ADDIS ABABA UNIVERSITY

SCHOOL OF PHARMACY

DEPARTMENT OF PHARMACEUTICS AND SOCIAL PHARMACY

ASTHMA TREATMENT OUTCOME AND FACTORS ASSOCIATED WITH UNCONTROLLED ASTHMA AMONG ADULT ASTHMATIC PATIENTS ATTENDING AMBULATORY CARE UNITS OF SELECTED PUBLIC HOSPITALS IN ADDIS ABABA, ETHIOPIA: A CROSS-SECTIONAL STUDY

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Asthma Treatment Outcome and Factors Associated with Uncontrolled Asthma among Adult Asthmatic Patients Attending Ambulatory Care Units of Selected Public Hospitals in Addis Ababa, Ethiopia: A Cross-Sectional Study

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This is to certify that the thesis prepared by Tesfaye Tsegaye, entitled: " Asthma Treatment Outcome and Factors Associated with Uncontrolled Asthma among Adult Asthmatic Patients Attending at Ambulatory Care units of Selected Public Hospitals in Addis Ababa, Ethiopia: A Cross-Sectional Study" and submitted in partial fulfillment of the requirements for the Degree of Master of Science in Pharmacoepidemiology and Social Pharmacy complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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List of acronyms

BMQ	Beliefs about Medicine Questionnaire
COPD	Chronic Obstructive Pulmonary Disease
GINA	Global Initiative for Asthma
ICS	Inhaled Corticosteroids
LTRA	Leukotriene Receptor Antagonist
MARS	Medication Adherence Rating Scale
MRH	Menelik II Referral Hospital
SPHMMC	Saint. Paul's Hospital Millennium Medical College
TASH	Tikur Anbessa Specialized Hospital

Abstract

Background: Asthma is a major health challenge globally where majority of the patients have uncontrolled disease status. To this effect, development of various management protocols and considerable effort have been develop in broad understanding of important behavioral, social and administrative aspects of asthma care. However, lists of socio-demographic factors, disease characteristics factors and medication related conditions were revealed as risk factors for uncontrolled asthma.

Objective: To assess asthma treatment outcome and factors associated with uncontrolled asthma among adult asthmatic patients attending ambulatory care units of selected public hospitals in Addis Ababa, Ethiopia.

Methods: A cross-sectional study was conducted in selected public hospitals of Addis Ababa (Saint. Paul's Hospital Millennium Medical College and Menelik II Referral Hospitals) between March 1 to June 30, 2018. A consecutive sampling technique was employed to enroll asthmatic patients taking anti-asthmatic medications for at least three months. Pretested interviewer administrated questionnaire adopted from Global Initiative for Asthma Guideline, Medication Adherence Rating Scale and Beliefs about Medicine Questionnaire tools were used to collect the required data through chart review and patient interview. Asthma treatment outcome was categorized as controlled, partially controlled and uncontrolled. Descriptions of variables were done using frequencies and proportion while multivariate logistic regression analysis was employed to identify factors associated with uncontrolled asthma. The strength of association was presented by odds ratio with 95% CI and variable with $p < 0.05$ were considered as statistically significant. Data were entered and analyzed using SPSS version 20.0.

Results: A total of 230 (response rate of 98.2%) study participants were interviewed. More than half (65.2%) of respondents were females and their mean age was 54±15.1 years. About 116 (50.4%) patients had uncontrolled asthma status. Moderate persistent (40%) and mild intermittent (21.7%) asthma was ascribed by high proportion of asthma severity. Patients on salbutamol puff as needed + beclomethasone puff BID (43.5%) followed by salbutamol puff as needed + beclomethasone puff BID + prednisolone (23.9%). Cold weather [AOR=2.16; 95%CI:1.00-4.63], exacerbations of asthma

in the last 12 months [AOR=2.37; 95%CI:1.26-4.45], moderate persistent [AOR=3.62;95%CI:1.50-8.69], severe persistent [AOR=2.90;95%CI:1.03-8.20], patients on salbutamol puff with beclomethasone [AOR=5.95;95%CI:2.00-17.72] and patients on salbutamol puff with beclomethasone and prednisolone [AOR=15.50;95%CI:4.62-52.36] were found to be significantly associated with uncontrolled asthma. Adherence rate to controller anti-asthmatic medications was found to be 79 (44.9%).

Conclusion: The study showed that more than half of asthmatic patients had uncontrolled asthma status and the rate of non-adherence towards controller medication was high, which warrants that health care providers should focus on medication adherence and strengthening asthma care education program.

Key words: Asthma, treatment outcome, uncontrolled asthma, adherence, severity, exacerbations and trigger factors.

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1. Introduction

1.1. Background

"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 air flow limitation" (Reddel *et al.,* 2015) .

The specific etiological features of asthma can be genetic factors or environmental risk factors (e.g. allergen exposure, urbanization, ambient air pollution and viral respiratory infection) with fixed air flow limitation (Subbarao *et al.,* 2009). Its diagnosis is based on physical examination, physiological test and identifying both a characteristic pattern of respiratory symptoms such as wheezing, dyspnea, chest tightness or cough and variable expiratory air flow limitation (Masoli et *al*., 2004).

Asthma is triggered by dusty environment, upper respiratory tract infection, house hold pests, colds, laughter, tobacco smoke and strong smell features are typical of asthma, and in the presence of these the probability that the patient has asthma will be increase (See *et al.,* 2016). Typically, its management involves achieving and maintaining current asthma control, reducing risk and primarily prevention of asthma exacerbations (GINA, 2018).

Trends in asthma prevalence vary between countries. Asthma is still increasing worldwide as communities adopt modern lifestyles and become urbanized (Oyanan *et al.,* 2004). Worldwide asthma is estimated to affect 339 million people (GINA, 2018). Also it is a major health concern in developed countries as well as in low-income countries. According to global report on Disability Adjusted Life Years (DALYs) of chronic respiratory disease, asthma accounted for about 1.1% of Disability Adjusted Life Years (Soriano *et al.,* 2017).

According to treatment algorithm based on GINA guidelines recommended a step wise approach for treatment of asthma based on patient response towards the medication. However, the symptoms are well controlled and lung functions are stable that use step down treatment with follow up care (GINA, 2018).

For adult patients, mild intermittent asthma is treated with Inhaled Short Acting Beta two Agonist (SABA) as needed. Persistent asthma treatment starts from step 2 up to step 5, mild persistent

asthma treated with low dose of Inhaled Corticosteroids (ICS). Optionally, Leukotriene Receptor Antagonist (LTRA) can be used. Moderate persistent asthma should be treated with low dose of ICS and Long Acting Beta two Agonist (LABA). Alternatives include medium or high dose of ICS or low dose of ICS and LTRA or Theophylline preparation administrated. Step 4 and 5 options are available for management of severe asthma depending on patient response towards their treatment. At step 4, medium or high dose of ICS and LABA. Alternatives include medium or high dose of ICS and LTRA or Theophylline preparations. At step 5, if poor response is noted for the above medications the other adds on medications to be introduced like Oral Corticosteroids (GINA, 2018).

Despite the progress made over the past 30 years in terms of pathophysiology and management of asthma, studies show that this condition remains largely uncontrolled (Hugo *et al.,* 2016). Moreover in spite of the widespread availability of therapies reported as highly effective in randomized controlled trials, variable level of asthma control have been shown in several "real-life" studies using well-validated self-assessment questionnaire (Busse *et al.,* 2012; Schatz *et al.,* 2006). Thus, this study aims at assessing level of treatment outcome and identifying factors associated with uncontrolled asthma among asthmatic patients at ambulatory care.

1.2. Statement of the problem

There is significant physical and socio-economic burden with asthma related health cost. Asthma results is an estimated 420,000 deaths every year this means more than 1000 per day worldwide (GINA, 2018). Adults and children with uncontrolled asthma, as well as adults, who are caregivers of children with uncontrolled asthma, use the health care service highly and lose a considerable amount of time at work compared to those with controlled asthma. Patients with the poorest control account for the greatest burden of disease (Peters *et al*., 2007). Patients with uncontrolled asthma are frequently exposed to visit emergency service and health care providers without schedule (Rabe *et al*., 2004). As a result of this, uncontrolled asthma accounts high economic burden than controlled asthma (Reddel *et al.,* 2009).

The economic cost of asthma is too high in the United States of America (USA) estimated that the direct and indirect cost to be approximately $ 56 billion mostly related to medication cost and the average annual cost per patient was $ 5000 (Nunes *et al.,* 2017). As a result of this poor asthma control associated with higher medical costs, increased productivity loss and substantial reduction quality of life was reported (GINA, 2018).

In Africa factors contributed to uncontrolled asthma were under diagnosis, non-availability, unaffordability of inhaled medications and lack of organized health promotion (Van Gemert *et al.*, 2011). The levels of asthma control and health responses in developing countries have been below recommended standards, and these have contributed to the size of disease burden (Masoli *et al.*, 2004). In addition, although majority of developing countries not have standard national guideline protocol for assessing and managing Non-Communicable Chronic Respiratory Disease (NCCRD) for the management (Ait-khaled *et al.*, 2001).

The study that was conducted in Tikur Anbessa Specialized Hospital (TASH), Addis Ababa, Ethiopia showed the level of uncontrolled asthma was 53.3% (Gebermariam *et al.*, 2017). Even though this study that was conducted in Addis Ababa, Ethiopia, in these set-ups (Saint. Paul's Hospital Millennium Medical College and Menelik II Referral Hospital) were selected for the study based on their patient load at ambulatory units and their voluntariness to be enrolled the study also previous study hadn't carried out and the study should be reproduced for improving health service and patient outcome. In addition to this, the study that was done in TASH didn't address level of adherence to anti-asthmatic medication (s).

Good management of asthma is also essential to reduce the economic burden of the disease. If not controlled properly, asthma can affect daily activities and lead to physical, emotional and social limitations which can impair quality of life (GINA, 2018). The present study was therefore carried out to assess the level of treatment outcome and identifying factors associated with uncontrolled asthma among adult asthmatic patients enrolled from selected public hospitals of Addis Ababa, Ethiopia.

1.3. Significance of the study

The main goals of asthma management are to control symptoms, prevent exacerbations, improve and maintain lung function while minimizing side effects of asthma medications. Improvements in asthma control do not only impact the patients' daily life but are also associated with a reduced risk of exacerbations and lung function impairment (Masoli *et al.*, 2004). Additionally, gaining and maintaining asthma control is expected to be cost-effective by reducing the overall cost of asthma care and indirect costs related to decreased productivity. Uncontrolled asthma has a significant impact on the everyday lives of patients. Additionally, patients with uncontrolled asthma require considerably more medication, including rescue inhaler and oral corticosteroids (Reddel *et*

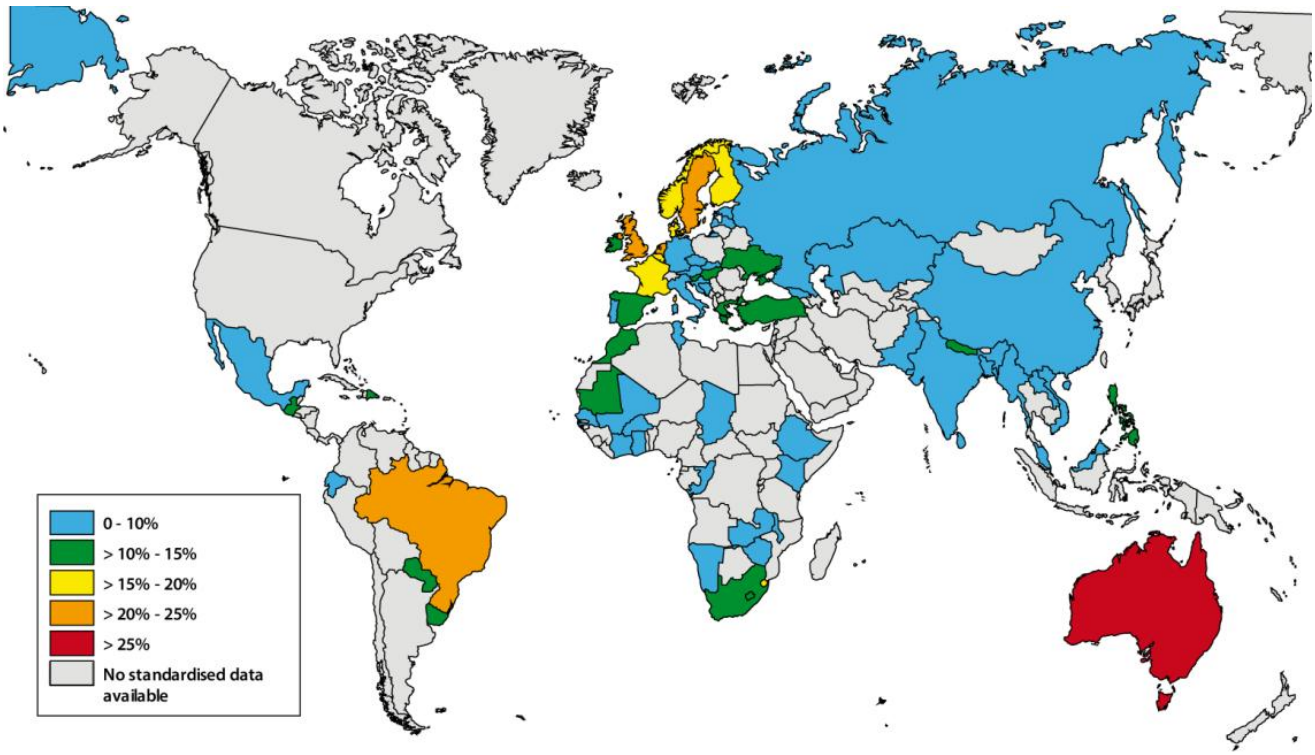
al., 2009). On the other hand, it imposes significant burden on the health care system due to admission and hospitalization which intern impose in short of beds for other patients it impose high burden either directly or indirectly on different government as well as Nongovernmental organizations (NGOs) due to lost working hour and lost productivity to the country in general.

Hence, the finding be vital to stakeholders working in the study setting and area by showing level of asthma treatment outcome and factors associated with uncontrolled asthma. Also, the study contributes to body of knowledge for further study that might be conducted on related topic and for organizations working with asthma patients. Finally, this study might have important clues to characterize and stratify patients at follow up care and optimize care based pertinent precipitants for clinicians.

2. Literature review

Asthma is chronic inflammatory disorder of the air ways in which many immunohistopathologic features are include like neutrophils, eosinophils, T-helper type 2 lymphocytes, mast cells and epithelial cells (Miller, 2001). This inflammation causes recurrent episodes of wheezing, breathlessness, chest tightness and coughing, particularly at night or in the early morning. These episodes are usually associated with variable air flow obstruction that is often reversible by treatment (GINA, 2018).

Asthma is more prevalent in Australia (21.5%), Netherlands (15.3%) and Brazil (13.0%). However, the prevalent was low in Vietnam (1.0%), Bosnia-Herzegovina (1.4%) and China (1.4%) (Enilari and Sinha, 2019). In Africa the prevalence of asthma was estimated 9.6% in Swaziland, 7.8 in Comoros, 7.54% in Mauritania and in range of 0-10% in Ethiopia (GAR, 2018).



Source To T *et al.*, 2012

Figure 1: prevalence of symptoms of asthma in the past 12 months among persons aged 18 to 45 years in 70 counties.

Asthma is one of the non-communicable diseases which are common in developed and developing countries. As reported from guidelines, various factors contribute to figure of uncontrolled asthma.

For instance; urbanization, underutilization of effective therapies, limited access of medicine and patient perception towards asthma care (GINA, 2018; Ayele *et al.*, 2017).

2.1. Level of uncontrolled asthma

Effective life style and medical management were a corner stone for asthma control (GINA, 2018). Unexpectedly high levels of uncontrolled asthma were reported by different outcome studies. For instance, a study conducted in 8000 European asthma patients showed that nearly half 45% of asthmatic patients who were at least on controller medication were found to have uncontrolled asthma (Price *et al.,* 2014).

A population based survey conducted in eleven European countries asthma outcome was shown to be uncontrolled in about 38.5% of asthmatic patients enrolled by survey (Bradio *et al.,* 2016). Likewise those hospitals based observational study done in Florence, Italy reported that uncontrolled asthma accounts for 51.3% (Corrado *et al.,* 2013).

Cross sectional studies done in Spain (Del Carmen Vennera *et al.,* 2014), Vietnam (Nguyen *et al.,* 2018), South East Nigeria **(**Umoh *et al.,* 2013), Cameroon (Hugo *et al.,* 2016) showed that high level of uncontrolled asthma status each accounts for 62.1%, 46%, 82.9%, 42% respectively.

Studies done in Ethiopia at Jimma **(**Korinan and Fekede, 2016) and Addis Ababa **(**Geberemariam *et al.,* 2017) showed that 64.5% and 53.3% level of uncontrolled asthma status respectively. However, studies done in China (Zhang *et al.,* 2014), Saudi Arabia **(**Hamdan *et al.,* 2013) and Italy (Milanese *et al.,* 2014) indicated that uncontrolled asthma was found to be lower each accounts for 17.2%, 23.3%, 12% respectively.

2.2. Level of anti-asthmatic medications adherence

Population survey done in twelve European countries (Bradio *et al.,* 2016) and other studies that was conducted in Denmark (Nguyen *et al.,* 2014) indicated that the rate of adherence to controller medication were 61.3% and 38.7% respectively. In other study conducted in Cameroon show that 44.8%, 36.3% and 18.9% of asthmatic patients were low, medium and high rate of adherence respectively to their prescribed anti-asthmatic medications (Hugo *et al.,* 2016).

2.3. Factors associated with uncontrolled asthma

A number of factors are aggravating the disease. Exposure to these intrinsic and extrinsic factors make patients are shifting from one level of severity classification to another over time and this can trigger periodic exacerbations or attacks (Bourdin *et al*., 2009).

2.3.1. Socio-demographic and socio-economic factors

In various studies, ages of respondents were found to be risk factor for uncontrolled asthma. Studies done in Sweden (Kampe *et al.,* 2014) and Italy (Corrado *et al.,* 2013) showed that being elderly was found to have direct correlation with uncontrolled asthma treatment outcome.

Likewise, being female was reported to be one of the socio-demographic factors indicated by studies as risk factor for uncontrolled asthma. As it was reported in Italy (Corrado *et al.,* 2013) and Cameroon (Hugo *et al.,* 2016). In Asthma call back nationwide survey done in England showed that being Hispanic was reported to be risk factor for poor asthma control (Nguyen *et al.,* 2011). In addition to this, general literacy was revealed to increase overall chance of uncontrolled asthma among asthmatic patients as reported from studies done in England (Nguyen *et al.*,2011) and Sweden (Kampe *et al.*,2014) where those who had lower educational levels were found to have higher chance of uncontrolled asthma.

Economic and social index of the society was also risk factors for uncontrolled asthma. Participants who had lower monthly income relative to population were reported to have higher chance for their asthma being uncontrolled (Nguyen *et al.,* 2011; Korinan and Fekede, 2016).

Cross-sectional and longitudinal assessment study that was conducted in twelve European countries on asthmatic patients indicated that persisting exposure to allergen and seasonal worsening was significantly associated with uncontrolled asthma (Bradio *et al.,* 2016).

2.3.2. Disease characteristics related factors

Among clinical characteristics reported to be correlated with treatment outcome in various studies was history of asthma exacerbation. For instance those studies done in Florence, Italy (Corrado *et al.,* 2013), Addis Ababa, Ethiopia (Geberemariam *et al.,* 2017) and England (Nguyen *et al.,* 2011) showed that patients who revealed to have asthma exacerbation history were observed to have their asthma being uncontrolled. Likewise, clinical appointments on follow up severity assessed in one or

other way found as one of risk factor for uncontrolled asthma status. A study done in Jimma, Ethiopia showed that moderate to severe persistent severity category as risk factors for uncontrolled asthma (Korinan and Fekede, 2016).

Different comorbidities by multiple studies were indicated as factors for uncontrolled asthma. As reported in England (Nguyen *et al.,* 2011) patients who have Chronic Obstructive Pulmonary Disease (COPD) were at higher risk poor asthma control. Similarly a study conducted in twelve European countries (Bradio *et al.,* 2016), Italy (Milanese *et al.,* 2014) and Jimma, Ethiopia (Korinan and Fekede, 2016) showed that comorbidities as risk factor for uncontrolled asthma.

2.3.3. Patient behavior and anti- asthmatic medication related factors

Adherence to anti-asthmatic medication (s) was essential for achieving asthma control to as per GINA recommendations (GINA, 2018). A study conducted in South East Michigan, USA indicate that non-adherence to Inhaled Corticosteroids (ICs) was found to be significantly associated with uncontrolled asthma (Williams *et al.,* 2004). However, studies done in Latvia showed that cognitive and emotional illness perception were significantly associated with uncontrolled asthma (Smits *et al.,* 2017). Anti-asthmatic medication (s) access have been ensured by GINA,2018 as different formulations and varied dosage forms were listed as national essential list of medication worldwide. A study conducted in Jimma, Ethiopia (Korinan and Fekede, 2016) revealed that Short Acting Beta Agonist use alone was reported as significantly factor for uncontrolled asthma.

3. Conceptual framework

Socio-demographic, clinical characteristics, medication related and patient behavior were identified as factors associated with uncontrolled asthma and examined by (Corrado *et al.*, 2013; Hugo *et al.*, 2016; Nguyen *et al.*, 2011; Geberemariam *et al.*, 2017; Bradio *et al.*, 2016; Korinan and Fekede, 2016; Williams *et al.*, 2004) (Fig 1).

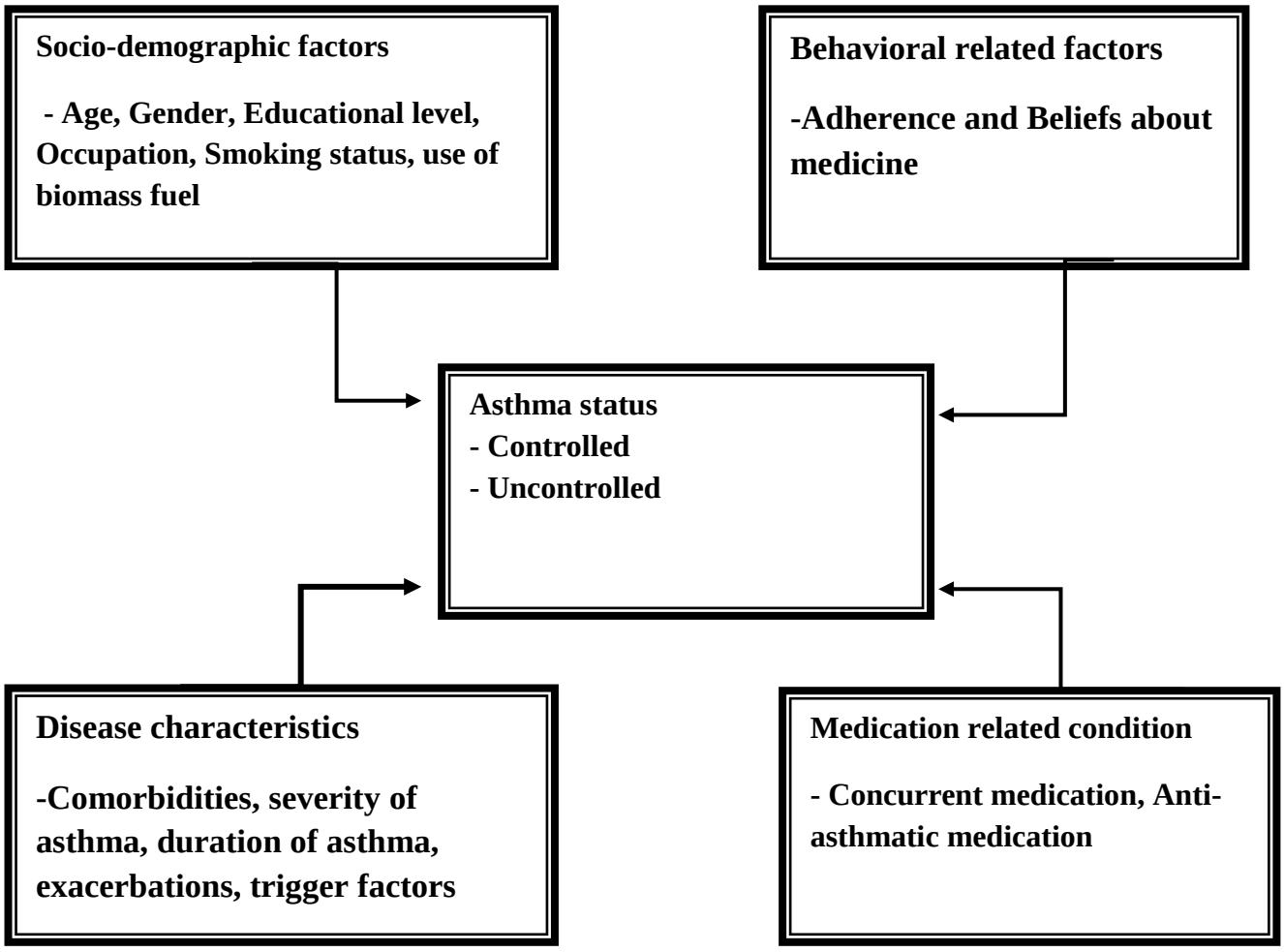


Figure 2: Conceptual framework for factors associated with uncontrolled asthma among adult asthmatic patient.

4. Objectives

4.1. General objective

- To assess asthma treatment outcome and factors associated with uncontrolled asthma among adult asthmatic patients attending ambulatory care units of selected public hospitals in Addis Ababa, Ethiopia.

4.2. Specific objectives

- To assess asthma treatment outcome among adult asthmatic patients attending ambulatory care units of selected public hospitals in Addis Ababa, Ethiopia.
- To identify factors associated with uncontrolled asthma among adult asthmatic patients attending ambulatory care units of selected public hospitals in Addis Ababa, Ethiopia

5. Method

5.1. Study area, settings and period

The study was conducted in Addis Ababa, the capital and the largest city of Ethiopia (World population review, 2018). Addis Ababa has 11 public hospitals, 25 private hospitals and 97 health centers (Health and Health related indictors, 2018). The study was conducted on two governmental hospitals (St. Paul's Hospital Millennium Medical College (SPHMMC) and Menelik II Referral Hospital (MRH) between March 1 to June 30, 2018.

SPHMMC is one of the largest public hospitals established in 1961. The hospital has 404 beds and provides services to about 333,752 patients of both at ambulatory care and admitted patients. The total number of patients seen in 2017 in chest clinic was 2692, and of these 388 patients account for asthma. The chest clinic had pulmonologist, residents and nurses. It provides treatment to different types of respiratory disease including asthma. The clinic days are mainly on Tuesday and Friday and the appointment period (follow-up) for each patient was ranged 15 to 45 days.

MRH was established in 1910 and it has 352 beds, the total number of patients seen in 2017 was 206,919 and of these 143 patients accounts for asthma follow up. The clinic days are mainly on Monday and Friday.

5.2. Study design

The study was a hospital based cross-sectional study using patient interview and review of their records.

5.3. Source and study population

The source population was all adult asthmatic patients attending ambulatory care units of SPHMMC and MRH. All adult asthmatic patients attending ambulatory care units of SPHMMC and MRH at the time of data collection period and who fulfill the eligibility criteria were the study population.

5.4. Eligibility criteria

5.4.1. Inclusion criteria

- Patients with asthma 18 years old and above
- Being on anti-asthmatic medications at least for 3 months.

5.4.2. Exclusion criteria

Patients with the following comorbid conditions were excluded.

- Acute lower and upper respiratory tract infection (Viral or Bacterial)
- COPD, Emphysema and CHF
- Pulmonary hypertension
- Asthma patient with incomplete chart information

5.5. Sample size determination and sampling technique

The sample size was calculated using the single population proportion formula (Daniel, 2009). The proportion of patients with uncontrolled asthma was done based on previous study and 53.3% was taken (Geberemariam *et al.*, 2017).

$$ni := z\alpha_{/2} * \frac{p * (1 - p)}{d^2}$$

Where

ni= the desirable sample size

$Za/_2$= the critical value at 95% level of significance ($Za/_2$ = 1.96)

p= proportion of patients with uncontrolled asthma (0.533)

d= marginal error (0.05)

The sample size was calculated to be 383.

The expected number of source population in the study period (N), based on the number of asthmatic patients on follow up at SPHMMC and MRH was 531 based on Health Management Information System, which is <10,000. Hence, the corrected sample size, using the correction formula below was 223. Finally, considering a 5% contingency final sample size was calculated to be 234.

$$nf := \frac{ni * N}{ni + N}$$

Two governmental hospitals SPHMMC and MRH were purposively selected for the study based on their patients load and their willingness to be enrolled in the study. Consecutive sampling technique was used to obtain the required participants and participants were recruited from each study settings based on proportion of patient load.

5.6. Study variables

5.6.1. Dependent variable

- Treatment outcome

5.6.2. Independent variables

- Patient socio-demographic factors (age, gender, educational level, income, occupation, residence, health service access, smoking status, trigger factors and use of biomass fuel).
- Patient behavioral related characteristics (adherence and beliefs about medicine).
- Patient clinical characteristics (comorbidities, severity of asthma, exacerbations, duration of asthma).
- Patient medication-related condition (concurrent and type of anti-asthmatic medication).

5.7. Data collection instrument and process

A questionnaire was prepared that was adopted from Global Initiative for Asthma guidelines (GINA, 2018), Medication Adherence Rate Scale (MARS) (Thompson *et al.,* 2000), old version of Beliefs about Medicine Questionnaire (BMQ) (Horne *et al.,* 1999) and other different literatures (Geberemariam *et al.,*2017; See *et al.,* 2016). This structured questionnaire prepared in English was translated to local language (Amharic) and back translated to English to ensure consistency. Pre-test was done by the principal investigator at ambulatory care units of TASH on 12 (5%) adult asthmatic patients at follow-up care and necessary modification was made accordingly.

The pretested structured data collection tool consisted of four parts. Part I; was aimed at collecting information on basic socio-demographic characteristics. Part II; consisted of questions required to gather information on asthma symptom control and severity of asthma. Part III and IV; included questions to assess beliefs about medicine and medication adherence respectively. Data were collected by two nurses and two pharmacists. In addition, patient chart was reviewed to collect information on duration of asthma, comorbidities, concurrent medication (s) and anti-asthmatic

medication (s) pattern. A belief and adherence issues of asthmatic patients to their anti-asthmatic medication was measured by using BMQ and MARS.

A belief about Medicine Questionnaire specific is a 10 item questionnaire that assesses the patient beliefs to their prescribed medication. It is composed of two-five item scales that are specific-necessity and specific-concerns scale. The specific-necessity scale that assesses patients' beliefs about prescribed medication to maintain their health now and in the future. However, specific-concerns scale assess patients' perception about adverse consequences of taking medicines related to long term effect and dependence (Neame and Hammond, 2005). The patients' level of beliefs about medicine (s) before and during clinical appointments towards their asthma management care was computed using a 5-point likert-type scale ranging from strongly disagree=1 to strongly agree=5 (Cornelia *et al.,* 2010). This tool assesses the necessity and concerns of participants towards their anti-asthmatic medications.

Medication Adherence Rating Scale was used to collect information regardless on medication adherence. It consist both features of Drug Attitude Inventory and Morisky Adherence Questionnaire. It is self-reported 10-item questions with yes/no response which can assess unintentional, intentional non-adherence behaviors and patient perception towards their treatment. The items were two categories' such as non-adherent and adherent (Thompson *et al.,* 2000).

5.8. Data quality assurance

Two day training was given to all data collectors by the principal investigator. The training was given to them regarding the appropriate use of the data collection instruments and the principal investigator, throughout the data collection process was done close supervision. The collected data was checked for clarity, consistency and competency on daily basis.

5.9. Data analysis and interpretation

Data was entered and analyzed by using SPSS version 20. Descriptive statistics (mean, standard deviation, percentages and frequencies) was used to present the data. Multivariate logistic regression analysis was employed to identify factors associated with uncontrolled asthma. A *p*- value of 0.05 or less was considered as statistically significant. Asthma treatment outcome was defined based on current GINA asthma control tool (GINA, 2018). This tool was validated by a multiple systematic reviews and reliability studies. In this study outcome variables were defined into two categories such

as well control and partially control asthma were considered as “controlled” and the uncontrolled one was considered as “uncontrolled” asthma. The patients' beliefs about medicine from overall responses, participants’ percentage of agree/strongly agree towards their anti-asthmatic medication(s) was analyzed based on necessity and concerns score about their asthma care (Neame and Hammond, 2005) and each necessity or concerns variables were summed for the mean necessity and concerns-scale with total scores ranging from 5 to 25 (Percival *et al.,* 2012). Medication adherence was categorized into two. Accordingly, non-adherent as "non-adherent" with a score of ≤ 5 and adherent was with score of > 5 (Thompson *et al.,* 2000).

5.10. Ethical consideration

Ethical clearance was obtained from Ethical Review Committee of School of pharmacy, Addis Ababa University, SPHMMC and MRH in reference numbers of ERB/ SOP/10/2018 and PM23/192, respectively. In addition, the respective heads of hospital permitted the study to be conducted in the clinic. Before questionnaire were administrated, a verbal consent was obtained from each study participant after the study was explained to them in detail by the respective data collectors. Study participants were informed to refuse or discontinue to participation at any time and the chance to ask any thing about the study. All other personal information was kept entirely anonymous and confidentiality was secured throughout the study period.

5.11. Operational definitions

Out of pocket access: this means a method by which respondents access their medication through covering prescription bills by themselves.

Third party coverage /access: Those whom revealed to access their prescription either of the following methods:

- Insured: - bill covered by insurance company either health insurance or other companies /organizational/offices.
- Bills for underprivileged citizens: - those participants whom found that the governments try to cover their health service bills.
- Fund (refugee); charity organization: - those participants whom found that those described firms or organization cover their bills for prescription.

Well controlled: It represent asthma treatment outcome in which a respondent's response to asthma symptom control assessment tool like day time symptoms, night time symptoms, limitation in activities and rescue medications use to be none in the past four weeks (GINA, 2018).

Partially controlled: This stands for asthma symptom control assessment tool, if the respondent's answer is about one or two "yes's "(GINA, 2018).

Uncontrolled: This stands for asthma symptom control assessment tool in which sample of respondent's answer is about three or four "yes's" (GINA, 2018).

Treatment outcome: Patients response for therapeutic regimen they had been prescribed during clinical follow up visit based on current clinical subjective findings reported by each respondent. Thus, overall outcome could be defined in to two categories which is controlled and uncontrolled considering GINA score report sum partial control and well control as "controlled" status and not controlled as "uncontrolled" status (Geberemariam *et al.,* 2017).

Adherent to controller medication: A patient who scored ≤ 5 for the MARS was said to be adherent to the controller medication (Thompson *et al.*, 2000).

Non-adherent to controller medication: A patient who scored >5 for the MARS was said to be non-adherent to the controller medication (Thompson *et al.*, 2000).

6. Results

6.1. Socio-demographic characteristics of the study population

A total of 230 study participants were interviewed for the study, with response rate of 98.2%. The reason for non-response was not willing to participate in the study. The mean (SD) age of the study participants was 54.3±15.1 years (ranged: 18 and 97 years). Of the interviewed participants, 150 (65.2%) were female; 130 (56.5%) of them were married and more than three-fourth, (83.9%) were residing in Addis Ababa. Over half (57.4%) of the respondents had access to free health care services. Majority 197 (85.7%) were never smokers (Table 1).

Table 1: Socio-demographic characteristics of adult asthmatic patients attending ambulatory care units of selected public hospitals in Addis Ababa, Ethiopia 2018.

Variables	Frequency (n)	Percentage (%)
Gender		
Male	80	34.8
Female	150	65.2
Age category (in years)		
18-34	24	10.4
35-64	138	60.0
>65	68	29.6
Marital Status		
Single	24	10.4
Married	130	56.5
Divorced	25	10.9
Widowed	51	22.2
Residence		
Addis Ababa	193	83.9
Out of Addis Ababa	37	16.1
Education		
No Formal Education [a]	84	36.5
Grade 1-8	68	29.6
Grade 9-12	47	20.4

College and above	31	13.5
Occupation		
Government employee	61	26.5
Private employee	74	32.2
Merchant	18	7.8
House wife	62	27.0
Others [b]	15	6.5
Access of care		
Free payment	132	57.4
Out pocket	94	40.9
Others [c]	4	1.7
Use of biomass fuel		
No	139	60.4
Yes	91	39.6
Smoking Status		
Never-smoker	197	85.7
Current - smoker	6	2.6
Ex - smoker	27	11.7

[a]: Those unable to read and write due to informal education like religious teaching

[b]: Include individual with daily labor, student, self-employed and pensioner

[c]: Include insurance and institutional linkage

6.2. Disease characteristics of study population

The mean duration of illness from clinical diagnosis of asthma was found to be 12± of 9.2 years. More than one-third (35.2%) of them had comorbid conditions. Nearly half (47.4%) of the patients reported that, they had at least one history of asthma exacerbations in the last one year. According to GINA based severity classification, 92 (40%) of the respondents had moderate persistent and 50 (21.7%) had mild intermittent asthma (Table 2) and (Fig 2).

Table 2: Disease characteristics of adult asthmatic patients attending ambulatory care units of selected public hospitals in Addis Ababa, Ethiopia 2018.

Variables	Frequency (n)	Percentage (%)
Duration of asthma (in years)		
< 12	148	64.3
≥ 12	82	35.7
Exacerbations in last 12 months		
No	121	52.6
Yes	109	47.4
Comorbidities		
No	149	64.8
Yes	81	35.2

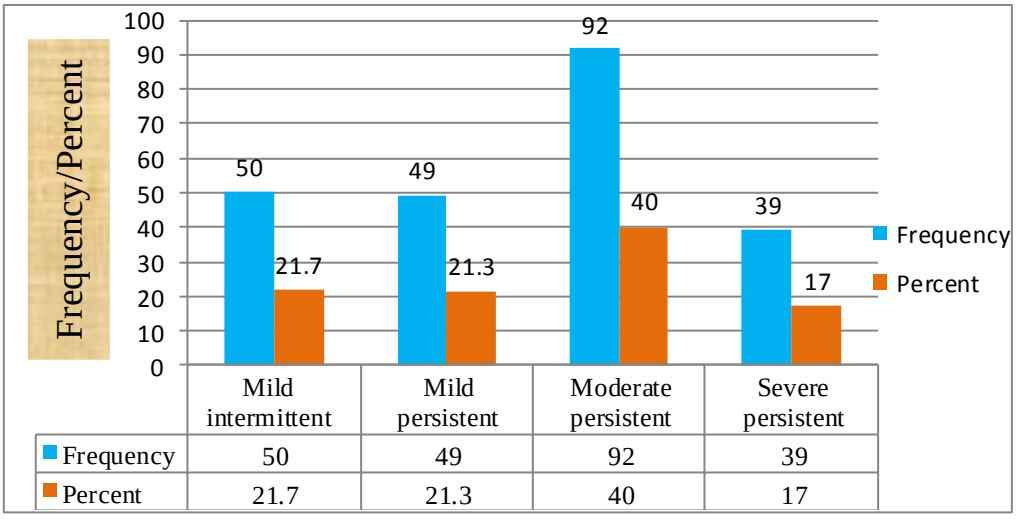


Figure 3: Severity of asthma based on GINA at ambulatory care units of selected public hospitals in Addis Ababa, Ethiopia 2018.

6.3. Trigger factors for asthma exacerbations

Cold weather 106 (46.1%) and bad or strong smell 95 (41.3%) were the two leading triggering factors for asthma exacerbations. Over half (55.7%) of the respondents were found to have at least one trigger and the number of trigger/s among the study participants was reported to be within range of one-three and above trigger/s per respondents (Table 3).

Table 3: Trigger factors for asthma exacerbations patients with asthma attending ambulatory care units of selected public hospitals in Addis Ababa, Ethiopia 2018.

Variables	Frequency (n)	Percentage (%)
Triggering factors		
No trigger	35	15.2
One trigger	128	55.6
Two trigger	39	17.0
Three and above trigger	28	12.2
Type of triggering factors		
Cold Weather	106	46.1
Bad or strong smell	95	41.3
Dust	61	26.5
Smoke	32	13.9
Others [a]	14	6.1

[a]: Fumes, pollen and irritants

: More than one triggering factor was possible.

6.4. Medications used by asthmatic patients and anti- asthmatic medications adherence

Treatment with anti-asthmatic medication (s) was found as alone or combination therapy. Patients on Salbutamol puff was 54 (23.5%) and among the combination therapy, Salbutamol puff + Beclomethasone inhaler was the leading anti-asthmatic medications, 100 (43.5%). More than one-third (35.2%) of patients were prescribed with concurrent medications like antibiotics. Of 176 study participants, assessment of patients response to the Medication Adherence Rating Scale showed that 79 (44.9%) patients were adherent to the prescribed controller medication (s) (Table 4).

Table 4: Medications used by adult asthmatic patients and anti-asthmatic medications adherence ambulatory care units of selected public hospitals in Addis Ababa, Ethiopia 2018.

Variables	N (%)
Types of anti-asthmatic medications	
Salbutamol puff PRN [a]	54 (23.5%)
Salbutamol puff PRN [a] + Beclomethasone puff Bid [b]	100 (43.5%)
Salbutamol puff PRN [a] + Prednisolone	21 (9.1%)
Salbutamol puff PRN [a] + Beclomethasone puff Bid [b]+ Prednisolone	55 (23.9%)
Concurrent medication	
No	149 (64.8%)
Yes	81(35.2%)
Anti-asthmatic medication adherent	
Adherent	79 (44.9%)
Non-adherent	97 (55.1%)

[a]: as needed

[b]: two times/day

6.5. Beliefs about Medicines in the study population

The mean Specific-Necessity Scale of 16.88±3.08 out of 25 was lower than the mean Specific-Concerns Scale of 17.69±3.54 towards to their anti-asthmatic medications. Higher Specific-Concerns Scale represents stronger concerns about the adverse effect of the medication (Table 5).

Table 5: Percentage of respondents agreed/strongly agreed with Beliefs about Medicines at ambulatory care units of selected public hospitals in Addis Ababa, Ethiopia 2018.

Variables	N (%)	Mean ± SD
Specific-Necessity Scale		
My health at present depends on my asthma medicines	107 (46.5%)	3.34±1.09
My life would be impossible without my asthma medication	77 (33.5%)	3.21±1.07
Without my asthma medication I would be very ill	153 (66.5)	3.56±1.13
My health in the future will depend on my asthma medication	90 (39.1%)	3.12±1.09
My asthma medication protects me from becoming worse	125 (54.3%)	3.65±0.96
Sum Specific-Necessity Scale		**16.88±3.08**

Specific-Concerns Scale		
Having to take asthma medication worries me	146 **(**63.5%)	3.50±1.21
I sometimes worry about the long-term effects of my asthma medication	182 (79.1%)	3.83±1.09
My asthma medication is mystery to me	72 (31.3%)	3.14±0.87
My asthma medication disrupts my life	127 (55.2%)	3.37±1.17
I sometimes worry about becoming too dependent on my asthma medication	183 (79.6%)	3.86±0.95
Sum Specific-Concerns Scale	**17.69±3.54**	

6.6. Asthma treatment outcome of study population

Well and partially controlled asthma was found to account for 52 (22.6%) and 62 (27%) respectively. However, over half 116 (50.4%) of them had history of uncontrolled asthma. Above half (70.9%) of study participants used reliever medication more than twice per week in months before clinical appointments or refill period, 138 (60%) had day time symptoms before their clinical appointments and 98 (42.6%) had night waking due to asthma symptoms (Table 6).

Table 6: Asthma treatment outcome of adult asthmatic patients attending ambulatory care of selected public hospitals in Addis Ababa, Ethiopia 2018.

Variables	**Frequency (n)**	**Percentage (%)**
Daytime asthma symptoms more than twice per week	138	60.0
Any night waking due to asthma	98	42.6
Reliever needed for symptoms more than twice per week	163	70.9
Any activity limitation due to asthma	94	40.9
Asthma Symptom control		
Well controlled	52	22.6
Partially controlled	62	27.0
Uncontrolled	116	50.4

6.7. Factors associated with uncontrolled asthma

Multiple variables were identified as risk factors for uncontrolled asthma after bivariate logistic regression analysis was run and nine independent variables were observed as being significant factors for uncontrolled asthma status. After adjusting for other variables in the multivariable logistic regression; cold weather, history of exacerbations in last 12 months, moderate persistent, severe persistent, patients on Salbutamol puff with Beclomethasone and patients on Salbutamol puff with Beclomethasone and Prednisolone were identified as significant factors for uncontrolled asthma. Patients who had cold weather as trigger factor were about 2.16 times more likely to have uncontrolled asthma than patients who had not cold weather as trigger factors [AOR=2.16;95%CI:(1.00-4.63)]. Patients with exacerbations were about 2.37 times more likely to have uncontrolled asthma status compared to patients with no exacerbations [AOR=2.37; 95%CI: (1.26-4.45)]. Patients with moderate and severe persistent asthma were about 3.62 times and 2.90 times more likely to have uncontrolled asthma than mild intermittent [AOR=3.62; 95%CI :(1.50-8.69)] and [AOR=2.90; 95%CI :(1.03-8.20)], respectively. Also, the model indicated that patients who had been on Salbutamol puff with Beclomethasone prescription and Salbutamol puff with Beclomethasone and Prednisolone prescription were about 5.95 and 15.50 times more likely to have uncontrolled asthma status than other anti-asthmatic medications [AOR=5.95;95% CI:(2.00-17.72)] and [AOR=15.50;95%CI:(4.62-52.36)], respectively (Table 7).

Table 7: Multivariate logistic regression analysis result of factors associated with uncontrolled asthma among adult asthmatic patients attending ambulatory care units of selected public hospitals in Addis Ababa, Ethiopia 2018.

Characteristics	Uncontrolled asthma of		COR (95% CI)	AOR(95%CI)
	Yes; n (%)	No; n (%)		
Gender				
Male	32 (13.9)	48 (20.9)	1.00	1.00
Female	84 (36.5)	66 (28.7)	1.91(1.10-3.31)*	1.73(0.85-3.20)
Cold Weather				
No	51 (22.2)	73 (31.7)	1.00	1.00
Yes	65 (28.3)	41 (17.8)	2.26(1.33-3.85)*	2.16(1.00-4.63)*
Number of triggers				
No	12 (5.2)	23 (10)	1.00	1.00
One	69 (30)	59 (25.7)	2.24(1.02-4.88)*	1.29(0.49-3.41)
Two	18 (7.8)	21 (9.1)	1.64(0.64-4.20)	0.64(0.17-2.33)
Three and above	17 (7.4)	11 (4.8)	2.96(1.05-8.30)*	4.63(0.96-22.37)
Exacerbations in last 12 months				
No	50 (21.7)	71 (30.9)	1.00	1.00
Yes	66 (28.7)	43 (18.7)	2.18(1.28-3.69)*	2.37(1.26-4.45)*
Comorbidities				
No	78 (33.9)	71 (30.9)	1.00	1.00
Yes	38 (16.5)	43 (18.7)	0.80(0.46-1.38)	0.92(0.47-1.78)
Duration of asthma				
< 12 years	73 (31.7)	75 (32.6)	1.00	1.00
> 12 years	43 (18.7)	39 (17.0)	1.13(0.66-1.94)	1.01(0.52-1.94)
Severity of asthma				
Mild intermittent	14 (6.1)	36 (15.7)	1.00	1.00
Mild persistent	23 (10.0)	26 (11.3)	2.27(0.98-5.23)	1.91(0.73-5.30)
Moderate persistent	56 (24.3)	36 (15.7)	4.00(1.89-8.43)*	3.62(1.50-8.69)*
Sever persistent	23 (10.0)	16 (6.9)	3.69(1.52-8.98)*	2.90(1.03-8.20)*
Type of anti-asthmatic medications				
Sal puff [a]	14 (6.1)	40 (17.4)	1.00	1.00
Sal puff [a] +Beclo[b]	54 (23.5)	46 (20.0)	3.35(1.62--6.92)*	5.95(2.00-17.72)*
Sal puff [a] + Pred[c]	7 (3.0)	14 (6.1)	1.42(0.47-4.26)	1.74(0.43-6.98)
Sal puff[a] +Beclo[b] + Pred[c]	41 (17.8)	14 (6.1)	8.36(3.54-19.70)*	15.5(4.62-52.36)*

*** Significant association p<0.05**

Sal puff [a] : Salbutamol ; Beclo[b] :Beclomethasone ; Pred[c] :Prednisolone

7. Discussions

This study was conducted to assess treatment outcome and identify factors associated with uncontrolled asthma among asthmatic patients at ambulatory care units of selected public hospitals in Addis Ababa, Ethiopia. The study found that about half of the patients had uncontrolled asthma status. Disease characteristics and medication related conditions are factors which contributed for uncontrolled asthma status. Adherence to the controller medication was also found to be 44.9%.

From the present study, the level of uncontrolled asthma status was found to be high (50.4%), which is relatively concordant with previous studies conducted in Addis Ababa (53.3%) (Geberemariam *et al.,* 2017), Europe (45%) (Price *et al.,* 2014), Vietnam (46%) (Nguyen *et al.,* 2018) and Italy (51.3%) (Corrado *et al.,* 2016). The level was found to be higher than the result found in China (17.2%) (Zhang *et al.,* 2014) and Saudi Arabia (23.3%) (Hamdan *et al.,* 2013). The reason behind this difference was that, in the studies done in China and Saudi Arabia the patients that may have access to better treatments and educational status of the study participants was high. In addition, the disparities seen might be due to most study participants in these studies having taken health education about asthma disease by health educator. It might also be related to the lower education status among participants in the present study and health education about asthma disease given by health care providers was low. However, the status was better as compared to study done in South Eastern Nigeria (82.9%) (Umoh *et al.,* 2013) and Jimma, Ethiopia (64.5%) (Korinan and Fekede, 2016).The reason for this difference might be due to patients tendency to over-estimate their disease control since the data collection was done by patient self-report (Umoh *et al.,* 2013) and lower monthly income status of the patients which might also lead to medication not affordable especially ICS.

In the present study, adherence to controller medication was 44.9% which is very low compared to standard GINA guidelines recommendations (GINA, 2018). The low level medication adherence can lead to substantial worsening of asthma symptom control and worse asthma related quality of life (GINA, 2018). The contributing reasons for low level of adherence might be due to misunderstanding about instructions, forgetfulness, cost, perception about the treatment is not necessary and concern about side effects (GINA, 2018).

The level of adherence in this study was greater than the result found in Denmark 38.7% (Nguyen *et al.,* 2014) and Cameroon 18.9% (Hugo *et al.,* 2016). The disparities seen might be due to difference in methodological approach (cohort study Vs cross-sectional study) and tool, this tool includes eight-item

Morisky medication adherence scale and electronic prescription database that are used for assessing level of adherence to controller medication (Hugo *et al.*,2016; Nguyen *et al.*, 2014;). However, it was lower than that of a study done in twelve European countries 70.3% (Bradio et al., 2016). The reason for this difference might be due to educational level. Identifying specific contributing factors for low level of adherence and develop suitable approaches to overcome them will be important to improve medication adherence. Current standard of asthma management comprises effective maintenance pharmacologic regimen which revealed to pose relative safety profile over half of asthmatic patients were observed found non-adherence to their physician prescribed controller regimen (GINA, 2018). Similarly non-adherence to asthma regimen was observed in this study. It was found to be congruent to finding revealed in many studies, was reported in those study done in 11 European countries (Price et al., 2014), China (Nguyen et al., 2014) and Saudi Arabia (Hamdan et al., 2013) and Cameroon (Hugo et al., 2016). Non- adherence has been indicated as independent factor for uncontrolled asthma in studies done South East Michigan (Williams *et al.*,2004), however in this study finding showed that poor adherence shown to have non-significant correlation to uncontrolled asthma it was not observed as factors when for bivariate logistic regression analysis. These discrepancies might be due to variability in defining adherence assessment tools employed.

Among the risk factors for uncontrolled asthma among the participants in the present study was cold weather. This finding was congruent to those finding reported by study done in 12 European countries (Bradio *et al.*, 2016) which showed that seasonal worsening and persistent exposure to irritants was identified as factors for uncontrolled asthma though it was different in this study only based on the type of triggers. Majority of participants being current residents in Addis Ababa which is cool in weather at the time of data collection. Exacerbation in the last 12 months was the other variable that had significant association with uncontrolled asthma in the present study. Similar results were also observed from studies done in Italy (Corrado *et al.*, 2016), England (Nguyen *et al.*, 2011) and Addis Ababa (Geberemariam *et al.*, 2017). This similarity might be due to clinical and demographic similarity in context of defining exacerbations and parameters.

According to asthma diagnosis and management recommendations, asthma was categorized into four clinical severities for the ease of better management at each level of care. This study finding showed that most participants were found as inappropriately put on asthma medications which was proved that patients who were assigned as severe persistent, moderate persistent and mild persistent were not put on any controller medications but found to receive reliever medication. In this study moderate and severe persistent asthma was revealed as factors for uncontrolled asthma similar to those studies

done in Brazil (Dalcin *et al.*, 2009) and Jimma, Ethiopia (Korinan and Fekede, 2016). This similarity might be due to health care providers does not prescribe alternative anti-asthmatic medication or dose adjustment based on severity grade.

In the present study patients on anti-asthmatic medication was associated with uncontrolled asthma, namely Salbutamol puff with Beclomethasone and Salbutamol puff with Beclomethasone and Prednisolone. Guidelines recommended controller medication that improve treatment outcome of asthmatic patients (GINA, 2018). In contrast, our finding reported that controller medication prescription were associated with uncontrolled asthma. The reason for significant association of controller medication prescription with uncontrolled asthma might be due to patients' adherence problem such as using only when symptom arise, poor inhaler technique, higher specific-concern to the medication and non-availability that may lead to underutilization of controller medication. This finding was found to be similar those results reported by study done in Jimma and Addis Ababa in Ethiopia.

8. Limitations of the study

This study used dual centered cross-sectional study in which generalization to Addis Ababa hospitals could be difficult. In addition, we didn't use spirometric assessment technique for better measurement of the asthma control level and also the tools that used for assessment of beliefs and adherence was adopted from another disease other than asthma. In spite of these limitations, the study used different assessment tools which helped in acquiring the required data for status of asthma treatment outcome, clinical and behavioral related characteristics of the study.

9. Conclusions

The finding of the study indicated that the level of uncontrolled asthma was found to be 50.4% and the patients' level of adherence towards to their anti-asthmatic medications was found to be 44.9%. The cold weather, exacerbation in the last 12 months, moderate persistent and severe persistent asthma, patients on Salbutamol puff with Beclomethasone and patients on Salbutamol puff with Beclomethasone and Prednisolone were found to be possible factors for uncontrolled asthma.

10. Recommendations

Based on the findings of the study the following recommendations could be mentioned: -

For Health professionals

- ✓ Health care providers should work in improving patients' awareness on their medications adherence, avoidance of asthma triggering factors for decreasing the progression of the disease and better asthma control level.

For respective hospitals

- ✓ Prepare schedule for client's education on patients' behavior like the importance of adherence and its medication by each team on weekly base.

For FMOH and Higher education institutes

- ✓ Health policy makers should develop and implement national asthma guidelines and extended coverage of asthma care program.
- ✓ Further qualitative and quantitative studies should be conducted to explore experiences of patients and providers in asthma management.

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Annexes

Annex I: English Version of information and consent form

Dear participant, Good morning

My name is _____. I am being assigned by school of pharmacy, Addis Ababa University. I am here to collect data for a research entitled " Treatment Outcome and Factors Associated with Uncontrolled Asthma among Asthmatic Patients at Ambulatory Care of Public Hospitals, Addis Ababa, Ethiopia: A Cross-Sectional Study". The research investigator is Tesfaye Tsegaye, a Masters student in Pharmacoepidemiology and Social Pharmacy at Addis Ababa University. The aim of this study to assess rate of treatment outcome and identify factors associated with uncontrolled asthma. For this study you are selected as a participant and before your consent of your participation you need to know all necessary information related to the study. Thus, this information will be detailed as:

Hence, conducting this study will be vital to stakeholders working the study setting and area by showing institutional based rate of treatment outcome. Also this study will contributes body of knowledge for further study.

The interview it might takes 10-15 minutes to finish. Your participation is voluntary and you are not obligated to answer any question which does not wish to answer**.** You have the right to withdraw from the study in any time if you want. Your name and address will not be written in this form. All the information given by you will be kept and only used for this study.

Can we proceed? Yes ☐ No ☐

Correspondence:

Tesfaye Tsegaye (B.Pharm)

Student, AAU, CHS, SOP, Department of Pharmaceutics and Social Pharmacy

Email:tesfish2828@gmail.com

Card number_____

Annex 1. Data collection format (patient interview)

Part I :Socio- demographic characteristics		
1	Age	_____years
2	Gender	a. Male b. Female
3	Where is your place of residence?	a. Urban b. Rural
4	What is your marital status?	a. Single b. Married c. Divorced d. Widow
5	What is your educational level	a. Unable to read & write b. Able to read & write (Informal education) c. 1-8 Grade d. 9-12 Grade e. college/certificate and above
6	What is your occupation?	a. Government employee b. private employee c. Merchant d. Daily laborer e. Student f. house wife g. Others (specify) _____
7	Did you use Biomass fuel for work?	a. Yes b. No
8	How did you get a health care service from the hospital	a. Out pocket b. Free payment c. Insurance d. others (Specify)_____
9	Cigarette smoking	
	9.1 Do you ever smoke cigarette?	a. Yes b. No
	9.2 Are you currently a smoker?	a. Yes b. No
10	Do you think that is there anything that triggers your asthma?	a. Yes b. No
11	If yes to Q.no 10, what are your trigger factors that exacerbate your asthma?	a. Dust b. Smoke c. Cold weather d. Strong smell e. Other (s) specify_____
12	Have you ever faced any asthma exacerbation symptoms in the last 12 months?	a. Yes b. No
Part II :Asthma symptom control and Asthma severity based on GINA **Patients are expected to remember for the past 1 month only**		
13	Does day time symptoms occurred more than	a. Yes b. No

	twice/week? (cough, shortness of breath, chest tightness,)	
14	Does any night waking due to asthma symptoms was occurred in the past 4 weeks?	a. Yes b .No
15	Does reliever medication needed more than twice / week?	a. Yes b. No
17	Asthma symptom control	a. Well controlled b. Partially controlled c. Uncontrolled
18	Severity of asthma based on GINA	a. Mild intermittent b. Mild persistent c. Moderate persistent d. Severe persistent
Part III: Beliefs about anti-asthmatic medication (s)		
19	My health at present depends on my asthma medicines	a. Strongly agree b. Agree c. Uncertain d. Disagree e. Strongly disagree
20	Having to take asthma medication worries me	a. Strongly agree b. Agree c. Uncertain d. Disagree e. Strongly disagree
21	My life would be impossible without my asthma medication	a. Strongly agree b. Agree c. Uncertain d. Disagree e. Strongly disagree
22	Without my asthma medication I would be very ill	a. Strongly agree b. Agree c. Uncertain d. Disagree e. Strongly disagree
23	I sometimes worry about the long-term effects of my asthma medication	a. Strongly agree b. Agree c. Uncertain d. Disagree e. Strongly disagree
24	My asthma medication is mystery to me	a. Strongly agree b. Agree c. Uncertain d. Disagree e. Strongly disagree
25	My health in the future will depend on my asthma medication	a. Strongly agree b. Agree c. Uncertain d. Disagree e. Strongly disagree
26	My asthma medication disrupts my life	a. Strongly agree b. Agree c. Uncertain d. Disagree e. Strongly disagree
27	I sometimes worry about becoming too dependent on my asthma medication	a. Strongly agree b. Agree c. Uncertain d. Disagree e. Strongly disagree
28	My asthma medication protects me from becoming worse	a. Strongly agree b. Agree c. Uncertain d. Disagree e. Strongly disagree

Medication adherence (Medication Adherence Report Scale, MARS) **Based on the past 1 month**			
29	Do you ever forget to take your medicine?	a. Yes	b .No
30	Are you carless at times about taking your medicine?	a. Yes	b .No
31	When you feel better, do you sometime stop taking your medicine?	a. Yes	b .No
32	Sometimes if you feel worse when you take the medicine, do you stop taking it?	a. Yes	b .No
33	I take my medication only when I am sick	a. Yes	b .No
34	It is unnatural for my mind and body to be controlled by medication.	a. Yes	b .No
35	My thoughts are clearer on medication.	a. Yes	b .No
36	By staying on medication, I can prevent getting sick.	a. Yes	b .No
37	I feel weird, like a zombie, on medication.	a. Yes	b .No
38	Medication makes me feel tired and sluggish.	a. Yes	b .No

Annex 2: Data collection format (Chart review)

Patient clinical information

39	Year of diagnosis confirmed.	_____
40	Either any confirmed comorbidities in the past 12 months?	a. Yes b .No
41	If yes question No 40, Specify it.	_____
42	Was there any concurrent medication(s) intake in the past 12 months?	a. Yes b. No

Anti-asthmatic medication (s) pattern

S.No	**Drug Name**	**Dose**	**Frequency**

Annex II: Patient Interview Questionnaires, (Amharic Version)

ቅጽ 1: የጥናቱ መረጃ ቅጽ

ውድ የቃለ መጠይቅ ተሳታፊ፤ እንደምን አደሩ/ርሽ?

የጥናቱ መግቢያ

ስሜ _____ እባላለሁ፡፡ ከ አዲስ አበባ ዩኒቨርስቲ ፋርማሲ ት/ቤት እወከላለሁ፡፡ አሁን እዚህ የተገኘሁት"በ ኢትዮጵያ ፡ በ አዲስ አበባ ውስጥ በሚገኙ የመንግስት ሆስፒታሎች ላይ በአስም ታካሚዎች መካከል የሕክምና ውጤቶች እና ተያያዥነት ባላቸዉ ጉዳዩች ዙሪያ " በሚል የ ርእስ ጥናት ስር የሚታከሙ ታካሚዎቸ የሚሰጡን ዳታ እየሰበሰብን እንገኛለን፡፡የምርምሩ አስተባባሪ ተስፋዬ ፀጋዬ ይባላል ፤ በ አዲስ አበባ ዩኒቨርስቲ ፋርማሲ ት/ቤት በ ፋርማኮ-ኢፒዶሚዮሎጂ እና ሶሻል ፋርማሲ የ ማስተርስ ድግሪ ተማሪ ነው፡፡

የጥናቱ አላማ

በአስም ሕክምና ውጤቶች መጠን እና ተያያዥነት ባላቸዉ ጉዳዩች ዙሪያ ላይ የሚካሄድ ጥናት ነው፡፡ ስለዚህ በዚህ መሰረት የሚመለከታቸዉ አካላት ይሄን ጥናት መሰረት በማድረግ ጥናቱ በተካሄደባቸው ሆስፒታል የሕክምና ውጤቶች እና ተያያዥነት ያላቸውን ጉዳዮች ለማወቅ ይረዳል፡፡ እንዲሁም የዚህ ጥናት ውጤት ለ ሌሎች ተጨማሪ ጥናቶች እንደግባት ያገለግላ,ል፡፡

መጠይቁን ለመጨረስ ከ 10-15 ደቂቃ ሊወስድቦት ይችላል፡፡ የሚሰጡትን መረጃ ለጥናቱ አላማ ብቻ እንደሚውል እና ከዋናው የጥናቱ አስተባባሪ እጅ ብቻ እንደሚቀመጥ እንዲሁም የእርስዎ ስምና ፊርማ በዚህ ቅጽ ላይ አይጻፍም ፡፡ በእርስዎ የሚሰጡ ማንኛውም አይነት መረጃዎች ለዚህ ጥናት ብቻ አገልግሎት ላይ የሚውሉ ይሆናል፡፡ ተሳትፎ በእርስዎ የበጐ ፈቃደኝነት ላይ የተመሠረተ ሲሆን መመለስ የማይፈልጉትን ጥያቄ የመመለስ ግዴታ አይኖርብዎትም፡፡

መቀጠል እንችላለን? አዎ ☐ አይደለም ☐

ዋና አጥኚ:

ተስፋዬ ፀጋዬ

አዲስ አበባ ዩኒቨርሲቲ፣ ጤና ሳይንስ ኮሌጅ፤ ፋርማሲ ት/ቤት፤ የ ፋርማሲቲክስ እና ሶሻል ፋርማሲ ትምህርት ክፍል

ኢሜል: tesfish2828@gmail.com

ቅጽ 2፡ ቃለ-መጠይቅ ከታካሚው **የካርድ ቁጥር _____**

ክፍል 1፡ስለ ታካሚው አጠቃላይ መግለጫዎች		
1	እድሜ	_____ (በቁጥር ይፃፍ)
2	ፆታ	a. ወንድ b. ሴት
3	የመኖርያ ስፍራከ/ሽ የት ነው?	a. ገጠር b. ከተማ
4	የጋብቻ ሁኔታ	a. ያላገባ b. ያገባ c. የፈታ/ች d. ባል የሞተባት /ሚስት የሞተችበት
5	የትምህርት ሁኔታ	a. መፃፍ እና ማንበብ የማይችል b. መፃፍ እና ማንበብ የሚችል (ኢ-መደበኛ ትምህርት) c. 1-8 ደረጃ d. 9-12 ደረጃ e. ኮሌጅ(ሰርተፍኬት) እና ከዛም በላይ
6	የስራ ሁኔታ	a. የሲቪል አገልጋይ b. የግል ሠራተኛ c. ነጋዴ d. የቀን ሠራተኛ e. ተማሪ f. የቤት እመቤት g. ሌሎች (ግለጽ) _____
7	ለምግብ ማብሰያነት ማገዶ እና የጋዝ ውጤቶችን ይጠቀማሉ	a. እጠቀማለሁ b. አልጠቀምም
8	እዚህ ሆስፒታል ውስጥ ያገኙትን የሕክምና እንክብካቤ አገልግሎት እንዴት አገኙት ?	a. ከራስ ኪስ b. በነጻ ክፍያ c. CBHI d. ሌሎች (ግለጽ) _____
9	ሲጋራ	
	9.1. ሲጋራ አጭሰው ያውቃሉ?	a. አዎ b. አላዉቅም
	9.2. ምላሽዎ አዎ ከሆነ፡አሁንስ ሲጋራ ያጨሳሉ?	a. አዎ b. አላጨስም
10	የአስም በሽታዎን የሚያነሳሳብዎ ነገር አለ ብለው የሚያምኑት ነገር አለ ?	a. አዎ b. የለም
11	በቁጥር 10 ለተጠቀሰው ጥያቄ መልስዎ አዎ ከሆነ የሚያነሳሳብዎ ምክንያት ወይም የሚያባብስዎ ነገር ምን እንደሆነ ይግለጹ	a. አቧራ b. አለርጂክ c. ቀዝቃዛ አየር d. ሌላ (ሎች) ግለጽ_____
12	ባለፉት 12 ወራት ውስጥ የአስም በሽታ መባባስ አጋጥሞት ያውቃል?	a. ያውቃል b. አያውቅም
ክፍል 2 ፡የአስም ምልክቶች መቆጣጠሪያ እና የአስም ህመም ደረጃ ታካሚዎች ላለፈው ወር ብቻ ማስታወስ ይጠበቅባቸዋል		
13	ባለፈዉ ሳምንት የአስም በሽታ ምልክቶች በቀን ጊዜ 2 እና ከ 2 ጊዜ በላይ አጋጥሞት ነበር?	a. አዎ b. አይደለም
14	ላለፉት አራት ሣምንታት የአስም በሽታ ምልክቶች ከመኝታዎት ቀስቅሶት ነበር ?	a. አዎ b. አይደለም
15	የአስም በሽታ መቆጣጠሪያ መድኃኒቶችን በ ሳምንት ከ 2	a. አዎ b. አይደለም

	ጊዜ በላይ አስፈልጎት ነበር ?	
16	ላለፉት አራት ሣምንታት የአስም በሽታዉ ማናቸዉም አይነት እንቅስቃሴ ከማድረግ አግዶት ነበር?	a. አዎ b. አይደለም
17	የአስም በሽታ ምልክቶች ቁጥጥርዎ በምን አይነት መልኩ ይቀመጣል ?	a. ሙሉ ለሙሉ ተቆጣጥሬዋለሁ b. ከሞላ ጐደል ተቆጣጠሬዋለሁ c. ምንም አልተቆጣጠርኩትም
18	የአስም ህመም ደረጃ	a. Mild intermittent b. Mild persistent c. Moderate persistent d. Severe persistent

ክፍል 3: ስለ መድኃኒቶቹ ያልዎት አስተሳሰብ

19	በአሁኑ ወቅት ያለውት ጤንነት በአስም መድኃኒቶች ላይ የተመሰረተ ነው፡፡	a. በደንብ እስማማለሁ d. አልስማማም	b. እስማማለሁ e. በደንብ አልስማማም	c. እርግጠኛ አይደለሁም
20	የአስም መድኃኒቶችን መውሰድዎ ያስጨንቅወታል፡፡	a. በደንብ እስማማለሁ d. አልስማማም	b. እስማማለሁ e. በደንብ አልስማማም	c. እርግጠኛ አይደለሁም
21	ያለ አስም መድኃኒቶች ሕይወቱ ሊቆይ ይችላል፡፡	a. በደንብ እስማማለሁ d. አልስማማም	b. እስማማለሁ e. በደንብ አልስማማም	c. እርግጠኛ አይደለሁም
22	ያለ አስም መድኃኒቶች እጅግ በጣም ይታመማለሁ፡፡	a. በደንብ እስማማለሁ d. አልስማማም	b. እስማማለሁ e. በደንብ አልስማማም	c. እርግጠኛ አይደለሁም
23	አልፎ አልፎ ስለ አስም መደኃኒቶች የረጅም ጊዜ ተጽእኖዎች ይጨነቃለሁ፡፡	a. በደንብ እስማማለሁ d. አልስማማም	b. እስማማለሁ e. በደንብ አልስማማም	c. እርግጠኛ አይደለሁም
24	የአስም መድኃኒቶች ለእርሶ ሚስጢራዊ ናቸው፡፡	a. በደንብ እስማማለሁ d. አልስማማም	b. እስማማለሁ e. በደንብ አልስማማም	c. እርግጠኛ አይደለሁም
25	ወደፊት ጤንነትዉ በአስም መድኃኒቶች ላይ የሚወሰን ይሆናል ብለዉ ያምናሉ፡፡	a. በደንብ እስማማለሁ d. አልስማማም	b. እስማማለሁ e. በደንብ አልስማማም	c. እርግጠኛ አይደለሁም
26	የአስም መድኃኒቶች ሕይወቴን ያዛቡታል ብለዉ ያምናሉ፡፡	a. በደንብ እስማማለሁ d. አልስማማም	b. እስማማለሁ e. በደንብ አልስማማም	c. እርግጠኛ አይደለሁም
27	በአስም መድኃኒቶች ላይ ጥገኛ ስለመሆን አልፎ አልፎ ያስጨነቃወታልሁ፡፡	a. በደንብ እስማማለሁ d. አልስማማም	b. እስማማለሁ e. በደንብ አልስማማም	c. እርግጠኛ አይደለሁም
28	የአስም መድኃኒቶች ከባሰ ሁኔታ ይጠብቁኛል ብለዉ ያምናሉ ፡፡	a. በደንብ እስማማለሁ d. አልስማማም	b. እስማማለሁ e. በደንብ አልስማማም	c. እርግጠኛ አይደለሁም

ክፍል 4 MARS,መድኃኒትን በታዘዘው መሰረት በአግባቡ ስለመውሰድ" መለኪያ

29	መድኃኒት መውሰድን ዘንግተው ያውቃሉ ?	a. አዎ	b.አይደለም
30	አንዳንድ ጊዜ ላይ መድኃኒትን ለመውሰድ ግድየለሽ ሆነው ያውቃሉ ?	a. አዎ	b.አይደለም
31	የተሻለ ስሜት ሲሰማዎ መድኃኒትዎን መውሰድ ያቆማሉ ?	a. አዎ	b.አይደለም

32	አንዳንድ ጊዜ መድኃኒቱን በሚወስዱበት ጊዜ ሕመሙ ሲባባስብዎ መድኃኒቱን መውሰድ ያቆማሉ ?	a. አዎ	b.አይደለም
33	መድኃኒቱን የሚወስዱት ሲያሞት ብቻ ነው፡፡	a. አዎ	b.አይደለም
34	ለአይምሮዬ እና ሰውነቴ በመድኃኒት ቁጥጥር ሥር መሆን ተፈጥሮአዊ አይደለም	a. አዎ	b.አይደለም
35	በመድኃኒቶች ላይ ያለወት አመለካከት ግልጽ ነው፡፡	a. አዎ	b.አይደለም
36	በመድኃኒቱ ላይ በመቆየት ከመታመም ራሴን መከላከል እችላለሁ ብለዉ ያምናሉ፡፡	a. አዎ	b.አይደለም
37	መድኃኒቱን በሚጠቀሙበት ወቅት እጅግ የተለየ ስሜት ይሰማወታል ፡፡	a. አዎ	b.አይደለም
38	መድኃኒቱን መዉሰድዉ ድካም እንዲሰማዎት እና ደካማ እንደሆኑ ያደርገዎታል ብለዉ ያምናሉ ፡፡	a. አዎ	b.አይደለም