

Assessment of the Factors that Contribute for the Cause of Asthma Disease in Ambo Town

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Abstract

Asthma is a chronic disease of airways; that is widely characterized by an increased responsiveness to a large variety of stimuli, airway inflammation and obstruction. It is the most common respiratory disorder disease in developed and developing countries. The study was aimed to assess the factors that contribute for the cause of asthma disease in Ambo town and cross-sectional survey was conducted to gather information from March to April 2022. 30 respondents were selected using purposive sampling technique for interview and data collections. According to the study the more affected age group were 22-32(53%) and the major risk factor for the disease was air pollution (53%). The pollution is due to domestic wastes that are discharged to the environment. Therefore, the government and extension health workers should aware the community about the risk factors of asthma and proper waste disposal mechanisms.

Introduction

Background of the Study

Asthma is a chronic inflammatory disease of air ways. The chronic inflammation is associated with air way hyper-pensiveness or an exaggerated air way narrowing response to, such as allergens and exercise, that lead to recurrent symptom such as wheezing, dyspnea (shortness of breath), chest tightness and coughing. Symptoms episodes are generally associated with a wide spread, but variable, air flow obstruction within lungs that is usually reversible either spontaneously or with appropriated asthma treatment. It is generally accepted that there are both allergic and non-allergic forms of asthma disease [16].

The prevalence of asthma varies widely around the world, probably because of gene-by-environment interaction. Parental risk factors for asthma may include maternal smoking, diet and nutrition, stress, use of antibiotics, and delivery by cesarean section. Childhood risk factor for asthma may include allergic sensitization, environmental tobacco smoking, exposure to animals, breastfeeding decreased lung function in infancy, family size and structure, socio-economic status, antibiotics and functions, sex and gender. Occupational exposure constitutes a common risk factors adult asthma [38].

Several factors have been proposed to account of the cause of asthma disease and

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increase the prevalence (Jorge and Mazza, 2011). It is agreed that genetic changes in population would be too slow to account. Environmental factors have been a key role in the genesis of asthma disease. Among the environmental determinants, exposure to allergens such as house dust mite, grass pollen, cockroach and animal dander [4].

Moreover, in developing countries like Ethiopia, the effect of this disease is more serious [45]. According to the latest data published in 2017, asthma deaths in Ethiopia reached 6,269 or 0.99% of total deaths. The age-adjusted death rate is 11.98 per 100,000 of population, ranking Ethiopia in the world [43]. Particularly, southwestern Ethiopia is a place where several peoples are affected by asthma. Therefore, this study aimed to assess the risk factors that contribute to the cause of this disease. No research can be found that focuses on the factors that contribute to asthma disease in Ambo town.

Statement of the Problem

Asthma is a worldwide problem affecting more than 230 million people around the globe. It is the most common respiratory disease in developing and developed countries. Furthermore, asthma disease can affect all age groups of people in Ethiopia (Yemaneberhan *et al.*, 2011). It is also one of the diseases observed in Ambo Town. Several factors have been proposed to account for the risk factor impact and difficulty, even environmental factors play a key role. The main issue to do this study is the higher prevalence and the lack of awareness of the risk factor impact and difficulty in this study area. Therefore, this study aimed to assess the risk factors' impact and difficulty for asthma in Ambo town. So, this study was attempted to answer the following questions:

What are the factors that contribute to the cause of asthma disease?

What is the effect of the asthma disease?

How are the symptoms of asthma disease identified from other respiratory diseases?

What is the main factor for the prevalence of asthma disease?

How could the environment be one of the major factors for the cause of asthma diseases?

Objective

General objective

To assess the factors that can contribute to the cause of asthma disease in Ambo town.

Specific Objectives

- To identify the risk factors of asthma disease in Ambo town, Oromia, Ethiopia.
- To determine the impacts of asthma on the asthma patients in Ambo town.
- To identify the difficulties of asthma patients in Ambo town, Oromia, Ethiopia.

Significance of the Study

Asthma is a worldwide problem affecting more than 230 million people around the globe. The findings of this study may provide certain information about the risk factors that aggravate asthma. The findings of this study also give awareness about the risk factors' impact and difficulty and effect of asthma, and the study may serve as reference data for those who want to conduct further studies on the area's risk factors of asthma.

Limitation of study

The research was conducted on some asthma patients of Ambo town. A questionnaire was distributed to 60

respondents living in ambo town of them only 30 respondents are found to have asthma. The data was collected from 17 respondents from school and 13 respondents from hospital who are patients. Since the study design is a cross sectional descriptive which studies are carried out at one time point or a short period which may recall bias

Literature Review

Epidemiology of Asthma

Asthma is a chronic disease characterized by recurrent attack of breathlessness and wheezing. According to WHO estimates 235 million people suffer from asthma. It occurs in all countries regardless of development. Over 80% of asthma diseases occur in low and lower middle income countries.

Asthma remain the most common chronic respiratory disease [37] affecting approximately 10% of the population. Although, asthma is often believed to be disorder localized to the lungs, current evidence indicate that it may represent a component of symptoms air way disease involving the entire respiratory tract, and this is supported by the fact that asthma frequently allergic rhinitis. Poor asthma control contributes to unnecessary morbidity, limitation to daily activities and impairment in overall quality of life [4].The chronic inflammation associated with air way hyper responsiveness (an exaggerated air narrowing response to triggers such as allergens and exercise), dyspnea (shortness of the breath), chest tightness and coughing[4].

As of 2011, 235-330million people world are affected by asthma, and approximately 250,000-345,000people die per year from the disease [16] Lozano, 2012. Rates vary between 1and 18% [16].It is more common in developed than developing country. One thus sees lower rates in Asia, Eastern Europe and Africa. Within developed countries it is more common in those who are economically disadvantaged while in contrast in developing countries it is more common in the affluent[16]. Low and middle income countries make up more than 80% of the mortality [12].

Risk factors for asthma

Genetic factors

Family history is a risk factor for asthma, with many different genes being implicated. If one identical twin is affected, the probability of the other having the disease is approximately 25% (Elward *et al.*, 2010).

Genome-wide linkage studies and case -control studies have identified 18 genomic regions and more than 100 genes associated with allergy and asthma in 11 different population. In particular, there are consistently replicated regions on the long arms of chromosomes 2, 5, 6, 12 and 13. Association studies of unrelated individuals have also identified more than 100 genes associated with allergy and asthma, 79 of which have been replicated in at least one further study [35]

Prenatal risk factors

Risk factors in the prenatal period are multi-factorial. Assessment is complicated by the variety of wheezing conditions that may occur in infancy childhood, only some of which evolve to classical asthma.

Prenatal tobacco smoke

Prenatal maternal smoking has been consistently associated with early childhood wheezing [16, 5] and there is a dose- response relation between exposure and decreased airway caliber in early life Boulet *et-*

al., 2011[16].Prenatal maternal smoking is also associated with increased risks of food allergy (George and Renald, 2005), cytokine responses in the cord blood and concentration of nitric oxide in exhaled air in newborn [15].

Diet and nutrient

Observational studies examining prenatal nutrient level or dietary intervention and the subsequent development of atopic disease have focused on foods with anti-inflammatory properties (e.g. Omega -3 fatty acids) and anti-oxidants such as vitamin E and zinc. Higher intake of fish or fish oil during pregnancy is associated with lower risk of atopic disease (specifically eczema and atopic wheeze) up to age 6 years. Similarly, higher prenatal vitamin E and zinc levels have been associated with lower risk of development of wheeze up to 5 year [28, 42].

Stress

A number of animal model have suggested that prenatal maternal stress acts through regulations of offspring's hypothalamic-pituitary-adrenal axis to decrease cortisol levels, which may affect the development of an allergic phenotype. Although there is a correlation between caregiver stress early in the infant's life and higher level of immune -globulin E in the infant and early wheezing [45], no studies to data have shown an association with asthma [24].

Risk factors in childhood

Phenotypes

Although some 50% of preschool children have wheezing, only 10%-15% have diagnosis of "true" asthma by the time they reach school age (Sears *etal.*, 2003). Commonly described phenotypes in early infancy and children are transient wheezing, non-atopic wheezing, late-onset wheezing and persistent wheezing [32]. Only transient wheezing in early infancy has been well characterized, with decreased airflow rates on pulmonary function testing at birth [32], onset of wheezing within the first year and resolution by mid-childhood is with no lasting effects on pulmonary function.

Breastfeeding

The influence of breastfeeding on the risk of childhood atopy and asthma remains controversial. Some studies have shown protection [3, 36]where as others have reported higher rates of allergy and asthma among breastfed children. A meta-analysis and several individual studies showed that exclusive breastfeeding for at least 3 months was associated with lower rates of asthma between 2 and 5 years of age, a greatest effect occur among those with a parental history of atopy. One of the difficulties in interpreting the data lies in differentiating viral-associated wheeze in childhood from developments of atopic asthma. Breastfeeding was associated with a higher risk of atopic asthma in later childhood, with the greatest influence occurring among those with maternal history of atopy Sears *etal.*, 2002[45].

Lung function

Decrease airway caliber in infancy has been reported as risk factor for wheezing [32], perhaps related to prenatal and postnatal exposure to environmental tobacco smoke [29].The presence of airway decreased with caliber has been associated with increased bronchial responsiveness and increased symptoms of wheezing [32]. Several studies have suggested an association between reduced airway function in the first weeks of life and asthma in later life (Young *etal.*, 2000).

Children with wheezing (and diagnosed asthma) persisting to adulthood have a fixed decrement in lung function as early as age 7 or 9 years (Sears *et al.*, 2003). Recent studies of preschool children have documented abnormal lung function in children with persistent wheezing as young as age 3 years [31].

Family structure

Family size and the number and order of sibling may affect the risk of development of asthma. The hygiene hypothesis posits that exposure of an infant to a substantial number of infections and many types of bacteria stimulate the developing immune system toward non-asthmatic phenotypes [40]. This may be exemplified in the real world by large family size, whereby later-born children in large families would be expected to be at lower risks of asthma than first-born children, because of exposure to their older sibling's infection [40].

Socio-economic status

Children of parents with lower socio-economic status have greater morbidity from asthma [17], but finding with respect to the prevalence of asthma mixed [27], such result may depend both on how socio-economic status measured and on the specific outcome examined. Some studies have reported association of lower socio-economic status with greater airway obstruction and symptoms but not with a diagnosis of asthma [11]. Whether socio-economic status is as relevant to the incidence of allergy and asthma as it is the expression, severity and managements of this disease remains unclear. Parental stress has also been prospectively associated with wheezing in infancy [24], and family difficulties have been linked to asthma. Children whose caregivers report high level of stress and who have difficulties parenting are at greater risk for asthma [45].

Exposure to environmental tobacco smoke

Postnatal exposure to environmental tobacco smoke, especially from maternal smoking, has been consistently associated with respiratory symptoms of wheezing [41]. Exposure to environmental tobacco smoke also consistently worsens asthma symptoms and is a risk factor for severe asthma [11].

Exposure to animal

Although several studies have demonstrated a lower risk of developments of atopy and asthma with exposure to farm animals in early life, the findings of studies of the influence of exposure to domestic cats and dogs have been inconsistent [31]. In some studies, exposure to cats was associated with greater risk of allergic sensitization [1], whereas other studies showed lower risk. Exposure to dogs may be protective not only against the development of specific sensitization to dog allergen [1] but also against other sensitization (e.g., to house dust mite) and asthma.

Sex and gender

Sex affects the development of asthma in a time development manner. Until age 13- years, the incidence and prevalence of asthma is greater among boys than among girls (de Marco *et al.*, 2000). Greater incidence of asthma among adolescent and young adult female and a greater proportion of male with remission of asthma [8]. Before age 12, boys have more severe asthma than girls, with high rates of admission to hospital [21]. In contrast, adult female have more severe asthma than males, with more hospital admission. In childhood, airway hyper-responsiveness is more common and more severe among males; however, airway hyper-responsiveness increase in females during adolescence [10].

Occupational asthma

Asthma related to workplace exposure has been documented in many occupational settings. Commonly associated occupations and exposures include car painting (isocyanates), hair-dressing (various chemicals), domestic and commercial cleaning (cleaning solutions), healthcare professions (latex) and baking (flour dust), among many others [2].

Symptoms of asthma

Asthma is characterized by recurrent episode of wheezing, shortness of breath, chest tightness and coughing [16]. Symptoms by recurrent episodes of wheezing, shortness of breath, chest tightness and coughing are usually worse at night in the early morning or in response to exercise or cold air [5]. Some people with asthma rarely experience symptoms, usually in response to triggers, whereas others have marked and persistent symptoms [16].

Diagnosis of asthma

The diagnosis of asthma should be suspected in patient with recurrent cough, wheeze, chest tightness and shortness of the breath such variable symptoms occur upon exposure to allergen or irritant, that worsen at night and that respond to appropriate asthma therapy are strongly suggestive of asthma [22]. Alternative cause susceptible asthma symptoms should be excluded such as chronic obstructive pulmonary disease, bronchitis, chronic sinusitis gastro esophageal reflux disease, recurrent respiratory infection and heart disease.

A positive family history of asthma or other atopic disease and/or personal history of atopic disorder particularly allergic rhinitis, can also be helpful in identifying patient with asthma [14]. Exposure to agents encountered in the work environment can also cause asthma. The diagnosis of asthma in young children is often more difficult since episodic wheezing and cough are common and spirometry is a reliable in patients under 6 years of age.

A useful method of confirming a diagnosis in young children is a trial treatment with short acting bronchodilators [23]. Spirometry is the preferred objective measure to assess for the reversible air way obstruction [45], (i.e. rapid improvement in lung function after enation of rapid acting bronchodilators and confirm a diagnosis of asthma). During spirometer the patient is instructed to take the deepest breath possible and then to exhale as hard as fully as possible into the mouth piece the spirometry.

Control and treatment

Asthma is a long term disease that has no cure. The asthma treatment is to control the disease. It is controlled by prevent chronic and troublesome symptoms, such as coughing and shortness of breath, reduce your need for quick-relief medicine, help you maintain good lung function, let you maintain your normal activity level and sleep through the night and prevent asthma attacks that could result in an emergency room visit of hospital [39].

Avoidance of relevant allergens or irritants is an important components of asthma management [33] patients allergic to house dust mite should be instructed to use allergen impermeable covers for bedding and keep the relative humidity in the home below 50% (to inhibit mite growth). According to the recent estimates, asthma affects 300million people [39]. Although people of all age suffer from the disease, it most often starts childhood, especially children who have low birth weight, who are exposed to tobacco smoke and are raised in a low income environment.

Asthma in Ethiopia

According to the latest data published in 2017 asthma death in Ethiopia reached in 6.269 or 0.99% of total death. The age adjusted death rate is 11.98 per 100,000 of population ranks Ethiopia in the world [43].

Materials And Methods

Description of Study Area

Ambo town is the ancient of historian place which is situated in central administrative zone of Oromia regional state in the West Shewa tip of the Ethiopian plateau at 8°59'N latitude and 37°51' E longitude of 2101m above sea level. Geographically Ambo is located west shewa and zone of Oromia region west of Addis Ababa. Regarding to the climatic condition it is conducive for all activities which is "Weynadega" with mean annual temperature ranges between 9.3⁰c and 29.8⁰c whereas the mean annual rainfall range between 85.8ml and 428ml. The total population growth of Ambo town in 2007E.C was 48,171 of these population 23,537 were female and 24,634 were males. [7]

Ambo is known for its mineral water, which is bottled outside of the town; it is reportedly the most popular brand in Ethiopia. Ambo is also the location of a research station of the Ethiopian institution of Agricultural research; initiated in 1977, this station hosts research in protecting major crops in Ethiopia.

Study Population and study design

A cross-sectional study design was used to assess on the factors that contribute for asthma disease in Ambo Town. This study was conducted from March to May in 2022. The research was conducted to Some Asthma patients of Ambo town. A questioner was distributed to 60 respondents living in ambo town of them only 30 respondents are found to have asthma. The data was collected from 17 respondents from school and 13 respondents from hospital who are patients.

Sample Size and Sampling Technique

Non-probability purposive sampling technique was used to determine the sample size. The sample size for this study was 60 respondents of them 30 respondents was asthma patients ≥11 years old and the other 30 was excluded patient who do not have asthma. The sample size was determined using Yamane's (1967) formula (considering a confidence level of 95% and accepting the margin error of 5%).

The total number of Ambo town population was 48171. Applying the formul (Yamane's, 1967), the sample size for the *Ambo town* was 220. But the researcher was selected 60 respondents due to delimitation of time and budget.

$$n = \frac{N}{1 + N(e^2)}$$

Where: n = sample size; N = Population; e = Margin error (5%).

Data Collection Method

Data collection method was employed to the people in Addis ketema primary school and Ambo referral hospital asthma patients. The data was collected by using semi-structured questionnaire. During data collection the cause of Asthma and the impact was asked. The questionnaire was originally prepared with English and interpreted to Amharic language. Data collection was carried out for about 15 days. Data Analysis

In order to evaluate the reliability of information during the interview, informants are contacted at least two times for the same ideas to check the validity of the information recorded. If the ideas of the informants contradicted with the original information, it will be rejected since it is considered as unreliable. The collected data was analyzed by using statistical tool Microsoft Excel and the result was presented in the form of tables and figures summarizing them into percentage and frequency.

Ethical Consideration

Gathering data was carried out with full consent of respondents. By respecting their beliefs and culture of the respondents was informed about the objectives of the study and their agreement was taken before to assure that the information providers was confidential and use only for the purpose of research.

Results

Table 1 indicate the Socio-demographic characteristics of the study respondents. Out of 30 study respondents 13 (43%) were male and 17 (57%) female, the age group from 22-32 years were the most affected 16 (53%) and least affected were age group from 33-43 years 3 (10%), based on the occupation students were the most affected 16 (53%) and least affected was driver 1 (3%).

Table 2 indicate the risk factor that contribute for Cause of asthma. According to respondents factors that contribute for the cause of asthma were air pollution 53%, cold air 17%, tobacco smoke 10%, dust mite 10%, other 10%.

Table 3 indicates symptoms of asthma experienced by the respondents. Out of 30 respondents 17 (53%) experienced cough or sneeze and 6 (20%) chest tightness. The least symptom experienced by the respondents was itching of nose and wheeze both are accounts 7%.

Table 1. Socio-demographic characteristics of the study respondents in Ambo town in 2022.

Characters	Sex		Total	Percent (%)	
	Male	Female			
Sex	13	17			
Age groups	11-21	3	4	7	23
	22-32	5	11	16	53
	33-43	2	1	3	10
	44-54	3	1	4	14
	Total	13	17	30	100
Occupation	Students	4	12	16	53
	Employer	5	2	7	24
	Merchants	2	1	3	10
	Driver	1	0	1	3
	Other	1	2	3	10
	Total	21	9	30	100
Family status	Single	4	10	14	30
	Married	9	7	21	70
Total	13	17	30	100	

Table 4. Depicts the mechanisms the respondent removed solid waste. 67% respondent removes solid waste by discarding away from environment. 23% of the respondents remove their solid waste through accumulating and using it as fertilizer, 10% of respondents remove solid by burning.

Table 5 indicates the period of difficulties of asthma by respondents. As shown in the table, the asthmatic patients feel difficulties during the rainy season (50%) and 17% feel difficulty during warm season. 23% feel difficulty in the night and 10% in the morning.

Discussion

Even though the most affected age group was (22-32) or 16 (67%) out of total respondents, the next most affected group was (11-21) which was seven (23%) out of total 30 respondents. Age group the least af-

Table 2. Risk factors that contribute for cause of asthma in Ambo town in 2022.

Factors	Sex		Total	Percent (%)
	Male	Female		
Air pollution	8	8	16	53
Tobacco smoke	1	2	3	10
Cold air	1	4	5	17
Dust mite	0	3	3	10
Other	3	0	3	10
Total	13	17	30	100

Table 3. The symptoms of asthma experienced by the respondents in Ambo town in 2022.

Symptoms	Frequency	Percent (%)
Cough or sneeze	17	53
Shortness of breath	5	17
Chest tightness	6	20
Wheeze	1	3
Itching of nose	1	3
Total	30	100

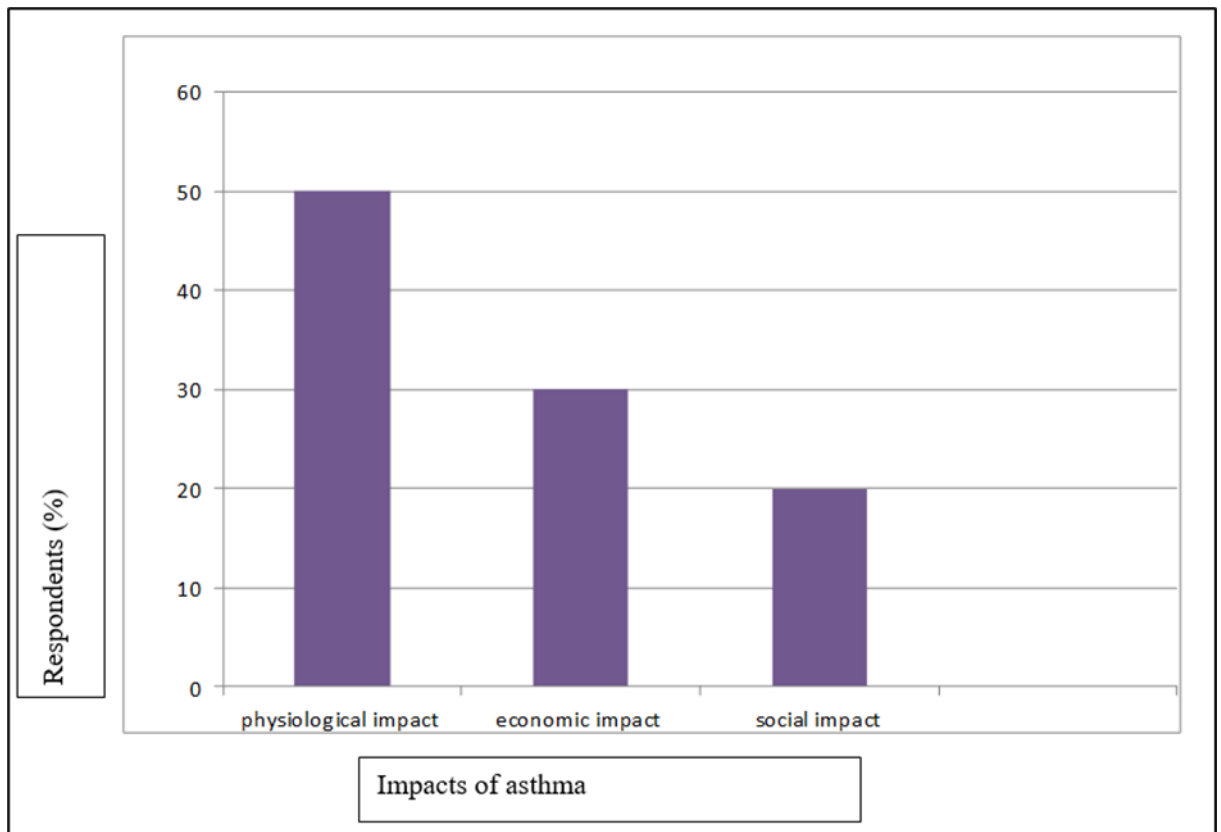
Table 4. Methods of removing solid waste in Ambo town in 2022.

Methods	Sex		Total	Percent (%)
	Male	Female		
Burning	2	1	3	10%
Discarding far away from environment	6	14	20	67%
Accumulating and using as fertilizer	5	2	7	23
Total	13	17	30	100

Table 5. Period of difficulties of asthma in Ambo town in 2022.

Period	Frequency	Percent (%)
Night	7	23
During rain	15	50
During warm	5	17
Morning	3	10
Total	30	100

Figure 1. The impacts of asthma on the respondents in Ambo town in 2022.



affected was (33-43) that was three (10%) but According to Peter, 2007 study estimation, asthma affects peoples of all age group even though it most often starts at childhood.

The most affected sex was female 17 (57%) and the least was male 13 (43%). In the case of the occupation of the respondents, 16 (53%) were student and the driver were the least affected (3%). comparatively opposite result was investigated by de Marco in 2000 and 2002, His result indicate Sex affects the development of asthma in a time development manner. Until age 13- years, the incidence and prevalence of asthma is greater among boys than among girls. Greater incidence of asthma among adolescent and young adult female and a greater proportion of male with remission of asthma.

When we see the risk factors for asthma (Table 2), air pollution accounts 16(53%), , dust mite 4 (13%), cold air 4 (13%), tobacco smoke 3 (10%) other 3 (10%) similarly [4]study indicate, Environmental pollution has been a key role in genesis of asthma.

The findings of this study has shown symptoms of asthma experienced by the respondents such as coughing and sneezing (57%), chest tightness (20%) shortness of breath (17%), and wheezing (3%) but some have itching nose (3%), similarly The finding of Global Initiative for Asthma, 2009 study indicate the symptoms of asthma are wheezing, shortness of breath, chest tightness and coughing. In addition to these four symptoms, this study the respondents experienced additionally itching of nose as a symptom.

The method of removing domestic solid waste was through burning, discarding away from the environment and accumulating and using as fertilizers later. As shown in table (4) 3 (10%) remove wastes by burning, discard away from the environment 20 (67%) and 7 (23%) accumulate and use as fertilizers, reversely the recent stud's indicate the burning of waste is the main cause for respiratory disorder, this indicate the misunderstanding most of the respondent and they are used improper waste removing way of method.

According to this study the asthmatic patients feel difficulty of pain during the night 11 (36%) during rain nine (30%), in morning 8(27%) and only 2(7%) feel difficult during warm time. comparatively the estimation of the British Guide line, at 2009 indicate less frequent difficulties of asthma usually worsen at night and in early morning or in response to exercise or cold air.

In this study physiological impact was shown to be the significant that 15 (50%) respondents were affected physiologically whereas 9(30%) and 6 (20%) were affected economically and socially, respectively (figure 2) similar with the study of Jorge and Mazza, 2011, they estimate that in their study “In addition to its health impact, asthma has other different impacts such as social, economic psychological impacts”. Finally, the inexistence of significant associations between some socio-demographic or socioeconomic factors and OHIP can be attributed to the participants' small number included in the study. Future studies on socioeconomic factors for quality of life including oral cavity are needed [19].

Conclusions And Recommendations

Conclusion

In general, this study concluded by using non-probability purposive sampling technique and semi structured data collection methods, the data was analyzed by using statistical tool like Microsoft Excel indicate that the risk factors, impact and difficulty of asthma in the study area were, air pollution, dust mite, cold air, tobacco smoke Beside this asthma has economic, psychological and social impacts on the patients and the period of difficulty are during night, rain, morning and warm time.

Recommendation

The society should properly remove the domestic wastes.

The health sector should work with the society towards prevention and control of asthma by giving awareness on better environmental protection, stopping smoking tobacco and reducing indoor and outdoor air pollution and occupational exposures.

It is suggested that further work be conducted, especially studies with a larger sample size, to analyze more broadly the situation of asthma in the Keble also in a wide range.

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