplanned extubation (19.74%) in this study, the result showed 10.2% was occurred during the weaning process. The possible justification for this during weaning process inappropriate reduction of sedative drugs and decrease care giver concentration due to the patient becomes more stable than the beginning of patient condition.

The result of this study showed being male was a risk factor for the occurrence of unplanned extubation. Male patients are three times more likely to experience unplanned extubation than females **(Table-4)**. The reason for this could be male patients are stronger than females due to the overall increase of muscle mass in male by the effect of testosterone(33). This could results in removing the ETT by themselves. This result was similar with different

studies(1,8,15,17,18).But another study reported in 2016 by Aydog .S et al being male was not significantly associated with the incidence of unplanned extubation(16).

The patient managed by junior residents were more than five times more likely associated with the occurrence of unplanned extubation than senior residents **(Table-4)**. This result was supported by Abbas et al in 2019(20). The reason for this could be junior residents are still on learning and demanded for high work load and stress than senior residents. The other could be they have less skill in the management of patients in the intensive care unit.

Another significant association with occurrence of unplanned extubation was the intubation duration of less than five days. We found patient intubated for less than five days was two times more likely experienced unplanned extubation than others **(Table-4)**.This was supported by authors Chin Dc et al(1) and Gueret.RM et al (34). The possible justification would be patients in these days wouldn't adapt to the ETT, feeling discomfort and remove the ETT by themselves as most of unplanned extubation was self extubation (15.6%) evidenced by our data.

We found in this study higher level of consciousness or GCS greater than 9T was not associated with the occurrence of unplanned extubation. In contrast to this different studies showed higher level of consciousness GCS greater than 9T was associated to the occurrence of unplanned extubation(2,18,21,26). The possible reason for this discrepancy could be patients whose levels of consciousness higher or GCS greater than 9T were had high level of sedation.

In this study agitation was associated with the incidence of unplanned extubation**(Table-4)** . This finding was supported by different studies done in different countries(1,2,8,18,20). This could be because when patients are agitated they became unstable and experience unnecessary movement. This movement leads to the removal of ETT during medical care accidentally or by the action of the patient.

The patient being physically restrained was significantly associated with the occurrence of unplanned extubation .Patients who were physically restrained more than four times more likely experience unplanned extubation than not physically restrained**(Table-4).**This finding was in agreement with different studies(6,18,20).The possible justification could be physically restrained may increase anxiety due to the inability to express themselves by moving their hand freely and gesture. The other reason could be restraining the patients may be considered as the

preventive strategy of unplanned extubation in agitated patients without appropriate sedation protocol.

We found in this study night shift had significant association with the incidence of unplanned extubation**(Table-4)**. This finding was supported by author Kwon E et al in 2017(2) and Abbas A et al in 2019 (20). The reason for this could be staffs assigned for night shift are working for long time than staffs working morning shift and afternoon shift. Staff working during night shift may spent day time by other work and become exhausted during night time may be the other reason. In addition to the above the biological sleep –awake may play an important role, during night time the patient may be disturbed by the alarming of the ventilator and monitoring. The staffs may also become sleepy due to this biological sleep-awake cycle.

6.1 Limitation of the study

- Limited availability of previous cross-sectional study on this topic.

6.2 Strength of the study

- We use multi-center study area which includes around 55% of all governmental hospitals found in Addis Ababa which gives normal ICU service.
- This study includes all patients in the study area during the study period.
- As far as, this study was the first study in our study area, so it will be base line information for further study.

CHAPTER SEVEN: CONCLUSION AND RECOMMENDATION

7.1 conclusions

The prevalence of unplanned extubation was 19.74% in Addis Ababa governmentalhospitals which was high compared to most studies conducted worldwide and also conducted in Africa. Being male, patients managed by junior resident, intubation duration less than five days, agitation, being physically restrained and night shift were significantly associated with the occurrence of unplanned extubation.

7.2 Recommendation

For Addis Ababa governmental hospital ICU staffs

- Give special attention to early intubated patients especially for male patients.
- Don't restrained patients rather follow appropriate sedation protocol.

For Addis Ababa governmental hospitals stakeholders

- Rearrangement of time of shifts by dividing night shift in to two.
- Assigning of senior residents with junior residents especially at night shift.
- Prepare ICU patients sedation protocol.

For academician researchers

- Further cohort studies need to be conducted.

REFERENCE

1. Chin DC, Mohamad N, Mulud ZA. risk factors and Outcomes of Unplanned Extubation amonng intubated patients In The ICU. Sciendo,. 2020;12–23.

2. Kwon E, Ph D, Choi K, Ph D. Case-control Study on Risk Factors of Unplanned Extubation Based on Patient Safety Model in Critically Ill Patients with Mechanical Ventilation. Asian Nurs Res (Korean Soc Nurs Sci) [Internet]. 2017;11(1):74–8. Available from: http://dx.doi.org/10.1016/j.anr.2017.03.004

3. Karim HR, Yunus M, Bhattacharyya P. A retrospective study of endotracheal or tracheostomy tube blockage and their impact on the patients in an intensive care unit. J Mahatma Gandhi Inst Med Sci. 2017;22(1):12.

4. Dasgupta S, Singh SS, Chaudhuri A, Bhattacharya D. Airway accidents in critical care unit : A 3 - year retrospective study in a Public Teaching Hospital of Eastern India. 2016;(37):91–6.

5. Köhne KM, Hardcastle T, Group F. Unplanned extubations in a level one trauma ICU Unplanned extubations in a level one trauma ICU. 2018;1181.

6. Curry K, Cobb S, Kutash M, Diggs C. Characteristics associated with unplanned extubations in a surgical intensive care unit. Am J Crit Care. 2008;17(1):45–51.

7. Da Silva PSL, De Aguiar VE, Neto HM, De Carvalho WB. Unplanned extubation in a paediatric intensive care unit: Impact of a quality improvement programme. Anaesthesia. 2008;63(11):1209–16.

8. Groot R De, Dekkers O, Herold IHF, Ziekenhuis C, Jonge E De. Risk factors and outcomes after unplanned extubations on the ICU : a case-control study. 2014;(January 2011).

9. Tanios M, Epstein S, Grzeskowiak M, Nguyen HM, Park H. Influence of Sedation Strategies on Unplanned Extubation in a Mixed Intensive Care Unit. 2014;(800):306–14.

10. Cosentino C, Fama M, Foà C, Bromuri G, Giannini S. Unplanned extubations in Intensive Care Unit : evidences for risk factors . A literature review. 2017;88(Suppl 5):55–65.

11. Metnitz PGH, Metnitz B, Moreno RP, Bauer P, Sorbo L Del, Hoermann C, et al. Epidemiology of Mechanical Ventilation: Analysis of the SAPS 3 Database. Intensive Care Med. 2009;35(5):816–25.

12. Chittawatanarat K, Jaikriengkrai K, Permpikul C, Permpikul C, Chaiwat O, Kongsayreepong S, et al. Survey of respiratory support for intensive care patients in 10 tertiary hospital of Thailand. J Med Assoc Thail. 2014;97(1 SUPPL. 1).

13. Kiekkas P, Aretha D, Panteli E, Baltopoulos GI, Filos KS. Unplanned extubation in critically ill adults : clinical review. 2012;

14. Vincent F, Cohen Y, Garrouste-orgeas M, Adrie C. Impact of Unplanned Extubation and Reintubation after Weaning on Nosocomial Pneumonia Risk in the Intensive. 2002;(1):148–56.

15. In I, Nursing P. Unplanned extubation in orally intubated medical patients in the intensive care unit : 2007;(August):270–6.

16. Aydog S. The Assessment of the Risk of Unplanned in an Adult Intensive ExtubationCare Unit. 2016;36(1).

17. Suratos TR, Miguel RTD. Incidence , Associated factors , and outcomes of unplanned extubation in adult patients in limited-resource teaching hospital in the Philippines : a cohort study. 2019;31(1):79–85.

18. Cunio M, Fonseca M. Unplanned Endotracheal Extubations in the Intensive. 2012;114(5):1003–14.

19. Mpe MJ, Moloto MS, Mphahlele B V. Unplanned extubations in an academic intensive care unit. 2004;1181.

20. Abbas A, Lutfy SM. Incidence, risk factors, and consequences of unplanned extubation. Egypt J Chest Dis Tuberc [Internet]. 2019;68(3):346–60. Available from: https://rsm.idm.oclc.org/login?url=https://www.rsm.ac.uk?url=http://dialog.proquest.com/professional/docview/2291437767?accountid=138535%0Ahttp://vw4tb4ff7s.search.serialssolutions.com?ctx_ver=Z39.88-2004&ctx_enc=info:ofi/enc:UTF-

8&rfr_id=info:sid/ProQ%3A

21. Chang LY, Wang KWK, Chao YF. Influence of physical restraint on unplanned extubation of adult intensive care patients: A case-control study. Am J Crit Care. 2008;17(5):408–15.

22. Moons P, Boriau M, Ferdinande P. Self-extubation riskfactors dettermine tool: predictive validity in a real-life setting. Nurs Crit Care. 2008;13(6):310–4.

23. Ediboğlu Ö, Çimen P, Anar C, Kıraklı C, Tatar D. Plansiz ekstübe olan yoğun bakim hastalarinda reentübasyon risk faktörleri ve reentübasyonun yoğun bakim sonuçlarina etkileri. J Med Surg Intensive Care Med. 2017;8(1):10–3.

24. Meregalli CN, Baróna FAJ, D'Alessandro MA, Danzi EP, Debaisi GE. Impact of a quality improvement intervention on the incidence of unplanned extubation in a Pediatric Intensive Care Unit. Arch Argent Pediatr. 2013;111(5):391–7.

25. Yeh SH, Lee LN, Ho TH, Chiang MC, Lin LW. Implications of nursing care in the occurrence and consequences of unplanned extubation in adult intensive care units. Int J Nurs Stud. 2004;41(3):255–62.

26. Sels K. Development of a risk assessment tool for deliberate self-extubation in intensive care patients. 2004;1348–55.

27. Lee AL, Chung CR, Yang JH, Jeon K, Park C-M, Suh GY. Factors Affecting Invasive Management after Unplanned Extubation in an Intensive Care Unit. Korean J Crit Care Med. 2015;30(3):164–70.

28. Piriyapatsom A. Incidence and Risk Factors of Unplanned Extubation in Critically Ill Surgical Patients : The Multi-center Thai University-based Surgical Intensive Care Units Study (THAI-SICU Study). 2016;99:153–62.

29. Salahuddin M, Eiger G, Fernandez GA, Wheeler D, Wani A. Characteristics Of Unplanned Extubations In An Urban Icu Rationale : Methods : 2014;5293.

30. Krinsley JS, Barone JE. The Drive to Survive * Unplanned Extubation in the ICU. Chest

[Internet]. 2004;128(2):560–6. Available from: http://dx.doi.org/10.1378/chest.128.2.560

31. Lee TW, Hong JW, Yoo JW, Ju S, Lee SH, Lee SJ, et al. Unplanned extubation in patients with mechanical ventilation: Experience in the medical intensive care unit of a Single Tertiary Hospital. Tuberc Respir Dis (Seoul). 2015;78(4):336–40.

32. Statistical C. 2007 POPULATION and HOUSING CENSUS OF ETHIOPIA ADMINISTRATIVE REPORT Central Statistical Authority Addis Ababa. 2012;(April).

33. Lassek WD, Gaulin SJC. Costs and benefits of fat-free muscle mass in men: relationship to mating success, dietary requirements, and native immunity. Evol Hum Behav [Internet]. 2009;30(5):322–8. Available from: http://dx.doi.org/10.1016/j.evolhumbehav.2009.04.002

34. Gueret RM, Tulaimat A, Morales-Estrella JL. Self-extubation revisited: A case-control study. Respir Care. 2020;65(9):1301–8.

10. ANNEX

10.1 Informed consent

My name is_____on behalf of Mr.Zewdu Minda A student of post graduate at Addis Ababa University College of health science department of anesthesia. He is conducting a research for the partial fulfillment of the degree of master of anesthesia on the incidence and associated factors of unplanned extubation in Addis Ababa governmental hospitals. He received ethical clearance from Addis Ababa University College of health science department of anesthesia ethical committee. Being part of this study will not affect in any way the service yours family or lovely are getting in this hospital. You are selected to participate in this study on behave of your family or lovely, because your family or loves intubated and can't communicate in the intensive care unit. You are free to withdraw your family (lovely) from the study. In the study any assessment confidential and in addition your family (lovely) name, address or any information that identifies your family (lovely) will not be used. The data will get be kept strictly confidential and will not disclose to anyone other than member of our survey team.I respect any of your decision.

The findings of I study will provide information about the incidence and risk factors of unplanned extubation helps for responsible stakeholders to develop strategies and take appropriate measures to solve the gaps and ensure the welfare of patients management in ICU. This study will not harm any study participants.

Do you agree to participate in this study?

1. Yes 2.No (if no stop)

Family (lovely) signature_____ Data collector's _____

If you have any suggestion don't hesitate to call to the principal investigator Zewdu Minda 0989811867(zeduminda21@gmail.com)

10.2 Questionnaires

A questioner form for data collector for patients intubated in ICU in selected Addis Ababa governmental hospitals.

Assessment on the incidence and associated factors of unplanned extubation in selected governmental hospitals in Addis Ababa, Ethiopia 2020, 2021.

Part-I: Socio-demography

Questions	option	Answer	Remarks
101. Sex	1.male 2.female		
102.Age		……	

Part –II: Intubation states of a patient

201. from where a patient is admitted to ICU?	1.ED 2.Ward 3.OT 4.Other hospitals referred		
202. What is the cause of intubation?	1.Resparatory distress(air way protection) 2. Septic shock 3.Neurovascular disease 4.Polytrauma 5.cardio vascular 6.Endocrine disease 7.Kidney disease 8.Others		
203. What is the route of intubation?	1.oral 2.nasal		
204. The type of ETT used for intubation?	1.cuffed 2.uncuffed		
205. What type of ETT fixation used?	1.Plaster 2.rollbandage(gauze) 3.Plaster+rollbandage		

Part –III: Cause of unplanned extubation

301. Dose the patient has previous history intubation?	1.yes 2.no		
302. If" yes "for question "301" how many times during the study period?			
303. What is the RASS score of the patient before extubation?	1-5(unarousable) 2-4(deeply sedated) 3.-3(moderately sedated) 4-2(Lightly sedated) 5-1(drowsy) 6.0(alert and calm) 7.1(restless) 8.2(agitated) 9.3(very agitated) 10.4(combat)		
304. The drug used for sedation for the last 24 hrs.	1.benzodiazepine 2.ketamine 3.propofol		
305. Physically restrained before extubation?	1.Yes 2.No		
306. GCS of the patient before extubation?	1.10T 2.9T 3.8T 4.<8T		
307.Is there any responsible anesthetist (anesthesiologist)	1.yes 2.No		
308.Nurse :patient ratio	1.1:1 2.1:2 3.1:3		
309.Physcian working in the shift	1.junior resident 2.senior resident 3.sepecialist		
310. When extubation occurred?	1.morning shift 2.afternoon shift 3.night shift		
311. For how long the patient is intubated?		….	

Part-IV: About unplanned extubation

Is the extubation unplanned? 1. Yes 2.No

If" yes' continue the following questions.

401. Dose the patient has previous history of unplanned extubation?	1.yes 2.no		
402. If "yes" for question "401" how many times during the study period?			
403. Is nurse or other staff at bed side during unplanned extubation?	1.Yes 2.No		
404. Type of unplanned extubation?	1.accidental 2.self		
405. Where unplanned extubation occurred?	1.In ICU at bed side 2.out side ICU		
406. At what situation unplanned extubation occurred?	1.during weaning 2.during procedure 3.during fully MV with AC,VCV 4.during fully MVwithAC,PCV 5.duringfully MV with AC,PRVCV 6.during fully MV withSIMV,VCV 7.during fully MV with SIMV,PCV 8.during fully MV with SIMV,PRVCV		

10.3 Richmond agitation sedation scale (RASS)

point	**name**	**Explanation**
4	combative	overtly aggressively movement
3	Extremely agitated	Remove catheters, aggressive
2	agitated	Frequent non-purposeful movements, fights ventilator
1	restless	Anxious with movement but is not aggressive
0	Alert	calm
-1	drowsy	Not fully alert, but sustained awakening, eye contact to voice>10seconds
-2	Light sedation	Briefly awakens with eye contact to voice<10seconds
-3	Moderate sedation	Eye opening to voice but no eye contact
-4	Deep sedation	No response to voice but has response to physical stimulation
-5	Unarousable	No response to voice and physical restrained

10.4 Glasgow coma scale (GCS)

Adult ,children over 2years	**score**	**Children under 2years**
Eye opening response		**Eye opening response**
1 Spontaneous	**4**	**1 Spontaneous**
2 opens to verbal command, shout	**3**	**2 To speech, shout**

3 Opens to pain	**2**	**3 To pain**
4 none	**1**	**4 none**
Verbal response		**Verbal response**
1 Oriented	**5**	**1 infant coos or babbles**
2 confused	**4**	**2 irritable, continually cries**
3 Inappropriate response	**3**	**3 cries to pain**
4 Incomprehensible speech	**2**	**4 Moans to pain**
5 none	**1**	**5 none**
Motor response		**Motor response**
1 obey command for movement	**6**	**1 Spontaneous movement**
2 localized pain	**5**	**2 Withdrawal from touch**
3 Withdrawal from pain	**4**	**3 Withdrawal from pain**
4 Flexion to pain	**3**	**4 flexion to pain**
5 Extension to pain	**2**	**5 extension to pain**
6 none	**1**	**6 none**