

Magnitude and Factors Associated With Uncontrolled Asthma Among Patients at Government Hospitals Follow-Up Clinic in Harar and Dire Dawa, Eastern Ethiopia.

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Abstract

Background: Uncontrolled asthma adds to the burden of non-communicable diseases. The studies on the level of asthma control in Ethiopia are confined to some specific geographical areas, didn't assess trigger related factors and factors associated with partially and poorly controlled asthma separately and done with small sample sizes. The purpose of this study is to assess the magnitude and factors associated with uncontrolled asthma among patients at government hospitals follow-up clinic in Harar and Dire Dawa, Eastern Ethiopia.

Methods: An institutional based cross-sectional study was conducted on selected 509 adult asthmatic patients on follow up at 6 government hospitals in Harar and Dire Dawa cities from February 21- April 20, 2020. Multinomial logistic regression has been used to identify factors associated with uncontrolled asthma and the result was presented using COR and AOR with their corresponding 95% confidence interval.

Result: The magnitude of uncontrolled (poorly controlled and partially controlled) asthma was 420 (82.5%). Poor knowledge about asthma (AOR: 5.442; 95% CI (1.839-16.101)), negative attitude towards asthma (AOR=4.247; 95% CI (1.594-11.312)), non-adherence to medications (AOR=4.692; 95% CI (1.554-14.17)) and using the combination of Inhaled Corticosteroid (ICS) and Long Acting Beta2 Agonist (LABA) to control asthma (AOR=0.287; 95% CI (0.102-0.803)) were significantly associated with poorly controlled asthma. Average knowledge about asthma (AOR=3.918; 95% CI (1.276-12.03)) and using the combination of ICS and LABA (AOR=0.283; 95% CI (0.084-0.947)) were significantly associated with partially controlled asthma.

Conclusion: This study indicated a higher magnitude of uncontrolled asthma. Poor and average knowledge about asthma, negative attitude towards asthma, non-adherence to medications, and using the combination of ICS and LABA to control asthma were associated with uncontrolled asthma. Health care providers, hospitals, health policymakers, and researchers should work on asthma control by different methods through enhancing patients' knowledge and attitude towards asthma.

Background

Asthma affects all including people in high income, middle income and low income countries [1]. Worldwide, 339 million people are suffering from asthma [2]. There are 50 million individuals affected in Africa [3]. It was estimated that 420,000 people died from asthma in the world in 2016, which means around 1000 people died due to Asthma per day [4]. In Ethiopia the prevalence of asthma is 2% each for doctor diagnosed asthma and clinical asthma and it is 5.3% for asthma that was diagnosed by wheezing symptom [5].

There are different guidelines to assess the level of asthma control among asthmatic patients, one of the validated and internationally standardized tool is Asthma Control Test (ACT). The components of ACT include activity limitation due to asthma, shortness of breath, presence of asthma symptoms, use of rescue inhaler or nebulizer medication and individual perception on how well they controlled asthma [6].

Uncontrolled asthma has a major problem, it adds to the burden of non-communicable diseases which leads to the decline in the development of countries. Asthma can also cause major problems on the individuals with the disease like limitation on the physical, emotional, social and professional career [5, 7]. The quality of life of individuals with asthma is more affected as the severity of asthma increases. The more serious effects are with uncontrolled asthma [8, 9].

Several studies in different parts of the world stated the high magnitude of uncontrolled asthma [10–15]. Some studies conducted in parts of Ethiopia revealed higher magnitude of poorly controlled asthma ranging from 53.3% – 73.1%. This staggering numbers could be attributed to poor knowledge about asthma, poor attitude towards asthma, presence of exacerbation within 12 months, presence of comorbid illness and poor medication adherence [16–18].

The studies on the level of asthma control in Ethiopia are confined to some specific geographical areas and done with smaller sample size. Those studies assessed socio demographic, treatment related, disease related, and patient related factors that might be associated with uncontrolled asthma, but they didn't assess trigger related factors. Also they didn't assess factors associated with partially and poorly controlled asthma separately.

Since controlling asthma is the core element for the management of asthma, knowing and studying the magnitude of uncontrolled asthma and different influencing factor in different geographical areas and societal context is essential to decrease mortality rate due to asthma and to improve the quality of life of asthmatic patients.

Therefore, this study tried to assess the magnitude and factors associated with uncontrolled asthma among patients at government hospitals follow-up clinic in Harar and Dire Dawa, Eastern Ethiopia.

Methods

Study design

Institutional based cross-sectional study was conducted from February 21, 2020 to April 20, 2020 in 6 government hospitals of Harar and Dire Dawa. In Harar, Hiwot Fana Hospital (HFH), Jugel Hospital (JH), and Harar General Hospital (FPHGH) and in Dire Dawa, Dilchora Referral Hospital (DRH), Sabian General Hospital (SGH), and Federal Police, and East Command Level Three Referral Hospital (ECLTRH).

Population and Sample

All asthmatic patients who took asthma medications at least for the previous 3 months and whose age is greater than or equals to 18 years were included in the study. Asthmatic patients who were mentally unstable or critically ill and Patients with physician-diagnosed active lung infections, bronchiectasis or chronic obstructive pulmonary disease (COPD), congestive heart failure, pulmonary hypertension were excluded from the study due to similarities with asthma symptoms.

Sample size is calculated using two sided confidence level of 95%, margin of error of 5%, power of 80% and ratio of exposed to unexposed 1:1 using Epi Info Version 7. So, the sample size taken was 352 including 10% non-response rate and design effect of 1.5 lead to the final sample size of 528. There was proportional allocation to the hospitals based on the patients load, and then every asthmatic patient who came for follow-up was included in the sample until the desired sample size was obtained.

Data collection instruments and management

Data were collected using pre tested semi structured questionnaire. Asthma control test (ACT) tool which includes 5 questions and scored out of 25 was used to assess the level of asthma control. Accordingly, participants getting greater than 19 out of 25 were considered to have well-controlled asthma, 16–19 partially controlled asthma and less than 16 as poorly controlled asthma an uncontrolled asthma includes both partially and poorly controlled asthma [6].

The Morisky tool which is used to assess level of drug adherence was used to assess individual's drug adherence. It includes 8 questions. Out of the 8 questions, if the patient score 0, high adherence is considered, if the patient scores 1 or 2, medium adherence and greater than 2, poor adherence [19]. The knowledge of patients about asthma was assessed by 20 questions. From the 20 knowledge questions, participants who achieved knowledge score greater than or equals to 13 were considered to have good knowledge about asthma, from 9–12 considered as having average knowledge and ≤ 8 as poor knowledge [20, 21]. Patients attitude towards asthma was assessed based on 5 attitude questions measured on 5 point likert scale ranging from strongly disagree to strongly agree. Accordingly, participants getting greater than or equals to 15 out of 25 were considered to have positive attitude and negative attitude if they score less than 15 [20, 21]. The questions to assess different factors that might be associated with uncontrolled asthma including socio-economic status of patients, patient related factors, type of medication used, family history of asthma, and presence of exacerbation in the past 12 months were adapted from similar studies in Ethiopia [17, 18, 21, 22].

Statistical analysis

Descriptive statistics including frequencies, percentage, median, range, and Interquartile Range (IQR) were computed to measure the prevalence of the proposed factors. In order to determine the socio-economic status of participants, wealth index using principal component analysis was carried out. Participants' household wealth was ranked into 5 quintiles. Multinomial logistic regression analysis was done and all explanatory variables with p-value less than 0.25 entered to the final multiple logistic regression model to identify factors associated with asthma control. To measure the level of association with the outcome variables, Crude Odd Ratio (COR) and Adjusted Odd Ratio (AOR) along with 95% Confidence interval (CI) were used. The fitness of the model was tested by Deviance and Pearson Chi-square goodness of fit tests, and the model was considered fit because both the models yielded p-value greater than 0.05. Multicollinearity test was carried out to see the correlation between independent variables using a variance inflation factor (VIF). A P-value of less than 0.05 was taken to declare the presence of statistical significance.

Ethics

The study was approved by the Institutional Health Research Review Committee (IHRERC) of the college of Health and Medical Science of Haramaya University in accordance with the Declaration of Helsinki, standard international guidelines and regulations and the study shared similar methodology from previously published works. Informed written voluntary consent was obtained from all the study participants after providing information regarding the study procedures, potential risks, benefits and their right to refuse and withdraw at any time during the study. Participant's confidentiality was maintained by excluding names and identification in the questionnaires.

Result

Socio-demographic characteristics

Of the total 528 expected participants, 509 had participated in this study making the response rate 96.4%. Among the participants 271 (53.2%) were females, the median (\pm IQR) age of participants was 40 years (\pm 20) with a range of 18 to 82 years and 127 (25%) of the participants were in the age group of 35–44 years. Concerning the marital status of the study participants' majority of them were married which is 306 (60.1%) and in their educational status, 127 (25%) of the participants completed secondary education and 136 (26.7%) of them were government employees. Most of the study participants were urban residents, which is 464 (91.2%). Regarding their household wealth, 103 (20.2%) were very rich (Table 1).

Table 1
Socio demographic characteristics of adult asthmatic patients on follow-up.

Variables	Category	Frequency	Percentage (%)
Age	18-24	46	9.0
	25-34	120	23.6
	35-44	127	25.0
	45-54	115	22.6
	55-64	62	12.2
	>/=65	39	7.7
Sex	Male	237	46.6
	Female	272	53.4
Marital status	Single	109	21.4
	Married	306	60.1
	Divorced/separated	39	7.7
	Widowed	55	10.8
Educational status	Unable to read and write	53	10.4
	Read and Write	57	11.2
	Primary school	91	17.9
	Secondary school	127	25.0
	College/university student	26	5.1
	Diploma	93	18.3
	BSC and above	62	12.2
Occupation	Merchant	111	21.8
	Daily laborer	56	11.0
	Private employee	58	11.4
	Government employee	133	26.1
	Housewife	88	17.3
	Farmer	34	6.7
	*Other	29	5.7
Residence	Urban	464	91.2
	Rural	45	8.8
Wealth quintile	Very poor	101	19.8
	Poor	102	20.0
	Medium	103	20.2
	Rich	100	19.6
	Very rich	103	20.2

*Other: unemployed, retired and student

Level of Asthma Control

From the total participants majority of them 420 (82.5%) had uncontrolled asthma based on ACT classification (76 (14.9%) partially controlled and 344 (67.6) poorly controlled) and only 89 (17.5%) of the participants had well controlled asthma.

Patient Related Factors

Majority of them, 314 (61.7%) didn't follow their regular medical follow up as scheduled. 440 (86.4%) had never smoked and 298 (58.5%) of them had a habit of chewing khat. Regarding their knowledge and attitude, 217(42.6%) of the participants had poor knowledge about asthma and 270 (53%) of them had positive attitude towards asthma (Table 2).

Table 2
Patient related characteristics of adult asthmatic patients on follow-up.

Variables	Category	Frequency	Percentage (%)
Following scheduled regular medical follow up	Yes	195	38.3
	No	314	61.7
Smoking	Currently smoking	47	9.2
	Previously smoking	22	4.3
	Never smoked	440	86.4
Chewing khat	Yes	298	58.5
	No	211	41.5
Knowledge	Good knowledge	186	36.5
	Average knowledge	106	20.8
	Poor knowledge	217	42.6
Attitude	Positive attitude	270	53.0
	Negative attitude	239	47.0

Treatment Related Factors

All the study participants used prescribed medications to control asthma and 320 (62.9%) of them use their medications regularly to control asthma and the rest 189 (37.1%) use their medications only to relieve symptoms. The type of medications used by the participants is presented in Fig. 1, from the total participants, majority of them 431 (84.7%) used SABA inhalation. Among those who used medication regularly to control asthma 211 (65.9%) had non-adherence to medications, 58 (11.4%) medium adherence and 51 (10%) good adherence.

Disease Related Factors

The median (\pm IQR) duration of asthma was 7 years (\pm 10) with range of 0.5–37 years and more than half of the participants 288 (56.6%) stayed with asthma for less than 10 years. From the total study participants almost half of them 254(49.9%) had experienced asthma exacerbation in the past 12 months. Regarding comorbid illness, 311 (61.1%) of them didn't have any comorbid illness and from those who had comorbid illness, 107 (54%) had diabetes mellitus (Table 3).

Among the study participants, 56 (11%) were admitted in the hospital within 12 months prior to the study period, and from those who were admitted only 21 (37.5%) admitted due to asthma. concerning family history of asthma, 177 (34.8%) of the study participants had family history of asthma (Table 3).

Regarding triggering factors, for 369(72.5%) of the total study participants, seasonal variation was the major triggering factor (Fig. 2).

Table 3
Disease related characteristics of adult asthmatic patients on follow-up.

Variables	Category	Frequency	Percentage (%)
Duration of asthma	< 10 years	288	56.6
	11–20 years	121	23.8
	21–30	57	11.2
	>30	43	8.4
Exacerbation in the past 12 months	Yes	254	49.9
	No	255	50.1
Comorbid illness	Yes	198	38.9
	No	311	61.1
Type of comorbid illness	Allergic rhinitis	27	13.6
	Hypertension	91	46.0
	Diabetes mellitus	108	54.5
	HIV	22	11.1
	*Other	13	6.6
Hospital admission in the past 12 months	Yes	56	11.0
	No	453	89.0
Reason for hospital admission	Asthma	21	37.5
	**Other	35	62.5
Family history of asthma	Yes	177	34.8
	No	332	65.2

*other: hepatitis, thyroid disease, breast cancer, chronic kidney disease, Epilepsy

**other; Diabetic ketoacidosis, pneumonia, appendicitis, traumatic injury, peptic ulcer disease Benign prostate hyperplasia and anemia

Factors Associated with Uncontrolled Asthma

In bivariate analysis socio-demographic variables which included marital status, educational status, residence, and wealth quintiles were associated with both poorly controlled asthma and partially controlled asthma and age was associated only with poorly controlled asthma. Patient related factors which included, chewing khat and knowledge about asthma were associated with both poorly controlled asthma and partially controlled asthma and attitude towards asthma and following scheduled regular medical follow up were associated only with poorly controlled asthma. From treatment related factors use of SABA inhalation and adherence to medication were found to be associated with poorly controlled asthma and using the combination of ICS and LABA to control asthma was found to be associated with both poorly controlled and partially controlled asthma. In addition to those factors presence of comorbid illness was found to be associated with poorly controlled asthma.

The results for bivariate and multivariable multinomial logistic regression are found in Table 4 which is located on page 22. In multivariable analysis using multinomial logistic regression, asthmatic patients who had poor knowledge about asthma were 5 times more likely to have poorly controlled asthma than those who had good knowledge about asthma (AOR: 5.442; 95%CI (1.839–16.101)). Patients who had a negative attitude towards asthma were 4 times more likely to have poorly controlled asthma than those who had positive attitude (AOR = 4.247; 95%CI (1.594–11.312)). Regarding treatment related factors, asthmatic patients who were non-adherent to medications were 4 times more likely to have poorly controlled asthma than patients who had good medication adherence (AOR = 4.692; 95%CI (1.554–14.17)) and those who used the combination of ICS and LABA to control asthma were almost 0.3 times less likely to have poorly controlled asthma than those who didn't use (AOR = 0.287; 95%CI (0.102–0.803)).

Table 4
Bivariate and multivariable analysis for factors associated with uncontrolled asthma.

Variables	Category	Level of asthma control					
		Well Controlled (%)	Partially controlled (%)	COR (95% CI)	AOR (95% CI)	Poorly controlled (%)	COR (95% CI)
Age	18–24	13 (28.3)	11 (23.9)	1	1	22 (47.8)	1
	25–34	26 (21.7)	19 (15.8)	0.864 (0.319–2.341)	2.587 (0.347–19.297)	75 (62.5)	1.705 (0.752–3.862) 3.965 (0.816–19.274)
	35–44	19 (15)	18 (14.2)	1.12 (0.4–3.135)	2.828 (0.3–26.674)	90 (70.9)	2.799 (1.202–6.52) 3.139 (0.525–18.787)
	45–54	19 (16.5)	17 (14.8)	1.057 (0.375–2.979)	3.839 (0.389–37.911)	79 (68.7)	2.457 (1.051–5.743) 2.648 (0.426–16.459)
	55–64	7 (11.3)	6 (9.7)	1.013 (0.262–3.924)	1.312 (0.095–18.067)	49 (79)	4.136 (1.451–11.791) 3.068 (0.397–23.739)
	>/=65	5 (12.8)	5 (12.8)	1.182 (0.27–5.176)	5.869 (0.367–93.871)	29 (74.4)	3.427 (1.063–11.052) 7.425 (0.729–75.583)
Marital status	Single	35 (32.1)	20 (18.3)	1	1	54 (49.5)	1
	Married	42 (13.7)	45 (14.7)	1.875 (0.939–3.745)	1.555 (0.381–6.353)	219 (71.6)	3.38 (1.973–5.79) 1.973 (0.589–6.607)
	Divorced/separate	4 (10.3)	6 (15.4)	2.625 (0.661–10.427)	1.008 (0.128–7.94)	29 (74.4)	4.699 (1.52–14.526) 0.677 (0.113–4.052)
	Widowed	8 (14.5)	5 (9.1)	1.094 (0.315–3.799)	0.428 (0.055–3.323)	42 (76.4)	3.4.3 (1.429–8.102) 0.464 (0.078–2.775)
Educational status	Unable to read and write	4 (7.5)	6 (11.3)	3 (0.686–13.118)	3.489 (0.237–51.367)	43 (81.10)	6.719 (2.092–21.582) 0.92 (0.09–9.403)
	Read and Write	5 (8.8)	6 (10.5)	2.4 (0.587–9.819)	1.887 (0.207–17.178)	46 (80.7)	5.75 (1.955–16.912) 1.928 (0.293–12.692)
	Completed Primary school	14 (15.4)	13 (14.3)	1.857 (0.637–5.417)	1.026 (0.0193–5.452)	64 (70.3)	2.857 (1.279–6.385) 0.796 (0.195–3.246)
	Completed Secondary school	19 (15)	21 (16.5)	2.211 (0.829–5.893)	2.037 (0.434–9.565)	87 (68.5)	2.862 (1.355–6.042) 1.883 (0.504–7.039)
	College/university student	9 (34.6)	5 (19.2)	1.111 (0.294–4.205)	2.998 (0.282–31.886)	12 (46.2)	0.833 (0.298–2.332) 1.011 (0.139–7.367)
	Diploma	18 (19.4)	15 (16.1)	1.667 (0.599–4.634)	1.235 (0.258–5.899)	60 (64.5)	2.083 (0.967–4.49) 1.464 (0.391–5.485)
	BSC and above	20 (32.3)	10 (16.1)	1	1	32 (51.6)	1
Residence	Urban	86 (18.5)	70 (15.1)	1	1	308 (66.4)	1
	Rural	3 (6.7)	6 (13.3)	2.457 (0.593–10.179)	2.522 (0.119–53.234)	36 (80)	3.351 (1.007–11.145) 5.536 (0.374–81.994)

Variables	Category	Level of asthma control						
Regular medical follow up	Yes	54 (27.7)	43 (22.1)	1	1	98 (50.3)	1	1
	No	35 (11.1)	33 (10.5)	1.184 (0.636–2.205)	0.993 (0.365–2.699)	246 (78.3)	3.873 (2.383–6.293)	2.272 (0.952–5.393)
Chewing Khat	No	57 (27)	35 (16.6)	1	1	119 (56.4)	1	1
	Yes	32 (10.7)	41 (13.8)	2.087 (1.117–3.899)	1.405 (0.517–3.82)	225 (75.5)	3.368 (2.07–5.479)	1.767 (0.764–4.087)
Knowledge about asthma	Good knowledge	51 (27.4)	25 (13.4)	1	1	110 (59.1)	1	1
	Average knowledge	17 (16)	34 (32.1)	4.08 (1.92–7.8.669)	3.918 (1.276–12.03)**	55 (51.9)	1.5 (0.793–2.837)	1.742 (0.621–4.882)
	Poor knowledge	21 (9.7)	17 (7.8)	1.651 (0.743–3.67)	3.535 (0.958–13.04)	179 (82.5)	3.952 (2.255–6.925)	5.442 (1.839–16.101) **
Attitude towards asthma	Positive attitude	75 (27.8)	63 (23.3)	1	1	132 (48.9)	1	1
	Negative attitude	14 (5.9)	13 (5.4)	1.105 (0.484–2.525)	1.297 (0.392–4.292)	212 (88.7)	8.604(4.672–15.844)	4.247(1.594–11.312)**
SABA	No	17 (21.8)	17 (21.8)	1	1	44 (56.4)	1	1
	Yes	72 (16.7)	59 (13.7)	0.819 (0.385–1.744)	0.626 (0.227–1.726)	300 (69.6)	1.61 (0.869–2.981)	0.903 (0.365–2.236)
combination of ICS and LABA	No	65 (14.1)	69 (15)	1	1	17 (35.4)	1	1
	Yes	24 (50)	7 (14.6)	0.275 (0.111–0.681)	0.283 (0.084–0.947)**	15 (31.2)	0.141 (0.072–0.277)	0.287 (0.102–0.803)**
Adherence	Good adherence	19 (37.3)	14 (27.5)	1	1	18 (35.3)	1	1
	Medium adherence	14 (24.1)	15 (25.9)	1.454 (0.533–3.967)	0.722 (0.204–2.556)	29 (50)	2.187 (0.883–5.415)	1.586 (0.459–5.487)
	Poor adherence	25 (11.8)	18 (8.5)	0.977 (0.39–2.448)	0.491 (0.15–1.61)	168 (79.6)	7.093 (3.286–15.312)	4.692 (1.554–14.17)**
comorbid illnesses	No	65 (20.9)	51 (16.4)	1	1	195 (62.7)	1	1
	Yes	24 (12.1)	25 (12.6)	1.328 (0.68–2.593)	1.247 (0.381–4.085)	149 (75.3)	2.069(1.237–3.462)	1.335 (0.472–3.78)
Wealth quintile	Very poor	8 (7.9)	12 (11.9)	1.333 (0.435–4.085)	1.387 (0.239–8.056)	81 (80.2)	2.348 (0.948–5.818)	2.11(0.445–10)
	Poor	23 (22.5)	18 (17.6)	0.696 (0.279–1.734)	0.967 (0.233–4.022)	61 (59.8)	0.615 (0.298–1.27)	1.467 (0.412–5.222)
	Medium	22 (21.4)	12 (11.7)	0.485 (0.183–1.284)	1.204 (0.29–5.003)	69 (67)	0.727 (0.352–1.502)	2.202 (0.625–7.756)
	Rich	20 (20)	16 (16)	0.711 (0.277–1.822)	1.615 (0.389–6.708)	64 (64)	0.742 (0.354–1.556)	3.185 (0.91–11.146)

Variables	Category	Level of asthma control					
	Very rich	16 (15.5)	18 (17.5)	1	1	69 (67)	1

**= statistically significant at $p < 0.05$, CI = Confidence Interval, COR = Crude Odds Ratio, AOR = Adjusted Odds Ratio.

Asthmatic patients who had average knowledge about asthma were almost 4 times more likely to have partially controlled asthma than those who had good knowledge (AOR = 3.918; 95%CI (1.276–12.03)). Those who used the combination of ICS and LABA to control asthma were almost 75% times less likely to have partially controlled asthma than those who didn't use (AOR = 0.283; 95%CI (0.084–0.947)) (Table 4).

Discussion

The magnitude of poorly controlled asthma in this study was 67.6%, 14.9% for partially controlled and 17.5% for well controlled asthma. Poor knowledge about asthma, negative attitude towards asthma, non-adherence to medications and using the combination of ICS and LABA to control asthma were significantly associated with poorly controlled asthma and average knowledge about asthma and using the combination of ICS and LABA to control asthma were significantly associated with partially controlled asthma.

The magnitude of poorly controlled asthma in this study was 67.6%. This is consistent with the one conducted in northwest Ethiopia, where the magnitude of poorly controlled asthma was 70.4% [23]. But this finding is higher than previous studies conducted in Addis Ababa, Ethiopia 53.3% [17], Jimma, Ethiopia 50.4% [18], and Middle East and North Africa 41.5% [14]. This variation might be attributed to the difference in study area, sample size, and the type of tool they used to measure the level of asthma control. The study which was conducted in Addis Ababa used the GINA asthma symptom control assessment tool [17], but in this study ACT classification guideline was used to classify patients on their level of asthma control. So the variation between the two studies might be due to the different tools they used to level asthma control. The sample sizes of the studies done in Addis Ababa and Jimma, Ethiopia were less than half of the sample size of this study [17, 18]. So the difference might be due to sample size difference that this study has identified larger magnitude of asthmatic patients with poorly controlled asthma by addressing larger number of asthmatic patients. The difference might also be attributed to different awareness and knowledge about how to control asthma.

The magnitude of partially controlled asthma in this study was 14.9% which is almost comparable with the study done in Morocco where the magnitude of partially controlled asthmas was 18% [10]. But this finding is a little bit lower than the studies in Addis Ababa Ethiopia 22.5% [17], and Middle East and North Africa 29.1% [14]. This variation might be attributed to the difference in study area, sample size, and the type of tool they used to level asthma control. The study which was conducted in Addis Ababa used the GINA asthma symptom control assessment tool [17], but in this study ACT classification guideline was used to classify patients on their level of asthma control. So the variation between the two studies might be due to the different tools they used to level asthma control. The study done in Middle East and North Africa was a large scale study including more than 7000 study participants. So the difference might be due to sample size difference.

Asthmatic patients who had poor knowledge about asthma were 5 times more likely to have poorly controlled asthma than those who had good knowledge about asthma. This finding is in line with the study done in Jimma University medical center, Ethiopia [21].

Asthmatic patients' attitude towards asthma was another factor which was found to be associated with poorly controlled asthma in this study. Patients who had negative attitude towards asthma were 4 times more likely to have poorly controlled asthma than those who had positive attitude. This study is comparable with the one done in Jimma University medical center, Ethiopia [21].

In this study, adherence to medication was significantly associated with poorly controlled asthma. Asthmatic patients who had poor medication adherence were 4 times more likely to have poorly controlled asthma. This finding is comparable with the studies done in Jimma university medical center and China, [15, 21]. But in the study done in Middle East and North Africa poor medication adherence was protective factor, asthmatic patients who had poor medication adherence were 0.5 times less likely to have poorly controlled asthma than those who had good medication adherence [14]. The discrepancy between the two studies might be due to sample size difference that the study done in Middle East and North Africa was a large scale study with more than 7000 study participants and this study was done with 509 study participants. Another reason for the discrepancy might be due to that poor knowledge and negative attitude were significantly associated with poorly controlled asthma in this study, so this might lead to poor medication adherence.

In this study using the combination of ICS and LABA to control asthma was a protective factor. Asthmatic patients who used the combination of ICS and LABA to control asthma were almost 0.3 times less likely to have poorly controlled asthma than those who didn't use. But in the study done in China using a combination of ICS and LABA inhalation was not significantly associated with poorly controlled asthma [15]. This discrepancy might be attributed to the difference in study area and the analysis models used. The study done in china was analyzed using binary logistic regression by dichotomizing the outcome variable in to uncontrolled and controlled asthma but this study was analyzes

by multinomial logistic regression considering the three values of the outcome variable which are well controlled, partially controlled and poorly controlled asthma. This might lead to show the real association between the two variables.

It was found that average knowledge about asthma was significantly associated with partially controlled asthma. Asthmatic patients who had average knowledge about asthma were almost 4 times more likely to have partially controlled asthma than those who had good knowledge. This might be due to that as the level of knowledge increases from poor knowledge through average knowledge to good knowledge, the level of asthma control moves from poorly controlled through partially controlled to well controlled asthma. So, patients with partially controlled asthma tend to have average knowledge.

Using the combination of ICS and LABA to control asthma was another factor which was found to be significantly associated with partially controlled asthma. Those asthmatics who used the combination of ICS and LABA to control asthma were 0.2 times less likely to have partially controlled asthma than those who didn't use. The reason for this association may be explained by the knowledge, attitude and drug adherence level of asthmatic patients. If the patients with well controlled asthma had good knowledge and attitude towards asthma they tend to be adhered to the combination of ICS and LABA, this might led to the significant association between those variables.

Strength of the Study

The strength of this study includes using different types of hospitals like general hospitals and tertiary hospitals to recruit patients from. This made our study to include different types of asthmatic patients with different characteristics and level of asthma control. In addition, standardized ACT questionnaire tool was used to assess the level of asthma control which makes the study to be more valid.

Limitation of the Study

The limitation of this study includes the use of physician diagnosis to classify patients as having asthma but most studies done on asthma used physician diagnosed asthma. Since some of the data's were collected by recalling things that happened within the past 12 months and 4 weeks and based on self-report, hence might cause recall bias.

Conclusion

The magnitude of uncontrolled asthma is high in the study area. Poor knowledge about asthma, negative attitude towards asthma, non-adherence to medications and using the combination of ICS and LABA to control asthma were associated with poorly controlled asthma. Furthermore average knowledge about asthma and using the combination of ICS and LABA to control asthma were associated with partially controlled asthma. Health care providers, hospitals, health policymakers, and researchers should work on asthma control by different methods including providing routine health education, planning and incorporating health education programs and conducting further research to investigate the problem further and enhancing patients' knowledge and attitude towards asthma.

Abbreviations

AOR- Adjusted Odds Ratio

CI- Confidence Interval

COPD- Chronic Obstructive Pulmonary Disease

COR- Crude Odd Ratio

GINA- Global Initiative for Asthma

ICS- Inhaled Corticosteroid

IQR- Interquartile Range

LABA- Long Acting Beta2 Agonist

NCD- Non Communicable Disease

NHLBI- National Heart Lung and Blood Institution

SABA- Short Acting Beta2 Agonist;

Declarations

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Authors' contribution

HH, NA, YD, AT and DT fully contributed to conception, design, methodology, analysis, interpretation of the data, writing the manuscript and managing all aspects of the study.

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Availability of data and materials

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

Ethics approval and consent to participate

The ethical clearance was obtained from the Institutional Health Research Review Committee (IHRERC) of the college of Health and Medical Science of Haramaya University. Information regarding the study procedures, potential risks, benefits and their right to refuse and withdraw at any time during the study was described for the study participants; then after informed written voluntary consent was obtained. Participant's confidentiality was maintained by excluding names and identification in the questionnaires.

Consent for publication

Not applicable

Competing interest

The authors declare that they have no competing interests.

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Figures

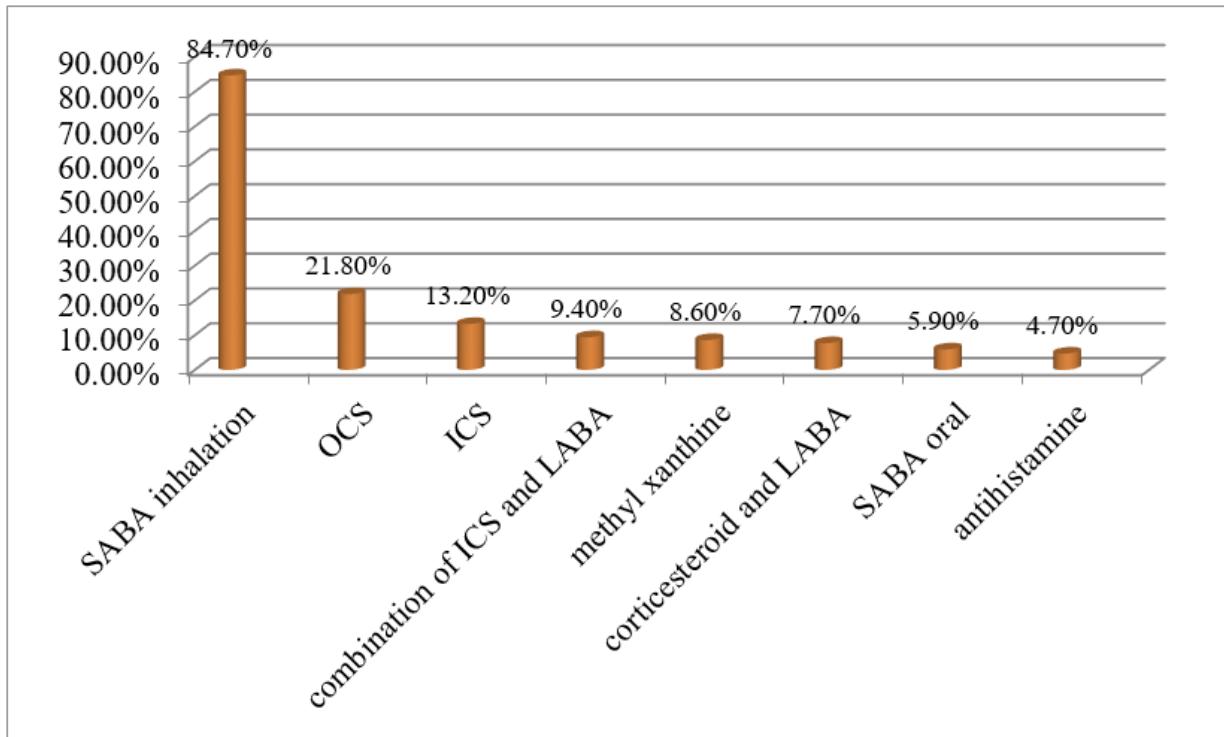


Figure 1

Type of medications used by adult asthmatic patients on follow-up.

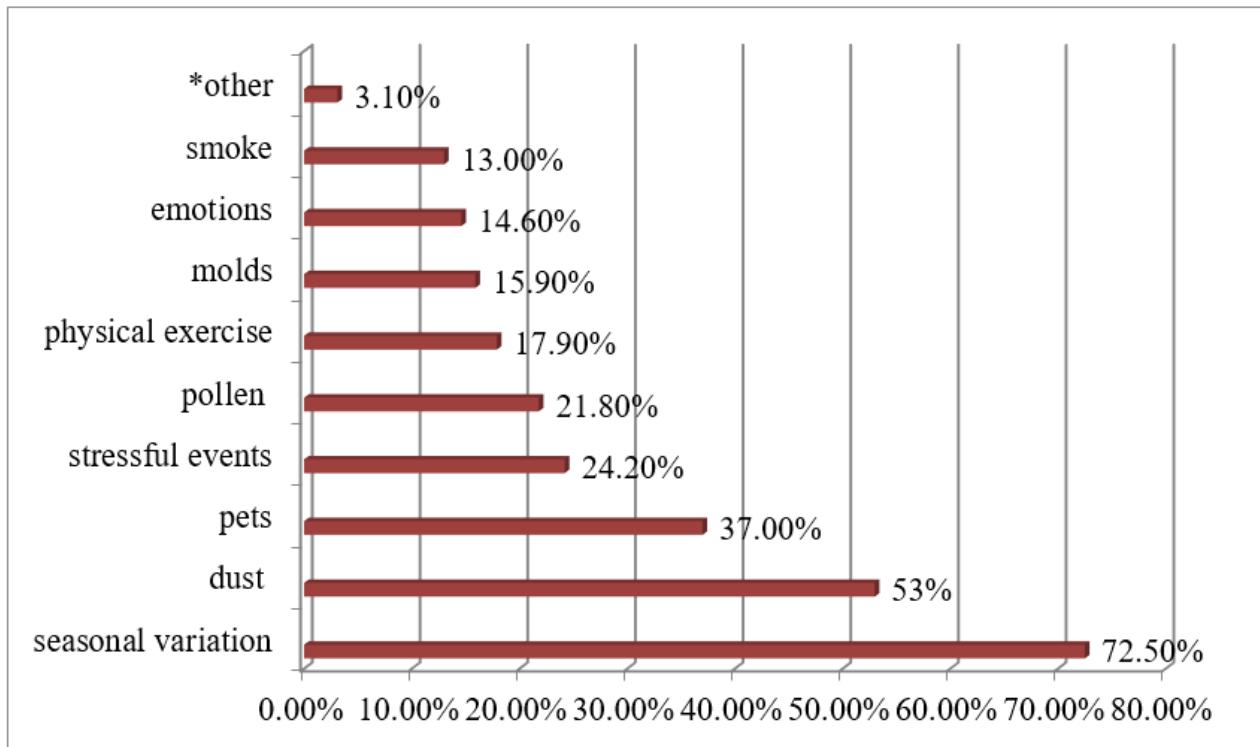


Figure 2

*Other: perfume, aspirin, certain food, work related trigger (working in industry), and beta-blockers Triggering factors for adult asthmatic patients on follow-up.