International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Factors Associated with Asthma Among Children Attending Selected Tertiary Care Child Hospitals in Dhaka, Bangladesh

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ABSTRACT

Background: Asthma is one of the most common chronic childhood illnesses, with rapidly increasing prevalence in low income countries. Among young children, asthma is often underdiagnosed. We investigated the factors associated with asthma among children attending two selected tertiary care child hospitals in Dhaka, Bangladesh. The primary objective was to identify factors associated with childhood asthma, also to find the socio-demographic information of the asthmatic patients.

Methods: A hospital-based cross sectional study was conducted between January and December 2018 among 280 asthmatic children aged 5-14 years. Diagnosis was done by physician. Structured questionnaire based on *International Study of Asthma and Allergies in Childhood* (ISAAC) Phase II for asthma in children was administered to the mothers. Analysis was done using descriptive and inferential measures.

Results: The Mean (±SD) age of the patients was 7.5 (± 2.5) (95% CI: 7.3 – 7.9). Boys (68.2%) were in higher proportion than girls (36.8%). The other prominent features of the children were: caesarian delivery 43.6%, breastfed 96.4% of which 62.9% had more than 12 months breast feeding and 46.4% were exclusively breast fed. The mean (± SD) monthly family income of the families was Taka 26,700 (± 11200; 95% CI: Tk. 25400 – 28000).

There was statistically significant association between age and type of asthma (χ^2 =10.5, p= 0.001, df= 1) (OR= 3.02; 95% CI: 1.51 – 6.0). We also found statistically significant association between type of delivery and type asthma passive smoking (χ^2 = 6.84, p= 0.009), OR= 0.398; 95%CI: 0.196 – 0.81), passive smoking and type of asthma (χ^2 = 4.2, p= 0.04, OR= 2.378; 95%CI: 1.02 – 5.57), gestation period and type of asthma (χ^2 = 8.5, p= 0.004, OR= 0.28; 95%CI: 0.12 – 0.69) and gender (χ^2 = 4.5, p= 0.03, OR= 0.6; 95% CI= 0.3 – 0.96).

Conclusion: Proportion of asthmatic patients was higher in boys than girls; also males were at 60% higher risk of exposure of passive smoking than females. Age, passive smoking, gestation period and birth by caesarean were significant risk factors for allergic asthma in childhood.

Keywords: Passive smoking, Asthma, Childhood.

Background

Asthma is caused by a combination of complex and incompletely understood environmental and genetic

interactions [1]. These factors influence both its severity and its responsiveness to treatment. It is believed that the recent increased rates of asthma are due to changing epigenetic and a changing living environment [2]

Passive smoking is the inhalation of smoke by persons other than the intended "active" smoker [2]. It occurs when tobacco smoke infuses any environment and is inhaled by people within that environment.

Globally, about 40% of children younger than 14 years are exposed to passive smoke within their homes these estimates are much higher for low-income countries in the South-East Asia, Western Pacific and Eastern Mediterranean regions [3].

A population-based study of 8,327 Hong Kong children found that infants exposed to passive Smoking in the first three monthsof life were most vulnerable to infections requiring hospitalization [4].

Furthermore, a systematic review and meta-analyses of 71 studies suggests pre- or post-natal exposure to second-hand smoke may account for an increased risk of wheezing and asthma [5]

In Bangladesh, passive smoking is recognized as a principal source of indoor air pollution and a major public health problem [6].

In these circumstances this study will be conducted to find out the factors affecting asthma among children attending tertiary hospitals, moreover, findings of this study will help to take appropriate measures to reduce the risk factors of asthma which in turn can minimize the risk of childhood asthma.

Methodology

It was a Hospital based cross-sectional study, conducted during January 2018 to December 2018.

This study was conducted at _Dhaka Shishu Hospital and National Institute of Diseases of the Chest and Hospital (NIDCH)‘ Dhaka Bangladesh.

Study population was all asthmatic children aged 5 – 14 years with physician diagnosed asthma in the two hospitals listed above. Based on day to day OPD attendance the study population of both hospitals together was estimated to be 1000, Hence, the sample size was calculated using the standard formula for cross sectional study viz.

$$\text{n0} = \frac{Z2pq}{d2}$$

Where, n0= initial sample size;

P= assumed prevalence of a factor (passive smoking = (40%, Zafar Ullah, et al., 2013)

q= 1- p

d= amount of error to be tolerated (5%)

z= 1.96, critical value of a standard normal deviate at 95% level of confidence.

Using these values in the above formula we have no = 369.

As the calculated sample size was much larger than the initial sample size finite population correction (fpc) was needed. Sample size with fpc was calculated using the formula below.

$$\text{nf} = \frac{n0}{1 + n0/N}$$

Where, no = Initial sample size =369

nf = sample size following fpc

N= Number of study Population =1000

Using these values in the formula we have, nf= 270

We apprehend 5% non-response. So response rate would be 95%
Final sample size n was obtained by applying adjustment for non-response and the sample size was 280. All diagnosed asthmatic children aged between 5 – 14 years with mother willing to participate were included in this study. Children in Bangladesh are grouped in three categories: shishu - anybody under 5 years of age, balak or balika - a child of 6 to 10 years and kishor or kishori - a child of age between 11 and 14 [7] , so all our participants were children.
Following points were ethically considered
Ethical clearance was obtained from the ethical review committee of Bangladesh University of Health Sciences, Dhaka (separate file)
Written permission was obtained from Hospital directors (separate file)
Written informed concnt was obtained from each mother of the child and assured confidentiality of the information provided and that the information is not used for any purpose other than research.
They have the liberty not to answer any particular question and or to withdraw at any stage of the study unconditionally.
Finally, the research report and subsequent publication of journal articles will consist of anonymous tables where individuals cannot be identified.
Structured questionnaire based on International Study of Asthma and Allergies in Childhood (ISAAC) Phase II for asthma in children was used. All questions were translated into Bengali.
Descriptive and inferential measures were used for the data analysis. For categorical variables, frequencies and proportions were presented as **point estimate**. For quantitative variables mean (±SD), Median (range) was employed wherever necessary. Confidence Interval (95%) was used to get **Interval estimate** of the prevalence rate/ mean for population. We also performed χ^2 test to identify association between two qualitative variables. All statistical analyses were performed using Statistical Package for Social Sciences (SPSS) for Windows version 16.

Results

A total of 280 childhood asthma patients were included in this study, More than sixty percent of asthmatic patients 177 (63.2 %) were male and remaining 103 (36.8 %) were females, 65.3% of asthmatic patients were class 1 – 5 followed by 23.6% class 6 – 10, 5.7% Madarasa, 5% Nursery and 0.4% were illiterate, More than one fourth of the asthmatic patients 225 (80.4%) were 5 – 9 years age group and remaining 55 (19.6%) were 10 – 14 years age group. Mean ± SD age group was 7.5 ± 2.5; (95% CI: 7.3 – 7.9), Distribution of asthmatic patients by type of delivery showed that more than half 158 (56.4%) were normally delivered and remaining 122 (43.6%) were caesarian section (Table 1). More than half of the asthmatic patients 149 (53.2%) had 1- 2 rooms, followed by the 116 (41.4%) 3 – 4 rooms and 15 (5.4%) had 5 or more rooms in their house. Mean ± SD room was about 2.58 ± 1 in number in their house, (95% CI = 2.45 – 2.71).
The study showed that, most of asthmatic patients 234 (83.6%) have allergic asthma, 34 (12.1%) night time asthma and remaining 12 (4.3%) exercise induced asthma, Majority of the asthmatic patients 176 (62.9%) had asthma one or more years, remaining 104 (37.1%) had less than one year, Most of the mothers 254 (90.7%) indicated that weather makes their Childs asthma worse, 230 (82.1%) fumes, 94 (33.6%) Cigarette smoke, 45 (16.1%) foods and drinks make worse their
Childs asthma (Table 2). 53.9% of asthmatic patients had no family history of asthma, but 129 (46.1%) had family history of asthma. majority of the asthmatic patients 44 (34.1%) who had family history of

asthma said that father had asthma, 37 (28.7%) mother, 19 (14.7%) grandfather, 18 (14%) Brother, 15 (11.6%) grandmother, 11 (8.5%) uncle, 9 (7%) aunt and 6 (4.7%) sister was who had asthma in their family. 158 (56.4%) of asthmatic patients were normally delivered while the remaining 122 (43.6%) were Caesarian.

Association between Type of asthma and associated risk factors

Allergic asthma was found higher (87.1%) in asthmatic patients; those age group were 5 to 9 years, the association between Age of asthmatic child and type of asthma was statistically significance (χ^2 = 10.5, P= 0.001, df= 1), Age group (5 – 9) years has three times higher risk of allergic asthma as compared to (10 – 14) year's group (OR= 3.02, 95%CI= 1.51 – 6.0), we also found that type of delivery and type of asthma were significantly associated (χ^2 = 6.84, P 0.009), normally delivered group have 40% lower risk of allergic asthma as compared to Caesarian group (OR= 0.398, 95%CI= 0.196 – 0.81), The association between passive smoking and type of asthma was also found statistically significant (χ^2 = 4.2, p= 0.04), group exposed to a passive smoking have 2.4 times higher risk of allergic asthma as compared to non passive smokers (OR= 2.378; 95%CI: 1.02 – 5.57) and gestation period were significantly associated with type of asthma (χ^2 = 8.5, p= 0.004), Group with less than 36 weeks gestational period have 28% lower risk of allergic asthma as compared to group with 36 weeks or more gestational period (OR= 0.28; 95%CI: 0.12 – 0.69). All other risk factors were found not statistically significantly associated with type of asthma (Table 3).

Table 1: Distribution of asthmatic patients by of type of delivery

Type of delivery	Frequency	Percentage
Normal birth	158	56.4
Caesarian section	122	43.6

Table 2: Distribution of asthmatic patients according to what makes asthma worse

Asthma worse	Frequency*	Percent
Weather	254	90.7%
Fumes	230	82.1%
Cigarette smoke	94	33.6%
Detergents	17	6.1%
Foods or drinks	45	16.1%

*Multiple responses

Table 3: Association between Type of asthma and associated risk factors

Variable	**Type of asthma**		**2 χ**	**P-value**	**OR (95% CI)**	**P-value**
	Allergic (%)	**Non allergic (%)**				
Gender						
Boy	145(81.9%)	32(18.1%)	0.96	0.33	0.749 (0.35 – 1.60)	0.457

Girl	89(86.4%)	14(13.6%)				
Age						
5 – 9 years	196(87.1%)	29(12.9%)	10.50	0.001	2.627 (1.21 – 5.70)	0.015
10 – 14 years	38(69.1%)	17(30.9%)				
Type of delivery						
Normal	124(78.5%)	34(21.5%)	6.84	0.009	0.493 (0.23 – 0.90)	0.038
Caesarian	110(90.2%)	12(9.8%)				
Passive smoke						
Yes	70(90.9%)	7(9.1%)	4.2	0.04	2.869 (1.15 – 7.16)	0.013
No	164(80.8%)	39(19.2%)				
Gestation period						
Less than 36 weeks	15(62.5%)	9(37.5%)	8.5	0.004	0.251 (0.09 – 0.70)	0.032
36 weeks or more	219(85.5%)	37(14.5%)				
Animal in home						
Yes	34(81%)	8(19%)	0.25	0.62	1.16 (0.42 – 3.19)	0.781
No	200(84%)	38(16%)				
History of asthma						
Yes	107(82.9%)	22(17.1%)	0.068	0.79	0.78 (0.39 – 1.56)	0.322
No	127(84.1%)	24(15.9%)				
Breast fed						
Yes	226(83.7%)	44(16.3%)	0.096	0.76	0.41 (0.047 – 3.55)	0.570
No	8(80%)	2(20%)				
Duration of asthma						
Less than 12 months	88(84.6%)	16(15.4%)	0.131	0.72	1.158 (0.80 – 1.67)	0.435
12 months more or	146(83%)	30(17%)				

DISCUSSION

This cross-sectional study was conducted in tertiary care hospital to determine the factors affecting asthma among children attending tertiary care hospital and also determinatns the sociodemographic characteristics of the respondents.

The mean (± SD) age (in years) of asthmatic patients was 7.5 (± 2.5) (95% CI: 7.3 – 7.9). Among the asthmatic patients number of boys was proportionally more (63.2%) than girls (36.8%) however, statistically not significant p= (0.457) but Similar findings were reported from India [8], Italy [9], United Arab Emirates [10], and Iran [11]. The reason for male gender predominance during childhood is not known. It would be due to gender wise difference in airways patency due to hormonal differences.

The study also showed that 158 (56.4%) of asthmatic patients were normally delivered while the remaining 122 (43.6%) were caesarian, also there was statistically significance between type of delivery and type of asthma (χ^2 = 6.84, P 0.009), normally delivered group have 40% lower risk of allergic asthma as compared to Caesarian group (OR= 0.398, 95%CI= 0.196 – 0.81).

Caesarian section has been previously reported as risk factor of asthma for different studies from several countries, Although we do not yet know the mechanisms by which caesarian deliveries may be linked with risk of developing asthma, it has been suggested that babies born by normal delivery swallow the microbial flora that colonizes the vaginal mucosa of the mother, which has been shown to stimulate the immune system to deviate towards a stronger direction than those born by the caesarian delivery who essentially have a sterile delivery [12].

From this study most of the mothers 270 (96.4%) indicated that their child get a breast milk, Among those (62.9%) were breastfed more than 12 months, and (46.4%) of that was exclusive.

In an earlier reported study [13], we found that children those not exclusively breastfed showed a stronger association with asthma as compared to those who were exclusively on breast milk for the first 6 months in their life.

The mechanism of effect of breastfeeding on asthma is, however, not clear. This could be due to the immunological and nutritional benefits of human milk [14]. Specific components in human milk have been suggested to promote the maturation of the immune system, such as large numbers of active white cells which release biologically active chemicals into the digestive system and surrounding tissues that have the potential to influence the developing immune system [15]. Furthermore, it has been shown that lung development is aided by a number of growth factors found in human milk. [16].

Numerous studies have suggested that exposure to tobacco smoke is indeed an important risk factor for the development of childhood asthma, about (27.5%) of asthmatic children, father was smoker and 14 (5.0%) were exposed with passive smoking in home. The association between passive smoking and type of asthma was found statistically associated ($\chi^2 = 4.2$, p= 0.04), group exposed to a passive smoking have 2.4 times higher risk of allergic asthma as compared to non-passive smokers (OR= 2.378; 95%CI: 1.02 – 5.57).

Earlier studies from different parts of the world have also reported a strong association between family history of asthma with reported prevalence of asthma from Australia [17], Scotland [18], Taiwan [19], and Sweden [20]. In this study (46.1%) of asthmatic patients had family history of asthma, 34.1% of them father had asthma, 28.7% mother, 14.7% grandfather, 14% Brother,

11.6% grandmother, 8.5% uncle, 7% aunt and 4.7% sister was who had asthma in their family.

We also observed that 80.4% of asthmatic patients were 5 – 9 years age group and remaining 19.6% were 10 – 14 years age group, as well as this age group (5 – 9) has 66.7% gestational period less than 36 weeks as compared to other group (10 – 14) year‘s age group with 33.3% gestational period. It is clear from previous studies that babies born prematurely may have poorly developed airways and delicate lungs that may make them susceptible to develop asthma [22].

The association between type of asthma and age group was found statistically significant (χ 10.5, P= 0.001, df= 1). Based on logistic regression 4 – 9 years age group were three times higher risk of allergic asthma than 10 – 14 years age group (OR= 3.0; 95%CI= 1.5 – 6). Although gender and family history of asthma have been previously associated with type of Asthma, we did not find any significant association with them in this study ($\chi^2 = 2.278$, P= 0.32) ($\chi^2 = 0.068$, P= 0.794) respectively. Similarly, there was no association between exclusive breastfeeding and type of asthma (($\chi^2 = 3.6$, P= 0.6).

Conclusion

The overall findings of this study revealed that in asthmatic patients the proportion of male was higher 63.2% than female 36.8%, Age, Passive smoking, gestation period and birth by Caesarean were significant

risk factors for allergic childhood asthma, Reducing exposures of children with asthma to these risk factors will reduce the health burden of allergic asthma and significantly improve their quality of life.
There is a need to strengthen capacity to prevention of asthma by increasing awareness about risk factors. Exposure to passive smoke has long been recognized as a risk factor for the development and attack of asthma, this effect can also contribute increasing duration of asthma, Reduction of the effect of passive smoking will reduce the health burden of asthma duration and significantly improve quality of life.

Limitations of the study

It was a hospital-based study at a tertiary care hospital; there may be many children particularly girls might not have received same attention as that of a boys thus giving low figure for girls, Sample size was small to determine the significant difference for factors with low prevalence. We did not include the severity assessment which could have helped us to analyze some important aspects.

Recommendations

Passive Smoking increases the chance of childhood asthma; moreover passive smoking increases duration of asthma which can lead to worse of asthma in adulthood. So, it is very important not to expose the child to passive smoking before and after birth. Since breast-feeding for at least four to six months strengthens a child's immune system, it is recommended that mothers to breast fed their children at least the first 6 months of their life.
Further studies are required to evaluate the exact role of the environment, socio-demographic and host factors in particular; however this study included only asthmatic patients it is recommended to include non-asthmatic patients for deeply investigation of risk factors.

Data availability

The data used to support the findings of this study are available from the corresponding author upon request.

Ethical approval:

This study was approved by the ethical Review committee of the Bangladesh University of Health Sciences, Bangladesh (Memo number BUHS/BIO/EA/17/142).

Conflict of interest:

The authors declare that they have no conflict of interests.

Authors contributions:

All authors read and approved the final manuscript.

Acknowledgements

We are grateful to all the subjects who participated in the study despite their time constraints.

Funding source:

This study was supported by the Bangladesh University of Health Sciences, Bangladesh. The sponsor had no role in the design of the study, collection, analysis and interpretation of data, writing the manuscript

and the decision to submit the article for publication.

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