

## ***Uncontrolled asthma and associated factors: Institution-Based Cross-sectional Study***

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### **Abstract**

**Background:** Asthma is a chronic illness in which goals of management aim to achieve and maintain control of its clinical manifestations. Achieving control of symptoms, however, has proved to be difficult, even in the developed countries. Uncontrolled asthma causes a great health and economic burden on patients and their families and there are many factors contributing to it. However, the extent of the problem and the risk factors associated with poor control of asthma has not been studied in the region served by ACSH. Such information will help effect better asthma control in our patients.

**Objective:** To determine the proportion of uncontrolled asthma and associated risk factors among adult patients of ACSH chest clinic, Mekelle, Ethiopia; March 2017 to October 2017.

**Methods:** A hospital based cross-sectional study design was employed. Seventy patients were included using a consecutive sampling technique. Data were collected using pretested structured questionnaire to get demographic and clinical data; entered into Statistical package for Social Sciences version 23 software for analysis. Crude and adjusted odds ratio with 95% CI was calculated to determine the strength of association between response and predictable variables. P-value less than 0.05 were considered as a level of significance. Descriptive analysis was used to see the magnitude of uncontrolled asthma and bivariate and multivariate regression was used to see association between the dependent and independent variables.

**Result:** Seventy patients were included in the study with age range from 17 to 91 years, and mean age of 45 years. There were more females (55.7%) than males. Majority, (93 %), of patients were started on controller treatment. Forty percent of patients had uncontrolled asthma, according to the GINA criteria, and factors independently associated with it were family history of asthma (AOR= 4.71, 95% CI: 1.028-21.5) and improper inhaler techniques (AOR= 6.6,95% CI: 1.14- 38).

**Conclusion:** Large proportions of patients have uncontrolled asthma symptoms despite being on treatment and follow up. Patients education about asthma control and proper inhaler techniques is recommended.

**Key word:** *Asthma control, poor inhaler technique, Ayder, Asthma Ethiopia*

## Background

Asthma is episodic disease characterized by recurrent episodes of wheezing, breathlessness, chest tightness, and coughing, particularly at night or in the early morning (1,3).

The prevalence of asthma has been increasing worldwide consistently (3). According to the 2014 global asthma report estimates, as many as 334 million people were living with asthma worldwide. Most people affected are in low- and middle-income countries and its prevalence is estimated to be increasing in those countries; as they become more westernized, with an estimated 10% prevalence in Ethiopia (3,4).

As a chronic illness, asthma imposes major economic and social burdens on the life of the individual and the family, in particular when it is uncontrolled. Low-income populations, experience disproportionately higher morbidity and mortality because of asthma (5).

The goal of asthma care is to achieve control of the clinical manifestations of the disease and maintain it for prolonged period (6). However, several surveys have shown that the majority of patients do not have adequate asthma control yet, even in developed nations (7,8). In a five year cross-sectional surveys done in five European countries, more than 50% of asthmatics remain not well controlled (9). Also a cross-sectional survey done in 7 countries in Asia showed the level of uncontrolled asthma was as high as 51% (10) while the Asthma Insights and Reality in Latin America (AIRLA) survey done in 2003 in 11 Latin American countries, reported a similar 51% of patients had uncontrolled asthma and only 2.3% adults met all criteria for asthma control (11). In Africa, asthma control studies are few. The Asthma Insights and Reality in the Maghreb (AIRMAG) survey, performed in three north African countries of Algeria, Morocco and Tunisia

showed a relatively poor asthma control, with 71.3% uncontrolled asthma, when compared to other regions evaluated (12).

In Ethiopia, a cross-sectional hospital-based study was conducted in Jimma, western Ethiopia, on 234 physician-diagnosed asthmatic patients in chest clinic. Using the GINA based algorithm, 76.1% had uncontrolled asthma (13).

Even though, there are several validated measures for the assessment of asthma control, the GINA guideline criteria are the gold standard measure (14). According to GINA 2015, controlled asthma is defined with absence of nocturnal symptom, no limitation of activities, no day time symptoms (or twice or less per week), no need for rescue inhaler (or twice or less per week) and no exacerbations in the last four weeks (14).

There are several risk factors that contribute to poor control like low socio economic status, tobacco smoking, biomass use, allergic rhinitis, obesity, incorrect inhaler use and poor adherence to treatment (16). It is crucial to assess for those factors during each patient follow up for better asthma control thereby contributing for betterment of patient's quality of life (17).

This study provides information on asthma control and factors contributing to poor control in ACSH.

## Methods

The study was carried out in the chest unit of ACSH, Mekelle, Ethiopia, from March 2017 to October 2017. A Cross-sectional study design was used and all adult asthma patients seen during the study period who were on asthma management for more than 8 weeks were included. Pregnant and those with concomitant COPD, lung cancer, bronchiectasis, heart failure were excluded from the study.

The Global Initiative for Asthma criteria was used to define asthma control where patients are said to have uncontrolled asthma when fulfilling 3 or more the following criteria; day time symptoms >2 days/week, night time awakening, use of reliever medication for >2 days/week and any activity limitation because of asthma. Adherence for medication was defined as taking 80% of the prescribed medications and patient self-report was used for assessment. Patients demonstrated how they use their inhaler and the nurse working at the chest clinic assessed if it was a proper technique.

Structured interviewer administered questionnaires were prepared in English and translated to local languages during interview. Data collection was carried out mainly by the chest unit nurses and residents. The collected data were checked for completeness, coded and entered to SPSS version 23 for analysis. Bivariate and multivariate logistic regression models were used for association analysis. Odds ratio at 95% confidence interval was determined and a p-value less than 0.05 was regarded as statistically significant.

### **Ethical Considerations**

The study was conducted after obtaining ethical approval from Ethics Review Committee of Mekelle University, College

of Health Sciences, Institutional review board. Informed verbal consent was obtained from each participant after participant information sheet which was prepared in English was read to patients by the data collector physician or nurse, All information provided by participants were kept confidential.

### **Results**

Between March 2017 and October 2017, a total of 72 asthma patients seen at the chest unit were screened and 70 study participants were included in the study. The patients' age ranged from 17 to 91 years, with mean of 45 years. Females accounted for 55.7% the participants.

All patients were taking short acting beta agonist (SABA) and 93% of them were on controller medications (80% on Inhaled Corticosteroid (ICS), 13% on Inhaled Corticosteroid/ Long acting beta agonist (LABA)). Seventy-nine percent of the patients demonstrated proper inhaler technique during data collection.

During evaluation of symptoms of asthma control, 38.6% had day time asthma symptoms for >2days/ week, 60% had night time asthma symptoms for  $1 \geq$  days/week, 37.1% used SABA to relieve their symptoms more than twice per week and 80% had activity limitations because of symptoms of asthma [Fig 1].

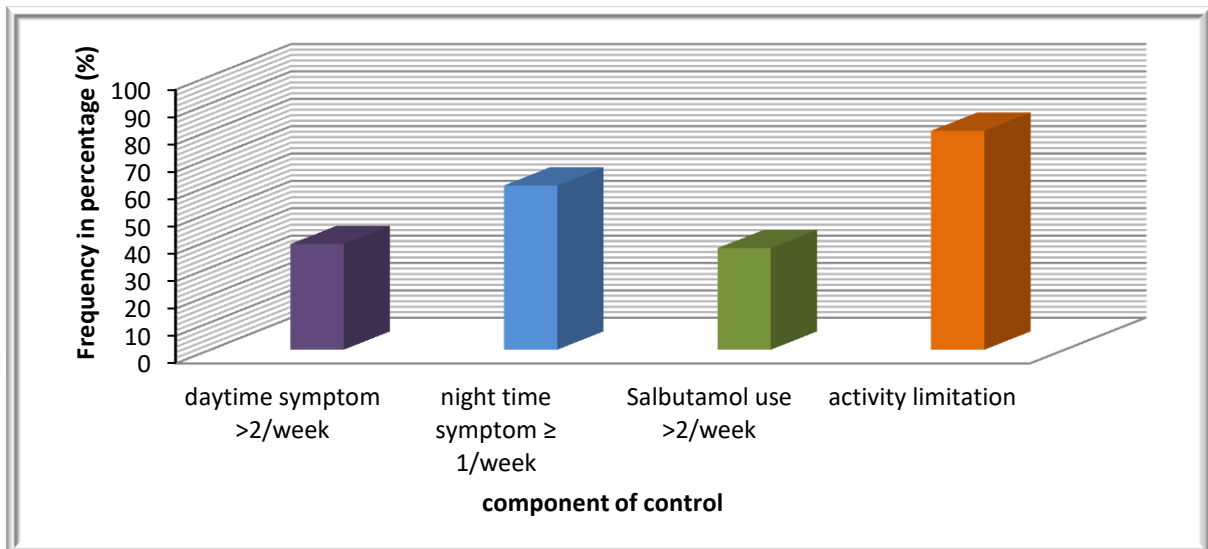


Fig. 1 Frequency of components of asthma control assessment in patients in ACSH, March 2017-October 2017

Based on the GINA asthma control assessment, 48% of patients had partly controlled asthma, 40% of them uncontrolled asthma and the rest (12%) had well controlled asthma[Fig 2].

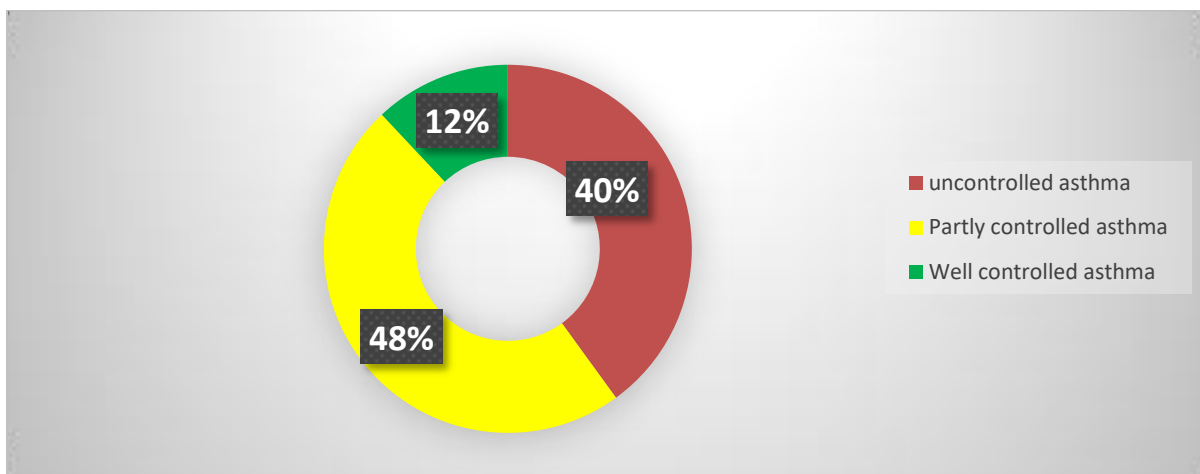


Fig. 2 Asthma control status in patients seen at ACSH, March 2017 to October 2017

From the patients with uncontrolled asthma, majority, (71%) were between the ages of 30 to 60 years, and 60.7% were female. Three-fourth of patients with uncontrolled asthma live in urban areas.

From all the uncontrolled patients, 9(32%) were on high dose ICS, 7 (25%) on medium dose ICS, 8(29%) on LABA –

ICS while 4 patients were not taking any controller therapy.

Patients with symptoms of allergic rhinitis constitute one fourth of the uncontrolled asthma, while those with improper technique of inhaler and non-adherence to treatment account for 28.6% and 7.2%, respectively[Fig 3].

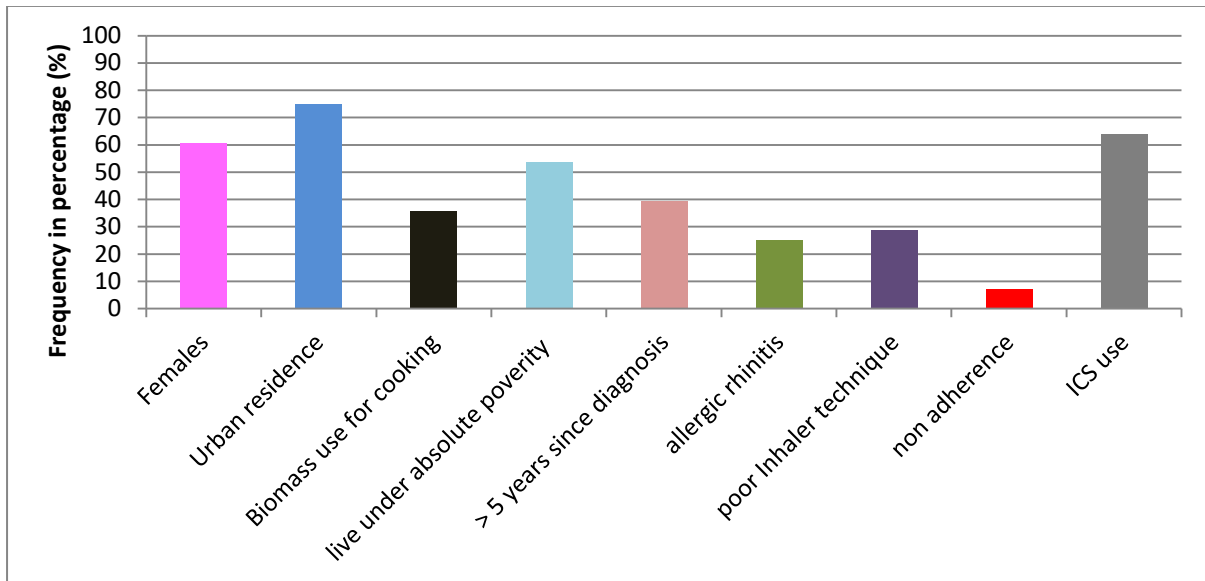


Fig.3 Frequency of Sociodemographic and clinical characteristics in uncontrolled asthma patients in ACSH, March 2017-October 2017

Family history of asthma (2.818, 95% CI 1.026 - 7.745) and ICS use (0.189, 95% CI 0.052 – 0.687) showed association with uncontrolled asthma in bivariate regression analysis. While on multivariate regression analysis, only family history (4.7, 95% CI 1.02 – 21) and inhaler technique (6.6, 95% CI 1 – 38) were significantly associated with uncontrolled asthma.

When starting follow up at the chest clinic 61 (87%) patients were on Prednisolone, of which 23% were taking it for 6 months or more (average dose of 30mg/day). Patients were followed and eventually tapered off their prednisolone and only 1 patient was taking Prednisolone for more than 10 days during the time of data collection.

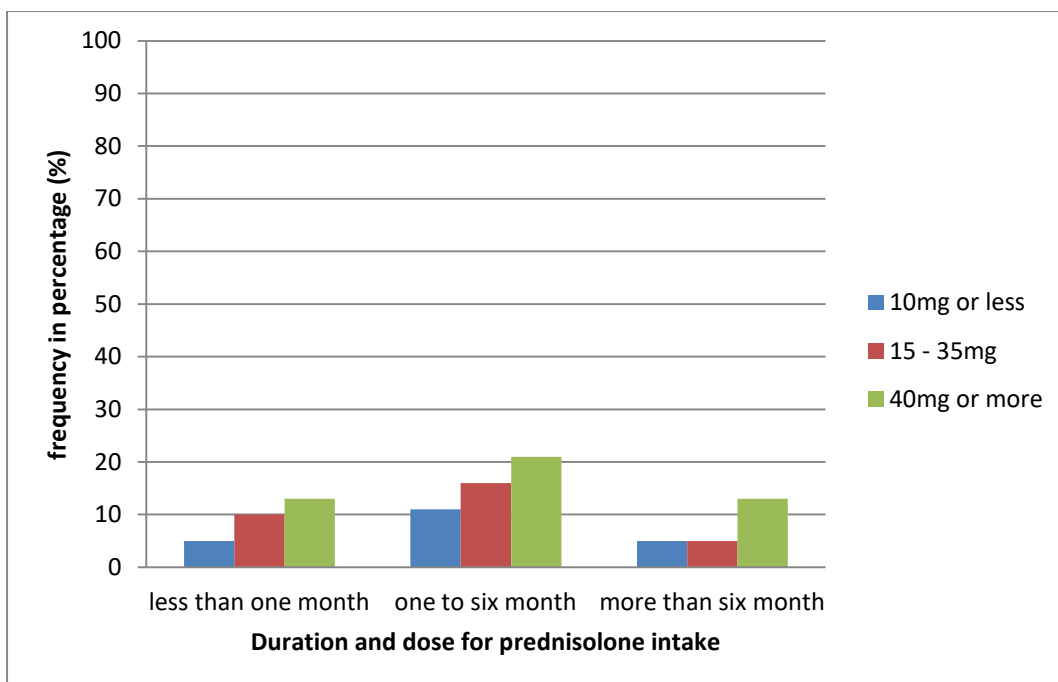


Fig. 4 Frequency of the dose and duration of prednisolone for the 61 patients before

starting follow up at the chest unit of ACSH

## Discussion

The results of this study show only 12% of patients met the GINA goal for asthma management. A significant proportion of patients had uncontrolled asthma (40%), despite the high utilization rate (93%) of asthma controller medications, according to the standard guidelines. A thorough assessment is required to properly assess the utilization rate and techniques of ICS/ICS-LABA.

Compared to what standard guidelines recommend and with European studies which reported a 25% poor asthma control rate [18], the control level is inadequate. The possible reasons for this are: most well controlled asthma patients disappear from follow-up (and therefore not included in our study), less use of controller medications other than ICS. In addition, 14% of patients were not started on any controller therapy and for 16 (57%) of them appropriate escalation of treatment was not done, the reason for this gap was not addressed in this study.

The prevalence of uncontrolled asthma in our study was lower than that reports of AIRMAG survey and the study in Jimma (12,14) and consistent with the results of previous studies conducted in a set up with a specialist consultation (19). The reasons for a better control level in our study are likely the presence of specialist care and the higher use of controller treatment (98% Vs 26.1% in AIRMAG and 3.8% in Jimma).

In a review of 21 studies of puffer Metered Dose Inhaler (pMDI) use, the prevalence of poor inhaler technique ranged from 14% to 90%, with an average of 50% (20). Our study reported a lower (21 %) prevalence, probably because our patients were given practical demonstration about proper use of their inhalers when they started follow

up at the chest unit. But still patients with poor inhaler technique were 7 times more likely to have uncontrolled asthma (AOR = 6.624, 95% CI: 1.14 – 38.44). This finding is consistent with previous studies which showed similar associations (21) and that control can be improved by improving adherence technique.

Family history was the other factor which had statistically significant association with asthma control. Patients with family history of asthma were 5 times more likely (AOR = 0.29, 95% CI: 0.089 - .958) to have uncontrolled asthma. This finding needs further elaboration in larger studies in the future.

The lack of association with previously proven independent risk factors is likely due to the small sample size of our study.

Poor adherence is among the most common causes of uncontrolled asthma, with reported rates of >30 – 70%. Our patients reported only 4% prevalence. Several studies have reported that adherence to medication might be overestimated by patients and can be made more objective by using methods like daily medication diary for follow up (22). We believe our evaluation of adherence might have been prone to this bias and needs to be further studied using a more thorough and detailed questionnaire.

Another significant finding of the study is that it was possible to wean oral steroid dependent patients from their Prednisolone without compromising their symptom control and unnecessary steroid prescription in asthma patients can be avoided when patients are followed properly by a pulmonologist. This prevents patients from the untoward effects of systemic steroids.

## Limitation of the study

This study used small sample size which most likely contributed to the loss of association between uncontrolled asthma and independent risk factors proven to have association in previous studies. It also used cross sectional study design making it difficult to comment if the attained asthma control was maintained subsequently. It was done in a single hospital and cannot be generalized to other hospitals or the population. It did not use spirometer due to technical limitations. Assessment of adherence was based on patient report and was not detailed, so it might be subjected for overestimation, especially it might have overestimated the use of ICS.

### Conclusion

Large proportions of asthma patients in ACSH have inadequate control of their symptoms. Poor inhaler technique and family history of asthma have significant association with uncontrolled asthma.

### Abbreviations

AIRLA: The Asthma Insights and Reality in Latin America  
 AIRMAG: The Asthma Insights and Reality in the Maghreb  
 BMI: Body Mass Index  
 COPD: Chronic Obstructive Pulmonary Disease  
 CI: Confidence Interval

ECRHS: European Community Respiratory Health Survey  
 FEV1: Forced Expiratory Volume in 1 sec  
 GINA: Global Initiative for Asthma  
 ICS: Inhaled Corticosteroid  
 IRB: Institutional Review Board  
 ISAAC: International Study of Asthma and Allergies in Childhood  
 LABA: Long Acting Beta Agonist  
 pMDI: puffer Metered Dose Inhaler  
 SABA: Short Acting Beta Agonist

### Declarations

#### Consent for publication

Not applicable

#### Availability of data

The dataset used and/or analyzed during the current study is available from the corresponding author on reasonable request.

#### Competing interests

The authors declare that they have no competing interests

#### Funding

Funding was obtained from Mekelle university post graduate grant for small scale research. The funding body did not participate in the design of the study and collection, analysis, and interpretation of data and in writing the manuscript

#### Author's contribution

EK designed and prepared the proposal, collected data, did analysis and write up of the research. KG and BA helped in the preparation of the proposal and analysis of the research. All authors have read and approved the final manuscript

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