EFFECTIVENESS OF PARENT-TARGETED HEALTH EDUCATION ON CONTROL OF ASTHMA AMONG CHILDREN ATTENDING CLINICS AT MOI TEACHING AND REFERRAL HOSPITAL, KENYA

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Effectiveness of Parent-Targeted Health Education on Control of Asthma among Children attending Clinics at Moi Teaching and Referral Hospital, Kenya

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other University.

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DEDICATION

I dedicate this work to my family, my wife Rosemary K., my children (Ryan, Ayanna, Reon) as well as the children who have inspired me to pursue respiratory medicine.

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ABBREVIATIONS AND ACRONYMS

ACQ	Asthma Control Questionnaire
ACT	Asthma Control Test
ATAQ	Asthma Therapy Assessment Questionnaire
BHR	Bronchial Hyper responsiveness
c-ACT	Childhood Asthma Control Test
FeNO	Fractional concentration of exhaled Nitric Oxide
FEV1	Forced Expiratory Volume in 1 second
FVC	Forced Vital Capacity
GINA	Global Initiative for Asthma
IgE	Immunoglobulin E
IREC	Institutional Research and Ethics Committee
ISAAC	The International Study of Asthma and Allergies in Childhood
KEMRI	Kenya Medical Research Institute
MTRH	Moi Teaching and Referral Hospital
PEF	Peak Expiratory Flow
RCT	Randomized Controlled Trial
TRACK	Test for Respiratory and Asthma Control in Kids
WHO	World Health Organization

DEFINITION OF OPERATIONAL TERMS

Asthma control The extent to which the various manifestations of asthma have been reduced or eliminated by treatment.

Good asthma control A score above 20 on childhood -Asthma Control Test (c-ACT) was used to categorize an individual child as having good control. Qualitatively, good asthma control refers to a situation where an individual does not have frequent symptoms, is able to perform his/her duties without limitation due to the asthma symptoms.

Poor asthma control A score of 20 and less on childhood Asthma Control Test. Qualitatively, this is a situation where an individual has frequent asthma symptoms that do interfere with functioning.

Observed status of control This refers to either poor or good control of asthma as determined in the individual child at baseline.

Self- management of asthma in childhood The tasks that individuals must undertake to live with asthma. In children who are not independent, these tasks have been recognized must essentially involve the parents.

Targeted asthma health education Health care provider-delivered asthma health education intervention which has taken into consideration the local context as well as the socio-cultural characteristics of the participant

ABSTRACT

Asthma control is the extent to which the various manifestations of asthma have been reduced or removed by treatment. In developing countries including Kenya, many children continue to visit hospitals with acute symptoms of asthma, which is a pointer to poor control. This study sought to determine the effectiveness of targeted health education on the level of control among children with asthma attending clinics at Moi Teaching and Referral Hospital (MTRH) in Eldoret, Kenya. A two phased study with Phase one: Cross-Sectional Study and Phase two: A Randomized Controlled Trial (RCT) study was carried out. A total of 166 children with asthma aged 6-11 years and their parents/caretakers were enrolled between August 2016 and October 2017 for baseline study. Subsequently between November 2017 and May 2018, 103 of these children and their parents/caretakers were involved in the RCT. The intervention for the RCT was video recorded health education. The main outcome was level of asthma control using childhood asthma control test (c-ACT). The secondary outcomes were factors associated with asthma control, knowledge and asthma perceptions among caretakers/parents; and health education material. Data was analysed using STATA with descriptive statistics being generated from the baseline study. Chi-square test or Fischer's Exact test as appropriate and multivariate logistic regression were used to analyse for associations. Outcome analysis was done based on intention to treat. Level of significance was set at 95%. Ethical clearance was obtained from MTRH/ Moi University; and informed consent was sought from all participants. The median age of enrolled children was 8.17 years with males being the majority, 94 (56.6%). Using a cut off for FEV1/FVC at <0.9, 96.9% of children had airflow limitation. Using c-ACT, 92 (55.4% 95%CI: 47.5, 63.1) had well controlled asthma at baseline. At univariate analysis, having a medical insurance cover (p=0.034), dry season (p=0.036), and parental perception of asthma control (p=0.002) were significantly associated with good control of asthma. Acceptance that a child had asthma was associated with poor control of asthma, p=0.046. On multivariate logistic regression, a perception of a well-controlled child by the parent/caretaker correlated well with good level of control of asthma. Although about 50% of the caretakers had asthma medications at home, only a third felt their children had asthma. One hundred and fourteen (68.7%) had basic asthma knowledge. Syrups were preferred to inhalers by 71.1%, with 64.5% believing that inhalers were for the very sick. Only 36 (31%) felt preventer medications in asthma were necessary. Acceptance of asthma as a diagnosis and presence of asthma drugs were significantly associated with better knowledge of asthma, p-values 0.0001 and 0.009 respectively. The odds of improving asthma control for the intervention group was 2.7 [95%CI (0.79-9.07)] higher than the control group after a 6month follow up. In conclusion**,** about half of the children in this set up have good control of asthma with the observed status of asthma control being affected by parental/caretaker perception on asthma despite having good basic knowledge on asthma. Video recorded health education improved asthma control based on c-ACT in this cohort, although not to statistical significance. Adoption of the tool and its strengthening by having more individualized innovative methods is recommended to effectively address asthma perceptions among caretakers in resource poor settings.

CHAPTER ONE

INTRODUCTION

1.1 Background

Asthma is a long lasting, non-communicable respiratory disease usually starting from childhood. It is defined as a chronic inflammatory disease of the airways. The disease develops due to interaction between environmental (mostly allergens) and genetic factors with the underlying hallmark being the chronic inflammation of the airways. The airways in the affected individuals usually are hyper responsive leading to recurrence of wheezing, coughing as well as breathlessness and chest tightness (GINA, 2021; Network, 2018). It is agreed that asthma is a complex condition with no single biological marker but has multiple aetiological causes (Network, 2018).

Asthma currently affects as many as 339 million people in all parts of the world. It causes substantial burden to the affected reducing their quality of life in different spheres of life. The burden is highest for children 10-14 years and those aged 75-79 years. Globally, fourteen percent of children experience asthma symptoms (Network, 2018). Asthma is an emerging public health problem in Africa as demonstrated by The International Study of Asthma and Allergies in Childhood (ISAAC) phase 3 study, where some countries had prevalence of 'current wheezing' comparable to that seen in Europe. Systematic review of published data on prevalence have shown similar trends (Adeloye *et al.*, 2013; Ait-Khaled *et al.*, 2007).

In Kenya, 10% of population has asthma (DLTLD, 2011). The ISAAC studies in Nairobi and Eldoret reveal an increasing prevalence in the country. In Eldoret the prevalence increased from 10.4 % to 13.8% between 1995 and 2000 (DLTLD, 2011; Esamai *et al.*, 2002; Esamai & Anabwani, 1996; Network, 2018).

The management of asthma mainly includes use of bronchodilators such as salbutamol and also steroids mainly the inhaled ones. The intensity of the treatment chosen is mainly influenced by the severity (Taylor *et al.*, 2008). These medications form the cornerstone of management (GINA, 2021). There has been concerted efforts

to ensure that these drugs are available in order to ease on individual's burden of asthma. However, though not at optimum levels, there is evidence that the availability of these medications alone does not lead to good control (Mash *et al.,* 2009).

Many other factors have been shown to influence the level of asthma control. Some of these factors are related to health workers while others relate to the caretakers of the affected children. Patients and their parents should therefore have asthma education to optimally manage the disease (self-management), in collaboration with healthcare professionals if good control is to be attained. While in independent children, self-management refers to individual's actions, in younger children, this encompasses their parents/caretakers actions (Capanoglu *et al.,* 2015; GINA, 2021; Jones, 2008; Papadopoulos *et al.,* 2012; D. Taylor *et al.,* 2008).

Health care provider-delivered health education interventions for children who have asthma has been effective in improving asthma self-management. With appropriate self-management there is improved level of asthma control. This has mainly been shown in developed countries (Guevara *et al.,* 2003; Jeminiwa *et al.,* 2019; Papadopoulos *et al.,* 2012; Wu & Pai, 2014). The asthma health education is delivered via tutorials, written materials, audio, video as well as computer programme. It is unclear whether these interventions work in the set-up of this study, which has different socio-cultural background. The extent to which adaptation of the international guidelines exists in order to tackle the burden of chronic respiratory diseases in low resource settings is unclear (Aït-Khaled *et al.,* 2001). In sub-Saharan Africa, a multinational study is evaluating use of drama to enhance childhood asthma control (Mosler *et al.,* 2020). Further how best to deliver these interventions has not been determined in Kenya and in particular patients attended to at the Moi Teaching and Referral Hospital (MTRH), which is the second largest national referral hospital in Kenya. We therefore set out to determine the level of asthma control and its associated factors among paediatric patients at MTRH and further checked whether modifying international health education messages and having them recorded in videos would help improve care in our set up. In this study after assessing the baseline characteristics of the study population, we used emerging perceptions

relating to childhood asthma and its management to come up with education videos. We programmatically tested whether these innovatively made education videos had effect on the level of asthma control among the children in our cohort.

1.2 Statement of the Problem

In developing countries including Kenya, many children continue to visit hospitals with acute symptoms of asthma, which is a pointer to poor control. In a study in Nairobi and its environs, good level of asthma control was reported to be 42% among asthmatic children aged 1-14years (Kigathi, 2012). Poor control of asthma is brought about by among others, poor knowledge on asthma self-management, the triggers of the exacerbations/flare ups in different individuals and the level of acceptance of the currently accepted care. In addition the socio-economic factors have a great role in exacerbating asthma flare ups (Buelo *et al.,* 2018). The level of acceptance of current care is affected by misconceptions and stigma associated with the management especially the use of inhalers (Ahmad & Ismail, 2015).

There is consensus world over that to achieve good control, child patients and their parents should be educated to optimally have self-management of the disease (Papadopoulos *et al.,* 2012). The evidence of implementation of such asthma health education is lacking in most community setup. Asthma management care gaps in Kenya include lack of health education and guidance on self-management (GINA, 2021). The national asthma guidelines in Kenya, provides a list of items that should be taught to parents and/ or their caretakers as well as the patients (DLTLD, 2011). However, a blanket application of international guidelines may not have the desired effect making them ineffective in the Kenyan poor resource set up. Furthermore, the lack of health education targeting children and young people disempowers these individual making them unable to participate in shared decision making of their condition (Sinha *et al.,* 2021). These contribute to poor asthma control. Lack of efforts to reduce asthma suffering is a contributor to more suffering and death. While asthma deaths are considered relatively few, the current estimates have overtaken malaria deaths worldwide. In 2019, asthma caused 461,000 deaths while malaria caused 409,000 (WHO, 2020). Even worse, the disability adjusted life years

(DALYS) attributable to asthma stood at 23.7 million in 2016. These asthma effects are worse in low- and middle-income countries (Network, 2018).

1.3 Justification

While self-management is determined by patients/care takers knowledge on asthma, health education is best offered in the clinical setting. Studies in developed countries focusing on educational interventions for asthma in children, have contributed to proper asthma management hence improving the quality of life. Addressing knowledge gaps in asthma self-management is important in ensuring optimal care at a national referral hospital. Anecdotally, at MTRH, on average 3-4 children are nebulized every day, this national referral hospital does not have an asthma specific clinic for children. It is difficult to give group education in such a set up. Innovative strategy of video recorded targeted asthma health education offers an opportunity for a continuous process, repeated and supplemented at every subsequent consultation. In Western Kenya, use of firewood and charcoal for cooking, pollination episodes, low income of parents, and health facilities being far are some of the issues which call for local adaptation of international guidelines and practices. This is in line with international consensus that health education should be tailored to the sociocultural background of the family.

This study generates evidence on adaptation of international asthma health education guidelines in children in low resource set up. Further, it will offer innovative approach to health education in a set up with limited healthcare workforce as well as enable replication of this intervention in other centres within the country with similar situation. These in turn will help alleviate the suffering that is occasioned by asthma to such children, including lack of schooling, creating an economic burden to the family and the society in general as well as being at risk of premature deaths.

1.4 Research Questions

1. What proportion of children with asthma attended to at MTRH have good level of control of asthma?

2.What factors are associated with good level of control of asthma in children attended to at MTRH?
3.What is the perceived knowledge on asthma self-management among caretakers of children with asthma at MTRH?

1.5 Hypothesis

1.5.1 Null Hypothesis

There is no difference in asthma control between children whose parents receive targeted health education and those who do not.

1.6 Objectives

1.6.1 Broad Objective

To determine the effectiveness of targeted health education on the level of control among children with asthma attending clinics at MTRH.

1.6.2 Specific Objectives

1.To determine the proportion of children with asthma attended to at MTRH having good level of asthma control.
2.To determine factors associated with good level of asthma control among children attended to at MTRH.
3.To establish knowledge and perceptions existing among caretakers of children with asthma on self-management of asthma at MTRH.
4.To compare the level of asthma control among children of caretakers given targeted health education and those who receive standard care at MTRH.

CHAPTER TWO

LITERATURE REVIEW

2.1 Definition and Scope of Asthma

Asthma is a heterogeneous disease, usually characterized by chronic airway inflammation. It is defined by the history of respiratory symptoms such as wheeze, shortness of breath, chest tightness and cough that vary over time and in intensity, together with variable expiratory airflow limitation (Network, 2018). This definition is largely descriptive (Papadopoulos *et al.,* 2012). This has posed difficulties in making a firm diagnosis of asthma especially in children below 5 years. Wheezing for example can occur repeatedly in children without asthma due to viral infections (Zar & Levin, 2012). In most developed countries, there is axillary test support especially in those above 5years. This is difficult in developing countries and most of the time, the diagnosis is made based on symptoms and detailed history taking (Lalloo *et al.,* 2011; Zar & Levin, 2012).

While the symptomatology has its challenges as exemplified above, there are concerns that asthma as currently understood is probably different diseases presenting as one. These have been termed the asthma phenotypes; they include allergen induced, obesity related, exercise induced, virus-induced, multi-trigger and unresolved. This has been thought to have implications in treatment outcome by some quarters although more research is needed to make this conclusive (Papadopoulos *et al.,* 2012). Other aspects of this diversity in the presentation of asthma have led to the classifications of either using severity into mild intermittent and persistent asthma subdivided into mild, moderate and severe; or into the level of control (GINA, 2021).

The lack of consensus on what asthma really is, has been compounded by the inability to have common pathway of the aetiopathogenesis of asthma (Carlsen *et al.,* 2015). Some important aspects of aetiology have been thought to be the prenatal exposures as well as the early life especially as pertaining infancy. These exposures

play a critical role in genetically predisposed individuals. The factors in this paradigm include tobacco smoke exposure, viral infections, early use of antibiotics, exposure to cow's milk, being delivered via caesarean section and male gender are thought to increase risk of development while maternal use of fish oil, diets high in vitamin E and zinc, large family size especially in subsequent birth order, exposure to farm animals have been shown to decrease asthma development risk consistently. The issue of breastfeeding, exposure to dogs and cats, vitamin D deficiency, socio-economic status and stress are not consistent in various studies (GINA, 2021; Papadopoulos *et al.,* 2012; Pitter *et al.,* 2016; Shen *et al.,* 2018; Subbarao *et al.,* 2009). The development of allergen-specific IgE, especially if it occurs in early life, is an important risk factor for asthma (Papadopoulos *et al.,* 2012). However, this association of asthma and atopy has been contested especially in developing countries where other factors including presence of helminths has been shown to play a role (Atiim & Elliott, 2016; Bousquet *et al.,* 2003; Sunyer *et al.,* 2000; van Gemert *et al.,* 2011).

The result of this gene-environment interaction is chronic airway inflammation with remodelling making such airways hyper responsive to environmental triggers. Some of the asthma triggers which have been documented include: indoor allergens, for example house dust and pet dander; outdoor allergens including pollens and moulds; tobacco smoke; chemical irritants; cold air; extreme emotional arousal like fear and anger; exercise as well as certain medications as exemplified by nonsteroidal anti-inflammatory drugs like Aspirin, and beta-blockers (WHO, 2016).These triggers when present trigger an acute reaction which clinically manifests as cough, wheezing, chest tightness and shortness of breath. Acute episodes of airway narrowing are initiated by a combination of oedema, infiltration by inflammatory cells, mucus hypersecretion, smooth muscle contraction, and epithelial desquamation (Papadopoulos *et al.,* 2012).

2.2 Prevalence of Asthma

Current estimates show that asthma affects 339 million people worldwide. Unfortunately, these current estimates are based on model data from studies carried

out 10years ago. At least 14% of the world's children experience asthma symptoms (Network, 2018)

In Africa, as at 2010, it was projected that 49.7 million (13.9%; 95% CI 9.6-18.3) children <15 years had asthma (Adeloye *et al.,* 2013). These estimates vary widely among the countries. Generally most countries which participated in the ISAAC studies reported asthma symptoms prevalence of between 10 and 20% (Ait-Khaled *et al.,* 2007). The asthma symptoms prevalence is generally increasing in Africa (Masekela *et al.,* 2018; Pearce *et al.,* 2007).In a study done in Uganda by Nantanda *et al.,* 2013, the prevalence of asthma in children presenting to the emergency department with respiratory symptoms was 20.8% (Nantanda *et al.,* 2013).

In Kenya the prevalence of childhood asthma has been estimated by the ISAAC studies which were done in Eldoret and Nairobi. The National Guidelines for Management of Asthma in Kenya indicate that from these studies, it is estimated that overall 10% of the population has asthma (DLTLD, 2011). The most recent estimates showed that in Eldoret the asthma symptoms occurred in 13.8% while in Nairobi it was at 18.0% (Ait-Khaled *et al.,* 2007). There has been demonstrated increasing prevalence of asthma symptoms in Eldoret from the previous estimates from 10.4% to 13.8% (Esamai *et al.,* 2002; Esamai & Anabwani, 1996). Overall, Kenya has little prevalence data on asthma in general, with no recent updates, what is considered recent is close to 20 years now (Network, 2018).

Difficulties in estimating asthma prevalence and hence the paucity in data relating to the same have been brought about by challenges in diagnosis of asthma, more so childhood asthma (Van Wonderen *et al.,* 2010). This subject will be further dealt with in subsequent discussion.

2.3 Diagnosis of Asthma

The most important aspect of asthma diagnosis in children lies in getting a good clinical history. While tests such as lung function tests are considered important and are part of national guidelines (DLTLD, 2011), they are largely unattainable in most developing countries. In a study done in Nigeria only 34% of the clinicians

considered lung function testing for their patients (Ayuk *et al.,* 2010). Another study done among private practitioners in South Africa showed even a lower rate of 9%. These studies serve to give evidence which is normally not acknowledged that most children are in fact treated for asthma without ever receiving lung function testing. Even when it is available the reference values are not determined (Masekela *et al.,* 2019). The question thus arises, can diagnosis of asthma be made without the complementary testing.

The current estimates of asthma are based on model data from ISAAC studies carried out 10 years ago (Network, 2018). This is based on questionnaires diagnosis. There is consensus that the questions used are sensitive, some as high as above 80% and can be used to estimate asthma prevalence. Specificity for these questions is as high as above 90%. They have been validated and used in multicentre surveys (Adeloye *et al.,* 2013; Manual, 1993; Van Wonderen *et al.,* 2010).This includes having been used in Eldoret during the ISAAC surveys (Esamai *et al.,* 2002; Esamai & Anabwani, 1996). The testing for bronchial hyper-responsiveness in addition to positive questionnaire response is highly specific but not sensitive at 47% (Jenkins *et al.,* 1996). There is evidence that bronchial hyper-responsive testing only adds minimal sometimes non-significant advantage over well thought out questionnaires like those used in ISAAC studies (Ponsonby *et al.,* 1996; Remes *et al.,* 2002).

Similarly, there are counter arguments as presented by Salome et.al, 1987, that questionnaire data of wheeze and diagnosed asthma do not reflect accurately the level of bronchial hyper responsiveness (BHR) in the community. In their study, 6.7% of children had BHR without symptoms or a previous diagnosis of asthma and 5.6% had had a diagnosis of asthma but had no BHR. However, they concluded that there was a strong association between BHR and symptoms, particularly in children with severe and moderate BHR (Salome *et al.,* 1987). This paper was published close to 20 years back with the more recent arguments supporting the questionnaires written around the time ISAAC studies were carried out.

To demonstrate further the difficult and challenges of making diagnosis in poor resource set up, a study in Uganda, used review of clinical history to make a

diagnosis of asthma in children who presented to hospital with respiratory symptoms (Nantanda *et al.,* 2013). Turning to the aspect of age of diagnosis using wheezing as a measure of asthma diagnosis, it is generally agreed that individuals who continue to wheeze recurrently beyond 6 years of age are consistently diagnosed with asthma when complementary measurements are used (Stern *et al.*, 2008). Current studies are now showing persistence of recurrent wheezing beyond 18months of age is associated with asthma diagnosis (Duijts *et al.*, 2016).

2.4 Asthma Control

In this section, the different aspects of asthma control have been addressed. These range from the definitions, measures as well as determinants of asthma control in childhood.

2.4.1 Definition of Asthma Control

Controversies exist on the definition of asthma that extend to what control is. Consensus building has resulted in the following definition: Asthma control is defined as the extent to which the various manifestations of asthma have been reduced or removed by treatment (Reddel *et al.,* 2009). Further, asthma control is the degree to which therapy goals are met (Bousquet *et al.,* 2010). In practice, the level of asthma control, is determined from features such as symptoms and the extent to which the patient can carry out activities of daily living and achieve optimum quality of life; another domain of asthma control is future risk of adverse outcomes (GINA, 2021; Reddel *et al.,* 2009; Taylor *et al.,* 2008). Three levels of asthma control have been identified: controlled, partly controlled and uncontrolled. This is as shown in the table 2.1.

Table 2.1: GINA Assessment of asthma control in children 6-11 years

Asthma Symptom Control	**Level of Asthma Symptom Control**		
In the past 4 weeks, has the patient had:	**Well Controlled**	**Partially Controlled**	**Uncontrolled**
Daytime asthma symptoms more than 2/week? Yes/No Any night waking due to asthma? Yes/No Reliever needed for symptoms more than 2/week? Yes/No Any activity limitation due to asthma? Yes/No	None of these	1-2 of these	3-4 of these

*Adopted from GINA Guidelines (GINA, 2021).

2.4.2 Asthma Control Measurements

There is no gold standard for measuring asthma control in children, it is argued that the current classification by GINA into levels of control has not been validated in children (Reddel *et al.,* 2009). Previously there was a lot of emphasis in doing lung function tests while assessing control. However, even where applicable, it is advised that this should be done as part of compressive assessment rather than a stand-alone asthma end point (Bousquet *et al.,* 2010).

In determining asthma control in children, various methods have been used including web based diaries, GINA criterion, childhood asthma control test (c-ACT), asthma control questionnaire (ACQ), Asthma Therapy Assessment Questionnaire (ATAQ), Test for Respiratory and Asthma Control in Kids (TRACK), performing lung function tests, and fractional concentration of exhaled nitric oxide (FeNO) (Dinakar *et al.,* 2017; Voorend-van Bergen *et al.,* 2015).

Generally the c-ACT, has received much attention and is currently recommended by the national guidelines in Kenya (DLTLD, 2011). It is used for children aged between 4 and 11 years. This c-ACT has been validated in several countries and has been shown to be sensitive in determining the level of control (Green *et al.,* 2013; Liu *et al.,* 2007). It can differentiate between poor and good control of asthma in

children. Comparing it with FeNO, the c-ACT was found to be superior in determining the control status of children with asthma and has been recommended as a complementary tool in clinical practice to detect children with not well-controlled asthma (Yavuz *et al.,* 2012). A study by Kim, *et al.* (2015) showed that c-ACT correlated well with PEF and FeNO (Kim *et al.,* 2015). When compared to GINA criteria, most studies have shown consistency (Voorend-van Bergen *et al.,* 2015) except one study which showed small inconsistencies were apparent, the authors attributed it to the fact that the duration of recall is different as well as use of lung function tests in the GINA criterion (Erkoçoğlu *et al.,* 2012). However, this may be contested since most studies have shown consistency of FEV1 and PEF on c-ACT scores (Kim *et al.,* 2017; Voorend-van Bergen *et al.,* 2015).

In this study, c-ACT has been adopted. A score of 20 or more is usually used to categorize an individual child as having good control while a score of 19 and usually is used to categorize children as poorly controlled (DLTLD, 2011). The score of 19 as a cut off has a sensitivity of 68% and specificity of 74% (Liu *et al.,* 2007). However, Koolen *et al.* (2011) found a sensitivity of 33% and specificity of 100% when compared to GINA criterion at that cut off. These cut offs are generally agreed to be suitable although some overlap may occur between 19 and 22. Poor control as per this terminology is like the uncontrolled GINA terminology with the partially controlled and controlled being those with 20 and above. Though not commonly done, the scores of 23 and above, essentially those above the overlap area, are the well-controlled (Koolen et al., 2011; Liu et al., 2007; Voorend-van Bergen *et al.,* 2015). Where there is negative perception towards asthma, a higher score is likely to give a better picture (Shi *et al.,* 2012). Using data from Liu *et al.* 2007, the cut off of 20 we adopted has a sensitivity of 73% and specificity of 63%.

2.4.3 Determinants of Asthma Control

Asthma control is the degree to which therapy goals are met. One way of achieving this is by use of control-based asthma management. This model involves pharmacological and non-pharmacological treatment being adjusted in a continuous

cycle that involves assessment, treatment and review (GINA, 2021). This is shown in the chart in figure 2.1 that has been adopted from GINA guidelines (GINA, 2021).

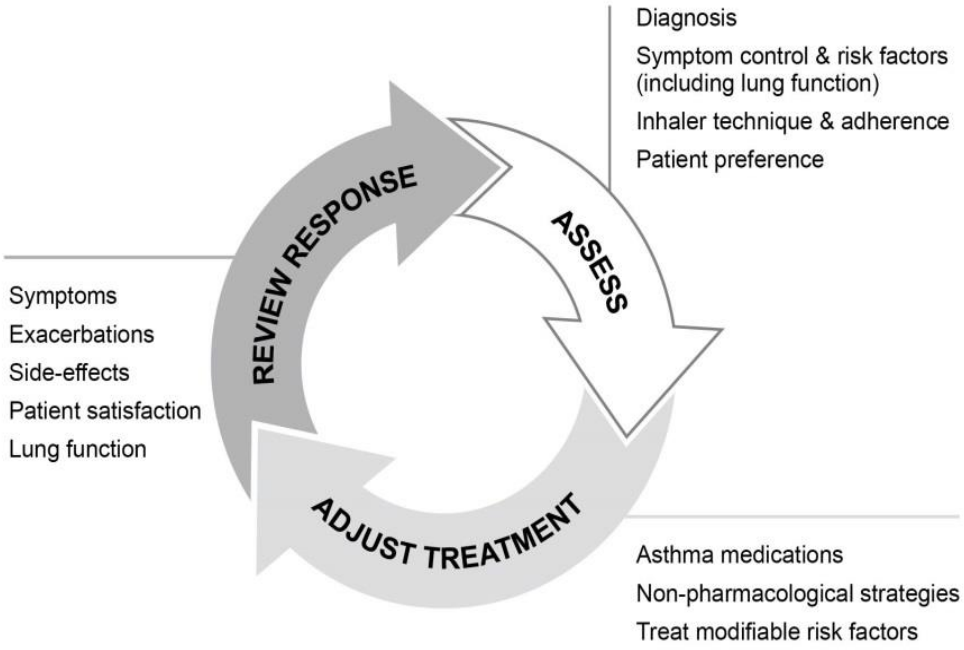

Figure 2.1: The control-based asthma management cycle

It is clear that asthma control is determined by several factors. Guideline-based asthma care has been associated with good asthma control in most children. Adherence to inhaled corticosteroids is an independent strong predictor of long-term asthma control (Jabeen *et al.*, 2018). It has been shown that, highest levels of asthma control are found in children with adherence >80% of doses prescribed (Klok *et al.,* 2014). These inhaled corticosteroids are part of pharmacological agents used in treatment of asthma. They belong to what is referred to as controller medications while those agents used when an individual has an exacerbation are referred to as rescue(reliever) medications (GINA, 2021).

Other factors which have been shown to influence level of control is the parents' satisfaction with shared decision-making as well as perceived self-efficacy in interacting with the health worker (Gandhi *et al.,* 2013). Similarly, low educational attainment, low income, cigarette smoking, co-morbid conditions including obesity

and depression (Sheehan & Phipatanakul, 2015; Zahran *et al.,* 2015), cockroaches (Pomés *et al.,* 2017), pet ownership, other allergic comorbid diseases, especially rhinitis (Sasaki *et al.,* 2014), weather seasonality (including pollination), occupation and food allergies (Kewalramani & Bollinger, 2010; Mireku *et al.,* 2009; WHO, 2016) have also been shown to affect control in asthmatics.

Although, 'difficult to treat asthma' can affect control even when everything has been done as expected (Chung *et al.,* 2014), there is overwhelming evidence that poor asthma education affects medication compliance (GINA, 2021; Guevara *et al.,* 2003; Papadopoulos *et al.,* 2012; Sánchez-Borges *et al.,* 2011; Wolf *et al.,* 2002). Adherence to treatment has been shown to be the single most important determinant of asthma control (Klok *et al.,* 2014).

2.4.4 Asthma Health Education in Childhood Asthma Control

There is no clear consensus on how to define asthma education. Asthma self-management education involves a collaborative partnership between the education provider and the patient. Teaching asthma education to children has to involve the parents/ caretakers for it to be successful (Boulet *et al.,* 2012; Jones, 2008).

Among many communities, there are misgivings and stigma associated with asthma diagnosis as well as asthma treatment (GINA, 2021). More so the use of inhalers is given a wide berth by many parents and the communities. In many instances, parents feel that the inhalers are bad and likely to lead to worse adverse outcomes compared to the delivery of bronchodilators using such means as syrups which is the opposite of the truth. Further, these misgivings as well occur among health workers who have not received specific asthma training especially on the GINA guidelines (Lalloo *et al.,* 2011; Mash *et al.,* 2009). This situation is worse in resource poor settings (Ait-Khaled *et al.,* 2006; Sánchez-Borges *et al.,* 2011). It has been recommended that educational programmes should be considered a part of the routine care of young people with asthma (Guevara *et al.,* 2003).

Key educational issues for the patient receiving asthma education include the understanding of the disease process in asthma, including its chronic/relapsing

nature, the need for long-term therapy, and the different types of medication ('controllers' and 'relievers'), how they work and when they should be used, what to do in an emergency situation (with self-management instructions), and adequate education on the proper technique for the use of inhaled medications as well as identifying triggers. Physical demonstration of their use should be done. Importantly, education should highlight the importance of adherence to prescribed medication even in the absence of symptoms (Agusala *et al.,* 2018; GINA, 2021; Papadopoulos *et al.,* 2012; Sánchez-Borges *et al.,* 2011).

Asthma education is necessary as there is evidence that with good knowledge on asthma education among patients or their parents and/or caretakers, self-management of asthma improves. Educational programmes for the self-management of asthma in children and adolescents improve lung function and feelings of self-control, reduce absenteeism from school, number of days with restricted activity, number of visits to an emergency department, and possibly number of disturbed nights (Guevara *et al.,* 2003; Kelly *et al.,* 2000; Morgan *et al.,* 2004; Papadopoulos *et al.,* 2012).

In developed countries, studies have shown that health education interventions to the patients and/or their parents has positive impact on the control. In a systematic review done as part of the Cochrane reviews in 2002, it showed that asthma education improves the level of control among children affected by asthma. This review recommended that further research should be on what components of asthma education are effective (Wolf *et al.,* 2002). Existing consensus statement emphasize that asthma education should be tailored to the socio-cultural background of the patients (Papadopoulos *et al.,* 2012). In several papers looking at the treatment of asthma, it is noted that blanket application of international guidelines may not have the desired effect (Aït-Khaled *et al.,* 2001; Andrade *et al.,* 2010; Bousquet *et al.,* 2007; van Gemert *et al.,* 2011). The national asthma guidelines in Kenya, provides a list of items that should be taught to parents and/ or their caretakers as well as the patients. The guidelines do not attempt to provide the process of asthma education nor do they provide details of what else should be covered when educating patients and/or their parents on asthma (DLTLD, 2011).

Asthma education can be delivered to individuals or groups with possibly similar results. However, in facilities without many patients coming on specific days, it's hard to give group education as demonstrated in South Africa (Mash *et al.,* 2009). There is no much evidence to prefer any mode of delivery over another (Homer et al., 2000; Partridge & Hill, 2000). Personalized paediatrician recorded messages given to parents of children aged 4-11 years could be effective in enhancing control (Cowden *et al.,* 2015). Asthma education should not be regarded as a single event but rather as a continuous process, repeated and supplemented at every subsequent consultation (Papadopoulos *et al.,* 2012). In randomized trials, the effect of asthma education has been demonstrated from 3-12months, with consensus that more effects are demonstrated in studies reviewing impact on control between 6 and 12 months (Wolf *et al.,* 2002). Further, these effects wear off with time and it appears such interventions should be sustained if the effects noted above are to be sustained (Tantawi *et al.,* 2012; Wu & Pai, 2014).

2.5 Research Gaps

While asthma education has been effective in enhancing asthma control in patients who suffer from this condition, there is little evidence that this is actively practiced in resource poor setting. Again, it is unclear whether the recommendations of having effective health education have been followed in these countries. There is thus need to come up with an effective educational tool to help in effectively controlling asthma in children.

In developing asthma education targeted to a particular group, it is essential to review existing guidelines on the same, in this case GINA guidelines, it will be necessary to look at the background cultural practices including existing knowledge gaps, consider what has been thought to be effective and the basic concepts of what must constitute asthma education. This has been reported to be a key process while developing and/or planning asthma education (Boulet *et al.,* 2012; Jones, 2008).

2.6 Conceptual framework

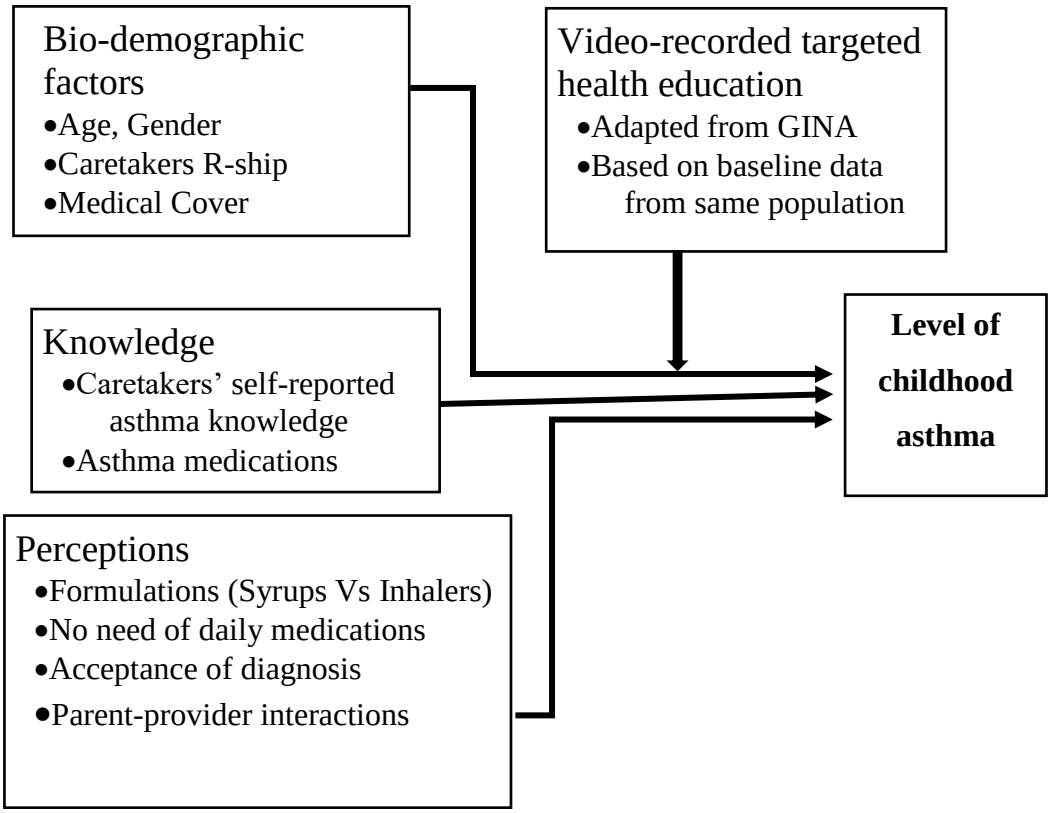

Figure 2.2: Conceptual Framework

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study Site

Study was carried out at the children's outpatient clinics of the Moi Teaching and Referral Hospital (MTRH). MTRH is a national referral hospital serving the Western part of Kenya with a catchment population of approximately 15 million. It is situated in Eldoret town, in Uasin Gishu County. Uasin Gishu County has a rainy season that extends from March to November of every year with June, July and August having low intensity of rainfall. The annual average temperature is 16.6^{o}C, with range of 8.4^{o}C to 27^{o}C. Uasin Gishu County is largely agricultural with Eldoret town being the economic hub of the county.

MTRH has an average of 3,100 children visiting the hospital for treatment in a month. On average 3,000 attend the filter outpatient clinics both in the general and private wings. There are two specialized paediatric clinics per week which attend to an average of 100 children per month. There is no asthma specific clinic for children in the hospital. There are no special asthma health educators and thus patient education is at the discretion of the attending clinician. Routinely no lung function tests are performed on children who are on management for asthma at the hospital.

3.2 Study Design

This was a two phased study. Phase one used a cross-sectional study design. This initial phase was used for screening prevalence, establishing knowledge gaps and factors associated with childhood asthma control. Information generated in phase 1 was used to develop an education tool that was used in the intervention phase 2.

In phase two, a randomized controlled trial (RCT) study design was used. The study participants were randomized into either an intervention or a control arm then followed for 6 months to determine differences in level of asthma control. In this phase, an innovative tool that involved video recorded health education material was used as the intervention and compared to routine care.

3.3 Study Population

Children with asthma attending clinics at MTRH together with their parents/caretakers were enrolled into the study based on the following inclusion/exclusion criteria.

3.3.1 Inclusion criteria:

- Children aged between 6-11 years and accompanied by a parent/caretaker
- Meeting criteria for diagnosis of asthma using ISAAC screening questionnaire
- Parental/caretakers consent

3.3.2 Exclusion criteria:

- Children who were unstable or very sick (requiring urgent resuscitation measures such as oxygen, urgent rehydration, anticonvulsants) and succumb to illness within 24 hours of screening.
- Children with serious chronic comorbidities, for example, Chronic Heart Failure.
- Children who were not to continue residing in western Kenya for 6 months after recruitment.

3.4 Sample size

Phase one: Cross-Sectional Study:

To determine the minimum sample size necessary to establish the prevalence of good level asthma control among children with asthma seen at MTRH, the Fisher's formula was used.

$$n = \frac{Z^2 \hat{p}(1-\hat{p})}{e^2}$$

n = the sample size

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

$\hat{P}$ = Estimated proportion of children with asthma that have good level of control (42%) (Kigathi, 2012)

e = Desired level of statistical significance (5%)

n= 374

Applying FINITE Population Correction for sample size

$$n_a = \frac{n}{1 + \frac{(n-1)}{N}}$$

Where

n_a =the adjusted sample size

n = the original required sample size

N= Population size (40 Children with asthma per month [10% of 400 Screened, taking care of diminishing numbers as per above permutations for 6 months] = 240

Thus: n_a = 147

Phase Two: RCT Study:

Sample size was calculated based on differences in proportions to establish the effect of targeted asthma education among children with asthma seen at MTRH.

Taking predictor (intervention) and outcome (Asthma control) variables as both dichotomous, the following formulae would be applicable (Betty & Jonathan, 2003).

$$N = \frac{\{Z \propto \sqrt{(P1(1-P1) + P0(1-P0))} + Z\beta\sqrt{\left(2\dot{P}\left(1-\tilde{P}\right)\right\}^2}}{(P0-P1)^2}$$

Where

P0= 42% -Prevalence of good control, based on a Nairobi study (Kigathi, 2012).

P1-P0= Expected clinical difference* =25%. *The difference in children with good control asthma.

Thus, P1 is taken as 67%

$\dot{P}$ = (P0+P1)/2

α = Level of Significance= 0.05, Two-sided

β= Type II error=20% and 1-β=Power of study at 80%.

N= 69 participants

3.5 Sampling Techniques

All children that met criteria for asthma diagnosis, were consecutively enrolled into the study for phase I and subsequently randomized into the phase II.

3.6 Study Procedures

3.6.1 Person In charge of Study/Research Assistants

At the beginning of the study, research assistants who were clinicians with paediatric background (that is, Clinical Officers with Higher National Diploma in Paediatrics or in Training as well as Paediatric Residents in Training) as well paediatric nurses, were trained on the expectations and the objectives of the study, including on the tools used. At least 4 research assistants were contracted to ensure adequate coverage of the filter clinics as well as the specialized clinics on all the weekdays from 8am to 5pm during screening. Participants were recruited at exit from the outpatient department after being attended to.

3.6.2 Screening Procedures

All children, aged 6-11years, presenting to hospital were screened for eligibility until the minimum phase 1 sample size was achieved irrespective of the reason for visiting the hospital to determine suitability for being enrolled into the study. This was done between August 2016 and October 2017. After the child met age criteria, the parent or caretaker were subjected to a screening questionnaire after consenting. The ISAAC questionnaires which were validated and used in multicentre surveys in several countries were used (Adeloye *et al.,* 2013; Ellwood *et al.,* 2005; Manual, 1993; Network, 2018; van Gemert *et al.,* 2011). This tool has 8 questions which are answered by the parent/caretaker (Appendix 1). Those who met asthma definition as per this screening tool were enrolled into the study.

3.6.3 Baseline Data

All children identified as having asthma had data collected from them using a questionnaire which mainly looked for background variables including spirometry values, level of asthma control using a childhood asthma control test [this a tool which has been validated for 4-11year old and used in several countries (Green *et al.,* 2013; Liu *et al.,* 2007) and is part of national guidelines in Kenya (DLTLD, 2011), it has 7 questions and is answered both by the child and the caretaker/parent]. Data on

parental knowledge and beliefs concerning asthma treatment was also collected. Spirometry was done using the MicroLab III®Spirometer model. See appendices II and III.

3.6.4 Randomization

At the end of October 2017, once the baseline information had been collected, 166 children-caretaker pairs were randomized into either intervention or control groups without reference to their baseline characteristics. Randomization was done by computer software based on study identification numbers. The computer software was programmed to give two sets of numbers with labels of control and intervention. The randomization was done at the end of the screening once all the participants to be in the study had been identified. This ensured that allocation of participants to either group was not predictable.

3.6.5 Blinding

After allocation, the two groups were open labelled though the assessors of the outcome were single blinded to allocation of participants. Due to the nature of the study, it was not possible to blind the participants on the arm they were allocated in. However different return dates were given to minimize on 'spill overs'.

3.6.6 Intervention Procedures

Once the participants came for the first visit of the second phase of the study, baseline outcome measure of the level of asthma control using c-ACT was done. This is the point we managed to do the baseline spirometry lung function testing.

The intervention group (the parents/caretakers of children with asthma) received targeted education material (details of the development of the education material are provided as appendices IV and V). This was adopted from the Global Initiative on Asthma guideline (GINA, 2021) as well the national guidelines on treatment of asthma (DLTLD, 2011)**.** Local adaptation was done with the help of the baseline data. The local adaptation was based on knowledge gaps as well as sociocultural issues identified from the questionnaire. This was published as a peer reviewed

article (Simba *et al.,* 2018). This education was delivered using videotaped teaching based on the above education material. Recordings of health education session were made, where children with asthma together with their parents were educated in the clinic by the principal investigator. None of these children was part of the study. The video clips were 7 minutes long, for English version and 4.5 minutes for Kiswahili version and were repeated twice in each session. The final video version had been validated through an elaborate process described in the appendix aforementioned. The intervention was delivered to a group of participants of up to 15 parents/ caretakers per session. A room for this purpose was reserved at the outpatient Memorial Wing of MTRH, 1st Floor, ensuring that there was a conducive environment for learning. The videos were projected to the screen using an EPSON projector Model EB-X31, 3LCD Projector system, 3200 Lumens, Native Resolution 1024*768 connected to computer through HDMI, ensuring maximum clarity. This was done in two sessions a month apart. The first session occurred on the third week of November 2017. Each study day, up to 30 participants were able to watch the videos. The return dates were carefully selected to avoid mixing with control arm participants. This was to avoid contamination effect. *A priori,* an exit interview was planned to assess any possibility of contamination. These occurred in the month of January 2018. After use of the rooms, all the study apparatus, including the videos were secured by the study coordinators to ensure they are not accessed by any other person. The videos were encrypted, and password protected.

The control group continued to have their routine care. Routine care for children with asthma at MTRH involves the child with his/her parent/caretaker being seen by the clinician/doctor who provides the appropriate treatment and counsels them as appropriate. No additional health education is offered to them after the consultation.

This was a pragmatic trial and thus the other aspects of care were left as they were so as to simulate what is likely to happen in the real life if the intervention was to be adopted. However, where a patient was identified as having asthma/ the spirometry showed they had significant airflow obstruction, necessary action was taken by the research team. Throughout the study, participants were contacted through their

phones and text messages to remind them of upcoming scheduled return dates for the study.

3.6.7 Monitoring

Throughout the study period, both groups were monitored for any adverse outcomes (Appendix VI). The principal investigator recruited a research coordinator to work closely with the research assistants. Any new member of the team was appropriately trained on the research protocols and actions to be undertaken in case of emergency.

3.7 Data Collection Tools

A structured questionnaire was used to collect data on background variables which include socio-demographic characteristics as well as possible risk factors and triggers for asthma in the individual child. Other clinical parameters sought included, the mode of diagnosis and the treatment the patient has been on including level of adherence. The questionnaire was also used to determine the level of asthma control. Other aspects assessed from this tool were the parental knowledge and beliefs concerning asthma treatment.

Outcome measurement at the end of follow up was done by use of childhood asthma control test. Exit questionnaire (appendix VII) was administered to the participants to assess for awareness of intervention among them.

3.8 Outcome Measures

The primary outcome measure for this study was effectiveness of intervention/care. It was measured as the proportion with either good or poor level of control of asthma in the intervention and control arms. This was done by independent persons (Two Clinical Officer with Higher National Diploma in Child Health and Paediatrics), blinded on the allocation, using the childhood asthma control test. It was assessed after 6 months of follow up after randomization and first intervention (Wolf *et al.,* 2002). This was done from the second to the fourth week of May 2018. The secondary outcome measures were from the baseline study and include factors

associated with asthma control, knowledge gaps on childhood asthma as well as coming up with educational tool.

3.9 Data Management

Data was cleaned and entered into MS Access. It was then exported to analytical software (STATA Version 13) for analysis. Descriptive statistics such as means, median, frequencies, and standard deviation for continuous data and frequency listings for discrete data statistics were then generated from the baseline study. Knowledge on asthma was assessed by scoring individual questions with 1 score for correct response and dichotomized to ≤9 and ≥10 as not knowledgeable and knowledgeable respectively. Attitude questions were individually scored and presented as such. For c-ACT, a cut off of above 20 was used as good control having adjusted for possible negative impact of the perceptions on asthma in this community (Shi *et al.,* 2012; Simba *et al.,* 2018).

Chi-square test or Fischer's Exact test as appropriate (Fischer's exact test used for categorical values below 5), was used to test for categorical variables association at baseline. Multivariate logistic regression was used to check for factors independently associated with control at baseline. Outcome analysis was done based on intention to treat. To compare the difference in proportion of good level of asthma control (c-ACT) between baseline and end-term, logistic regression adjusting for difference in baseline control was done (similar to difference-in-difference analysis). Level of significance was set at 95%.

Data has been presented in prose, graphs, charts as well as tables. Dissemination of results has been through presentation to the hospital, to the university in form of thesis, and the scientific community through presentation in conferences as well as publication in peer reviewed journals.

3.10 Ethical Considerations

Ethical approval was obtained from the ethics review committee of MTRH/College of Health Sciences, Moi University (Appendix VIII). Permission from Director of

MTRH was sought to undertake the research in the hospital. Informed consent was obtained from all participants with assent being sought from those children above 7 years of age (Appendices IX and X). Confidentiality has been maintained by ensuring only de-identified data was shared. No coercion to participate was done, however, transport was reimbursed at a flat rate of Ksh.300.00 per follow up visit. The participants were linked to care at the various specialist clinics at MTRH. Dissemination of findings has been done in peer reviewed journals (Appendix XI)

3.11 Study Flow Chart

Figure 3.1, shows the number of study participants screened and subsequently those that were recruited for phase II, the RCT

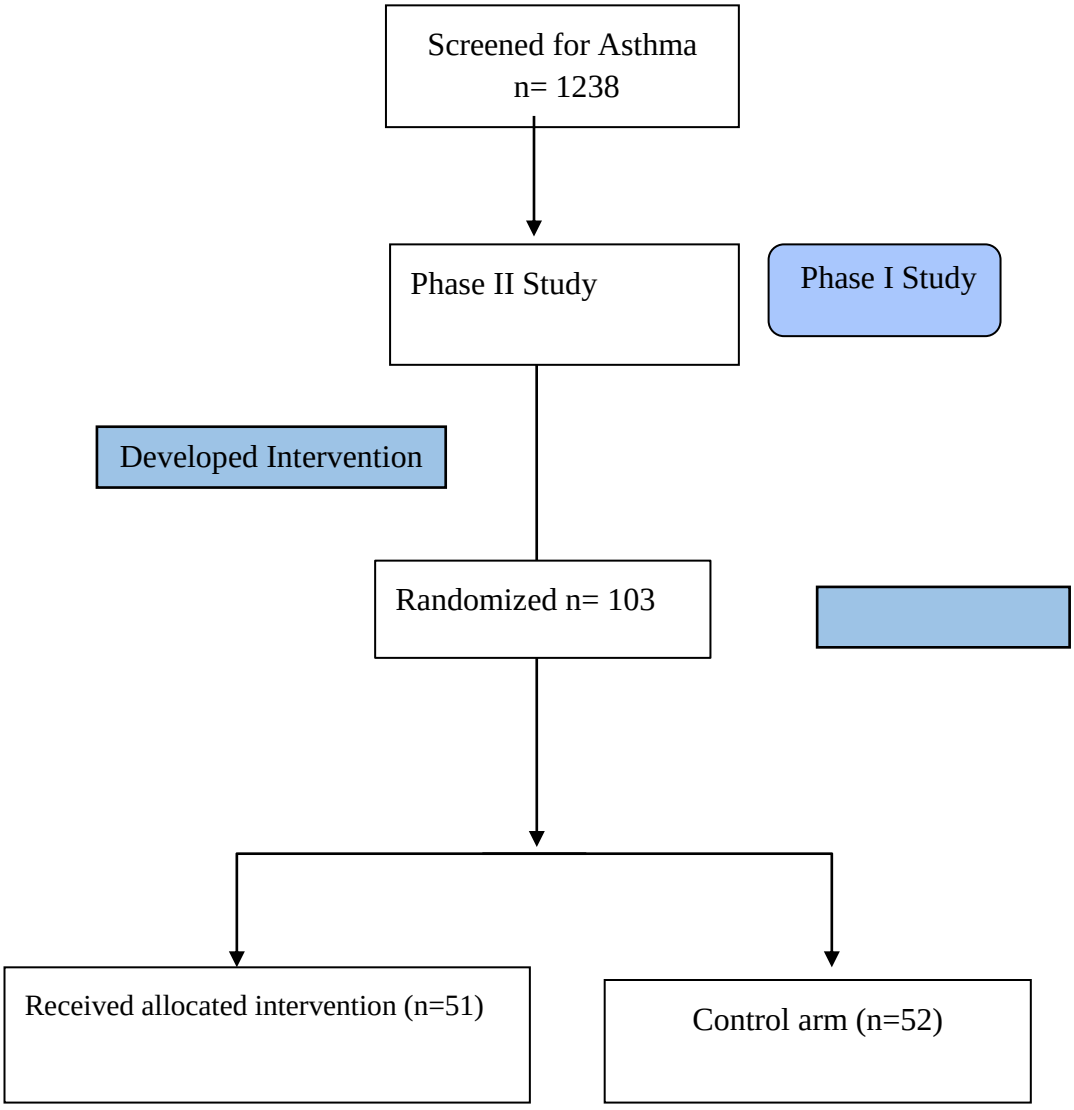

Figure 3.1: Study flow chart

CHAPTER FOUR

RESULTS

4.1 Baseline Characteristics of Study Participants

A total of 166 caretakers/parents-child pairs were enrolled for the baseline study. The median age of the enrolled children was 8.2 years (Interquartile range =7.0-10.0) with the males being the majority, 94 (56.6%). Majority of parental respondents were mothers (117, 70.5%) from urban settings (124, 74.7%) who had attained at least secondary school education (144, 86.7%). The results are summarized in table 4.1.

Table 4.1: Socio-demographic characteristics for study participants

Variable	Freq	%
Age in years	**n=166**	
Median (IQR)	**8.2 (7.0, 10.0)**	
Gender of child		
Male	94	56.6
Female	72	43.4
Caretaker		
Mother	117	70.5
Father	30	18.1
Other	19	11.5
Residence		
Urban	124	74.7
Rural	42	25.3
Caretakers' occupation		
Formal employment	64	38.6
Self-employment	39	23.5
Casual/None	63	37.9
Season recruited		
Wet	95	57.2
Dry	71	42.8
History of asthma in family		
Yes	101	60.8
No	65	39.2
Caretakers' highest education level		
No Formal education	6	03.6
Primary	16	09.6
Secondary	39	23.5
Tertiary/University	105	63.2
Caretakers' level of knowledge		
Not knowledgeable	52	31.3
Knowledgeable	114	68.7

4.2 Spirometry Characteristics for Enrolled Children

Spirometry was done to 80 children at the start of randomization and thus not all the children had a chance to have lung function measured (This was due to logistic challenges in acquiring the spirometer and the subsequent loss to follow up before the start of second phase of the project). Spirometry was acceptable in majority (65, 81.2%) of these children whose characteristics are shown in figure 4.1. Spirometry was done as per ATS/ERS guidelines. Sixty-three (96.9%) of those with acceptable spirometry would be considered asthmatic children using the widely used cut off of 0.9 for FEV1/FVC. Other cut offs used by different guidelines have been shown for comparison.

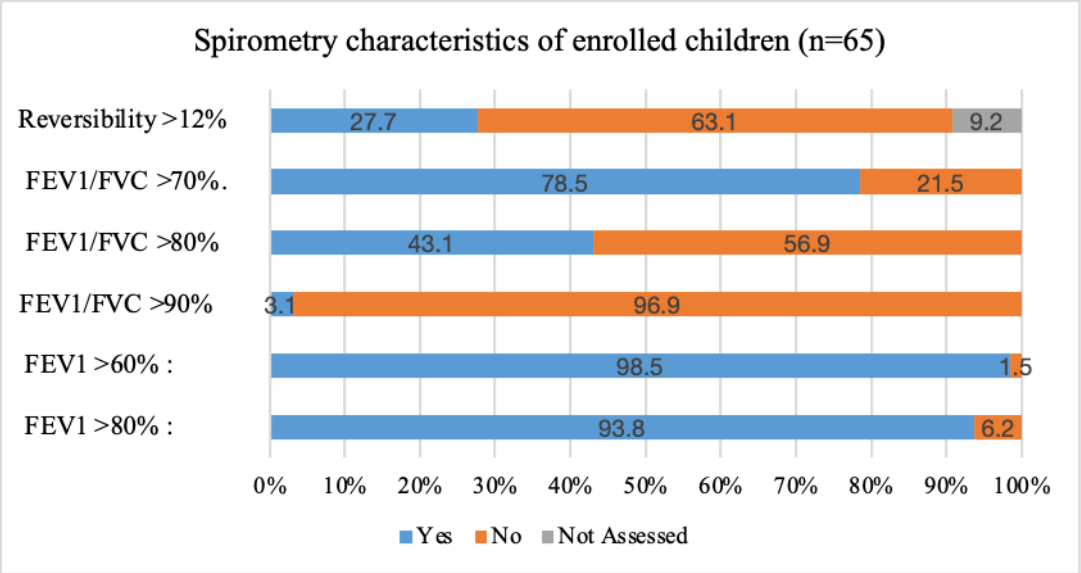

Figure 4.1: Spirometry Characteristics for Enrolled Children

4.3 Proportion of children with good control of asthma at MTRH

Among the 166 children assessed at baseline study 92 (55.4% 95% CI: 47.5, 63.1) had good level of asthma control using c-ACT.

4.4 Factors associated with asthma control among children at MTRH

4.4.1 Social demographics factors associated with asthma control

Upon testing for associations among the various socio-demographic variables which included residence, level of education and medical insurance cover, only medical insurance cover was associated with good level of control with a p value of 0.034 at baseline (Table 4.2).

Table 4.2: Socio-demographic factors associated with asthma control at baseline

Variable	Poor control	Good control	Chi square	df	p-value
Gender of child					
Male	42 (44.7)	52 (55.3)	0.001	1	0.98
Female	32 (44.4)	40 (55.6)			
Caretaker's relationship to child					
Mother	53 (45.3)	64 (54.7)	0.091	2	0.96
Father	13 (43.3)	17 (56.7)			
Other	8 (42.1)	11 (57.9)			
Residence					
Urban	55 (44.4)	69 (55.6)	0.01	1	0.92
Rural	19 (45.2)	23 (54.8)			
Occupation of caretaker					
Formal	25 (39.1)	39 (60.9)	1.294	2	0.52
Self employed	19 (48.7)	20 (51.3)			
Unemployed	30 (47.6)	33 (52.4)			
Medical insurance cover					
Yes	45 (39.1)	70 (60.9)	4.497	1	0.03
No	29 (56.9)	22 (43.1)			
Highest education level of caretaker					
None	4 (66.7)	2 (33.3)			0.38[f]
Primary	9 (56.3)	7 (43.8)			
Secondary	20 (51.3)	19 (48.7)			
Tertiary/University	41 (39.0)	64 (61.0)			

f-Fischer Exact Test

4.4.2 Environmental and Clinical factors associated with asthma control

The dry season was significantly associated with good control of asthma with a p value of 0.04. Factors like type of fuel (p=0.85), type of the house (p=0.61) as well as living near industries (p=0.20) were not significantly associated with childhood asthma control at baseline. This is shown in table 4.3.

Table 4.3: Environmental and clinical variables in relation to control at baseline

Variable	Poor control	Good control	Chi-square	df	p-value
Season Recruited					
Wet	49 (51.6)	46 (48.4)	4.406	1	0.04
Dry	25 (35.2)	46 (64.8)			
Occupation of caretaker					
Formal	25 (39.1)	39 (60.9)	1.294	2	0.52
Self employed	19 (48.7)	20 (51.3)			
Unemployed	30 (47.6)	33 (52.4)			
Type of residence house					
Permanent	44 (43.1)	58 (56.9)	0.987	2	0.61
Semi-permanent	22 (44)	28 (56)			
Temporary	8 (57.1)	6 (42.9)			
Have carpets at home					
Yes	35 (40.7)	51 (59.3)	1.088	1	0.30
No	39 (48.8)	41 (51.2)			
Ownership of pet					
Yes and child plays with pet	21 (53.8)	18 (46.2)	1.778	2	0.41
Yes and child doesn't play with pet	19 (41.3)	27 (58.7)			
No pet	34 (42.0)	47 58.0			
Fuel for cooking					
Kerosene	10 (41.7)	14 (58.3)	0.321	2	0.85
Firewood	37 (46.8)	42 (53.2)			
Gas	27 (42.9)	36 (57.1)			
Caretaker aware what makes child wheeze					
Yes	46 (47.4)	51 (52.6)	0.764	1	0.38
No	28 (40.6)	41 (59.4)			
Asthma drugs at home					
Yes	42 (48.8)	44 (51.2)	1.31	1	0.25
No	32 (40)	48 (60)			
Caretakers' perception on child's control level					
Well controlled	27 (36.5)	47 (63.5)			0.001[f]
Partially controlled	36 (45)	44 (55)			
Poorly controlled	11 (91.7)	1 (8.3)			
Acceptance that child has asthma					
Yes	31 (55.4)	25 (44.6)	3.974	1	0.046
No	43 (39.1)	67 (60.9)			
Perceived knowledge on asthma					
Knowledgeable	26 (44.1)	33 (55.9)	2.46	2	0.29
Knows a little	29 (39.7)	44 (60.3)			
Not knowledgeable	19 (55.9)	15 (44.1)			
Asthma knowledge					
Not knowledgeable	16 (30.8)	36 (69.2)	5.844	1	0.02
Knowledgeable	58 (50.9)	56 (49.1)			

f-Fischer's Exact Test

Multivariate logistic regression showed that only caretaker's perception on child's control level and knowledge on childhood asthma were associated with the observed status of asthma control among the study participants adjusting for the other factors.

A perception of a well-controlled child by the parent/caretaker was associated with good control of asthma (Table 4.4).

Table 4.4: Multiple logistic regressions on selected factors associated with asthma control at baseline

Variable	Odds Ratio	p-value	[95% Conf.	Interval]
Male	1.00			
Female	1.12	0.74	0.56	2.25
Wet season	1.00			
Dry season	1.47	0.28	0.74	2.93
Health insurance	1.00			
No health Insurance	0.63	0.20	0.30	1.29
Presence of person who smoke	1.00			
No person smoke	2.61	0.16	0.70	9.76
Industries	1.00			
No industries	1.83	0.16	0.78	4.30
Caretakers' perception on child's control level				
Well controlled	1.00			
Partially controlled	0.62	0.18	0.31	1.25
Poorly controlled	0.05	0.009	0.006	0.48
Not knowledgeable	1.00			
Knowledgeable	0.45	0.039	0.21	0.96

4.5 Knowledge and asthma perceptions among caretakers/parents of children with asthma attending clinics at MTRH

4.5.1 Knowledge among caretakers/parents of children with asthma attending clinics at MTRH

Whilst self-reported asthma knowledge was high, with just about one-fifth of caregivers rating themselves as 'not knowledgeable' (34, 20.5%) just less than one third of respondents accepted that their child had asthma (56, 33.7%). Nearly half (74, 44.6%) perceived their child's illness to be well controlled and interestingly 86 (51.8%), acknowledged that they had drugs at home to control their child's symptoms. Majority of the caretakers,114 (68.7%) were knowledgeable.

Generally, the presentation of asthma was well identified. Breathlessness (difficulty in breathing) was the least identified as the presentation of asthma by 115 (69.3%). Caretakers were able to identify correctly that chemicals with bad smell, 90 (54.2%), cold air, 145 (87.3%), and strong perfumes, 105 (63.3%) trigger asthmatic exacerbation. Few individuals were able to identify that emotional stress, 34 (20.5%),

exercise, 73 (44.0%), cockroaches, 17 (10.2%) and aspirin/ibuprofen, 12 (7.2%) trigger asthmatic attack. About half, 48.8%, of the participants were able to pick the correct definition of asthma. However, most participants were not able to identify the cause of asthma.

Family history of asthma (p=0.0001), acceptance that child has asthma (p=0.001) and acknowledgement that there were drugs at home to help with attacks (p=0.009) were positively associated with being knowledgeable (Table 4.5).

Table 4.5: Association between caretaker's baseline characteristics and knowledge on asthma

Variable	Not Knowledgeable	Knowledgeable	Chi-square	df	p-value
Gender of child					
Male	26 (27.7)	68 (72.3)	1.354	1	0.25
Female	26 (36.1)	46 (63.9)			
Relationship to child					
Mother	41 (35)	76 (65)	3.749	2	0.15
Father	5 (16.7)	25 (83.3)			
Other	6 (31.6)	13 (68.4)			
Residence					
Urban	41 (33.1)	83 (66.9)	0.69	1	0.41
Rural	11 (26.2)	31 (73.8)			
Season recruited					
Wet	24 (25.3)	71 (74.7)	3.794	1	0.05
Dry	28 (39.4)	43 (60.6)			
History of asthma in family					
Yes	24 (23.8)	77 (76.2)	6.858	1	0.009
No	28 (43.1)	37 (56.9)			
Education level of caretaker					
None	2 (33.3)	4 (66.7)			0.66[f]
Primary	6 (37.5)	10 (62.5)			
Secondary	15 (38.5)	24 (61.5)			
Tertiary/University	29 (27.6)	76 (72.4)			
Drug at home to relieve attack					
Yes	17 (19.8)	69 (80.2)	10.441	1	0.001
No	34 (43)	45 (57)			
Talk about asthma action plan					
Yes	10 (22.7)	34 (77.3)	1.881	1	0.17
No	41 (33.9)	80 (66.1)			
Caretakers' perception on child's control level					
Well controlled	20 (27)	54 (73)			0.26[f]
Partially controlled	30 (37.5)	50 (62.5)			
Poorly controlled	2 (18.2)	9 (81.8)			
Acceptance child has asthma					
Yes	6 (10.7)	50 (89.3)	16.688	1	0.000
No	46 (41.8)	64 (58.2)			

f-Fischer's Exact Test

4.5.2 Asthma perceptions among caretakers/parents of children with asthma attending clinics at MTRH

Majority (62.0%) of the caretakers preferred syrups for inhalers in the management of asthma while only 48(28.9%) would prefer inhalers on their child given choice. Slightly above one thirds, 60 (36.1%) feared inhalers. About one quarter (28.3%) felt daily medications were necessary in asthma care. More than half (54.8%) report that not enough information concerning their child's condition had been addressed by healthcare workers (Table 4.6).

Table 4.6: Caretakers' perceptions on asthma treatment at baseline

Variable	Freq	%
Bronchodilator treatment is best achieved when given as:		
Inhaler	63	38.0
Syrup	103	62.0
Given a choice caretaker prefers inhaler over syrup:		
Yes	48	28.9
No	118	71.1
Believe that inhalers are for the seriously sick:		
Yes	107	64.5
No	59	35.5
Fear inhaler as not approved by other people:		
Yes	60	36.1
No	106	63.9
No need of daily drugs, given with wheezing		
Yes	119	71.7
No	47	28.3
Child 6-11 years requires a spacer to use inhalers:		
Yes	68	41.0
No	98	59.0
Feeling enough information given concerning child		
Yes	75	45.2
No	91	54.8
Concerns/fears addressed by health workers:		
Yes	84	50.6
No	82	49.4

4.6 Effect of targeted asthma education on control of childhood asthma

4.6.1 Comparison of randomized children baseline characteristics

A total of 103 were included in the final analysis of the outcome of asthma control using c-ACT. The treatment (intervention) arm had 51 participants while the control

arm had 52. The baseline clinical characteristics between the two groups were similar (Table 4.7).

Table 4.7: Baseline characteristics for participants enrolled into randomized controlled trial

Variable	Arm		Chi-square	df	P-value
	Intervention	Control			
Gender of child					
Male	28 (47.5)	31 (52.5)	0.234	1	0.63
Female	23 (52.3)	21 (47.7)			
Relationship to child					
Mother	37 (50)	37 (50)			1.00[f]
Father	10 (50)	10 (50)			
Other	4 (44.4)	5 (55.6)			
Residence					
Urban	36 (49.3)	37 (50.7)	0.004	1	0.95
Rural	15 (50)	15 (50)			
Season recruited					
Wet	29 (50)	29 (50)	0.012	1	0.91
Dry	22 (48.9)	23 (51.1)			
History of asthma in family					
Yes	35 (54.7)	29 (45.3)	1.809	1	0.18
No	16 (41)	23 (59)			
Education level of caretaker					
None	2 (100)	0 (0)			0.34[f]
Primary	8 (66.7)	4 (33.3)			
Secondary	9 (34.6)	17 (65.4)			
Tertiary/University	32 (50.5)	31 (49.5)			
Drug at home to relieve attack					
Yes	25 (51)	24 (49)	0.039	1	0.84
No	26 (49.1)	27 (50.9)			
Talk about asthma action plan					
Yes	16 (59.3)	11 (40.7)	1.541	1	0.22
No	34 (45.3)	41 (54.7)			
Recurrent wheezing					
Well controlled	24 (48)	26 (52)			0.38[f]
Partially controlled	21 (46.7)	24 (53.3)			
Poorly controlled	6 (75)	2 (25)			
Acceptance child has asthma					
Yes	22 (57.9)	16 (42.1)	1.692	1	0.19
No	29 (44.6)	36 (55.4)			
Caretaker knowledge on asthma					
Knowledgeable	22 (55)	18 (45)	1.767	2	0.41
Knows a little	17 (41.5)	24 (58.5)			
Not knowledgeable	12 (54.5)	10 (45.5)			

f-Fischer's Exact Test

4.6.2 Effect of intervention on asthma control using childhood-Asthma Control Test

The odds of the intervention improving asthma control adjusting for the baseline control using logistic regression was 2.7 compared to the control group, however it was not statistically significant (Table 4.8). The following logistic regression equation was used: Logistic regression model used: $\ln(P/1-P)= \beta 0+\beta 1X+\beta 2Z$; where X=intervention, Z=baseline level of asthma control, P=ρ(Y=1), Y=outcome. This

was the equation used to test for the null hypothesis that *"There is no difference in proportion of good asthma level of control between children whose parents receive targeted health education and those who do not."*

Table 4.5: Effect of targeted asthma education on asthma control measured by c-ACT

Variable	Odds Ratio	P-value	95% CI	
Intervention	2.7	0.12	0.79	9.1
Baseline control	3.3	0.046	1.02	11.0

The respective proportion with good level of asthma control pre and post intervention in each arm are shown in figure 4.2. This difference in control at baseline was adjusted for as described in the logistic regression formulae, previously described.

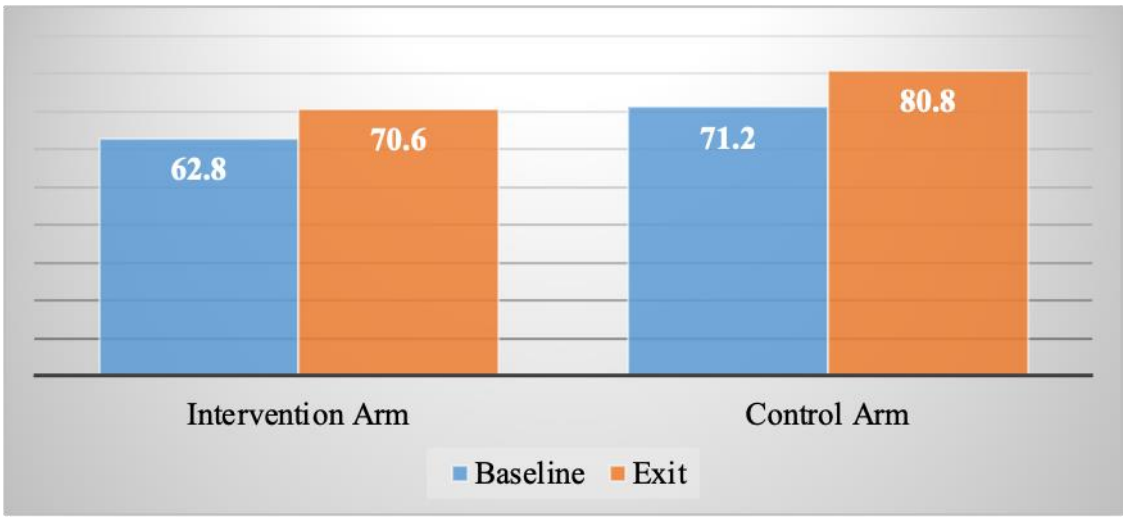

Figure 4.2: Childhood asthma control at baseline and at exit per arm

4.6.3 Effect of intervention on asthma control using Spirometry

Two spirometry parameters, persistence of bronchodilator response as well as FEV1/FVC ratios were used to assess for differences in control between the two groups. Although persistence of bronchodilator response (PBDR) was only in 13.5% (n=52) of the participants. No difference in PBDR was noted between the control and intervention arm with a p-value of 0.61 as shown in figure 4.3.

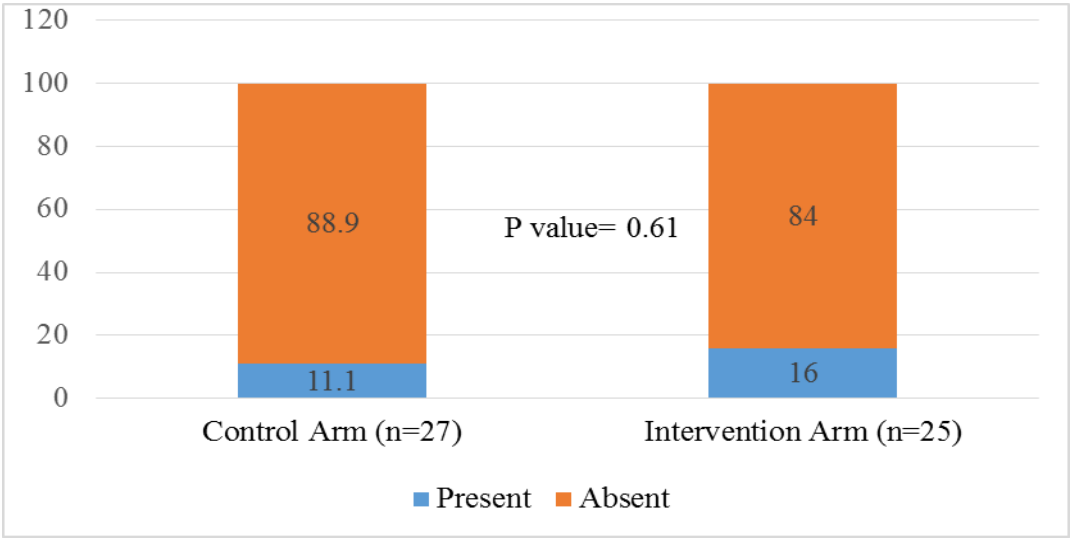

Figure 4.3: Post intervention effect assessed using presence or absence of persistence of bronchodilator response per arm

On the use of FEV1/FVC, only 2 participants had values above the cut off of 0.9 adopted as the criteria for diagnosing obstruction, and thus no differences using proportions could meaningfully be assessed.

4.7 Exit questionnaire

At exit, the possibility of contamination or spill overs as well as the quality of the videos were assessed. Full details of what was assessed is in appendix VII.

Out of 63 who filled the questionnaire, only one (1.6%) was aware that they had been allocated to the intervention group.

There was positive feedback of the quality of the study and the conduct. All participants were willing to be enrolled in future such studies.

CHAPTER FIVE

DISCUSSION, CONCLUSSIONS AND RECOMMENDATIONS

5.1 Discussion

5.1.1 Socio-demographic characteristics of children with asthma attending clinics at MTRH

Majority of the study participants were males at 56.6%. This is consistent with most other studies, which have reported that more males are generally affected by asthma (Almqvist *et al.,* 2008; Kuti *et al.,* 2017). Majority of the participants lived in urban area 74.7% with nearly half of them (47.6%) using firewood as fuel for cooking. Although it's likely the high number of asthmatic children in the current cohort were from urban set up due to the catchment area of MTRH, this together with use of firewood in those with asthma contributes greatly to high burden of asthma (Masekela *et al.,* 2018). Kuti *et al.* in Nigeria found that only 12% of participants used clean fuel, although majority in their study used kerosene rather than firewood (Kuti *et al.,* 2017).

In this study, just about one fifth (21.1%) had an inhaler at home. Children were screened for asthma as long as they came to hospital during the study period and thus not everyone had physician made diagnosis of asthma prior to this. In a Brazilian study where children were screened for asthma from schools, a low prevalence of asthma medication prescription was found at 32.3% (Roncada *et al.,* 2016). However, in the current study there was the unique feature that those who were on asthma medications at home, close to half (47.7%) were actually on syrups rather than the recommended inhaled bronchodilators/ICS. It also brings to fore that there are children with asthma who are not receiving proper treatment since they have never been diagnosed (Masekela *et al.,* 2018). This is also exemplified by the low level of those who have ever had or heard of asthma action plan at 26.5%. Asthma action plans should be encouraged even if modifying them to suit literacy levels (Yin et al., 2017).

Out of the children who attempted spirometry, 81.2% were able to perform it satisfactorily, yet they had never done one. Based on GINA and the national set standard ratio of 0.9 for FEV1/FVC, 96.9% had airflow obstruction, however dropped to 56.9% and 21.5% if Canadian/European set ratios of 0.8 and 0.7 respectively were used (DLTLD, 2011; GINA, 2021; Murray *et al.,* 2016). It remains a debate what cut off should be used to determine who has childhood asthma (Green *et al.,* 2013; Saglani & Menzie-Gow, 2019).

5.1.2 Asthma control among children with asthma attending clinics at MTRH

Using c-ACT, an estimated 55.4% of children in this study had well controlled asthma at baseline. This is higher than the control level of Kigathi 2012, in Nairobi and its environs where only 42% had good control (Kigathi, 2012). In a South African study, c-ACT had shown that 66.2% of children in their area were well controlled (Green *et al.,* 2013). In Nigeria, 82.1% of children enrolled in a cross-sectional study in 2015 had optimal asthma control based on the Global Initiative for Asthma (GINA) criteria, this is largely a very good control in Africa (Kuti *et al.,* 2017). One difference is that these children were on follow up in an asthma clinic, while as described earlier at the time of data collection a chest clinic was being set up at the facility (Kuti *et al.,* 2017; Simba *et al.,* 2018). There is paucity of studies evaluating asthma control in in this set up, especially in children more so on c-ACT. In this study, 20 as a cut off as opposed to 19 was used. While Liu *et al* has previously argued a cut off of 19 has the best sensitivity, it is generally agreed that there exists overlap in the scores between 19 and 22 (Koolen *et al.,* 2011; Liu *et al.,* 2007; Voorend-van Bergen *et al.,* 2015). In a study among Mexican youth, communities with negative perceptions on asthma, higher cut-offs were likely to give the true level of control, hence it was felt this held for this population based on earlier analysis (Shi *et al.,* 2012; Simba *et al.,* 2018).

5.1.3 Factors associated with asthma control among children attending clinics at MTRH

In univariate analysis, it was found that individuals who had accepted that their children were having asthma had poor control. In this same cohort, it has been

demonstrated that those with good knowledge on asthma were those who had accepted asthma as a diagnosis for their children (Simba *et al.,* 2018). It is postulated that in this population with negative perception towards asthma, it is possible that those who had severe disease were likely to have accepted asthma status. On the other hand, Kolbe, J., *et al.* 1996, showed that there exists difference between asthma self-management knowledge and actual behaviour on asthma management (Kolbe *et al.,* 1996). Silva D et.al 2013 did not find any association between parental asthma knowledge and childhood asthma control (Silva & Barros, 2013). This could be the reason for what appears to be a reverse association. Further, consistently with existing literature (Ferreira-Magalhães *et al.,* 2015; Ghanname *et al.,* 2018), children who had a medical insurance cover were well controlled. It is likely this points to that these children were likely to be brought to the clinics for regular check-ups. It has been shown that, highest levels of asthma control are found in children with adherence to treatment (Klok *et al.,* 2014). Although there is association of having medical insurance with good control, some studies including Zahran *et al.* have not found associations (Zahran *et al.,* 2015).Weather seasonality had a significant association with control. Consistently like in other studies, wet weather was associated with poor control. Only knowledge on asthma and perception on child's asthma level of control were independently associated with the observed asthma control status. In this, study it was found that perception of child's poor state of control was associated with poor c-ACT score (Sastre *et al.,* 2016).

Although low educational attainment, low income, cigarette smoking (Zahran *et al.,* 2015), pet ownership (Sasaki *et al.,* 2014), and occupation of the parent (Kewalramani & Bollinger, 2010; Mireku *et al.,* 2009; WHO, 2016) have also been shown to affect control in asthmatics, these factors were not found to be significantly associated with control in this cohort. It worth noting that majority of caretakers/parents had attained tertiary and university education.

5.1.4 Knowledge and perceptions on childhood asthma among caretakers of children with asthma at MTRH

Analysis of this cohort of caretakers shows that the level of knowledge was fairly high with 72.4% answering more than half of the questions correctly. In a large study from China, 51.3% of the parents scored less than half for the questions assessed (Zhao *et al.,* 2013). In Egypt, Tantawi H. *et al.* recorded a pre-intervention knowledge of 18.8% (Tantawi *et al.,* 2012). In this populations, 94% of the participants had attained secondary education. This could partially be responsible for the high level of knowledge. Again, this study was carried out in a largely urban set up and included both the private wing and the general wing of the hospital. The private wing of the MTRH is the one where hospital staff and their dependents are attended to. This could have an influence as most of the staff are health workers.

Although inhalers are advocated world over, this study shows that the parents/guardians preferred using syrups for their children. This perception was assessed by asking three different questions which had similar results. While several possibilities could be responsible for this, it shows that the challenges in different regions may differ as it pertains asthma care. While this same group appeared knowledgeable, they prefer syrups which are associated with more side effects and are less effective. Similarly, although preventer medications which are given daily are the cornerstone of asthma medications(GINA, 2021), only 69% of the study participants felt they were necessary. A Saudi Arabian study found similar misconceptions about asthma treatment in a cohort who had moderately good knowledge about asthma (AlOtaibi & AlAteeq, 2018). This could mean there are unmet needs both for the parents and health workers which have been shown can occur in different cultures/ regions (Lalloo *et al.,* 2011).

On testing for association of knowledge and selected baseline characteristics, having reliever medications as well as acceptance that child had asthma by the parents/caretaker was associated with better knowledge of asthma. This might mean that health workers need to take up the mantle of educating caretakers of children with asthma on the disease. There is widespread concern that asthma stigma is

worsened by the health workers as they do not attempt to tell a patient that they could be having asthma. Although there is no asthma registry at this hospital, when children who came hospital for whatever reason were screened, at least 10% met the criteria using the ISAAC questionnaire that they were suffering from asthma. However, a good number either were not aware or did not acknowledge that their child had asthma. Only 32% of the parents/caretakers felt their child had asthma. The physician's diagnosis of asthma to a child has been shown to a be strong determinant of asthma treatment (Maziak *et al.,* 2002). When a child has not received a diagnosis of asthma, they are less likely to be on any asthma medications. In this cohort however, those who had good knowledge of asthma, were the same ones who had acknowledged that their children had asthma. It is possible that such knowledge may have been driven by the need to know more about asthma as their children had poor control. While other studies have found that education level is a main determinant of level of knowledge (Zhao *et al.,* 2013), this association was not found in this study. Notable however, is that, in this cohort a small minority (12.2%) had lower level of education.

5.1.5 Effectiveness of targeted health education on childhood asthma control

Video recorded targeted health education improved asthma control with odds of 2.7. However, this did not reach statistical significance when control was assessed using childhood-Asthma Control Test (c-ACT). Available evidence in developed countries show that health education improves self-management of children with asthma (Guevara *et al.,* 2003; Wolf *et al.,* 2002). There is no documentation of such in LMICs especially in sub-Saharan Africa. On the other hand, even with acknowledged multidisciplinary educational interventions programmes, sometimes their effects on patient's lifestyle and quality of life are hard to measure or even demonstrate (Cowden *et al.,* 2015; Guevara *et al.,* 2003; Jeminiwa *et al.,* 2019; Stenberg *et al.,* 2019). Schuermans, *et al.* 2018, showed that a single 10 minutes standardised education delivered by a nurse practitioner did have benefit on asthma control using ACT in adults (Schuermans *et al.,* 2018). There are however still many more studies which have not shown difference in adults' asthma control as well (Dalcin *et al.,* 2011; Mancuso *et al.,* 2011; Moral *et al.,* 2019).When differences

were checked using spirometry measurements, again no difference was noted. There is no clear correlation between spirometry and symptom based outcome in childhood asthma as per available published literature (Moeller *et al.,* 2015). There exists no gold standard of diagnosing asthma, worse still that of uniformly validating control (Green *et al.,* 2013; Sinha *et al.,* 2008). Statistically, the study did not have enough evidence to reject the null hypothesis that there is no difference in childhood asthma control after providing targeted asthma education in LMICs.

A video recorded health education that took into considerations the local perspectives of asthma was chosen as the method to deliver asthma health education in this study. There is generally no agreed method of how health education can better be delivered (Homer *et al.,* 2000; Partridge & Hill, 2000). The videos were validated through an extensive process ensuring they were devoid of medical jargon. The effect was assessed after 6 months of follow up, this has been shown to be adequate to measure effectiveness of educational interventions in previous studies (Wolf *et al.,* 2002).The effect shown by Schuermans, *et al.* was measured after 3 months of the intervention (Schuermans *et al.,* 2018). While Arıkan-Ayyıldız *et al.* 2016, did not demonstrate statistically significant difference over the same duration (Arıkan-Ayyıldız *et al.,* 2016). Brown *et al.* in US, did not demonstrate change using ACT among urban youth who had watched a similar 5 minute video (Brown *et al.,* 2017). It is therefore unlikely that the duration per se would have influenced our results.

While overall, a statistically significant improvement in asthma control was not demonstrated in this study, it is possible that certain participants whom the message resonated with their perceptions had in their own way benefited. The new concepts of improving asthma care are pointing to the direction of personalised messages (Cowden *et al.,* 2015) or shared decision making where individual children and/or their parents/caretakers receive messages that target their asthma needs (Sinha *et al.,* 2021; Taylor *et al.,* 2018). This is exemplified by what was found in this cohort appearing to be reverse association, that those with good asthma knowledge their children had worse control, and these are the same individuals who had accepted asthma as a diagnosis for their children (Simba *et al.,* 2018). They would therefore likely require a different approach to improve control, including considerations of

face to face education (Atawi, 2017). New ways for diagnosing and managing asthma are evidently required (Lenney *et al.,* 2018).

5.1.6 Development and Validation of Health Education Tools

Asthma education can be delivered in various ways including face to face, online or recorded audio or video messages. Recorded video messages were used to standardize the approach in this study. Further, considerations of prevailing misconceptions, which majority of those reviewing the video were able to pick were taken included. The validation method followed is similar to what Brown *et al.* utilized in a 5 minute video aimed at improving inhaler technique, asthma knowledge as well as control among urban youth in Michigan, US (Brown *et al.,* 2017). Murphy *et al.* 2016, argue that video recorded messages are a great tool in ensuring standardization (Murphy *et al.,* 2016). While developed countries continue to document evidence towards asthma education, there is hardly any information from sub-Saharan Africa on asthma education for childhood asthma (Agusala *et al.,* 2018; Taylor *et al.,* 2018). This study therefore provides information on the situation in sub-Saharan Africa more so in the non-documented area of childhood asthma education. Recently, a multinational study that will involve use of music and drama to educate school children on asthma has kicked off in 6 African countries (Mosler *et al.,* 2020). This will provide further insights into how best asthma education can be delivered in the African set up to enhance control of childhood asthma.

5.1.7 Study Limitations

It is acknowledged that studies of these nature have inherent limitations including possibility of contamination effect which would reduce chances of finding a difference in the two groups. However, only one (1.6%) individual was aware that they had been allocated to the intervention group. Limiting the contamination was done by ensuring that different review dates were given to the participants. Further, the prolonged health workers strikes which happened in Kenya in 2016 and 2017 affected many spears of healthcare and apart from leading to a substantial loss to follow up for our study, it caused suffering which may in itself have caused worsening asthma control (Adam *et al.,* 2018; Irimu *et al.,* 2018; Kenyon, 2017).

Lastly, it cannot be ignored that time in asthma studies is important, as with time the control may fall as lung remodelling occurs as well as the seasonality may affect control.

5.2 Conclusions

In this cohort, about half of the children had good control of asthma which is similar to what has been reported in the country previously.

The observed status of good asthma control is affected by perceived level of control and acceptance of asthma as a diagnosis.

In this community despite having good basic knowledge on asthma, there are misconceptions towards asthma self-management including that inhalers should be reserved for the very sick and that syrups are better than inhalers for treatment of childhood asthma.

Video recorded health education improved asthma control based on c-ACT in this cohort after 6 months of follow up, although not to statistical significance.

Overall, the study did not find enough evidence to reject the null hypothesis, that is, there is no difference in asthma control between children whose parents receive targeted health education and those who do not.

5.3 Recommendations

A significant number of children with asthma exists at MTRH, more emphasis should be put in place to increase level of control among children with asthma including MTRH/other hospitals to set up a specialized asthma clinic for follow up/care.

The Ministry of Health, Kenya should look into ways of ensuring asthma guidelines are followed. This can be leveraged with the basic paediatric protocols that are widely used in Kenya.

Health promotion department at MTRH/other hospitals, should enhance health education among parents/caretakers of children with asthma to address asthma knowledge gaps.

Adoption of the tool and its strengthening by having more individualized innovative methods is recommended to effectively address asthma perceptions among caretakers in resource poor settings

It is observed that spirometry is feasible in children, thus recommend efforts should be put in place to ensure this is part of evaluation for children with asthma at MTRH.

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APPENDICES

Appendix I: Asthma Screening Tool for Targeted Asthma Education Study

Impact of Targeted Health Education on Asthma Control among Children attending Clinics at Moi Teaching and Referral Hospital, Kenya: A Randomized Controlled Trial

Study No…… Clinic Locator number: …… IP No……

Date of Contact: ……

I: Demographic data:

1. Age: ……Yrs……..Months. 2. Sex: 1.Male [ ] 2.Female [ ]
3. Informant Relationship with Patient: Name: …….
4. Area of Residence: Estate/Location…… ….. County……...
5. Contact number of informant: …… Alternate number: …….

The information which can identify you shall be confidentially kept and shall only be for the sole purpose of contacting you if we select your child for the follow up study as explained in the consent form.

*II: Screening Questions**

Has your child **ever** had wheezing or whistling in the chest at any time in the past?

Yes [ ] No [ ]

IF YOU HAVE ANSWERED "NO" PLEASE SKIP TO QUESTION 6

Has your child had wheezing or whistling in the chest in the past 12 months? Yes[ ]No[ ]

IF YOU HAVE ANSWERED "NO" PLEASE SKIP TO QUESTION 6

How many attacks of wheezing has your child had in the past 12 months?

None [ ] 1 to 3 [ ] 4 to 12 [ ] More than 12 [ ]

In the past 12 months, how often, on average, has your child's sleep been disturbed due to wheezing?

Never woken with wheezing [ ] Less than one night per week [ ] One or more nights per week [ ]

In the past 12 months, has wheezing ever been severe enough to limit your child's speech to only one or two words at a time between breaths? Yes [ ] No [ ]

Has your child ever had asthma? Yes [ ] No [ ]

In the past 12 months, has your child's chest sounded wheezy during or after exercise?

Yes [ ] No [ ]

In the past 12 months, has your child had a dry cough at night, apart from a cough associated with a cold or chest infection? Yes [ ] No [ ]

**Adopted from core questions for 6-7year olds used in ISAAC studies*

Appendix II: Baseline Questionnaire

Impact of Targeted Health Education on Asthma Control among Children attending Clinics at Moi Teaching and Referral Hospital, Kenya: A Randomized Controlled Trial

Study No…… Clinic Locator number: ……

Date of Contact: ……

I: Demographic data:

1. Age: …Yrs.… Months 2. Sex: 1.Male [ ] 2.Female [ ] Birth Order: (eg.1-10): …..

3. Informant Relationship with Patient:

4. Area of Residence: Estate/Location……Urban [ ] Rural [ ]. County……

5. School Child Attends: ……

6. Occupation of primary caretaker: …….

7. Season Recruited: Wet [ ] Dry [ ]

II: Risk Factors for Development of Asthma

Does any member of your family have history of asthma? Yes [ ] No [ ]

Does any of his/her siblings have allergy (gets reaction from food/drugs/dust/cold etc.)? Yes [ ] No [ ]

Does your child have any allergies to any of these: foods/drugs/dust/cold? Yes [ ] No[ ]

Did the mother smoke during pregnancy? Yes [ ] No [ ] Don't Know [ ]

Did the mother use fish oil during pregnancy? Yes [ ] No [ ] Don't Know [ ]

Did the mother use supplements during pregnancy other than iron/folate?

Yes [ ] No [ ] Don't Know [ ]

What was the mode of delivery? CS [ ] SVD [ ] Don't Know [ ]

When was the child born? Term [ ] Preterm [ ]

Did the child have any infections during the first 12months which the doctor told you were viral Upper Respiratory Tract Infections? Yes [ ] No [ ] Don't Know [ ]

Did the baby use antibiotics during the first few months after birth?

Yes [ ] No [ ] Don't know [ ]

Did the child use any other milk apart from breastmilk before 6 months of age?

Yes [ ] No [ ] Don't Know [ ]

Was the child frequently dewormed after 2 years of age? Yes [ ] No [ ] Don't know [ ]

Where did this child grow? Urban [ ] Rural [ ] If urban, which part of town? Informal settlement [ ] Estate [ ]

III: Factors likely to affect control

(a) Which type of house does the child stay in? Permanent [ ], Semi-permanent [ ] Temporary [ ].

(b) If semi-permanent what is the type of floor? Earthen [ ] Cemented [ ]

(c) Do you have carpets in your house? Yes [ ] No [ ]

(d) How aerated is your house? Good [ ] Poor [ ], *determine using whether window size approximately at least 10% of floor*

(a) Do you have pets (such as dogs/cats) where this child stays? Yes [ ] No [ ]

(b) If yes, does this child play with the pets? Yes [ ] No [ ]

Do you have farm animals in the compound you stay in? Yes [ ] No [ ]

What type of fuel do you use to cook? Kerosene[ ] Firewood [ ] Gas[ ] Sawdust[ ]

Does any person smoke at home where the child stays? Yes [ ] No [ ]

Are there any industries which produce smoke around where the child lives? Yes [ ]No[ ]

(a)Do you have any insurance cover that takes care of your child's medications?

Yes [ ] No [ ]. (b) If yes, does it cover outpatient? Yes [ ] No [ ]

What is the highest education level attained by the primary caretaker of the child?

None [ ] Primary [ ] Secondary [ ] Tertiary College [ ] University [ ]

Are you aware of what makes your child wheeze? Yes [ ] No [ ]

(a) Do you have any drugs at home which you use to make your child feel better whenever he gets an attack? Yes [ ] No [ ]

(b) If yes above which ones?

Syrup Salbutamol/Ventolin [ ] Salbutamol Inhaler/Ventolin [ ] Inhaled Corticosteroid e.g. Budesonide/Budecort [ ] Prednisolone [ ] any other [ ] specify……

Has your healthcare provider ever talked to you about 'Asthma Action Plan'? Yes[ ]No[ ]

Concerning the recurrent wheezing/asthma, would you say your child is:

Well controlled [ ] Partially Controlled [ ] Poorly Controlled [ ]

Would you say your child has asthma or not? Asthmatic [ ] Not Asthmatic [ ]

What would you say is your knowledge concerning asthma in childhood?

Knowledgeable [ ] Knows a little [ ] Not Knowledgeable [ ]

Please go to section IV f or further questions on asthma to enable us understand more about your knowledge on childhood asthma

IV: Knowledge on Asthma

What do you believe is asthma?

A long lasting condition which affects ones airways (pipes which take air to the lung [ ]

A condition which affects the lungs and is healed after childhood [ ]

Recurrent Pneumonia [ ]

Bronchitis [ ]

What do you believe is the cause of asthma?

Interaction of environment and an individual's body [ ]

Infections same as would cause pneumonia [ ]

Allergic condition [ ]

Bad air [ ]

Cold weather [ ]

How does asthma present? (*Tick all those apply*)

Recurrent Cough [ ] Wheezing [ ] Breathlessness (difficulty in breathing) [ ] Chest tightness [ ]

What factors are likely to contribute to asthmatic attack? (*Tick all those apply*)

Emotional stress [ ] Chemicals with bad smell [ ] Cold air [ ] Exercise [ ] Using Brufen/aspirin [ ] using inhalers [ ] Hot sun [ ] Staying with Pets [ ]

Strong Perfumes [ ] Cockroaches [ ]

If my child puts on enough sweaters while going to school he/she will not suffer from this condition: Yes [ ] No [ ]

The treatment of children with asthma is best achieved by bronchodilators (such as Salbutamol/Ventolin) given as: Inhalers [ ] Syrup [ ]

Given a choice, I would prefer an inhaler compared to syrup bronchodilators for my child: Yes [ ] No [ ]

I believe inhalers are for those who are seriously sick: Yes [ ] No [ ]

I fear using inhalers on my child as other people do not approve of it: Yes [ ] No [ ]

There is no need of the child being on daily drugs for asthma, drugs should only be given when there is wheezing/ difficulty in breathing: Yes [ ] No [ ]

Given an inhaler to explain how to use it to your child, would you be comfortable explaining how to use it? Yes [ ] No [ ]

Do you think your child being between 6 and 11 years would require a spacer if they were to use inhalers? Yes [ ] No [ ]

Do you feel the health workers who see your child have told you enough concerning the condition of your child? Yes [ ] No [ ]

Have your concerns and fears been addressed during the times you have visited hospital while your child has this condition? Yes [ ] No [ ]

Tell us freely what you think about asthma? What would you like to be done to your child?.....
.....
.....

V: Spirometry Measures

Did the child make acceptable effort? Yes [ ] No [ ]

Is the measurement acceptable? Yes [ ] No [ ]

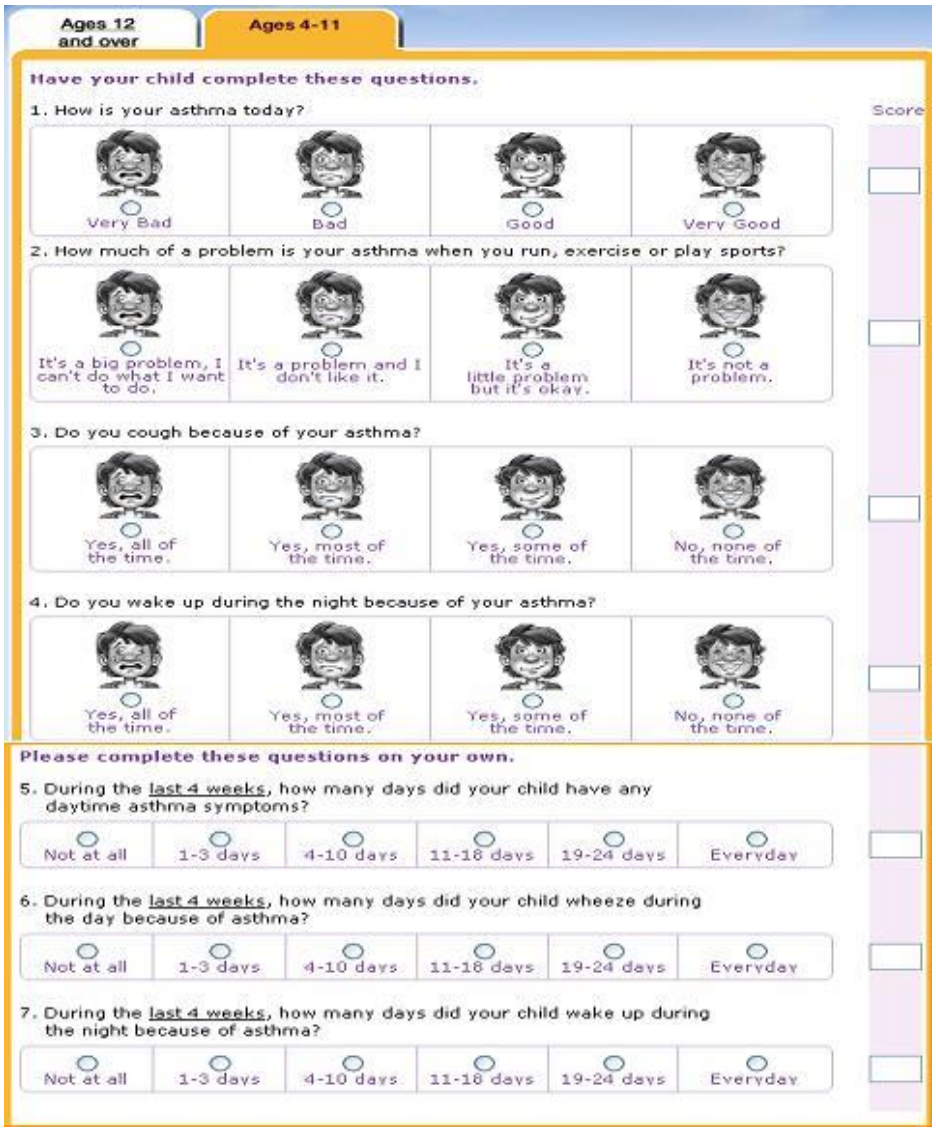
What is the FEV1? …….. What is the FVC? …… What is the FEV1/FVC%? ……

How much does the FEV1 change with one dose of bronchodilator? ……% change.

Is it consistent with asthma? Yes [ ] No [ ]

Appendix III: Childhood Asthma Control Test

Study Number: ……. Clinic Locator Number: ……

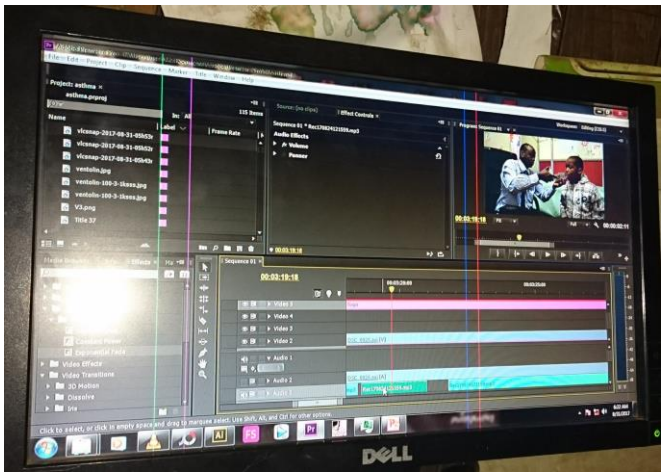


Appendix IV: Developed Health Education Video

In this appendix, the description of the targeted health education tool has been provided.

a.Development

Based on analysis of baseline findings, the key messages that were to be addressed were found to be around why inhalers are used in asthma management. To put this into context, the message was delivered on inhaler techniques, including use of spacers and the overall goal of asthma control to enhance fullness of living. The latter was demonstrated by use of athletes' photographs using inhalers (the site of the study resonates well with long distance running). Details of these slides are provided subsequently in figure IV.4. Video recording included real patients who were booked to the PI's clinic and attended to by the PI, with the aim of the study explained and consent/assent taken from participants, 3 children were involved- 2 boys and 1 girl. This was to ensure the videos reflected a real clinic set up for those who were to watch these videos. None of the children was involved in the study.



Video made by 2 individuals with knowledge in media production. Voice overs were included.

Figure IV.1 shows a screen shot of the video during the development

b.Validation and User Acceptability

The process of validation used both qualitative and semi-quantitative techniques to evaluate whether the educational tool developed was appropriate for caretakers/parents of children with asthma. Participants were sequentially recruited

in a snowballing manner, with revisions made at several stages. A total of 15 individuals were involved in the validation process. A paediatric respiratory specialist as well as three paediatricians made the expert validation. The characteristics of these individuals involved is show in figures IV.2 and IV.3.

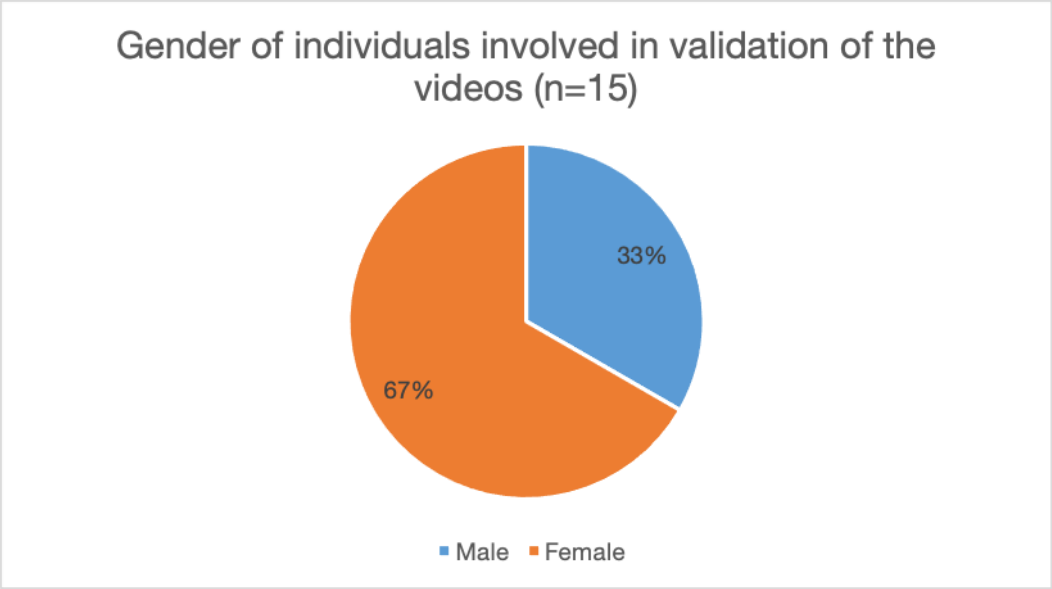


Figure IV.2: Relative gender distribution of individuals involved in validation of videos

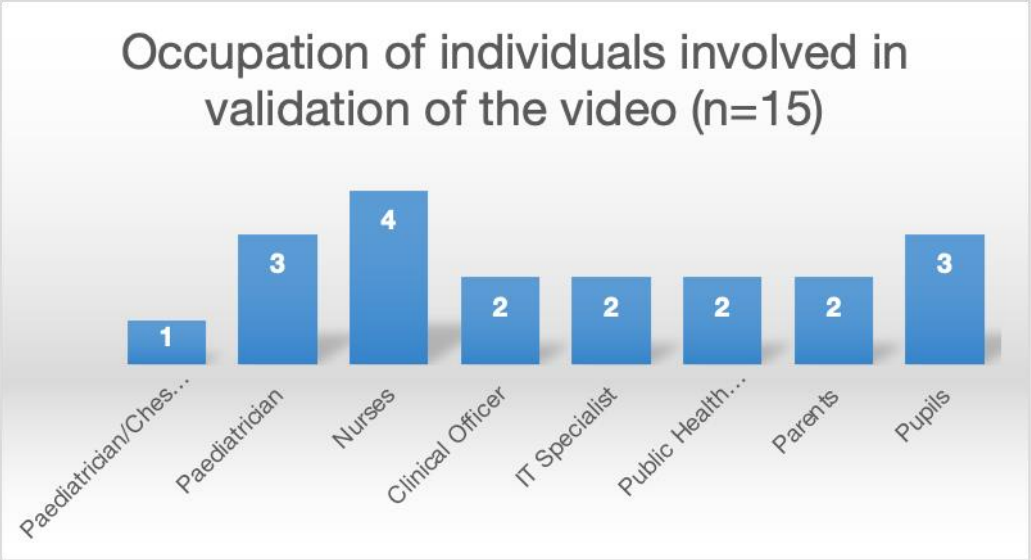


Figure IV.3: Occupation of individuals involved in validation of videos

Parents selected did not have any medical background. The three children were to test whether the message was in plain language that could be understood by anyone.

Table IV.1: Domains assessed on the quality of video developed

Domain	Yes	No			
Video clarity	6	3			
Appropriate Length.	8	1			
Pictorials easy to follow	6	3			
Video devoid of Medical jargon	4	4			
Video addresses a misconception in Asthma	8	1			
Extra Questions to Paediatricians/Chest Specialist (n=3)					
Content adequacy to address gap	2	1			
Likert Scale	***5***	***4***	***3***	***2***	***1***
Video provides targeted education material$	2	1			

$ Strongly Agree [5] Agree [4] Neutral [3] Disagree [2] Strongly Disagree [1]

On being asked what misconceptions the video was addressing, the themes that came up were: related to medication use in asthma. A few excerpts are presented below:

Participant one: “Picked that syrup was misconception being addressed….”

Participant two: “ *inhalers are better than syrups, giving inhalers directly is not good compared to using spacers. Inhalers are for seriously sick children, use of syrups in asthma, you can live with asthma*.”

Participant three: “*The misconception that asthmatic individuals cannot participate in strenuous activities e.g. Sporting. From the video I have seen that they can participate if they keep the condition in control.”*

Initial suggestions to improve the video included:

Participant 1: “*Low voice in some sections, add administration demos, use of device should have clear demonstration, remove study findings, there is a mistake on inflammation [blood vessels], calculations are not necessary, remove branded photos- you are marketing for Cipla and GSK, the spacer story not coming out well, the use of controller not coming out, the voice during inhaler technique should be heard-not the voice over. At 30sec it can be shortened by reducing the writing “what is known about*”.”

Participant 2: *“At the point the doctor is talking to the patient and his mother the voice is not very audible compared to the rest of the video. The pictorials not clear (Understanding asthma- the photo on knowledge and perception is good but misplaced. The demonstration during explanation of inhaler??). Not devoid of medical jargon-may be difficult for most, salbutamol-expound on this drug. Ok with the ‘wall movement’ video. The clip on spacer/inhaler prolonging to medication..- when explaining to family about the action plan. Clarity of video: most of the parts are not clear; Diagrams in the video are not clear; is it possible to add a pointer to demonstrate airways and inflammation (normal airways and understanding asthma); check typos in the video; how easily can you explain in layman that inhalers are*

safer than syrups?; why did you use the home made spacer for demonstration, can you use both?; Asthma action plan-we need to see your voice; when demonstrating spacer use, there is lack of synchrony; some places in the video are lacking continuity e.g. From spacer demonstration to asthma action plan, 'you are not alone (who?)', the video is ending abruptly left hanging; comparison of voices yours and commentator; the use of spacer is not well demonstrated- you cannot acquire the skill from the video."

Participant 3: "*Video clarity no-lighting. Video clarity a lot of use of 'aaa' and pauses. Not easy to follow all pictorials especially the asthma chart on the wall. Medical jargons-bronchoconstriction, exacerbations and side effects."*

After the revisions, these three reviewers were given an opportunity to look at the video again. They were satisfied with the level of clarity and corrections done. Participants without medical background were involved after the initial revisions.

c.Refinement

Seven revisions were made for the educational video. The corrections were stopped when there were no further edits suggested. The video eventually was a 7-minute English version, which was looped to play on subsequently to a Kiswahili version of 4.5 minutes. Each parent/caretaker together with their child watched the video, in a quiet room at the Memorial wing of MTRH hospital.

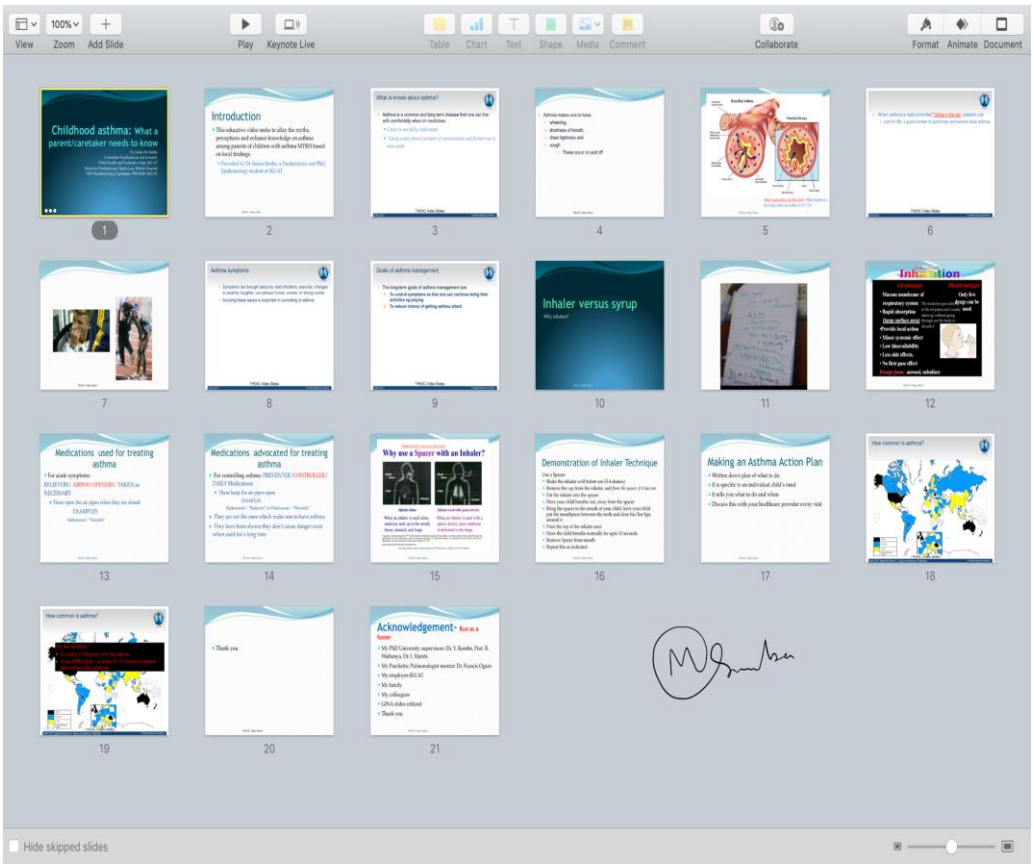


Figure IV.4: Slides used in the targeted health education video

Appendix V: Video Evaluation Tool

This tool is for the purpose of evaluating the video to be used in phase II of the study: '**Impact of Targeted Health Education on Asthma Control among Children attending Clinics at Moi Teaching and Referral Hospital, Kenya: A Randomized Controlled Trial'**

I have selected you as one of key people to review this video so as to ensure it meets basic educational standards and is able to deliver the intended asthma education.

(Tick the best option)

Is the video clear? Yes [ ] No [ ]

Is the length appropriate (not too short/long)? Yes [ ] No [ ]

Are the pictorials easy to follow? Yes [ ] No [ ]

Is it devoid of Medical jargon? Yes [ ] No [ ]

Does the video seem to address any misconception in asthma? Yes [ ] No [ ]

If yes in No.5 above, what misconception do you think is being addressed? .....
.....

Additional Questions for Paediatricians/Paediatric Pulmonologists

How does the message in this video relate to the GINA educational videos?

Very Similar [ ] Similar [ ] Neutral [ ] Different [ ] Very Different [ ]

Would you agree with this statement "This video provides targeted education material to parents/caretakers of children with asthma seen at MTRH"

Strongly Agree [ ] Agree [ ] Neutral [ ] Disagree [ ] Strongly Disagree [ ]

Is the content adequate to address the knowledge gaps/misconceptions? Yes [ ] No [ ]

See attached separate PowerPoint presentation for further reference based on baseline analysis

Any other input?……

Appendix VI: Monitoring Tool

This tool is for the purpose of monitoring the study: '**Impact of Targeted Health Education on Asthma Control among Children attending Clinics at Moi Teaching and Referral Hospital, Kenya: A Randomized Controlled Trial'** *

1.Is the study going on as expected? Yes [ ] No [ ]

2.Is the study protocol being observed? Yes [ ] No [ ]

3.Has there been any coercion during the study at this point? Yes [ ] No [ ]

4.Control Arm

5.How many times have the participants in control arm:

6.Visited emergency department in the last 1 month? .....

7.Admitted due to asthmatic attack? ……..

8.Required to use emergency medications? .....

9.Has there been any death in the control arm? Yes [ ] No [ ]

10.If yes to 5 above, what the circumstances?

.....

.....

.....

.....

.....

.....

11.Is this death in 5, above related to this study? Yes [ ] No [ ]

12.Has this been reported to IREC? Yes [ ] No [ ]

13.If no in 8 above, any explanations? Yes [ ] No [ ]

14.Intervention Arm

15.How many times have the participants in intervention arm:

16.Visited emergency department in the last 1 month? .....

17.Admitted due to asthmatic attack? ……..

18.Required to use emergency medications? .....

19.Has there been any death in the intervention arm? Yes [ ] No [ ]

20.If yes to 11 above, what the circumstances?

.....

.....

.....

.....

.....

21.Is this death in 11, above related to this study? Yes [ ] No [ ]

22.Has this been reported to IREC? Yes [ ] No [ ]

23.If no in 14 above, any explanations? Yes [ ] No [ ]

24.Decision of the independent monitoring individuals

25.We independently certify that this study should continue as planned: Yes [ ]

No [ ]

26.Signed:

1.…… Date: ……
2.…… Date: ……
3.…… Date: ……
4.*The board will meet twice during the study and as necessary if there is an adverse event.

Appendix VII: Exit Questionnaire

Study number …….

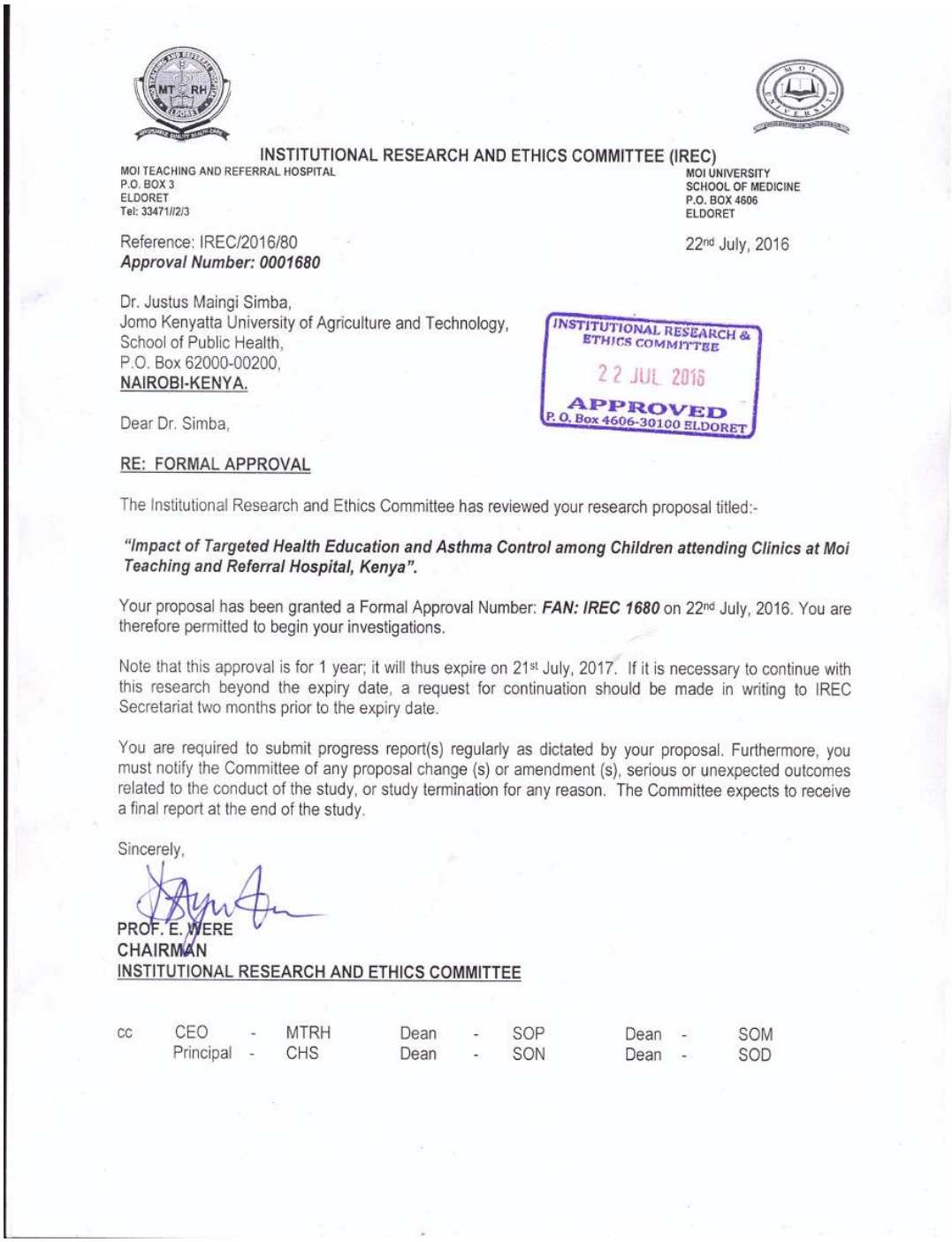
Indicate Seasons Participant was in Study: Wet only [ ], Wet Mostly [ ], Dry only [ ], Dry Mostly [ ], Wet and Dry [ ],

This questionnaire will help us evaluate how much we adhered to the set protocol as much as how well you adhered. We do acknowledge the nature of this study makes it possible for one to know what was offered to each group.

Kindly answer the questions as candidly as possible, it shall not affect the care you receive or any other thing for that matter.

1. Were you aware of the group you were placed in? Yes [ ] No [ ]
2. Which arm were you in? Control/received routine care [ ] Intervention/Watched education video [ ]
3. If you were in the Control/Routine care arm, do you get to know what was happening with the other group? Yes [ ] No [ ]
4. If your answer for 3, above is yes, how did you know this
5. From Participants in that group [ ], From Health worker in the clinic [ ] From Study Health Worker [ ]
6. How much were you able to participate?
7. Explained the whole material [ ], partially aware [ ] Managed to watch the Video [ ]
8. If you were in the intervention arm, did you watch the videos as you were supposed to? Yes [ ] No [ ]
9. If no to 6 above, why was that? .....
10. Studies of this nature help us evaluate/ determine treatment to be offered. Would you participate in such study in future? Yes [ ] No [ ]

Appendix VIII: Institutional Research and Ethics Committee Approvals



INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE (IREC)

MOI TEACHING AND REFERRAL HOSPITAL
P.O. BOX 3
ELDORET
Tel: 33471//2/3

MOI UNIVERSITY
SCHOOL OF MEDICINE
P.O. BOX 4606
ELDORET

Reference: IREC/2016/80
Approval Number: 0001680

22nd July, 2016

Dr. Justus Maingi Simba,
Jomo Kenyatta University of Agriculture and Technology,
School of Public Health,
P.O. Box 62000-00200,
NAIROBI-KENYA.

INSTITUTIONAL RESEARCH & ETHICS COMMITTEE
22 JUL 2016
APPROVED
P. O. Box 4606-30100 ELDORET

Dear Dr. Simba,

RE: FORMAL APPROVAL

The Institutional Research and Ethics Committee has reviewed your research proposal titled:-

"Impact of Targeted Health Education and Asthma Control among Children attending Clinics at Moi Teaching and Referral Hospital, Kenya".

Your proposal has been granted a Formal Approval Number: ***FAN: IREC 1680*** on 22nd July, 2016. You are therefore permitted to begin your investigations.

Note that this approval is for 1 year; it will thus expire on 21st July, 2017. If it is necessary to continue with this research beyond the expiry date, a request for continuation should be made in writing to IREC Secretariat two months prior to the expiry date.

You are required to submit progress report(s) regularly as dictated by your proposal. Furthermore, you must notify the Committee of any proposal change (s) or amendment (s), serious or unexpected outcomes related to the conduct of the study, or study termination for any reason. The Committee expects to receive a final report at the end of the study.

Sincerely,

PROF. E. WERE
CHAIRMAN
INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE

cc CEO - MTRH Dean - SOP Dean - SOM
Principal - CHS Dean - SON Dean - SOD

INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE (IREC)

MOITEACHING AND REFERRAL HOSPITAL
P.O. BOX 3
ELDORET
Tel: 33471//2/3

MOIUNIVERSITY
SCHOOL OF MEDICINE
P.O. BOX 4606
ELDORET
Tel: 33471/2/3

Reference: IREC/2016/80
Approval Number: 0001680

13th January, 2017

Dr. Justus Maingi Simba,
Jomo Kenyatta University of Agriculture & Technology,
School of Public Health,
P.O. Box 62000-00200,
NAIROBI-KENYA.

INSTITUTIONAL RESEARCH & ETHICS COMMITTEE
13 JAN 2017
APPROVED
P. O. Box 4606-30100 ELDORET

Dear Dr. Simba,

RE: APPROVAL OF AMENDMENT

The Institutional Research and Ethics Committee has reviewed the amendment made to your proposal titled:-

"Impact of Targeted Health Education and Asthma Control among Children attending Clinics at Moi Teaching and Referral Hospital, Kenya."

We note that you are seeking to make an amendment as follows: -

1. To downsize sample size for phase 1 from 374 to 170.

The amendment has been approved on 13th January, 2017 according to SOP's of IREC. You are therefore permitted to continue with your research.

You are required to submit progress(s) regularly as dictated by your proposal. Furthermore, you must notify the Committee of any proposal change(s) or amendment(s), serious or unexpected outcomes related to the conduct of the study, or study termination for any reason. The Committee expects to receive a final report at the end of the study.

Sincerely,

PROF. E. WERE
CHAIRMAN
INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE

cc: CEO - MTRH Dean - SPH Dean - SOM
Principal - CHS Dean - SOD Dean - SON

INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE (IREC)

MOI TEACHING AND REFERRAL HOSPITAL
P.O. BOX 3
ELDORET
Tel: 33471//2/3

MOI UNIVERSITY
SCHOOL OF MEDICINE
P.O. BOX 4606
ELDORET
Tel: 33471/2/3

Reference: IREC/2016/80
Approval Number: 0001680

22nd July 2017

Dr. Justus Maingi,
Jomo Kenyatta University of Agriculture & Technology,
School of Public Health,
P.O. Box 4606-30100,
NAIROBI-KENYA.

INSTITUTIONAL RESEARCH & ETHICS COMMITTEE
22 JUL 2017
APPROVED
P. O. Box 4606-30100 ELDORET

Dear Dr. Simba & Team,

RE: CONTINUING APPROVAL

The Institutional Research and Ethics Committee has reviewed your request for continuing approval to your study titled:-

"Impact of Targeted Health Education and Asthma Control among Children attending Clinics at Moi Teaching and Referral Hospital, Kenya".

Your proposal has been granted a Continuing Approval with effect from 22nd July, 2017. You are therefore permitted to continue with your study.

Note that this approval is for 1 year; it will thus expire on 21st July, 2018. If it is necessary to continue with this research beyond the expiry date, a request for continuation should be made in writing to IREC Secretariat two months prior to the expiry date.

You are required to submit progress report(s) regularly as dictated by your proposal. Furthermore, you must notify the Committee of any proposal change (s) or amendment (s), serious or unexpected outcomes related to the conduct of the study, or study termination for any reason. The Committee expects to receive a final report at the end of the study.

Sincerely,

PROF. E. WERE
CHAIRMAN
INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE

cc:	CEO	-	MTRH	Dean	-	SOD
	Principal	-	CHS	Dean	-	SPH
	Dean	-	SOM	Dean	-	SON

Appendix IX: Consent form

Consent Form for the Parent/Guardian of Child Involved in Targeted Asthma Health Education study.

Study No: ……..

We are conducting a study titled: **'Impact of Targeted Health Education on Asthma Control among Children attending Clinics at Moi Teaching and Referral Hospital, Kenya: A Randomized Controlled Tria**l'

This study shall be in two parts: the initial part involves getting clinical information of your child by directly asking you questions which will enable us determine whether your child has asthma. You may not have been told this diagnosis by your primary clinician. The questions we shall use have been shown to be useful in determining whether a child has this condition or not. We do not intend to carry out any extra test on your child apart from those the primary doctor seeing you will request. We shall ask you to provide us with details which we shall use to contact you should we feel that your child has this condition. We however shall keep your information confidential.

Should your child be among those we feel should enter into the second part of the study, we shall contact you and ask you to come at specific dates at a place to be clearly described within this hospital.

Those children who have been identified as asthmatic from this initial screening shall have a baseline interviews which shall enable us understand what they know about asthma, how best their treatment is working and their beliefs and fears concerning asthma. We intend to do spirometry testing (meaning the measuring of breath) to your child as part of baseline information collection. This involves your child trying to breathe through a machine and having this recorded. The process caries very minimal risks which are taken care of by proper infection prevention measures which we shall undertake.

Subsequently we shall divide these children by chance into two groups. One group we shall give you their parent/caretaker a specific education material concerning asthma by having them watch short videos of approximately 15minutes. The other group we shall not do anything extra. All the children in this study shall continue to have their care as before. We shall follow these children for 6 months with at least two revisits from initial contact. At the end of the 6 months we shall have revaluation of how best their treatment is working.

We intend to compare the findings from this study and possibly influence future policies on management of asthma. Children identified as asthmatic by this study shall be linked to care at MTRH. There is however no direct benefit for participating in this study. Although there are no dangers of participating in this study, it cause you some inconvenience of having to adhere to strict clinic attendance for this study. Again it may be a little disturbing to know that your child has what is likely asthma when you have believed otherwise.

We therefore request your permission to involve you and your child in this study. Refusing to participate in this study will not affect the management of your child in this hospital.

If you have any questions which you feel the investigator explaining to you has not handled or you would want another opinion, feel free to contact the **Principal Investigator, Dr. Simba, Justus 0723114529.**

Alternatively you could make further enquiries from the Institutional Research and Ethics Committee of MTRH/ Moi University College of Health Sciences which has reviewed and approved this study through **0787723677.**

I have understood the explanation given to me about this study and hereby give consent for my child to take part in it. I further authorize you to keep my contact for the sole purpose of the study as described above.

Name: ……Signature…… …Date ……

Investigator:

Name..... Signature .....Date.....

Witness:

Name: …… Signature ……. Date……

Kiswahili Version:

Tunafanya utafiti wenye kichwa cha habari: **'Impact of Targeted Health Education on Asthma Control among Children attending Clinics at Moi Teaching and Referral Hospital, Kenya: A Randomized Controlled Trial'**

Utafiti huu utakuwa katika sehemu mbili: sehemu ya kwanza inahusisha kupata taarifa ya kliniki ya mtoto wako na moja kwa moja kuuliza wewe maswali ambayo itawezesha kuamua kama mtoto wako ana pumu. Wewe huenda haujaambiwa utambuzi huu na mhudumu wako wa afya ya msingi. Maswali tutayotumia yameonyesha kuwa muhimu katika kuamua iwapo mtoto ana hali hii au la. Hatutarajii kufanya kipimo yoyote ziada kwa mtoto wako mbali na zile daktari wako ameitaji. Tunaomba utupe nambari yako ya simu ambayo tunatumia kuwasiliana nawe ikiwa tunahisi kuwa mtoto wako ana hali hii. Hata hivyo tutaweka maelezo yako kwa siri.

Mtoto wako akiwa miongoni mwa wale tunahisi wanapaswa kuingia katika sehemu ya pili ya utafiti, sisi tutawasiliana nawe na kukuuliza uje tarehe maalum katika hospitali hii mahali tutakapo kuelezea.

Wale watoto ambao wametambuliwa kama wenye pumu kutokana na uchunguzi wa awali, watafanyiwa mahojiano ya msingi ambayo itakuwa kutuwezesha kuelewa kile wanajua kuhusu pumu, jinsi matibabu yao yanafanya kazi na imani zao na hofu kuhusu pumu. Tunakusudia kupima pumzi mtoto wako kama sehemu ya ukusanyaji wa taarifa ya msingi. Hii inahusisha mtoto wako kujaribu kupumua kupitia mashine

na kuweka hii kumbukumbu. Mchakato huu una hatari ndogo sana ya maambukizi ambayo tumechukulia hatua za kuzuia.

Hatimaye sisi tutagawa watoto hawa kwa bahati katika makundi mawili. Kundi moja sisi tutatoa kwa wazazi wao vifaa vya elimu maalum kuhusu pumu kwa kuwa wao wataangalia videyo fupi ya takriban dakika kumina na tano. Kundi lingine sisi hatutafanya chochote ziada. Watoto wote katika utafiti huu wataendelea kufanya huduma yao kama kabla. Sisi tutafuata watoto hawa kwa miezi 6 na kiangalizi angalau mbili kutoka mawasiliano ya awali. Mwishoni mwa miezi sita, tutakuwa na uangalizi wa jinsi matibabu yao yanafanya kazi.

Tunadhamiria kulinganisha matokeo ya utafiti huu na pengine kushawishi sera za baadaye kwenye usimamizi wa pumu. Watoto watakaotambuliwa kama pumu na utafiti huu wataunganishwa na huduma katika hospitali ya rufaa ya Moi, Eldoret. Hakuna faida ya moja kwa moja kwa ajili ya kushiriki katika utafiti huu. Ingawa hakuna hatari ya kushiriki katika utafiti huu, kushiriki kunaweza kukusababishia usumbufu ya kuweza kuzingatia mahudhurio ya kliniki kali kwa ajili ya utafiti huu. Tena unaweza kuwa na usumbufu kidogo kujua kuwa mtoto wako ana uwezekano wa kuwa na pumu wakati umeamini vinginevyo.

Kwa hivyo tunaomba kibali chako kwa kuhusisha wewe na mtoto wako katika utafiti huu. Kukataa kushiriki katika utafiti huu haitaathiri kushungulikiwa kwa mtoto wako katika hospitali hii.

Kama una maswali yoyote ambayo unahisi mchunguzi anaye ongea nawe hajasahahisha kabisa, jisikie huru kuwasiliana kuu mchunguzi, Dr. Simba, Justus **0723114529.**

Vinginevyo unaweza kupata habari zaidi kutoka taasisi ya utafiti na kamati ya maadili ya MTRH / Chuo Kikuu cha Moi ambayo imeangalia na kupitishwa utafiti huu kupitia **0787723677.**

Nimeelewa maelezo niliyopewa na kuhusu utafiti huu na natoa idhini kwa ajili ya mtoto wangu kuhushishwa. Zaidi ninaruhusu kuwekwa kwa nambari yangu ya mawasiliano kwa madhumuni pekee ya utafiti kama ilivyoelezwa hapo juu.

Jina: ..... Saini.....
Tarehe.....

Mchunguzi:

Jina: .....
Saini.....Tarehe…….....

Shahidi:

Jina: ..... Saini.....
Tarehe……...

Appendix X: Assent form

Study Number……

This assent form shall be used for children aged 7 years and above

Study Title: **'Impact of Targeted Health Education on Asthma Control among Children attending Clinics at Moi Teaching and Referral Hospital, Kenya: A Randomized Controlled Trial'**

We are doing a research study about asthma health education and how it influences how well children with recurrent coughing/ wheezing from asthma have their symptoms made less severe. A research study is a way to learn more about people. If you decide that you want to be part of this study, you will be asked to answer some questions on what you feel about your recurrent coughing and wheezing and how it makes you feel. Some of you will also have your breathe checked, using something we call spirometer. If you are selected to be part of this group which will have breathe measured, we shall ask you to blow into some equipment your breathe. We shall not take any blood from you or any other substance. At the end of the study period, which will take several months, we shall ask you to answer again the few questions about how you feel.

While it will not directly concern you, we shall have your parent/guardian divided into two groups. One group shall continue to receive usual care while another group of parents/guardians shall be given addition education where they shall watch videos.

Not everyone who takes part in this study will benefit. A benefit means that something good happens to you. We think these benefits might be: this study will make us better understand how to take care of children with this disease.

When we are finished with this study we will write a report about what was learned. This report will not include your name or that you were in the study.

You do not have to be in this study if you do not want to be. If you decide to stop after we begin, that's okay too. Your parents know about the study too.

If you decide you want to be in this study, please sign your name.

I, _____, want to be in this research study.

Sign your name_____

Date_____

Name of Investigator: _____ Sign _____

Kiswahili Version:

Fomu hii ya kupata kibali itatumika kwa watoto wenye umri wa miaka saba na zaidi

Utafiti: '**Impact of Targeted Health Education on Asthma Control among Children attending Clinics at Moi Teaching and Referral Hospital, Kenya: A Randomized Controlled Trial'**

Sisi ni tunafanya utafiti kuhusu elimu ya afya pumu. Utafiti ni njia ya kujifunza zaidi kuhusu watu. Kama utahamua kwamba unataka kuwa katika utafiti huu, utaulizwa kujibu baadhi ya maswali juu ya pumu yako, ama asthma, na jinsi inafanya ujisikie. Baadhi ya watoto wengine, tutangalia vile wanapumua kwa kutumia kitu tunaita spirometer. Kama wewe utachaguliwa kuwa sehemu ya kundi hili ambayo itakuwa ikipimwa kwa iki kifaa, tutakuuliza upumulie kwa hiyo kifaa. Hatutachukua damu yoyote kutoka kwenu au kitu kingine chochote. Mwishoni mwa kipindi cha utafiti, ambayo kitachukua miezi kadhaa, tutakuuliza wewe kujibu tena maswali machache kuhusu jinsi unajisikia.

Ni vyema kukueleza ya kwamba wazazi/walezi watangawanywa kwa makundi mawili. awanyika katika makundi mawili. Kundi moja litaendelea kupokea huduma ya kawaida wakati kundi jingine la wazazi / walezi watapewa elimu ya ziada ambapo watakuwa wakiangalia video.

Si kila mtu ambaye anashiriki katika utafiti huu hatafaidika. Faida maana yake ni kwamba kitu kizuri kinachotokea kwako. Tunadhani faida yaweza kuwa: utafiti huu utafanya sisi kuelewa vizuri jinsi ya utunzaji wa watoto wenye ugonjwa huu.

Wakati sisi tutamalizana na utafiti huu, tutaandika ripoti kuhusu kile tumejifunza. Ripoti hii haitakuwa na jina lako au kwamba ulikuwa kwa huu utafiti.

Huwezi kuwa katika utafiti huu kama hutaki. Kama utaamua kuacha baada tunaanza , hiyo ni sawa pia. Wazazi/walezi wako wanajua kuhusu huu utafiti pia.

Kama umeamua unataka kuwa katika utafiti huu, tafadhali ashiria na jina yako.

Mimi, _____ , nataka kuwa katika utafiti huu .

_____

_____

(Sahihi lako hapa) (Tarehe)

Jina la Mpelelezi : _____ Sahihi _____

Appendix XI: Publications from this work

East African Medical Journal Vol. 95 No. 8 August 2018

ASTHMA CONTROL AND FACTORS ASSOCIATED WITH CONTROL AMONG CHILDREN ATTENDING CLINICS AT A NATIONAL REFERRAL HOSPITAL IN WESTERN KENYA

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ASTHMA CONTROL AND FACTORS ASSOCIATED WITH CONTROL AMONG CHILDREN ATTENDING CLINICS AT A NATIONAL REFERRAL HOSPITAL IN WESTERN KENYA

J. M. Simba, I. Marete, R. Waihenya, Y. Kombe, A. Mwangi, R. K. Kithuci, P. Mburugu, and F. Ogaro

ABSTRACT

Background: **Asthma control is the extent to which the various manifestations of asthma have been reduced or removed by treatment. In developing countries including Kenya, many children continue to visit hospitals with acute symptoms of asthma, which is a pointer to poor control.**

Objectives: To determine the level of asthma control and factors associated with the observed control among children at a national referral hospital. *Design:* Cross-sectional study

Setting: Moi Teaching and Referral Hospital, Eldoret, Kenya paediatric clinics. *Subjects:* A total of 166 asthmatic children aged 6-11 years and their parents/caretakers were enrolled between August 2016 and October 2017. *Main Outcome:* Level of control using childhood asthma control test (c-ACT)

Results: The median age of enrolled children was 8.17 years with males being the majority, 94 (56.6%). Using c-ACT, 92 (55.4%, 95%CI: 47.52, 63.10) had well controlled asthma at baseline. At univariate analysis, having a medical insurance cover (p=0.034), dry season (p=0.036), and parental perception of asthma control (p=0.002) were significantly associated with good control of asthma. Acceptance that a child had asthma was associated with poor control of asthma, p=0.046. On multivariate logistic regression, a perception of a well-controlled child by the parent/caretaker correlated well with good control of asthma.

Conclusion: About half of the children in this set up have good control of asthma with the observed status of control being affected by parental/caretaker perception on asthma.

INTRODUCTION

Asthma control is defined as the extent to which the various manifestations of asthma have been reduced or removed by treatment

(1). Further, asthma control is the degree to which therapy goals are met (2). In developing countries including Kenya, many children continue to visit hospitals with acute symptoms of asthma, which is a pointer to poor control. In a recent study in Nairobi and its environs, good control was reported as 42% among asthmatic children aged 1-14year (3).While controversies exist on how best to define asthma control, we utilized childhood asthma control test (c-ACT) which has been widely used and validated in the world (4,5) .

Anecdotal evidence shows that on average

3-4 children are nebulized with bronchodilators every day at Moi Teaching and Referral Hospital (MTRH), Eldoret, Kenya. This study therefore sought to establish the state of asthma control at such a national referral hospital as well as factors associated with the observed control.

MATERIALS AND METHODS

We carried a cross-sectional study among children attending Children's clinics of the Moi Teaching and Referral Hospital (MTRH) in western Kenya between August 2016 and October 2017. Other details of the study site and the study population have been described in a related publication (6).

We screened 6-11-year-old children for asthma using the International Study on Asthma and Allergies in Childhood (ISAAC) screening questionnaire. We excluded

very sick children as well as those with other chronic comorbidities such as chronic heart

failure. These children were subsequently enrolled to a randomized control trial registration PACTR201702002061736. We estimated the sample size based on the following assumptions:- desired confidence interval at 95%, estimation of asthmatic children with 'good control' at 42%

(3),desired level of statistical significance at

5% as well as adjusting for diminishing

numbers of asthmatics in subsequent months of recruitment. We analysed the data for the total of 166 study participants recruited.

A questionnaire was used to collect data from children identified as asthmatics from the screening. It collected data on background variables including spirometer values, level of asthma control using a childhood asthma control test as well as factors likely to affect asthma control. The c-ACT is a questionnaire which has been validated for 4-11year olds and used in several countries (4,5) and is part of national guidelines in Kenya (7), it has 7 questions and is answered both by the child and the caretaker/parent. We also assessed for parental knowledge and beliefs concerning asthma treatment, details of which have been published (6). We used a cut off of above 20 as good control having adjusted for possible negative impact of the perceptions on asthma in this community.

We analysed data using STATA version 13, generated descriptive statistics and used Chi-square test to check for associations among categorical variables. Multivariate logistic regression was used to check for factors associated with control at baseline adjusting for confounders. All analysis has been done at 95% level of significance. Ethical clearance to carry out this research was granted by the Moi Teaching and Referral Hospital/Moi University College of Health Sciences Ethics and Review Committee. Informed written consent was granted by caretakers/parents involved.

RESULTS

We enrolled a total of 166 children together with their caretakers/parents. The median age of the enrolled children was 8.17 years (Interquartile range =7.00-10.00) with the males being the majority, 94 (56.6%). Using the c-ACT, 92 (55.42% 95% CI: 47.52, 63.10) had well controlled asthma.

Factors associated with asthma control:

Social demographics characteristics: Upon testing for associations among the various socio-demographic variables which included residence, level of education and medical insurance cover, only medical insurance cover was associated with good control with a p value of 0.034. This is shown in table 1.

Table 1: Socio-demographic variables

Variable	No control	Control	p-value
Gender of child			
Male	42 (44.7)	52 (55.3)	0.976
Female	32 (44.4)	40 (55.6)	
Caretaker's Relationship to child			
Mother	53 (45.3)	64 (54.7)	0.956
Father	13 (43.3)	17 (56.7)	
Other	8 (42.1)	11 (57.9)	
Residence			
Urban	55 (44.4)	69 (55.6)	0.921
Rural	19 (45.2)	23 (54.8)	
Occupation of Caretaker			
Formal	25 (39.1)	39 (60.9)	0.524
Self employed	19 (48.7)	20 (51.3)	
Unemployed	30 (47.6)	33 (52.4)	
Medical Insurance Cover			
Yes	45 (39.1)	70 (60.9)	0.034
No	29 (56.9)	22 (43.1)	
Highest Education level of caretaker			
None	4 (66.7)	2 (33.3)	0.37
Primary	9 (56.3)	7 (43.8)	
Secondary	20 (51.3)	19 (48.7)	
Tertiary College	23 (41.1)	33 (58.9)	
University	18 (36.7)	31 (63.3)	

Environmental and Clinical factors: The dry season was significantly associated with good control of asthma with a p value of 0.036. Factors like type of fuel, type of

the house as well as living near industries were not significant. This is shown in table 2.

August 2018	EAST AFRICAN MEDICAL JOURNAL					1847	
			Table 2				
	Environmental and Clinical variables						
Variable		**No control**		**Control**		**p-value**	
Season Recruited							
Wet		49	(51.6)	46	(48.4)	0.036	
Dry		25	(35.2)	46	(64.8)		
Occupation of Caretaker							
Formal		25	(39.1)	39	(60.9)	0.524	
Self employed		19	(48.7)	20	(51.3)		
Unemployed		30	(47.6)	33	(52.4)		
Type of residence house							
Permanent		44	(43.1)	58	(56.9)	0.61	
Semi-permanent		22	(44)	28	(56)		
Temporary		8 (57.1)		6 (42.9)			
Have carpets at home							
Yes		35	(40.7)	51	(59.3)	0.297	
No		39	(48.8)	41	(51.2)		
Good house aeration*							
Yes		68	(44.2)	86	(55.8)	0.695	
No		6 (50)		6 (50)			
Ownership of pet							
Yes, and child plays with pet		21	(53.8)	18	(46.2)	0.411	
Yes, and child doesn't play with pet		19 (41.3)		27	(58.7)		
No pet		34	(42.0)	47	58.0		
Fuel for cooking							
Kerosene		10	(41.7)	14	(58.3)	0.852	
Firewood		37	(46.8)	42	(53.2)		
Gas		27	(42.9)	36	(57.1)		
Person smoke							
Yes		9 (69.2)		4 (30.8)		0.063	
No		65	(42.5)	88	(57.5)		
Industries Near Residence							
Yes		17	(54.8)	14	(45.2)	0.202	
No		57	(42.2)	78	(57.8)		
Caretaker aware what makes child wheeze							

Yes		46	(47.4)	51	(52.6)	0.382	
No		28	(40.6)	41	(59.4)		
Reliever Drugs at home							
Yes		42	(48.8)	44	(51.2)	0.252	
No		32	(40)	48	(60)		
Health provider talked about asthma action plan to caretaker							
Yes		21	(47.7)	23	(52.3)	0.624	
No		53	(43.4)	69	(56.6)		
Caretakers perception on child's control level							
Well controlled		27	(36.5)	47	(63.5)	0.002	
Partially controlled		36	(45)	44	(55)		
Poorly controlled		11	(91.7)	1 (8.3)			

Acceptance that child has asthma			
Yes	31 (55.4)	25 (44.6)	0.046
No	43 (39.1)	67 (60.9)	
Perceived knowledge on asthma			
Knowledgeable	26 (44.1)	33 (55.9)	0.292
Knows a little	29 (39.7)	44 (60.3)	
Not knowledgeable	19 (55.9)	15 (44.1)	
Asthma knowledge			
Not knowledgeable	16 (30.8)	36 (69.2)	0.016
Knowledgeable	58 (50.9)	56 (49.1)	
**Window size at least 10% of floor*			

Multivariate logistic regression showed that only caretaker's perception on child's control level and knowledge on childhood asthma were associated with the observed status of asthma control among the study participants adjusting for the other factors. A perception of a well-controlled child by the parent/caretaker correlated well with good control. This is shown in table 3.

Table 3: Multiple logistic regressions on selected factors associated with control

Variable	Odds Ratio	p-value	[95% Conf.	Interval]
Male	1.000			
Female	1.124	0.741	0.562	2.250
Wet Season	1.000			
Dry season	1.468	0.275	0.737	2.926
Health insurance	1.000			
No health Insurance	0.625	0.204	0.302	1.292
Person smoke	1.000			
No person smoke	2.607	0.155	0.696	9.758
Industries	1.000			
No industries	1.833	0.163	0.782	4.301
Caretakers perception on child's control level				
Well controlled	1.000			
Partially controlled	0.621	0.183	0.308	1.252
Poorly controlled	0.054	0.009	0.006	0.476
Not knowledgeable	1.000			
Knowledgeable	0.453	0.039	0.213	0.959

DISCUSSION

Using c-ACT, an estimated 55.4% of children in this study had well controlled asthma. This is higher than the control level of Kigathi et.al, 2012, in Nairobi and its environs where only 42% had control (3). In

South African study, c-ACT had shown that 66.2% of children in their area were controlled (5). In Nigeria, 82.1% of children enrolled in a cross-sectional study in 2015 had optimal asthma control based on the Global Initiative for Asthma (GINA) criteria, this largely a very good control in Africa (8). We note one difference that these children were on follow up in an asthma clinic, while as we described earlier at the time of our data collection chest clinic was being set up at our facility (6, 8). We have paucity of studies evaluating asthma control in our set up, especially in children more so on c-ACT. We however used 20 as a cut off as opposed to 19. While Liu et al has previously argued a cut off of 19 has the best sensitivity, it is generally agreed that there exists overlap in the scores between 19 and 22 (4,9,10). In a study among Mexican youth, communities with negative perceptions on asthma, higher cut-offs

were likely to give the true level of control, hence we felt this held for our population based on earlier analysis (6, 11).

In univariate analysis, we found that individuals who had accepted that their children were having asthma had poor control. In a related publication on the same cohort, we have demonstrated that those with good knowledge on asthma were those who had accepted asthma as a diagnosis for their children (6). We postulate that in this population with negative perception towards asthma (6), it is possible that those who had severe disease were likely to have accepted asthma status. On the other hand, Kolbe, J., et.al 1996, showed that there exists difference between asthma self-management knowledge and actual behaviour on asthma

management (12). Silva D et.al 2013 did not find any association between parental asthma knowledge and childhood asthma control (13). This could be the reason for what appears to be a reverse association. In this cohort therefore, we conclude that a parent/guardian taking care of a child with severe disease is likely to look up for information about asthma notwithstanding the fact that those with severe disease are likely to have poorly controlled asthma. Further, consistently with existing literature (14, 15), children who had a medical insurance cover were well controlled. It is likely our study points to that these children were likely to be brought to the clinics for regular check-ups. It has been shown that, highest levels of asthma control are found in children with adherence to treatment (16). Although there is association of having medical insurance with good control, some studies including Zahran et.al have not found associations (17). Weather seasonality had a significant association with control. Consistently like in other studies, wet weather was associated with poor control. Only knowledge on asthma and perception on child's asthma level of control were independently associated with the observed asthma control status. In our study we found that perception of child's poor state of control was associated with poor c-ACT score (18).

Although low educational attainment, low income, cigarette smoking (8,17), pet ownership (19), and occupation of the parent (20) have also been shown to affect control in asthmatics, we did not find these factors to be significantly associated with

control in our cohort. It worth noting that majority of caretakers/parents for our participants had attained tertiary and university education.

We conclude that nearly half of the children in this set up had well controlled asthma and that the observed status of asthma control among these children is affected by parental/caretaker perceptions on asthma including perceptions on control and on diagnosis of asthma. Enhancing health education among parents/caretakers of children with asthma should be pursued to enhance control levels.

Knowledge and perceptions on childhood asthma among care-takers of children with asthma at a National Referral Hospital in Western Kenya: a descriptive study

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Kenya Medical Research Institute.

Moi University School of Medicine, Behavioural Sciences.

Moi Teaching and Referral Hospital.

Abstract

Background: Identifying knowledge gaps in asthma self-management and identifying existing myths is an important step in determining appropriate health education and demystifying the myths so as to enhance asthma control.

Objective: To identify existing knowledge gaps and perceptions among the caregivers of asthmatic children.

Methods: A cross sectional study was done among caretakers of asthmatic children aged 6-11 years at Moi Teaching and Refer-ral Hospital. Data on knowledge and perceptions among caretakers was collected using a questionnaire.

Results: A total of 116 caretakers were recruited of whom 71.6% were mothers. Although 60% of the caretakers had asthma medications at home, only a third felt their children were asthmatic. Eighty four (72.4%) had basic asthma knowledge. Syrups were preferred to inhalers by 70.7%, with 64.7% believing that inhalers were for the very sick. Only 36 (31%) felt preventer medications in asthma were necessary. Acceptance of asthma as a diagnosis and presence of asthma drugs were significantly associated with better knowledge of asthma, p-values 0.015 and 0.009 respectively.

Conclusion: Most caregivers perceive syrups to be better despite having good basic knowledge on asthma. There is need to address asthma perceptions among caretakers in resource poor settings which is likely to improve control. **Keywords:** Childhood asthma, care-takers, Western Kenya.

DOI: https://dx.doi.org/10.4314/ahs.v18i4.16

Cite as: *Simba J, Marete I, Waihenya R, Kombe Y, Mwangi A, Mburugu P, Ogaro F. Knowledge and perceptions on childhood asthma among care-takers of children with asthma at a National Referral Hospital in Western Kenya: a descriptive study. Afri Health Sci. 2018;18(4): 965-971. https://dx.doi.org/10.4314/ahs.v18i4.16*

Background

The mainstay of asthma management includes use of bronchodilators such as salbutamol and use of steroids mainly the inhaled ones. The intensity of the treatment chosen is mainly influenced by the severity1. These med-ications form the cornerstone of management2. There have been concerted efforts to ensure that these drugs are available so as to ease the individual's burden of asthma. Some evidence shows that the availability of these medi-cations alone does not lead to good control3.

Many other factors influence the level of asthma control. Some of these factors are related to health workers while others relate to the caretakers of the children. Adherence to treatment is the single most important determinant of asthma control4. This however is affected by the parents' satisfaction with involvement in decision-making as well as perceived level of interaction with the health worker5. Similarly, low educational attainment, low income, ciga-rette smoking, co-morbid conditions including obesity and depression6, pet ownership, other allergic comorbid diseases,

especially rhinitis7, weather seasonality (includ-ing pollination), occupation and food allergies8-10 have also been shown to affect control in asthmatics.

In low income countries, including Kenya, many children continue to visit hospitals with acute symptoms of asth-ma, which is a pointer to poor control. In a recent study in Nairobi and its environs, good control was reported as 42% among asthmatic children aged 1-14years11. In addi-tion to the factors highlighted above, the socio-economic factors have a great role in exacerbating asthma attacks. The level of acceptance of current care is affected by mis-conceptions and stigma associated with the management especially the use of inhalers12. We describe the myths, perceptions and knowledge on asthma among parents of children with asthma in a poor resource setting.

Methods

A cross-sectional study was carried out at the chil-dren's clinics of the Moi Teaching and Referral Hospi-tal (MTRH), between August 2016 and December 2016. MTRH is a national referral hospital located in Eldoret serving the Western part of Kenya with a catchment population of approximately 15 million. Up to 3000 chil-dren are seen per month in this hospital. There are two specialized paediatric clinics per week which attend to an average of 100 children per month. Although there is a paediatric pulmonology clinic being set up, the numbers are still low. There are no asthma health educators and patient education is at the discretion of the attending cli-nician. No lung function tests are performed on children who are on management for asthma in this hospital.

Children aged 6-11 years attending the clinic at MTRH together with their parents/caretakers were enrolled into phase one, a cross sectional study, (subsequently enrolled into a second phase, a trial registration PAC-TR201702002061736) if they met diagnosis of asthma using ISAAC screening questionnaire and consent was given. We excluded children who were unstable or very sick (requiring urgent resuscitation measures such as oxy-gen, urgent rehydration, anti-convulsants) or succumbed to illness within 24 hours of screening. Similarly those with serious chronic comorbidities, for example, chronic

heart failure as well as non-residents of Western Kenya were excluded.

All children presenting to the hospital aged 6-11 years were eligible for participation and were screened for suit-ability using a validated parent/caregiver screening ques-tionnaire used originally in the ISAAC studies[2,13-16]. The questionnaire used for 6-7 year olds in the ISAAC stud-ies was used. Children identified as asthmatic from the screening had data collected using a questionnaire which mainly looked for background variables as well as paren-tal knowledge and beliefs concerning asthma treatment.

Data was entered into Microsoft Access. It was then ex-ported to STATA Version13 for analysis. Descriptive statistics were generated from the baseline study. We as-sessed

knowledge on asthma by scoring individual ques-tions with 1 score for correct response and dichotomized to ≤9 and ≥10 as not knowledgeable and knowledgeable respectively. Attitude questions were individually scored. The Chi-square test was used to test for categorical vari-ables association. Level of significance was set at 0.05.

Clearance to carry out the research was granted from the ethics review committee of MTRH/College of Health Sciences, Moi University. Enrolled participants gave in-formed consent.

Results

A total of 116 families took part. The median age of the children was 8.3 years. Most parental respondents were mothers (n=83, 71.6%) from urban settings (n=85, 73.3%) who had attained at least secondary school educa-tion (n=109, 94%). The results are summarised in Table 1.

Whilst self-reported asthma knowledge was high, with less than one-fifth of caregivers rating themselves as 'not knowledgeable' (n=23, 19.8%) just less than one third of respondents accepted that their child had asthma (n=38, 32.8%). At least 50.9% perceived their child's illness to be well controlled and interestingly 66 (56.9%), acknowl-edged that they had drugs at home to control their child's symptoms. This is shown in table 1.

Table 1: Baseline characteristics of children/caretakers

Variable	Freq	%
Age of child in years	n=116	
Median (IQR)	8.33 (7,10)	
Gender of child		
Male	65	56.00%
Female	51	44.00%
Relationship with child		
Mother	83	71.60%
Father	20	17.20%
Other	13	11.20%
Residence		
Urban	85	73.30%
Rural	31	26.70%
Season recruited		
Wet	65	56.00%
Dry	51	44.00%
History of asthma in family		

Yes	72	62.10%
No	44	37.90%
Highest education level of caretaker		
None	3	2.60%
Primary	4	3.40%
Secondary	21	18.10%
Tertiary college	43	37.10%
University	45	38.80%
Asthma drugs at home for child		
Yes	66	56.90%
No	50	43.10%
Health provider talked about asthma action plan		
Yes	30	25.90%
No	86	74.10%
Caretaker perception on child's control level		
Well controlled	59	50.90%
Partially controlled	49	42.20%
Poorly controlled	8	6.90%
Acceptance that child has asthma		
Yes	38	32.80%
No	78	67.20%
Perceived knowledge on asthma		
Knowledgeable	43	37.10%
Knows a little	50	43.10%
Not knowledgeable	23	19.80%

When questions measuring knowledge on asthma among the caretakers were analysed, 84(72.4%) were determined to be knowledgeable as they answered at least half of the questions correctly.

Generally the presentation of asthma was well identi-fied. Breathlessness (difficulty in breathing) was the least identified as the presentation of asthma by 84 (72.41%). Caretakers were able to identify correctly that chemi-cals with bad smell, 66 (56.9%), cold air, 101 (87.07%), and strong perfumes, 73 (62.93%) trigger asthmatic at-tack. Few individuals were able to identify that emotional stress, 25 (21.55%), exercise, 55 (47.4%) and cockroach-es 13 (11.21%) and aspirin/ibuprofen, 11(9.48%) trigger asthmatic attack. At least half, 50.86% of the participants were able to pick the correct definition of asthma. How-ever, most participants were not able to identify the cause of asthma.

We subjected the caretakers to a set of questions to es-tablish their perception on asthma treatment. Most of the caretakers preferred syrups for inhalers in the man-agement of asthma. Specifically 72(62.1%) felt broncho dilatation is best achieved by syrups while only 34(29.3%) would prefer inhalers on their child given choice. Interest-ingly though, only 39

(33.6%) feared inhalers. Concerning controller medications, only 36 (31.0%) felt daily medications were necessary in asthma care. More than half (55.2%) felt not enough information concerning their child's condition had been addressed by health care work-ers. This is shown in detail in table 2.

Table 2: Perceptions on asthma treatment by caretakers

Variable	**Freq**	**%**
Bronchodilator treatment is best achieved when given as:		
Inhaler	44	37.90%
Syrup	72	62.10%
Given a choice caretaker prefersinhaler over syrup:		
Yes	34	29.30%
No	82	70.70%
Believe that inhalers are	**for the seriously sick:**	
Yes	75	64.70%
No	41	35.30%
Fear inhaler as not approved by other people:		
Yes	39	33.60%
No	77	66.40%
No need of daily drugs, given with wheezing		
Yes	80	69.00%
No	36	31.00%
Child 6-11 years requires a spacer to use inhalers:		
Yes	54	46.60%
No	62	53.40%
Feeling enough information concerning child		
Yes	52	44.80%
No	64	55.20%
Concerns/fears addressed by health workers:		
Yes	60	51.70%
No	56	48.30%

On determining whether there are any predictors of knowledge from the baseline characteristics, acceptance that child has asthma and acknowledgement that there were drugs at home to help with attacks were positively associated with being knowledgeable at p value of 0.015 and 0.009 respectively. This is shown in detail in table 3.

Table 3: Association between caretaker's baseline characteristics and knowledge

Variable	Knowledgeable				p-value
Gender of child	**No**		**Yes**		
Male	15	(23.1)	50	(76.9)	0.22
Female	17	(33.3)	34	(66.7)	
Relationship to child					
Mother	25	(30.1)	58	(69.9)	0.383
Father	3	(15)	17	(85)	
Other	4	(30.8)	9	(69.2)	
Residence					
Urban	25	(29.4)	60	(70.6)	0.466
Rural	7	(22.6)	24	(77.4)	
Season recruited					
Wet	11	(16.9)	54	(83.1)	**0.004**
Dry	21	(41.2)	30	(58.8)	
History of asthma in family					
Yes	17	(23.6)	55	(76.4)	0.22
No	15	(34.1)	29	(65.9)	
Education level of caretaker					
None	0	(0)	3	(100)	0.412
Primary	0	(0)	4	(100)	
Secondary	8	(38.1)	13	(61.9)	
Tertiary college	11	(25.6)	32	(74.4)	
University	13	(28.9)	32	(71.1)	
Drug at home to relieve attack					
Yes	12	(18.2)	54	(81.8)	**0.009**
No	20	(40)	30	(60)	
Talk about asthma action plan					
Yes	7	(23.3)	23	(76.7)	0.545
No	25	(29.1)	61	(70.9)	
Recurrent wheezing					
Well controlled	16	(27.1)	43	(72.9)	0.565
Partially controlled	15	(30.6)	34	(69.4)	
Poorly controlled	1	(12.5)	7	(87.5)	
Acceptance child has asthma					
Yes	5	(13.2)	33	(86.8)	**0.015**
No	27	(34.6)	51	(65.4)	
Caretaker knowledge on asthma					
Knowledgeable	7	(16.3)	36	(83.7)	0.064
Knows a little	19	(38)	31	(62)	
Not knowledgeable	6	(26.1)	17	(73.9)	

Discussion

Our analysis of this cohort of caretakers shows that the level of knowledge was fairly high with 72.4% answering

African Health Sciences Vol 18 Issue 4, December, 2018 more than half of the questions correctly. In a large study from China, 51.34% of the parents scored less than half for the questions assessed[17]. In Egypt, Tantawi H. et.al 969 recorded a pre-intervention knowledge of 18.75%[18]. Our populations had 94% of the participants having attained secondary education. This could partially be responsible for the high level of knowledge. Our study again was car-ried out in a largely urban set up and included both the private wing and the general wing of the hospital. The private wing of the MTRH is the one where hospital staff and their dependents are attended to. This could have an influence as most of the staff are health workers.

Although inhalers are advocated world over, our study shows that the parents/guardians preferred using syr-ups for their children. We assessed for this perception by asking three different questions which had similar re-sults. While several possibilities could be responsible for this, it shows that the challenges in different regions may differ as it pertains asthma care. While this same group appeared knowledgeable, they prefer syrups which are associated with more side effects and are less effective. Similarly, although preventer medications which are given daily are the cornerstone of asthma medications[2], only 69% of our study participants felt they were necessary. This could mean we have unmet needs both for the par-ents and health workers which have been shown can oc-cur in different cultures/ regions[19].

Among other things, WHO has identified that ability to describe correctly asthma treatment is one of the pre-req-uisites for effective asthma care[20]. For patients to have proper knowledge, asthma education is important. It has to be actively provided[21]. The questions this raises are we attempting to focus on the patients while the bigger gap might be with the health workers? In our sample, only about half of the participants were satisfied with the in-formation they received from the health workers. There is evidence that better control is associated with perceived satisfaction by the patients/ care takers[5]. It is with this in mind that these results at a national referral hospital, which is home to one of the best medical schools in the region should be worrisome. Are we doing enough as far as basic education to health workers who see children with the possibility of asthma is concerned?

On testing for association of knowledge and selected baseline characteristics, having reliever medications as well as acceptance that child had asthma by the parents/ caretaker was associated with better knowledge of asth-ma. This might mean that health workers need to take up the mantle of educating care takers of children with 970 asthma on the disease. There is widespread concern that asthma stigma is worsened by the health workers as they do not attempt to tell a patient that they could be hav-ing asthma. Although there is no asthma registry at this hospital, when we screened children who came hospital for whatever reason, at least 10% met the criteria using the ISAAC questionnaire that they were suffering from asthma. However, a good number either were not aware or did not acknowledge that their child had asthma. Only 32% of the parents/caretakers felt their child had asthma. The physician's diagnosis of asthma to a child has been shown to a be strong determinant of asthma treatment[22]. When a child has not received a diagnosis of asthma,

they are less likely to be on any asthma medications. In our study, we found that 56% said they had a medication at home to relieve attacks. This is higher than the 9% that Maziak et.al found. However, our number included un-acceptable medications like syrups. While other studies have found that education level is a main determinant of level of knowledge[17], we did not find this association. Notable however, is that, in our cohort a small minority (6%) had lower level of education.

Conclusion

While inhalers have been shown to work and are advocat-ed for by national and international guidelines, most care-givers perceive syrups to be better. This is despite having good basic knowledge on asthma. This study provides evidence that there is need to address asthma perceptions among parents/caretakers in resource poor setting which is likely to improve control.

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Conflict of interest

The authors declare no conflict of interest.