

## Knowledge and Awareness of Childhood Asthma in a Population in the United Arab Emirates

By Shaikha Ali Alkhatri\* & Mohammed Shamssain<sup>‡</sup>

*Asthma is one of the most common chronic respiratory disease affecting young children. Parents, care providers and teachers face all the issues of asthma management. Antibiotics became a marker of irrational and overuse of these drugs in many countries which can result from many factors, such as unregulated drug availability, relaxed health policies concerning regulations on antibiotics use, obtaining of antibiotics without prescription, patients' knowledge and attitudes towards antibiotic use, self-medication, physicians' knowledge and experiences and patient-prescriber interaction. This study aimed to assess the knowledge and awareness of childhood asthma, its symptoms, triggers, prevention, management, education and antibiotic use in adults in a population in the UAE. Seven hundred questionnaires were distributed among population in Ras Al-Khaima, UAE. The knowledge about childhood asthma was evaluated using a validated questionnaire consisted of 34 questions. Six hundred and sixty three completed questionnaires were returned making the response rate of 94.7%. The overall mean (+/-SD) of knowledge score was 22.43 (+/- 4.1). A score of 70% and above was judged to be good, 50%-69% fair and <50% was poor. In all, 45.6% of the respondents had good Knowledge towards childhood asthma, 46.5% had fair Knowledge while 8% had poor Knowledge. Regarding the participants knowledge about asthma triggers, our study showed that 57.3% knew the triggers for asthma, 78.4% were knowledgeable about the fact that infectious respiratory diseases increase the chances of asthma progression, 88.4% correctly answered that exposures to sudden changes in environment ( dust or cold weather ) affect the progression of asthma, 88.8% believed that direct or indirect exposure to cigarette smoke could lead to acute attacks of asthma and 85.4% recognized that exposure to perfumes , incense or paint fumes could lead to acute asthma attack. The childhood asthma knowledge among Ras Al-Khaima population is quiet good which may indicate that the important role that has been taken by Ministry of Health in educational programmes. The population age group above 30 years old had lack of asthma knowledge which is important to improve their awareness about childhood asthma because it enhances their understanding of this disease which will reflect on people who interact with children in order to recognize asthma. Future educational efforts should seek to provide parents, care providers and teachers with accurate information about asthma with particular concern for sport and asthma. This will have a significant impact on the management of this chronic respiratory disorder. Educational campaigns are necessary to enhance and measure general public awareness of asthma, its differential diagnosis against other respiratory infections, environmental triggers, risk factors as well as treatment options.*

**Keywords:** asthma, knowledge, awareness, education, communication

---

\*Clinical Pharmacist, Ibrahim Bin Hamad Obaidallah Hospital, Ras Al Khaima, UAE.

<sup>‡</sup>Professor, AUC School of Medicine, UK Track Medical Programme, UK.

## Introduction

Bronchial Asthma is characterized by reversible airway obstruction as a result of hyperactivity of the airways passage to allergens (Walker et al. 1990). The hyperreactivity may result into obstruction of airflow that presents asthma symptoms i.e., wheezing, difficulty in breathing, coughing, chest tightness, chest pain, shortness of breath and mucus (Walker et al. 1990). These symptoms can either settle by themselves or resolved through treatment with bronchodilators and corticosteroid (Walker et al. 1990, Lanier and Nayak 2008). Asthma is one of the most common chronic respiratory diseases in children. Many studies have shown that the prevalence of asthma varies considerably from one country to another (ISAAC 1998, Lai et al. 2009, Gazotti et al. 2013). This fact could be associated with lack of information on the disease and ignorance of the disease among patients, families, health professionals, and school staff that might not recognize asthma as a potentially serious illness and may underestimate the symptoms of the disease (Akcaay et al. 2014, Jaramillo and Reznik 2015).

In the International Study of Asthma and Allergies in Children (Pearce et al. 2007), 13.8% of 13-14 year old children worldwide had asthma at some time in their lives. Meanwhile, there are few available data on the prevalence of asthma in the UAE. Also, in 2011, a study (Bener et al. 1994) has shown that the prevalence of asthma among school children in UAE was (13.6%). On other hand, a study has reported a prevalence of physician-diagnosed asthma of 13% (Burke et al. 2003).

Asthma is composed of a variety of heterogeneous phenotypes that differ in presentation, etiology and pathophysiology. There are risk factors for each phenotype of asthma include genetic, environmental and host factors. In spite of the fact that a family history of asthma is common, it is neither sufficient nor necessary for the development of asthma (Burke et al. 2003).

Parental smoking has been persistently associated with early childhood wheezing (Stein et al. 1999, Lewis et al. 1995, Lau et al. 2002, Tariq et al. 2000) and there is a relation between smoking exposure and decreased airway caliber in early life (Dezateux et al. 1999). Moreover, Childhood asthma risks are correlated with food intake during maternity, cytokine responses and concentration of nitric oxide in exhaled air in newborns (Devereux et al. 2002, Macaubas et al. 2003, Frey et al. 2004).

The risk of breastfeeding and childhood atopy and asthma have been on spotlight for the last few years. Several studies (Bergmann et al. 2002, Oddy 2000) have shown that breast feeding protects the body from asthma, others have reported higher rates of allergy and asthma among breastfed children (Sears et al. 2002, Wright et al. 2000). A meta-analysis (Gdalevich et al. 2001) and several individual studies (Oddy 2000, Sears et al. 2002, Wright et al. 2000, Gdalevich et al. 2001, Kull et al. 2004) showed that absolute breastfeeding for at least 3 months was related with lower rates of asthma in children with age 2 to 5 years old, with the greatest effect occurring among those with a parental history of atopy. Another study shows that removal of milk, eggs and fish from the maternal diet was linked with lowering atopic dermatitis in infancy (Businco et al. 1983, Lovegrove et al. 1994). On the other hand some studies showed no association (Sigurs et al. 1992,

Hattevig et al. 1999). Moreover, some studies (Muraro et al. 2004, Martinez et al. 1995) followed children to 4 years and have determined that there is no effect of maternal dietary restriction during lactation on the consequent development of atopic diseases, including asthma (Muraro et al. 2004).

A study has indicated an association between diminished airway function in the first few weeks of life and asthma in later life (Young et al. 2000). Asthmatic children who have wheezing and continuing to adulthood have a fixed diminution in lung function as early as age 7 or 9 years (Sears et al. 2003, Erzen et al. 1997). Recent studies of preschool children have reported abnormal lung function in children with persistent wheezing as young as age 3 years (Erzen et al. 1997). Nonetheless, some infants who developed continual wheezing have normal lung function shortly after birth, which suggests a vital period of exposures within the first few years of life, before the development of these persistent abnormalities in expiratory flows (Martinez et al. 1995). Maternal smoking within utero nicotine exposure has been associated with this type of lung dysfunction (Dezateux et al. 1999, Martinez et al. 1995) but the effects of other exposures have been not fully studied.

Patient awareness and education are important in prevention and control of acute exacerbations and consequences of bronchial asthma. It was reported that satisfactory treatment of asthma depends on the correct evaluation and intervention by the physician or the parent, in a timely manner with the patient. In the last few years, a significant improvement was seen in the pathophysiology and technology knowledge about asthma due to educational programmes. Moreover, patient education programmes gives a clear picture in managing and understanding of a disease such as bronchial asthma which lead to increase patients compliance in chronic diseases. One of those programmes is self-management awareness programme for asthma in children in order to improve healthcare practices, reduce morbidity, and lower the cost of care.

A systematic review and meta-analysis have reported that education programmes in childhood asthma was associated with improved lung function, self-efficacy, reduced absenteeism from school, and number of visits to an emergency department (Uevara et al. 2003). Moreover, it shows that education was also associated with a reduced number of nights disturbed by asthma. On other hand, an evaluation of educational programmes effectiveness test was done in Girl Scouts ages 5-17 years in northeastern Ohio, USA (Volsko et al. 2013). Educational components were in compliance with the guidelines established by the National Heart, Lung, and Blood Institute's National Asthma Education and Prevention Programme. They found that 21% of the participants were diagnosed and treated for asthma, 48% resided with an asthmatic, and 72% knew someone with asthma.

Al-Harbi et al. (2020) studied Saudi Arabian adults and found that the mean score for asthma knowledge was 15.6 out of 25. Asthma knowledge significantly correlated with age ( $P=0.002$ ), asthma status of the participants ( $P=0.001$ ), having children with asthma ( $P=0.005$ ) or knowing friends or family with asthma ( $P=0.029$ ) but not with other socioeconomic factors such as gender, marital status, occupation, level of education and number of children in the family ( $P>0.05$ ).

Mohammed et al. (2020) studied Iraqi parents of children 1-12 years. Duration of asthma since diagnosis ranged from 2 months to 11 years with about half of children present with symptoms between 1-2 years. The mean score for the first section (myths and beliefs regarding asthma) with regard to parents' level of education showed significantly higher knowledge score that was noted among groups with higher education. In the second section of the score (knowledge about asthma), the mean was significantly greater for the groups of parents who completed their university studies. They concluded that there was a significant correlation between level of education of parents and score of Asthma Knowledge Questionnaire, as the parents present with higher education can obtain knowledge easier, but despite of that most parents were highly educated but a lot of them have misconception and lack of information regarding use of inhalers and factors that triggering asthma of their children which necessitate to provide more effective education programmes

Fasola et al. (2022) studied mothers of asthmatic children answered a knowledge/practice questionnaire. The study hypothesized that Latent Class Analysis (LCA) could help identify underlying mother profiles with similar knowledge/practices. Mothers of asthmatic children answered a knowledge/practice questionnaire. LCA identified two classes: Class 1, "poor knowledge" (33%); Class 2, "good knowledge" (67%). Classification accuracy was 0.96. Mothers in Class 2 were more likely to be aware of asthma-worsening factors and indicators of attacks. Mothers in Class 1 were more likely to prevent exposure to tobacco smoke (91.1% vs. 78.8%,  $p=0.005$ ). For attacks, mothers in Class 2 were more likely to go to the emergency department and follow the asthma action plan. Mothers in Class 2 more frequently had a high education level (79.5% vs. 65.2%,  $p=0.004$ ). Children in Class 2 more frequently had fully controlled asthma (36.7% vs. 25.9%,  $p=0.015$ ) and hospitalizations for attacks in the previous 12 months (24.2% vs. 10.7%,  $p=0.003$ ). They concluded that LCA can help discover underlying mother profiles and plan targeted educational interventions.

Noureddin et al. (2019) have assessed the knowledge of asthma and identified the attitude and practice of mothers of asthmatic children in Sudan, concerning their use of inhalers, compliance to preventers and the severity of the disease in their children. Mothers of asthmatic children was enrolled. Any mother with a child diagnosed with bronchial asthma for more than 3 months, and who attended the outpatient clinic of paediatric asthma in hospitals was eligible to be included. Asthma was believed to be infectious by 7% of the respondents. Seventeen percent of the mothers thought asthma was preventable by a vaccine, 21% found inhaler use unacceptable. Half of the mothers did not use the inhaler correctly. Most of the mothers (69%) did not use the inhaler if symptoms were mild and 53% didn't use preventers. The severity of asthma was found to be significantly associated with the attitude and practice of mothers ( $P<0.05$ ). They concluded that sustained efforts are required to increase knowledge about all dimensions of asthma and its management among patients and to disperse myths and misguided judgments regarding the disease and its treatment.

Al-Khamis and Hashim (2019) studied teachers in Saudi Arabia. They found 59.6% of teachers had a high level of asthma knowledge as they were able to

answer  $\geq 75\%$  of the knowledge questions correctly. Teachers' level of asthma knowledge was not significantly associated with age, but significantly associated with years of teaching experience, educational level and contact with an asthmatic individual. Most of the respondents were at a high level of awareness concerning asthma symptoms, triggering and treatment (73.2%, 60.9%, 60.7%), respectively, while only 19.4% had high knowledge level about sport and asthma.

Willers et al. (2011) found that dyspnea was the most commonly reported symptom (9.0%) in children. Of the children with IgE data, 32.1% were sensitized to inhaled allergens, while 16.6% were sensitized to milk or egg. The methacholine provocation test was positive in 42.9% of the children. No consistent associations were found for long-term dietary consumption or consumption at early or later age on outcomes at 8 years of age except for fruit. Increased long-term fruit intake was significantly inversely associated with asthma symptoms and sensitization to inhalant allergens.

Khalkhal et al. (2014) studied children in Iran and found that antibiotic consumption during the first year of life increased the odds ratio of asthma symptoms at 2-8 years of age and the strength of association was similar after adjusting for a family history of asthma or atopic disorder, preterm delivery, birth order, and delivery method. They suggested that antibiotic consumption in children was associated with an increased risk of childhood asthma; an additional confirmative study is needed.

Al-Rawas et al. (2009) studied Omani children and found that 15.4% had current asthma. Bakhour use more than twice a week was three times more likely to affect breathing compared to no bakhour use and this effect was 2.55 times higher in asthmatics compared to non-asthmatics. In addition, bakhour caused worsening of wheeze in 38% of the asthmatics, making it the fourth most common trigger factor after dust (49.2%), weather (47.6%) and respiratory tract infections (42.2%). However, there was no significant association between bakhour use and the prevalence of current asthma. They concluded that Arabian incense burning is a common trigger of wheezing among asthmatic children in Oman.

Lau et al. (2000) carried out a prospective birth-cohort study in order to assess the relevance of mite and cat allergen exposure for the development of childhood asthma up to age 7 years in German cities. Assessments included repeated measurement of specific IgE to food and inhalant allergens, measurement of indoor allergen exposure at 6 months, 18 months, and 3 years of age, and yearly interviews by pediatricians. Pulmonary function and bronchial hyper-responsiveness were tested. They found that at age 7, the prevalence of wheezing in the past 12 months was 10.0% and 6.1% parents reported a doctor's diagnosis of asthma in their children. Sensitization to indoor allergens was associated with asthma, wheeze, and increased bronchial responsiveness. They concluded that there was no relation between early indoor allergen exposure and the prevalence of asthma, wheeze, and bronchial hyper-responsiveness.

Hallstrand et al. (2005) performed an analysis with 1001 monozygotic and 383 dizygotic same-sex twin pairs within the University of Washington Twin Registry. Twin correlations examined the association of asthma and obesity. They found that a strong association between asthma and BMI was identified in the

sample population. Substantial heritability was detected for asthma (53%) and obesity (77%), which is indicative of additive genetic influences on each disorder. The best-fitting model of shared components of variance indicated that 8% of the genetic component of obesity is shared with asthma. They concluded that the co-variation between obesity and asthma was predominantly caused by shared genetic risk factors for both conditions.

Koeppen-Schomerus et al. (2001) studied 4910 twin pairs who were born in England and Wales in 1994 and 1995. Data on asthma status were obtained from the twins' parents by postal questionnaire. They found that asthma causes are 68% heritability, 13% shared environment, and 19% non-shared environment. They concluded that asthma is highly heritable in 4 year olds, whereas shared environmental influences were not statistically significant.

Hill et al. (2016) studied children in the USA and found that the peak age at diagnosis of eczema, asthma, rhinitis, and food allergy was between 0 and 5 months (7.3 %), 12 and 17 months (8.7 %), 24 and 29 months (2.5 %), and 12 and 17 months (1.9 %), respectively. On other hand, in the cross-sectional cohort, eczema and rhinitis prevalence rates were 6.7 % and 19.9 %, respectively. Asthma prevalence was 21.8 %; higher than previously reported. Food allergy prevalence was 6.7 %, with the most common allergenic foods being peanut (2.6 %), milk (2.2 %), egg (1.8 %), shellfish (1.5 %), and soy (0.7 %). They concluded that food allergy was associated with the development of respiratory allergy.

Idris et al. (2016) found that there was a higher risk of asthma in those who had carpet at home. The exposure to lorry fumes doubled the prevalence of asthma. The prevalence of asthma was significantly associated with the distance of the house to the congested road. Also, Parents' educational level and family income may have an effect of prevalence of asthma, A total of 31.4% of children who had asthma had a father with lower educational level compared with 44.9% among children without asthma. They stated that environmental air pollutants increased the risk of asthma among children in Malaysia. Exposure to congested roads, lorry fumes, and indoor carpet were associated with asthma among children in this study. They recommended that parents or caregivers of children with asthma should be given adequate education on the prevention of asthmatic attack among these children.

Gosavi et al. (2016) studied 50 asthmatic patients in Bangalor in order to measure the asthma control using modified Mini Asthma Quality of Life Questionnaire (MAQOL) and sputum eosinophil count and to identify the role of factors like age, duration of asthma, severity, compliance, technique of inhalation and knowledge of asthma action plan on asthma control. A global score of <80% was considered as poor control. The proportion of patients under each factor, in poorly-controlled group (PC) was compared with the well-controlled group (WC). They found that (66%) patients were in PC category with a mean global asthma score of  $58.46 \pm 2.881$  vs  $85.2 \pm 1.19$  in the WC group (34%). The mean duration of asthma was  $16.76 \pm 2.761$  years in PC vs  $7.882 \pm 2.065$  years in WC. The severity score was  $7.265 \pm 0.4434$  in PC vs  $6.706 \pm 0.64$  in WC. Eight patients in PC and six in WC were unaware of the treatment plan. One in PC group and three in WC were unaware of technique of inhalation. One in PC group and three in WC

were non-compliant. They concluded that there is a need for an objective monitoring in asthma and the treatment strategies need to be modified accordingly.

Chu et al. (2015) studied Chinese singleton children who were followed up to 7 years of age. The prevalence of asthma was 5.5% in this population. However, the asthmatic children had a higher proportion of unmarried, asthmatic mothers, mothers with drug allergy history, male infants and black race. A total of 10,534 (26.4%) mothers were treated with antibiotics one month prior to last menstrual period (LMP) or during pregnancy. The vast majority of them used one type of antibiotics (22.5%). Penicillin was the most commonly used antibiotic (15.6% of all mothers) followed by sulfonamides and trimethoprim (10.1% of all mothers). Most mothers received antibiotic treatment in the second (12.8% of all mothers) or third (12.7% of all mothers) trimesters. Maternal use of penicillin or chloramphenicol was associated with a significantly increased risk of childhood asthma after adjusting for potential confounders. Penicillin or chloramphenicol use in first trimester was significantly associated with childhood asthma. They concluded that maternal exposure to certain antibiotics is associated with childhood asthma by 7 years of age.

Mahboub et al. (2012) studied a random sample of 1,220 participants in the UAE. They found that prevalence of individual respiratory symptoms from the European Community Respiratory Health Survey (ECRHS) screening questionnaire in all participants were generally ranging 8-10%, while participants 20-44 years presented lower prevalence in all symptoms. Participating women reported more individual symptoms than men. Overall, there were 15.4% of participants who fulfilled our screening criteria for asthma, while for consistency with ECRHS, there were 12.1% of participants who fulfilled the ECRHS asthma definition, being 9.8% of those 20-44 years, that is 8.6% of male and 11.8% of female young adults participating. They concluded that asthma is common in the UAE, and gender differences are not observed in reported asthma symptoms in young adults.

Mahboub et al. (2010) found that the current level of asthma control in the UAE is not ideal. Therefore, it is required to increase the awareness among patients and update doctors about asthma control guidelines in order to reach an optimal asthma control, and thus reducing the burden of the disease.

Al-Rawas et al. (2008) studied Omani children and found that over the period of six years, the Sharqiya (Eastern) region continued to have the highest prevalence of self-reported asthma diagnosis and all asthma symptoms in both age groups, with a significant increase in the prevalence of wheeze in the past 2 months and asthma diagnosis in the young group, and a significant increase in night cough in the older group. All other regions had lower prevalence rates in 1995 in both age groups, and showed either no significant change or a decline in one or two of the self-reported asthma symptoms. The prevalence of asthma diagnosis among wheezy children remained unchanged across all regions. In addition, asthma under-diagnosis remains a problem with only 60% of children with severe wheeze reporting asthma diagnosis in both surveys. They concluded that the geographic variation in the prevalence of self-reported of asthma symptoms among Omani school children persists with further increase in the Sharqiya region and asthma has not improved over time.

Janahi et al. (2006) did a cross-sectional study of 3,283 school children in Qatar living in both urban and rural areas based on ISAAC questionnaire. They found high prevalence of diagnosed asthma (19.8%), allergic rhinitis (30.5%), eczema (22.5%), and chest infection (11.9%). The frequency of asthma, allergic rhinitis, and eczema among parents reflected the same pattern as seen in their children. In general, males had more asthma, allergic rhinitis, and chest infections than females. The prevalence rate of asthma and allergic rhinitis decreased with age. The prevalence rate of asthma was significantly higher in mothers (11.8%) than in fathers (9.0%), in contrast, the frequency of allergic rhinitis symptoms was comparable (mothers, 18.5%; fathers, 17.5%). The prevalence rate of asthma (19.8%) in Qatari schoolchildren was very close to that in the neighboring Gulf country, Oman (20.7%), and higher than in some developing countries. They concluded that the genetic factors related to the high rates of consanguinity may play an important role in the high prevalence rates noted in the Qatari population, but changes in lifestyle and environmental factors cannot be discounted as possible causes of the high prevalence noted in their study.

Desalu et al. (2016) investigated asthma control measurement (ACM) tools in the management of asthma among doctors working in family and internal medicine practice in Nigeria. They found that majority (69.6%) had poor knowledge score of ACM tools. Almost, 26% assessed their patients' level of asthma control and 34 (17.5%) at every visit. Twenty percent have used ACM tools in their consultation, 15.0% of them used GINA defined control while 10 (5.2 %) used asthma control test (ACT). The use of the tools was associated with pulmonologists, having attended CME within six months and graduated within five years prior to the survey. The results highlight the poor knowledge and use of ACM tools and the need to address the knowledge gap.

Al-Harbi et al. (2016) studied Saudi Arabian children and adults and found that the awareness of bronchial asthma questions showed that 67% of total sample thought that it could be a fatal disease, and only 13.2% thought that there is a difference between bronchial asthma and chest allergies in children. Eighty six percent thought that the symptoms of bronchial asthma include dyspnea and nocturnal cough, and 45.7% thought that fever, a runny nose and throat inflammation are not symptoms. Sixty two percent thought that infectious respiratory diseases may increase bronchial asthma progression. Moreover, 40% thought that the use of antibiotics doesn't help in diminishing bronchial asthma complications, and some thought that the patient can stop medication after an acute asthma attack. Thirty four percent thought that inhaled medication for asthma does not cause addiction. They concluded that bronchial asthma knowledge in the Saudi Arabian population is insufficient, and efforts should be carried out to spread bronchial asthma management.

The aim of our study was to determine the prevalence of bronchial asthma in a population in Ras Al-Khaima, the UAE and to assess knowledge of childhood asthma, its symptoms, triggers, prevention, management and education.



## Materials and Methods

### *Study Setting and Design*

This study was a cross-sectional, performed using a Modified Structured Asthma Knowledge Questionnaire in Arabic and English languages, conducted in the city of Ras Al-Khaima in the UAE. A convenience sample was used comprising 663 participants. Participants were randomly selected from both genders males and females and from different age groups and different nationalities. The first author (pharmacist, Master student) has collected the data. All questionnaires have been completed by the participants in their homes. Participation in the study was voluntary, the background of the survey was explained, and the participants signed an informed consent form. Prior to the study, the questionnaire was validated by subject experts for its content and relevance. The questionnaire was field-tested several times on a pilot sample of 85 individuals to clarify any ambiguities and to determine the reliability of the questionnaire.

In our survey, we collected information from local and non-local population. Furthermore, Emiratis were 252 (38%) while the majority of the subjects were Non-Emiratis 411(62%). Almost 73% of the subjects were females and 27.1% were males. On other hand, (66.8%) of our sample were from age group 18 to 30 years old; most of them were students (60.8%).

### *Data Collection*

A self-administered questionnaire was used as a tool to collect the data from the participants. The questionnaire was designed for two objectives: to determine the prevalence of bronchial asthma in Ras Al-Khaima city and to assess the knowledge of childhood asthma, its symptoms, triggers, prevention, management and education. The questionnaire has been divided into four sections: The first section is individuals' demography consisted of age, gender, marital status, education, place of residence, job, if the person suffers from asthma, and whether they have a family member with asthma. The second section covers symptoms, warning signs of asthma, triggers & prevention of asthma. The third section covers asthma management, and the forth section covers self-education and communication about asthma.

### *Statistical Analysis*

We performed analysis of the demographic data and expressed them in percentages and frequencies using SPSS Version 20. Cronbach's alpha to validate the questionnaire was good ( $0.9 > \alpha \geq 0.8$ ). The level of statistical significance was defined as  $P < 0.05$ .

## Results

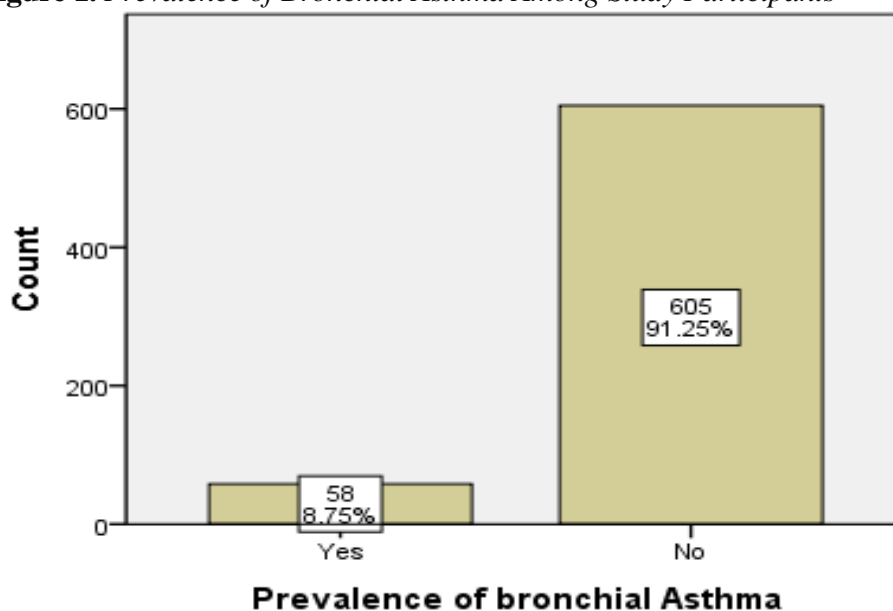
### *Demographic and Participants' Characteristics*

Seven hundred questionnaires were distributed among population in Ras Al-Khaima. Six hundred and sixty three 663 were returned making the response rate of 94.7%. Details of demographic characteristics of participants are shown in Table 1.

### *Prevalence of Asthma Among Study Participants*

The prevalence of bronchial asthma among study participants was 8.7% (n=58) and 44.2% of them had family history of asthma (Figure 1, Table 1).

**Figure 1.** *Prevalence of Bronchial Asthma Among Study Participants*



**Table 1.** *Demographic and Social Characteristics of the Participants*

Demographic (n=663)	n	(%)
Gender:		
Male	180	(27.1%)
Female	483	(72.9%)
Age group:		
< 18	74	(11.2%)
18-30	443	(66.8%)
> 30	146	(22%)
Marital status:		
Single	490	(73.9%)
Married	173	(26.1%)
Occupation:		
Student	403	(60.8%)
Employed	224	(33.8%)
Non-employed	36	(5.4%)

Educational Level:		
Less than university education	128	(19.3%)
University education	492	(74.2%)
Post graduate education	43	(6.5%)
Nationality:		
UAE local	252	(38%)
Non-UAE Local	411	(62%)
Place of birth:		
In UAE	403	(60.8%)
Outside UAE	260	(39.2%)
Suffer from bronchial Asthma:		
Yes	58	(8.7%)
No	605	(91.3%)
Family History of Asthma		
Yes	293	(44.2%)
No	370	(55.8%)

### *Knowledge about Childhood Asthma*

Participant's knowledge about childhood asthma was evaluated using a validated questionnaire consisted of 34 questions categorized under four headings namely childhood asthma, its symptoms, triggers, prevention, management and education. Tables 2-5 present the descriptive analysis of the knowledge of respondents.

Table 2 shows participants knowledge about Asthma symptoms and warning signs. A clear majority of respondents (86.7%) knew that Asthma is a chronic disease with acute exacerbations on exposure to allergens. About 71.3% of the respondents knew the symptoms of asthma and 92% identified dyspnea and nocturnal cough as symptoms of asthma. Genetic, hereditary and environmental factors were identified as important factors in the progression of asthma by 80.7% of the respondents. For important question regarding the difference between asthma and chest allergies in children, only 23.4% of participants correctly answered the question. A considerable proportion of respondents (41.6%) had wrongly answered that fever, runny nose and throat inflammation were symptoms of asthma. Moreover, 79.8% of the respondents were not knowledgeable about Asthma Control Test (ACT).

**Table 2.** *Symptoms of Childhood Asthma*

Items in Questionnaire	Yes (%)	No (%)
Do you know the symptoms of asthma?	473 (71.3%)	190 (28.7%)
Do you know Asthma Control Test (ACT)?	134 (20.2%)	529 (79.8%)
Asthma is a chronic disease with acute exacerbations on exposure to allergens.	575 (86.7%)	88 (13.3)
Genetic, Hereditary and environmental factors play a role in the progression of asthma.	535 (80.7%)	12 (19.3%)
There is a difference between asthma and chest allergies in children.	508 (76.6%)	15 (23.4%)
Asthma can be fatal disease.	483 (72.9%)	18 (27.1%)
Symptoms of asthma include dyspnea and nocturnal cough.	610 (92%)	53 (8%)
Symptoms of asthma include fever, runny noise.	276 (41.6%)	387 (58.4%)
Asthma's severe symptoms include children's inability to talk sentences or to lie on their back, aggression, and altered consciousness.	376 (56.7%)	287(43.3%)

Regarding knowledge about asthma triggers (Table 3), our study showed that 57.3% (n=380) knew triggers for asthma, 78.4% (n=520) were knowledgeable about the fact that infectious respiratory diseases increase the chances of asthma progression, 88.4% correctly answered that exposures to sudden changes in environment (dust or cold weather) affect the progression of asthma, 88.8% believed that direct or indirect exposure to cigarette smoke could lead to acute attacks of asthma and 85.4% recognized that exposure to perfumes, incense or paint fumes could lead to acute asthma attacks. Awareness about asthma preventive behaviors was assessed by the question “Do you think that asthmatic patient should avoid sports activities and physical education classes?” Our finding concluded that 47.2% of study participants correctly answered these questions.

**Table 3. Triggers of Childhood Asthma**

Items in Questionnaire	Yes (%)	No (%)
Do you know triggers for asthma?	380 (57.3%)	283 (42.7%)
Eating fish at an early age helps in Slowing down progress of asthma.	309 (46.9%)	354 (53.4%)
Infectious respiratory diseases increase the chances of asthma progression.	520 (78.4%)	143 (21.6%)
Exposures to sudden changes in environment affect the progression of asthma.	586 (88.4%)	77 (11.6%)
Direct or indirect exposure to cigarette smoke could lead to acute attacks of asthma.	589 (88.8%)	74 (11.2%)
Exposure to perfumes incense, or paint fumes could lead to acute asthma attacks.	566 (85.4%)	97 (14.6%)
An asthmatic child should avoid sports activities and physical education classes.	350 (52.8%)	313 (47.2%)
Asthmatic children should avoid certain foods such as fish, eggs and bananas.	265 (40.0%)	398 (60.0%)

Regarding knowledge about management of childhood asthma (Table 4), 48.0% of the respondents believed that frequent use of antibiotics helps in diminishing the complication of asthma and 73.3% agreed that treatment of asthma in children younger than 6 years of age. Only 37.3% of the respondents had correctly answered that patient can stop taking medication after an acute asthma attack. The knowledge regarding the steam inhalation for asthma treatment was lacking. Almost, 59% of the respondents believed that steam inhalation for treatment of asthma is better than mask or tube. Moreover, 33.5% of respondents considered using mask for patient older than 5 years of age is not necessary. In addition, conflicting findings regarding the inhaled medication and asthma's prophylactic treatment among respondents were observed. About 43.7% of the respondents believed that inhaled medications for asthma can cause addiction and 59.7% believed that asthma's prophylactic treatment can cause dangerous side effect if used without an acute asthma attack.

**Table 4. Management of Childhood Asthma**

Items in Questionnaire	Yes (%)	No (%)
The frequent use of antibiotics helps in diminishing the complication of asthma.	318 (48.0%)	345 (52.0%)
An asthmatic patient should constantly follow-up with physician for better results.	596 (89.9%)	67 (10.1%)
The patient should be educated about how to manage an acute asthma attack.	606 (91.4%)	57 (8.6%)

There is no need for treatment of asthma in children younger than 6 years of age.	177 (26.7%)	486 (73.3%)
The patient can stop taking medication after an acute asthma attack (beta-agonists and inhaled steroids).	247 (37.3%)	416 (62.7%)
One patient's asthma medication can be used by another asthmatic without a referral to a doctor.	148 (22.3%)	515 (77.7%)
Steam inhalation for treatment of asthma is better than mask or tube.	390 (58.8%)	273 (41.2%)
There is no need for using mask if the patient is older than 5 years of age.	222 (33.5%)	414 (66.5%)
An asthmatic patient can be treated in primary care clinic without referral to a pulmonology clinic, since it's a common disease (excluding severe disease).	342 (51.6%)	321 (48.4%)
Inhaled medicines for asthma can cause addiction.	290 (43.7%)	373 (56.3%)
Asthma's prophylactic treatment can cause dangerous side effect if used without an acute asthma attack.	396 (59.7%)	267 (40.3%)
Asthma could lead to increased school absenteeism in children.	510 (76.9%)	153 (23.1%)

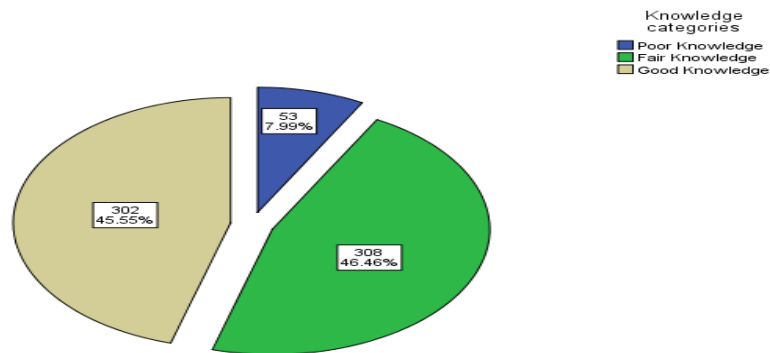
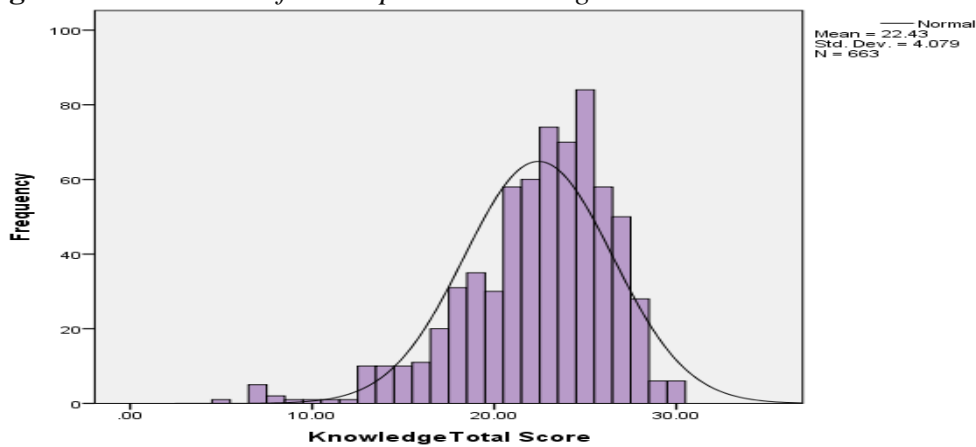
Regarding the asthma education and communication (Table 5), it can be observed that there was a positive attitude. The overall percentage of correct answers was from 52% to 91.3%. The highest percentage came from the fact that most of participants were aware of the fact that the patient's physician should inform them about the symptoms of asthma and how to handle the disease. However, 52% of respondents read or did search about the topic of asthma.

**Table 5. Asthma Education and Communication**

Items in Questionnaire	Yes (%)	No (%)
The patient's physician should inform him or her about the symptoms of asthma and how to handle the disease.	605 (91.3%)	58 (8.7%)
For better treatment of asthma, specialized centers are required to provide education and awareness to the patients and the community.	570 (86.0%)	93 (14%)
There is a need for including scientific content about asthma in student's curricula.	537 (81.0%)	126 (91%)
There is a need for creating educative programs for schools, aiming to increase awareness about asthma.	561 (84.6%)	102 (15.4%)
Have you ever read or search about the topic of asthma.	345 (52.0%)	318 (48%)

#### *Assessment of Knowledge towards Childhood Asthma*

A 34-item questions package was used to assess the knowledge of childhood asthma, its symptoms, triggers, prevention, management and education among population. A correct option was scored 1 while incorrect response was scored zero. A total score of 34 was obtainable. Knowledge scores for participants were calculated and summed up to give the total knowledge score. Knowledge score ranged between 0 and 34. For study participants, the overall mean of knowledge score was 22.43 ( $\pm$  4.1). A score of 70% and above was judged to be good, 50%-69% fair and <50% was poor. In all, 45.6% of the respondents had good Knowledge towards childhood asthma, 46.5% had fair Knowledge while 8% had poor Knowledge (Figures 2 and 3).

**Figure 2.** Distribution of Participant's Knowledge Category**Figure 3.** Distribution of Participants' Knowledge Score

#### Association of Demographic Characteristics and Mean Knowledge Score

The results of questions related to knowledge of Childhood Asthma among participants were analyzed using  $\chi^2$  test (Tables 8-10). The univariate statistical associations between the mean score of knowledge and socio-demographic characteristics of responders are shown in Tables 6-7. Among the demographic variables, age of the respondents was significantly associated with mean knowledge score ( $P=0.007$ ) in which participants with age ranged between 18-30 years scored remarkably better than participants aged 30 years and over ( $P=0.008$ ). However, no significant difference was found between other age groups.

Also, significant differences ( $P=0.001$ ) was found between the respondents in terms of educational level. The results showed that the respondents with university education scored significantly higher than respondents with less than university education ( $P=0.016$ ) as well as with the respondents with postgraduate education ( $P=0.021$ ). Non-UAE females who had family member suffers from asthma were characterized with higher mean score of Knowledge and they reach statistical significance ( $P=0.007$ ), ( $P=0.001$ ), ( $P=0.001$ ), respectively.

Comparing mean scores of Knowledge between students, employees and nonemployees, there was no significant difference ( $P=0.56$ ) between the mean of

3 groups. Similarly, there was no significant difference between single and married participants ( $P=0.375$ ). Furthermore, considering place of birth and being asthmatic patients, the results showed that there was no significant difference among study participants, ( $P=0.100$ ) and ( $P=0.158$ ), respectively.

**Table 6.** Factors Affecting Respondent Knowledge Towards Childhood

Knowledge Score	Mean $\pm$ (S.D)	F/t Value	Significance (p value)
Gender:			
Males	21.7 $\pm$ (4.5)	2.687	0.007
Females	22.7 $\pm$ (3.8)		
Age Group:**			
<18	22.2 $\pm$ (0.471)	5.032	0.007
18-30	22.7 $\pm$ (0.193)		
>30	21.5 $\pm$ (0.336)		
Marital Status: *			
Single	22.56 $\pm$ (4.03)	1.451	0.375
Married	22.04 $\pm$ (4.18)		
Occupation: **			
Students	22.6 $\pm$ (4.12)	2.896	0.56
Employed	22.4 $\pm$ (3.64)		
Unemployed	21.7 $\pm$ (4.14)		
Level of Education: **			
Less than University	21.6 $\pm$ (3.67)	7.113	0.001
University	22.7 $\pm$ (4.02)		
Postgraduate	20.9 $\pm$ (5.18)		
Nationality: *			
UAE National	21.6 $\pm$ (3.69)	3.867	0.001
Non-UAE National	22.9 $\pm$ (4.23)		
Place of Birth: *			
UAE	22.2 $\pm$ (3.92)	1.649	0.100
Non-UAE	22.7 $\pm$ (4.29)		
Asthma Disease: *			
Yes	23.15 $\pm$ (3.83)	1.413	0.158
No	22.36 $\pm$ (4.09)		
Asthma Family History: *			
Yes	23.09 $\pm$ (3.89)	3.739	0.001
No	21.9 $\pm$ (4.14)		

\* $P < 0.05$  is considered significant, \* Independent t test, \*\* One way ANOVA, SD: Standard deviation.

**Table 7.** Participants Knowledge on Childhood Asthma Stratified by Their Gender

Question (Correct Response)	All	Males	Females	P value
Do you know Asthma Control Test (ACT) (Yes)	134 (20.2%)	46 (25.6%)	88 (18.2%)	0.036
Symptoms of asthma include dyspnea and nocturnal cough (Yes)	610 (92.0%)	156 (86.7%)	454 (94.0%)	0.002
Exposures to sudden changes in environment affect the progression of asthma (Yes)	586 (88.4%)	148 (82.2%)	438 (90.7%)	0.002
Direct or indirect exposure to cigarette smoke could lead to acute attacks of asthma (Yes)	589 (88.8%)	150 (83.3%)	439 (90.9%)	0.006
The patient's physician should inform him / her about the symptoms of asthma (Yes)	596 (89.9%)	151 (83.9%)	445 (92.1%)	0.002
An asthmatic patient should constantly follow-up with physician for better results (Yes)	605 (91.3%)	157 (87.2%)	448 (92.8%)	0.025
The patient should be educated about how to manage an acute asthma attack (Yes)	606 (91.4%)	157 (87.2%)	449 (93.0%)	0.019
There is no need for treatment of asthma in children younger than 6 years of age (No)	486 (73.3%)	116 (64.4%)	370 (76.6%)	0.002

\* $p < 0.05$ ; #Significance; n (%): Frequency (Percentage)

**Table 8.** Participants Knowledge on Childhood Asthma According to their Gender Stratified by their Age

Question (Correct Response)	All	<18%	18-30%	>30%	P value
There is a difference between asthma and chest allergies in children (No)	155 (23.4%)	29 (39.2%)	93 (21.0%)	33 (22.6%)	0.003
Symptoms of asthma include fever, runny nose (No)	387 (58.4%)	47 (63.5%)	274 (61.9%)	66 (45.2%)	0.001
The frequent use of antibiotics helps in diminishing the complications of asthma (No)	345 (52.0%)	39 (52.7%)	244 (55.1%)	62 (42.5%)	0.030
Eating fish at an early age helps in slowing down progress of asthma (Yes)	309 (46.6%)	33 (44.6%)	192 (43.4%)	84 (57.5%)	0.011
Asthmatic children should avoid certain foods such as fish, eggs and bananas (No)	398 (60.0%)	52 (70.3%)	289 (65.2%)	57 (39.0%)	0.001
There is no need for treatment of asthma in children younger than 6 years of age (No)	486 (73.3%)	57 (77.0%)	338 (76.3%)	91 (62.3%)	0.003
There is no need for using mask if the patient is older than 5 years of age (No)	402 (60.6%)	52 (70.3%)	277 (62.5%)	73 (50.0%)	0.005
Inhaled medications for asthma can cause addiction (No)	344 (51.9%)	34 (45.9%)	245 (55.3%)	65 (44.5%)	0.043

\*p &lt;0.05; #Significance; n (%): Frequency (Percentage)

**Table 9.** Participants Knowledge on Childhood Asthma According to their Gender and Stratified by Their Education

Question (Correct Response)	All	Less than University	University	Postgraduate	P value
Do you know the symptoms of asthma(Yes)	473 (71.3%)	82 (64.1%)	366 (74.4%)	25 (58.1%)	0.010
Do you know triggers for asthma(Yes)	380 (57.3%)	56 (43.8%)	302 (61.4%)	22 (51.2%)	0.001
Do you know Asthma Control Test (ACT) (Yes)	134 (20.2%)	17 (13.3%)	99 (20.1%)	18 (41.9%)	0.001
Asthma is a chronic disease with acute exacerbations on exposure to allergens (Yes)	575 (86.7%)	103 (80.5%)	439 (89.2%)	33 (76.7%)	0.005
There is a difference between asthma and chest allergies in children (No)	155 (23.4%)	40 (31.3%)	100 (20.3%)	15 (34.9%)	0.006
Symptoms of asthma include dyspnea and nocturnal cough (Yes)	610 (92.0%)	112 (87.5%)	461 (93.7%)	37 (86.0%)	0.023
Symptoms of asthma include fever, runny nose (No)	387 (58.4%)	64 (50.0%)	308 (62.6%)	15 (34.9%)	0.001
The frequent use of antibiotics helps in diminishing the complications of asthma (No)	345 (52.0%)	48 (37.5%)	281 (57.1%)	16 (37.2%)	0.001
An asthmatic patient should constantly follow-up with physician for better results (Yes)	596 (89.9%)	110 (85.9%)	451 (91.7%)	35 (81.4%)	0.026
There is no need for treatment of asthma in children younger than 6 years of age (No)	486 (73.3%)	82 (64.1%)	382 (77.6%)	22 (51.2%)	0.001
The patient can stop taking medication after an acute asthma attack (Yes)	247 (37.3%)	62 (48.4%)	169 (34.3%)	16 (37.2%)	0.013
One patient's asthma medication can be used by another asthmatic, without referral to a doctor (No)	515 (77.7%)	100 (78.1%)	390 (79.3%)	25 (58.1%)	0.006

\*p &lt;0.05; #Significance; n (%): Frequency (Percentage)



**Table 10.** Participants Knowledge on Childhood Asthma Stratified by their Nationality

Question (Correct Response)	All	UAE National %	Non-UAE National %	P value
Do you know the symptoms of asthma (Yes)	473 (71.3%)	160 (63.5%)	313 (76.2%)	0.001
Do you know triggers for asthma (Yes)	380 (57.3%)	126 (50.0%)	254 (61.8%)	0.003
Asthma is a chronic disease with acute exacerbations on exposure to allergens (Yes)	575 (86.7%)	205 (81.3%)	370 (90.0%)	0.001
There is a difference between asthma and chest allergies in children (No)	155 (23.4%)	73 (29.0%)	82 (20.0%)	0.008
Symptoms of asthma include fever, runny nose (No)	387 (58.4%)	123 (48.8%)	264 (64.2%)	0.001
The frequent use of antibiotics helps in diminishing the complication of asthma (No)	345 (52.0%)	97 (38.5%)	248 (60.3%)	0.001
Eating fish at an early age helps in slowing down progress of asthma (Yes)	309 (46.6%)	133 (52.8%)	176 (42.8%)	0.013
Exposure to perfumes, incense or paint fumes could lead to acute asthma attacks (Yes)	566 (85.4%)	224 (88.9%)	342 (83.2%)	0.045
An asthmatic children should avoid sports activities and physical education classes (NO)	313 (47.2%)	96 (38.1%)	217 (52.8%)	0.001
Asthmatic children should avoid certain foods, such as fish, eggs and bananas (No)	398 (60.0%)	110 (43.7%)	288 (70.1%)	0.001
There is no need for treatment of asthma in children younger than 6 years of age (No)	486 (73.3%)	164 (65.1%)	322 (78.3%)	0.001
The patient can stop taking medication after an acute asthma attack (beta-agonists and inhaled steroids) (Yes)	247 (37.3%)	117 (46.4%)	130 (31.6%)	0.001
One patient's asthma medication can be used by another asthmatic, without referral to a doctor (No)	515 (77.7%)	184 (73.0%)	331 (80.5%)	0.024
Steam inhalation for treatment of asthma is better than mask or tube (No)	236 (35.6%)	73 (29.0%)	163 (39.7%)	0.005
Inhaled medications for asthma can cause addiction (No)	344 (51.9%)	117 (46.4%)	227 (55.2%)	0.028
Have you ever read or search about the topic of asthma (Yes)	345 (52.0%)	115 (45.6%)	230 (56.0%)	0.010

\*p <0.05; #Significance; n (%): Frequency (Percentage)

## Discussion

Most of the participants have a good level of knowledge of asthma. The UAE considered as one of the most countries in the gulf that attracts people from different nationalities. Our community has a great mixture of people from more than 40 countries from all over the world. Every individual comes from a different culture with a variety of disease awareness and knowledge.

A study have recorded that the prevalence of asthma among school children in UAE was 13.6% (Bener et al. 1994), while an ISAAC center reported a prevalence of physician-diagnosed asthma of 13% in 3,200 children aged 6-13 years in the seven Emirates of the UAE (Al-Maskari et al. 2000, Mahboub et al. 2012). Another study was conducted in asthmatic patients in the UAE (Mahboub

et al. 2010) showed that 64% of sudden severe attacks of asthma were reported in 2009. About 53% of the children and 17.1% of the adults missed school and work, while 17.8% ever owned a peak flow meter and 30% ever had a lung function test. Similarly, 17% had scheduled follow-up and 66% were followed-up by general practitioners. Researchers should use their research knowledge transfer of their results to physicians and consultants. After all, researchers should use their research knowledge transfer of their results to physicians and consultants.

### *Triggers for Asthma*

In our study majority of respondents knew that Asthma is a chronic disease with acute exacerbations on exposure to allergens. A previous study in Saudi Arabia has obtained nearly the same results (Al-Harbi et al. 2016). A study done in Spain on 7,494 teachers showed that 6.8% of teachers were capable of pointing out the three main symptoms of asthma (Varela et al. 2016). Genetic, hereditary and environmental factors were identified as important factors in the progression of asthma by 80.7% of the respondents which have been proven in many studies on families and twins that genetic plays an important role in the development of asthma and allergy (Lawrence et al. 1994). On other hand, a study done in turkey revealed that 51.1% knew asthma is a genetic disease and 58% said it is not an infectious disease (Yildiz et al. 2013). Additionally, only 23.4% answered the question if there is difference between asthma and chest allergies in children. A considerable proportion of respondents (41.6%) wrongly answered that fever, runny nose and throat inflammation were symptoms of asthma. Moreover, 79.8% of the respondents were not knowledgeable about Asthma Control Test (ACT).

Regarding the participants knowledge about asthma triggers, our study showed that 57.3% knew the triggers for asthma, 78.4% were knowledgeable about the fact that infectious respiratory diseases increase the chances of asthma progression, 88.4% correctly answered that exposures to sudden changes in environment (dust or cold weather) affect the progression of asthma, 88.8% believed that direct or indirect exposure to cigarette smoke could lead to acute attacks of asthma and 85.4% recognized that exposure to perfumes, incense or paint fumes could lead to acute asthma attack. Nearly similar finding has been shown in another study; 87% thought the same (Al-Harbi et al. 2016). Also, in another study done in Saudi Arabia (BinSaeed 2014) showed that 86.1% thought that smoking harms children with asthma, 47.2% of study participants have correctly answered a question if asthmatic patient should avoid sport activities and physical education classes.

### *Management of Childhood*

In our study, regarding the knowledge of management, 48% of the respondents believed that frequent use of antibiotics helps in diminishing the complication of asthma. However, 40.8% of parents in the Saudi Arabian study (Al-Harbi et al. 2016) had the same thought. Many studies conducted world-wide suggested that antibiotic consumption in children was associated with an increased risk of

childhood asthma (Kummeling et al. 2007, Alm et al. 2008, Khalkhal et al. 2014). Moreover, 73.3% agreed with treatment of asthma in children younger than 6 years of age. On other hand, 37.3% of the respondents had correctly answered that patient can stop taking medication after an acute asthma attack. But what clearly lacking, was the knowledge regarding the steam inhalation for asthma treatment in which 58.8% of the respondents believed that steam inhalation for treatment of asthma is better than mask or tube. Moreover, 33.5% of respondents considered using mask for patient older than 5 years of age is not necessary.

There are conflicting reports regarding the inhaled medication and Asthma's prophylactic treatment among respondents. About 43.7% of the respondents in our study believed that inhaled medications for asthma can cause addiction. On the other hand, in the another study (BinSaaed 2014), the answer to the question whether asthma medications caused drug dependency, only 27% answered "No" while 55.2% said "they do not know".

#### *Asthma Education and Communication*

In the present study, the overall percentage of correct answers on asthma education and communication were between 52% and 91%. The highest percentage showed that most of participants were aware of the fact that the patient's physician should inform them about the symptoms of asthma and how to handle the disease which indicate that Ras Al-Khaima society have a good knowledge. However, 52% of our respondents searched about the topic of asthma while 55.2% of the Saudi study (Al-Harbi et al. 2016) sample was familiar with asthma.

#### *Association between Demographic Characteristics and Mean Knowledge Score*

In the present study, among the demographic variables, age of the respondents was observed to be significantly associated with mean knowledge score ( $P=0.007$ ) in which participants with age ranged between 18-30 years scored remarkably better than participants aged 30 years and over ( $P=0.008$ ). Similar results have been found in previous study (Al-Harbi 2016); asthma knowledge was very highly significant with age ( $P<0.001$ , CI  $[-0.60, 1.41]$ ), illustrating that the higher the age group the higher the awareness score. However, no significant difference was found between other age groups.

Also, in the present study, significant differences ( $P=0.001$ ) was found between the respondents in terms of educational level. The results showed that the respondents with university education scored significantly higher than respondents with less than university education ( $P=0.016$ ) as well as with the respondents with postgraduate education ( $P=0.021$ ). Non-UAE females who had family member suffers from asthma were characterized by higher mean score of knowledge which was significant. The results indicate that non-UAE national have more knowledge than the UAE national as they came from different background. The present study confirms the Iraqi study (Mohammed et al. 2020) who found that there was a significant correlation between level of education of parents and score of Asthma

Knowledge Questionnaire, as the parents present with higher education can obtain knowledge easier.

A recent study (Fasola et al. 2022) have used Latent Class Analysis (LCA) in mothers and concluded that LCA can help discover underlying mother profiles and plan targeted educational interventions. However, the severity of asthma was found to be significantly associated with the attitude and practice of mothers (Noureddin et al. 2019). Thus, sustained efforts are required to increase knowledge about all dimensions of asthma and its management among patients and to disperse myths and misguided judgments regarding the disease and its treatment.

## Conclusion

The childhood asthma knowledge among the Ras Al-Khaima population in the UAE is quiet good which indicates the importance of the role of the Ministry of Health in the UAE in educational programmes to improve asthma knowledge and awareness. Moreover, the population age group above 30 years old had lack of asthma knowledge which is important to improve their awareness about childhood asthma because it enhances their understanding of this disease which will reflect on people who interact with children in order to recognize asthma. On other hand, attracting attention to childhood asthma and its consequences will promote collaboration among the health care, social, education and environmental service sectors and policy makers.

Furthermore, Educational programmes must cover all age groups in the society starting from parents, caregivers, students and patients. Also, educational programmes must be held for physicians and nurses on patient satisfaction and use of health services.

## Acknowledgments

The authors would like to thank all subjects, schools, parents and coordinators that took part in the study.

## References

- Akcay A, Tamay Z, Duksal F, Celtik C, Ergin A, Guler N (2014) Asthma knowledge level of child daycare center teachers' in Istanbul, Turkey. *Minerva Pediatrica* 66(4): 297–305.
- Al-Harbi S, Al-Harbi AS, Al-Khorayyef A, Al-Qwaiee M, Al-Shamarani IA, Al-Aslani W, et al. (2016) Awareness regarding childhood asthma in Saudi Arabia. *Annual Thoracic Medicine* 11(1): 60–65.
- Al-Harbi SA, Kobeisy SAN, AlKhater SA, Alharbi AS, Alqwaiee MM, Alotaibi FN, et al. (2020) Childhood asthma awareness in Saudi Arabia: five-year follow-up study. *Asthma and Allergy* 13(Oct): 399–407.
- Al-Khamis ZN, Hashim SA (2019) Awareness of asthma and its management in primary school teachers in Eastern Province. *Journal of Family Medicine and Primary Care* 8(7): 2554.

- Al-Maskari F, Bener A, Al-Kaabi A, Al-Suwaidi N, Norman N, Brebner J (2000) Asthma and respiratory symptoms among school children in United Arab Emirates. *Allergy and Immunology* 32(4): 159–163.
- Al-Rawas OA, Bazdawi M, Al-Riyami S, Al-Kindy H, Al-Maniri AA, Al-Riyami AA (2008) Regional variation in the prevalence of asthma symptoms among Omani school children. *Sultan Qaboos University Medical Journal* 8(2): 157–164.
- Al-Rawas OA, Al-Maniri AA, Al-Riyami BM (2009) Home exposure to Arabian incense (bakhour) and asthma symptoms in children: a community survey in two regions in Oman. *BMC Pulmonary Medicine* 9(23): 23.
- Alm B, Erdes L, Mollborg P, Pettersson R, Norvenius SG, Aberg N, et al. (2008) Neonatal antibiotic treatment is a risk factor for early wheezing. *Pediatrics* 121(4): 697–702.
- Bener A, Abdulrazzaq YM, Debusse P, Al-Mutawwa J (1994) Prevalence of asthma among Emirates school children. *European Journal of Epidemiology* 10(Jun): 271–278.
- Bergmann RL, Diepgen TL, Kuss O, Bergmann KE, Kujat J, Dudenhausen JW, et al. (2002) Breastfeeding duration is a risk factor for atopic eczema. *Clinical and Experimental Allergy* 32(2): 205–209.
- BinSaeed AA (2014) Caregiver knowledge and its relationship to asthma control among children in Saudi Arabia. *Journal of Asthma* 51(8): 870–875.
- Burke W, Fesinmeyer M, Reed K, Hampson L, Carlsten C (2003) Family history as a predictor of asthma risk. *American Journal of Preventive Medicine* 24(2): 160–169.
- Businco L, Marchetti F, Pellegrini G, Perlini R (1983) Predictive value of cord blood IgE levels in ‘at-risk’ newborn babies and influence of type of feeding. *Clinical Allergy* 13(6): 503–508.
- Chu S, Yu H, Chen Y, Chen Q, Wang B, Zhang J (2015) Periconceptional and gestational exposure to antibiotics and childhood asthma. *PLoS One* 10(10): e0140443.
- Desalu OO, Onyedum CC, Adeoti AO, Ozoh OB, Fadare JO (2016) Knowledge and use of asthma control measurement tools in the management of asthma: a survey of doctors working in family and internal medicine practice in Nigeria. *African Health Sciences* 16(2): 480–489.
- Devereux G, Barker RN, Seaton A (2002) Antenatal determinants of neonatal immune responses to allergens. *Clinical and Experimental Allergy* 32(1): 43–50.
- Dezateux C, Stocks J, Dundas I, Fletcher ME (1999) Impaired airway function and wheezing in infancy: the influence of maternal smoking and a genetic predisposition to asthma. *American Journal of Respiratory and Critical Care Medicine* 159(2): 403–410.
- Erzen D, Carriere KC, Dik N, Mustard C, Roos LL, Manfreda J, et al. (1997) Income level and asthma prevalence and care patterns. *American Journal of Respiratory and Critical Care Medicine* 155(3): 1060–1065.
- Fasola S, Malizia V, Ferrante G, Licari A, Montalbano L, Cilluffo G, et al. (2022) Asthma related knowledge and practices among mothers of asthmatic children: a latent class analysis. *International Journal of Environmental Research and Public Health* 19(5): 2539.
- Frey U, Kuehni C, Roiha H, Cernek M, Reinmann B, Wildhaber J, et al. (2004) Maternal atopic disease modifies effects of pre-natal risk factors on exhaled nitric oxide in infants. *American Journal of Respiratory and Critical Care Medicine* 170(3): 260–265.
- Gazotti MR, Nascimento OA, Montealegre F, Fish J, Jardim JR (2013) Level of asthma control and its impact on activities of daily living in asthma patients in Brazil. *Journal Brasileiro de Pneumologia* 39(5): 532–538.
- Gdalevich M, Mimouni D, Mimouni M (2001) Breast-feeding and the risk of bronchial

- asthma in childhood: a systematic review with meta-analysis of prospective studies. *Journal of Pediatrics* 139(2): 261–266.
- Gosavi S, Nadig P, Haran A. (2016) Factors contributing towards poor asthma control in patients on regular medication. *Journal of Clinical and Diagnostic Research* 10(6): 31–35.
- Hallstrand TS, Fischer ME, Wurfel MM, Afari N, Buchwald D, Goldberg J (2005) Genetic pleiotropy between asthma and obesity in a community-based sample of twins. *Journal of Allergy and Clinical Immunology* 116(6): 1235–1241.
- Hattevig G, Sigurs N, Kjellman B (1999) Effects of maternal dietary avoidance during lactation on allergy in children at 10 years of age. *Acta Paediatr* 88(1): 7–12.
- Hill DA, Grundmeier RW, Ram G, Spergel JM (2016) The epidemiologic characteristics of healthcare provider-diagnosed eczema, asthma, allergic rhinitis, and food allergy in children: a retrospective cohort study. *BMC Pediatrics* 16(Aug): 133.
- Idris IB, Hasanain FG, Zhie KH, Khairuman KA, Yahya SK, Abd Zaim FA, et al. (2016) Environmental air pollutants as risk factors for asthma among children seen in pediatric clinics in UKMMC, Kuala Lumpur. *Annual Global Health* 82(1): 202–208.
- Janahi IB, Bener A, Bush A (2006) Prevalence of asthma among Qatari school children: international study of asthma and allergies in Childhood, Qatar. *Pediatric Pulmonology* 41(1): 80–86.
- Jaramillo Y, Reznik M (2015) Do United States' teachers know and adhere to the national guidelines on asthma management in the classroom? A systematic review. *The Scientific World Journal* (Feb): 624828.
- Khalkhal HR, Oshnouei S, Salarilak S, Karamyar M, Khashabi J (2014) Effects of antibiotic consumption on children 2-8 years of age developing asthma. *Epidemiology of Health* 36: e2014006.
- Koeppen-Schomerus G1, Stevenson J, Plomin R (2001) Genes and environment in asthma: a study of 4 year old twins. *Archives Disease in Childhood* 85(5): 398–400.
- Kull I, Almqvist C, Lilja G, Pershagen G, Wickman M (2004) Breast-feeding reduces the risk of asthma during the first 4 years of life. *Journal of Allergy Clinical Immunology* 114(4): 755–760.
- Kummeling I, Stelma FF, Dagnelie PC, Snijders BEP, Penders J, Huber M, et al. (2007) Early life exposure to antibiotics and the subsequent development of eczema, wheeze, and allergic sensitization in the first 2 years of life: the KOALA Birth Cohort Study. *Pediatrics* 119: e225–e231.
- Lai CK, Beasley R, Crane J, Foliaki S, Shah J, Weiland S (2009) Global variation in the prevalence and severity of asthma symptoms: phase three of the International Study of Asthma and Allergies in Childhood (ISAAC). *Thorax* 64(6): 476–483.
- Lanier BQ, Nayak A (2008) Prevalence and impact of nighttime symptoms in adults and children with asthma: a survey. *Postgraduate Medicine* 120(4): 58–66.
- Lau S, Illi S, Sommerfeld C, Niggemann B, Bergmann R, von Mutius E, et al. (2000) Early exposure to house-dust mite and cat allergens and development of childhood asthma: a cohort study. *Lancet* 356(9239): 1392–1397.
- Lau S, Nickel R, Niggemann B, Gruber C, Summerfield C, Illi S, et al. (2002) The development of childhood asthma: lessons from the German Multicentre Allergy Study (MAS). *Paediatric Respiratory Reviews* 3(3): 265–272.
- Lawrence S, Beasley R, Doull I, Begishvili B, Lampe F, Holgate ST ,et al. (1994) Genetic analysis of atopy and asthma as quantitative traits and ordered polychotomies. *Annals of Human Genetics* 58(4): 359–368.
- Lewis S, Richards D, Bynner J, Butler N, Britton J (1995) Prospective study of risk factors for early and persistent wheezing in childhood. *European Respiratory Journal* 8(3):

349–356.

- Lovegrove JA, Hampton SM, Morgan JB (1994) The immunological and long-term atopic outcome of infants born to women following a milk-free diet during late pregnancy and lactation: a pilot study. *British Journal of Nutrition* 71(2): 223–238.
- Macaubas C, de Klerk NH, Holt BJ, Wee C, Kendall G (2003) Association between antenatal cytokine production and the development of atopy and asthma at age 6 years. *Lancet* 362(9391): 1192–1197.
- Mahboub BHS, Al-Hammadi S, Rafique M, Nabil Sulaiman N, Pawankar R, Al Redha AI, et al. (2012) Population prevalence of asthma and its determinants based on European Community Respiratory Health Survey in the United Arab Emirates. *BMC Pulmonary Medicine* 12(Feb): 4.
- Mahboub BHS, Santhakumar S, Soriano JB, Pawankar R (2010) Asthma insights and reality in the United Arab Emirates. *Annals of Thoracic Medicine* 5(4): 217–221.
- Martinez FD, Wright AL, Taussig LM, Holberg CJ, Halonen M, Morgan WJ (1995) Asthma and wheezing in the first six years of life. The Group Health Medical Associates. *New England Journal of Medicine* 332(3): 133–138.
- Mohammed MM, Abbas AN, Rashid AA (2020) Estimating the knowledge and attitude of parents about their children's asthma and evaluating the impact of their education status in Baghdad/ Iraq. *Systemic Review of Pharmacy* 11(8): 265–269.
- Muraro A, Dreborg S, Halken S, Høst A, Niggemann B, Aalberse R, et al. (2004) Dietary prevention of allergic diseases in infants and small children. Part III: Critical review of published peer-reviewed observational and interventional studies and final recommendations. *Pediatric Allergy Immunology* 15(4): 291–307.
- Noureddin AA, Shaaban KM, Mohamed SOO, Abdalla AA, Mahmoud AAA, Salman M ST (2019) The knowledge attitude and practice (KAP) of mothers of asthmatic children toward asthma in Khartoum asthma clinics. *Scientific Reports* 9(Aug): 12120.
- Oddy WH (2000) Breastfeeding and asthma in children: findings from a West Australian study. *Breastfeed Review* 8(1): 5–11.
- Pearce N, Ait-Khaled N, Beasley R, Mallol J, Keil U, Mitchell E, et al. (2007) Worldwide trends in the prevalence of asthma symptoms: phase III of the International Study of Asthma and Allergies in Childhood (ISAAC). *Thorax* 62(9): 758–766.
- Sears MR, Greene JM, Willan AR, Taylor DR, Flannery EM, Jan O, et al. (2002) Long-term relation between breastfeeding and development of atopy and asthma in children and young adults: a longitudinal study. *Lancet* 360(9337): 901–907.
- Sears MR, Greene JM, Willan AR, Wiecek EM, Taylor DR, Flannery EM, et al. (2003) A longitudinal, population-based, cohort study of childhood asthma followed to adulthood. *New England Journal of Medicine* 349(15): 1414–1422.
- Sigurs N, Hattevig G, Kjellman B (1992) Maternal avoidance of eggs, cow's milk, and fish during lactation: effect on allergic manifestations, skin-prick tests, and specific IgE antibodies in children at age 4 years. *Pediatrics* 89(4 Pt 2): 735–739.
- Stein RT, Holberg CJ, Sherrill D, Wright AL, Morgan WJ, Taussig L, et al. (1999) Influence of parental smoking on respiratory symptoms during the first decade of life: the Tucson children's respiratory study. *American Journal of Epidemiology* 149(11): 1030–1037.
- Tariq SM, Hakim EA, Matthews SM, Arshad SH (2000) Influence of smoking on asthmatic symptoms and allergen sensitization in early childhood. *Postgraduate Medical Journal* 76(901): 694–699.
- The International Study of Asthma and Allergies in Childhood Steering Committee – ISAAC (1998) Worldwide variations in the prevalence of asthma and asthma

- symptoms. *European Respiratory Journal* 12(2): 315–335.
- Uevara JP, Wolf FM, Grum CM, Clark NM (2003) Effects of educational interventions for self-management of asthma in children and adolescents: systematic review and meta-analysis. *British Medical Journal* 326(7402): 1308–1309.
- Varela AL, Esteban SR, Díaz SP, Murúa JK, Fernández-Oliva CR, Jiménez JS, et al. (2016) Knowledge of asthma in school teachers in nine Spanish cities. *Pediatric Pulmonology* 51(7): 678–687.
- Volsko TA, Walton M, Tessmer KA, Pohle-Krauza RJ, McBride JT (2013) The asthma awareness patch program for Girl Scouts: an evaluation of educational effectiveness. *Respiratory Care* 58(3): 458–464.
- Walker KH, Hall DW, Hurst WJ (1990) *The history, physical, and laboratory examination: clinical methods*. 3<sup>rd</sup> Edition. Boston: Butterworths.
- Willers SM, Wijga AH, Brunekreef B, Scholtens S, Postma DS, Kerkhof M, et al. (2011) Childhood diet and asthma and atopy at 8 years of age: the PIAMA birth cohort study. *European Respiratory Journal* 37(5): 1060–1067.
- Wright AL, Holberg CJ, Taussig LM, Martinez F (2000) Maternal asthma status alters relation of infant feeding to asthma in childhood. *Advance Experimental Medical Biology* 478: 131–137.
- Yıldız F, Bingöl Karakoç G, Ersu Hamutçu R, Yardım N, Ekıncı B, Yorgancıoğlu A (2013) The evaluation of asthma and COPD awareness in Turkey. GARD Turkey project-national control program of chronic airway diseases. *Tuberk Toraks* 61(3): 175–182.
- Young S, Arnott J, O’Keeffe PT, Le Souef PN, Landau LI (2000) The association between early life lung function and wheezing during the first 2 years of life. *European Respiratory Journal* 15(1): 151–157.