# Prevalence of bronchial asthma and its impact on the cognitive functions and academic achievement among preparatory school children in Damietta Governorate, Egypt

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**Abstract: Background:** Asthma is a major public health problem worldwide with wide differences in prevalence and severity throughout the world. Asthma is by far the most common of all chronic diseases of childhood. **Objectives*:*** to determine the prevalence of bronchial asthma and to investigate its impact on the cognitive functions and academic achievement among preparatory school children in Damietta Governorate. **Methods*:*** This work was done in two steps: (1) Determination of the prevalence of asthma for this purpose, a cross-sectional study was conducted during the academic year 2012-2013. Total number of students included in the study was 1426 (758 from urban and 668 from rural regions) with mean age 14.3±0.7 years. The questionnaire was filled by the participants themselves. (2) Assessment of impact of asthma on the cognitive function and academic achievement, for this purpose, Case control study was used to compare the asthmatic cases with control group**. *Results:*** The prevalence of asthma was 9.1%. The asthma was more prevalent among males (11.5%), than females (7.1%). There was no statistically significant difference between asthma and residence, parent's education and parent's occupation ($P > 0.05$ ). The asthma was more prevalent among students living in the lowest economic levels and those with high crowding index. The consanguinity among parents (OR=2.44; 95% CI: 1.62–3.66), positive family history of asthma (OR=3.79; 95% CI: 2.55–5.64), passive smoking (OR=2.74; 95% CI: 1.84–4.07), presence of other allergies (OR=2.37; 95% CI: 1.62–3.48), contact with birds (OR = 1.96; 95% CI: 1.34–2.87), contact with animals (OR=1.49; 95% CI: 1.02–2.17), presence of cockroaches (OR=1.73; 95% CI: 1.17–2.57), and frequent chest infection early in life (OR=2.05; 95% CI: 1.39–3.02) were risk factors which were significantly associated with asthma. There was a significant diminution of IQ total scale and classification scores among asthmatics. The mean free recall scores for asthmatics was (8.91 ± 3.74), compared to (11.54± 2.73) for control. There was statistically significant difference between asthmatics and controls regarding midyear Mathematic and Arabic scores ($P < 0.05$ ). **Conclusion:** The bronchial asthma is a significant health problem among school children in Egypt, and the following are recommended: Further in-depth study are in need to be conducted to explore the social, psychological and economic impacts of bronchial asthma on children, and to highlight the best prevention and control strategies for asthma in Egypt. Intensifying health education campaign to raise public awareness about the risk factors of asthma and its impact on school performance among school children. Establishment of a hotline to deal with public inquiries and all questions about asthma.

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## 1. Introduction

Asthma is a major public health problem worldwide with wide differences in prevalence and severity throughout the world. Significant increases in the prevalence and the severity have been noticed globally over the past few decades in certain geographical regions[(1)].

Asthma is a highly prevalent chronic respiratory disease affecting 300 million people world-wide[(2)]. Estimates from developed countries suggest that it affects between 11 and 20% of all school age children[(3)].

In Egypt, the bronchial asthma is a significant health problem among school children, and the prevalence was 7.7%[(4)].

Despite of our understanding of asthma's pathophysiology, there have been increase in the prevalence, morbidity and mortality of children with asthma during the prior 2 decades[(5,6)].

Independent of its impact, pediatric asthma results in significant number of hospitalization and time lost from school and other daily activities and has been associated with poor work and school performance, and 60% of students with asthma miss school annually due to respiratory symptoms[(7, 8, 9)]. Chronic asthmatic

disease has a negative effect on cognitive abilities, psychosocial behavior and academic achievement of such children[10].

Despite a large volume of clinical and epidemiological researches within affected populations, the etiology and risk factors of bronchial asthma remains poorly understood[11]. There are a number of known or common triggers that can cause inflammation or narrowing of the airways[12].

Children with asthma often suffer from more severe bouts of asthma because their lungs are narrower than those of adults[12].

Asthma symptoms can differ from person to person, but most people experience a worsening of symptoms at night and in the early morning. The symptoms include; coughing, wheezing, chest tightness, shortness of breath, increased mucus production. The presence of wheeze in the last 12 months is considered a surrogate marker for the diagnosis of asthma[12, 13].

For many patients, medication must be taken every day to control symptoms, improve lung function and prevent attacks[14].

Like adults, children can achieve better control of their asthma symptoms if they and their families work with health care providers to treat the disease as a chronic illness, and through regular ongoing treatment, aim to prevent symptoms from occurring[15].

**Rational**

So far, there have been few studies on the epidemiology of asthma in Egypt, but none in Damietta governorate. Therefore the present study has been carried out to determine the prevalence of bronchial asthma and to investigate its impact on the cognitive functions and academic achievement among preparatory school children in Damietta Governorate.

## 2. Subjects & Methods

**This work was done in two steps::**

1. Determination of the Prevalence of Asthma among preparatory school Children:

**Design & setting :** A cross-sectional study was conducted on the preparatory school students in Damietta Governorate. Damietta Center is one of (11 Centers and Cities) in Damietta Governorate and was chosen for the study due to the following reasons; ease of obtaining approvals from the relevant authorities to conduct the study, ease of data collection and ease of transportation, availability of target schools, and represented the urban and rural areas.

**Study sample:** Damietta Center included 40 preparatory schools. Four schools were selected randomly from the urban schools and included in the study (2 schools for boys and 2 for girls). On the other hand, four schools were selected randomly from the rural areas for the study. The rural schools included in the study were mixed (boys & girls). The study was covered all grades (grades 1, 2 & 3). All students in the selected schools were submitted in the study with response rate 60%. The total number of students included in the study were 1426 (758 from the rural areas and 668 from the urban areas). The study included 659 boys and 767 girls.

**Data collection:** The questionnaire used in the study was adapted from International Study of Asthma and Allergies in Childhood (ISAAC)[16]. The English version of the original questionnaire form was translated into Arabic language by specialist professional translator. The questionnaire form was tested on 30 students as a pilot study in order to evaluate the internal consistency and to determine the time needed to fill the questionnaire. Field work was conducted after obtaining approval for conducting the study from Damietta Educational Administration and from all schools selected for the study. Oral consent from every participant was obtained with nearly 60% response rate. All students in the selected schools were exposed to a brief orientation on the purpose of the study, variables included in the questionnaire and how to fill it?. The questionnaire was filled by the participants themselves under supervision of data collector over a period of one month (through February 2013). The field work took 3 days /weeks with an average number of 110-130 students per day. The socioeconomic status was assessed using Fahmy and El-Sherbini scale[17], (Low <17, Moderate 17-25 and High 26-34).

**1.** Assessment of cognitive abilities and academic achievement among asthmatic students:

**Study Design:** A case control study was used to compare the asthmatic cases with a control group to evaluate the cognitive function and academic achievement.

**Sample size:** The number of asthmatic students who have been diagnosed through the first part of the study were (130). The same number (130) students was chosen by systematic random sample from the same schools submitted in the study. All students were free from any chronic illness especially chronic asthmatic chest diseases were placed in a single list and every tenth was included in the study as a control. The control group was have the same characteristics of asthmatic students but they were free from any chronic illness especially chronic asthmatic chest diseases

The both groups (asthmatic and control) were subjected to the following:

**Assessment of cognitive abilities:** They were assessed by psychological tests that covered verbal and non-verbal intelligence, memory, learning, problem solving, and attention. The children were individually assessed. All psychological evaluations were administered in one session. The tests used were:

***A. The Arabic Version of the Revised Wechsler Intelligence Scale for Children (WISC-R)***[18, 19].This is the most widely used test for intellectual assessment and covers an age range of 6-16years.The test is scored according to a manual from which verbal and performance scores and intelligent quotient are obtained.

***B. The Auditory Vigilance Test:*** It measures the attention ability of the child. It is a measure of the efficiency of identifying signal stimuli in the context from the non-signal ones[20].

***C. The Figural Memory Test:*** This is a measure of the free recall of visual objects.[20] The free recall score is the number of items recalled correctly. The classification score is obtained by counting the number of the shifts from one category to the other, which is made by the subject during his recall. This was considered as an indicator of how he can organize aspects in his memory.

**Assessment of Academic Achievement:** Was assessed using the mid-year test scores of Arabic language and mathematics subjects for each child. It is considered as a good indicator of academic and learning performance[21]**.** Each group is classified according to the mid-year scores into good achiever (the mid-year score is ≥ 70%) and poor achiever (the mid-year score is < 70%).

***Data analysis:*** Data of this study were of both quantitative and qualitative types. Quantitative data were expressed as Mean ± SD, while Qualitative data were expressed as frequency and percent. Data were entered, organized, tabulated and analyzed using the standard computer program SPSS (Statistical Package for the Social Sciences) version 19. Student ***t***-test was used to measure the difference between means of two quantitative groups, while Chi square ($\chi^2$) was used to assess the relationship between two qualitative variables, with the significant level set at 0.05. Crude odds ratio (OR) and their 95% confidence intervals (CI) were calculated to test the significant of associated factors.

## 3. Results

The current study included 1426 students, (758 from the rural areas and 668 from the urban areas), with a mean age 14.3±0.7 years. Out of the 1426 responding children, 130 children fitted the diagnosis of asthma with a proportion of 9.1%.

The results revealed that, the asthma was more prevalent among males (11.5%), compared to (7.1%) among females. There was no statistically significant difference between asthma and residence, parent's education and parent's occupation ($P > 0.05$ ).

The findings shows that, there was a significant association between asthma and crowding index ($\chi^2_2$ = 9.40, $P < 0.05$ ), where the asthma was more prevalent among students living in the houses with crowding index 5 persons/room or more (14.0%), compared to (8.1% and 7.9%) among students with crowding index (3-5 persons/room) and (≤ 2 persons/room) respectively. The asthma was commonly prevalent among students living in the lowest economic levels, compared to (8.3% and 6.0%) for those living in the middle and highest levels respectively, table 1.

The findings revealed that, the consanguinity among parents (OR=2.44; 95% CI: 1.62–3.66), positive family history of asthma (OR=3.79; 95% CI: 2.55–5.64), passive smoking (OR=2.74; 95% CI: 1.84–4.07), presence of other allergies (OR=2.37; 95% CI: 1.62–3.48), contact with birds (OR = 1.96; 95% CI: 1.34–2.87), contact with animals (OR=1.49; 95% CI: 1.02–2.17), presence of cockroaches (OR=1.73; 95% CI: 1.17–2.57), and frequent chest infection early in life (OR=2.05; 95% CI: 1.39–3.02) were risk factors which were significantly associated with asthma, table 2.

The majority of asthmatic students (68.5%) had asthma for 10 years or more. The findings revealed that, the most common symptoms of asthma were; wheeze (91.5%), cough (75.4%), dyspnea (41.5%), and Chest tightness (37.7%). More than half of asthmatic attacks (63.1%) were commonly reported at night, while (23.8%) of the attacks were reported at day. The seasonal variation was reported among (77.7%) of asthmatic students, and the attacks were commonly reported in winter (71.5%). More than three quarters of asthmatic students (77.7%) were suffering from bouts of asthma once a month, while (16.2%) and (6.1%) of them were suffering once a week and once a day respectively. The most common triggering factors were; dust (86.9%), smoke (84.6%), physical effort (72.3%), food and drinks (52.3%), drugs (48.5%), common cold (46.2%), irritating odors (36.9%), and insecticide (30.0%). The majority of asthmatic students (81.5%) were undergone to the treatment during the bouts of asthma only, while (18.5%) of them were taking the treatment regularly, table 3.

Regarding total scale IQ, the mean total scale IQ for asthmatics was significantly lower than controls ($P < 0.05$). For free recall, the findings revealed that, the mean free recall scores for asthmatics was (8.91 ± 3.74), compared to (11.54± 2.73) for control and there was statistically significant difference ($P < 0.05$). For the classification, the mean scores for asthmatics was (2.86 ± 2.20), compared to (4.57 ± 1.61) for control, and there was statistically significant difference ($P < 0.05$). Regarding auditory vigilance test, the findings revealed that, the right answers in test A & B for asthmatics were significantly lower than controls ($P < 0.05$), and the wrong answers were significantly higher for asthmatics as compared to controls ($P < 0.05$), table 4.

The results revealed, there was statistically significant difference between asthmatics and controls regarding midyear mathematic scores ($\chi^2_1 = 52.30$, $P < 0.05$), where the majority of asthmatic students (88.1%) were achieved poor score, while (36.8%) of them were achieved a good score. Similar finding was also observed for midyear Arabic score, where (88.9%) of asthmatic students were achieved poor score, while (39.8%) of them were achieved a good score, table 5.

**Table (1): Distribution of studied sample according to asthmatic status and socio-demographic characteristics**

| Socio-demographic data | | Studied sample (n. = 1426) | | | | Total | df |
|---|---|---|---|---|---|---|---|
| | | Asthmatic (n= 130) | | Non-asthmatic (n= 1296) | | | |
| | | No. | % | No. | % | No. | |
| Gender | Male | 76 | 11.5 | 586 | 88.5 | 662 | 1 |
| | Female | 54 | 7.1 | 710 | 92.9 | 764 | |
| | $\chi^2 = 8.33$ | $P < 0.05$* | | | | | |
| Residence | Rural | 71 | 9.4 | 687 | 90.6 | 758 | 1 |
| | Urban | 59 | 8.8 | 609 | 91.2 | 668 | |
| | $\chi^2 = 0.12$ | $P > 0.05$ | | | | | |
| Father's education | Illiterate | 43 | 10.3 | 375 | 89.7 | 418 | 3 |
| | Basic education | 38 | 10.6 | 322 | 89.4 | 360 | |
| | Secondary | 26 | 8.0 | 301 | 92.0 | 327 | |
| | High education | 23 | 7.2 | 298 | 92.8 | 321 | |
| | $\chi^2 = 3.60$ | $P > 0.05$ | | | | | |
| Mother's education | Illiterate | 39 | 9.2 | 387 | 90.8 | 426 | 3 |
| | Basic education | 41 | 11.9 | 304 | 88.1 | 345 | |
| | Secondary | 28 | 8.3 | 311 | 91.7 | 339 | |
| | High education | 22 | 7.0 | 294 | 93.0 | 316 | |
| | $\chi^2 = 5.26$ | $P > 0.05$ | | | | | |
| Father's occupation | Employee | 38 | 9.3 | 370 | 90.7 | 408 | 2 |
| | Non employee | 40 | 9.0 | 405 | 91.0 | 445 | |
| | Skilled worker | 52 | 9.1 | 521 | 90.9 | 573 | |
| | $\chi^2 = 0.03$ | $P > 0.05$ | | | | | |
| Mother's occupation | Employee | 33 | 6.6 | 464 | 93.4 | 497 | 1 |
| | Housewife | 97 | 10.4 | 832 | 89.6 | 929 | |
| | $\chi^2 = 5.65$ | $P > 0.05$ | | | | | |
| Crowding index | ≤ 2 persons/room | 42 | 7.9 | 490 | 92.1 | 532 | 2 |
| | 3 – 5 persons/room | 51 | 8.1 | 579 | 91.9 | 630 | |
| | > 5 persons/ room | 37 | 14.0 | 227 | 86.0 | 264 | |
| | $\chi^2 = 9.40$ | $P < 0.05$* | | | | | |
| Economic level | Low | 67 | 11.7 | 506 | 88.3 | 573 | 2 |
| | Middle | 42 | 8.3 | 461 | 91.7 | 503 | |
| | High | 21 | 6.0 | 329 | 94.0 | 350 | |
| | $\chi^2 = 9.05$ | $P < 0.05$* | | | | | |

*Statistically significant difference.

**Table (2): Relationship between asthmatic status and some risk factors**

| Risk factors | | Asthmatic status | | | | Total | Odd ratio | 95% CI |
|---|---|---|---|---|---|---|---|---|
| | | Asthmatic (n= 130) | | Non-asthmatic (n= 1296) | | | | |
| | | No. | % | No. | % | | | |
| Consanguinity among parents | Yes | 45 | 16.3 | 231 | 83.7 | 276 | 2.44* | (1.62 – 3.66) |
| | No | 85 | 7.4 | 1065 | 92.6 | 1150 | | |
| Family history of asthma | Positive | 85 | 16.5 | 431 | 83.5 | 516 | 3.79* | (2.55 – 5.64) |
| | Negative | 45 | 4.9 | 865 | 95.1 | 910 | | |
| Passive smoking | Yes | 86 | 13.7 | 540 | 86.3 | 626 | 2.74* | (1.84 – 4.07) |
| | No | 44 | 5.5 | 756 | 94.5 | 800 | | |
| Presence of other allergies | Yes | 59 | 14.9 | 336 | 85.1 | 395 | 2.37* | (1.62 – 3.48) |
| | No | 71 | 6.9 | 960 | 93.1 | 1031 | | |
| Contact with birds | Yes | 73 | 12.5 | 512 | 87.5 | 585 | 1.96* | (1.34 – 2.87) |
| | No | 57 | 6.8 | 784 | 93.2 | 841 | | |
| Contact with animals | Yes | 71 | 10.9 | 579 | 89.1 | 650 | 1.49* | (1.02 – 2.17) |
| | No | 59 | 7.6 | 717 | 92.4 | 776 | | |
| Presence of cockroaches | Present | 48 | 12.8 | 327 | 87.2 | 375 | 1.73* | (1.17 – 2.57) |
| | Absent | 82 | 7.8 | 969 | 92.2 | 1051 | | |
| Frequent chest infection early in life | Yes | 81 | 12.3 | 579 | 87.7 | 660 | 2.05* | (1.39 – 3.02) |
| | No | 49 | 6.4 | 717 | 93.6 | 766 | | |

* Significantly associated factors.

**Table (3): Distribution of asthmatic students according to clinical characteristics of asthma**

| Clinical characteristics of asthma | | **Asthmatic students** (n. = 130) | |
|---|---|---|---|
| | | No. | % |
| Duration of asthma | < 5 years | 15 | 11.5 |
| | 5 – 10 years | 26 | 20.0 |
| | ≥ 10 years | 89 | 68.5 |
| | Mean ± SD 8.9 ± 4.6 | | |
| Asthmatic symptoms | Wheeze | 119 | 91.5 |
| | Cough | 98 | 75.4 |
| | Dyspnea | 54 | 41.5 |
| | Chest tightness | 49 | 37.7 |
| | Wheeze with cough | 45 | 34.6 |
| | Wheeze with cough and dyspnea | 31 | 23.8 |
| Daily variation | Nocturnal "at night" | 82 | 63.1 |
| | Diurnal "at day" | 31 | 23.8 |
| | Both | 17 | 13.1 |
| Seasonal variation | Yes | 101 | 77.7 |
| | No | 29 | 22.3 |
| Peak of seasonal attacks (n. = 101) | Winter | 93 | 71.5 |
| | Summer | 37 | 28.5 |
| Frequency of asthmatic attack | Once per day | 8 | 6.1 |
| | Once per week | 21 | 16.2 |
| | Once per month | 101 | 77.7 |
| Triggering factors | Dust | 113 | 86.9 |
| | Smoke | 110 | 84.6 |
| | Physical effort | 94 | 72.3 |
| | Food/drink allergen | 68 | 52.3 |
| | Drugs | 63 | 48.5 |
| | Common cold | 60 | 46.2 |
| | Irritating odors | 48 | 36.9 |
| | Insecticide | 39 | 30.0 |
| Course of therapy | During the attack only | 106 | 81.5 |
| | Regular treatment | 24 | 18.5 |

**Table (4): Distribution of studied groups according to Total scale IQ and results of Figural memory test and Auditory vigilance test**

| | | | **Studied groups** | | ***t*** | *P* value |
|---|---|---|---|---|---|---|
| | | | **Asthmatic** (n= 130) | **Control** (n= 130) | | |
| | | | Mean ± SD | Mean ± SD | | |
| Total scale IQ | | | 65.72 ± 15.53 | 94.13 ± 12.75 | 16.12 | P < 0.0* |
| Figural memory test | Free recall | | 8.91 ± 3.74 | 11.54 ± 2.73 | 6.47 | P < 0.0* |
| | Classification | | 2.86 ± 2.20 | 4.57 ± 1.61 | 7.15 | P < 0.0* |
| Auditory vigilance test | Test A | Right answer | 10.12 ± 2.39 | 14.51 ± 1.37 | 18.16 | P < 0.0* |
| | | Wrong answer | 3.22 ± 2.42 | 1.30 ± 1.35 | 7.89 | P < 0.0* |
| | Test B | Right answer | 10.13 ± 2.37 | 12.24 ± 1.31 | 8.88 | P < 0.0* |
| | | Wrong answer | 5.30 ± 2.58 | 0.95 ± 1.28 | 17.22 | P < 0.0* |

*Statistically significant difference.

**Table (5): Distribution of studied groups according to result of academic achievement**

| Result of academic achievement | | **Studied groups** | | | | **Total** (n.=260) | **df** |
|---|---|---|---|---|---|---|---|
| | | **Asthmatic** (n.= 130) | | **Control** (n.= 130) | | | |
| | | No. | % | No. | % | | |
| Midyear mathematic test | Good achiever | 71 | 36.8 | 122 | 63.2 | 193 | 1 |
| | Poor achiever | 59 | 88.1 | 8 | 11.9 | 67 | |
| | $\chi^2 = 52.30$ $P < 0.05$* | | | | | | |
| Midyear Arabic test | Good achiever | 82 | 39.8 | 124 | 60.2 | 206 | 1 |
| | Poor achiever | 48 | 88.9 | 6 | 11.1 | 54 | |
| | $\chi^2 = 41.23$ $P < 0.05$* | | | | | | |

* Significantly associated factors.

**4. Discussion**

Worldwide, the prevalence of asthma among children has increased steadily during the last 2 decades[22].

In the current study the prevalence of asthma was 9.1%, in agreement with Halim *et al.* who found that, the prevalence of asthma was (9.6%)[23]. Also a study conducted by Georgy *et al.* revealed that the prevalence was (9.4%)[24]. The current figure is higher than that reported in other studies[25, 26], and lower than that reported by other investigators[27,28]. Several factors may explain the discrepancy in the prevalence of asthma among the previous studies such as changes in the geographical, social, climatic and environmental factors as well as different levels of air pollution.

In literature, there is a controversy about gender vulnerability associated with an increased risk of developing asthma. Some studies revealed that male gender is associated with an increased risk of developing asthma. Boys are 1.5 to 2 times more likely than girls to develop asthma[29]. In the present study, the asthma was more prevalent among males than females, in agreement with other studies[13, 23, 27]. The exact reason for male predominance is not known but male predominance may be related to a greater degree of bronchial liability in males. Airways in boys are also smaller in comparison to their lung sizes when compared to girls[30].

In the present study, there was no statistically significant difference between the prevalence of asthma in urban and rural areas, in agreement with other studies[4, 25]. This may be due to similarity in environmental and climatic conditions in the urban and rural areas in Damietta Governorate due to close proximity to each other.

A study conducted by Abdallah *et al.* in Assuit Governorate, Egypt, revealed that , there was no statistically significant association between asthma and parent's educational and occupational levels[25]. The same finding was reported in the current study

A study conducted by Halim *et al.* in Ismailia Governorate, Egypt, revealed that, the prevalence and severity of asthma are affected by increase in low economic status and high crowding index families of school students[23]. In the current study the asthma was more prevalent among students living in the houses with high crowding index, in agreement with others studies[26, 31]. The crowding enhances the recurrent chest infection either viral or bacterial and this lead to increased nasal and bronchial hypersensitivity[31].

The asthma is more prevalent in poor area than less deprived area. This may indicate that poverty is associated with severe asthma or high percentage of persistent asthma symptoms[32]. The results revealed that, the asthma was commonly prevalent among students living in the lowest economic levels, in agreement with others studies[23, 24]. Also study conducted by Apter *et al.* revealed that, the higher prevalence of disability due to asthma present among children with low income families[33].

Genetics can play a role in triggering asthma. If asthma runs in the family, the chances are higher that younger generations will also contract the disease[34]. In the present study, the findings revealed that, both consanguinity among parents, and positive family history of asthma were significantly associated risk factors for asthma, in agreement with other studies[4, 23, 25]. This can be explained by the fact that asthma is a syndrome influenced by genetic and environmental factors[35].

Childhood exposure to smoking is also considered as a risk factor for the development of asthma. Similarly, in utero exposure to maternal smoking may be independently responsible for early onset asthma[36]. In the current study, the passive exposure to smoking was associated risk factors for asthma, in agreement with other studies[23, 26]. Smoking causes a lot of annoyance and bronchial irritation and may also increase bronchial sensitization[37].

In the present study, the presence of one type or more of other allergic diseases were significantly associated with asthma, in agreement with other studies[13, 25, 26] atopy particularly atopic dermatitis is a significant risk factor for development and persistence of asthma in children. In another study in Egypt, by Hossny *et al.* found that 53.3% of asthmatic children had associated allergic disease (atopic dermatitis, allergic rhinitis or food allergy)[38].

The results revealed that, the contact with birds and animals at home were significantly associated risk factors for asthma, in agreement with other studies[26, 39]. There is strong evidence that exposure to a number of animals allergens can lead to primary sensitization and increased the risk of developing allergic diseases[40].

A study conducted by Arruda *et al.* reported that, exposure to cockroach allergens in the first 3 months of life has been associated with repeated wheezing and asthma[41]. In the present study, the presence of cockroaches at home were significantly associated risk factor for asthma, in agreement with others studies[26, 42]. Cockroaches produce several allergens that induce sensitization, and exposure to high levels of cockroaches allergens in the home is a major risk factor for symptoms in sensitized individuals[43].

A study conducted by Nafstad *et al.* revealed that, the children who experience any respiratory infections during infancy have a higher risk of asthma later in childhood[44]. Also Busse *et al.* reported that, the viral respiratory infections during the early years of life

appear to be the dominant risk factor associated with the development and exacerbation of asthma[45]. The same finding was reported in the current study

The duration from onset of asthma symptoms to index date of asthma varies significantly depending on host and environmental factors[46]. In the current study the mean duration from onset of asthma symptoms was 8.9±4.6, in agreement with Abdallah *et al.* who found that, the mean duration from onset of asthma symptoms was 9.02 ± 5.04[25].

Asthma symptoms can differ from person to person, but most people experience a worsening of symptoms at night and in the early morning[12]. In the present study the most common symptoms of asthma were; wheeze, cough, dyspnea, and chest tightness, in agreement with others studies[4, 25, 38].

A study conducted by Abdallah *et al.* found that, 58.5% of the asthmatic children had their asthmatic attacks at night[25].The findings revealed that, the asthmatic attacks were commonly reported at night, in agreement with other studies[4, 26]. The mechanisms accounting for the worsening of asthma at night are not fully understood but may be stimulation of the vagus nerve causes bronchoconstriction and vagal tone might increase at night. Mediators might possibly stimulate irritant receptors in the airway to produce bronchoconstriction by vagal reflex[47].

The results revealed that, the seasonal variation was reported among (77.7%) of asthmatic students, and the attacks were commonly reported in winter, in agreement with other studies[25, 26]. Cold air, overcrowding, inadequate ventilation and increased frequency of upper respiratory tract infection, increases the chance of occurrence of allergy during the cool season[48].

Triggers differ between individuals and may change overtime. Overall the top five triggers for asthma symptoms were cold or infection, exercise, tobacco smoke, dust and pollen[49]. In the current study, the most common triggering factors were; dust, smoke, physical effort, food and drinks, drugs, common cold, irritating odors, and insecticide, in agreement with other studies[25, 50].

Children with asthma may be at risk for decreased school functioning due to acute exacerbations, increased absenteeism, iatrogenic effects of their asthma medication, and the stress associated with a chronic illness[51]. Also a study conducted by Samuel *et al.* revealed that, there was a significant effect of bronchial asthma on cognitive and behavioral functioning of asthmatic children[52]. Similar findings were reported in the current study. Factors that may contribute to poor school performance among children with asthma include iatrogenic effects of oral steroids, poor medical management of the disease, and psychological problems[13].

Chronic asthmatic disease has a negative effect on cognitive abilities, psychosocial behavior and academic achievement of such children[10]. The results of the current study revealed that, the asthma has a negative impact on children school achievement and educational process, in agreement with other studies[52, 53]. Increased school absence, stress of chronic illness, isolation from peers, diminished physical activities, reduced adult expectations and self-esteem, and depression can compromise children's academic adaptation and progress[54].

Several factors like severe chronic illness, poverty, and family dysfunction may increase the risk for educational and psychosocial impairment. In the current study, there is no opportunity to discuss the effects of such factors in the asthmatics.

## Conclusion

In conclusion; the current study revealed, the prevalence of asthma was 9.1%, and commonly reported among males than females. The asthma was more prevalent among students living in the lowest economic levels and with high crowding index. The consanguinity among parents, positive family history of asthma, passive smoking, presence of other allergies, contact with birds, contact with animals, presence of cockroaches, and frequent chest infection early in life were risk factors which were significantly associated with asthma. The asthmatic attacks were commonly reported in the winter and were reached to its peak at night. The bronchial asthma has a negative impact on cognitive abilities and academic achievement.

## Recommendations

Further in-depth study are in need to be conducted to explore the social, psychological and economic impacts of bronchial asthma on children, and to highlight the best prevention and control strategies for asthma in Egypt. Intensifying health education campaign to raise public awareness about the risk factors of asthma and its impact on school performance among school children. Establishment of a hotline to deal with public inquiries and all questions about asthma.

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