



**ST. PAUL'S HOSPITAL MILLENNIUM MEDICAL
COLLEGE**

**PREVALENCE AND ASSOCIATED FACTORS FOR POORLY
CONTROLLED ASTHMA AMONG ADULT ASTHMATIC
PATIENTS ON FOLLOW UP AT CHEST CLINIC OF SAINT
PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE,
ETHIOPIA**

Tiyouma Dugo (MD, Internal Medicine Resident)

A RESEARCH PROJECT SUBMITTED TO DEPARTMENTS OF INTERNAL
MEDICINE AND PUBLIC HEALTH, SPHMMC, IN PARTIAL FULFILLMENT
OF THE REQUIREMENT FOR SPECIALTY CERTIFICATE IN INTERNAL
MEDICINE.

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ADDIS ABABA, ETHIOPIA



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Abstract

Background; Asthma is one of the most common chronic diseases globally and currently affects about ~300 million people worldwide. The main goal of current asthma treatment guidelines is to achieve clinical control, including control of symptoms, maintenance of normal activity levels and to prevent exacerbations. Unavailability of appropriate and affordable medications, poor knowledge of patients, and poor communication between physician and patient increased the burden of asthma in Ethiopia. Uncontrolled asthma is a notorious public health problem throughout the world despite the presence of effective treatments. Characterizing phenotypes of patients with uncontrolled asthma and searching for risk factors of uncontrolled asthma have been suggested as priority research agenda in the prevention of chronic respiratory diseases. This study aimed to identify magnitude and determinants of uncontrolled asthma.

Objective; to assess the magnitude and associated factors of poorly controlled asthma in adult asthmatic patients in SPHMMC chest clinic. Addis Ababa Ethiopia

Methods; A Cross sectional study design was carried out by taking a total of 158 asthmatic patients attending chest clinic from June 2021 to August 2021. A structured questionnaire prepared in Amharic language, with components of demographic data, level of asthma control and disease related factors and medication adherence. The collected data was entered into a computer using Statistical Package for Social Sciences (SPSS) version 25.0 for windows. Means, standard deviations were calculated and cross-tabulations were used to compare different variables. Binary Logistic regression analysis model were used to assess factors associated with uncontrolled asthma.

Results: A total of 158 patients were included in the study the mean age of the subjects was 50.63yrs (SD 15.8) and among the sex distribution female numbers were higher which account 100(63.3%) and male 58 (36.7%).Among all asthmatics, the magnitude of uncontrolled asthma was 65.8%, according to GINA asthma level of control. Factors associated with uncontrolled asthma include; non-adherence to medication (AOR=8[1.5-47.7]), oral corticosteroid uses (AOR=7.5[1.94-35.27]) and medication use (SABA only) (AOR=18 [1.66-151.1]).

Conclusion: This study showed high prevalence of uncontrolled asthma and factors associated with uncontrolled asthma mainly showed non- adherence to medication and under treatment it

may be considered as target for future intervention. Regular health educations should be considered

Key words; Asthma, Asthma control, GINA

Acronyms and Abbreviations

BMI: Body Mass Index

CI: Confidence Interval

COPD: Chronic Obstructive Pulmonary Disease

DC: Data Collectors

GERD: Gastro Esophageal Reflux Disease

GINA: Global Initiative for Asthma

ICS: Inhaled Corticosteroids.

OCS; Oral Corticosteroid

PI: Principal Investigator

QoL: Quality of Life

SD: Standard Deviation

SPHMMC: Saint Paul's Hospital Millennium Medical College

SPSS: Statistical Package for Social Science

WHO: World Health Organization

WHS: World Health Survey

List of Tables

Table 1 Scio-demographic characteristics of the study participants.....	18
Table 2 Clinical characteristics of the study	19
Table 3 Associations between socio-demographic characteristics and asthma control.....	21
Table 4 Associations between clinical factors and asthma control	22
Table 5 logistic regression model for the risk of uncontrolled asthma	24

List of Figure

Figure 1 prevalence of asthma control in August 2021 SPHMMC	20
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Table of Contents

Acknowledgment.....	i
Abstract.....	ii
Acronyms and Abbreviations	iv
List of Tables	v
List of Figure	v
1 Introduction.....	1
1.1 Background	1
1.2 Statement of the problem.....	3
1.3 Significance of the study	4
2. Literature Review	5
2.1 Magnitude of poorly controlled asthma	5
2.2 Factors associated with poorly control asthma	7
3. Study objectives.....	10
4. Methods and Materials.....	11
4.1 Study Area.....	11
4.2 Study period	11
4.3 Study design	11
4.4 Population	11
4.4.1 Source population	11
4.4.2 Study population	11
4.5 Inclusion Criteria and exclusion criteria.....	11
4.5.1 Inclusion criteria	11
4.5.2 Exclusion Criteria	12
4.6 Variables	12
4.6.1 Independent Variables	12
4.6.2 Dependent Variables	13
4.7 Sample Size determination and sampling technique	13
4.8 Data Collection Procedure and Data Quality Management	14
4.9 Data processing and Analysis	14

4.10 Operational definition.....	15
4.11 Ethical Consideration	16
4.12 Dissemination of Results	16
5. Results	17
5.1 Socio demographic characteristics	17
5.2 Clinical profile	19
5.3 Magnitude of uncontrolled Asthma.....	20
5.4 Bivariate analysis of socio demographic characteristics and clinical factors	21
5.5 Association between clinical factors and asthma control	22
5.6 Multivariate analysis.....	23
6. Discussion.....	26
7. Strength of the study.....	28
8. Limitations of the study.....	28
9. Conclusion	29
10. Recommendations	30
11. Reference	31
12. Annexes	34
Annex I: Information Sheet.....	34
Annex II: Questionnaire	35
AnnexIII: GINNA Asthma control.....	39
Annex iv: Assurance of Investigator and Approval of Advisors	41

1 Introduction

1.1 Background

Asthma is a common respiratory disease which is characterized by variable symptoms of wheeze, shortness of breath, chest tightness and/or cough, and by variable expiratory air flow limitation. Both symptoms and air flow limitation characteristically vary over time and in intensity. These variations are often triggered by factors such as exercise, allergen or irritant exposure, change in weather, or viral respiratory infections (1). Asthma is a major cause of disability, health resource utilization and poor quality of life world-wide. Particularly because of its early onset, it accounts for considerable healthcare costs and loss of work productivity (2). Asthma is one among the most common chronic diseases globally and currently affects ~300 million people worldwide, with ~250,000 deaths annually. The prevalence of asthma has risen in affluent countries over the last 30 years but now appears to have stabilized, with ~10–12% of adults and 15% of children affected by the disease (3). According to the world Health Surveys (WHS) , global prevalence rates of doctor diagnosed asthma, clinical/treated asthma and wheezing in adults were 4.3%, 4.5%, and 8.6% respectively, and varied by as much as 21-fold among the 70 countries (2). The main goal of current asthma treatment guidelines is to attain clinical control, including control of symptoms, maintenance of normal activity levels and to prevent exacerbations. Previous studies have shown an association between asthma control and health-related quality of life (HRQoL) and worse control results in worse HRQoL scores(4). Moreover, poorly-controlled severe asthma can raise an individual's risk of hospitalization, and deaths (5). This may include restrictions on physical activity, sleep disorder, time off from school or work, poor life satisfaction, or emotional and psychological distress. More than approximately half of all asthma patients experience uncontrolled asthma despite the introduction of global and national disease management guidelines (5). In Africa, there are still many gaps in the report on asthma prevalence, reflecting the challenge in the diagnosis of asthma and therefore, the weak access to worry facilities and asthma medications in this continent. Many studies report prevalence rates based on single cross-sectional analyses not accurate for the evaluation of trends, and probably the real prevalence is underestimated. Studies in South Africa, Nigeria, Tanzania and Cameroon have reported prevalence of 3.8%, 2%, 3.3% and 2.7%, respectively (6). Bronchial asthma is one of the most common public health problems in Ethiopia

(7). The results of phase I of International Study of Asthma and Allergies in Childhood reported a prevalence of asthma ranging from 4.4% to 21.5% and 4.6% to 9.1% in Africa and Ethiopia, respectively. Moreover, for people in older age groups, premature death due to asthma is associated with poor control. Unavailability of appropriate and affordable medications, poor knowledge of patients, and poor communication between physician and patient increased the burden of asthma in Ethiopia (8).

1.2 Statement of the problem

Asthma is a chronic respiratory disease. The World Health Survey results highlight that asthma continues to be a major public health concern worldwide (2).

Around 315 million individuals worldwide have asthma diagnosis. This study estimated that nearly 623 million individuals are currently living with some level of asthma-related symptoms worldwide. It indicates that asthma control is not optimal in many countries (2).

Bronchial asthma is one of the most common public health problems in Ethiopia. Its prevalence increased over the last few decades with different contributing factors (7). It is known that asthma negatively influences the quality of life of the patients who suffer from it, so good control of the disease has a significant effect on a better HRQoL (4). When asthma is not well-controlled, patients generally experience functional limitations and are at an increased risk of exacerbations, pulmonary function loss and mortality resulting in significant direct and indirect resource costs (9). Poorly controlled asthma increases the risks of severe asthma exacerbations following upper respiratory and pneumococcal pulmonary infections (10). Knowing and preventing the associated factor for poorly controlled asthma will help in achieving better quality of life. The long-term goal of asthma management is to achieve and maintain asthma control. This in turn can be achieved through a continuous cycle of treatment assessment and adjustment as well as the review of response (5).

Bronchial asthma is being common from year to year; however, it is not having the level of attention it deserves for its proper management. Although its risk factors could be avoided to prevent the occurrence or even the exacerbation in Ethiopia, many health professionals and even the health sectors have done an inefficient effort (7).

Unlike other chronic diseases, such as diabetes mellitus and hypertension, the possibility of a relationship between current control and future risk of asthma adverse outcomes has received little attention by both health practitioners and patients. Exacerbations are recognized as a common clinical manifestation in asthma patients. Repeated exacerbations are, however, known to be the most important potential risk for hospitalization or death (5). Uncontrolled asthma poses an extra weight in the burden of non-communicable disease, which constitutes a major barrier for development (2).

Despite the availability of guidelines that enumerate goals of asthma control and specific management strategies, asthma remains relatively poorly controlled in different age groups across the globe (1). While uncontrolled asthma substantially contributes to the burden on the healthcare system. This requires improvement in the quality of asthma management and circumvents the risk factor for poor control. However, there is a knowledge gap due to limited research conducted on level of asthma control and associated risk factor among asthmatic patients in Ethiopia.

1.3 Significance of the study

Knowledge on the prevalence and associated risk factor for poorly controlled asthma is very important in identifying the burden of the disease in the health care system; this study will help to identify the specific risk factors associated with poorly controlled asthma. The study will address the identified gap by both patients and physicians and give help to prioritize for preventive measures and designing strategies to combat the disease burden in our community.

The study will also help in generating a more precise estimate of the prevalence of poorly controlled asthma and its relationship with major modifiable risk factors in the study area. An understanding of the needs and behaviors of asthma patients is important in developing asthma-related guidelines to improve the clinical practice.

2. Literature Review

2.1 Magnitude of poorly controlled asthma

Asthma is a major cause of disability, health resource utilization and poor quality of life worldwide. It is the most common chronic disease (2).

Clinical research showed that asthma control is an achievable target. However, real-life observations suggest that a significant proportion of patients suffer from symptoms and report lifestyle limitations with a considerable burden on patient's quality of life. This achievement of asthma control is a result of different interaction (11).

European National Health and Wellness Survey is a large, self-reported patient database based on an annual cross-sectional healthcare survey in France, Germany, Italy, Spain and the UK. Nearly 80% of asthma sufferers were treated and 50% of asthma sufferers were "not well controlled." Among those who were treated, 55% remain not well controlled. Uncontrolled patients were older, had lower education levels, and were more likely to be obese, depressed, and smokers, when compared to those considered to have controlled asthma (12).

Similarly a transversal study done on Spain's asthmatic population over 18 years of age who were monitored in primary care visits assess poorly controlled asthma which the analysis included 2159 patients showed that the prevalence of uncontrolled asthma was 63.9% & factors associated with this poorly-controlled asthma were treatment with OCS, baseline asthma severity, the presence of a recent stressful event, the importance given to therapy compliance, and living in a rural area (13).

The REALISE study aimed to evaluate whether asthma control has improved by assessing levels of symptoms, exacerbations and Global Initiative for Asthma-defined control in a real-life population of patients. The result showed that Levels of asthma control were low: 45% of respondents had uncontrolled asthma. Acute exacerbations were common: 44% of respondents reported having used oral steroids for asthma in the previous 12 months, 24% had visited an emergency department and 12% had been hospitalized (14).

LIAISON study is a prospective, multicenter, observational study with a cross-sectional and a 12-month longitudinal phase. Overall, 8111 asthmatic patients were enrolled in 12 European

countries. The authors evaluated the level of asthma control and quality of life as well as their determinants. The results showed Asthma control was suboptimal in 56.5 % of patients and it was associated with poorer asthma-related QoL, higher risk of exacerbations and greater consumption of healthcare resources. Variables associated with suboptimal control were age, gender, obesity, smoking and comorbidities. Major determinants of poor asthma control were seasonal worsening and persisting exposure to allergens/irritants/ triggers, followed by treatment-related issues (15).

Furthermore, a cross-sectional study done in Saudi Arabia where 260 patients included in the study .of which the proportion of patients with uncontrolled asthma was 68.1%.the associated actors for uncontrolled asthma were smoking, low income, unemployment & illiteracy (16).

Similarly a cross-sectional epidemiological study done in Adult Asthma Population in the Middle East and North Africa, where 7236 eligible patients were included in 577 sites to assess level of asthma control showed that among 7179 patients evaluated for GINA, asthma was controlled in 29.4%, partly controlled in 29.1%, and uncontrolled in 41.5%. Poor medication adherence, active smoking, absence of medical insurance, lower level of education, or diagnosis at least 5 years earlier were significantly associated with uncontrolled asthma (17). Another study done in Morocco Rabat, MOSAR (Multicenter Observational Study of Asthma in Rabat) is a prospective observational study conducted on 396 patients the result showed that 53% of the participants had controlled, 18% had partly controlled and 29% had uncontrolled asthma symptoms (18).

A cross-sectional study done at Tikur Anbesa Referral hospital Addis Ababa 182 asthmatic patients were included to assess the level of control of asthma. The research showed that (31%) were not using controller medications and 62 (34.6%) had improper inhaler technique. Only 44 (24.2%) subjects had well-controlled asthma. Causes attributed to uncontrolled asthma were use of biomass fuel for cooking, longer duration of asthma (> 30 year), incorrect inhalation technique, and asthma exacerbation in the last 12 months (19). Similar study done in Jimma 197 patients were included according to the classification by Global Initiative for Asthma Management and Prevention (GINA), 33.6% and 18.7% of study participants had moderate persistent and severe persistent asthma, respectively. Among the patients who received asthma medications, only 21% was according to GINA guideline recommendation. Accordingly, 127

respondents (64.5 %) were found to have uncontrolled asthma (20). A cross-sectional study comprising 184 physician-diagnosed asthmatic patients was conducted Asthma was uncontrolled in 67.9% subjects (5)

Despite the existence of effective treatments, Asthma remains uncontrolled everywhere throughout the world (21). Similarly, a significant proportion of asthmatic patients suffer from uncontrolled asthma in Africa (21). Studies conducted in Ethiopia showed different prevalence of uncontrolled asthma ranging from 64.5–85.2%, implying high prevalence of uncontrolled asthma in Ethiopia (5, 19 -21)

A substantial proportion of asthmatics remain not well-controlled across the world, resulting in a significant impact on health resources and patients' health status.

2.2 Factors associated with poorly control asthma

A cross-sectional study done in Telemark County, Norway Overall, 113 subjects (35%) reported poor asthma control. Factors associated with poorly controlled asthma were: self-reported occupational exposure to vapor, gas, dust, or fumes during the previous 12 months, body mass index >30 kg/m², female sex, current smoking, and past smoking (22).

The Living & Breathing Study, this study gives insight into patients' perception of their asthma & their understanding about the disease & management. Almost half of the sample reported that they had no regular discussion with a healthcare professional about their asthma, indicating that regular review of asthma does not appear to be happening universally, despite the recommendation of asthma management guidelines that patients should receive education and regular medical review (23). .

A case-control study done on cleaning sprays, household help and asthma among elderly women a significant association was observed between weekly use of at least one spray and current asthma & No association was observed among women with household help (24 25).

In clinical management of asthma one of the most important factors is medication adherence. A study done in Denmark, total participant 509 asthmatic patients were included. A total of 67% of the patients were prescribed inhaled corticosteroids (ICS). However, according to Global Initiative for Asthma (GINA)-guidelines' symptom severity classification, 85% should have

been on ICS. Accidental and intentional non-adherence with ICS at least twice a week was reported by 27% and 24%, respectively. Most of the factors associated with non-adherence reflected the patients' lack of understanding or acceptance of having a chronic disease requiring maintenance therapy (26).

A population-based, government-run health surveys of 135,000 Norwegians aged 14–60 years who were followed on average for 21 years that included height and weight measurements showed that a persons with a BMI (weight (kg)/height (m)²) of less than 25, overweight (body mass index: 25–29) men and women had relative risks of asthma of 1.27 and 1.30, respectively, while obese (body mass index: ≥ 30) men and women had relative risks of 1.78 and 1.99 respectively(27).

Proper inhaler technique is crucial for effective management of asthma. Cross-sectional, observational study investigated the prevalence of inhaler mishandling in COPD & asthmatic patients. They had a total of 2288 records of inhaler technique. Critical mistakes were widely distributed among users of all the inhalers, found the strongest association between inhaler misuse and older age, lower schooling and lack of instruction received for inhaler technique by health caregivers. Inhaler misuse was associated with increased risk of hospitalization, emergency room visits, courses of oral steroids and antimicrobials and poor disease control evaluated as an ACT score for the asthmatics and the whole population (27).

In a cross-sectional study done in Congo Kinshasa which includes 216 male and female asthmatic patients. Almost six out of ten participants (56%) had uncontrolled asthma. Factors associated with uncontrolled asthma were allergic rhinitis (73%), heartburn (60%), sleep disorders (37%), hypertension (28%), sinusitis 27%, and allergic dermatitis (21%). Twenty-six percent were overweight, 16% obese and 14% lean. Spirometry revealed that 65% of asthmatics had an FEV₁ <80% (28).

Institution-based case-control study was conducted on asthmatic patients who were on follow-up at chest clinic of Jimma University Medical result showed age of the patients , age of the cases' residential houses, presence of pets within the houses , having rhinitis , past asthma exacerbation, non-adherence to treatment and smoking were found to be determinants of uncontrolled Asthma(21).

This observational cross-sectional study was conducted in Ambo showed that asthmatic patients with concomitant disease like allergic rhinitis, chronic sinusitis and those that had no prescribed ICS were the most predictive of poor asthma control (29).

3. Study objectives

General objective

- To assess the prevalence and associated factor of poorly controlled asthma in adult asthmatic patients on follow up at SPHMMC chest clinic from June-August 2021 G.C

Specific objectives

- To assess the prevalence of poorly controlled asthma in adult asthmatic patients on follow up at SPHMMC chest clinic from June-August 2021 G.C
- To assess factor associated with poorly controlled asthma in adult asthmatic patients on follow up at SPHMMC chest clinic from June-August 2021 G.C

4. Methods and Materials

4.1 Study Area

The study was conducted at St. Paul's Hospital Millennium Medical College, the second largest governmental tertiary care hospital located in Gulele sub city, Addis Ababa, Ethiopia. SPHMMC is a referral and teaching hospital established in 2007 after a medical college was opened in a Hospital built by Emperor Haile Selassie I in 1969 with the help of the German Evangelical Church aiming to serve the poor. It is a medical center for a catchment area of more than 5 million people. On average, daily, the hospital gives medical service for 1,200 patients with diversified complaints, in several specialty and subspecialty fields. Internal medicine department has eight subspecialty clinics. Of which, chest outpatient clinic is one, being provided under the unit of pulmonology and critical care. Around 2000 patients visit chest clinic over the year and asthma patients account for nearly one-third of these visits (30).

4.2 Study period

The study was held from June 2021-August 2021 (G.C)

4.3 Study design

Cross sectional study design were employed.

4.4 Population

4.4.1 Source population

The source populations were all asthmatic patients seen at chest referral clinic.

4.4.2 Study population

The study included all out patient asthmatic patient attending chest clinic during the study period from June 2021-August 2021 G.C who fulfilled the inclusion criteria.

4.5 Inclusion Criteria and exclusion criteria

4.5.1 Inclusion criteria

1. Adult asthmatic patients age >18 yrs.

2. Adult asthmatic patients whose asthma was diagnosed for >6 months(difficult to assess control within short period of time)
3. Absence of untreated chronic diseases (other disease that may present with similar symptoms with asthma

4.5.2 Exclusion Criteria

1. Patient doesn't remember some patient related questionnaires
2. Permanent need for maintenance systemic corticosteroid treatment uses for other disease other than asthma since it will alleviate symptoms of asthma.
3. Acute exacerbations at time of inclusion in study since it will confuse with poorly controlled asthma but doesn't mean having one exacerbation as poorly controlled.
4. Active tuberculosis since it has similar symptoms with asthma.
5. Malignant disease in a palliative treatment phase since because it has similar symptoms with asthma.

4.6 Variables

4.6.1 Independent Variables

Socio demographic status

Age

Sex

Educational status

Marital status

Address

Religion

Occupation

Patient related factor

BMI

Duration of asthma

Smoking

Medication adherence

Treatment related factor

Type of Medication

4.6.2 Dependent Variables

Asthma control status

- Controlled asthma
- Uncontrolled asthma

4.7 Sample Size determination and sampling technique

The sample size was determined in advance based on the assumption of 95% confidence interval, 53.3% expected prevalence of uncontrolled asthma (19), and a 5% margin of error. Final sample size of 135 was obtained

Maximum sample size

p – Prevalence of uncontrolled asthma is taken as 53.3% from previous study (19).

d – Margin of error to be tolerated =5%

$Z_{\alpha/2}$ – standard normal variable at 95% CI

$$n = \frac{(Z_{\alpha/2})^2 \times P(1-P)}{d^2}$$

$$d^2$$

$$\frac{(1.96)^2 \times (0.533)(0.467)}{(0.05)^2}$$

$$(0.05)^2$$

$$=383$$

Since the population is less than 10,000, we use finite population correction;

$$n_f = \frac{n_i \times N}{1 + n_i/N}$$

$$1 + n_i/N$$

Where n_f = corrected sample size

n_i = minimum sample size

N = total population

Therefore, $n_f = 383 / 1 + 383 / 210 = 135$

Added 10 % for error gives total population of 148.

After calculating the simple random sampling for different variable sample size with ($p=0.64$) it was decided to take the Total population data for the specified study period because it is difficult to assess the true estimate of the associated factors for poorly controlled asthma.

4.8 Data Collection Procedure and Data Quality Management

Data were collected using a structured interviewer administered questionnaire which is prepared in English and translated to local language and includes baseline socio -demographic characteristics of patients assessing, level of asthma control and disease related factors, hospitalizations and medication adherence from June 2021-August 2021. Eight residents collected the data.

An hour-long training was given to eight data entry personnel on the components of the checklist and how to screen the data for completeness and enter into a computer. The computer data was checked by the data supervisor for any incompleteness and/or inconsistency and duplicates.

4.9 Data processing and Analysis

The data entry and analysis was done using the Statistical Package of Social Sciences (SPSS) version 25.0 for Microsoft Windows. Means and standard deviations were used for age and cross-tabulations were used to compare different variables and candidate for multivariate analysis were selected when the $P < 0.25$ in bivariate analysis. Significance level was set at $P < 0.05$. Binary logistic regression analysis was used to determine factors associated with poor asthma control. Asthma control was reclassified as controlled asthma which includes the controlled and partially controlled asthma and uncontrolled asthma. It is because of the small sample size.

4.10 Operational definition

The following operational definitions will be used in the study;-

- Income status –defined from previous study high income >2500br, middle income 1200-2499br, low income <1200br monthly (20).
- Smoker- an individual who smoked any tobacco in the previous 12 months and Former smokers who had quit smoking more than a year before the date of data collections according to CDC
- Nonsmoker: An adult who has never smoked, or who has smoked less than 100 cigarettes in his or her lifetime according to CDC
- Controlled asthma: the absence of daytime symptoms (no more than twice a week), the absence of nighttime symptoms, no limitations in activities, and limited need for rescue medication (not more than twice a week).And also include partially controlled asthma which had one or two of the four questions according to GINA criteria.
- Uncontrolled asthma: the presence of three or more events of daytime symptoms (more than twice a week), the presence of nighttime symptoms, limitations in activities, and need for rescue medication (more than twice a week) for the last four weeks.
- Physical limitation – limitation of any physical activities done as part of daily living associated with disease exacerbation or severity
- Hospitalization- Emergency or inpatient admission in the past 12 month related to exacerbation of bronchial asthma.

4.11 Ethical Consideration

Ethical clearance was obtained from the institutional review board of St. Paul's Hospital Millennium Medical College, and then permission was sought from the school administration through the academic provost to carry out the study. Each patient's information was collected using a structured checklist. All information was treated with utmost confidentiality.

4.12 Dissemination of Results

This research report will be submitted to Departments of Internal Medicine and Public Health, St. Paul's Hospital Millennium Medical College in partial fulfillment of the requirement for a specialty certificate in Internal Medicine. It will also be submitted to the hospital's Pulmonology unit. Attempts will be made to publish the information in peer-reviewed journals and make presentations in scientific conferences.

5. Results

5.1 Socio demographic characteristics

A total of 162 potential asthma patients approached at the outpatient's chest clinic of SPHMMC, from June -August 2021 G.C only 158 (94.92%) gave consent and completed the structured questionnaires.

Mean age was 50.63 years (± 15.8). 100 (63.3 %) of the patients were female and 58 (36.7%) were male. 121 (76.6%) of the patients were from urban residence. Only 36 (22.8%) are college/university graduates. Most of the participants were either employed staff or workers (70.9%) and with the income level of ≥ 2500 (36.7%). **Table 1**

Table 1 Scio-demographic characteristics of the study participants Aug 2021 at SPHMMC

CHARACTERISTICS	N (%)
Age in years	
18-29 years	15 (9.5)
30-44	45 (28.5)
45-59	36 (22.8)
≥60	62 (39.2)
Sex	
Male	58 (36.7)
Female	100 (63.3)
Place of residence	
Rural	37 (23.4)
Urban	121 (76.6)
Education level	
Not attended formal education	19 (12.0)
Can read/write	34 (21.5)
Primary education	30 (19.0)
Secondary education	39 (24.7)
Higher level education (College/University)	36 (22.8)
Occupation	
Daily labor	5 (3.2)
Farming	22 (13.9)
Private work	46 (29.1)
Governmental Employee	39 (24.7)
Others ¹²³	46 (29.1)
Monthly income	
≤1200 birr	55 (34.8)

¹ House wife

² Pension

³ student

1201–2499	45 (28.5)
≥ 2500	58 (36.7)

5.2 Clinical profile

The majority of the participants 82 (51.9%) had asthma symptoms for more than 10 years. The medications used were mainly SABA 98 (62%), both SABA and ICS 53 (33.5%). Steroids tablets were used by 22.2%. Only 39 (24.7%) of the participants had co morbidity, mainly depression in 12 patients and 42(26.6%) were current smokers. Patients who had spirometry done was only 37(23.45%) **Table 2**

Table 2 Clinical characteristics of the study participants in August 2021 at SPHMMC

CHARACTERSTICS	N (%)
Smoking	
Non smoker	116 (73.4)
Smoker	42 (26.6)
Medication use	
SABA only	98 (62.0)
SABA and ICS	53 (33.5)
None	7 (4.4)
Co morbidity	
Rhinitis	4 (2.5)
Rhino sinusitis	5 (3.2)
Gastro esophageal reflux	8 (5.1)
Depression & Anxiety	22 (14)
None	119 (75.3)
Follow up in years	
<5 yrs	27 (17.1)
5-10 yrs	49 (31.0)
>10 yrs	82 (51.9)
Body mass index	
<18.5	1 (0.6)
18.5-24.9	137 (86.7)

≥25	20 (12.7)
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5.3 Magnitude of uncontrolled Asthma

Based on the GINA asthma control score, uncontrolled asthma was present in 104 (65.8%) patients, partially controlled in 18 (11.4%) patients and controlled asthma was present in 36 (22.8%) patients.

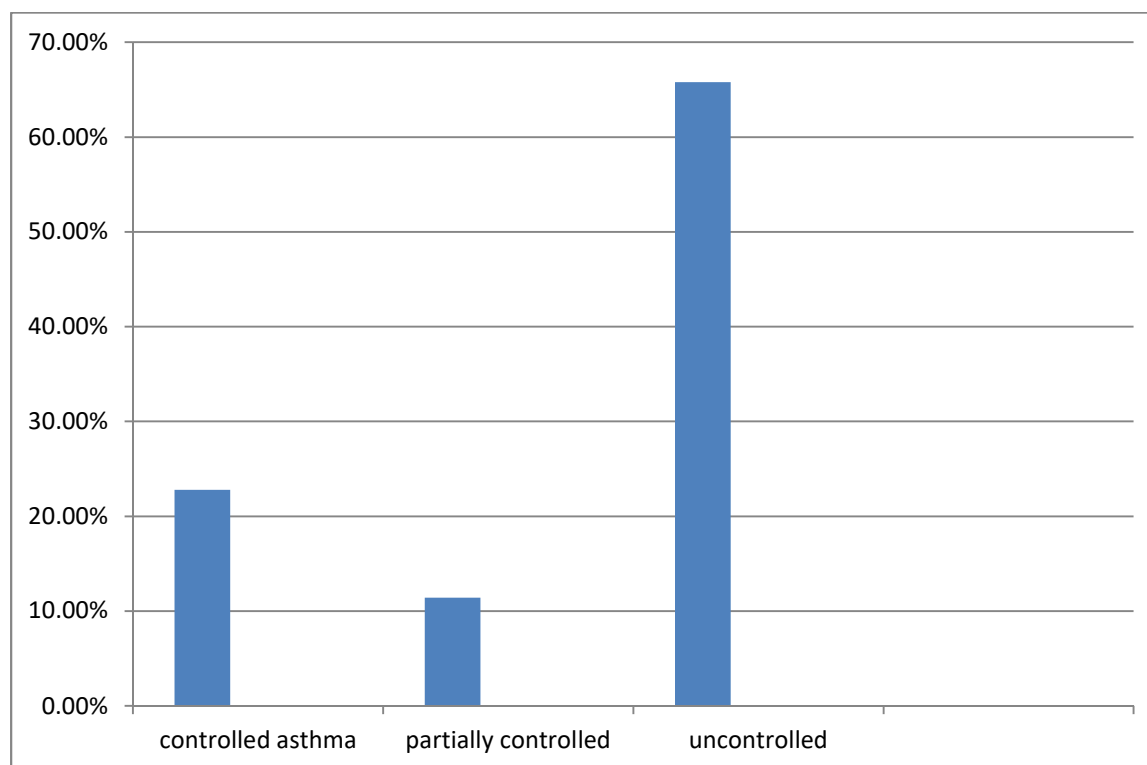


Figure 1 prevalence of asthma control in August 2021 SPHMMC

5.4 Bivariate analysis of socio demographic characteristics and clinical factors

All the studied variables of the socio demographic characteristics were not significantly associated with asthma control except level of income with <1200 (P < 0.02) **Table 3**

Table 3 Associations between socio-demographic characteristics and asthma control on August 2021 at SPHHMMC

Asthma Control				<i>P-value</i> [#]
	Controlled n (%)	Uncontrolled n (%)	COR (95% CI)	
Age				
18-29 years	2 (5.6)	12 (11.5)	1	
30-44	10 (27.8)	32 (30.8)	0.65(0.15-2.5)	0.5
45-59	11 (30.6)	18 (17.3)	0.25(0.06-1.03)	0.05
≥60	13 (36.1)	42 (40.4)	0.53(0.13-2.07)	0.3
Sex				
Male	20 (34.5)	38 (65.5)	0.98(0.5-1.94)	0.95
Female	34 (34)	66 (66)	1	
Residence				
Rural	12 (32.4)	25 (67.6)	1	
Urban	42 (34.7)	79 (65.3)	0.9(0.4-1.97)	0.79
Education				
Higher level	15 (41.7)	21 (68)	1	
Below higher level	39 (32)	83 (58.3)	1.5(0.7-3.2)	0.28
Occupation				
Employed	40 (34.8)	75 (65.2)	0.9(0.4-1.9)	0.9
Unemployed	11 (32.6)	29 (67.4)	1	
Monthly income				
≤1200 birr	18 (32.7)	37 (67.3)	2.8(1.2-6.8)	0.02
1201–2499	10 (22.2)	35 (77.8)	1.67(10.78-3.5)	0.2
≥ 2500	26(44.8)	32 (55.2)	1	

*Based on GINA asthma control level #Pearson's χ^2 test or Fisher's exact test were used according

5.5 Association between clinical factors and asthma control

Factors associated significantly with uncontrolled asthma were; Corticosteroid use ($P = 0.001$), Medication use ($P = 0.039$), adherence to medication ($P = 0.039$), Follow up in years ($P = 0.043$), Smoking ($P = 0.003$), and Hospitalization ($P = 0.000$) **Table 4**

Table 4 Associations between clinical factors and asthma control participants on August 2021 SPHMMC

Asthma control				<i>P</i> -value [#]
	Controlled <i>n</i> (%)	Uncontrolled <i>n</i> (%)	COR (95% CI)	
Corticosteroid use				
Yes	3 (8.6)	32 (91.4)	7.56(2.2-26.02)	0.001
No	51 (41.5)	72 (58.5)	1	
Medication use				
SABA only	29 (29.6)	69 (70.4)	5.95(1.1-32.4)	0.039
SABA and ICS	20 (37.7)	33 (62.3)	4.125(0.7-23.3)	0.109
None	5 (71.4)	2 (28.6)	1	
Adherence to medication				
Usually	6 (14.6)	35 (85.4)	3.9(1.1-13.5)	0.033
Sometimes	10 (26.3)	28 (73.7)	1.87(0.59-5.89)	0.29
Once in a while	30 (50.8)	29 (49.2)	0.6(0.2-1.8)	0.4
Never	8 (40)	12 (60)	1	
Follow up in yrs				
<5 yrs	13(48.1)	14 (51.9)	1	
5-10 yrs	19 (38.8)	30 (61.2)	1,47(0.57-3.8)	0.42
>10 yrs	22(26.8)	60 (73.2)	2.5(1.03-6.2)	0.043
Smoking				
Non smoker	48 (41.4)	68 (58.6)	1	
Smoker	6 (14.3)	36 (85.7)	4.23(1.66-10.8)	0.003
Hospitalization				
Yes	14(25.0)	73 (83.9)	6.7(3.2-14)	0.000
No	40 (75.0)	31 (43.7)	1	

*Based on GINA asthma control level [#]Pearson's χ^2 test or Fisher's exact test were used accordingly

5.6 Multivariate analysis

In the multivariate analysis, eight factors remained significantly associated with uncontrolled asthma with $p < 0.25$; age, monthly, income, follow up in years, smoking, corticosteroids tablets use, non-adherence to medication, hospitalization and medication use. Smokers were over three times more likely to have uncontrolled asthma (AOR=3 (0.93-10.7) than non-smokers. Those who used steroids were eight times more likely to have uncontrolled asthma (AOR=7.53[1.61-35.2]). Patients who are Non-adherent to medication were eight times more likely to have uncontrolled asthma (AOR=8 [1.5-47, 7]) than those patients who are adherent to their medications. Patients who have recent hospitalization were five times more likely to have uncontrolled asthma (AOR=5.2 [1.94-14.077]) than those who do not have recent hospitalization and patients who only use SABA were eighteen times more likely to have uncontrolled asthma (AOR=18.[1.66-216]) than patient who use both SABA and ICS. **Table 5**

**Table 5 logistic regression model for the risk of uncontrolled asthma on August 2021
SPHMMC**

	Uncontrolled n(%)	COR (95 % CI)	AOR (95 % CI)	P-value
Age				
18-29 years	12(80)	1	1	
30-44	32(71.1)	0.62(0.15-2.5)	0.21(0.3-1.6)	0.13
45-59	18(50)	0.25(0.06-1.03)	0.11(0.15-0.81)	0.03
≥60	42(67.7)	0.53(0.13-2.07)	0.13(0.01-0.9)	0.04
Monthly income				
≤1200 birr	37(67.3)	2.8(1.2-6.8)	1.78(0.5-5.7)	0.33
1201–2499	35(77.8)	1.67(10.78-3.5)	3.35(1.01-11.06)	0.05
≥ 2500	32(55.2)	1	1	
Smoking				
Yes	36(85.7)	4.23(1.66-10.8)	3.06(0.98-10..7)	0.06
No	68(58.6)	1	1	
Hospitalization				
Yes	73(83.9)	6.7(3.2-14)	5.2(1.94-14.07)	0.001
No	31(43.7)	1	1	
Corticosteroid use				
Yes	73 (83.9)	7.56(2.2-26.02)	7.53(1.6-35.2)	0.01
No	31 (43.7)	1	1	
Adherence to medication				
Usually	35(85.4)	3.9(1.1-13.5)	8(1.5-47.7)	0.013

Sometimes	28(73.7)	1.87(0.59-5.89)	4(0.8-9)	0.09
Once in a while	29(49.2)	0.6(0.2-1.8)	0.78(0.21-2.8)	0.7
Never	12(60)	1	1	
Medication use				
SABA* only	69(70.4)	5.95(1.1-32.4)	18(1.7-216)	0.018
SABA and ICS**	33(62.3)	4.13(0.7-23.3)	13(1.52-151)	0.05
None	2 (28.6)	1	1	
Follow up in years				
<5 yrs	14(51.9)	1	1	
5-10 yrs	30(61.2)	1.47(0.57-3.8)	1.6(0.41-6.4)	0.4
>10 yrs	60(73.2)	2.5(1.03-6.2)	3(0.8-11)	0.09

***SABA-short acting B-agonist**

**** ICS-inhalational corticosteroids**

CI- confidence interval

COR- Crude odds ratio AOR-adjusted odds ratio

6. Discussion

This research work presents the prevalence and associated factor and poorly controlled asthma at SPHMMC.

In the present study the prevalence of uncontrolled asthma is 65.8% among asthmatic patient attending SPHMMC. And the presence of non- adherence to medication, Steroid tablet use and SABA only use were significantly associated with uncontrolled asthma.

The finding of this study on the prevalence of uncontrolled asthma coincides with global reports. Globally several studies showed sub optimal asthma control. One of these studies done in 12 European countries the asthma control was sub optimal in 56.5% patients (15).

In other studies done in Spain and Saudi Arabia showed the prevalence of uncontrolled asthma was 63.9% and 68% respectively (13, 16). Similar studies done in Africa ,countries like Morocco Middle East and North Africa also showed similar results with 41.5% and 29% of uncontrolled asthma respectively(17,18).Studies conducted in Ethiopia showed different prevalence of uncontrolled asthma ranging from 64.5–85.2%, implying high prevalence of uncontrolled asthma in Ethiopia (5, 19 -21).

Hospitalization in the last 12 months preceding the study was also found to increase the likelihood of having uncontrolled asthma attacks (AOR5.2). The result of a study conducted in Addis Ababa; Ethiopia, was in line with this finding. The study showed that asthmatic patients who had hospitalization associated with exacerbation were more than two times more likely to develop uncontrolled asthma (19). Exacerbation often represents failure in chronic asthma (1). Possible explanation could be because past exacerbation predicts future exacerbation that might increase asthma symptoms.

This study also depicted that non-adherence to treatment was another determinant of uncontrolled asthma with (AOR 8 [1.5-47.7]). This finding is in line with studies conducted in, Denmark (27%) and North African and Middle East countries (26, 17). A similar study conducted at Jimma Medical Center, Ethiopia, also showed that the odds of uncontrolled asthma was about 3 times higher among non-adherent patients when compared to the adherent ones (21).Non- adherence to medication in this study mainly associated with forgetfulness.

In the present study uncontrolled asthma was associated with oral steroid use (AOR-7.5[1.61-14.27]) the REALISE survey also found a high incidence of oral steroid use over the 12 months before the survey done (14).The use of oral steroid might indicate that these patient were not on regular controller medication or with more severe forms of disease and therefore they were experiencing asthma control difficulties.

The high prevalence of uncontrolled asthma in this study may also be related to the under use of the recommended medication. In this study 70.3% of patients with uncontrolled asthma use only SABA. Only 31.7%patients use both SABA and ICS. In similar study done in Ambo patients who did not used ICS were found to have 4 times a higher risk of uncontrolled asthma (29).There is a significant increment from the other study likely because the patients included in this study were higher than in the study done in Ambo.

To achieve good asthma control the GINA guideline recommends improving the quality of service provided to asthma patient through implementation of asthma guideline (GINA) use of diagnostic tools such as spirometry. In this study spirometry was done for only 23.4 %(37) patients. Under use of the lung function test has been associated with under treatment of asthma and leads to poor asthma control (1).In a study done in Norway 20% participants with poor asthma control reported to have never undergone spirometry (22).

Even though in other similar studies like Norway and Jimma [AOR: 7.09; 95% CI: 1.84, 27.33] patients who smoke cigarettes were found to have seven times a higher risk of uncontrolled asthma compared to nonsmokers in both studies(21,22). In this study smoking showed that the odds of uncontrolled asthma was about 3 times higher among smoker (AOR 3.35 [0.93-10.7]) than non-smoker. But it was not statistically significant ($P=0.06$).

Age, gender, level of education, income, BMI and co morbid conditions (i.e., gastro esophageal reflux and allergic rhinitis), were not related to asthma control. Similar result has been found in study done in Addis Ababa University (19).

7. Strength of the study

Common associated factors were assessed which help to identify the prevalence and address them accordingly.

The study can be used as foundation for future researches.

8. Limitations of the study

This study is a hospital based study may not reflect the actual prevalence of uncontrolled asthma and associated factor in the community.

The cross-sectional nature of the study brings with it its limitation, including that the associations do not imply causality

9. Conclusion

In conclusion, this study had shown the prevalence and associated factors of uncontrolled asthma in SPHMMC.

Uncontrolled asthma (65.8 %) was the most common finding followed by controlled asthma (34.2%) and the major associated factors were, poor medication adherence, hospitalization and under use of recommended medications.

Prevention and limitation of the contributing factor is the foremost approach to decrease the prevalence of uncontrolled asthma.

This study highlights the need for an integrated approach to asthma management with the patients' knowledge about medication adherence, smoking cessation and health care providers' provision of guideline directed therapy should be prioritized.

10. Recommendations

For Health care professional

- Health education on medication adherence, the importance of follows ups and patients' perceptions of their asthma and guideline-defined levels of control should be given during every follow up to prevent asthma related hospitalization & uncontrolled asthma. And health care professionals should supervise treatment use more closely, provide hands-on advice and guidance
- Pulmonary function test should be done for all asthmatic patients on follow up which would help for diagnosis as well as follow up of patients

For Hospital administrators

- To avail instrument for diagnosis of asthma.
- To make available medications that are needed as per protocol which will prevent under treatment which leads to uncontrolled asthma
- To assure health care providers' are ensuing guideline directed therapy.

For Researcher

- Further cohort research to determine other factors related to uncontrolled asthma in different hospital in Addis Ababa sub-city.

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12. Annexes

Annex I: Information Sheet

Research Title: PREVALENCE AND ASSOCIATED FACTORS FOR POORLY CONTROLLED ASTHMA AMONG ADULT ASTHMATIC PATIENTS ON FOLLOW UP AT CHEST CLINIC OF SAINT PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE INTERNAL MEDICINE DEPARTMENT, ETHIOPIA

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Sponsor St. Paul's Hospital Millennium Medical College

Annex II: Questionnaire

Section I: Socio-demographic characteristics

1. Date-----

Card number -----

1. Baseline demographic characteristics

S. R	Question	Response category
1	Age (in years)	
2	Sex	1. Male 2. Female
3	Place of Residence	1. Urban 2. Rural
4	Occupation	1. Daily labor 2. Farming 3. Private work 4. Governmental Employee 5. Other (specify
5.	Monthly Income	1. ≤ 1200 birr 2. 1201–2499 birr 3. ≥ 2500 birr
6	Educational Level	1. Not attended formal education 2. Can read/write 3. Primary education 4. Secondary education 5. Higher level education (College/University)
7	Body mass index	<18.5 18.5-24.9 25.0-29.9

		>/=30
8	Smoking	Smoker Non-smoker

Assessment of level of asthma control (GINA score)

LEVEL OF ASTHMA CONTROL	DO YOU HAVE DAY TIME SYMPTOMS?	YES	NO
Controlled	TWICE A WEEK OR LESS DO YOU HAVE LIMITATIONS OF ACTIVITY? DO YOU HAVE NOCTURNAL SYMPTOMS OR AWAKENING? DO YOU USE RESCUE MEDICATIONS TWICE A WEEK OR LESS? NORMAL PULMONARY FUNCTION TEST		
Partially controlled	Do you have Day time symptoms twice a week or more?		
	Do you have Any limitations of activity?		
	Do you have Any nocturnal symptom awakening?		
	Do you use Rescue medications 2x a week?		
	Pulmonary function<80% predicted value		
Uncontrolled	Three or more criteria of partially controlled asthma in a given week		

	Exacerbations requiring oral corticosteroids in any given? Hospitalization/any emergency admission in the last 12 month?		
Medication use	Does the patient take SABA only? Does the patient SABA plus ICS?		
Presence of comorbidity	Rhinitis Rhino sinusitis Gastro esophageal reflux Depression Anxiety		
Follow up in years	<5 yrs. 5-10 yrs. >10 yrs.		

Morisky Medication Adherence Scale (MMAS)

DO YOU SOMETIMES FORGET TO TAKE YOUR MEDICATIONS?	YES	NO
People sometimes miss taking their medications for reasons other than forgetting. Thinking over the past two weeks, were there any days when you did not take your medications?		
When you travel or leave home, do you sometimes forget to bring along your medications?		
Did you take your medications yesterday?		
When you feel like your health condition is under control, do you sometimes stop taking you medications?		
Taking medications every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your treatment plan?		
How often do you have difficulty remembering to take all your medications?	Never/rarely 4 Once in a while 3 Sometimes 2 Usually 1 All the time 0	

AnnexIII: GINNA Asthma control

TABLE 1 GINNA assessment of asthma symptom control

LEVEL OF ASTHMA CONTROL			
Characteristic	Controlled (All of the following)	Partly controlled (Any measure present in any week)	Uncontrolled
Daytime symptoms	None ($\leq$ twice/week)	$>$ twice/week	Three or more features of partly controlled asthma present in any week
Limitations of activities	None	Any	
Nocturnal symptoms / awakening	None	Any	
Need for reliever/ rescue treatment	None ($\leq$ twice/week)	$>$ twice/week	

TABEL 2 Classification of asthma-according to severity of clinical features (GINNA)

INTERMITTENT	MILD PERSISTENT	MODERATE PERSISTENT	SEVERE PERSISTENT
Symptoms $<$ once a week	Symptoms $>$ once a week but $<$ once a day	Symptoms daily	Symptoms daily

Brief exacerbations	Exacerbations may affect activity and sleep	Exacerbations may affect activity and sleep	Frequent exacerbations
Nocturnal symptoms not > twice a month	Nocturnal symptoms > twice a month	Nocturnal symptoms > once a week	Frequent nocturnal asthma symptoms
• FEV1 or PEF $\geq$ 80 % predicted	• FEV1 or PEF $\geq$ 80 % predicted	Daily use inhaled short-acting β2-agonist	Limitation of physical activities
• PEF or FEV1 variability < 20 %	• PEF or FEV1 variability < 20-30 %	• FEV1 or PEF 60-80 % predicted	• FEV1 or PEF $\leq$ 60 % predicted
		• PEF or FEV1 variability > 30 %	• PEF or FEV1 variability > 30 %

Annex iv: Assurance of Investigator and Approval of Advisors

Assurance of Investigator

I the undersigned resident agree to accept all responsibilities for the scientific, ethical and technical conduct of the research project and for provision of required progress reports as per terms and conditions of the Research and Publication Directorate and /or Department of Public Health of St. Paul's Hospital Millennium Medical College.

Name of the Resident: _____

Signature: _____

Date: _____

Approval of Advisors

Name of Public Health Advisor: _____

Signature: _____

Date: _____

Name of Clinical Advisor: _____

Signature: _____

Date: _____