RESPONSE TO INITIAL THERAPY IN ACUTE ASTHMA AMONG PATIENTS ATTENDING KENYATTA NATIONAL HOSPITAL, EMERGENCY DEPARTMENTS

INVESTIGATOR:

LILIAN ATIENO OKOTH

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Declaration

I Lillian A. Okoth, Year II student pursuing Masters Degree in Nursing at the University of Nairobi do hereby declare that this thesis report is my original work and has not been presented in any university by any other person for the purpose of an award of a degree or examination, either in part or as a whole.

Lillian A.Okoth (Mscn II)

Signature...............................

Date.......................................

Supervisor's Approval

This dissertation has been supervised and approved by:

1. **Dr. Wakasiaka Sabina, PhD, MPH BScN, RN**
    Senior lecturer, School of Nursing Sciences,
    University of Nairobi

 Signature..

 Date..

2. **Mrs. Kirui Angeline MSc, BScN**
    Lecturer, School of Nursing Sciences,
    University of Nairobi.

Signature..

Date..

Dedication

This work is passionately dedicated to my family; my husband Kosida Kimuma, my dear children Danny, Minwa and Junior for their overwhelming support, prayers and encouragement from the beginning to completion of this academic process.

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First and foremost I thank the Almighty God for His favour, guidance and protection throughout this study period.

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Thank you and may God Bless you All

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ABBREVIATIONS & ACRONYMS

A & E   : Accident and Emergency

AHR   : Airway Hyper Responsiveness

ADE   : Adverse Drug Events

AEA   : Acute Exacerbation of Asthma

AOR   : Adjusted Odds Ratio

BMI   : Body Mass Index

B_2 : Beta 2

COPD   : Chronic Obstructive Pulmonary Disease

CVS   : Cardiovascular System

CCF   : Congestive Cardiac Failure

DPI   : Dry Powder Inhaler

DM   : Diabetes Mellitus

ED   : Emergency Department

ERC   : Ethical Review Committee

FEV1   : Forced Expiratory Volume in 1 second

HCP   : Healthcare Professionals / healthcare providers

HAM –A: Hamilton Anxiety Tool

ISAAC   : International Study of Asthma and Allergic Disease in Childhood

ICS   : Inhaled Corticosteroids

I L   : Interleukin

Ig E   : Immunoglobulin E

IUATLD: International Union against Tuberculosis and Lung Diseases

KNH   : Kenyatta National Hospital

KAPTLD: Kenya Association for the Prevention of Tuberculosis and Lung Diseases

LMIC   : Low and Middle Income Countries

MI   : Myocardial Infarction

MDI   : Metered Dose Inhaler

MOH   : Ministry of Health

NCD   : Non Communicable Disease

NAEPP   : National Asthma Education and Prevention Program

NSM   : Newman's System Theory

PEFR   : Peak Expiratory Flow Rate

PMDIs   : Pressurized Metered Dose Inhalers

SABA   : Short Acting Beta Adrenergics

UON   : University of Nairobi

WHO   : World Health Organization

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Operational Definitions of Variables

Asthma control: A state of stability, based on frequency of exacerbation of asthma symptoms and use of asthma rescue medication, limitation of activities, variability of lung functions measured by peak flow.

Adverse event: An unexpected outcome that results from an initial intervention or an event that results in unintended response or reaction by the patient.

Acute care setting: A branch of secondary health care where a patient receives active but short term treatment for episode of illness or an urgent medical condition such as asthma exacerbation

Acute Asthma Exacerbation: breathing related symptoms that necessitates visit to emergency department. Occasionally it maybe the initial presentation of asthma.

Co – intervention: An intended or purposeful "treatment" or therapeutic procedure or actions implemented by HCP alongside the primary intervention to move their condition towards desired outcome. For example; breathing exercises

FEV$_1$: Refers to the amount of air you can blow out in one second (measured by spirometry)

Initial therapy: Treatment administered in acute asthma exacerbation at emergency room or at first assessment with the aim of reversing acute airflow obstruction (usually short acting β2 and or with anticholinergics) delivered by inhalation through nebulizer or metered dose inhaler

Nebulization: A special technique of inhalation therapy using a device (nebulizer) to deliver inhaled medications and driven by gas, usually oxygen to relieve acute asthma symptoms

Primary intervention: An immediate course of treatment and best strategy for management of asthma exacerbation in the emergency setting

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PEFR: The fastest rate at which you can blow air out of your lungs, often used as a measure of response to therapy in acute asthma exacerbation (measured by peak flow meter)

Pulse oxymeter: A small sensor usually attached to a patient's finger or earlobe. The sensor uses light to estimate how much oxygen is in the blood. The test is painless and no needles are used. (< 90% indicate severe respiratory distress)

Spirometry – A test that measures how much air you breathe in and out and how fast you blow it out. This is measured in two ways; peak expiratory flow rate and / or forced expiratory volume in 1 second.

ABSTRACT

Background: Asthma is a chronic inflammatory disease of the airways. It is a globally significant Non Communicable Disease (NCD) affecting persons of all ages but whose prevalence varies widely from one region to another. Treatment of exacerbations involves use of drugs; relievers (bronchodilators) and controllers (anti inflammatory drugs). The preferred mode of administration for most asthma medications is through inhalation via metered dose inhalers (MDI), dry powder inhalers (DPI) and nebulizers.

Aim: To describe response to initial therapy in management of acute asthma among patients with exacerbations at the emergency setting (E.R) at Kenyatta national teaching and referral hospital.

Materials & Methods: Cross sectional descriptive study in which mixed methods of data collection was adopted. Target population consisted of patients with acute exacerbations of asthma visiting the emergency room and the chest clinic. Sampling was done by

purposive method and participants were evaluated by a clinician at the emergency or clinic visit.

Data was collected using structured questionnaires. Findings from physical examination, physiologic and vital parameters were recorded initially. This included height, weight, and assessment of respiratory symptoms, PEF and baseline vitals. This was repeated after every treatment cycle (30 – 60 minutes) until decision was made by clinician to review patient's management.

Informed consent was obtained from eligible participants after verbal introductions and assent from participants who were younger than eighteen years and no parent or guardian refused to give permission for the child to be interviewed. Approval was obtained from KNH/UON Ethics and Research Committee.

Data was analyzed using Statistical Packages for Social Sciences (IBM.20). Analysis was by descriptive statistics, determinants were first tested in univariate analysis and then bivariate analysis was done. A p-value [<0.05] was used to characterize statistically significant results.

Results: Majority of respondents were females (66, 74%), as compared to males. Mean age was 38.3 $\pm$10.83 years (range 16 – 57 yrs). Majority of the respondents (54, 60.7%) demonstrated poor response to initial therapy while only 19 (21.3%) of the subjects demonstrated adequate response. Of clinical characteristics, majority of respondents exhibited symptoms suggestive of asthma exacerbation; coughing in (65, 75%), wheezing in (70, 78.7%), chest tightness in (48, 53.9%) and shortness of breath in (75, 84.3%) of the subjects. More than half of respondents (56%) were reviewed in the E.R while the rest were seen in the chest clinic. The mean BMI for respondents was 26.64 and was found to be significantly associated with response (p =0.005). The mean PEF was 60.8% of predicted value and mean oxygen saturation at 92% (median 95, IQR 89.5 – 97.0) among the subjects at baseline evaluation.

The cumulative change in PEF and saturations was significant post therapy (p.000). Response was not significantly associated with demographic characteristics (p > .05), however there was less likelihood of adequate response among the younger patients < 20 years as compared to older age groups but was not found to be statistically significant (AOR = 0.006,CI 0.000 -1.423, P=.067). Likewise respondents without history of shortness of breath and chest tightness at presentation were 7.206 times and 4.477 times more likely to have adequate response as compared to those with history of the same, however no statistical association was observed between response and clinical characteristics (p value .025, .047).

Conclusion: Level of response to initial therapy in acute asthma is associated with BMI. This information can be used to support weight reduction strategies in asthma education with the aim of optimization of patient outcomes.

CHAPTER ONE:INTRODUCTION

1.0: Background Information

Asthma is a chronic condition of the airways that affects an estimated 300 million people across the world and has been associated with significant morbidity and mortality (IUATLD, 2011). Asthma has recently been included in the Non Communicable Disease agenda under chronic respiratory diseases by the World Health Organization (WHO), hence a growing need to promote prioritization and identification of asthma as a lung health disease of importance that would give it proper attention along with Chronic Obstructive Pulmonary Disease (COPD), pneumonia and tuberculosis (National Heart Lung and Blood Institute, 2008). In the Low and Middle Income Countries (LMIC), asthma together with other NCDs is increasingly becoming a burden to the healthcare systems as a result of the epidemiologic and demographic transitions currently being witnessed among the populations in these countries (Adeloye *et al*, 2013).

The Global Initiative for Asthma (GINA) defines asthma as a chronic inflammatory disease of the airways in which many cells and cellular elements play a role (GINA, 2015). The chronic airway inflammation is associated with airway hyper responsiveness (AHR) that leads to recurrent episodes of wheezing, breathlessness, chest tightness and coughing particularly at night or in the early morning. These episodes are usually associated with widespread but variable airways obstruction within the lung that is often reversible either spontaneously or with treatment (GINA, 2015). Asthma attacks vary greatly from occasional periods of wheezing and slight dyspnoea or breathlessness to severe attacks that almost cause suffocation (Barnes, 2012).

The global burden of asthma is currently estimated in the Global Asthma Report at 334 million by the Global Asthma Network of Newzealand and the IUATLD, while the W.H.O estimates that 235 million people currently suffer from asthma (Global Asthma Network, 2014). According to the Global Asthma Network report (2014), asthma is a public health problem for both high and low or middle income countries. A survey by the International Study of Asthma and Allergic Disease in Childhood (ISAAC) conducted globally in 2000 – 2001 showed that prevalence of asthma is varied from 1-18%. The burden of disease is reported further and indicates that 14% of world's children experience

asthma while 4.5% of young adults have been diagnosed with asthma or are taking treatment for asthma. ISAAC estimated that the global burden of asthma is greatest for children aged between ten and fourteen and the elderly population ages between seventy five up to seventy nine (Global Asthma Network, 2014), while in the global health survey of 2002 – 2003, the highest prevalence was observed in Australia, Northern and Western Europe and Brazil(IUATLD, 2011).

The World Health Organization reports that asthma is the 14th most important disorder in the world in terms of the extent and duration of disability (W.H. O, 2015), but in the LMIC, chronic respiratory diseases cause at least 15% of the deaths (Adeloye *et al*, 2013). Although mortality from airflow obstructive conditions is observed commonly in the high income economies, encompassed with high prevalence of cigarette smoking, IUATLD has established that age- standardized death rates from COPD are highest in low income regions of the world particularly South Asia and Sub Saharan Africa (Burney,2015)

Results of a systematic review on prevalence of asthma in Africa showed that in the year 1990, estimated 34.1 million of asthma cases occurred among children <15 years, 64.9 million cases were among people aged <45 years and 74.4 million cases occurred among the general population. While in the year 2000, estimated 41.3 million of asthma cases were among children < 15 years, 82.4 million cases was among people aged< 45years while 94.8 million cases occurred among the general population. This increased to 49.7 million cases among children < 15 years, 102.9 million cases people aged <45 years and 119.3 million cases in the total population in the year 2010 (Adeloye *et al,* 2013).

In Kenya, The Kenya Association of Tuberculosis, Pulmonary and Lung Diseases (KATPLD) estimate that asthma affects about 4 million people. Kenya participated in ISAAC phase 1 and 3 studies at two sites, Nairobi and Eldoret (Ministry Of Health, 2011). In this survey, ISAAC established the prevalence of wheeze in the past 12 months using a questionnaire among 13- 14 year old children in the phase 1 of the study carried out in 1995 at 17.1% and 10.4 % in Nairobi and Eldoret respectively. In the phase 3 studies of 2000; this prevalence had increased to 18% and 13.8 % in Nairobi and Eldoret respectively (Ministry of Health, 2011). Similarly, Odhiambo *et al* (1998) reported

prevalence of asthma in 9.5% for urban and 3.0% for rural children where asthma was defined as "attacks of shortness of breath with wheeze".

According to the W.H.O, lack of awareness presents the most important barrier to progress in the diagnosis, treatment and care of individuals with non communicable diseases including asthma (WHO, 2012). Feder (1995) concurs that lack of guidelines and non standardization of asthma management are some of the factors that contribute to poor management in asthma across all settings. According to IUATLD (2011), the two major challenges with asthma care the world over are under diagnosis and under treatment, leading to prolonged illness, poor quality of life, and socio economic consequences to the individual, the family and society at large and in some instances death. Therefore, effective and timely outpatient care and primary intervention is needed to prevent these challenges and improve overall quality of life among asthma patients. It is against this background that the researcher conducted this study with the purpose of assessing response to initial therapy among patients with acute asthma exacerbations.

1.2: Problem Statement

Despite advances in asthma management, acute exacerbations continue to be a major health problem affecting patients with asthma at KNH. KNH emergency and clinic setting reports incidence of between 112 to 138 cases of acute asthma exacerbation every month (see table1). Poor outcomes of therapy impact on quality of life among asthma patients, therefore assessment of response levels and outcomes is important in order to document factors associated with such clinical outcomes. This study sought to establish the patient's response to initial asthma interventions and related clinical aspects. This will provide information that can be used to predict response and clinical outcome to improve on the specific patient centered interventions for better management of asthma.

The data below represents new cases of asthma seen in KNH Accident and Emergency departments for the year 2015.

Table 1 . Prevalence of Asthma in KNH

Month	March	April	May	June	July	August	Sept	October	Nov	December
Number of asthma cases	125	116	159	201	112	120	117	115	138	134

Source: Statistics Unit; Health information department. (KNH) Retrieved on: 20/01/2016

1.3: Justification

Control is the most important goal in the overall management of asthma. The most important indicator for poor asthma control is the frequency of exacerbations experienced by patients. Acute asthma exacerbation is suggested by symptoms such as episodic breathlessness, wheezing, cough and chest tightness which respond to bronchodilator therapy. Response to treatment may take time and patients should be closely monitored using clinical as well as objective measurements. It is documented that, failure to respond to the reliever and controller medicines can lead to deterioration among patients with adverse clinical events and future risks and complications.

Upon knowledge of levels of response, clinical and related factors among patient with acute asthma, the health care providers will be able to assess and recognize and predict outcomes that will determine various approaches to optimize therapy in the management of asthma exacerbation. Currently, no data is available on concurrent factors or determinants of patient response to initial asthma therapy in our setting.

Research Questions:

1. What are the characteristics of patients presenting with acute asthma exacerbations at the emergency units at KNH?
2. How is the response to initial therapy among patients with acute asthma in emergency setting at the KNH?

1.5 Study objectives

The primary objective of this study was to assess patient's response to initial therapy in the management of acute asthma exacerbation in the acute care settings at the KNH.

1.5.1 Specific objectives

1. To describe social demographic characteristics of patients presenting with acute asthma at the emergency departments at the KNH

2. Describe the clinical characteristics of asthmatic patients at presentation in the emergency departments at KNH

3. Establish patient's responses after receiving initial therapy for acute asthma in the in emergency departments at KNH.

1.7 Study Variables
Independent Variables

Technical factors - procedure, setting, treatment protocol

Patient related factors – clinical characteristics of the patient to include asthma diagnosis, symptoms & severity, vital parameters and physiologic parameters, BMI and psychological state.

Demographic factors – Age, gender, level of education, occupation.

Dependent Variable:

Symptoms resolution; Improvement in one or more of physiologic, respiratory symptoms and vital parameters evaluated by objective measures to include peak flow, vital signs, and subjective measures of respiratory symptoms.

Confounding Variables

Co morbidity – presence of allergy, COPD, other lung diseases such as pneumonia, TB, lung cancer and active respiratory tract infections.

Duration of asthma symptoms/ characteristics of onset

Duration of illness

Concurrent use of other reliever's medicines.

Intermediate Outcomes

Repeat therapies, adverse events, Repeat attacks

1.8 Assumptions
This study made the following assumptions

- Other patient related factors are held constant, these include the comobidities.

- In the emergency clinical setting, the experience and skills of HCPs as regards initial management of acute asthma exacerbation is adequate and standardized.

- The initial intervention for acute asthma in the emergency setting is administration of bronchodilator drugs via nebulization or PMDIs.

1.8.1 Study Benefits

By conducting this study, the researcher was able to understand the patterns of response to asthma therapy and patient characteristics associated with the response patterns. This can be used to classify patients and design supportive interventions necessary to provide unique patient needs to optimize clinical outcomes.

1.9.1 Theoretical Framework and Application to the study

Betty Newman Systems Theory

This theory focuses on systems (Bassavanthappa, 2007). According to Neuman Systems Model (NSM), an individual is viewed as an open system, in which repeated cycles of impact, process, output and feedback constitute a dynamic organizational pattern. Exchanges with the environment are reciprocal whereby both the environment and the client may be affected ether positively or negatively, by each other. The client as a system is in dynamic, constant energy exchange with the environment. Neuman (1995) identified the two major components which are stress and reaction to stress. The client variables are physiological, psychological, socio cultural, developmental, and spiritual. The client system consists of a basic or core structure that is protected by lines of resistance. The usual level of health is identified as the normal line of defense that is protected by a flexible line of defense. Stressors are intra-, inter-, and extra personal in nature and arise from the internal, external, and created environments. When stressors break through the flexible line of defense, the system is invaded and the lines of resistance are activated and the system is described as moving into illness on a wellness-illness continuum. Nursing interventions occur through three prevention modalities. Primary prevention occurs before the stressor invades the system; secondary prevention occurs after the system has reacted to an invading stressor; and tertiary prevention occurs after the system has reacted to an invading stressor. This occurs after secondary prevention as reconstitution is being established.

Application of Theory to this Study

Newman defines environment as "all the internal and external forces affecting and being affected by the client at any time" (Gonzallo, 2011) the internal environment exists within the client system. All forces and interactive influences that are solely within the boundaries of the client system make up this environment. In asthma, this can be related to patient's physiological status such as co morbid illnesses, age, coping mechanisms and psychological state. the external environment that exists outside the client system are forces and interactive influences that are outside the system boundaries such as

occupation, trigger elements , medications as well as health systems related factors in the management of asthma.

In this study, acute exacerbation will be focal stimuli that disturb the stability or homeostasis of this system. This stability preserves the character of this system (the respiratory system). Since the system is an open one, the stability is dynamic. As output, becomes feedback and input, the system seeks to regulate itself. In case of exacerbation, the output include the acute asthma symptoms such as dyspnoea, rapid respirations, oxygen saturations, wheezing, coughing and use of accessory muscles as the respiratory system seeks to regulate itself. A change in one direction is countered by a compensated movement in the opposite direction. When the system is disturbed from its normal or stable state, there is a rapid surge in the amount of energy needed to deal with the disorganization which results from the disturbance. In the initial assessment of the patient, we will establish baseline characteristics associated with each of the five variables.

The Components of the System

Process or Function: The exchange of matter, energy and information with the environment and interaction of the parts and supports the system of man. A living system tends to move towards wholeness. In asthma, the patients' appropriate use of his controller medications and adherence to health teaching instructions in self care will tend to move him/ her to adequate asthma control and stable health.

Input / Output: NSM defines this as the matter, energy and information exchanged between man and his environment, which is entering or leaving the system at any point in time. In asthma, the elements of triggers such as dust, cold, exercise ,food or drugs that when taken by the patient could cause an attack or when avoided can enable the patient remain healthy. Output can be seen in the behavioral mechanisms, self care management and early recognition of asthma symptoms by the patient indicating adequate level of asthma control.

Feedback: NSM defines feedback as the process within which the matter, energy and information as a system output provides feedback for corrective action to change, enhance or stabilize the system. In this study, feedback is associated with resolution of acute

asthma attack. Especially the physiologic parameters measured to signify a full resolution, a recurrent attack or an adverse event.

Negentropy: NSM defines this as a process of energy utilization that assists system progression towards stability or wellness. In asthma, the exaggerated physiologic mechanisms such as the use of accessory muscles of respiration, cough, wheeze, diaphoresis and excessive fatigue are processes that symbolize energy utilization that could assist in restoring gaseous exchange in the event of an asthma attack.

Entropy: NSM conceptualizes this as a process of energy depletion that moves the system to illness or death. In the event of asthma attack, the deteriorating respiratory functions evidenced by FEV1/ FVC of below 50% and oxygen saturation < 90% could signify severe asthma that could result in unfavorable outcomes such as severe acidosis and respiratory failure.

Stability: NSM conceptualizes stability of the client system as successfully coping with stressors; it is able to maintain a level of health. Optimum asthma control is the symbol of systems stability which is assessed by the frequency of asthma exacerbations.

Stressors: Stressors are stimuli which may penetrate both the client's flexible and normal lines of defense. The potential outcome of an interaction with a stressor may be beneficial positive or noxious. In asthma, triggers are identified as stressors; these include noxious substances such as cigarette smoke, paints and dust. Others such as animal dunder, pollen, occupational triggers and intrinsic factors as well as emotional stress are all associated trigger factors.

Normal Lines of Defense: This represents a stability state for the individual system following adjustment made to stressors and maintained over time that is considered uniquely normal, in asthma, a chronic condition that requires coping mechanisms and self care management activities towards maintaining their health and managing asthma symptoms for the purpose of functioning within the environment are normal lines of defense for these patients.

Flexible Lines of Defense: This is an outer boundary and initial response, or protection of the system to stressors. It serves as a cushion and is described like an accordion as it expands away from or contracts closer to the normal line of defense. In the case of asthma, the flexible line of defense is the use of reliever medication, SABA in acute attacks, this is to reverse the airflow obstruction in a few seconds as fast as possible and used as needed, for instance during the cold morning or before sleep or exercise. Effectiveness of this intervention can be affected or altered by presence of emotional stressors, upper or lower respiratory tract infections and constant exposure to noxious substances in the environment.

Line of Resistance: This is the presence of resource factors that help the client defend its system against a stressor. In asthma, patient qualities can be considered as line of resistance. If the respiratory system is already weakened by chronic conditions such as COPD, the response may not be effective and resultant energy depletion may lead to death in an event of AEA.

Degree of Reaction: This may be positive or negative in a system. Positive reaction leads to resolution of acute symptoms and reversal of airway obstruction while negative reaction leads to repeated attacks or adverse reactions that may lead to repeated attacks and failure to respond to initial therapy, eventually leading to death if interventions are not adequate.

Interventions: Interventions are purposeful actions to help the client retain, attain, and /or maintain system stability. They can occur before and / or after lines of resistance are penetrated in both reaction and reconstitution phases. Interventions are based on possible or actual degree of reaction, resources, goals and the anticipated outcome. Newman identifies three levels of intervention; **primary, secondary and tertiary.**

Primary prevention is carried out when a stressor is suspected or identified. A reaction has not yet occurred but the degree of risk is known. In asthma, the primary prevention is the avoidance of asthma attack triggers as such the patient must be aware of trigger factors so as to avoid the exposure.

Secondary prevention occurs after the system reacts to the stressor and is provided in terms of existing symptoms. It involves administration of bronchodilator medications

using nebulization delivery method or MDI.   Tertiary prevention occurs after active treatment or secondary prevention strategies. It focuses on readjustment towards optimal client system stability. Intensive asthma education is aimed at optimizing use of inhaler medications, correct device use and asthma action plan.

1.9.2 Conceptual Framework

This conceptual framework indicates that patient related factors can influence their response to therapy in acute asthma. These include characteristics of the individual patient in terms of demographics and clinical factors. Subjective and objective parameters at presentation are also viable indicators for predicting patient's likelihood of response to therapy such as lung functions, oxygen saturations, and respirations as they indicate degree of airflow obstruction in these patients. So patients whose symptoms are less severe may respond faster and better to this initial intervention. Emotional status as well as other psychological factors may also influence patient's response and these factors may also be confounders in determining the response to nebulization.

Situational factors include patient care environment, settings and devices used in the delivery of medication. These may have an impact on patient's response levels and outcomes in this study. Duration of asthma illness and symptoms durations usually influence on the outcome since it determines the extent and degree of airflow resistance. These may influence response and outcomes as illustrated in figure1.

Independent variable

Confounders

Dependent   variable

| Demographic characteristics

Physiologic.

Psychological status

Situational factors (place of review) |

| Cormobidity

Duration of attack

Duration of illness

Concurrent use of other reliever medications & pharmacodynamics |

| Resolutions of symptoms

Asthma control |
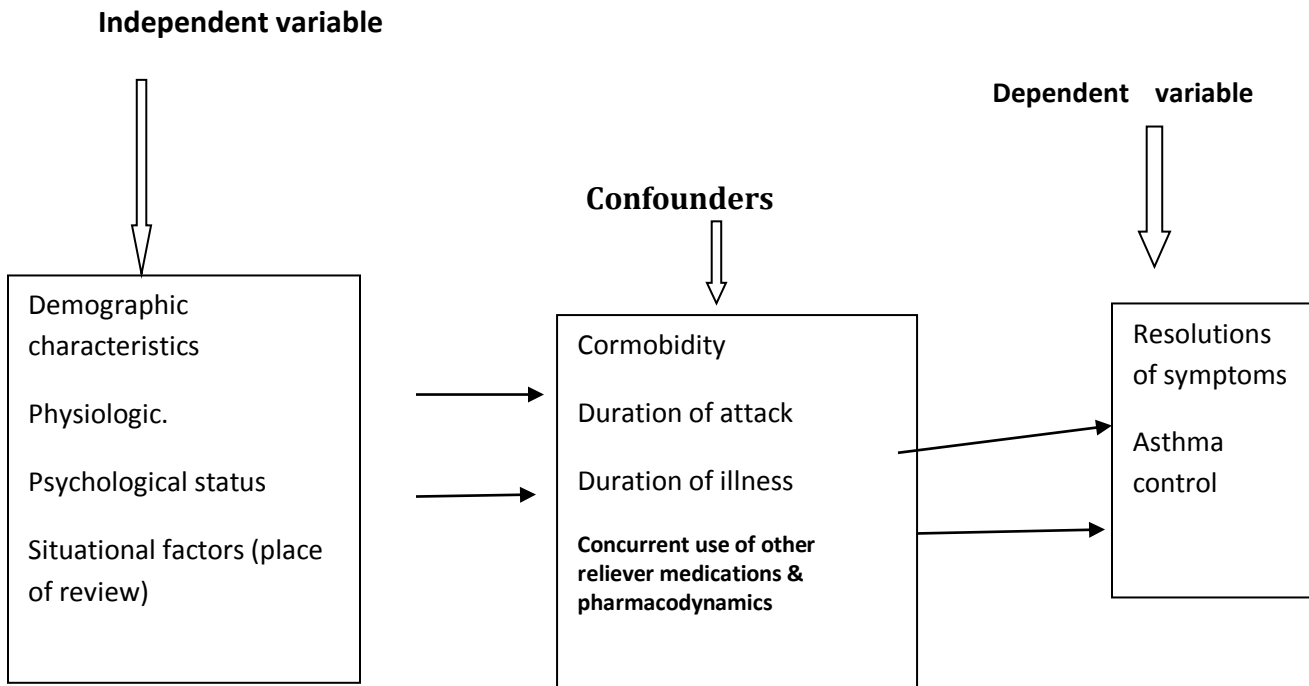
Figure 1. Conceptual Framework

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

The natural history of asthma is punctuated by acute exacerbations, most of which respond to conventional treatment using bronchodilators, steroids and oxygen (Gavreau, 2015). Patients who present in an emergency department(ED) with acute exacerbation of asthma (AEA) can be quite challenging in both assessment of severity, management and response to therapy (Reddel *et al*, 2015). Thus, timely and comprehensive assessment of the patient is needed in order to optimize the initial care. it is well documented that deterioration or failure to respond to initial measures in the treatment for asthma could lead to severe complications such as respiratory failure, which necessitates further interventions including admission into intensive care unit (Feder *et al*., 1995). Therefore such challenges in the management of asthma can be addressed successfully through proper interventions in the initial assessment, diagnosis and treatment.

Short acting B_2 agonists, are the most effective bronchodilators because of their rapid onset of action and the magnitude of bronchodilator that they achieve (Rodrigo, 2015). However, systemic steroids are now being considered early in the course of treatment for patients who have moderate or severe exacerbations (NAEP, 2007). The principal types of devices used to generate therapeutic aerosols include nebulizers, metered dose inhalers (MDIs) and dry powder inhalers (Hess D, 2007). Nebulization creates a mist of ß2-agonist diluted in saline which is inhaled through a mask by tidal breathing and can be accomplished with room air or supplemental oxygen, and requires a supply of compressed gas or a power source. More recently, ß2-agonists delivered via metered- dose inhalers through a spacer have been very popularly used in the delivery of medications in our setting (Ministry of Health, 2011). The inhaler is actuated into the spacer that is then emptied by the patient using either tidal breathing or single breaths (Hess, 2007).

2.1 Pathophysiology and Clinical characteristics of patients with Acute Asthma

A wide variety of risk factors are known to cause asthma. Literature documents that no specific cause for asthma, either biological or environmental. However, asthma can be

classified into three different categories; the allergic, intrinsic or mixed asthma. Allergic or atopic cause is mainly due to allergy usually caused by offending substances in the environment (Barnes, 2012). Environmental factors that may provoke an asthma attack include inhaled allergens such as pollen, dust , less commonly plants or animal dander and inhaled irritants such as cigarette smoke, fumes from cooking, heating or vehicle exhausts, cosmetics and aerosol sprays as well as medicines especially aspirin (Morris, 2014). The second category is an intrinsic asthma; usually due to chronic or secondary recurrent infections of the bronchi, sinuses or tonsils as well as adenoids (Barnes, 2012). Commonly asthma triggers include a variety of complex factors (Sanya *et al*, 2014). In a study to assess risk factors for asthma exacerbations in patients attending emergency unit, Sanya et al(2014) found that upper respiratory tract infections including common cold and lack of corticosteroid use was associated with exacerbations among known asthma patients. Exercises, acute emotional stress and exposures to non specific irritants as well as consumption of certain foods, beverages or medicines have also been implicated in studies by Szczeklik *et al* ;2003, Peden *et al* ;2002 and Sporik *et al*;1990 among patients (Sanya et al,2014).

Typically an acute asthmatic attack is characterized by breathlessness and wheezing(Morris, 2014). Self reported asthma symptoms commonly among patients include wheezing, night time coughing attacks being the most frequent (Perfura- Yone, 2015). On physical examination, the patient usually assumes a sitting position to ease breathing, leaning forward so as to use all the accessory muscles of breathing (Barnes, 2012). The skin usually appears pale and moist with sweat, but in a severe attack the lips and nail beds appear blue signaling extreme lack of oxygen but the early stages of the attack, coughing maybe present but dry as the cough becomes more productive of thick, sticky and mucous sputum (Barnes, 2012).

Physiology of asthma is complex and involves interplay of three main components; airway inflammation, intermittent airflow obstruction and bronchial hype responsiveness (NHLB, 2008) The 2007 expert panel report of the NAEPP noted several changes in the understanding of the pathophysiology of asthma and other various factors have also been investigated, such as psychological stress and anxiety in understanding pathophysiology of

asthma (NAEP, 2007). Airway inflammation is a mechanism that may manifest in acute, sub acute or chronic asthma as presence of oedema and excessive mucus secretion also contributes to this phenomena. Varying degree of mononuclear cell and eosinophil infiltration, mucus hyper secretion, desquamation of the epithelium, smooth muscle hyperplasia and airway remodeling are present (Whittemore *et al*., 2015). Some of the principal cells identified in airway inflammation include mast cells, eosinophils, epithelial cells, macrophages and activated T lymphocytes. In a review of mast cell physiology and functions, Whittemore *et al*., (2015) documented that one of the most significant pathological mechanism is degranulation of mast cells via antigen/IgE/FcϵRI cross linking. In the respiratory tract, the immune response to mast cell activation results in airway constriction, increased mucous production, and cough signifying asthma symptoms. The most common introduction of antigens to the respiratory tract is via inhalation. In the respiratory tract, mast cell degranulation increases vascular permeability and local edema, which can obstruct nasal airways and lead to congestion (Whittemore *et al*., 2015). Airway inflammation in asthma may represent a loss of normal balance between two opposing populations of Th lymphocytes. Two types of Th lymphocytes have been characterized, Th1 and Th2. Study by Gavreau *et al.,* (2011) demonstrated that IL-13 has a role in allergen induced airway responsiveness.

In a study to demonstrate the mechanism of airway inflammation in asthma, Piyadassa *et al*., (2016) conducted a house dust mite challenge in a murine model aimed at demonstrating the hallmark of allergic reaction seen in asthma. The study findings demonstrated that a significant AHR resulted at least after 24 hours after last house dust mite challenge. The histological assessment of the lung revealed increased epithelial thickness and goblet cell hyperplasia, in the absence of airway wall collagen deposition suggesting ongoing tissue repair concomitant with acute allergic lung inflammation (Piyadassa *et al.,* 2016).

Patient characteristics such as age, sex, clinical picture as well as lung functions have a role to play in influencing asthma exacerbation as well as response to therapy. Golden *et al* (2006) described "phenotypes" reflecting heterogeneity in a number of characteristics with clinical impact on response and progression of asthma. Knowledge of determinant

factors such as genetic predisposition, obesity, hormonal changes, smoking and environmental aspects should be utilized to document their influence in response to therapy among individual patients. In a study by Golden *et al* (2006), BMI was found to be an important determinant of response to active treatment in asthma as other authors suggested that obesity may also increase severity of asthma.

2.2 Clinical Assessment and Response therapy in Acute Asthma

As much as duration of action of bronchodilator drugs is varied, Manser *et al*., (2007) observed that 80 –90 percent of bronchodilator response occur by 5 – 10 minutes of inhalation therapy with short acting bronchodilators among patients with acute asthma. Miller *et al.,* (2005) concurs that a significant bronchodilator response is an increase in FEV1 of at least 200ml and by at least 12% in those with mild asthma. However, due to the physiopathology of acute asthma, the response to treatment in exacerbations seems to have two phase; a quick initial response followed by a slower one (Ribeiro *et al* 2007)

Challenge of defining exacerbations still exists among practitioners as symptoms suggestive of asthma are varied among individuals. Virchow *et al.,* (2015) concurs that a clear definition is needed for standard management. However (GINA, 2015) defines exacerbation or a flare up as an acute or sub acute worsening in symptoms and lung functions from a patient's usual status which occasionally may be also the initial presentation of asthma. This concurs with current view that moderate exacerbations are largely defined subjectively according to the patient's experience and physician led changes in clinical management (Virchow *et al*.,2015). In a review of clinical trials whose objective was to define moderate exacerbations, Virchow *et al*., (2015) proposed a definition for moderate exacerbation requiring one and or with presence of the following criteria combined with a change in treatment. The criteria include the following (a) nocturnal awakening(s) due to asthma requiring SABA for two consecutive nights or an increase of 0.75 or more from baseline in daily symptom score on two consecutive days. (b) increase from baseline in occasions of SABA use on two consecutive days (minimum increase in four puffs per day) and (c) more than 20% decrease in PEFR from baseline on

at least two consecutive mornings/ evenings or decrease of or more in FEV1 20% from baseline and or (d) a visit to emergency room or trial site not requiring corticosteroids.

Studies have demonstrated that severity of asthma attack is defined by its outcome rather than presenting initial symptoms, the most commonly included exacerbation outcomes are the need for systemic corticosteroids, urgent unscheduled care, emergency department (ED) or urgent care (UC) visits, and hospitalizations for asthma.

An important aspect in the management of acute asthma exacerbation includes monitoring response to therapy. The PEFR which is useful for detecting changes in asthma control is also used as indicator of response (Rodrigo, 2015). The primary goal for therapy in acute asthma is the rapid reversal of airflow obstruction and the correction of respiratory embarrassment and severe hypoxemia that may be present or developing. However, response may be varied and unpredictable whereby there are responders and non responders to a specific class of asthma therapy and involves several genetic polymorphisms (Oppenheimer, 2007).

Significant testing variability makes it important to confirm or exclude airflow limitation with a more reliable test such as spirometry (Langhan *et al*., 2009). Assessment and monitoring is an important prediction tool for outcomes in asthma therapy. Rodrigo, (2015) used PEFR measures at 15 − 60 min of treatment, together with saturation to assess patients with acute asthma and predicted their outcomes. Clinicians role include assessment, diagnosis and initiating proper treatment regimen that is aimed at rapid relief of symptoms. This approach involves choosing stepwise approach for asthma exacerbations depending on the severity of attacks. However the challenge of assessing acute asthma is experienced in the ED environment, as well as lack of standardization in decision making for asthma (GINA, 2015). The measurement of lung function testing with spirometry or peak expiratory flow measurement may enhance the diagnosis of asthma, provide an indicator of disease severity and help distinguish this disease from chronic obstructive pulmonary disease or other diseases that may present with cough, wheeze and shortness of breath (Ministry of Health, 2011).

Pruitt(2011) demonstrated how Pulmonary function tests (particularly the FEV_1 measurement from spirometry) and peak expiratory flow (PEF) measurement can help clinicians assess the severity of airflow limitation and used them to document response to therapy. However the practice is not common in our setting primarily due to lack of knowledge on performing the lung function tests and lack of equipments as well as cost and affordability among the patients. In a study to develop a predictive score for safe discharge in acute asthmatic patients from ER, Boonsarngsuk *et al.*,(2007) affirmed that predictive factors for unfavorable outcome in adult patients with acute asthma include inability to lie down on presentation and wheezing or low PEFR after the last dose of inhaled bronchodilators. Patients were admitted if further treatments were needed after the 4th nebulization.

2.5 Patient Outcomes

There are four components which define a successful outcome of an asthma patient; objective measures of lung function, environmental control efforts to reduce or eliminate exposure to allergens and irritants, pharmacologic therapy to prevent, reverse and control airway inflammation and obstruction and patient education (Burney *et al.,* 2015).

Knowledge of such factors is essential for making rational decisions. Such knowledge can contribute to decisions on admission, treatment and prediction of outcomes for patients with asthma with the overall goal of improving effectiveness in the clinical management of asthma.

Conclusion

This literature review suggests that exacerbation occurs among asthmatics with even good control levels. However, due to the heterogeneity of this condition, response to available pharmacological therapies may be varied and quite unpredictable. Genetic polymorphisms variants has been demonstrated in many studies but what makes our study different is the assessment of various characteristics of asthma related to physiological parameters at presentation. Therefore this study would contribute to the body knowledge on this phenomenon and additionally inform practice on the role of clinical assessment in predicting the course of asthma exacerbation. This literature therefore directs the

observational aspects of this study and permits new findings regarding characterization of asthma patients.

CHAPTER THREE: MATERIALS AND METHODS

3.1 Study Design

Cross sectional descriptive design was adopted in this study and mixed method was used to collect study data. This design was suitable for the researcher to make a description of the subject of interest as it occurs in the population. Descriptive design enables the researcher to examine characteristics of a single sample. It identifies a phenomenon of interest and the variables within the phenomenon, develops conceptual and operational definitions of the variables and describes the variables (Burns & Grove, 2009)

3.2 Study Site:

The study was conducted at the Kenyatta National Hospital, two settings i.e Emergency room and chest clinic. These are acute care setting where patients who require emergency visits for clinical conditions are managed before considering other co interventions in the management of patients. Acute asthma exacerbation is one of the many conditions patients present with at the emergency department of any hospital, in KNH; the trends indicate that patients present with acute asthma cases visit the ER more often than consultant chest clinic. Patients who are past the age of 12 years attend this emergency department since paediatric emergency unit attends to children only up to 12 years of age.

The chest clinic is an acute setting where patients with established diagnosis of asthma are routinely followed up. This involves review of ongoing asthma therapy, patient teaching on device techniques and management of acute exacerbations. The clinic operates once a week with a population of about 17 patients seen at each visit. Other cases being managed in this clinic include COPD, TB related complications, bronchiectasis, other lung diseases including cancers.

KNH is the largest teaching, referral and research hospital in Kenya, situated in the capital city, Nairobi. With a bed capacity of 1800, the hospital receives patients from both within and outside Nairobi seeking in patients as well as outpatient services for specialized care.

3.3 Target Population

Patients with known history of chronic asthma and the newly diagnosed of asthma formed the study population. They were recruited from ED and chest clinic following an assessment by the physician and the researcher. Purposive sampling method was used to select study participants and those who required treatment for acute asthma exacerbation were treated using routine protocol (nebulization or inhalation therapy).

3.4 Study Personnel:

The principal investigator was responsible for the recruitment, training and supervision of the assistants and other survey staff, as well as for the management of other logistics involved in data collection procedures. Two research assistants were trained in the use of questionnaire and an in depth interview guide as well as taking anthropometric measurements, vital and physiologic parameters.

3.5 Validity and Reliability of study instruments

The study tool was pretested in the emergency units at Mama Lucy Kibaki hospital and results from the pretest were incorporated into a revised questionnaire and any changes made. The study instruments were first tested in the pre test session and their reliability and validity ascertained before being used in the main study as follows;

These included PEF measured using a "mini- wright peakflow meter - white text on a black background" with a standard disposable mouthpiece (appendix 4b). The values in "L/Min" were recorded for three reading and best personal was selected at evaluation before drug administration, 15 - 30 minutes after initial nebulization then followed up 1 to 2 hours, and 4 hours for patients who required repeat nebulization. Each participant performed a minimum of three accepted peakflow manouvres according to the required

standards (Clark, 2004). The PEF readings were converted to predicted values using mini-wright Peak Flow Meter chart for normal values.

Height and weight was measured in all subjects without wearing shoes by a caliberated scale or tape measure and BMI was calculated for each subject. Blood pressure was measured using a digital BP machine (Omron Automatic blood pressure monitor; Model-M2, HEM- 7121-E, by Omron Healthcare Co. Ltd Kyoto, Japan). This was calibrated by the biomedical staff in the KNH unit of biomedical engineering. SPO_2 was measured using a handheld device. The pulse oximeter was attached to the thumb (Model: CMS50DL, 0123 by SN.

Pulse and respirations were counted using a wrist watch (set with seconds) and radial pulse was used. This was repeated twice at every cycle of treatment. A stethoscope was applied for chest auscultations to establish presence of inspiratory wheeze and this was confirmed by second personnel and documented by the attending physician.

3.6 Data Collection Procedures

Physiologic measurements and physical examination was conducted at each evaluation, recorded and entered into the data forms as follows;

Patient clinical characteristics

History: Age, sex, duration of acute attack, duration of illness, co morbid condition, reliever medication used and perception on asthma control.

Physical examination: presenting asthma symptoms: cough, wheeze, and breathlessness, use of accessory muscles, chest tightness.

Anthropometric measurements: weight, height were measured only once and the two values used to obtain BMI, and to calculate the predicted values for peak expiratory flow. Outliers and implausible measurements were generally not encountered. However, where applicable they were deleted to avoid distortion of study outcomes.

Physiologic and peak flow parameters: Blood pressure, heart rate, respirations, oxygen saturations were measured first at initial evaluation. Then follow up of each treatment

cycle included measurements of PEF, pulse, respirations and SPO_2. Blood pressure was taken only once.

Adverse events: Adverse events were recorded as documented if they occur within the ED or clinic setting.

PEF was used as standard measure for assessment of asthma severity and assessment of response to nebulization therapy. The treatment was then administered as per the routine protocol (Short acting B_2 agonists) via inhalation either through oxygen driven nebulizer or jet nebulizer as well as through inhalation via MDIs. Subjects were taken through correct inhalation techniques before medication delivery and significant changes in symptoms were recorded and described as adequate (resolution) or poor (worsening).

b) Tool for Qualitative Data

Record of Subjective aspects as observed

- Psychological stress and anxiety was measured using modified Hamilton Anxiety Rating Scale (HAM-A)

2. Key In-depth Interview Questionnaire Tool.

This was developed and used to collect qualitative data from patients with chronic asthma who also presented with acute exacerbation. This focused on; perception of asthma control, barriers to effective asthma control, opinions regarding asthma treatment outcomes among the respondents,

The information from this interview was recorded using an audio recorder, transcribed and analyzed in thematic areas.

3.7 Sample Size Determination
The sample size was calculated using Fisher's formula (2003) and was based on current prevalence data.

Fisher's formula for sample size calculation;

$$N = \frac{z^2 pq}{d^2}$$

Where;

N = desired sample size (pop. >10,000)

Z = normal deviation at the desired confidence interval (95%) = 1.96

P = proportion of the population with the desired characteristics (20%)

Q = proportion of the population without the desired characteristics (80%)

d^2 = degree of precision (5%)

Substitution for the formula:

$$N = \frac{1.96[1.96]\,[0.2]\,[0.8]}{[0.05][0.05]} = 2.45$$

N = 245

We will adjust for the formula since the population is less than 10,000 using the formula below;

$nf = n/[1+n/N]$

Where;

nf= the adjusted sample size

n = total pop. (The patients in the A & E, asthma clinic with acute asthma)

N = the sample size calculated

nf= 134/ [1+134/245)

134/ [1+0.527]

134/1.527

= 87

Sample size was 87 participants.

3.8 Sampling Criteria

A purposive sampling was used to arrive at the sample size for the study population. This was conducted in both A&E, as well as Chest clinic which mainly run on weekly basis every Tuesday of the week. A period of at least one month enabled the completion of data collection. The recruitment followed a process as shown in appendix I.

3.9.1. Inclusion Criteria

Participants were included in the study if;

- Age: 15 – 60 years(except those with COPD)

- If below 18 years, the patient was accompanied by an adult (guardian/parent) who is above 18 years

- Symptoms of acute exacerbation of asthma (GINA criteria ;see appendix 2) in known asthmatic or

- Has breathing related problem with diagnosis of asthma made by a clinician (if newly diagnosed)

- Gave consent/ assent

- Ability to perform peak flow manouvres

3.9.2 Exclusion Criteria
Patients were excluded if;

- Presenting with acute severe life threatening / near fatal asthma that requires critical care interventions or resuscitation.

- Patients with known comobidities related to respiratory system & cardiovascular system (COPD, CCF, TB) and experiencing acute symptoms

- Pregnant or lactating women

- Unable to consent

3.10 Recruitment and Consenting Procedures

The assessment was done by the attending clinician who established patient's symptoms and made the diagnosis of acute asthma exacerbation. A verbal introduction and consent form was done and each participant had chance to get study information. For those who were not able but were clinically eligible, the consent was obtained by the next of kin.

The vital signs and peak flow evaluation was then conducted, before the nebulization procedure in the procedure room where treatment was being administered, this provided an opportunity for the researcher to explain the study procedures to the patient and seek their informed consent after which an evaluation of the physiologic parameters and peak flow was done.

Patients who are younger than 18 years were assessed for eligibility only if they were accompanied to the facility by an eligible adult. The consent/ assent was obtained from the next of kin who received study information, the child's assent was then be sought. No parent or guardian refused to give permission for the child to be interviewed.

If the patient is stable after receiving therapy, the researcher then took an opportunity to administer an in depth interview questionnaire to the participant; this was done mainly in the chest clinic)

3.11 Data Management

Editing, coding, data entry and development of tables was done by the investigator with technical assistance as necessary from the statistician.

Quantitative data: Quantitative data was entered into IBM-SPSS v.20 for Windows to SPSS version 20.

Descriptive statistics was used to summarize data for categorical variables; percentages and frequencies were calculated and for discrete variables, means and medians were calculated. Potential determinants were first tested in univariate analysis and then bivariate analysis was done. A p-value [<0.05] was used to characterize statistically significant results.

Qualitative data: Six interviews were conducted during this study. This data was recorded using an audio recorder during the interview session after which it was transcribed verbatim by the researcher. The transcriptions were used to generate codes manually and were presented to form the themes from which areas of interest were drawn and analyzed as per study objectives. These thematic codes have been used in the discussion of study results.

3.12 Ethical Consideration

Study protocol was submitted to KNH/UON Ethical Review Board for review and approval of the same. Consent was obtained as well as permission to access study sites. Written consent form was used to obtain consent for participation from study participants as well as assent from those participants who are below the legal age of 18 years and no parent refused to consent for their children.

The research involved no more than minimal risks to the subjects, whereby participants encountered no inconvenience beyond what would be expected in the course of standardized asthma treatment protocols. There were no physical risks to patients and no risk to the HCP who were routinely performing their clinical duties.

The researcher explained every aspect of the study to participants before obtaining the consent and before conducting observations. The permission to access the study site was obtained from the casualty manager A& E and the Nursing Managers at A& E, chest clinic. The confidentiality of the data was assured by the investigator. No names were

included in the data forms and observation checklist as well as dates which could easily lead to a positive identification of the participants.

No coercion whatsoever was used in selecting individuals for observation or interview but voluntary participation was encouraged and verbal consent obtained.

There was no direct benefit for those who participated in this study either monetary or materially but the unit may benefit later if recommendations for the improvement in resources and capacity building is supported.

CHAPTER FOUR: RESULTS

4.0 Introduction

This chapter presents results of the study. During the study period, a total of 89 asthmatics were seen at the emergency room and chest clinics. Of those who were eligible for the study, clinical evaluation was done and they were enrolled. The response rate was above 95%. The results have been presented and summarized in tables, figures   and charts as shown.

4.1 Demographics characteristics of participants

Majority of respondents were female 66 (74.2 %), mean age was 38.3 (SD 10.8).Twenty seven of respondents were in age group of 21 to 30 years and similarly age group of 31 to 40 years while only six were below the age 20. while, most of the respondents had secondary level of education 29(32.6%), a quarter of the respondents had tertiary level of education23 (25.8%) and most of them 35 (39.3%) were in formal employment while 28 (31.5%) reported that they are currently unemployed while 26 (29.2%) were self employed. The commonest business engagement among the respondents was second hand clothes, hotel and groceries while nature of employment was varied.

The study shows that majority of respondents were not smokers (91%) while only 11 % reported a prior smoking history and exposure to secondary smoke. Majority (85%) of respondents knew the trigger factors associated with the asthma attack.

Fifty participants (56.2%) were reviewed at the emergency room of KNH while the rest 39(43.8%) of the respondents visited the chest clinic (table 2).

Table 2. Demographic characteristics of respondents with acute asthma at Kenyatta National Hospital E.R and Chest clinic

Variables (n=89)		
Age (yrs)	Frequency(n)	Percent (%)Mean (IQR)*
		38.34±10.8 (
<20	6	6.7
21-30	27	30.3
31-40	27	30.3
41 -50	26	29
>50	13	15
Gender		
Female	66	74.2

Male	23	25.8
Marital status		
Single	22	24.7
Married	61	68.5
Separated/widowed/divorced	6	6.9
Level of education		
None	9	10.1
Primary	28	31.5
Secondary	29	32.6
Tertiary	23	25.8
Employment		
Formal employment	35	39.3
Self employed	26	29.2
Unemployed	28	31.5
Smoking status		
Current	4	4.5
Past/ever/lived with smoker	11	12.4
Place of review		
ER	50	56.2
Clinic	39	43.8

4.2 Clinical characteristics of respondents with acute asthma

Fifty nine (66%) of respondents reported having chronic asthma whose diagnosis was more than two years, while only less than 10% were recently diagnosed asthma but 21

(24%) could not say when they had the asthma diagnosis. 40% (36) of respondent experienced slow onset of symptoms lasting more than 24 hours while 44(49%) experienced sudden onset of symptoms lasting only less than 6 hours. The rest could not really tell how long their symptoms had lasted.

Majority of respondents reported at least one or more classical symptoms of asthma exacerbation (cough, wheeze, chest tightness or shortness of breath). However these symptoms were varied among the respondents. Majority had self reported history of cough 67,(75%,) and wheezes70, (78.7%) while slightly more than half reporting chest tightness 48,(53.9%). However shortness of breath was also reported by majority 75,(84%).

While most of respondents 35, (38%) did not suffer any cormobid medical condition, however   allergy(atopy) was the most common condition reported among asthma patients18, (21.3%), followed by hypertension13,(14.6%) and COPD/pneumonia13, (14%). Others 10, (10.1%) reported among respondents were CCF, DM, goiter, cancer and arthritis.

As expected majority the respondents had used medications for relief of the symptoms before visiting ER, majority 64,(71.9%)of respondents had used salbutamol inhalers, and 9, (10%) had used oral drugs (controllers) while13,(14.6%) did not use any medicines to relieve symptoms. Majority 61, (67%) of initial therapy was delivered by nebulization while 28,(32.4%) had their initial therapy by metered dose inhalation (MDIs).

On evaluation of physiologic parameters, mean diastolic pressure was found to be 81.2mmHg & systolic was 123mmHg. Mean pulse and respirations rate 93.4 and 25.2 respectively. Mean height for males and females 169cm and 162cm respectively while weight was 62kg and 74kg respectively. For BMI, the mean for females was 28.4 (overweight) and 21.6 for males. The mean BMI was 26.64 for total study population. Half of the respondents, 45 (50%) had no anxiety on assessment while 27, (30%) presented with mild anxiety. However, 11(12 %) were moderately anxious while only 6(7%) demonstrated severe or extreme anxiety at presentation (Table 3).

Table 3. Clinical Characteristics and physiologic findings at evaluation in the ED/Clinic

Clinical and physiologic findings at initial evaluation following presentation at ED/Clinic with an exacerbation		
Symptoms suggestive of attack	Frequency(n) Median*	Percent (%)(IQR)*

Cough	67	75
Wheeze	70	78.7
Chest tightness	48	53.9
Shortness of breath	75	84.3
Awareness of trigger factors	76	85.4
Use of reliever medication prior to ED/clinic visit		
None	13	14.6
Inhaler	64	71.9
Oral drug	9	10.1
Other	3	3.4
Co-morbidities		
CVS (Hypertension)	13	14.6
Resp(COPD)	13	14.61
Allergy/Atopy	18	21.35
Others(cancer, arthritis, goiter)	10	10.11
Physical examination findings		
BP (median,IQR)	120/82*	73/52 -194/174*
Pulse(median, IQR)	90*	75 -112*
Resp rate	24*	20-26*
SPO2	95*	89-97*
BMI		
Underweight(< 18.5)	6	6.7
Normal (18.5 – 24.5)	33	37.1
Overweight (25 – 29.9)	26	29.2
Obese(> 30)	24	27
Anxiety (assessed using modified "Hamilton anxiety scale")		
None	45	50.6
Mild	27	30.3
Moderate	11	12.4
Severe	6	6.7

4.2.2 Severity of asthma exacerbation on assessment of the physiologic parameters.

Majority of respondents had mild to moderate asthma attack.   On evaluation physiologic parameters, majority 57, (64%), attained more than 50% of predicted PEF values as score. While 65, (73%) of respondents had SPO2 of above 92% which was indicative of mild to moderate exacerbation. Majority 84, (94%) and 74, (83%) of respondents had Pulse rate ranging   between

100 to 120 beats per minute and respirations of 14 beats per minute up to 26 beats per minute respectively as shown in table(4.) below

Table 4. Severity of exacerbation assessed by physiologic parameters (PEF reported as predicted values

Parameters N= 89	N (%)
PEF Mild / moderate (>50%)	57(64%)
Severe (< 50%)	32 (36%)
Spo₂ Moderate/mild (90 – 95%)	65 (73%)
Severe (< 90%)	24 (27%)
Pulse Rate Mild/ moderate	84 (94%)
Severe (>120bpm)	5 (6%)
RR Mild/moderate	74 (83%)
Severe (> 30bpm)	15 (16.9%)
*PEF (peak expiratory flow), SPO2(peripheral oxygen saturations) RR(respiratory rate)	

4.2.3. Clinical management of acute asthma at the emergency department and clinic

For treatment of exacerbations, unit protocols and procedures were followed. It was seen that initial therapy was administered by inhalation and drugs used were represented in the figures (2,3, & 4)below.

Drugs given at initial phase of asthma exacerbation n=89

72(80.9%)

15(16.8%)

10(11%)

2(2%)

B2 agonist alone(salbutamol

combined (B2/anticholinergic

anticholinergic alone

ICS
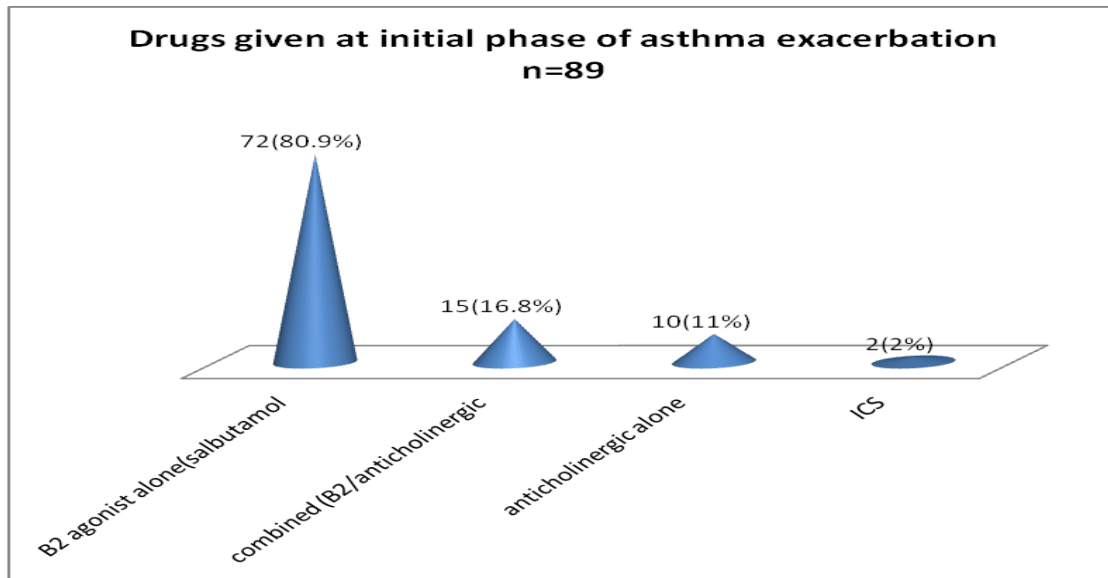
Figure 2. Drugs used at initial phase (1st cycle)

Majority(80.9%) of patients were managed with salbutamol , a short acting beta 2 agoinst for their asthma exacerbation while only 16.8% received combined therapy. ICS was administered in only 2% of the cases.

Drugs used during repeat(2nd cycle) phase(n=54)

■ %

50%

8%

5%

28%

3%

B2 agonist alone(salbutamol

combined (B2/anticholinergic

(CS/B2)

ICS
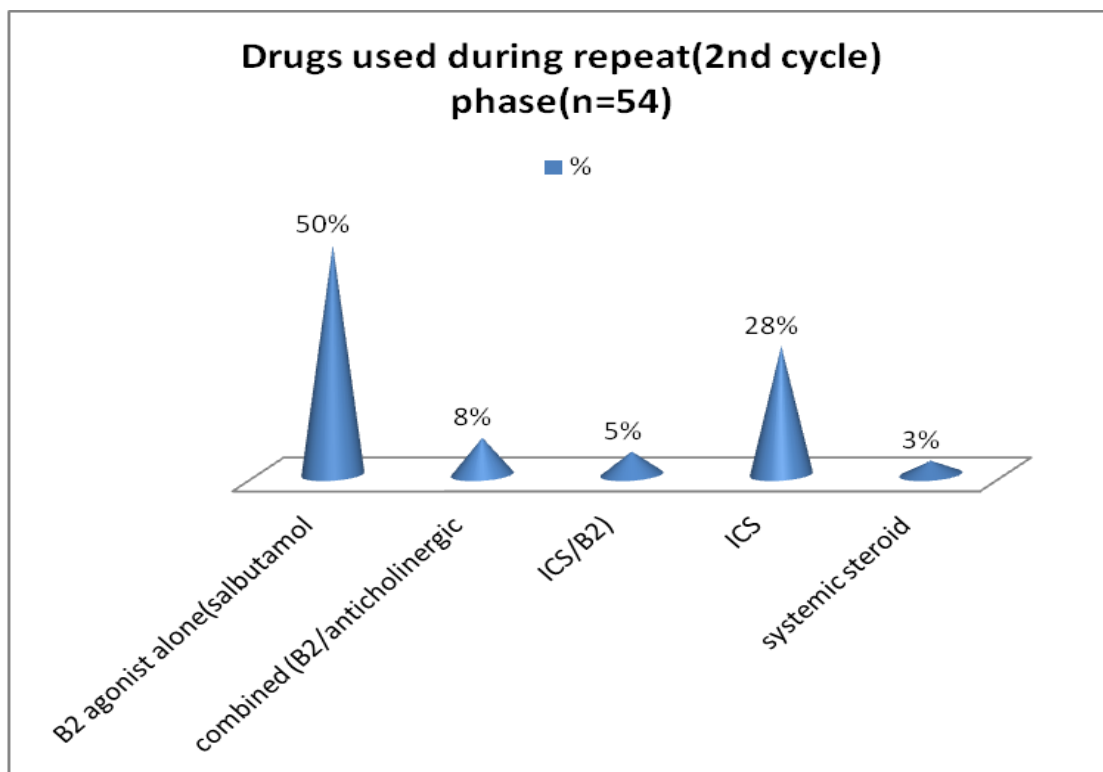
systemic steroid

Figure 3. Drugs used in repeat treatment(2nd cycle)
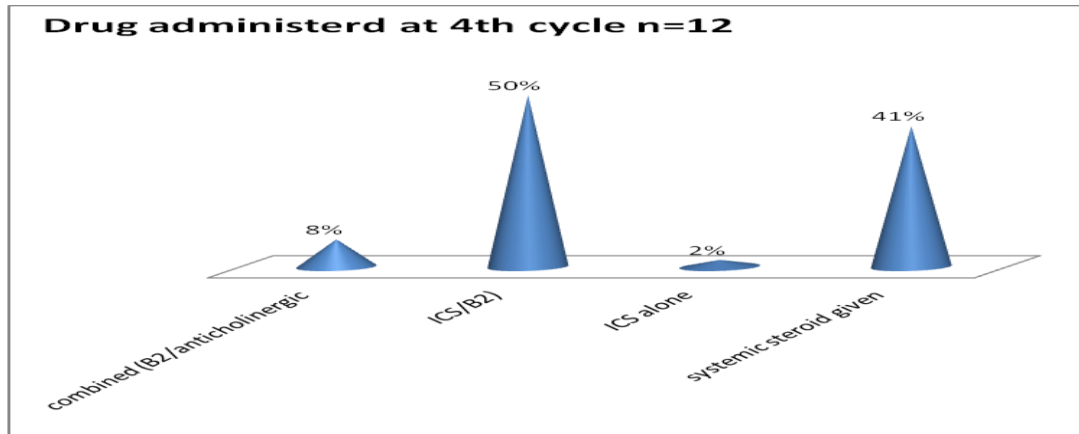
Figure 4. Drugs used in the repeat phase of treatment (4th cycle)

Majority (50%) of respondents were treated with combination therapy of ICS and B2 while systemic steroid introduced at second cycle and continued at fourth cycle (3% & 41% respectively)

4.3 Response to Therapy in acute Asthma:

Response to therapy was established by evaluating patients after taking their treatment. Any improvement in respiratory symptoms and physiologic parameters as compared to baseline values was indicating change and thus response to therapy. The vital and physiologic parameters were measured after each cycle, 30 to 60 minutes following each cycle of treatment. These were recorded and described as improvement or non improvement. Table (5) shows how this has been presented.

Table 5. Levels of response by Changes in physiologic parameters

At the initial assessment all respondents were evaluated for dyspnoea (making incomplete sentences or phrases while talking), use of accessory muscle, wheezing & physiologic parameters.

 Dyspnoea: 32, (36%) of respondents did exhibit dyspnoea while 19(29.3%) had dyspnoea at second assessment post treatment.

Use of accessory muscles: Thirty five, (39.3%) of respondents did demonstrate any use of accessory muscles at initial examination, while 17, (19.1%) at second assessment. However following further assessments after 3rd cycle of therapy only five (5) persistently

Indices	Pre- therapy	Post-therapy 1st cycle	2nd cycle:	3rd cycle:	4th cycle
Dyspnoea	32 (36%)	19 (21.3%)	12(13.4%)	12(13.4)	0
Use of accessory muscles	35 (39.3%)	17 (19.1%)	5(0.56%)	2	0
Wheeze	70 (78.7%)	38 (42.7%)	13(14%)	5	0
PEF (Mean $\pm$ SD)	60.8 $\pm$23.8	66.5$\pm$ 9.21	44[68.5$\pm$23]	27(median 14)	3(median 60)
SPO2	91.92 $\pm$ 9.21	96.31 $\pm$ 1.62	46[92$\pm$9.3])	27(median 94)	5(mean89$\pm$6.6)
RR	25.24 $\pm$ 7.9	29.07$\pm$ 8.8	43[29$\pm$8.81]	24(mean31$\pm$10)	0
Pulse	93.4 $\pm$ 21.5	96.31$\pm$ 23.8	46[median113]	19(median 120)	1(median 129)

had use of accessory muscles in breathing.

Wheezing: Wheeze was evaluated by chest auscultation before and after the initial therapy. Among the respondents 19 had no history, while 70 (78%) had wheeze on auscultation. On examination only 38 (42%) of the respondents still had wheeze on auscultation after initial therapy (2nd phase). The changes in PEF, pulse, SPO2 & respirations were observed and presented as means. This has been illustrated in the table (4)

4.3.1 Correlation between PEF values pre and post treatment parameters

Relationship between PEF & SPO2 parameters at pre treatment and post 1st cycle of treatment is illustrated in figures (4 & 5)
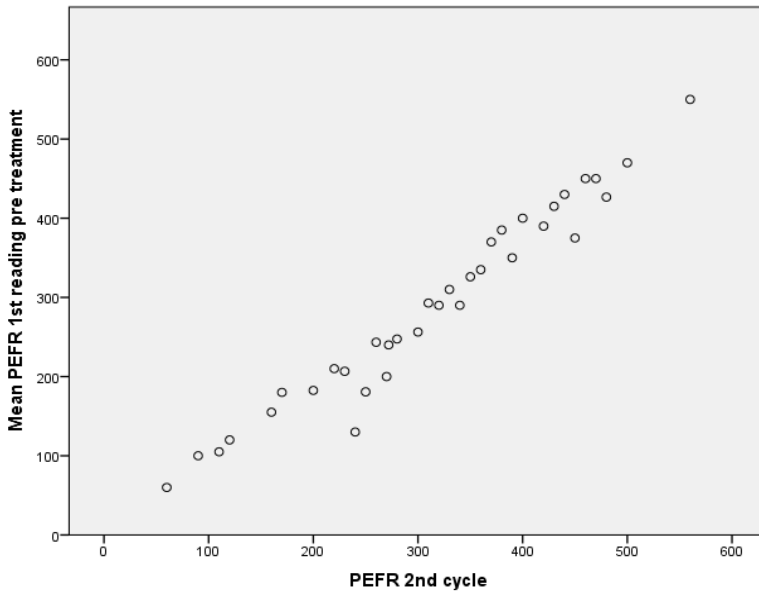
Figure 5 . a scatterplot diagram to show changes in PEF values pre & post treatment 1st cycle
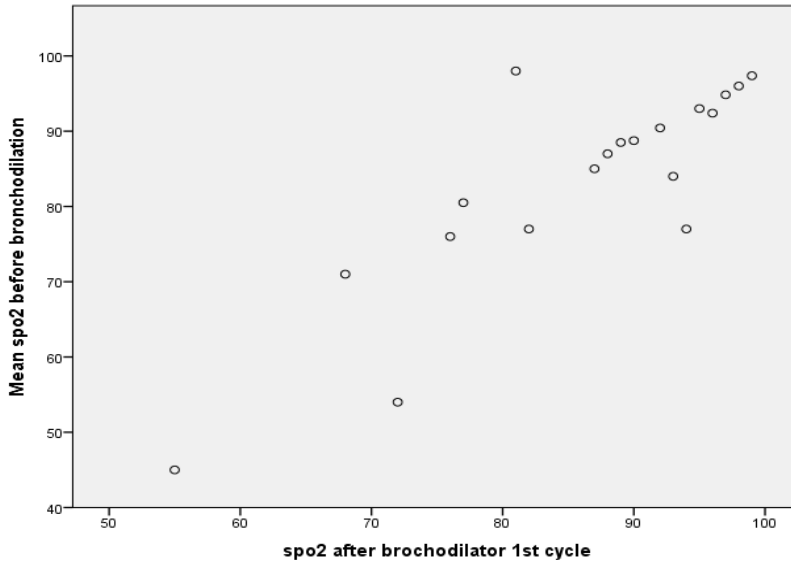
Figure 6. a scatterplot diagram to show the change in oximetry measurement pre & post treatment(1st cycle)

A linear correlation is observed between PEF before treatment and after treatment 1st cycle. The mean value for PEF increased by 5.9 ± 9.21 (from 60.8 to 66.5). All values for PEF & SPO_2 were significantly higher after first phase of initial therapy (p value .000)

4.3.2 Perception on response to therapy

Most of the respondents 34,(38.2%) perceived their asthma to be poorly controlled, while slightly more than quarter 26, (29.2%) regarded their asthma as fairly controlled. Only 15,(17.9%) perceived their asthma as uncontrolled but few, less than 10% regarded their condition as well controlled as shown in figure (7)
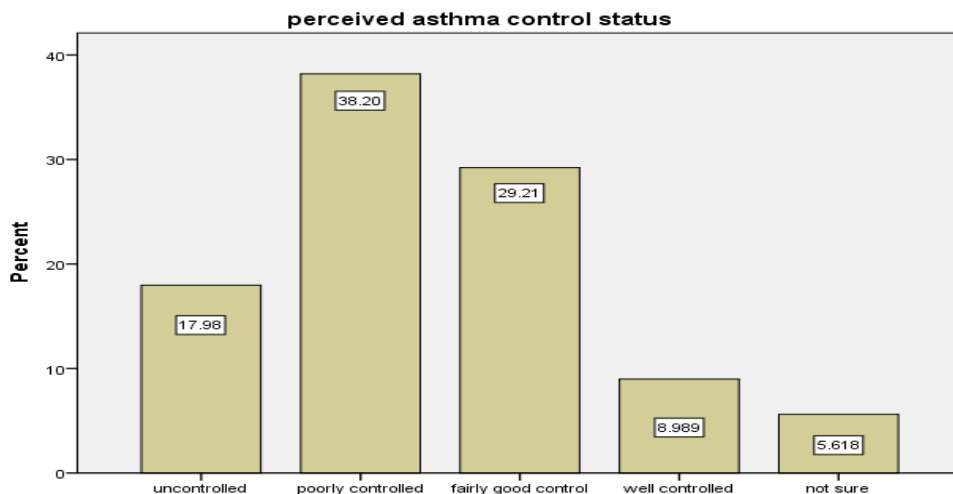
Figure 7. Perception on asthma control

4.3.3 . Overall response to therapy

Majority of cases 67, (75%) were discharged home after the initial therapy while 22, (24.7%) of the asthma cases received other co- interventions and were hospitalized after initial therapy. Majority of respondents experienced no adverse events during the treatment period, however small proportion had adverse events as documented in their treatment profiles. Among them, 6.7% experienced respiratory distress while the rest had severe headaches and or with palpitations. Overall level of response from evaluation has been illustrated in table (7)

Table 6. Overall response among respondents

Response	Frequency(n)	Percent (%)
Poor	54	60.7
Partial	14	15.7
Adequate	19	21.3
Missing	2	2.2

Majority 54,(60.7%) of the respondents' demonstrated poor response, 14,(15.7%) had partial response while only 19,(21.3%) demonstrated adequate response to therapy.

4.4 Qualitative data analysis: Factors associated with levels of response to therapy in asthma

The following coded themes were generated from the key informants among asthmatic patients as factors that could influence their response to treatments and outcomes in asthma;

- Awareness of triggers and knowledge on medications and device use,

- Acceptance of asthma condition, adoption of coping strategies to avoid attacks,

- Family support, personal beliefs and opinions about asthma,

- Cost of asthma medication, knowledge of manifestations of asthma symptoms,

- Challenges experienced in asthma control and responsiveness to therapy,

- Non pharmacological approaches used in asthma management at home

- Quality of life with asthma as well as asthma action plan.

Knowledge of triggers: Almost all respondents knew the risk factors for asthma exacerbation and common triggers were dust, cold smoke, strong scents e.g perfumes & paints, while a few of them mentioned that car fuels. "*When am in a cold place, when I am in a dusty place and eeh some strong perfumes also*" **Asthmatic patient during an interview (KII,2).** Therefore when these triggers are encountered, respondents knew how to prevent or prepare themselves in case of attack.

Personal beliefs and perception : Most of the respondents(38.2%) perceived their asthma to be poorly controlled, while slightly more than quarter(29.2%) regarded their asthma as fairly controlled. Only 17.9% perceived their asthma as uncontrolled but few, less than 10% regarded their condition as well controlled. Depending on how asthmatics perceive their symptoms, some do not regard their symptoms as serious and would not visit a health facility while at times they believe that self evaluation will help as to when to seek medical treatment. assessment of symptoms before they can visit a facility "*when the attack is not that acute, I get relieved but when, especially when I get an attack after a sore throat that is when my asthma becomes acute and I have to go to the health center, because I know even when I use an inhaler it doesn't work much*" **asthmatic patient during interview (3).**

"*My asthma is beyond control, now I agree when doctors tell me that drugs only keep me going".(5)* This perception about asthma status is likely to influence how asthma patients

may lose control of their situation and wait for the worst to happen. *"My asthma is unpredictable , today I am like this, tomorrow you may find me in very critical state" Asthmatic patient during interview session"(5)*. Others may delay seeking medical attention since they can underestimate these symptoms hence leading to poor response.

Quality of life as experienced by missed work/ school days, loss of job due to asthma

Most asthma patients often miss to go to work or school due to attacks, oftenly this is worsened by poor coping mechanisms and feelings of isolation. This study reveal that majority (65,73%) of asthmatics reported having missed work or school due to asthma symptoms while 18(20.2%) had not missed work in the recent past. Many a times, people with asthma stop working just because they cannot cope with frequent exacerbations symptoms, thus impacting on their quality of life as well. *"I don't work, I stopped like five years ago, I used to run my own business but when I got very sick the doctors adviced me to stop working because of my symptoms" key informant (1)*

"Asthma stops me from doing somethings especially housework because when it is sometimes acute I get even admitted in hospital..."key informant (1)

"It is a log term condition, as in I get down knowing that this is something I can never put down, I must carry it whenever I go...".key informant (1). Respondent talking about having to carry along asthma medication throughout.

Findings of this study show that despite the various challenges, asthma patients accept their condition and this helps them to cope well and have improved outcomes.

"Since I accepted that I am asthmatic, I normally avoid staying in a crowded room, I avoid strong perfumes. So I don't want anything to do with perfumes even soap" and upto now, I believe my asthma is fairly controlled because it is a long time since I got a serious attack" key informant (3).

4. 5. 1. Multivariate analysis of relationship between demographic factors and levels of response to therapy

Age: Findings reveal that patients who were below 20 years were less likely to have adequate response as compared to other age categories. However introduction of

covariates including presence of comorbidity, duration of illness and symptoms and use of other relievers showed there was no statistical significant relationship between age and levels of response (p. 067).

Education: Patients with primary education were less likely (AOR = 0.049) to have adequate response as compared to patients with tertiary level of education but was not significant (p value=.175).

Employment status: Patients who were self-employed were less likely (AOR = 0.123) to have adequate response as compared to patients with formal employment. However introduction of covariates decreased effect to this likelihood to 0.053.

BMI: Patients who had normal weight were less likely (AOR = 0.161) to have adequate response as compared to obese patients. However, adjustment of covariates caused this effect to be statistically significant (p value= 0.043) as shown in table (7).

Table 7. Demographic characteristics and response to therapy

		Poor/partial	Adequate	AOR$^\$$	p-value	AOR$^\varphi$	p-value
Age categories	<=20	5(83.3)	1(16.7)	.010(.000-1.154)	.057	.006(.000-1.423)	.067
	21 – 30	13(81.3)	3(18.8)	.109(.007-1.716)	.115	.161(.008-3.363)	.239
	31 – 40	22(84.6)	4(15.4)	.276(.041-1.850)	.185	.757(.080-7.132)	.808
	41 – 50	19(79.2)	5(20.8)	.235(.035-1.598)	.139	.347(.037-3.230)	.353
	> 50 (Ref)	8(61.5)	5(38.5)				
Gender	Male	21(91.3)	2(8.7)	.194(.030-1.233)	.082	.165(.019-1.414)	.100
	Female (Ref)	47(73.4)	17(26.6)				
Education	None	8(88.9)	1(11.1)	.118(.003-3.973)	.233	.303(.006-16.022)	.556
	Primary	26(96.3)	1(3.7)	.049(.003-.769)‡	.032	.118(.005-2.587)	.175
	Secondary	19(65.5)	10(34.5)	1.501(.329-6.845)	.600	1.575(.264-9.409)	.618
	Tertiary (Ref)	15(68.2)	7(31.8)				
Marital status	Never married	17(77.3)	5(22.7)	4.428(.185-106.177)	.359	4.479(.114-175.398)	.423
	Married	46(78.0)	13(22.0)	.781(.058-10.479)	.852	1.017(.054-19.179)	.991
	Widowed/separated (Ref)	5(83.3)	1 (16.7)				
Occupation	Unemployed	23(82.1)	5(17.9)	1.381(.097-19.670)	.812	.816(.035-18.829)	.899
	Self employed	24(92.3)	2(7.7)	.123(.017-.876)‡	.036	.053(.005-.584)‡	.016

	Formal employment (Ref)	21(63.6)	12(36.4)				
BMI	Underweight	6(100.0)	0(.0)	.000	.999	.000	.999
	Overweight	19(73.1)	7(26.9)	.573(.172-1.912)	.365	.334(.075-1.486)	.150
	Normal Weight	29(90.6)	3(9.4)	.161(.038-.689) ‡	.014	.043(.005-.392) ‡	.005
	Obese (Ref)	14(60.9)	9(39.1)				
Asthma severity	Mild to moderate	50(72.5)	19(27.5)	-	-	-	-
	Severe	18(100.0)	0(.0)				
Ref – Reference category; ‡ P-value <0.05; AOR$ - Adjusted Odds Ratio without covariates; AORφ - Adjusted Odds Ratio with covariates							

4.5.2 Multivariate analysis of relationship between clinical characteristics and levels of response

Patients with no shortness of breath and chest tightness were 7.206 times and 4.477 times more likely to have adequate response as compared to patients with shortness of breath and chest tightness respectively but relationship was not significant p=0.047 (table 8)

Table 8. Physiologic parameters and response among acute asthma patients

.

		Poor/partial	Adequate	AOR$	p-value	AORφ	p-value
History of cough	Yes	53(81.5)	12(18.5)	.753(.211-2.693)	.663	1.559(.304-8.005)	.595
	No(Ref)	15(71.4)	6(28.6)				
History of chest tightness	No	25(65.8)	13(34.2)	3.027(.905-10.130)	.064	4.477(1.018-19.683) ‡	.025
	Yes(Ref)	41(87.2)	6(12.8)				
History of shortness of breath	No	8(61.5)	5(38.5)	3.658(.928-14.409)	.072	7.206(1.286-40.387)‡	.047
	Yes(Ref)	59(80.8)	14(19.2)				
History of wheeze	No	12(66.7)	6(33.3)	2.100(.596-7.397)	.248	1.660(.358)	.517
	Yes(Ref)	56(81.2)	13(18.8)				
Ref – Reference category; ‡ P-value <0.05; AOR$ - Adjusted Odds Ratio without covariates; AORφ - Adjusted Odds Ratio with covariates							

4.5.3 Multivariate analysis of relationship between anxiety, perceived asthma control, treatment area and levels of response

The response was not significantly related with asthma control ratings and anxiety ratings

(p=.282, p=.186). Patients who had received treatment from emergency unit were 0.195

times less likely to have adequate response to treatment; however, there was no significant relationship between treatment area and adequacy of response (table 10)

Table 9. Relationship between anxiety, perceived asthma control and treatment area and response

		Poor/partial	Adequate	AOR$^\$$	p-value	AOR$^\varphi$	p-value
Asthma control rating	uncontrolled(Ref)	47(87.0)	7(13.0)				
	Controlled	21(63.6)	12(36.4)	2.716(.849-8.690)	.092	2.033(.559-7.391)	.282
Anxiety rating	0 -2(Ref)	28(65.1)	15(34.9)				
	3-5	24(88.9)	3(11.1)	.271(.068-1.079)	.064	.356(.077-1.648)	.186
	6 – 8	10(90.9)	1(9.1)	.331(.034-3.206)	.340	.451(.041-4.900)	.513
	> 8	6(100.0)	0(.0)	.000	.999	.000	.999
Treatment area	emergency unit	44(89.8)	5(10.2)	.195(.063-.607) ‡	.005	.205(.035-1.208)	.080
	Clinic	24(63.2)	14(36.8)				
Ref – Reference category; ‡ P-value <0.05; AOR$^\$$ - Adjusted Odds Ratio without covariates; AOR$^\varphi$ - Adjusted Odds Ratio with covariates							

4.5.4 Multivariate analysis of relationship between length of stay and response to therapy : The relationship between duration of hours in observation for patients and levels of response was significant   ($p = 0.002$)

Table 10. Length of stay and response among acute asthma patients

		Poor/partial	Adequate	AOR	p-value
Length of stay in unit	30 minutes	3(75.0)	1(25.0)	4.556(.356-58.271)	.244
	Up to 1 hour	24(61.5)	15(38.5)	8.542(2.241-32.557)	.002
	More than 1 hour	41(93.2)	3(6.8)		
Outcome of therapy	Discharge	46(70.8)	19(29.2)	-	-
	Hospital admission	22(100.0)	0(.0)	-	-

CHAPTER FIVE: DISCUSSION CONCLUSION AND RECOMMENDATION

5.0 Introduction

This chapter presents the discussion, conclusion and recommendations of the study findings. The purpose of the study was to assess and describe response to initial therapy among patients with acute asthma. This chapter will therefore discuss study findings in relation to the variables under study including demographic factors, clinical and physiological factors and then discuss the levels of response among the respondents according to the results of the study.

5.1 Socio demographic characteristics of respondents
Age:

With a mean of 38.16 years, this study reveals that disease burden is experienced among the middle age and younger population in our setting. On the contrary, Chastek *et al*(2016) found older age group among patients with severe asthma in developed countries (mean age of 50.8 and 46.5). In terms of response to therapy, Patients who are below 20 years were less likely to have adequate response as compared to other age categories. it is known that younger age groups are assumed to have better response as compared to the old, given the fact that the prevalence of co morbidities is low in that age group. However on introduction of covariates including presence of comorbidity, duration of illness and symptoms and use of other relievers showed there was no statistically significant relationship derived between age and adequacy of response after adjusting for these covariates (p 0.067), contradicting findings by Braido *et al*(2016) that a higher score on quality of life was positively related to younger age (18 – 39 years) among patients with asthma(p<.001) while in a Cameroonian study, mean age of asthma prevalence was 34.9(SD 13.5) depicting a similar situation in our setting.

Although asthma is known to be a common childhood condition among the under the age of 18 (Johnson et al, 2016), we cannot underpin the prevalence in adult population in our setting and thus, control strategies should be focused on this population.

Gender: Proportion of female was higher than males among the study participants; however no statistically significant relationship in terms of response to therapy (p .100) was seen. These findings concurs with a study conducted by Serugendo *et al* (2014), Hamdan *et al*(2012) where females were more than males with asthma exacerbation and had poor control of asthma. Mohammed *et al*(2016) also observed high prevalence in females than males, but there was no statistical significance(p=0.63). Ramnath *et al* (2007) also observed overall predominance of females with sudden asthma exacerbation as compared to males. Similarly Braido *et al* (2016) observed statistically significant association between female gender and asthma control compared to males (p<.001). Trzcinska *et al* (2013) also observed significantly more females with inadequate asthma control (p=0.008). This probably points that females are probably more sensitive to physiologic changes in the respiratory system as compared to the males thus, early manifestations of symptoms. Female gender is also well known for their positive health seeking behavior, thus probability of a visit to hospital due to asthma is higher than for males who are known to have poor health seeking habits.

Education and occupation: Thirty two (29, 32%) had secondary level of education. Patients with primary education were less likely (AOR = 0.049) to have adequate response as compared to patients with tertiary level of education (p.032) but there was no relationship between education level and adequacy of response (p.618) a similar finding in a Cameroonian study, majority had university education(32%) but not associated with asthma prevalence(p0.051). However, this finding reflects the economic burden of asthma being experienced among the age in the population with significant level of highest education. Education is a key factor in asthma control since management involves teaching patients on proper device technique, so education is expected to cause a positive impact in terms of asthma control.

Patients who were self-employed were less likely (AOR = 0.123) to have adequate response as compared to patients with formal employment but there was no significant association between employment status and levels of response. Trzcinska *et al* (2013) however, significantly associated inadequate asthma control with rural inhabitants (p=020) and professionally active individuals (p=0.000) as compared to the unemployed.

5.2 Clinical characteristics of participants with asthma exacerbations

Smoking history: The prevalence of smoking was quite low (4,8%), likewise, Mohammadi *et al, (*2016) also observed a low prevalence of smoking among asthma patients (2.1%) as well as Perfura –Yone *et al*(2014). Smoking and respiratory disorders such as asthma are known to be significantly related since smoking is one of the risk factors to causation and acute exacerbations and physiologically impairs respiratory system integrity thus reduces likelihood of adequate response, but this association was not tested in the study.

Respiratory symptoms:

Results of this study showed that majority of respondents   had self reported symptoms of wheezing (70, 78.7%), shortness of breath (75, 84.3%), cough (67, 75%) and chest tightness (48, 53.9%). Similarly, Bateman *et al*, (2008) observed that the most usual abnormal finding is wheezing on auscultation, a finding that confirms the presence of airway limitation a susceptible individual. Symptoms caused by airway inflammation include wheezing, breathlessness and coughing. This concurs with Mohammadi *et al* (2016) who observed wheezing (11.1%), coughing at rest (12.4%), coughing at night (13.4%), breathlessness at rest (13.3%), exercise induced wheezing and exercise induced coughing (16.7%) in chronic asthmatics. The symptoms were significantly more common in those with a confirmed asthma diagnosis for the last 12 months and were observed over time. Majority of asthmatics   had their diagnosis   made in more than two years (62, 66%)

There was no statistical relationship between those having symptoms and those who did not have these symptoms in regards to   response (p=0.47, p=0.25) however, However, those with persistent chronic asthma could under estimate their severity and adopt to these symptoms. This could have an impact on their response as demonstrated by respondents in their understanding and rating of asthma symptoms. "*when Iam going to get worse attacks, I usually know; I started witnessing some headaches and I fel difficulty in breathing so I know that later maybe I get serious*"*(KII,5) asthma patient in interview session*

5.2.2. Comobidity in asthma

Based on self reporting, those with conditions such as COPD and upper respiratory tract with active symptoms were not included among the asthma patients studied. However, (55, 61%) reported having medical comobidities which is slightly more than 53% reported by Ramnath *et al*(2007). The commonest (18, 21.3%) comorbid condition reported was allergy (allergic rhinitis) which concurs with findings from other studies. Serugendo *et al* (2014) & Songu (2012) reported high prevalence of atopy, (nasal congestion) among uncontrolled asthmatics, however hypertension being the most significant as reported by Ramnath *et al* (2007). As expected allergic rhinitis and asthma co exist in the same individuals in varying degrees, and has been physiologically known to manifest in a similar way (Obimbo *et al*, 2007). Pefura-Yone *et al, (*2014) observed that determinants of current wheezing were signs of atopic eczema [2.91 (1.09-7.74)] and signs of allergic rhinitis 3.24 (1.83-5.71). Similarly the majority of patients in this study reported that common cold and running nose were triggers for their current asthma exacerbations.

5.2.2 Anthropometrics characteristics of respondents

The findings highlight the significance of anthropometrics as a reliable factors influencing response to therapy in asthma. Most of respondents had normal BMI (33, 37.1%), while (26, 29.2%) and (24, 27%) were overweight and obese respectively however, it reveals that adequacy of response was significantly associated with BMI (p=0.005, AOR 0.005 - .392). In a study by Rodrigo *et al* (2007), it was reported that majority of study participants were obese. Tantisira *et al* (2003) associated increases in body mass index with increased prevalence of asthma, while noting that the mechanisms behind this association were unclear (Bateman *et al*, 2008). Similarly, Braido *et al*(2016) observed that obese patients were significantly more likely to have partly controlled/ uncontrolled asthma compared to patients with normal weight(p <.001) while Golden *et al* (2006) reported a higher percentage of asthma control among those with normal weight as compared to the overweight (P=.002) or obese (p=0.026). In a study by Golden *et al, (*2006) findings suggested that BMI may influence the natural history of asthma control and may differentially influence response to active agents and that BMI influences responsiveness to asthma therapy. Mohanan *et al* (2014) suggests that effects of obesity

on asthma prevalence, management, exacerbation and treatment response need to be looked at.

5.2.3 Psychological characteristics of respondents as measured by the modified Hamilton anxiety scale

It is known that emotional stress may lead to asthma exacerbation. Rietveld et al, (1999) and Sandberg *et al*, (2000) observed that extreme emotional expressions can lead to hyperventilation and hypocapnia which can cause airway narrowing (Bateman et al, 2008). This study found that majority of asthma patients were not anxious (45, 50.6%), while (27, 30.3%) and (11, 12.4%) had mild and moderate anxiety respectively and levels of anxiety was not significantly associated with adequacy of response (p = .186). A study byTrzcinska *et al,* (2013) showed that individuals with inadequate control of asthma were characterised by significantly higher levels of anxiety and depression compared to those controlling their condition (p=0.001).

When asked about their coping strategies, key informants declared that stress is a determinant of asthma exacerbation in many circumstances and many a times they try to avoid stress and anxiety as suggested here; "*When you annoy me and I get very much annoyed to a point of no return, it normally gives me an attack. I normally avoid it very much not to cross somebody's line and not for somebody to cross my line ...."[**KII, 4]***
Braido *et al*, (2016) mentioned psychological status as one of the variables associated with control status among asthmatics. Education, Counselling and psychological support is therefore important in achieving adequate response as expressed by this key informant. "*i think my treatment comes out better because one this i have accepted i am sick and i have received counselling to live with my condition*" asthmatic patient during interview[4]. Some expressed satisfaction after getting support*" i am satisfied by the way i am using inhalers because once you know how to use them, you wouldnt' find problems*"

5.3 Response to therapy

Results   showed that, cumulatively on assessment majority had poor response (54, 60.7%) had poor response to the first session of the initial therapy, while (19, 21.3%)

demonstrated adequate levels of response at the first initial therapy. however it is suggested that response to initial treatment may take time and patients should be closely monitored using clinical assessments and objective measurements(Bateman et al,2008) Rodrigo *et al* (2010) reported that about 10% of adults who suffered an asthma attack and up to 5% have severe disease responded poorly to treatment.

On prognosis, however majority (70, 75.2%) of respondents were discharged home from the ED while (22, 24.7%) were hospitalized due to poor response. Response was determined by the indices of severity, particularly PEF, pulse rate, respiratory rate and pulse oximetry which were observed continuously for 30 minutes to one hour during each cycle of treatment. According to this criterion, response was divided into three categories as described by Maomary *et al*, (2012). *Adequate response* defined as; sustained improvement of respiratory symptoms, stable vital signs, O_2 saturation >92% on room air and PEF >60% of predicted. *Partial response*: defined as minimal improvement of respiratory symptoms but stable vital signs, O_2 saturation >92% on oxygen therapy, PEF between 33% and 60% of predicted while *Poor response* was defined as no improvement of respiratory symptoms with or without altered level of consciousness, drowsiness, or severe agitation, signs of fatigue or exhaustion,O_2 saturation <92% with high-flow oxygen. There was partial response in (14, 15.7%) of respondents however, statistically significant association between length of observation at emergency department and response (p=0.02) was observed since respondents who had stayed in the observation unit for up to one hour were more likely to have shown good response and were discharged as compared to those who were observed for up to four hours (AOR 8.542, CI 2.241 -32.557 p= 0.002).

A study by George *et al,* (2014), personal beliefs about control could undermine adherence to medication and likely to contribute to high rates of uncontrolled asthma. Barriers to adequate response to therapy as well as control of asthma could be inadequate coping mechanisms among asthmatics include;

- Delayed treatment; reasons given for delay in seeking therapy were continuous and overuse of reliever medications, under estimating severity of symptoms.

-Use of non pharmacological methods such as drinking hot water when experiencing chest tightness and steam inhalation.

- Avoiding of asthma medications especially when they do not experience symptoms.

5.4 Conclusion

Based on the findings, the study deduced the following conclusions

1. Response in asthma is varied among the study population. Body mass index was significantly associated with levels of response in asthma therapy, clinical characteristics remain key determinants in the diagnosis, and however response was not significantly associated with severity of asthma symptoms in this study. This suggests that anthropometric measurements should be included in the assessment of patients with asthma symptoms such as wheeze, cough, chest tightness and breathing difficulties experienced especially body weight.

2. The assessment of asthma severity was based on clinical characteristics and objective measurements and findings strongly suggest that most patients presented with mild to moderate exacerbations, with majority having normal vital and physiologic parameters. Yet the response was poor. The patterns of these symptoms strongly suggest that asthma symptoms are varied. Measurements of asthma severity should be based on presence of airflow limitation. Functional assessments such as PEF and FEV_1 are strongly recommended, however PEF measurement may not be reliable as it is also effort dependent and quality maybe poor.

3. Response to initial therapy was poor however this response could be attributed to inadequate optimization of pharmacologic therapy as well as other physiologic factors among them presence of co morbidities such as COPD, allergy and acute rhinitis. We suggest that some individuals who develop acute respiratory symptoms during an asthma attack may present challenges in differentiating them with true asthmatics response to bronchodilator therapies.

5.5 Recommendations

1. Assessments of asthma patients should include anthropometric parameters especially body weight so as to incorporate them in the asthma management plan.

2. A coordinated effort is needed to improve access to early treatment for acute asthma exacerbation and this   needs to be enhanced by proper education on signs and symptoms so that patients with acute exacerbations do not under estimate their symptoms and can present to emergency department for timely and adequate management.

3. Intensify asthma education to our patients and relatives as well as significant others who often carry the burden of care giving especially for newly diagnosed asthmatics   to include the benefits of physical exercise so as to achieve and maintain normal body weight for effective response to therapy.

5.6 Areas of further research

Further studies are required in the future to cover specific areas such as the following;

a) Similar study need to be done in lower level facilities and in multiple settings to determine the prevalence, trends and demographic patterns of asthma and determine response to therapy in those primary care facilities.

b) Case control study is recommended to evaluate   specific risk factors for poor response to initial therapy among asthmatics.

5.7 Study Limitations

1. The study used a purposive sampled population of patients presenting with acute asthma exacerbations in emergency unit at Kenyatta national hospital which is a referral facility.

2. Generalizability of these findings is not possible since the study was done only in one setting.

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APPENDICES

APPENDIX I (a): Recruitment Procedures

Patient in Accident & emergency, chest clinic

↓

Asthma diagnosis (new or old)

Mild or moderate asthma exacerbation   severe asthma exacerbation

↓   ↓

Physical, physiological assessment, PEFR   unable to undertake peak flow,
unstable

↓   ↓

Eligible   Not eligible

↓   ↓

**Include in study
study**   **Exclude from**
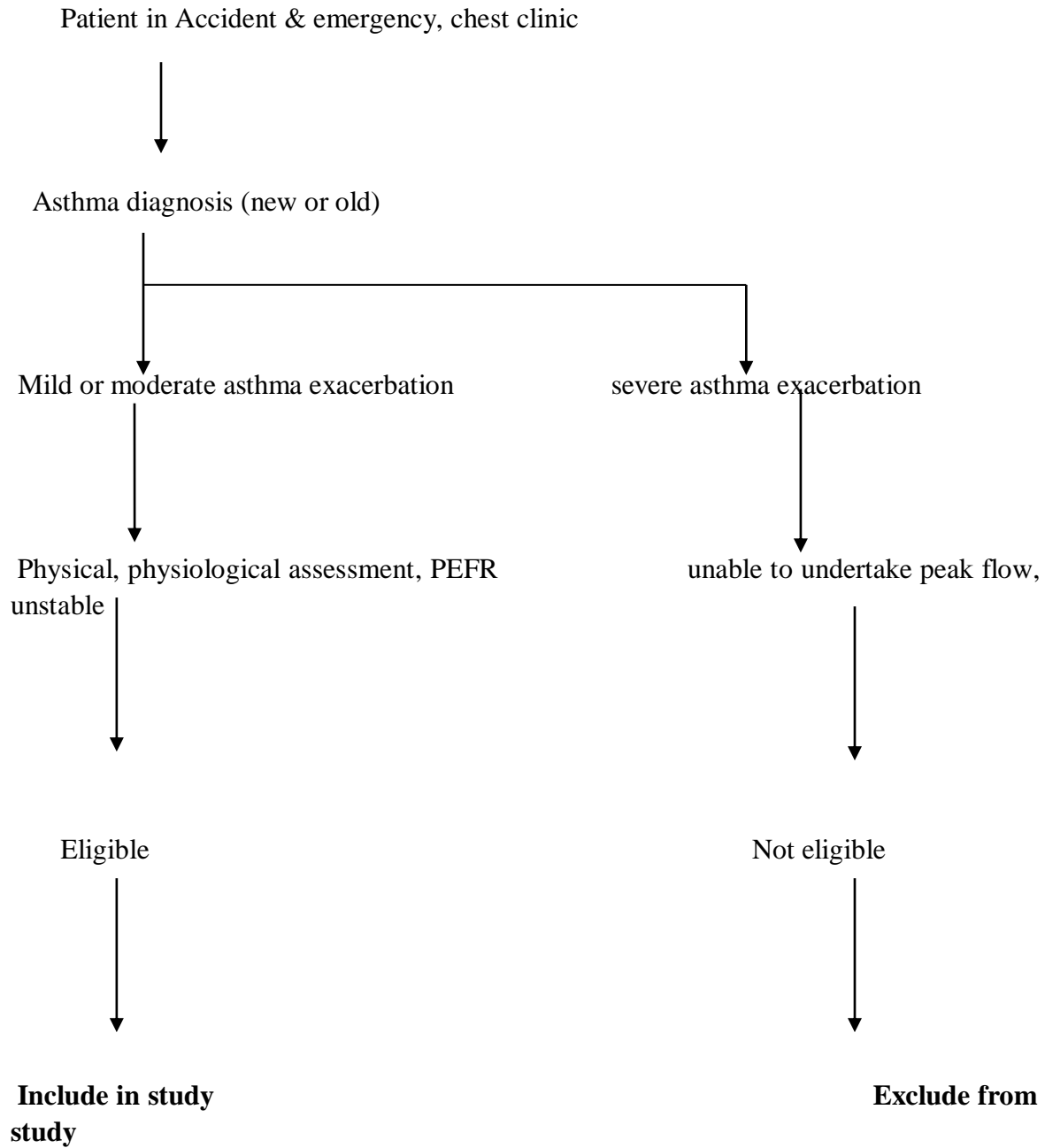
APPENDIX I (b)

Box 10. Management of asthma exacerbations in primary care
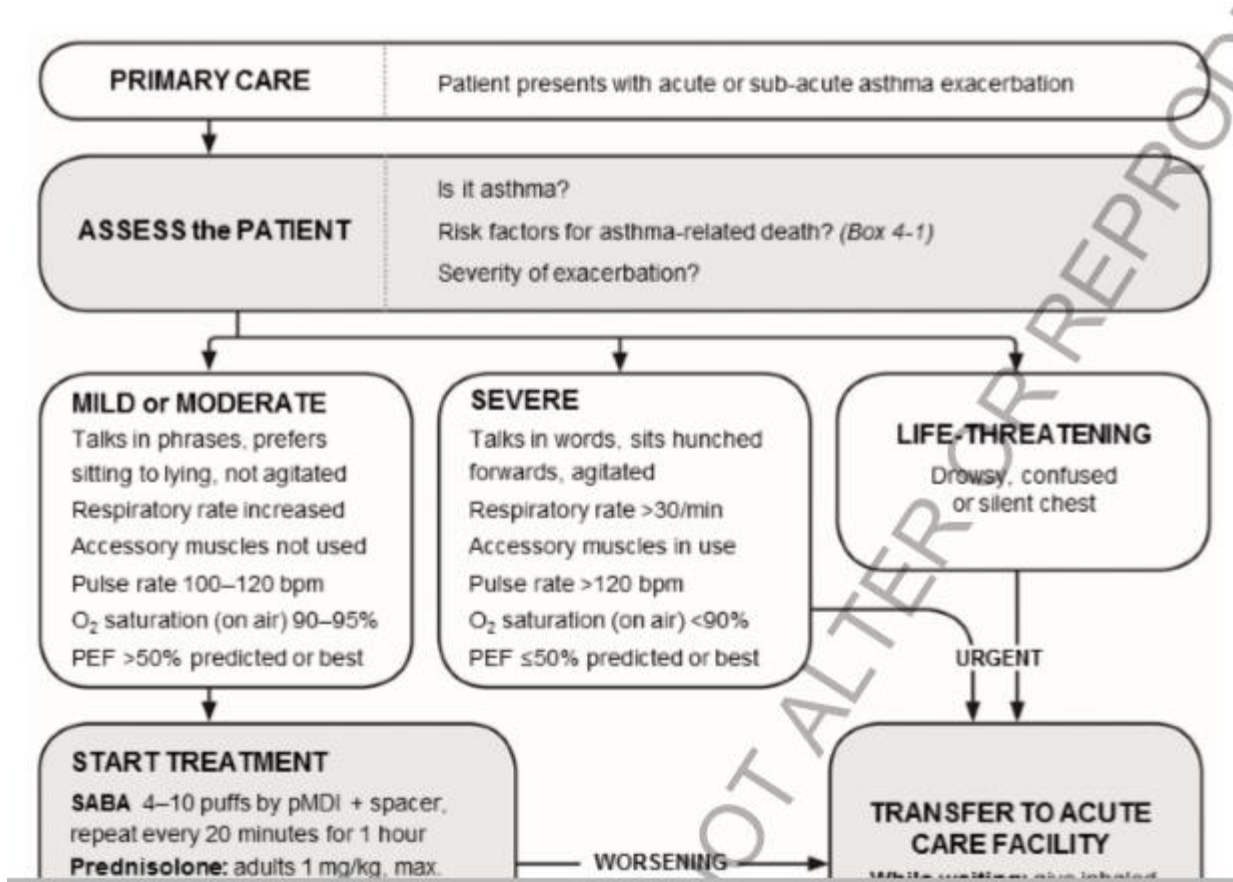
Extracted from: GINA pocket guide (2015)

APPENDIX II a)   **Consent Form**

Title of study: Response to Nebulization in Acute asthma management among adults attending KNH A & E, Chest Clinic

Investigator: Lilian Atieno Okoth

 University of Nairobi; School of Nursing Sciences

Introduction

My name is .... and I am a student at the University of Nairobi, I am conducting a study to determine effectiveness of nebulization in acute asthma at the Kenyatta National Hospital, Accident and Emergency Department. Acute asthma exacerbation is a common occurrence for people with asthma. Asthma is a chronic condition caused by unknown factors and whose symptoms include wheezing, breathlessness, chest tightness and occasional cough symbolizing airway irritation and obstruction. Treatment involves use of short acting inhaled medications given to relieve symptoms of attack. I am now going to explain to you what this study is all about.

 Before you decide whether to join this study or not, please remember that, the decision to join the study is upon you (voluntary). If you decide not to join the study, you will not lose any health care benefits. If after joining the study you change your mind about taking part in the study, I will not prevent you from doing so and you will continue getting your routine treatment as usual. I will ask you to sign this form and put the date of signing if you agree to participate in this study. We will give you a copy of the signed form if you so wish.

Study procedures

If you are willing to take part in this study, and sign this consent form, you will be taken through a set of questions and physical examination. A respiratory test will be done on you before you get your treatment(nebulizaton) and will be repeated shortly after the

nebulization and even much later if you continue getting nebulization here at the emergency unit. A short interview will follow which will ask you about yourself, your asthma status and your concerns about asthma for the duration you have had this condition and during your treatment here and even hospitalization. If you join the study, the usual treatment or routine nebulization will continue by the nurse or clinician.

After the discharge from casualty or admission into the ward, you will not be followed up by the study team. You are only participating in this study while here at the emergency department.

In addition, a checklist will be filled by the study staff based on certain procedures that the nurses will perform in administering the nebulization to you but you will not be asked anything during nebulization, questions will be asked later after your nebulization session in a short interview for about 20 – 30 minutes.

Who are taking part in this study?

A number of patients with acute asthma, attending Accident and Emergency whose treatment include nebulization for their symptoms relief as well as those attending chest clinic and require nebulization.

Benefits

You will not benefit from this study other than the usual care and observation during your treatment period but you may benefit from asking questions and learning more about your asthma condition. The information we obtain from this study will help us better understand how patients respond to nebulization therapy. This may result in better management of patients with asthma and overall quality care for asthma patients who seek treatment in our hospital.

Risks

There is a small risk of sharing our clinical findings, should the information obtained be necessary in the process of care by the clinicians and nurses. This may end up being shared with other medical staff. However, the data collection forms and questionnaires

will not contain personal or sensitive information such as your full names or exact hospital number. In addition, only authorized persons will be able to obtain your full information in our database.

Confidentiality

We will do everything possible to keep the information you give us confidential and we will not share your responses in the interview with anyone outside this research process. All interviews will be conducted face to face in privacy or in an enclosed area to ensure that the other people do not hear the information you give. Your full names will not appear in the forms. This means that no one can identify that this story has come from you.

All the filled forms will be filed under lock and key in our offices and only a few people working on this research can find it. If study findings is published or presented at scientific meetings, your name and other personal information will not be used.

Investigator's Statement:

I will not influence the management of the patient but will only monitor the response to the intervention (nebulization) before, during and after the procedures. I will also participate in the examination of the patient and record my findings. The results of this study will be useful in care of patients in the future and do not have any other conflicts of interest in the study.

Do you have any questions about the things I have just said?

Are you willing to participate in this interview?

1. Yes, I agree to participate (CONTINUE)

2. No, participation declined (TERMINATE, THANK PARTICIPANT)

I would like you to please sign below. If you have questions about the study after I leave you can contact me on;

Lillian A. Okoth. Mobile: 0726024509

If you have further questions or concerns about taking part in this study, please contact;

 Supervisors on: 0727438359, 0720440665.

This research has been approved by the KNH/UON Ethical Review Committee.

This committee can also be contacted on: Telephone 020- 726300-9 or 020- 2726300 Ext 44355

Participant's statement of consent

Name of study staff conducting session/ principal investigator................. Signature...

I have read this consent form and / had this study process explained to me. I have had a chance to ask questions and the questions have been answered fully. If I have further questions about the study, I am free to ask the investigators listed above. By signing this form I confirm that I have freely chosen to take part in this study and that I can withdraw anytime without suffering any penalties in terms of health care services.

Participant signature/ thumbprint...

Investigator's signature..

Appendix II b)   **Child Assent Form**

My name is: Lilian Okoth and my colleague's names are..

We are doing a study on asthma to learn about people with asthma who have an attack, respond to treatment given by nebulization.

We are asking you to be part of this study because we know that children your age who have asthma commonly seek treatment here when they get an acute attack.

We have explained everything about this study to your parent/ guardian and seek her/his permission to include you in this study. If you agree to be in this study, we are going to ask you some questions about your asthma condition and also we will observe how you breathe after your treatment. This is going to involve you breathing into this device (peak flow) which measures how well you can expel air so that we can know how this treatment has changed your symptoms. We will also obtain other observations of your symptoms.

You can ask questions about this study and all the observations we will make at any time. It is okay if you decide not to take part, or if you decide at any time not to finish then you can ask us to stop. If you decide to participate, then questions that we will ask are only about your asthma condition. There is no right or wrong answers because this is not a test. We will not include your name in this questionnaire and nobody will know that you said these responses.

We will not pay you any money for participating, but the reports from this study will be used to improve the treatment for asthma in this hospital.

If you sign this paper, it means that you have read this and that you want to be in this study. If you don't want to be in the study, don't sign this paper. It is okay and your treatment will continue anyway. Being in the study is up to you and no one will be upset if you don't sign this paper or if you change your mind.

Your signature..   Date.....................

Signature of person obtaining assent (researcher).......................   Date.....................

Kiswahili Consent Form

UTAFITI WA majibu ya matibabu katika pumu papo hapo kati ya wagonjwa watu wazima (15-49 yrs) wanaohudhuria Accident & Emergency, kifua kliniki: Hospitali ya Taifa ya Kenyatta

Karatasi la Habari za Mshiriki – Kipengele 3

Tahiti: Lilian Atieno Okoth

Tangulizi

Jina langu ni...................................... Mimi ni mwanafunzi katika chuo kikuu cha Nairobi. Ninafanya utafiti ya kuboresha matibabu ya ugonjwa ya kupumua linalojulikana kama Dalili hizi huwa sana wakati wa usiku na asubuhi sana.

Wewe unaalikwa kushiriki katika utafitiuiti wa "asthma". Kabla ya kuamua kama unataka kushiriki katika utafiti huu, ni muhimu uelewe kwa nini utafiti huu unafanywa nakile kitahusisha. Tafadhalichukua muda na usome taarifa zifuatazo kwa makini na ujadiliane na wengine kama unataka.Tafadhali uliza kama kuna kitu chochote ambacho haukielewi au kama ungependa kupewa habari zaidi. Chukua muda ndio uamue kama unataka kushiriki au la. Asante kwa kusoma habari zizi.

Nani ataendesha   utafiti?
Mimi ni mwanafunzi katika chuo kikuu cha Nairobi. Masomo ya uuguzi

Nini Lengo la utafitini nini?
Asthma ni mmojawapo ya magonjwa ya kifua ambalo dalili zake ni kukosa kupumua hewa vizuri, kufungana kwa kifua, pamoja na kukohoa na dalili hizi huja kwa wakati mwingine halafu zinapotea wakati mwingine. Matibabu ya ugonjwa huu unahusu matumizi ya dawa za kupuliza tu ili kupeana nafuu kwa muda ili kuondoa hizo dalili zake.

Timu ya utafiti huu itafanya kazi pamoja na madaktari wa hapa inaalenga kuongeza ufahamu na kukuza utendakazimazuri ya kupata matokeo mazuri kwa matibabu ya asthma.

Kwa ninimimi nimechaguliwa?

Sisi tuko na nia ya kutafuta matokeo ya ugonjwa wa asthma na kuchunguza dalili kama zitapungua baada ya nebulization, na pia kuangalia kama dalili ambazo uko nazo zinazidi. Umechaguliwa kwa sababu wewe uko kwenye kundi moja ya makundi haya ya wagonjwa ambao tungependelea kuwahoji.

Umechaguliwa kwa sababu wewe kwa sasa ni mgonjwa anapata huduma za kwanza hapa kwa sababu ya asthma. Sisi tunataka kufahamu vyema matokeo ya huduma haya, na kuelewa ni matokeo gani tunaweza kupata kutoka huduma huu wa nebulization.

Nini nitaulizwa nifanye ikiwa nitashiriki?

Ukichagua kushiriki utaulizwa kukamilisha na kurudisha fomu ya idhini. Baada ya kupimwa na daktari, na kupewa huduma ya nebulizer tutawasiliana nawe ili tukuulize maswali mafupi kidogo kuhusu wewe na hali yako ya asthma kiafya. Hii itachukua takribani dakika 5 – 10. Pia tutapima dalili za hewa mwilini, kipimo cha pressa, tutaangalia dalili zote za kupumua, na hii itahitaji wewe kufanya peak flow.utafanya pumzii kwenye hii chombo(onyesha peak flow meter). Wewe pia uko na uwezo wa kujiondoa katika utafiti wakati wowote na sii lazima utoe sababu.

Nini kinatokea kwa data zilizokusanywa?

Data zote zitahifadhiwa bila kutambulika kwenye file na records salama cha utafiti .Sisi tutapatia kila mshiriki kificho na kubadilisha jina lolote ili kwamba usiweze kutambuliwa katika ripoti yoyoteya utafiti.Habari zitahifadhiwa kwenye kompyuta itakayo tumia mfimo wa kuhifadhi habari zilizoko kwa kutumia *password*. Data yako inaweza pia kuangaliwa na watu waliopewa mamlaka kutoka Chuo Kikuu cha Nairobi na ERC, Wenye mamlaka ya udhibiti ambao huangalia kwamba utafiti unafanywa kwa njia nzuri.

Je siri zitadumishwaje?

Sisi tutafuata mwenendo wa kimaadili na kisheria na taarifa zote zilizokuchukuliwa kuhusu wewe na wakati wa mahojiano zitawekwa kwa njia ya siri. Isipokuwa tu kama wewe utasema kitu ambacho ni cha kupendekeza uvunjaji wa sheria, au kitu ambacho kina pendekeza hatari ya madhara kwa wewe binafsi au mtu mwingine. Tuko na wajibu wa kupiga repoti mwenendo wowote ambao ni mbaya kwa mamlaka ya kisheria. Kama wewe utasema kitu chochote cha kupendekeza hatari ya madhara (kwa mfano mawazo ya kujipea madhara), basi hii sisi tutaambia wenye mamlaka za kisheria za nchi. Mahojiano yatarekodiwa na kumbukumbu za maelezo zitaandikwa. Rekodi zote za kidigitali na maandishi yote zitahifadhiwa kwa usalama na timu ya utafiti tu na watu waliopewa mamlaka ndio wataweza kuziona. Data itakuwa haitambulishi na itahifadhiwa kwenye kompyuta (laptop, kompyuta na vijiti vya kuhifadhia data ya kompyuta) vitanunuliwa kwa utafiti huu.

Vifaa hivi vitakuwa na usimbaji fichewa Programu (ulinzi na kitambulisho cha siri).

Nini kinatokea kama sitaki kushiriki kwenye utafiti au kama nitabadili nia?

Ni juuyako kuamua kama unataka kushiriki au la. Kama utaamua kushiriki utapewa karatasi hii yenye habari ujiwekee na kuulizwa kutia sahihi fomu ya idhini. Kama utaamua kushiriki utakuwa bado uko huru kujitoa wakati wowote bila kutoa sababu yoyote.

Utafiti ni wa muda gani?

Sisi tutawasiliana nawe baada ya wewe kupata huduma za kwanza hapa ili tukuulize maswali mafupi machache kuhusiana na huu ugonjwa wa asthma. Hii itachukua takribani dakika 5 – 10. Pia tutaangalia vipimo za kimwili, na hii itahitaji wewe kufanya peak flow.

Utafiti huu unafanywa wapi?

Utafiti utafanyika katika mazingira ya emergency na clinici ya kifua hapa hospitali ya Kenyatta.

Je,matokeo ya utafiti yatachapishwa?

Habari zitawasilishwa katika semina na makongamano nakuchapishwa katika majarida yanayotumiwa na wataalamuwa afya na watafiti wa afya lakini hakuna washiriki watakao tambulikana kwenye matokeo hayo.Kama ungependa kupokea muhtasari wa matokeo unaweza kutoa maelezo yako jinsi unavyo taka kuwasilishwa ukiwa umeshiriki kwenye utafiti.

Nani amepitia mradi huu wa utafiti?

Utafiti huu umeangaliwa na kupitishwa na Kamati za Maadili na Utafiti za Chuo Kikuu Cha Nairobi na Hospitali Ya Kenyatta.

Kwa hahabari zaidi Wasiliana na : Lilian Okoth . Namabari ya simu: 0726024509

Je kama kitu fulani kitaenda vibaya?

Wewe uko huru kusimamisha mahojiano wakati wowote au kuchagua kutojibu swali.

Kwa washiriki wote:

Kama kitu chochote kuhusu utafiti kitakutatiza au kitaibua maswali kwako,wakati wewe unashiriki au baadaye, tafadhali wasiliana mtafiti **Lilian Okoth** au mpigie simu 0727466460. Kama kuna masuala yoyote kuhusu utafiti huu na hungependelea kujadili na wanachama watimu ya utafiti, tafadhali wasiliana na timu ya Utawala wa utafiti naUadilifuaidha kwa kuandikia 'Maneja wa Utawala wa utafiti na Uadilifu, Sanduku la Posta: 19676 002002, Nairobi au kwa kupiga simu 020 2726300 Ext 44355

....
....

Sahihi ya mshiriki / onyesho la kidole   Tarehe

 ....
....

Sahihi   ya   mtafiti   ....

Tarehe.............................

Asante kwa kuchukua muda wa kusoma Karatasihii Habari

APPENDIX 111:   QUESTIONNAIRE

Title: Response to Nebulization in acute Asthma Management among adult patients attending Kenyatta National Hospital, Emergency Departments

BIODATA

Patient ID.......................

Name (initials)....................

Physical address...................

Date of enrollment:

I: SOCIAL DEMOGRAPHIC DATA

1. Age(in years)
2. Gender   a) male.................... b) female
3. Marital status a) single .... b) married c) Never married
4. Level of education a) none ....b) primary ....c) secondary
    ....d) tertiary............
5. Occupation a) formal .... b) self employed ....c) never
    employed d) other(specify

11. CLINICAL CHARACTERISTICS MEDICAL

6. Do you currently smoke?   a) Yes .... b) No.....................
7. Have you ever smoked?   a) Yes............   pack years(   )   No( )
8. Do you cough(   ), wheeze (   ) or have shortness of breath(   ) , or a tight chest (   )
9. How do the above symptom(s) come?   a) Vary with time.................b) all the
    time, persistent/ chronic.................
10. Are these symptoms worse at night or early morning?   Yes).......................
    no).............
11. Do your symptoms have specific trigger? a) Yes.............................. b)
    no.................

If yes, what triggers

them..?

12. Do your symptoms get relieved by inhaler or nebulizer?

a) Yes................................b) no.................

13. When was the diagnosis of asthma? a) < 6 months, b) 6 – 12 months c) 1 – 2yrs
    d) > 2 years
14. How long have you had this current attack/ symptoms? a) < 2 hours, b) 2 – 6 hours
    c) 7 – 11 hours d) > 12 hours

15. Other medical conditions? a) CCF b) hypertension c) pneumonia   d) TB   e) allergy (specify...)

   Other.... (Specify)

16. Have you used any asthma medicines to relieve these current symptoms?   a) Yes. b) no

17. If yes, indicate the drug..

18. Do you have any other asthma medications you regularly use? a) yes   b) no

   Which one?

19. If yes, how long have you used the medication? a) < 6 months b) 6- 12 months c) 12 – 24 months d) > 24 months

20. In your own opinion, Rate your asthma control? 0 – uncontrolled , 1-poorly controlled 2 – fairly controlled   3 – well controlled

21. Have you missed any school day or work day because of   asthma in the past 3 months?

    a) Yes..... b) No.................................

22. If yes, how many times....................................

PHYSICAL EXAMINATION

Weight....................

Height....................

Blood pressure..................

Spo2:   pre neb..............

        Post neb...............

Respirations: pre neb.........

             Post neb.........

Pulse.................

Wheeze............... (Yes)

        .... (No)

Use of accessory muscles: pre neb.....yes ( )   no.... ( )

                      Post neb;   yes... ( ).   No..... ( ).

Dyspnoea   yes ( )   No ( )   pre neb:

                   Yes ( )   No ( ) Post neb:

PEFR (before neb): 1st reading ....litres/min   (Post neb) ....

                      2nd reading.............................litres/ min

....

                      3rd reading .... litres/ min

....

Key:

PEFR : >50% of personal best (moderate exacerbation)
PEFR </ = 50% of personal best (severe exacerbation)

II) KEY INDEPTH INTERVIEW GUIDE

Introduction:

Good morning/ afternoon?

My name is Lillian. I am going to take about 20 to 30 minutes to talk with you some issues concerning your asthma condition. This conversation is part of the research that you have been enrolled into and that you agreed to participate by the consent you signed. If you need any clarifications at this point, you are still welcome and I will address any concerns you have before we begin. Feel free to ask any questions during this brief interview session.

1. Kindly tell me, how do you perceive your level of asthma control? (probe; what are your trigger factors, specific activities or strategies you do to avoiding these triggers)

2. What do you think are the barriers to effective asthma control for you? (probe; asthma action plan, medications used, costs, family support, asthma information)

3. What is your opinion regarding the outcome for this current asthma exacerbation? (Probe; Are there any factors that you think could have contributed to this outcome?)

<div align="center">END</div>

APPENDIX IV: TOOLS

a) Anxiety Questionnaire

PSYCHOLOGICAL (ANXIETY SCORE) QUESTIONNAIRE								
Mood	0- Relaxed 1- irritable 2- Worried							
Tension	0- Calm 1- agitated 2- restlessness							
Fear	0 – no fear 1- expresses fear of unknown 2- fear being left alone							
Insomnia	0 – slept well 1- difficult falling asleep 2- night mares							
Memory at interview	0 – alert 1- difficulty concentrating 2- poor memory							
Depression	0 – enthusiastic 1- lacks interest 2- depressed							
Behavior at interview	0 – relaxed 1- fidgeting/ restless 2- confused							

**Modified tool; Hamilton Anxiety Rating Scale (HAM – A) available at
www.psychcongress.com/scales- screeners**

b) PEAK FLOW TABLE

APPENDIX V: TIMELINES
GHANT CHART

Duration in months: Nov 2015 – Nov.2016
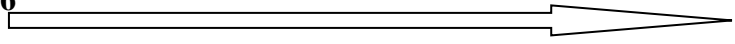
Activity	Nov. 2015	Nov	Dec	Dec	Dec	Jan	Jan	Feb	Feb	Mar	Apr	Apr	May	Jun	Jul	Aug	Sep	Oct	Oct	Nov 2016
Proposal development	█	█	█	█																
Proposal review by Ethical Committee				█	█	█	█	█												
Develop study instruments								█	█	█										
Pilot and refine study tools											█	█								
Data collection													█	█	█					
Data analysis and draft report writing															█	█	█			
Presentation of results and defense																		█	█	
Publication																			█	█

APPENDIX IV: BUDGET

Budget for proposed study				
Components	Unit of Measure	Duration/Number	Cost(kshs)	Total
a)Personnel				
Data analyst/statistician	1	15 days	2000	30,000
ERC	1		2000	2,000
Research assistant	2	20 days	1500	60,000
Data entry clerk	1	10 days	1500	15,000
b)Supplies/ materials				
Questionnaires	90	5	5	450
Consent documents	90	5	5	450
Draft report	60 pages	2	5	600
Final report	60 pages	2	5	600
Binding	2		800	1600
Document folders	8	2	100	1600
Pens	50		10	500
Rubber	10		5	50
Note books	10		5	50
Mouth pieces(for peak flow)	90	@100	9000	9000
c)10% contingency				10,630

Grand Total				116,930

APPENDIX VII: ETHICAL APPROVAL

APPENDIX VIII: Letter of Introduction

Appendix X: GRANT APPROVAL LETTER