Clinical profile and outcomes of adult patients presenting with non-traumatic respiratory distress to the emergency department of Muhimbili National Hospital

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CLINICAL PROFILE AND OUTCOMES OF ADULT PATIENTS PRESENTING WITH NON-TRAUMATIC RESPIRATORY DISTRESS TO THE EMERGENCY DEPARTMENT OF MUHIMBILI NATIONAL HOSPITAL

By

Winnie K. Mdundo

A Dissertation Submitted in (Partial) Fulfillment of the Requirements for the Degree of Master of Medicine (Emergency Medicine) of

Muhimbili University of Health and Allied Sciences
October, 2020

CERTIFICATION

The undersigned certifies that he has read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation titled; **‘‘Clinical profile and outcomes of adult patients presenting with non-traumatic respiratory distress to the Emergency Department of Muhimbili National Hospital’’,** in (partial) fulfilment of the requirement for the degree of Master of Medicine (Emergency Medicine) of Muhimbili University of Health and Allied Sciences.

_____

Dr. Hendry Sawe

Supervisor

_____

Date

DECLARATION AND COPYRIGHT

I, **Winnie K. Mdundo**, declare that this **dissertation** is my original work and that it has not been presented and will not be presented to any other university for a similar or any other degree award.

Signature..... **Date**.....

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DEDICATION

To my beloved family and friends, especially my parents Mr. and Mrs. William Mdundo.

ABSTRACT

Background: Respiratory Distress (RD) is a life-threatening condition among adults at the emergency department that presents with an abnormal respiratory rate or respiratory effort (increased or inadequate) and is usually associated with high mortality.

Objectives: Aimed to determine the clinical profile and outcome of adult patients who present to the emergency department with non-traumatic RD in a low resource setting.

Methodology: This was a prospective observational cohort study in a public tertiary hospital of adult patients who presented with respiratory distress at ED September 2019 to January 2020. Adult patients that presented with non-traumatic RD and consented were included in the study using a structured case report form we documented patient demography, clinical presentation, and ED management provided. ED and in-hospital LOS were recorded as well. Modified early warning signs (MEWS) score was calculated. Patients were followed-up until death or discharge. We determined the proportion of patients with RD and their mortality using proportions and identified the risk factors for mortality using logistic regression analysis.

Results: We enrolled 345 (2.8%) adults with respiratory distress from 12,184 adult patients that presented to the ED during the study period. The median age was 54 years (IQR 38 to 66 years) and 190(55.1%) were men. 742 patients (16.8%) had difficulty breathing and the most common associated complaints were cough 109(31.6%), chest pain 101(29.3%), and lower limb swelling 100(29%). Cardiovascular diseases were the most frequently reported comorbidity 218(63.2%). The median MEWS score was 4 (IQR 1-7). The most frequent imaging done was bedside ultrasound 281(81.4%.). Oxygen therapy during transport from referring health facilities was provided to a few 98(28.4%) while more patients were given oxygen treatment in ED 223(64.6%). Median LOS in ED was 4 hours (IQR 3-6hours). Most patients were admitted 292(84.6%), median LOS in-hospital was 6 days(IQR 2-10days) and in-hospital mortality was 126(43.2%). MEWS score of 5 or more (OR=4.39(95%CI1.70-11.32), p=0.002) was independently associated with mortality.

Conclusion: In this descriptive study we found that RD has a high in-hospital mortality of 43.2%. Abnormal airway sounds and elevated urea level are ominous indicators in patients with respiratory distress. The MEWS score 5 and above was independently associated with increased mortality and future studies should consider linking its use in low-resource setting.

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ABBREVIATION

ABG	Arterial Blood gases
ACLS/ALS	Advanced cardiac life support/Advanced Life Support
AIDS	Acquired Immune Deficiency Syndrome
BP	Blood Pressure
COPD	Chronic Obstructive Pulmonary Disease
BiPAP	Bi-level Positive Airway Pressure
BLS	Basic Life support
BVM	Bag-valve Mask
CPR	Cardiopulmonary Resuscitation
CT	Computer Tomography
CPAP	Continuous Positive Airway Pressure
EWS/MEWS	Early Warning signs/Modified early warning signs
ECG	Electrocardiogram
ED/EMD	Emergency Department/ Emergency Medicine Department
EMS	Emergency Medical Services
FBP/CBC	Full Blood picture/ Complete Blood Count
GCS	Glasgow Coma Scale
HEENT	Head, ear, eye, nose and throat
HDU	High Dependency Unit
HIV	Human Immunodeficiency Virus
HR/PR	Heart rate/pulse rate
ICU	Intensive care Unit
IQR	Interquartile range

MRDT	Malaria rapid diagnostic test
MNH	Muhimbili National Hospital
MUHAS	Muhimbili University of Health and Allied Sciences
LOS	Length of Stay
O2	Oxygen
ORCI	Ocean Road Cancer Institute
RA	Room air
RD	Respiratory distress
RR	Respiratory rate
RFT	Renal Function Test
SPO2	Oxygen saturation
TB	Tuberculosis
Temp	Temperature
USA	United States of America
RBG	Random Blood Glucose
WOB	Work of breathing

DEFINITION OF KEY TERMS

1. **Respiratory distress:** Increased respiratory rate, effort, and work of breathing (1–3).

2. **Tachypnea:** Abnormally high respiratory rate, above the upper limit of a range specific to that age group of the patient (1,2).

3. **Bradypnea:** Abnormally low respiratory rate, below the lower limit of a range specific to the patient (1,2).

4. **Tachycardia:** Abnormally high heart rate, above the upper limit of a range specific to the patient's age (1).

5. **Bradycardia**: Abnormally low heart rate, below the lower limit of a range specific to the patient's age (1).

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Dyspnea/ difficulty in breathing has been identified as the most common complaint associated with a high mortality of critically ill patients presenting to the Emergency department thus can be used as a mortality predictor (3,9). Respiratory distress is severe difficulty in achieving adequate oxygenation despite significant efforts to breathe. It is usually associated with increased breathing rate and the use of accessory muscles of the chest wall.

Respiratory distress is a term used by the physician, combining the patient's subjective sensation of dyspnea with signs indicating difficulty breathing such as cough, wheezing/ stridor, tripod body positioning, sweating, and fast breathing rate (4).

Respiratory distress is characterized by an abnormal respiratory rate (e.g. tachypnea) or effort. The respiratory effort may be increased (nasal flaring, retractions, and use of accessory muscles) or inadequate (e.g. hypoventilation or bradypnea (<12/min). Respiratory distress can range from mild to severe including some or all of the following signs; tachypnea(>20/min), increased respiratory rate, inadequate respiratory effort, abnormal airway sounds, tachycardia, pale/cool skin, changes in levels of consciousness/ agitation and use of abdominal muscles (1).

Respiratory failure is the end-stage of respiratory distress; it is a clinical state of inadequate oxygenation, ventilation, or both. The patient may show little or no respiratory effort. Respiratory failure should be suspected if the patient has one or more of these signs; marked tachypnea, bradypnea/ apnea (later), increased/ decreased respiratory effort, poor or absent distal air movement, tachycardia (early), bradycardia (late), cyanosis and stupor/coma. Respiratory failure is usually marked by a rise in arterial carbon dioxide levels (hypercapnia) or a drop in blood oxygenation (hypoxemia) (1).

There are many potential causes for respiratory distress in adults worldwide; those due to asthma, chronic obstructive pulmonary disease, lower respiratory tract infection; pneumonia, upper respiratory tract infection, decompensated heart failure/ cardiogenic pulmonary edema,

HIV/AIDS-related pneumonia and comorbid conditions such as anemia, acidosis, diabetes mellitus, kidney disease/ renal failure, ischemic heart disease, HIV infection, liver disease, and other malignancy apart from lung cancer tends to worsen the patient's RD (4–7).

Previously identified in high-income countries risk factors for poor outcomes in patients with respiratory distress include comorbidities (such as asthma/COPD, heart failure), immunosuppression (such as HIV infection, malignancy), poor adherence to medications, inadequate/ inappropriate initial treatment and late presentation to the hospital (5,8).

Respiratory Distress in the Emergency Department

The ED plays a critical role in quickly assessing the patient with respiratory distress through history and physical examination including vital signs (BP, RR. SPO2, Temp and PR), bedside tests (ABG, RBG, chemistry, troponin-I, ultrasound, urine dipstick, urea, and ECG). Patients will receive interventions based on the combination of these bedside findings to come up with differential diagnosis. This differential diagnosis is used to guide immediate therapy to stabilize the patient before admission without having all the confirmatory test results (2,5,10).

Diagnostic imaging for the patients who are critically ill with respiratory symptoms includes chest X-ray, ultrasound, and CT scan of the chest. Bedside ultrasound can be performed by the emergency physician. It is more sensitive than chest x-ray in detecting abnormalities, using CT scan as a gold standard in detecting the underlying pathology (11).

Depending on the preliminary diagnosis, treatment commonly provided to adult patients with respiratory distress may include oxygen therapy, antibiotics, diuretics, nitrates, bronchodilators, antihypertensives (beta-blockers, calcium channel blockers, and angiotensin-converting enzyme inhibitors/ angiotensin receptor blockers), steroids and anticoagulants. Oxygen therapy provided will depend on the severity of respiratory distress and the level of consciousness. Those requiring mechanical support will be placed on CPAP/BiPAP (non-invasive mechanical ventilation) or be intubated and placed on positive pressure ventilation.

In developed countries, in-hospital mortality is 7-10% among adults with respiratory distress. The rate increases in the elderly (>65 years) population to 16% because respiratory distress in this population is missed at the emergency department (20%) or offered inappropriate

treatment of the underlying comorbidities such as heart failure, renal failure, and COPD inadvertently they are discovered when they are in respiratory failure (8). In low-resource settings, the in-hospital mortality was 40-60% of those who are hospitalized with the highest mortality being in patients with acute respiratory distress syndrome-ARDS (8,13,14,18).

In low-income countries, most of the studies on respiratory distress have been done in the pediatric population and trauma patients. The documented information available for the adult patients with respiratory distress; the mortality is quite high ranging from 30-60% reported in Rwanda, Ghana, Nigeria, and Uganda (7,12–14). The length of stay ranges from 3- 35 days, with fewer days for acute conditions such as asthma and the longest stay in patients with malignancy and COPD.

A study done on patterns of respiratory disease morbidity and mortality in a Southern-eastern Nigeria tertiary hospital demonstrated that predictors of unfavorable outcomes include age, hospital stay, gender, smoking, HIV, Tuberculosis, and lung malignancy. In which HIV infection was found to increase the mortality by 5 times in comparison with the HIV negative population(7).

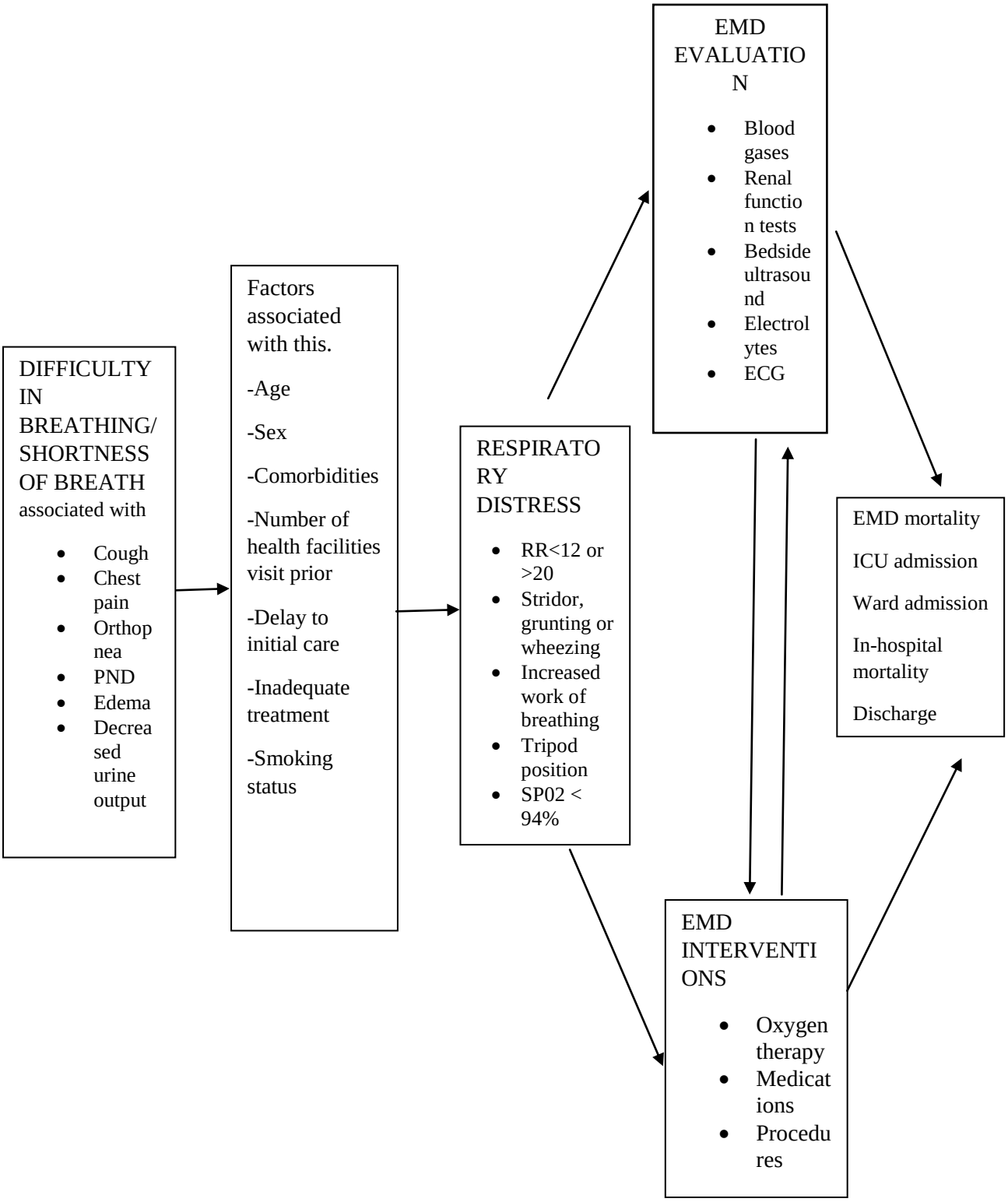
Since there is a scarcity of data in our set up despite the significant mortality shown in the high resource setting through this study on clinical profile and outcome will help set the baseline information on where we are currently management wise and what more needs to be done for this patient population.

1.2 Problem Statement

Respiratory Distress is among the life-threatening presentations of patients at the ED that may progress to respiratory failure and death if not effectively managed (5). The global mortality from respiratory disease is 20%. The estimated in-hospital mortality is of up to 60% depending on the cause for the respiratory distress(13,14,18). In high-income countries, the transfer of these types of patients from home to hospital or between hospitals is rapid through the well trained BLS and ACLS provider who can take the patient to the appropriate care facility. This has ensured a better outcome for the patients that have respiratory distress (3). The patients with respiratory distress in developing countries face difficulties attending the nearby health facilities because of a lack of transportation and when they arrive, oxygen therapy equipment and other resources and medications may not be available. Patients may have multiple hospital visits before reaching tertiary hospital due to the referral system in place, making them arrive with severe symptoms(15). Patients with respiratory distress require quick appropriate assessment, special tests, and procedures (such as nebulization, oxygenation, intubation, pericardiocentesis/ paracentesis/ thoracostomy, etc.) that require proper techniques and skills, which are mostly available at ED in tertiary hospitals. In Tanzania, there was no documentation on whether current management was adequate or if more efforts need to be done in the ED and hospital in general to ensure a better outcome of the patients.

1.3 Conceptual Framework

The patient's age, sex, cause, comorbidities, multiple health visits, inappropriate initial care, and low level of education are amongst the factors that increase the chance of worsening of difficulty in breathing to respiratory distress. When the patient arrives at the EMD the patient receives medical evaluation and interventions are initiated and then monitored for the response. After arrival to emergency department recognition of respiratory distress and particularly predictors of deterioration and mortality, will lead to life-saving interventions depending on the available resources. This will result in different outcomes including, cardiac arrest, death, the need for ICU admission, discharge, admission to the ward, and length of hospital stay (LOS).


DIFFICULTY IN BREATHING/ SHORTNESS OF BREATH associated with
Cough
Chest pain
Orthopnea
PND
Edema
Decreased urine output
Factors associated with this.
-Age
-Sex
-Comorbidities
-Number of health facilities visit prior
-Delay to initial care
-Inadequate treatment
-Smoking status
RESPIRATORY DISTRESS
RR<12 or >20
Stridor, grunting or wheezing
Increased work of breathing
Tripod position
SP02 < 94%
EMD EVALUATION
Blood gases
Renal function tests
Bedside ultrasound
Electrolytes
ECG
EMD INTERVENTIONS
Oxygen therapy
Medications
Procedures
EMD mortality
ICU admission
Ward admission
In-hospital mortality
Discharge

1.4 Rationale of the study

In Tanzania, the opening of a public EMD with an advanced capacity has provided the opportunity for diagnosis, early resuscitation, stabilization, and appropriate disposition of patients. Studying the presentation and outcomes of patients treated in the EMD with respiratory distress will help us know what the common characteristics in different groups of adult patients with respiratory distress may have that can contribute to their length of stay or mortality. Knowing these can allow us to identify patients earlier who will need aggressive treatment. Besides, understanding whether if there was an effect of multiple visits to the lower level hospitals or oxygenation during transport effect can identify system problems that need to be addressed to improve the outcome of the patients.

Knowing types of diseases, the investigations and treatments needed would help determine what resources are necessary for the EMD and in the hospital in general. Assessing the outcomes of patients will contribute to the improvement of our patient care in general and the findings shall be used to formulate guidelines and protocols with provided evidence.

1.5 Research Question

What is the clinical profile and outcomes of adult patients with respiratory distress presenting to the Emergency Department of Muhimbili National Hospital?

1.6 Objectives

1.6.1 Broad Objective

To determine the clinical profile and outcome of adult patients with Non-Traumatic Respiratory distress presenting at the Emergency Department of Muhimbili national hospital from September 2019 to January 2020.

1.6.2 Specific Objectives

1. To determine the proportion of adult patients with Respiratory distress presenting at the Emergency Department of Muhimbili national hospital from September 2019 to January 2020.
2. To describe the demographics and clinical characteristics of adult patients with Respiratory distress presenting at the Emergency Department of Muhimbili national hospital from September 2019 to January 2020.
3. To describe the management strategies of adult patients with Respiratory distress presenting at the Emergency Department of Muhimbili national hospital from September 2019 to January 2020.
4. To describe the disposition and in-hospital mortality rate of adult patients with Respiratory distress presenting at the Emergency Department of Muhimbili national hospital from September 2019 to January 2020.
5. To determine factors associated with in-hospital mortality among adult patients with Respiratory distress presenting at the Emergency Department of Muhimbili national hospital from September 2019 to January 2020.

1.7 Literature review

Presentation of Respiratory Distress

Respiratory distress is defined as a symptom of shortness of breath with an increased respiratory rate (25 br/min) and low saturation (<94% in RA). It is caused by several conditions, including decompensated heart failure, pneumonia, COPD, pulmonary embolism, and asthma (8).

Assessment of the work of breathing (WOB) in a patient is crucial to identify severe respiratory distress that requires immediate attention these include; use of accessory muscles to breathe, difficulty speaking in between breaths, inability to lie flat, diaphoresis and restlessness/ agitation.

Alarming signs include confusion, marked cyanosis (as a new finding), dyspnea while speaking, and insufficient respiratory effort or respiratory exhaustion and measurement of the vital signs (heart rate, blood pressure, oxygen saturation of the blood) contributes to timely decision-making about what to do next, in particular, whether the patient acutely needs to be treated in an intensive care unit or to receive invasive assisted ventilation (15).

A study done at the University Hospital of Pennsylvania on characteristics and outcomes on adults presenting with chest pain in the emergency department reported that the condition was associated with shortness of breath (46%), diaphoresis (16 %), awareness of heartbeat (14%). Another study on community prevalence of respiratory symptoms in rural Malawi 3554 (22.5%) reported having experienced chronic cough(55.3%), shortness of breath, or wheeze, either as individual symptoms or in some combination(44.7%) (17,18)

The burden of Respiratory Distress

The global estimated mortality from respiratory diseases is 20.0% (3). It is estimated that globally 12% of patients seen by emergency medical rescue teams have dyspnea, and half of them need to be hospitalized; those who are hospitalized have in-hospital mortality of 10% to 60% depending on the cause for the respiratory distress with the highest mortality being in patients with acute respiratory distress syndrome-ARDS (13,14,18).

It was observed that the EMD presentation of respiratory distress not associated with trauma is a common presentation that leads to admission and in-hospital mortality of 10% in the USA and 14% in Canada (16,19,20).

In Africa, most studies of respiratory distress have been done in the pediatric population, especially neonates and infants. Respiratory failure is a common presentation in African emergency centers and intensive care units for all age groups (12). The common respiratory symptoms included cough (55.3%), wheeze, and/or shortness of breath (44.7%) in the African population (20).

In low-income countries, there is minimal data on adult respiratory distress. A study done in an ICU in Uganda found a mortality rate of 40.1%, with sepsis, head injury, acute lung injury and HIV/AIDS were the most common admission diagnoses. It was observed that Acute respiratory distress syndrome/acute lung injury occurred for 41.8% of the population of the patients admitted in the ICU (13).

In low-income countries, a study in Southern Nigeria on the pattern of respiratory morbidity and mortality showed that 7% of the patients smoked cigarettes. Commonest respiratory conditions were tuberculosis (66.8%), and pneumonia (24.9%). The commonest comorbidity was HIV infection (39.7%). Tuberculosis/HIV co-infection rate was 50.7%(7).

Risk factors of Respiratory Distress

The risk factors for respiratory distress in adults that lead to emergency department visits included comorbidities such as asthma/COPD, heart failure, infection, poor medication adherence, and low social-economic status were reported in a study done in Greece. Similar findings were reported in Ghana, with an additional risk factor of the inappropriate or inadequate treatment regimen to the patient by the outpatient provider. (6, 12).

Management of RD

The management of patients with respiratory distress is based on the severity of the presentation of the patient at the ED starting with the assessment and correction of their airway, breathing, circulation and disability (A, B, C, D) by administering oxygen, nebulization (if appropriate), invasive (if the patient has altered mental status) or non- invasive

ventilation (if the patient is cooperative). Patient improvement is monitored by using pulse oximetry at the bedside.

ABG analysis, chest x-ray, and bedside ultrasound are often used to determine the severity of illness and the possible cause. Abnormal findings are common in patients with respiratory distress. Other investigations depending on the clinical findings and suspicion of the clinician include if suspecting of immunosuppression HIV test, for diabetes mellitus RBG, for heart failure ECG, ECHO, creatinine kinase, and Troponin I, for renal insufficiency electrolytes, creatinine, and urea, for liver failure aspartate aminotransferase, alanine aminotransferase, and bilirubin levels, for anemia hematocrit, hemoglobin, and complete blood count, for chronic lung diseases spirometry, and chest CT scan. The drugs commonly prescribed include adrenaline, corticosteroids, fluids, bronchodilators, antibiotics, furosemide, and antihypertensives (26,27).

In a study done in 46 EDs in Asian- Pacific region it was found thatregarding investigations the vast majority of patients with acute dyspnea had a chest x-ray (86.1%), serum electrolytes (78.9%) and white cell count (77.8%) however the analyses of natriuretic peptides (8.3%) and d-dimer (3.5%) were uncommon and CT pulmonary angiography (3.3%) was used uncommonly while lung ultrasonography was rare (0.6%)(28).

Predictors of outcome of Respiratory Distress

Pre-hospital characteristics associated with admission for respiratory distress were age, male sex, and abnormal physiology (greater respiratory rate and heart rate, lower systolic blood pressure (SBP), and low oxygen saturation. (13, 14).

Vital signs taken at triage can help to predict an outcome. A study in a high-income country analyzed the association between the main components of the triage system and two endpoints.; ICU admission and in-hospital mortality Multivariate logistic regression analysis, including the vital signs, age, gender, time, complaints, and final diagnosis demonstrated that abnormal RR and SpO2 were strongly associated with the adverse outcome especially impaired GCS, RR, and SpO2 (2).

In elderly patients (65years and above) respiratory distress is a common presentation that can be missed at the ED in this population of patients; inappropriate initial treatment in the emergency room has been associated with increased mortality in elderly patients. In the study done in urban settings in Paris, on elderly patients, a missed diagnosis of respiratory distress in the ED was noted in 101 (20%) patients. The accuracy of the diagnosis of the emergency physician ranged from 0.76 for cardiogenic pulmonary edema to 0.96 for asthma. An inappropriate treatment occurred in 162 (32%) patients and led to a higher mortality (25% versus 11%; $p < 0.001$). In a multivariate analysis, inappropriate initial treatment (odds ratio 2.83, $p < 0.002$), hypercapnia > 45 mmHg (odds ratio 2.79, $p < 0.004$), clearance of creatinine < 50 ml minute^{-1} (odds ratio 2.37, $p < 0.013$), elevated NT-pro-B-type natriuretic peptide or B-type natriuretic peptide (odds ratio 2.06, $p < 0.046$), and clinical signs of acute ventilatory failure (odds ratio 1.98, $p < 0.047$) were predictive of death. Besides age, sex, previous quality of life, respiratory rate, initial severity of hypoxemia, and admission to ICU were not significantly associated with mortality. (8,24).

The predictors of mortality in acute respiratory distress included hypercapnia (abnormal blood gases), signs of respiratory failure (the respiratory rate at least 25 /minute, an arterial partial pressure of oxygen (PaO_2) of 70 mmHg or less, a peripheral oxygen saturation (SpO_2) of 93% or less while breathing room air, and arterial partial pressure of CO_2 ($PaCO_2$) of 45 mmHg or more with an arterial pH of 7.35 or less) and elevated creatinine levels (8). Systolic blood pressure and cardiovascular hormone levels are higher in patients with hypercapnia than those with normocapnia and hypoxemia (22).

A study was done in India to determine the etiology and risk factors for the development of acute respiratory distress syndrome (ARDS). The study enrolled 50 patients and observed for the outcome of interest, laboratory markers, managements, and length of stay in the ICU. They also tried to find if there is an association between clinical and laboratory parameters and outcome in patients with ARDS. In this study, the variables for respiratory distress in adults that determine their outcome and recommended to be used to evaluate in-hospital mortality include age, sex, initial respiratory rate, initial pulse rate, treatment, and final diagnosis. The mortality in their study was 62% which is comparable to figures reported in the literature, a

significant increase in the mortality among patients who were prescribed inotropic support when compared to those who were not ($P< 0.001$) and CRP and procalcitonin did not show a statistically significant correlation with mortality. Hence concluded that a longer duration of the study with a larger sample size may be required to consolidate findings. (24).

A study was done in India on Dyspnea, Eosinopenia, Consolidation, Acidemia and Atrial Fibrillation Score and BAP-65 Score, Tools for Prediction of Mortality in Acute Exacerbations of COPD confirmed that elevated urea level as part of these mortality predictors a high BAP-65 score was sensitive for the need for mechanical ventilation and increased risk for mortality amongst patients admitted in the ED due to acute exacerbation(25).

Early warning scores can be used to monitor patients regarding the severity of illness and the need for interventions. They were originally designed for inpatient use but have been applied to emergency care. In a study in North East Wales general hospital on early warning score, modified from the early warning score for medical admissions, found that patients who scored 5 or more in the emergency department had an increased risk of death(OR 5.4, 95% CI 2.8-10.7), ICU admission (OR, 10.9, 95%CI 2.2-55.6) and HDU admission (OR 3.3, 95% CI 1.2-92). Modified early warning score (MEWS) can be applied easily and can help identify patients at risk for deterioration who require increased levels of care in the intensive care unit or high dependence unit(29).

Apart from that, a study conducted in Nigeria established that the mortality rate from respiratory failure due to community-acquired pneumonia was higher in patients aged 65 and above (58.8%) and the patients with HIV positive (31.6%) in comparison with HIV negative patients (10.1%) (19). Another study done in Nigeria reported that HIV infection was the single most important predictor of an adverse outcome (OR 5.1, 95% CI 2.05–12.7). Concluded that infective conditions make up a large percentage of respiratory diseases in low-income countries with HIV infection constituting a significant risk factor for a poor disease outcome (7).

Delay of care for patients with Respiratory Distress

A qualitative study done in Uganda on provider perceptions of barriers to oxygen therapy for pediatric patients in three government-funded eastern Ugandan hospitals found that the main barriers included poor electricity supplies, frequent concentrator malfunctions, low staffing levels, and lack of training. At other centers, these barriers appeared compounded by lack of oxygen cylinders, lack of oxygen concentrators, lack of delivery equipment, and no access to pulse oximetry. This shows a picture for the east African countries dispensary and some of the district hospitals that lead to poor provision for oxygen therapy to the patients during transfer to a tertiary facility (15).

A cross-sectional study done in an ED of a tertiary hospital in Brazil found 28.7% of adults were motivated by respiratory symptoms. Younger patients had a shorter duration of illness before arriving for care (< 6 days) and those with a longer duration of their illness (21days or greater) had a lower level of education. The length of ED stay was found to be 0.5-1 days while the length of hospital stay 0.5-3 days. The greater the duration of onset of illness was found to correlate with a greater need for admission(p value< 0.0001), a longer length of stay(p value< 0.0001), and higher mortality.(p value=0.028) (23).

CHAPTER TWO

2.0 METHODOLOGY

2.1 Study Design

This was a prospective observational study of adult patients with non-traumatic respiratory distress presenting to the MNH EMD from September 2019 to January 2020.

2.2 Study Area

Muhimbili National Hospital (MNH) is the National Referral Hospital and University Teaching Hospital in Tanzania. It is a 1,500-bed facility, admitting 1,000 to 1,200 inpatients per week with Intensive care unit (ICU) 50 beds capacity with 9 ventilators each in the medical ICU and surgical ICU. The Emergency Department (ED) is the first and largest in Tanzania and has been open since 2010; it is a full capacity Emergency Medicine Department having emergency physicians available in the department for 24-hours every day including weekends to serve critically ill patients, conduct research in emergency medicine, as well as train emergency care providers for the country. EMD has a main unit with triage, treatment and resuscitation areas, Mass Casualty area, and an Emergency Operating Theater.

The resuscitation area comprises of 4 rooms with one dedicated to pediatric patients and the other 3 for patients >14 years. Although the rooms can hold multiple patients, each room is equipped to accommodate 2 patients requiring oxygen support through in-line oxygen via nasal prongs/ nasal cannula or non-rebreather oxygen mask or nebulization mask, also there are small tanks and oxygen concentrator may be used as well if more than 2 people require oxygen within the same resuscitation room. There is one resuscitation room with a ventilator that is used to provide noninvasive positive pressure ventilation (CPAP/ BiPAP) or invasive positive pressure ventilation for the patients that cannot achieve oxygenation with the initial oxygen therapy. During a busy shift, these rooms can be occupied with 4-6 adult patients where they receive resuscitation (medications, procedures, and oxygen therapy) and diagnostic workups before being disposed to the appropriate ward, Intensive Care Unit, or High

Dependence Unit. The health information system (Wellsoft) at the department allows electronic charting of patient information and ordering of the investigation.

When a patient with difficulty in breathing arrives at the emergency department they are triaged. The triage nurse is responsible for taking chief complaints, demographics, and vital signs. If determined the patient is unstable, they are triaged emergency and taken to resuscitation area where they are kept on a cardiac monitor and are seen immediately for resuscitation. This involves diagnostic bedside and laboratory investigations, being given medications, procedures, and different modalities of oxygenation or ventilation depending on the need of the patient and how they respond to the interventions. Then they are disposed to intensive care unit if they require ventilatory support or are on inotropes, to high dependent unit for those on infusion pump medication or oxygen therapy but unstable and to the ward for those on oxygen therapy with stable vital signs and those without oxygen therapy.

The bedside investigations are interpreted by the primary physicians and are used to guide the appropriate treatment for the patient. This includes Blood gas analysis, electrolytes level, HIV test, MRDT, urea, and creatinine. For the bedside ultrasound, the primary physician will be the one to use it as an extension to the physical examination of the patient to guide decisions on the intervention for the patient. The chest X-ray and CT scans are interpreted by the radiology department and the results are posted into the health information system of the hospital.

2.3 Target Population

All patients 18 years and above with non-traumatic respiratory distress who present at the ED in public Hospitals in Tanzania.

2.4 Accessible Population

All 18 years and above patients who presented with respiratory distress at the ED in Muhimbili National hospital during the 5 months of the study (September 2019-January 2020)

2.5 Study Population

All patients 18 years and above who presented with respiratory distress at the Muhimbili National Hospital ED and triaged to adult resuscitation area during the 5 months of the study and when the research assistant was available at the department for recruitment. The principal investigator or research assistant was available 4 days of the week on alternate days and alternate clinical shifts between 0800hrs to 2000hrs or 2000hrs to 0800hrs.

2.6 Sampling Design

We consecutively enrolled adult patients presenting at the ED in MNH who met the inclusion criteria during the time the research assistant or the main investigator was available and patient or next of kin provided consent to be in the study.

2.7 Subjects

Any patient aged 18 years and above with any sign of respiratory distress or respiratory failure as defined by ACLS was included in the study(1). Adult patients with a history of trauma or CPR before arrival to the EMD were excluded.

Respiratory distress was defined by one or all of the following clinical features in a patient with difficulty in breathing; tachypnoea or bradypnea, increased respiratory effort(e.g. retractions, nasal flaring), inadequate respiratory effort(e.g. hypoventilation or bradypnea), abnormal airway sounds(e.g. stridor, grunting, wheezing), tachycardia or bradycardia, pale/ cool skin (including diaphoresis), changes in levels of consciousness/ agitation and use of abdominal muscles to assist breathing(1). The gold standard to check for the inadequate effort is ABG but being in a resource-limited set up this may not be available all the time; thus, pulse oximetry on room air was checked in all patients.

All doctors and nurses at the beginning of the shift were informed to notify the researcher or research assistant if there is a patient with respiratory distress; additionally, the research assistant looked at the electronic tracking board for chief complaints related to respiratory distress (such as difficulty in breathing, shortness of breath or cough) and then asked the primary physician about the presence of signs of respiratory distress to determine if the patient

was eligible for the study. The patient was enrolled in the study if the aged 18 and above that had anyone sign of respiratory distress and if the patient or the proxy gave consent.

2.7.1 Inclusion Criteria (1)

18 years and above patients presenting with Respiratory Distress at the ED in MNH triaged to level 3 (Resuscitation room) during the time the research assistant was available for enrolment with any of the following

1. Tachypnea/ Bradypnea- respiratory rate >20 breath/minute/ <12.
2. Airway sounds – stridor, wheezing, grunting.
3. Increase in respiratory effort/ use of Accessory muscles- use of abdominal muscles, suprasternal/ intercostal retractions, restlessness/agitation, diaphoresis, speaking in phrases, tachycardia.
4. Tripod body positioning/ inability to lie flat due to respiratory distress.
5. SPO2 <94% on room air.

2.7.2 Exclusion Criteria

1. Patients with a history of trauma before the onset of symptoms as they are recorded in the trauma registry
2. Arrived in ED while in cardiac arrest or CPR is going on
3. No informed consent.

2.8 Data sources and variables

The treating physician and the patient's proxy were used as sources of data. Data were recorded at the time of enrolment by a research assistant who asked the physician for this data or looked at patient electronic records for data available at the time of the ED visit.

Demographics, clinical presentation (main complaints, comorbidities, duration of illness, vital signs, Modified Early warning score, etc) the diagnostic workup done, treatment given, admitting diagnosis, duration of stay, type of disposition, arrests and death of the patient while at EMD will be recorded by a research assistant while a patient is at EMD.

Outcomes of patients after the ED visit were collected while the patient was in the hospital and included death, duration of hospital stay, and discharge diagnosis. All the information was recorded in a special case report form. The primary outcome was the risk of mortality. Secondary outcomes were hospital mortality, EMD mortality, duration of stay, in-hospital mortality, and the need for major surgical intervention in the emergency medicine department.

2.8.1 Predictor Variables

- Demographics (age, gender)
- Presenting complaints including associated symptoms and duration
- Physical findings
- Previous medical history (risk factors) at presentation and comorbidities
- Social history such as smoking, alcohol intake, drug adherence, economic status
- Number of health facilities visited prior to arrival
- EMD primary clinical impression
- Final discharge/hospital diagnosis
- Treatment provided

2.8.2 Outcome Variable

- The primary outcome is the risk factors for mortality
- The secondary outcome is mortality; ED mortality, 24-hour mortality, length of hospital stay of the patient, and in-hospital mortality.

2.9 Sample Size

The sample size calculation was based on risk factors for mortality estimates among patients with Acute Respiratory Distress and Respiratory failure in low-income countries.

In the study done in Nigeria by Ilyasu G. et al on Epidemiology and Clinical Outcome of Community-Acquired pneumonia, the mortality rate in patients aged 65 and above was found to be 58.8% due to developing respiratory failure and the patients aged below 65 to be 41.2%.

Taking to account that life expectancy is lower in African countries, the proportion of the elderly is 30%. Thus, it was used in the sample calculation using two population proportion in which the patients with age 18-64 years were expected to be 70% and those with age 65 and above were expected to be 30%

Using the Sample Size Required per Group When Using the Chi-Squared Statistic or Z Test to Compare Proportions of Dichotomous Variables

From the following formula:

The general formula for calculating the total sample size (N) required for a study using the z statistic, where P1 and P2 are defined above, is as follows

Let q1 =proportion of subjects in group 1= 0.3

q2 =proportion of subjects in group 2= 0.7

P1= 0.40

P2 = 0.60

α (two-tailed) = 0.050

β= 0.2,

N =total number of subjects

P =q1P1 +q2P2

Then $N = [z\alpha\sqrt{\{P(1-P)(1/q1 +1/q2)\}}+z\beta\sqrt{\{P1(1-P1)(1/q1)+P2(1-P2)(1/q2)\}}]^2/(P1 -P2)^2$

=230

Continuity correction (added to N group 0)= CC=1/(q1*{IP1-P0})= 17

N = 253

Thus, minimum sample for each age group with continuity correction. Thus, we needed to enrol a minimum of 76 patients above the age of 65 years and 177 patients aged 18-64 years old.

Hence 253 was the minimum number of Adult patients with Respiratory distress that present at the EMD triaged to Adult resuscitation area that needed to be enrolled to predict the in-hospital mortality of Adult patients with Respiratory Distress (RD) presented at ED. In which there were estimated to be 76 patients aged 65 years above and 177 patients aged 18-64 years at a minimum to determine the predictors of the outcome of the patients in this study.

2.10 Patient recruitment and data collection

The principal investigator or research assistant screened the patients through scanning the resuscitation rooms or the tracking board on Wellsoft to find the adult patients (18 years and above) with no recent trauma who reported having difficulty in breathing or shortness of breath or any other complaints related to respiratory distress. They were approached for possible recruitment. To screen for eligibility the research assistant would look at the patient respiratory rate, vital signs, or ask the primary physician attending the patient for the presence of any sign of respiratory distress that was in the inclusion criteria such as the abnormal airway or breath sounds and use of accessory muscles.

The patient was enrolled by a research assistant into the study if they had one or more criteria of respiratory distress and they or a family member signed informed consent. A handwritten structured case report was used to document patient demographics, clinical presentation, management, ED diagnosis, disposition plan, and outcomes. Patient with respiratory distress upon arrival to the resuscitation room \ was immediately checked their oxygen saturation on room air and if < 94% kept on oxygen using nasal prongs, non-rebreather masks, non-invasive positive pressure ventilation or invasive positive pressure ventilation and we recorded the modality that helped them maintain appropriate oxygenation (saturation above 94% on pulse oximetry) and ventilation (improvement of mental status or reduced their initial work of breathing). Each participant's Modified early warning score (MEWS) was calculated after the visit using relevant data collected prospectively. This was transferred to an online data Capture Software (REDCap version 7.2.2, Vanderbilt, Nashville, TN, USA) weekly overseen by the principal researcher to maintain the quality and accuracy of the data entered.

Then patients were admitted to the ICU, high dependency unit ward, or the cardiac institute. After admission, the patient's outcome was tracked checking on their discharge dates from the discharge record book in some of the wards and by looking through their discharge summary on medical files at the medical record office in the hospital or their electronic files in the health information system after getting the appropriate permit from the hospital or mobile phone calls.

2.11 Statistical methods and data analysis

Data from REDCap was exported to Microsoft Excel in which data cleansing was done by placing the correct values, crosschecking the information in the electronic data sheet with the electronic patient file to add any missing information. This comprehensive data set was then exported to Statistical Package for Social Science (SPSS version 25.0 IBM Ltd, Carolina, USA) for analysis. The median and interquartile range was calculated for length of stay in the EMD, length of stay in the hospital, length of stay in the referring facility, and MEWS. Categorical variables are expressed as number and percentage. Univariate associations between categorical variables and outcomes were computed using the risk ratio to quantify the strength of the association and multivariate regression analysis was completed on variables with p-value ≤ 0.20 in the univariate analysis to identify factors independently associated with mortality. Statistical significance was set at p-value < 0.05. The proportion of patients with respiratory distress was obtained by dividing the number of adult patients meeting the inclusion criteria of RD by the total number of adult patients attending the EMD during the period of the study when the research assistant was available.

2.12 Ethical Clearance

This study was conducted after approval from the MUHAS Institution Review Board (IRB) and permission from MNH. Verbal consent was requested from the patient or patient's proxy. Data collection was undertaken after the patient was able to speak or the patient's proxy consented to participate. The structured questionnaires built into REDCap were identified by serial numbers and the patient's medical record number, but the patient's name was not included. The use of medical record number was required for tracking patient information related to the study in case a need should arise to revisit the medical record of a certain patient for missing information or correctness. The completed questionnaires were not shared with anyone. In this study, no intervention or invasive procedures were performed on patients beyond usual care.

CHAPTER THREE

3.0 RESULTS

3.1 The proportion of adult patients with Respiratory distress presenting at the Emergency Department of Muhimbili national hospital

During the study period, 12,184 adult patients arrived during the time the research assistant was available in the department. Of which 742 patients (16.8%) had difficulty breathing triaged to resuscitation. Among patients with difficulty in breathing, 172 patients (23.1%) were not in respiratory distress and 158 patients (21.2%) had a history of recent trauma and were excluded (Figure1). Thus, the Proportion of adult patients with Non-Trauma Respiratory Distress was (412/12,184× 100) = 3.4%

Of the 412(3.4%) patients that met the criteria for respiratory distress, 345 were enrolled. 30 patients went into cardiac arrest prior to enrollment and 37 did not give consent to be enrolled in the study. (Figure 1)

Of the 345 patients enrolled into the study 5(1.4%) were discharged from the ED, 15 died in the ED(4.3%) and 292 (84.6%) were admitted to the hospital Of these, 28(9.6%) were admitted to the Intensive care unit/ high dependence unit(ICU/HDU), 112(38.3%) were admitted to the cardiac institute and 152(52.1%) were admitted to the general wards. 312 patients were followed up for the outcome of interest; 33 patients could not be located in the wards due to early deaths and subsequently, admission information was not found in the electronic system and their files were not available at the hospital medical record office. (Figure 1)

Of the patients admitted 126 patients died (43.2%); 22 (17.5%) died in the ICU/HDU, 30(23.8%) died in the cardiac institute and 74 (58.7%) died in the ward while 166 patients survived until discharge (56.8%). (Figure 1)

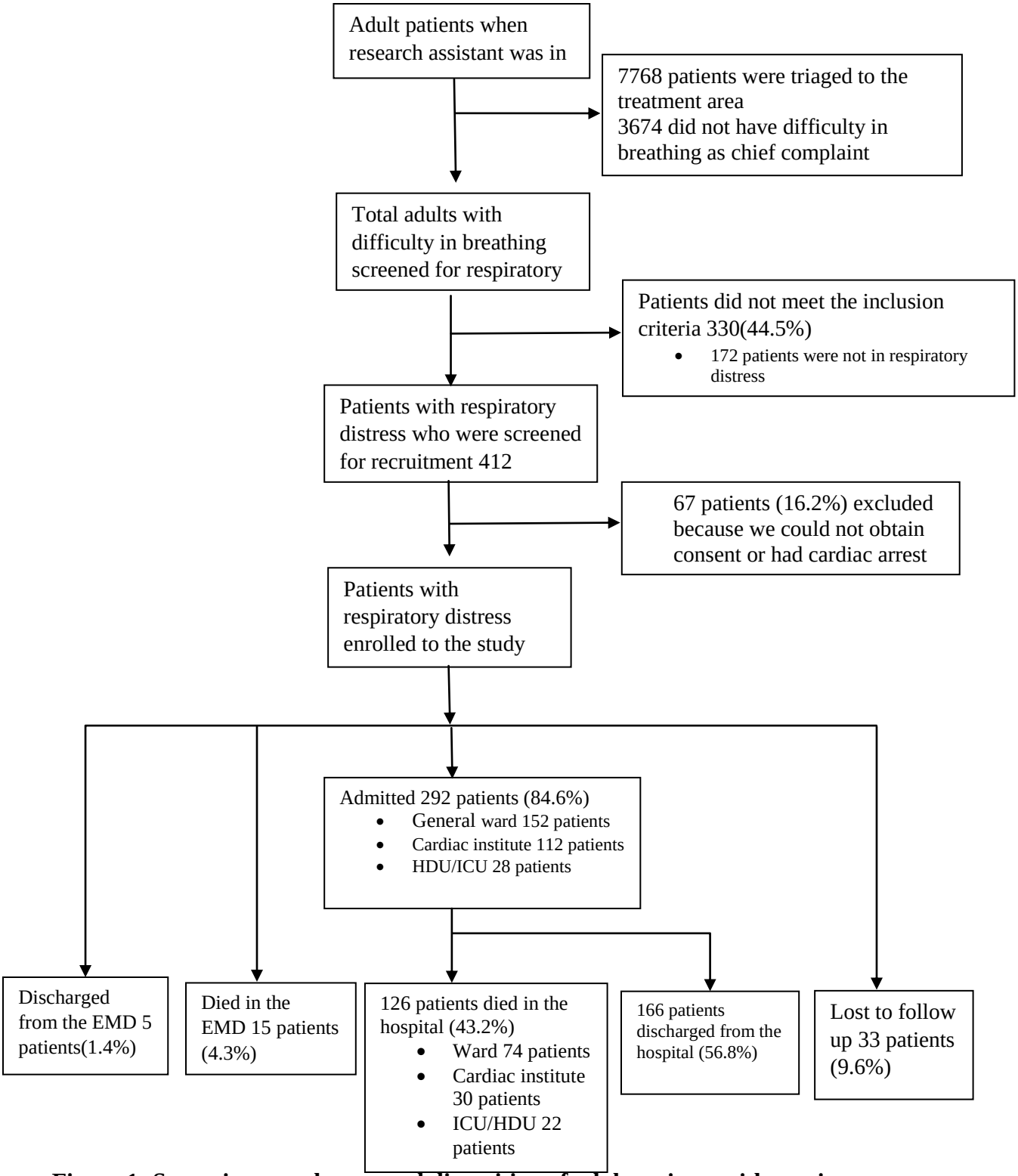


Figure 1: Screening, enrolment, and disposition of adult patients with respiratory distress presented to the Emergency department at MNH.

3.2 Clinical characteristics of adult patients with respiratory distress that presented to the Emergency Department at Muhimbili National Hospital

3.2.1 Demographic characteristics

The age distribution was 18 to 97 years with a median age of 54 years (interquartile range of 38 to 66 years). Of these 70.7% were the age between 18-64 years age group, 55.1% were men. (Table 1)

The level of education completed most frequently reported by the participants was primary school education (69.6%). The most common reported co-morbidity was a cardiovascular disease at 63.2%. (Table1). The patients that reported alcohol use were 82 (23.8%) and smoking were 59 (17.1%). (Table 1)

Most participants (80.3%) reported the onset of illness was less than 7 days from their arrival at MNH-EMD and 51.6 % of the participants visited at least one other health facility before arrival to the emergency department (Table1). These patients frequently reported that the onset of the illness was less than 7 days (80.6%).

Of the participants in the study, 39.4% were referred from other health facilities in the country. These patients reported a median of 48 hours at the referring facilities ranging from 1 hour to 2688 hours (1hour to 112 days) with an interquartile range of 24 to 72 hours (1-3 days) and the rest of the patients (60.6%.) were self-referred. Overall, the patients included in the study that were referred to the department on oxygen therapy during transport due to their difficulty in breathing were 98 patients (28.4%). (Table1)

Table 22: Characteristics of the patients with non-traumatic respiratory distress that presented at the Emergency Department Muhimbili National Hospital

Demographic	Total (N= 345)	Percentage (%)
Age		
18-64 years	**244**	**70.7**
65 years and above	101	29.3
Median (IQR) was 54 years {(IQR 38-66 years)}		
Male	**190**	**55.1**
Comorbidities		
Cardiovascular disease	218	63.2
Respiratory disease	41	11.9
Infectious disease	27	7.8
Renal disease	36	10.4
Malignancy	33	9.6
Others; Diabetes, autoimmune	23	6.7
Neurological disease	6	1.7
Risk factors		
Smoking	**59**	**17.1**
Occasional alcohol intake	48	13.9
Excessive alcohol intake	34	9.9
Drug abuse	5	1.5
Education level		
No education	34	9.9
Primary school	**240**	**69.6**
Secondary school	59	17.1
University/ college	12	3.5
Mode of arrival		
Self-referral	**209**	**60.6**
Referral	139	39.4
Length of stay in referring hospital (Median) was 48 hours {(IQR 24-72 hours)}		
Previous visit to health care facility	178	51.6
Time of symptom onset		
< 7days	278	80.6
>7 days	67	19.4
Oxygen given during transport	98	28.4

3.2.2 Clinical presentation

In the study population, the most frequent abnormal vital sign was tachypnoea 323 patients (93.6%), tachycardia 178 patients (51.6%). 120 patients (34.8%) had pulse oximetry oxygen saturation <94%. Bradycardia was seen in 8 patients (2.3%) and bradypnea in 2 patients (0.6%). (Table 2)

Apart from the difficulty in breathing, cough 109 patients (31.6%) and diaphoresis11 patients (3.2%) were the most and the least frequent presenting complaints, respectively. The modified early warning sign score for the enrolled participants ranged from 1 to 12, the median score was 4 (interquartile range 1 to 7) of which the median score for those who died within the first 24 hours was 5. (Table 2)

Table 2: Clinical presentation of the patients with non-traumatic respiratory distress who presented at the Emergency Department Muhimbili National Hospital

	Overall N=345	
Variable	**number of patients**	**Percentage (%)**
Vital signs		
Tachypnoea (>20breath/min)	323	93.6
Tachycardia(>100beats/min)	178	51.6
Low oxygen saturation (<94%)	120	34.8
Systolic BP*< 100mmHg	40	11.6
Systolic BP* >180mmHg	34	9.8
Bradycardia (<60 beats/min)	8	2.3
Bradypnea (<12 breath/min)	2	0.6
Modified early warning score median was 4 (IQR 1-7) ***		
Chief complaints		
Difficulty in breathing	345	100
Cough	109	31.6
Chest pain	101	29.3
Lower limb swelling	100	29.0
Orthopnoea	81	23.5
PND**	59	17.1
Abdominal distention	47	13.6
Chest tightness	26	7.5
Decreased urine output	24	7.0
Diaphoresis	11	3.2

***BP blood pressure, **PND Paroxysmal nocturnal dyspnoea,**

***** the median score for those who died in the first 24 hours was 5 (IQR 4-7)**

3.3 Common investigations done for patients with respiratory distress that presented to the Emergency Department at Muhimbili National Hospital

At the EMD blood sampling, bedside ultrasound, chest X-ray, or CT scan varied according to the discretion of the physician that was taking care of the patient. Among those who had blood gasses drawn, 52.8% were abnormal, with acidemia being the more frequent finding (37.2%). Metabolic acidosis (33.9%) was more common than respiratory acidosis(11.1%) (Table 3).

Among those who had electrolytes tested, the most frequent sodium abnormality was hyponatremia (65.1%). Hypernatremia/elevated sodium level was the least frequent sodium level observed (3.1%). The potassium level abnormality frequently observed was hypokalemia/low potassium level (23.6%) (Table 3).

Among patients whose renal function tests were done at the EMD, 89.7% had elevated creatinine level and 52.3% had elevated urea level. Other bedside tests included HIV and Malaria rapid diagnostic test-MRDT of which positive results were 33.3% and 18.1% respectively (Table 3).

The imaging tests frequently done ; bedside ultrasound 281 patients(81.4%), ECG 161 patients (46.7%) and chest x-ray 110 patients(31.9%) of which abnormal findings reported were bedside point of care ultrasound (96.1%), ECG(82.4%), and chest x-ray(86.4%). CT scan chest was the least frequently ordered imaging investigation at the EMD ordered for 30 patients; among these, 26.7% had an abnormal finding. (Table 3)

Table 3: Common Investigations of the patients with non-traumatic respiratory distress that presented at the Emergency Department Muhimbili National Hospital

Variable	Proportion	Percentage (%)
Laboratory tests		
Creatinine elevated(>110µmol/l) (N=184)	165	89.7
Urea elevated (>7.1 mmol/l) (N=184)	98	52.3
Blood gas abnormal (N=180)	95	52.8
Low pH level (<7.35) (N=180)	67	37.2
Metabolic acidosis(N=180)	61	33.9
Respiratory acidosis(N=180)	38	21.1
Low Potassium (<3.5mmol/l) (N=195)	46	23.6
Elevated potassium(>5.5mmol/l) (N=195)	30	15.4
Low Sodium(<135mmol/l) (N=195)	127	65.1
Elevated sodium(>145mmol/l) (N=195)	6	3.1
MRDT positive(N=22)	4	18.1
HIV positive(N=9)	3	33.3
Imaging tests		
Bedside ultrasound abnormal (N=281)	270	96.1
ECG abnormal (N=161)	133	82.6
Chest X-ray abnormal (N=110)	95	86.4
CT scan chest abnormal (N=30)	8	26.7

3.4 Intervention provided for patients with respiratory distress that presented to the Emergency Department at Muhimbili National Hospital

In the ED, oxygen therapy was provided to 64.6% of the patients in which the most frequently used modality was oxygen through non-rebreather mask 170 patients (49.3%) and the least frequent modality used was non-invasive positive pressure ventilation 15 patients (4.3%). Endotracheal intubation was done for 29 patients (8.4%). (Table 4).

Medications were provided to 73.6% of the patients admitted to the ED. Fluid replacement was provided to 175 patients (50.7%); of these intravenous fluid bolus 170 and 5 patients received blood products (packed red blood cells) in the ED. A total of 144 patients (41.7%) received antibiotics for suspected infection. Diuretics were administered to 85 patients (24.6%), Nitrates intravenous or puff was administered to 48 patients (13.9%) and 27 patients (7.8%) received inotropes (dobutamine, dopamine, norepinephrine, and epinephrine) (Table 4).

Bronchodilators were administered to 56 patients (16.2%) of which salbutamol was administered to 40 patients and ipratropium was administered to 16 patients. Steroids (dexamethasone or hydrocortisone) were administered to 12 patients (3.5%). Nebulized medications were administered to 48 patients (13.9%). (Table 4)

During the ED visit, 106(30.7%) patients had one or more bedside procedures. Of the participants 30 (8.7%) patients had pleural tapping/ thoracostomy, 13 patients (3.8%) had paracentesis, and 3patients (0.9%) had pericardiocentesis done at the ED to relieve the respiratory distress. CPR and synchronized cardioversion were provided to 15 patients (4.3%) and 2 patients (0.6%) respectively. (Table 4)

Table 4: Interventions provided at bedside of the patients with non-traumatic respiratory distress that presented at the Emergency Department Muhimbili National Hospital

	Overall N=345	**Percentage (%)**
Intervention		
Oxygen therapy given at EMD	223	64.6
Oxygen via NRBM	170	49.3
Invasive positive pressure ventilation	29	8.4
Oxygen via Nasal prong	18	5.2
Non-invasive positive pressure ventilation	15	4.3
Medication given at EMD	254	73.6
Intravenous fluids and blood products transfusion	175	50.7
Antibiotics	144	41.7
Diuretics	85	24.6
Bronchodilators; Salbutamol, Ipratropium	56	16.2
Nitrates	48	13.9
Inotropes	27	7.8
Steroids	12	3.5
Procedures done at EMD	106	30.7
Nebulization	48	13.9
Pleural tap/ thoracostomy	30	8.7
Endotracheal intubation	29	8.4
CPR	15	4.3
Ascitic tap/ paracentesis	13	3.8
Pericardiocentesis	3	0.9
Cardioversion	2	0.6

3.5 Final hospital/discharge diagnosis of adult patients with non-traumatic respiratory distress

The top three final hospital diagnosis for the patients with respiratory distress was acute heart failure and other cardiovascular diseases (such as arrhythmias, cardiogenic shock, structural heart diseases) in 134 patients (42.9%), sepsis syndromes and other infections (such as severe

pneumonia, severe malaria, meningitis) 34 patients (10.9%) and malignancy/neoplasm diseases (advanced breast, esophageal, laryngeal, colon, liver, mesentery and ovaria cancers) 30 patients (9.6%) (Figure 2). Other moderately frequent diagnoses were severe anemia in failure 18 patients (5.8%), renal failure 17 patients (5.4%), pulmonary edema/ ARDS 16 patients (5.1%), stroke with pneumonia 14 patients (4.5%). Less frequent final diagnosis were pulmonary embolism 8 patients (2.6%), HIV with complications/ AIDS-defining illness 8 patients (2.6%), Others; opiate toxicity, status epilepticus and autoimmune such as SLE, myasthenia gravis, ALS in 8 patients (2.6%), chronic lung diseases such as asthma, COPD and interstitial lung diseases in 7 patients(2.1%) and Tuberculosis and related complications in 7 patients (2.1%). The least frequent final diagnosis was liver failure 6 patients (1.9%) and surgical abdomen due to peritonitis or intestinal obstruction (5 patients, 1.6%). (Figure 2).

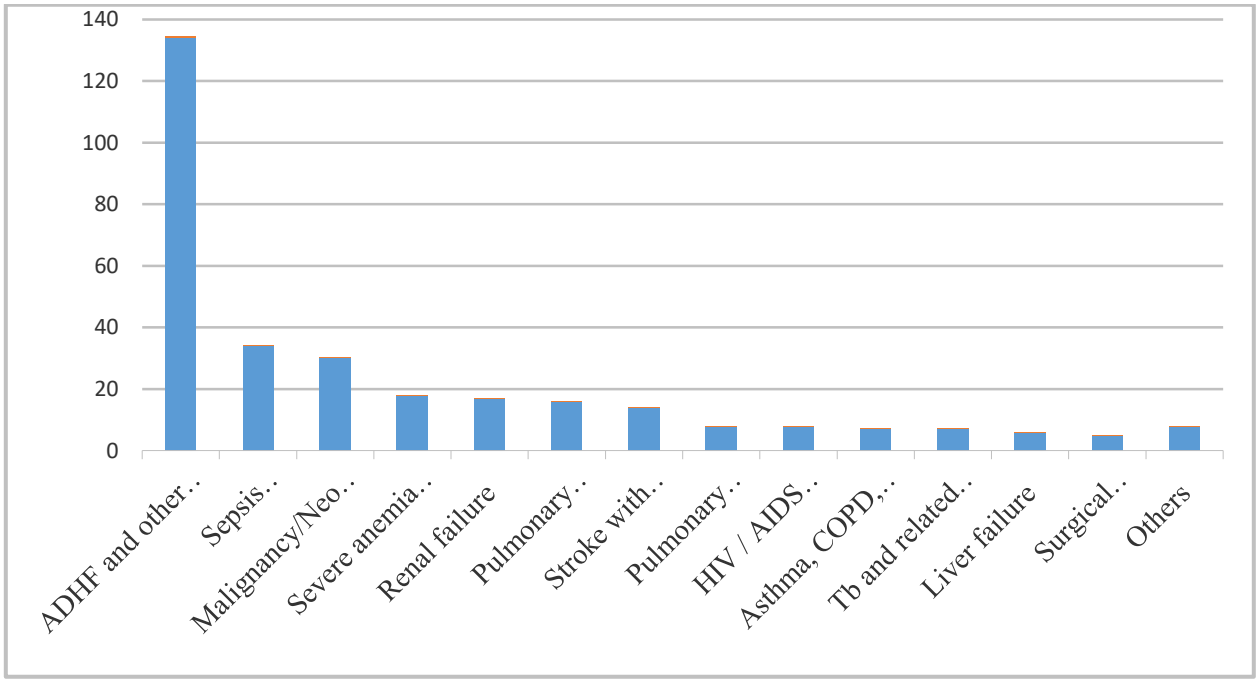


Figure 2: Final diagnosis/discharge diagnosis of adult patients with non-traumatic respiratory distress that presented at the Emergency Department Muhimbili National Hospital

3.6 Disposition from the Emergency department and outcome of adult with non-traumatic respiratory distress

Of the 345 adult patients with respiratory distress seen in the ED, we were able to follow up 312 patients to the outcome of interest; 292 (84.6%) were hospitalized for inpatient care, while fifteen patients (4.4%) died in the ED; five patients (1.4%) were discharged home. The median length of stay in the ED was 4 hours (interquartile range (IQR): 3-6 hours) and the median length of stay in hospital was 6 days (Interquartile range (IQR): 2–10) days. The overall mortality (ED plus inpatient) was 141 (40.9%) of which, 38 (26.9%) of deaths occurred within 24 h of ED presentation and the in-hospital mortality was 126 (43.2%)(Table 5).

Table 5: Patient6 hours) and the median le outcome of the patients with non-traumatic respiratory distress that presented at the Emergency Department Muhimbili National Hospital

Disposition	**Proportion**	**Percentage (%)**
Admitted	292/345	84.6
Died in EMD	15/345	4.4
Discharged from EMD	5/345	1.4
Lost to follow up	33/345	9.6
Death within 24-hr of EMD presentation*	38/345	11.0
In-hospital mortality**	126/292	43.2
Overall mortality	141/345	40.9
	Median	**IQR**
Median length of stay in the ED	4 hours	3-6 hours
Median length of stay in hospital	6 days	2-10 days

***This includes ED and in-patient deaths,**

****This includes only patients' death those who were admitted(N=292)**

3.7 Factors associated with in-hospital mortality among adult patients with Respiratory distress presenting at the Emergency Department of Muhimbili national hospital

3.7.1 Univariate analysis

Of patients aged 65 years and above, the mortality rate was 48.9% and the mortality rate for those 18 to 64 years was 43.7% (p =0.4038) The mortality rate in Male patients was 49.4%% vs. 39.9 % in females (p=0.0922). Cardiovascular diseases were reported mortality of 38.1% in comparison with the other comorbidity. Diabetes mellitus was reported mortality of 60% (p=0.1147) that was not statistically significant while Malignancy/ neoplasm was reported in 9.0% had a mortality of 71% (p=0.0001) that was found to be statistically significant (Table 6).

Physical examination factors found to be statistically associated with increased risk for mortality included the presence of abnormal airway sounds (87.5%), GCS 7 and below(78.6%), GCS 8-12(68.0%), and MEWS 5 or more(62.9%); p=<0.0001, p=0.0001, p=0.0003 and p=<0.0001 (Table 6).

Among the abnormal laboratory findings, none were found to be statistically significant in this analysis for example elevated creatinine level (p=0.4234), urea level (p=0.0723). However, patients with hypernatremia/ elevated sodium level, those who had cardioversion, or had ascitic tapping done or had pericardiocentesis done all died; p=<0.0001, p=<0.0001, p=0007 and p=<0.0001 respectively. HIV had a mortality of 75% that was not statistically significant; p=0.2065 (Table 6).

Amongst interventions provided to the patients in the study; oxygen treatment at the ED (0.0050), previous health facility visit (p=0.0013), CPR done (<0.0001), and intubation was done (<0.0001) were associated with mortality. (Table 6).

Table 6: Univariate Analysis of Factors Associated with Mortality adult patients with non-traumatic respiratory distress that presented at the Emergency Department Muhimbili National Hospital

	Died N=141	**Survived N=171**	**RR(95%CI)**	**P-Value**
Age				
18-64 years	97(43.7%)	125(56.3%)	0.89(0.69-1.16)	
65 years and above	44(48.9%)	46(51.1%)	1.11(0.86-1.45)	0.3947
Sex				
Male	86(49.4%)	88(50.6%)	1.24(0.96-1.60)	0.0970
Female	55(39.9%)	83(60.1%)	0.80(0.62-1.04)	
Comorbidity				
Cardiovascular diseases	75(38.1%)	122(61.9%)	0.66(0.52-0.84)	**0.0007**
Respiratory disease	15(41.7%)	21(58.3%)	0.91(0.60-1.37)	0.6603
Infectious disease	13(50.0%)	13(50.0%)	1.12(0.74-1.67)	0.5921
Neurological disease	2(33.3%)	4(66. %)	0.66(0.21-2.06)	0.4771
Malignancy/Neoplasm	22(71.0%)	9(29.0%)	1.67(1.29-2.18)	**0.0001**
Renal disease	16(47.1%)	18(52.9%)	1.04(0.71-1.53)	0.8141
Diabetes mellitus	12(60.0%)	8(40.0%)	1.36(0.93-1.99)	0.1147
Oxygen therapy during transport				
Yes	29(35.4%)	53(64.6%)	0.73(0.53-1.00)	**0.0384**
No	112(48.7%)	118(51.8%)	1.38(1.00-1.90)	
Previous health facility visit	85(54.5%)	71(45.5%)	1.51(1.17-1.96)	**0.0013**
Time of symptom onset				
<7 days	119(45.6%)	142(54.4%)	1.05(0.75-1.49)	0.7508
>7 days	22(43.1%)	29(56.9%)	0.94(0.67-1.33)	
Abnormal airway sounds				
Present	21(87.5%)	3(12.5%)	2.10(1.71-2.57)	**<0.0001**
Initial assessment				
Tachypnoea (>20breath/min)	130(44.7%)	161(55.3%)	0.85(0.56-1.31)	0.4654
Tachycardia(>100beats/min)	78(47.3%)	87(52.7%)	1.1(0.86-1.41)	0.4358
Low saturation (<94%)	54(48.6%)	57(51.4%)	1.12(0.88-1.44)	0.3560
Bradycardia (<60 beats/min)	5(62.5%)	3(37.5%)	1.4(0.81-2.42)	0.2344
Bradypnea (<12 breath/min)	2(100%)	0(0.0%)	2.2(1.97-2.52)	0.2424

GCS				
8-12	17(68.0%)	8(32.0%)	1.57(1.16-2.12)	**0.0003**
7 and below	11(78.6%)	3(21.4%)	1.80(1.33-2.43)	**0.0001**
Severity score				
MEWS Score 5 or more*	61(62.9%)	36(37.1%)	1.69(1.34-2.13)	**<0.0001**
Investigations				
Creatinine elevated (>110)	78(47.3%)	87(52.7%)	1.28(0.70-2.36)	0.4234
Low Potassium (<3.5)	25(54.3%)	21(45.7%)	1.06(0.77-1.44)	0.7270
Elevated potassium (>5.5)	15(51.7%)	14(48.3%)	0.99(0.67-1.45)	0.9602
Low Sodium (<135)	69(55.2%)	56(44.8%)	1.23(0.89-1.69)	0.2126
Urea elevated (>7.1 mmol)	52(53.1%)	46(46.9%)	1.34(0.97-1.85)	0.0723
Elevated sodium (>145)	5(100%)	0(0.0%)	1.98(1.71-2.28)	**<0.0001**
HIV status Positive	6(75.0%)	2(25.0%)	1.35(0.85-2.15)	0.2067
Intervention done				
Oxygen treatment at ED	113(50.7%)	110(49.3%)	1.61(1.15-2.25)	**0.0050**
CPR done	14(93.3%)	1(6.7%)	2.18(1.81-2.64)	**<0.0001**
Intubation done	25(86.2%)	4(13.8%)	2.10(1.72-2.57)	**<0.0001**
Pleural tapping done	13(43.3%)	17(56.7%)	0.95(0.62-1.46)	0.8321
Ascitic tapping done	10(76.9%)	3(23.1%)	1.75(1.27-2.43)	**0.0007**
Cardioversion done	2(100%)	0(0.0%)	2.23(1.97-2.52)	**<0.0001**
Pericardiocentesis done	3(100%)	0(0.0%)	2.23(1.98-2.53)	**<0.0001**

3.7.2 Multivariate analysis

Multivariate regression analysis model completed on variables with p-value ≤0.20 in the univariate analysis with and without the MEWS score of 5 or more and we found that malignancy as comorbidity, abnormal airway sounds on examination and elevated urea level. were independently associated with increased risk of mortality. Also modified early warning score of 5 or more were independently associated with increased risk for mortality (Table 7)

Table 7: Multivariate Regression Analysis of Factors Associated with Mortality adult patients with non-traumatic respiratory distress that presented at the Emergency Department Muhimbili National Hospital

	OR (95%CI)
Intubation done	0.86(0.14-5.22)
CPR done	3.27(0.84-12.69)
Previous health facility visit	1.17(0.52-2.65)
Diabetes comorbidity	1.51(0.38-5.89)
Malignancy comorbidity	**4.27(1.88-20.68)**
Cardiovascular comorbidity	0.44(0.19-1.11)
Abnormal airway sounds present	**6.16(1.11-34.08)**
Oxygen therapy on transport	0.33(0.09-1.24)
MEWS	**4.39(1.70-11.32)**
Sex	0.79(0.36-1.76)
Urea level	**3.77(1.58-9.00)**
Oxygen treatment in ED	0.82(0.31-2.19)
Low GCS	0.89(0.30-2.59)

CHAPTER FOUR

4.0 DISCUSSION

In our study respiratory distress was a frequent clinical presentation amongst adult patients at the emergency department with a multitude of final diagnoses, the most common being acute heart failure and other cardiovascular diseases, sepsis syndromes and other infections, and malignancy/neoplasm diseases. Of the participants 8.4% were intubated, more than thirty percent had severity score MEWS 5 and above, and needed ICU level of care (29) but less than ten percent were admitted in the ICU/HDU. Most of the patients were admitted (86.4%), the in-hospital mortality was high (43.2%) with 26.9% of deaths occurring within the first 24-hours from arrival to the emergency department of which their median MEWS score was 5.

The study population consisted mostly of young persons and male gender with more than one-third of the patients who were referred from other health facilities. The median length of stay at these facilities was reported to be 2 days. Thus, our system is not ideal for early recognition of patients with respiratory distress contrary to high resource countries where these patients are taken directly to the facility capable of taking care of patients with respiratory distress (19).

Less than thirty percent of the patients with respiratory distress that arrived at the emergency department were kept on oxygen during transport while upon arrival to the department more than sixty percent of the patients were placed on oxygen. This was because some of the patients came from home while others were brought from referring facility without provision for oxygenation due to lack of oxygen cylinders or oxygen delivery equipment at the referring hospital just as reflected by a study done by *Jonathan W.D. et al* on Health care provider perception of barriers to oxygen therapy in Uganda(15).

Most of the patients reported less than 7 days of duration of illness compared to those with more than 7 days duration of illness like other studies. In our study, we noted that respiratory distress is an unsettling condition for patients, next of kin, and referring hospital with quick deterioration if the patient is not treated promptly thus most of the patients came to ED less

than 7 days except for patients with chronic conditions or those referred from other regions of the country. A study done by *Kelly A. M. et al* and *Silva D.R. et al* reported the majority of the patients having less than 7 days of illness (27-28).

Initially, we expected that factors associated with mortality to be age, abnormal airway sounds, MEWS score 5 and above, elevated urea/ creatinine level, previous health facility visit, duration of illness, low GCS, not being given oxygen during transport, need for oxygen treatment at ED, need for procedures at the ED and comorbidities which were reported to be significant for increased risk of mortality amongst the patients with respiratory distress (2,7,8,10,17,26,28,29).

Participants aged 18 to 64 years old had fewer deaths compared to those aged 65 years and above while most of the participants were male with more deaths compared to females and both were not statistically significantly similar to other studies (2,7,8,10,28). The previous studies supporting age and gender as a risk factor because the proportion of the older population was small in comparison to the total population (8-12%) and there were more female participants in these studies hence coincidentally reported those findings. This shows us that neither age nor gender were as factors directly contributed to the high mortality.We believe that in our study those that are in the young age group arrive to ED quite sick as the old. The old people have good health and the young people also have multitude of illnesses that deter their outcome we see young people with strokes, end stage renal diseases and malignancy.

The comorbidity diseases amongst the patients in the study were cardiovascular disease(such as heart failure, hypertension, structural heart diseases), malignancy/ neoplasm diseases, neurological diseases, diabetes mellitus, respiratory disease, renal disease and infectious diseases (such as HIV, tuberculosis) similar to other studies(2,7,8,10,28). In our study malignancy/neoplasm disease commonest being breast cancer and esophageal cancer contributed to the high mortality of patients with RD due to arriving at late stages of the disease course. We believe it is because MNH is the main center countrywide where the cardiac institute is located for cardiovascular diseases and biopsies or confirmatory diagnostic

tests are done for neoplasm diseases before patients are initiated treatment at oncology unit or taken to the cancer institute (ORCI) for chemotherapy and/or radiotherapy. Surprisingly, the rate of testing for HIV was low even though our population has <55 years old and we may have missed some of the patients. This informs us that there is a need to encourage counseling and testing among adult patients with RD at our ED.

Smoking predisposes patients to malignancy/neoplasm diseases or chronic lung diseases. We found that there were patients that reported having a history of smoking (17%) slightly higher proportion compared to other studies. The studies done by *Umoh V.A. et al*, *Kelly A.M. et al*, and *Ilyasu G. et al* reported history of smoking 7-14.3% and mostly in males (7,19,26). This information for some of the patients was taken from a third party due to the severity of the illness of the patient and possibly we may have missed out on more patients with a history of smoking and also there were more male participants in our study.

The common presenting complaints among all patients with respiratory distress who also had other symptoms such as cough, chest pain, lower limb swelling, orthopnea, paroxysmal nocturnal dyspnea, decreased urine output and diaphoresis in our studies similar to studies done by *Ray P. et al* reported 50% had orthopnea and *Kelly A.M. et al* reported peripheral edema in 20.8% and *Banda H.T. et al* reported cough only in 55.3% and cough with dyspnea or wheezes in 44.7% in patients with respiratory symptoms(1,8,21,27,28). Emergency care providers can use these other complaints in making the diagnosis of the primary cause and treat to reverse the respiratory distress, for instance giving bronchodilator nebulization for patients with wheezes on examination.

A significant number of patients had tachycardia and tachypnea like other studies while a few patients had bradypnea, bradycardia, low GCS, and low oxygen saturation. In our study, 84.3% of patients were tachypneic and 32% had an oxygen saturation of less than 94%. Even though almost forty percent of patients had hypoxia less than ten percent ICU/HDU admissions were observed in comparison to a study done by *Riviello E.D. et al* whereby they reported less than one-third of patients had hypoxia and 12% were admitted to the ICU. *Barfod C. et al* reported 21.8% of tachypneic patients were admitted to the ICU admission.

The reported in-hospital mortality ranged from 24%-34% (1,2,14). There is a difference because our study setting is in a limited resource country also the limited number of ICU/HDU beds for the patients impedes the escalation of care for these patients and thus more efforts are needed for provisions for equipment, skilled personnel, and oxygenation/ventilatory support to cater for this population.

The severity of the illness of the patient was scored using the modified early warning signs in which among those that scored 5 and above were in twenty-eight percent and even less than ten percent were admitted to the intensive care unit (ICU) and the others were admitted to the ward due to lack of bed availability contrary to high resource setting. A study done by *Subbe C. P. et al* on validation of modified early warning signs (MEWS) score in medical admission reported that those that scored 5 or more were at 5.4 times increased odds of mortality similar to our study whereby it was found to be 4.3 times increased odds of mortality. Contrary to our study 30% of the patients with MEWS score 5 and above were admitted in the ICU because this study was done in high resource hospital (28,29).

In our study whereby few of the patients (28.4%) received oxygen therapy during transport reflected the reality of the area of our study, a limited resource whereby the patients were transported with vehicles without equipment or trained personnel. Conversely to a study done by *Prekker M.E et al* in Washington on epidemiology and outcome of respiratory distress of non-injured adults transported by EMS reported that higher proportion of patients received supplemental oxygen during transport and half of the patients requiring mechanical ventilation was intubated before arrival to the hospital (19). In Washington patients with respiratory distress were transported by BLS or ACL provider who were able to recognize and intervene before arrival to the ED. We believe that there is a need for appropriate oxygenation equipment and provisions for training for the health care workers responsible for patient transport.

Upon arrival to the department, the patients were evaluated using bedside investigations such as blood gas analysis and bedside chemistry of which elevated urea (>7.1mmol/l) was found to have increased risk of death among this study population similar to other studies(25). This

reflects that this can be used as an indicator of the need for aggressive treatment for patients arrive at the ED with RD and elevated urea levels. However, the investigations and bedside tests were done for a few of the patients depending on the primary physician discretion and the availability of the test in the department thus we missed out on information on over half of the patients enrolled in our study (2,5,8,10).

Interestingly the use of the bedside ultrasound was performed more frequently than a chest x-ray. The ultrasound for dyspnea was used to determine the possible causes for dyspnea such as pericardial effusion, pleural effusions, ascites, the size of the inferior vena cava and the heart contractility to guide the procedure and other intervention for the patient similar to high resource setting who use bedside ultrasound frequently as well while contrary to studies contrary to low resource setting where it was reported to be used less common (9,11,28). This was because this is a teaching hospital with regular training and encouragement for the primary physicians (residents and registrars) on the use of ultrasound. As an extension of physical examination together with history and bedside tests guide primary physician to determine appropriate interventions for these patients such as fluid resuscitation, pleural tapping/thoracostomy, paracentesis or pericardiocentesis depending on findings. Bedside ultrasound is a good tool to utilize as it is fast, low cost, and can be done with appropriate training.

Surprisingly, the medications given were similar to those given in high resource settings, reflecting the growing capacity of emergency medicine in our country similar to other studies done in high- resource settings (26,27).

Over three-quarters of the patients were admitted to the hospital after initial stabilization in the emergency department, this is a much higher admission rate than reported in developed countries(28). The in-hospital mortality was 43.2% with 26.9% of the deaths occurring within the first 24 hours of presentation to the emergency department. We received patients with severe symptoms that require aggressive resuscitation with continuity of care in HDU/ICU which we do not have, and this has led to a significant number of deaths.

The length of stay in the emergency department was 1-50 hours and the length of in-hospital stay ranged from 0-67 days, the prolonged was since the participants in this study presented with more severe respiratory symptoms that took longer to treat in the ED and hospital due to some presenting with multiple systems affected. For example, we found elevated creatinine levels even in patients who initially had no renal disease as comorbidity. We also had a relatively high proportion of patients with malignancy. A study in Brazil on adults presenting with respiratory symptoms found that length of ED stay was found to be 0.5-1 days while the length of hospital stay 0.5-3 days(24).

In our study apart from elevated urea level and malignancy as comorbidity; abnormal airway sounds on examination was associated with 6.1 higher odds of mortality in adult patients with respiratory distress while MEWS score 5 and above was independently associated with 4.4 times higher odds for mortality, similar to studies in other high resource and low resource setting studies (8,19,23,28). This reflected on the fact that when a patient with respiratory distress develops abnormal airway sounds meant the patency of the airway is compromised which means that they are failing to compensate. MEWS score contains the level of consciousness and vital signs of the patient and thus combines many of the individual findings that make someone extremely ill. This score does not include abnormal airway sounds partly why this still came out independently significant. Hence MEWS score 5 and above should prompt the ED health care provider to consider aggressive interventions and close monitoring in ICU/HDU. Because if escalation of care is not done promptly at any stage of disease course to support oxygenation or ventilation leads to adverse outcome(29).

4.1 Strength of study

The prospective cohort study allowed us to follow and establish factors associated with mortality and severity of the illness was calculated based on the patient presentation at the ED using modified early warning signs scale.

4.2 Limitations

This is a single centered study in a tertiary referral government hospital hence the generalizability of the study is limited thus the sample seen at this emergency department might be different than seen in the district hospitals and health centers. The patients who were unable to speak due to the severity of their presentation their information was taken from their next of kin which may not be as accurate as it was able to be extracted from the patient. This is a limited resource country-based study thus the results may not apply to high resource countries. The diagnostic imaging and laboratory investigations were performed to the discretion of the primary physician and their availability during the time of the study leading to underestimation or overestimation of the findings.

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

In this descriptive study on adult patients with respiratory distress presenting to the emergency departments in a tertiary referral hospital in Tanzania, we found that RD has a high in-hospital mortality of 43.2%. Abnormal airway sounds, malignancy as comorbidity and elevated urea level can be used as an ominous indicator in patients with respiratory distress. The MEWS score 5 and above was independently associated with increased mortality and future studies should be done to assess use in low-resource setting.

5.2 Recommendations

1. The 24-hour mortality may reflect on incoherence in continuation of care from ED to in-hospital admission, thus advocating for use of the MEWS score ≥ 5 and elevated urea level as criteria for care escalation for these patients may prove critical to mortality reduction.

2. More clinical research in this field to be done to optimize care for adult patients with respiratory distress from pre-hospital to in-hospital to ensure the appropriate continuity of care of patients with respiratory distress.

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APPENDICES

Appendix I: Consent Form (English Form)

Greetings, my name is Dr. Winnie Mdundo, a postgraduate student in Emergency Medicine, conducting research on Respiratory Distress. You may be eligible to take part in this research project. This form gives you important information about the study. It describes the purpose of the study, and the risks and possible benefits of participating in the study. Please take time to review this information carefully. If you have any queries, please do not hesitate to consult me. Once you understand the information in this form, please sign below if you agree to take part in the study.

Study Title: Clinical Profile and outcome of adult patients presenting with Respiratory Distress at the Emergency medicine department of Muhimbili National Hospital (**CPOARD**-study)

Researcher: Dr. Winnie Mdundo, MD, Department of Emergency Medicine Muhimbili University of Health and Allied Sciences.

Purpose of this study: Respiratory distress is a condition that affects many individuals in our population. It can lead to various health problems including mortality. Proper management of this problem will lead to better outcomes for the patients. This study is aimed at looking at what possible factors can help us predict the outcome and appropriate care of patients with Respiratory distress. With this information, we may be able to manage you and any other patient that may present with this disease to our department.

Who can take part in this study? This study is for all adults above the age of 18 years who are seen at the emergency department with Respiratory distress. Participation in this study is entirely voluntary. You may also leave this study at any time without any harm on you. You will not lose any benefits, nor will you be given improper treatment if you decide not to take part in this study.

What will happen in this study? When you agree to be part of this study, you will be asked a few questions about your demographic characteristics. We will also look at your blood investigation results and the management provided to you. All of this will be done to identify which factors can affect the outcome in patients with Respiratory distress. You will be given all the information regarding your results during this study. You will also receive the standard of care that is appropriate for you, as per the hospital policies.

Are there any risks of taking part in this study? There are no risks for you for participating in this study. The laboratory/Point-of-care investigations that will be done are the same routine ones that are done for all patients with Respiratory distress. You will not be given any experimental medication, nor will any additional test be done on you as part of the research.

Are there any benefits of taking part in this study? You may not receive any personal benefits from being in this study. However, any new information that will be learned in this study will be used to manage your condition better.

Are there any costs or fees for entering this study? There will be no additional costs to you or your family for being in this study. You will only pay for all the things that you would have paid for if you were not in the study.

Is there confidentiality in this research project? The information gained in this study about you will only be known to you and the researcher. No other person will be given open access to the information. If your information is needed in the future by another doctor for your treatment, it will be made available to him. The results of this study could be published in an article for other researchers to read but would not include any information that would let others know who you are.

Your signature below means you have read the above information understood it well and are voluntarily ready to participate in this study.

Signature of Participant **Date**

_____ _____

Thank you for agreeing to participate in the study. Please do not hesitate to contact me for any clarification should need to arise.

Contact Information:

Dr. Winnie Mdundo,

Principal Investigator.

Mobile No: 0786 675 882

Director of Research and Publications,

Research and Publication Committee,

Muhimbili University of Health and Allied Sciences,

P.O. Box 65001, Dar es Salaam.

Telephone Number: 2150302-6

Appendix II: Consent Form (Swahili Form)

Jina langu naitwa Dkt. Winnie Mdundo, mwanafunzi wa udaktari bingwa wa ugonjwa wa dharura. Nina fanya utafiti kuhusu Ugonjwa wa shida ya kupumua. Unaweza kuwa na haki ya kushiriki katika mradi huu utafiti. Hati hii inakupa habari muhimu kuhusu utafiti. Inaelezea madhumuni ya utafiti, hatari na faida ya kushiriki katika utafiti. Tafadhali chukua muda wa kupitia taarifa hii kwa makini. Kama una maswali yoyote, tafadhali usisite kuwasiliana na mimi. Baada ya kuelewa habari katika fomu hii, tafadhali saini hapa chini kama utakubali kushiriki katika utafiti.

Mada: Wasifu na matokeo ya wagonjwa waliolazwa kwasababu ya ugonjwa wa shida ya kupumua katika idara ya dharura ya hospitali ya Taifa Muhimbili.

Mtafiti: Dk. Winnie Mdundo, MD, Idara ya Tiba ya dharura, Chuo Kikuu cha Afya na Sayansi Muhimbili.

Lengo la utafiti huu: Ugonjwa wa shida ya kupumua ni hali ambayo huathiri watu wengi katika jamii yetu. Ugonjwa huu unaweza kusababisha matatizo mbalimbali pamoja na vifo. Matibabu sahihi ya tatizo hili itasababisha matokeo bora kwa wagonjwa. Lengo la utafiti huu ni kuangalia sababu ipi inaweza kutusaidia kutabiri matokeo na matibabu sahihi ya wagonjwa wanaolazwa na ugonjwa huu. Kwa utafiti huu, tunaweza kuwa na uwezo wa kutibu wewe na wagonjwa wengine ambao wana ugonjwa huu.

Nani anaweza kushiriki katika utafiti huu? Utafiti huu ni kwa ajili ya watu wazima wote juu ya umri wa miaka 18 ambao wamelazwa katika wodi ya Dharura kwa sababu ya ugonjwaa wa shida ya kupumua. Kushiriki katika utafiti huu ni hiari kabisa. Unaweza pia kuacha utafiti huu wakati wowote bila ya madhara yoyote kwako. Huwezi kupoteza faida yoyote, wala hautapewa matibabu yasiyofaa kama wewe huamua kutoshiriki au kuacha utafiti huu.

Nini kitatokea katika utafiti huu? Utaulizwa maswali kadhaa kuhusu tabia yako binafsi. Pia tutakuwa tunaangalia matokeo yako ya damu na matibabu utakayopewa. Wewe utapewa taarifa zote kuhusu matokeo yako wakati wa utafiti huu. Wewe pia utapata huduma sahihi kulingana na hali yako, kwa mujibu wa sera hospitali.

Je, kuna hatari yoyote kwa ajili ya kushiriki katika utafiti huu? Hakuna hatari kwako kwa kushiriki katika utafiti huu. Vipimo vya maabara ambavyo vitafanyika ni sawa na vipimo kwa wagonjwa wote wa ugonjwa ya shida ya kupumua. Hautapewa dawa yoyote ya majaribio, wala vipimo vyovyote vya ziada havitafanyika kwasababu ya kushiriki katika utafiti.

Je, kuna faida yoyote ya washiriki katika utafiti huu? Hutapata faida yoyote ya kibinafsi kutoka kuwa katika utafiti huu. Hata hivyo, taarifa yoyote mpya ambayo kitatokea katika utafiti huu kitatumika kutibu hali yako bora.

Je, kuna gharama yoyote au ada kwa ajili ya kushiriki katika utafiti huu? Hakutakuwa na gharama za ziada kwa wewe au familia yako kwa kuwa katika utafiti huu. Wewe utalipa kwa ajili ya huduma zote ambazo ungepewa usingekuwa katika utafiti.

Je, kuna usiri katika utafiti huu? Taarifa zitakazopatikana katika utafiti huu kuhusu wewe zitabaki na wewe na mtafiti. Hakuna mtu mwingine atapewa uwezo wa kujua taarifa hizo. Kama taarifa yako zitahitajika katika siku zijazo na daktari mwingine kwa ajili ya matibabu yako, zitatolewa kwake. Matokeo ya utafiti huu inaweza kuchapishwa katika makala kwa ajili ya watafiti wengine kusoma lakini taarifa itakuwa bila ya taarifa yoyote ambayo ingeweza kuruhusu wengine kujua wewe ni nani.

Saini yako chini ina maana umesoma habari hapo juu, huelewa vizuri na unashiriki katika utafiti huu kwa hiari.

Saini ya mshiriki **Tarehe**

_____ _____

Asante kwa kukubali kushiriki katika utafiti. Tafadhali usisite kuwasiliana na mimi kwa maswali yoyote.

Mawasiliano:

Dkt. Winnie Mdundo,

Mtafiti Mkuu.

Namba ya Simu: 0786 675 882.

Mkurungenzi wa Utafiti na Machapisho,

Kamati ya Utafiti na Machapsiho,

Chuo Kikuu Cha Sayansi na Tiba Cha Muhimbili,

S.L.P. 65001, Dar es Salaam.

Namba ya Simu: 2150302-6

Appendix III: Data Collection Form

The data will be collected from interviewing the patient or proxy after giving consent and through the electronic record in the patient's file as documented by the healthcare providers.

INCLUSION CRITERIA

Criteria	**Yes**	**No**
• Adult patient > 18 years • Features of respiratory distress; ➢ Look for increased work of breathing, tripoding, diaphoresis ➢ Count the RR>20 or < 12 ➢ SBP< 100 or >180 ➢ SPO2 <94% ➢ Ask the physician if the patient has abnormal airway sounds; wheezing, stridor or grunting		

EXCLUSION CRITERIA

Criteria	Yes	No
History of recent Trauma prior Arrived in cardiac arrest or ongoing CPR Informed consent		

WKM CPOARD IRB NO:

A: Demographic information:

MRN

EWS score ……

Patient initials

Date of attendance

Level of education

EDUCATION LEVEL	**YES**	**NO**
No education		
Primary school education		
Secondary school education		
University/ college education		

Age in years

Gender

male female

Address (district/ region)

Time of arrival at ED

Mode of arrival ……

Self-referral

Referral

Facility

Time spent at the facility

Hours

New admission Readmission

Number of health facilities visited prior arrival

Health care center	Yes	No	Time spent at the facility(days/ hours)
Dispensary			
District hospital/ Health center			
Regional hospital/ Private hospital			

Reason for referral

Date of onset of symptoms						

Oxygen given during transportation (ask the physician or nurse in the ED room)

Yes ☐ No ☐

B: Vital signs

						INITIAL
						FINAL

BP Pulse RR SPO2 Temp. GCS

C: Clinical characteristics

Chief complaints 1.

2.

3.

EMD diagnosis 1.

2.

3.

D: Comorbidities

☐ Respiratory disease specify……. Duration ……

☐ Cardiovascular disease specify……Duration……..

☐ Renal disease specify……Duration……

☐ Infectious diseases specify……Duration……

☐ Malignancy specify……Duration……..

☐ Neurological disorders specify……Duration……..

☐ Others specify……Duration……..

E:Risk factors

☐ Smoking history specify……/ …….pack years

☐ Alcohol intake specify……

☐ Drug abuse ☐ Opiates ☐ Others specify…….

F: Employment status

☐ Employed specify ……..

☐ Unemployed

☐ Self-employed specify…….

☐ Retired

G: Physical Examination

Primary Survey

	Normal	Abnormal	Not done	Remarks
AIRWAY				
BREATHING				
CIRCULATION				
DISABILITY				
EXPOSURE				

Secondary Survey

System	Normal	Abnormal	Not done	Findings
HEENT				
Respiratory				
Cardiovascular				
Gastrointestinal				
Genitourinary				
Musculoskeletal				
Neurological				
Other specify				

H: Laboratory investigation

TEST	NORMAL	ABNORMAL	NOT DONE	FINDINGS/VALUE
MRDT/BS				
HIV Test				
ABG				
Potassium				
Sodium				
Calcium				
Magnesium				
Chloride				
Urea				
Creatinine				
Urine dipstick/Urinalysis				
Blood culture				
FBP/CBC				
Other specify 1.				
2.				
3.				

I: Imaging investigations

INVESTIGATION	Area	Normal	Abnormal	Findings/value	Not Done
X-ray	1. 2. 3.				
CT scan	1. 2. 3.				
Ultrasound	1. 2. 3. 4.				
ECG					
Others specify 1. 2. 3.					

J: EMD treatment

YES	NO

Oxygen therapy

☐ O2 Nasal prongs ……L/min

☐ O2 Mask (NRBM) ……L/min

☐ Non invasive positive pressure ventilation

☐ Invasive positive pressure ventilation

Medications

Drug	Dose	Route
Diuretics		
Salbutamol		
Ipratropium		
Steroids		
Nitrates		
Fluids		

EMD procedure

	DONE	NOT DONE	TIMES/ DOSE/AMOUNT	REMARKS
Nebulization				
Pleural tap/ thoracostomy				
Ascitic tap/ peritonealcentesis				
Pericardialcentesis				
Intubation				
CPR				
Cardioversion				
Defibrillation				
Others specify 1. 2.				
3.				

K: Disposition

At EMD

☐ Alive on Disposition

☐ Died while in EMD specify Date

Time spent in the EMD …… hours

☐ Admitted to ☐ Ward ……

☐ ICU/HDU……

☐ Others …….

☐ Discharged home from EMD LOS at EMD……..hours/Days

Progress in the Ward

☐ Survived to discharge

Date of discharge

LOS inhospital ☐ days

☐ Died in ICU

							Time of death(24hr)		

Date of Death

☐ Died in the Ward

Date of Death

Final hospital diagnosis

1. ☐

2. ☐

Appendix IV: Modified Early Warning Score (26)

SCORE / **VITAL SIGNS**	**3**	**2**	**1**	**0**	**1**	**2**	**3**
Systolic Blood pressure (mmHg)	<70	71–80	81–100	101–199		≥200	
Heart rate (bpm)		<40	41–50	51–100	101–110	111–129	≥130
Respiratory rate (bpm)		<9		9–14	15–20	21–29	≥30
Temperature (°C)		<35		35–38.4		≥38.5	
AVPU score				Alert	Reacting to voice	Reacting to pain	Unresponsive

Appendix V: Approval of ethical clearance

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR OF POSTGRADUATE STUDIES

P.O. Box 65001
DAR ES SALAAM
TANZANIA
Web: www.muhas.ac.tz

Tel G/Line: +255-22-2150302/6 Ext. 1015
Direct Line: +255-22-2151378
Telefax: +255-22-2150465
E-mail: dpgs@muhas.ac.tz

Ref. No. DA.287/298/01A/

01 August, 2019

Dr. Winnie Mdundo
MMed. Emergency Medicine,
School of Medicine
MUHAS.

RE: APPROVAL OF ETHICAL CLEARANCE FOR A STUDY TITLED:" CLINICAL PROFILE AND OUTCOME OF ADULT PATIENTS PRESENTING TO THE EMERGENCY DEPARTMENT WITH RESPIRATORY DIASTRESS "

Reference is made to the above heading.

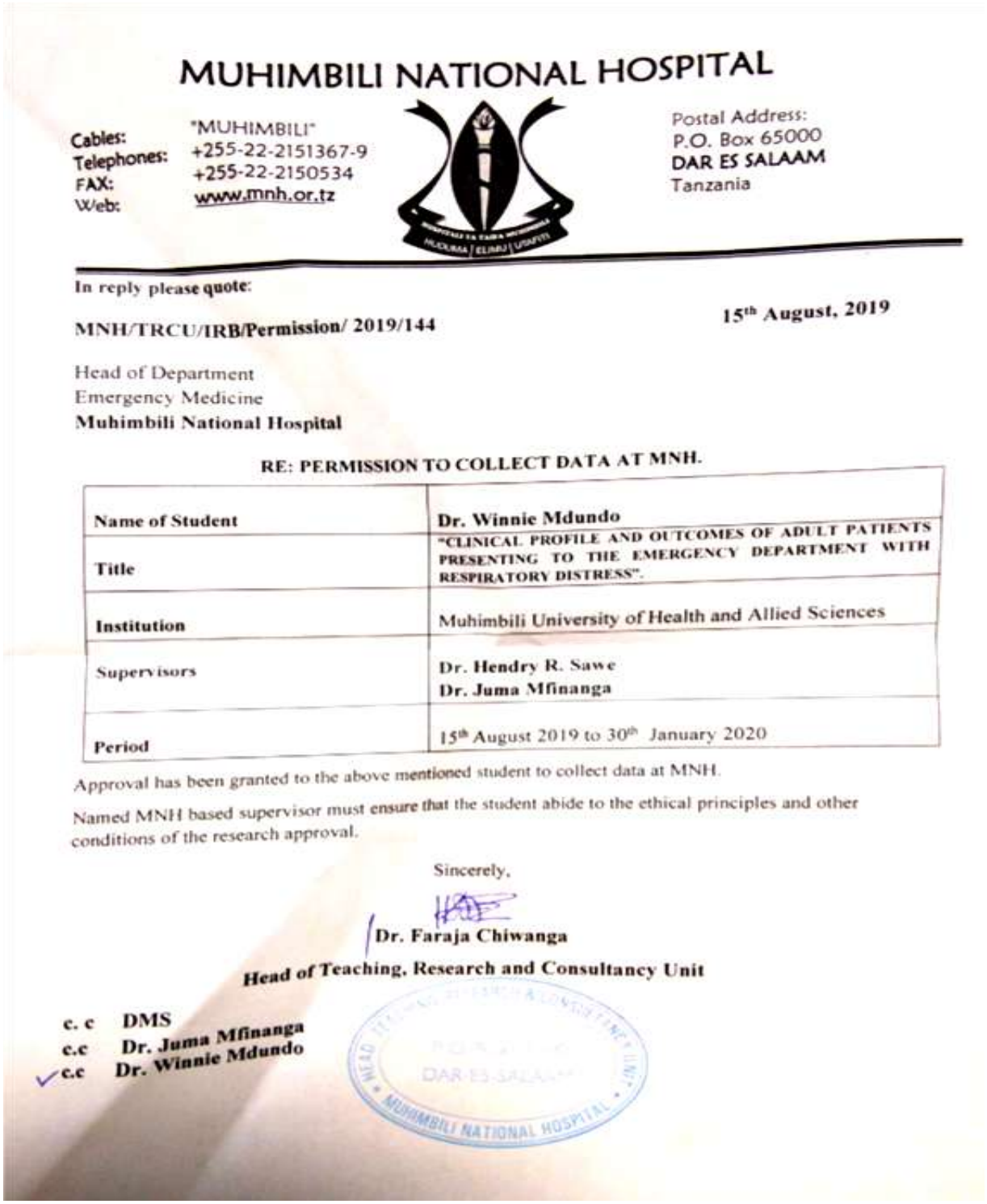
I am pleased to inform you that, the Chairman has, on behalf of the Senate, approved ethical clearance for the above-mentioned study. Hence you may proceed with the planned study.

The ethical clearance is valid for one year only, from **01st August, 2019 to 31st July 2020.** In case you do not complete data analysis and dissertation report writing by **31st July, 2020,** you will have to apply for renewal of ethical clearance prior to the expiry date.

Dr. Emmanuel Balandya
ACTING: DIRECTOR OF POSTGRADUATE STUDIES

cc: Director of Research and Publications
cc: Dean, School of Medicine, **MUHAS**

Appendix VI: Permission to collect data at MNH



MUHIMBILI NATIONAL HOSPITAL

Cables: "MUHIMBILI"
Telephones: +255-22-2151367-9
FAX: +255-22-2150534
Web: www.mnh.or.tz

Postal Address:
P.O. Box 65000
DAR ES SALAAM
Tanzania

In reply please quote:

MNH/TRCU/IRB/Permission/ 2019/144

15th August, 2019

Head of Department
Emergency Medicine
Muhimbili National Hospital

RE: PERMISSION TO COLLECT DATA AT MNH.

Name of Student	**Dr. Winnie Mdundo**
Title	**"CLINICAL PROFILE AND OUTCOMES OF ADULT PATIENTS PRESENTING TO THE EMERGENCY DEPARTMENT WITH RESPIRATORY DISTRESS".**
Institution	Muhimbili University of Health and Allied Sciences
Supervisors	**Dr. Hendry R. Sawe** **Dr. Juma Mfinanga**
Period	15th August 2019 to 30th January 2020

Approval has been granted to the above mentioned student to collect data at MNH.

Named MNH based supervisor must ensure that the student abide to the ethical principles and other conditions of the research approval.

Sincerely,

Dr. Faraja Chiwanga

Head of Teaching, Research and Consultancy Unit

c. c DMS
c.c Dr. Juma Mfinanga
c.c Dr. Winnie Mdundo