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Research Article

Prevalence of Asthma and Its Association with Daily Habits in Jimma Town, Ethiopia

Abstract

Background: Many studies showed a low risk of asthma in sub-Saharan countries. However, due to indoor pollutions and environmental hazards, developing countries are always the prior victims of all types of respiratory illnesses including asthma. Jimma, south-western Ethiopia, is known by its wide range of vegetations including khat and coffee. Together with high plantation of those cash crops, there is widespread consumption of them by the locals.

Objective: To investigate prevalence and severity of bronchial asthma and its association with daily habits in Jimma town, Ethiopia

Methods and Materials: A community-based cross-sectional study was conducted in Jimma town on 1300 participants. Systematic random sampling technique was employed to select households. Semi-structured questionnaire and pulmonary function tests were used to collect data. SPSS was used to execute simple descriptive, independent t-tests and chi-square.

Results: Chewer participants had higher pulmonary function tests. Khat might indeed have bronchodilating effect when chewed before the measurement. Except for FVC; the other pulmonary function test parameters were higher among coffee consumers. The bronchodilating effect of caffeine may increase pulmonary function parameters. In the current study, the prevalence of asthma in Jimma town was 4.9%. A significantly large proportion of asthmatic smokers had asthmatic symptoms in once or more than once per week [χ2-20.208, p-0.00].

Conclusion and clinical Relevance: Bronchial asthma is public health burdon in Jimma town. FVC, FEV and PEFR functional parameters were lower in asthmatic patients when compared to nonasthmatic participants that may indicates the severity of asthma in the study area. Lung functions, onset, severity & asthma managements could be affected by the daily consumption of khat, coffee, and cigarette.

Introduction

Respiratory diseases are always the commonest public health burden across the globe [1]. Among them asthma is the widely spread that potentially attack people of all age and race [2]. Asthma is a disease of both sexes [3]. To date more than 200 million people worldwide are experiencing asthmatic attack resulting in more than 0.18 million deaths per year [1]. It becomes an increased concern of many societies especially developed countries. However the rate of the disease burden is always evaluated in developed countries, the greatest public health challenge is on developing countries due to poor disease management and monitoring & evaluation of the disease progress [4,5]. Many studies showed a low risk of asthma in sub Saharan countries. A worldwide prevalence study on asthma and allergies in childhood indicates that prevalence rate in Ethiopia was 9.1%, Kenya 15.8%, Nigeria 13.0%, South Africa 20.3%,Algeria 8.7%, Morocco 10.4%, and Tunisia 11.9%. The highest prevalence was in Costa Rica 37.6 while the lowest in the list was Albania 3.4% next to Indonesia 2.8% [6]. The potential factors for the onset and exacerbation of asthma was investigated several times by different researchers. Genetic predisposition or environmental factors are indicated for asthma prognosis. indoor and outdoor air pollution, personal and environmental hygiene, occupational hazards are mentioned as especially the biggest issues in developing countries to cause disease [7].Stress, malnutrition, drug use for comorbid diseases are also risk factors indicated for the onset of asthma in a different times of individuals life [8].Apart from the aforementioned risk factors some of the daily habits could influence asthma recurrence, exacerbation or have potential preventive properties. Khat, for example, has been traditionally used as a remedy for common cold [9] and asthma [10].

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Beside to Khat, long-term consumption of coffee could have effect in reducing asthmatic symptoms and episodic attacks [11,12]. On the other hand, regular smoking could be the reason for the late onset of asthma and its exacerbation [13,14].

This study deals with the prevalence of asthma and the effect of daily habits that are associated to asthma among adults who are permanent residents of Jimma town. In this study daily habits are defined as khat chewing, consumption of coffee and smoking cigarette. The study area, Jimma town, is known by its khat cultivation and consumption apart from its being the origin and high plantation of coffee [15, 16]. Chewing khat is mostly accompanied by coffee ceremony and smoking cigarette by the local community [17]. To the best of the author's knowledge this study is one of its kinds in the area to provide important information about magnitude and severity of adult bronchial asthma in Jimma town together with its association with the daily habits that are defined above.

Methods and Material

Study setting

This study was conducted in Jimma town. Jimma is located 354 km south west of Addis Ababa. The town has an average altitude of 1760 mt above sea level with the minimum and maximum temperature of 11ºC and 27 ºC respectively. According to the national census done in 2007, the total population of Jimma town was estimated to be 120,569. The population composed of Muslims and Christians with diversified ethnic groups. Muslims and Oromos are predominant in number. Jimma is one of the cash crop producing areas in Ethiopia where coffee and khat are grown abundantly as the major source of income.

Study design-Community based cross sectional study was conducted in Jimma town.

Study population-All adults who were permanent residents of Jimma town.

Sample size and sampling technique

Sampling size

$$N = \frac{Z^2(p(1-p)}{D^2} = 600$$

- Assumptions; P=50% to get maximum sample size
- Z=95% level of significance
- D=4% Margin of error

The above calculated sample size was multiplied by two since multistage sampling technique was undertaken. Therefore the final sample size was1200.Adding 10 % the non-response rate the total study population was 1320 individuals.

Sampling technique

A house to house survey was done in all 13 Kebeles of Jimma Town. From each Kebele, 102 households were selected using systematic random sampling technique and from each house, one adult member of the family was selected by a lottery method to respond to the questionnaire and undergo spirometry until the required sample size was attained.

Study variables

Independent variables

- Socio demographic characteristics of subjects
- Chewing status
- Drinking status (coffee)
- Smoking status

Dependent variables

- FVC,FEV_1 and PEFR measure
- Control and severity indicator parameters (clinical parameters)

✓ Night time awakening

✓ Frequency of symptom

✓ Use of short acting β_2 agonist

Data collection instrument

Questionnaire: data was collected using semi- structured questionnaire consisting of socio demographic characteristics of respondents, asthmatic, smoking & coffee consumption status and assessment on asthma management.

Pulmonary function test: Pulmonary function test was performed using datospir digital spirometer. Measurements or calculations was made on forced vital capacity (FVC), percent predicted forced expiratory volume in one second (FEV_1) and peak expiratory flow rate (PEFR).

Data processing and analysis: SPSS version 16 computer program executing different statistical analysis. The principal analyses executed were simple descriptive statistics. chi square and independent sample t tests. A P value < 0.05 was considered as statistically significant. The result will be summarized and presented using tables.

Ethical consideration: The consent of study participants was assured before asking and taking any tests. And the information obtained from the participant was kept confidential and this was verified to participants verbally and in a written sheet. Special care was given to elders and pregnant.

Results

1300 subjects were included in this study. Sociodemographic distribution of the subjects was illustrated under table 1. A large number of females were found to be nonchewers and nonsmokers. However, a significant number of females were found to consume coffee compared to the other parameters under study. A large number of Muslims witnessed their

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Table 1: Socio-demographic variables vs daily habits.

		Chewing Status		Smoking Status		Coffee Drinking Status	
		Yes N (%)	No N (%)	Yes N (%)	No N (%)	Yes N (%)	No N (%)
Sex	Male	242(62.5)	385(42.2)	118(51.5)	509(47.6)	567(48.3)	60(47.2)
	Female	145(37.4)	528(57.8)	111(48.5)	562(52.4)	606(51.7)	67(52.8)
Religion	Orthodox	71(18.3)	316(34.6)	64(27.9)	324(30.0)	336(28.6)	51(40.1)
	Protestant	58(15)	264(28.9)	55(24.0)	267(24.9)	292(24.8)	30(23.6)
	Muslim	247(63.8)	285(31.2)	98(42.8)	434(40.6)	498(42.5)	34(26.8)
	Other	11(2.8)	48(5.3)	12(5.2)	47(4.4)	47(4)	12(9.4)
Marital Status	Married	211(54.5)	531(58.2)	110(48.)	632(59)	699(59.6)	43(33.9)
	Divorced	10(2.6)	15(1.6)	13(5.7)	2(1.1)	25 (2.1)	0
	Widowed	16(4.1)	19(2.1)	15(6.6)	20(1.9)	28(2.4)	7(5.5)
	Single	150(38.8)	348(38.1)	91(39.7)	407(38.0)	421(35.9)	77(60.6)
Ethnicity	Amhara	56(14.5)	222(24.3)	39 (17.0)	239(22.2)	258(22)	20(15.7)
	Oromo	255(66)	466(51)	108(47.1)	613(57.3)	651(55.5)	70(55.1)
	Tigray	17(4.4)	18(2)	17(7.4)	18(1.7)	29(2.5)	6(4.7)
	Gurage	40(10.3)	104(11.4)	35(15.3)	109(10.2)	129(11)	15(11.8)
	Kefa	12(3.1)	46(5.0)	16(7)	42(3.9)	51(4.3)	7(5.5)
	Other	7(1.8)	57(6.2)	14(6.1)	50(4.7)	55(4.7)	9(7.1)
Educational Status	Illiterate	39(10.0)	133(14.6)	28(12.2)	44(13.5)	165(14.0)	7(5.5)
	primary School	49(12.7)	155(17)	41(17.9)	163(15.1)	181(15.4)	23(18.1)
	Secondary School	43(11.1)	137(15.0)	28(12.2)	152(14.2)	154(13.1)	26(20.5)
	College/University	256(66.5)	488(53.5)	132(57.6)	612(57.2)	673 (57.4)	71(55.9)
Employment Status	House wife	97(25.1)	311(34.1)	84(36.7)	324(30.2)	1173(32.1)	127(25.2)
	Student	156(40.3)	348(38.1)	74(32.3)	430(40.2)	436(37.2)	68(53.5)
	Office worker	109(28.2)	202(22.1)	60(26.2)	251(23.5)	289(24.6)	22(17.3)
	Field Worker	20(5.2)	34(3.7)	7(3.1)	47(4.4)	53(4.5)	1(0.8)
	Factory Worker	5(1.3)	18(2)	4(1.7)	19(1.8)	19(1.6)	4 (3.1)

consumption of khat. Greater numbers of married individuals were found to use khat and smoke cigarette than the rest. In the same way, consumption of khat & coffee and smoking cigarette were practiced by a larger proportion of Oromo ethnic participants than the others. The aforesaid daily habits were exercised largely among university/college graduates. Significantly large numbers of housewives were found to consume coffee while students and a proportional number of office workers were found to consume khat, and cigarette (Table 1).

Chewer participants had higher pulmonary function tests. Though it was not statistically significant, only FVC was found higher among nonsmokers. Mean predicted percent FEV and PEFR were found to be the same as nonsmokers or high among smokers. Except for FVC, the other pulmonary function test parameters were higher among participants who had the habit of consuming coffee (Table 2).

In the current study, the prevalence of asthma was 4.9 %. Of the total 64 asthmatic participants 42 (34.4%) were females. Relatively larger numbers of asthmatic patients were housewives. The significant number of asthmatic patients had asthma family history. The majority of asthmatics had habits of chewing khat, smoking cigarette, consumption of alcohol (Table 3).

Table 2: Association between pulmonary function parameters and daily habits

	Sex		Khat Chewing status Mean%		Smoking status Mean%		Coffee consumption status Mean%	
	Male	Female	Yes	No	Yes	No	Yes	No
FVC	69.5	64.4	69.7	65.7	63.2	67.6	66.8	67.9
t, *p*	5.4, 0.008*		3.896, 0.008*		3.488, 0.655		-0.707, 0.553	
FEV	75.5	70.2	76.8	71.0	72.8	72.7	73.0	70.6
t, *p*	5.6, 0.00*		7.256, 0.000*		0.105, 0.000*		-1.453, 0.000*	
PEFR	75.0	67.4	73.3	70.1	81.0	69.0	71.9	63.3
t, *p*	5.6, 7.20		2.145, 0.474		6.801, 0.000*		-3.768, 0.003*	

*-statistically significant

Among total asthmatic respondents, some of them had hardly recalled the exact frequency of asthmatic attack per a given period of time. As a result, the number given under each category varies. Among female asthmatic participants, 28.0 (63.6%) of them had more than once per week asthmatic attacks while 30 of them had greater than twice per day usage of short-acting B agonist.

Of the total chewer participants 37.0 (84.1%) of chewer asthmatic respondents experienced frequent asthmatic symptom for more than once per week and among nonchewer asthmatic respondents, 13 (56.5%) of them had

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experienced night time awakening due to asthmatic attack less than twice per month. Significantly large proportion of asthmatic smokers had asthmatic symptoms in more than once or more than once per week. In the same way they also found to be exercising greater than twice per day usage of short acting B agonist. Larger proportion of coffee consuming asthmatic participants experienced asthmatic symptom in once or more than once per week, night time awakening for more than once per week and used short acting B2 agonist for more than twice per day (Table 4).

Below is a table indicating personal best percent predicted pulmonary function test. Accordingly, male participants had higher pulmonary function tests over female participants. FVC, FEV and PEFR functional parameters were lower in asthmatic patients when compared to nonasthmatic participants (Table 5).

Mean percent predicted pulmonary function parameters were calculated among asthmatic participants. The result showed that asthmatic chewers had better FEV and PEFR .Asthmatic nonsmokers had reduced pulmonary function tests (Table 6).

Table 3: Socio-demographic and daily habits vs asthmatic status.

		Asthmatic Status		p-value
		No (%)	Yes (%)	
Sex	Male	22(34.4)	605(48.9)	0.02*
	Female	42(65.6)	631(51.1)	
Employment Status	Housewife	27(42.2)	381(30.8)	0.01*
	Student	12(18.8)	492(39.8)	
	Officer	19(29.7)	292(23.6)	
	Field worker	3(4.7)	51(4.1)	
	Factory worker	3(4.7)	20(1.6)	
Family history of asthma	Yes	59(92.2)	28(2.3)	0.00*
	No	5(7.8)	1198(97.7)	
Chewing Status	Yes	42(65.6)	345(27.9)	0.00*
	No	22(34.4)	891(72.1)	
Coffee drinking status	Yes	42(65.6)	345(27.9)	0.00*
	No	22(34.4)	891(72.1)	

*-statistically significant

Discussion

In Ethiopia, it is noticeable that the number of males who chew khat and smoke cigarette outnumbers females. However, coffee drinking is practiced more by females. As in this study, such proportionality difference was also shown by previous studies [17, 18]. Consuming khat and smoking cigarette are prohibited by religion rules and are cultural taboos for women while they are not strictly forbidden for males [18]. A large proportion of Muslim religion followers found to chew khat and smoke cigarette than other region followers. This is in line with previous findings explaining Muslims use Khat during prayer [17]. The number of the married participant who practiced chewing khat, smoking cigarette and consumption of coffee was high. This finding was in contradiction with the former study where married khat chewer participants were smaller than their counterparts. However, in the study, the number of the married participant was significantly larger [17]. Practically, in married Ethiopian houses, there is a tradition to make a more regular coffee ceremony than single households. Chewing khat, consumption of coffee and smoking cigarettes in Oromo ethnic participants were more common than the others. This result was also in line with the previous studies [18]. The study area is more populated by Oromo society and the number of participants from with Oromo ethnic background was outnumbered by the other ethnicities. The number of college/university graduates who practiced khat chewing consumption of khat and smoking cigarette was higher than the rest of their counter partners. Kaht is perceived to increase concentration by the community. As a result, individuals used it while reading and study regular lessons [19]. A significant number of housewives consume coffee than the other group of participants. In Ethiopian tradition, women thaw coffee parties and ceremonies at least once a day especially when they are not working wives.

Percent predicted mean FVC and FEV of male respondents were higher than females. The finding was similar to previously

Table 4: Association between clinical parameters sex and daily habits.

		Sex			Khat Chewing status			Smoking status			Coffee Drinking status		
		Male N %)	FemaleN (%)	χ^2p	Yes N (%)	No N (%)	χ^2p	Yes N %)	No N %)	χ^2p	Yes N %)	No N %)	χ^2p
symptoms experienced per week	less than once per week	6.0 (35.3)	11.0 (64.7)	0.01, 0.94	5.0 (23.5)	13.0 (76.5)	20.22, 0.00*	4.0 (23.5)	13.0 (76.5)	20.21, 0.00*	16.0 (88.9)	2.0 (11.1)	0.32, 0.573
	more than once per week	16.0 (36.4)	28.0 (63.6)		37.0 (84.1)	7.0 (15.9)		37.0 (84.1)	7.0 (15.9)		41.0 (93.2)	3.0 (6.8)	
Frequency of night time awake	less than twice per month	10.0 (43.5)	13.0 (56.5)	0.02, 312	10.0 (43.5)	13.0 (56.5)	10.00, 0.00*	8.0 (34.8)	15.0 (65.2)	8.18, 0.00*	19.0 (82.6)	4.0 (17.4)	4.29, 0.038*
	More than once per week	12.0 (30.8)	27.0 (69.2)		32.0 (82.1)	7.0 (17.9)		34.0 (87.2)	5.0 (12.8)		38.0 (97.4)	1.0 (2.6)	
Frequency of Short acting B agonist usage	less than twice 2	7 (35.3)	11.0 (64.7)	1.86, 0.40	7.0 (35.3)	11.0 (64.7)	11.47,00.003*	7.0 (35.3)	11.0 (64.7)	1.472, 0.003*	14.0 (77.8)	4.0 (22.2)	6.857,0.022*
	More than twice per	15.0 (34.1)	30.0 (65.9)		35.0 (79.5)	9.0 (20.5)		35.0 (79.5)	9.0 (20.5)		43.0 (97.7)	1.0 (2.3)	

*-statistically significant

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Table 5: Mean Percent predicted pulmonary function parameters in asthmatic and non asthmatic participants.

	Sex	Mean%	t, p	Asthmatic Status	Mean%	t, p
FVC	Male	69.5	5.4, .00*	Yes	49.4	8.5, 0.0*
	Female	64.4		No	67.8	
FEV	Male	75.5	5.6, .00*	yes	67.5	-2.5, 0.2
	Female	70.2		no	73.0	
PEFR	Male	75.0	5.6, .20	yes	66.7	-1.4, 0.7
	Female	67.4		no	71.3	

*-statistically significant

Table 6: Pulmonary function test among asthmatic participants.

	FVC (Mean %)	FEV (Mean %)	PEFR (Mean %)
Asthmatic Chewer	45.9	70.2	71.1
Asthmatic non chewer	56	62.4	62.4
Asthmatic smoker	69.1	67.5	75.4
Asthmatic non smoker	64.1	64.1	50.2
Asthmatic coffee consumer	46.9	67.5	66.7
Asthmatic coffee non-consumer	79	90	66.6

published articles as mean personal percent predicted pulmonary functions tests were higher than females [20-23]. Pulmonary function test parameters, FVC, FEV, and PEFR, among chewer, were found to be higher than nonchewers. The results indicated as it is similar to the previous fining which indicated lower mean predicted pulmonary function parameters percentages [10]. Khat might indeed have bronchodilating effect when chewed before the measurement considering the half-life of its active ingredients to cause an effect. Together with that, previous research explained bronchial muscle tone could be modulated by the effect of the active ingredient in khat [24,25]. Mean personal percent predicted FVC was higher among nonsmokers. However, the finding was not statistically significant which could be as a result of a disproportional number of participants between the two categories. The mean percent predicted of PEFR and FEV were higher among smokers than nonsmokers. This finding contradicts the previous study where pulmonary function test parameters were lower among smoker participants [26,27]. Percent predicted mean of FEV and PEFR among coffee consumer participants were significantly higher than their counterparts. These findings are in line with the previous research that showed the potential bronchodilating effect of caffeine in coffee resulting in an increased pulmonary function test parameters [12].

In this study, the prevalence of asthma was 4.9%. Even though there is no recent study on the prevalence of asthma in Ethiopia and particularly in Jimma, Previous studies showed closer prevalence rate as this study. To date, asthma is widely spread than before and it is expected to be higher than the previous prevalence rate which was around 5% [28,29]. Females were found to be affected by asthma than males. This is particularly true that after puberty women are more likely to be attacked by asthma than men. The result is in line with previously published works [30-32]. A number of unpublished and published articles mentioned the protective value of testosterone over a fluctuating concentration of estrogen in females in reducing the risk of onset of asthma and its symptoms [33]. Among asthmatic patients, the larger proportions were housewives. As a result, it is possible to predict Indoor pollution is associated with asthmatic attacks as it is highly prevalent in developing countries here [34]. The family history of asthmatic history and current asthmatic status were found to be strongly associated. To date, there are a number of confirmed genes associated with susceptibility to allergens at different ages [35-37]. Thus predisposition can be linked through families [38]. Among asthmatic respondents majority of them confronted they chew khat. There exists a belief that khat reduces asthmatic symptoms [39]. It could also have somehow a relief effect when chewed during or before the attack [10]. The majority of chewer also consumes coffee. Coffee has a therapeutic effect by bronchodilating airways [12], it could also have a beneficial effect by reducing symptoms of asthma [11] these and personal preference to drink could be the reasons for consuming coffee by asthmatic patients.

Though statistically not significant, females had frequent asthmatic symptoms, nighttime attack and frequent use of short-acting B agonist. Among the many reasons, the fluctuation of the hormonal level at the different monthly cycle of a woman has a different response to short-acting B agonists. Accordingly, the level of IgE varies influencing the severity of asthmatic symptoms [31]. The number of chewer asthmatic respondents experiencing mildly severe asthma is more than nonchewer which was contradictory from the previous finding [10]. Apart from that pulonary function tests among chewer asthmatic patients were slightly higher than nonchewer except for FVC. However, in the current study, the numbers of chewer asthmatic patients were almost twice as much as nonchewers. By the same token, asthmatic smokers had severe asthmatic symptoms than their counterpart. A number of studies revealed smoking exacerbates asthmatic symptoms and potentially decrease the response of drugs that are given for the treatment of asthma [40,41]. Moreover, smoking may impair the function of airways significantly [26,42]. However, all pulmonary function tests were higher among asthmatic smokers. In contrast, what has been published as coffee has a protective effect by decreasing asthmatic symptom, it is found that coffee consuming asthmatic patients had severe asthmatic symptoms. Parallel to that, all of the pulmonary function test parameters were higher among coffee consuming asthmatic patients. However, studies showed the sympathomimetic effect of caffeine in coffee has preventive properties against asthmatic systems [11,43]. Despite that, the numbers of coffee consuming asthmatic respondents were high. This could be because coffee consuming asthmatic respondents may trust that drinking coffee could give them relief.

Except for FVC, the other pulmonary function tests were significantly higher among nonasthmatic participants. This is in line with the fact that bronchoconstriction due to excessive inflammation results in difficulty of breath especially expiration which is revealed by a decrease in pulomary function test parameters [44-46]. Women often experience more severe asthma symptom with a frequent episode of attack than men [31]. Even though the exact mechanism is not yet clear, as

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described above the protective value of testosterone together with the effect of estrogen and progesterone as agents that potentially induce inflammation reactions favors men to have less severe and recurrent asthmatic symptoms after puberty [31,47].

Conclusion

In this study the prevalence of asthma is close to the previous studies. Apart from that, high plantation of coffee and khat could be the reason for the high consumption of those cash crops by the local communities. Accordingly, the onset, severity and asthma management could be affected by the daily consumption of khat, coffee and cigarette. In the same way, lung function might be directly affected by the aforementioned factors.

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