



## Relationship between asthma and related factors of birth

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### Original Article

#### Abstract

**BACKGROUND:** Asthma is the most common chronic disease of childhood that causes disturbance in the physical, emotional, mental health, and different information has been mentioned on its risk factors, including factors associated with birth. Therefore, in this study, the relationship between children asthma and factors associated with birth was studied.

**METHODS:** This case-control study was performed on 50 children with asthma as the case group and 150 children hospitalized without asthma as the control group (after matched for age and sex) in an age range of 4-14 years old. Information required on factors affecting asthma was recorded for both groups. Data analysis was performed using SPSS for Windows software.

**RESULTS:** The results of this study showed that the majority of children in the case group were males born through cesarean operation (C-section). A significant difference was seen between two groups in terms of factors such as preterm [odds ratio (OR) = 3.27, confidence interval (CI) 95% = 1.57-6.81] and family history of asthma (OR = 8.50, CI 95% = 4.10-17.60). Regression model of relational variables with asthma show that the family history of asthma was most effective determinant on birth-related factors of asthma.

**CONCLUSION:** The findings of this study showed that positive family history of the disease and premature-birth in infant correlates significantly and directly with asthma occurrence in children. Thus, it is recommended to make further follow-ups in providing prenatal care and early diagnosis of the disease.

**KEYWORDS:** Asthma, Children, Birth-Related Factors

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### Introduction

Asthma is a chronic disorder of the airways.<sup>1</sup> It is the most common childhood disease that causes physical, emotional, psychological and mental problems in children and concerns the parents.<sup>2</sup>

Nowadays, more than 300 million people around the world suffer from asthma.<sup>3,4</sup> It has been estimated that 4.8 million children around

the world are suffering from asthma.<sup>5</sup> The prevalence of asthma among children has increased and its prevalence in different populations has been reported from 1% to over 30%.<sup>4,6</sup> Its prevalence in Iranian children has been reported as 8-12%.<sup>7</sup> It is anticipated that by 2015, the prevalence of asthma symptoms in children will exceed over 15%; a phenomenon that needs more consistent attention and planning.<sup>8,9</sup>

The role of multiple risk factors in causing childhood asthma has been studied including risk factors in childhood, maternal related factors and

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environmental factors.<sup>10</sup> Although in some cases, according to different roles of environmental factors, the risk factors for asthma have been studied at perinatal period, infancy, and childhood.<sup>11</sup>

Different birth-related factors such as gender, method of delivery, neonatal infections, and birth weight are involved in the development of childhood asthma.<sup>12</sup> Short gestation period can also impair fetal development.<sup>13</sup> Some studies indicate an association between cesarean section and asthma.<sup>14</sup> For example, a study in Norway showed that the infants born by cesarean section compared to babies born in the normal way were 50% more likely to develop asthma.<sup>15</sup> Regarding the relationship between breastfeeding and incidence of asthma, different results have been reported and hence that some of them have pointed to protective effects of breastfeeding,<sup>16</sup> and some others have mentioned it ineffective.<sup>17</sup> Of other important risk factors, the positive family history of atopic diseases can be mentioned since it increases the risk of asthma alone as 3-4 times more.<sup>16,18</sup> Other factors include living near industrial plants, maternal history of asthma, and birth weight less than 2500 g, maternal smoking (more than half a pack per day), small house and a large number of family members during the infancy period.<sup>19</sup>

Altogether asthma leaves behind many complications and causes high economic costs,<sup>20</sup> while using prevention methods, 70% of attacks can be prevented.<sup>21</sup> Since many factors can have a role in causing asthma, and the relationship of some of them is still not clear definitely, the researchers carried out this study to investigate the relationship between childhood asthma and birth-related factors in children in Iran.

## Materials and Methods

This case-control study was performed since March 2012 to December 2013 on children hospitalized in emergency and internal wards in Besat Hospital, Sanandaj, Iran. The case group included 50 children with asthma (convenience

sampling), and the control group included 150 children (convenience sampling), which were selected from children who had been hospitalized due to non-respiratory diseases and other reasons, including growth monitoring or transient viral infections and/or gastroenteritis in the ward. In this study, the case and control groups were matched based on age and gender. The inclusion criteria were 4-14 years of age range and the parents' consent for entering the study for both groups; for the case group, diagnosed as having asthma by a specialist in allergy and immunology and based on results of spirometry. Study exclusion criteria for the case group had any non-asthmatic chronic lung disease. All information was collected based on a questionnaire developed in conjunction with birth relevant factors. After obtaining parents' consent to participate in the study and explanations regarding confidentiality of information, data were collected by questionnaire and through interviews with parents. The questionnaire included demographic information and factors related to birth (age, sex, gestational age, type of delivery, birth weight, duration of exclusive breastfeeding, supplementary feeding time, and birth rank) and maternal factors (age, education level, occupation, and place of living). The questionnaire validity was assessed through content validity. Thus, the questions were provided to 10 pediatricians and nurses, and finally, their corrective and suggestive feedbacks were applied. The tool reliability was measured by Cronbach's alpha ( $\alpha > 0.79$ ) after completing by 20. The findings from studies were analyzed using SPSS for Windows (version 16.0, SPSS Inc., Chicago, IL, USA) software and chi-square test and t-test. The significance level was considered as  $\alpha < 0.05$  in this study; quantitative data and qualitative data were expressed as mean and standard deviation and as frequency and percentage, respectively. Finally, to specify more effective determinant of birth-related factors of asthma, a regression model was provided. Asthma's related variables with P-values  $< 0.2$

considered in the regression model in univariate analysis.

## Results

The two groups were matched for age and sex. The age mean in the case group and in the control group were respectively as  $7.19 \pm 3.31$  and  $7.26 \pm 3.30$  years old, and in both groups, the frequency of male subjects was higher than female ones, and the chi-square test showed no significant relationship between the two groups. Most studied samples in the two groups had a weight over 2.5 kg at birth, and the majority in case and control groups were developed according to gestational age and the t-test indicated a significantly relationship in this regard ( $P = 0.001$ ). The cesarean delivery was common in both groups that no significant differences were seen between the two groups. The duration of exclusive breastfeeding in the control group was about 6 months, and in about 3

months for the case group, and supplementary feeding for the age of 3-6 months was longer in the case group. In both studied groups, the incidence rate of first birth had the highest frequency. The mean maternal age at pregnancy period in the case and control groups was as  $29.36 \pm 7.51$  and  $30.00 \pm 7.50$  years, respectively, and no significant differences were observed between the two groups in this regard. No significant differences were seen between the two groups in terms of education and place of residence. Family history of asthma was as 50% in the case group and as 15% in controls, and the t-test was significant ( $P < 0.001$ ). The adjusted odds ratio (OR) values were calculated for studied parameters, and there was a significant difference between the two groups regarding factors such as preterm [OR = 3.27, confidence interval (CI) 95%: 1.57-6.81] and family history of asthma (OR = 8.50, CI 95% = 4.10-17.60) (Table 1). Considering the significance of the results with regard to the

**Table 1. Distribution of studied parameters in case (with asthma) and control groups**

	Group	Asthma frequency (%)	Control frequency (%)	OR (CI 95%)	P
Gestational age	Preterm	18 (36)	22 (14.70)	3.27 (1.57-6.81)	0.0500
	Term	32 (64)	77 (85.60)		
Type of delivery	Natural	26 (52)	96 (64.00)	0.60 (0.32-1.17)	0.1000
	Cesarean	24 (48)	54 (36.00)		
Birth weight	Below 2.5 kg	11 (22)	29 (19.30)	1.17 (0.54-2.57)	0.4000
	Above 2.5 kg	39 (78)	121 (80.87)		
Breastfeeding	6 months	19 (38)	35 (49.30)	1.60 (0.82-3.06)	0.0500
	Under 5 month	31 (62)	76 (50.70)		
Supplementary feeding time	From month 4	41 (82)	118 (78.80)	1.23 (0.54-2.80)	0.9000
	From month 6	9 (18)	32 (21.30)		
Birth rank	First rank	24 (48)	65 (43.30)	1.20 (0.63-2.30)	0.5000
	Second rank and higher	26 (52)	85 (56.70)		
Family history of asthma	Yes	30 (60)	25 (15.00)	8.50 (4.10-17.60)	0.0001
	No	20 (40)	125 (85.00)		
Mother age at pregnancy	Under 18 and over 35	11 (22)	40 (26.70)	0.77 (0.36-1.66)	0.5000
	18-35	39 (78)	110 (73.30)		
Exposed to cigarette smoke	Yes	17 (34)	55 (36.70)	0.89 (0.45-1.74)	0.5000
	No	33 (66)	95 (63.30)		
Place of living	Urban	42 (84)	108 (72.00)	2.04 (0.88-4.70)	0.0900
	Village	8 (16)	42 (28.00)		

OR: Odds ratio, CI: Confidence interval

**Table 2. Regression logistics model of relational birth factors with children asthma**

Variables	$\beta$	SE	Wald	df	P	Exp(B)	95% CI for Exp(B)	
							Lower	Upper
Preterm	1.118	0.425	7.827	1	0.005	3.280	4.229	18.009
Family history of asthma	2.166	0.382	32.267	1	0.001	8.727	1.427	7.540
Place of living	-0.881	0.512	2.959	1	0.085	0.415	0.152	1.131
Exposed to cigarette smoke	0.684	0.433	2.493	1	0.114	1.982	0.848	4.632

SE: Standard error, Df: Degree of freedom, CI: Confidence interval

relation between the variables of preterm, family history of asthma, exposed to cigarette smoke and place of living with children asthma incidence, a regression logistic model was provided to determine, which of these variables could be a better predictor. It shows that the family history of asthma ( $\beta = 2.166$ ) was most effective determinant on birth-related factors of asthma (Table 2).

## Discussion

In this study, birth risk factors in children asthma were studied, and the role of birth-related factors investigated. Finally, preterm and family history of asthma were related to the incidence of asthma.

Kiechl-Kohlendorfer *et al.* believes that susceptibility to asthma is affected by several factors early in the life.<sup>22</sup> The results of this study showed that male gender in line with previous studies was a risk factor for asthma. Asthma is more common in boys than girls before puberty time, and in different studies, a higher prevalence has been reported in boys.<sup>1,9,19,20,22,23</sup> In Iran, Rajaeifard *et al.* reported the male gender as the most important risk factor for the asthma.<sup>24</sup> Serum immunoglobulin E (IgE) levels in males under 1 year were significantly higher, and a significant association between the risk of persistent wheezing and serum IgE levels has been observed that could explain the increasing asthma rate in males.<sup>25</sup>

In the present study, short gestational age or premature infants in the case group was twice more than the control group. This result is in line with previous studies, which have reported a direct and significant relationship between early occurrence and increased prevalence of asthma.<sup>13,26,27</sup> In other studies, the association

between intrauterine lifetime and incidence of asthma did not show any significant difference.<sup>28,29</sup> Preterm birth causes reduced lung maturation, and thereby, increased sensitivity and respiratory diseases,<sup>13</sup> since exposes the infant to complications associated with respiratory system events.<sup>19</sup> Thus, it seems that identifying mothers with high-risk pregnancy and providing special care and appropriate follow-up can help to prevent preterm delivery, which in turn can help reducing the risk of childhood asthma.

In the present study, although the majority of children with asthma were born by cesarean section, but statistical test showed no significant relationship in this regard, which was consistent with previous studies in this area.<sup>30-32</sup> Due to the higher frequency of cesarean in Iranian women, this issue can be explained.<sup>33</sup> In other conducted studies, there was a significant association between delivery by cesarean section and asthma incidence.<sup>28,32,34</sup> In Salam *et al.* study, 25.13% of patients with asthma were born by cesarean section, which indicated a higher prevalence of asthma in children born through caesarean section.<sup>35</sup> In cesarean delivery, due to more contact with microbes and stimulating the creation of T-cell causing atopic reaction, the prevalence of asthma and atopic diseases is higher.<sup>36</sup> Also, vaginal delivery may reduce the risk of childhood asthma or prevent it.<sup>37</sup> In natural birth delivery, the infants contact with probiotics of the delivery channel and such material make the baby resistant to various allergies and life-threatening infections.<sup>16</sup> In this study, although there was no significant statistical relationship between cesarean rate and asthma, however, providing proper training to encourage mothers for natural birth

delivery can be one of the ways to reduce allergic diseases such as asthma.

Duration of exclusive breastfeeding in the case group was about 3 months that the study was consistent with Kramer *et al.* study, in which no significant difference was observed in the asthma incidence in case and control children<sup>38</sup> versus, in Bilan and Shiva analysis, in atopic children not nourished with breastfeeding, showed the risk of wheezing has been reported as 5.4 times more.<sup>27</sup> Based on the results of similar studies, with increasing absolute duration of breastfeeding (for at least 6 months), the prevalence of asthma has decreased dramatically.<sup>24,28,39,40</sup> It is believed that the mother milk creates some sort of protection against infections by transferring of IgG.<sup>13,39,40</sup> Despite the lack of statistically significant correlation, the rate of breast-feeding in the first 3 or 6 months of study samples was high that represents mothers higher tendency in both groups, which in turn can cause a lot of benefits.

Although the majority of samples in this study in the case group lived in the city, but no statistically significant relationship was seen between the risk of asthma and the location of residency, which was consistent with Mehrabi *et al.* study, is in the same region.<sup>41</sup> In other studies, such as Sole *et al.*, the higher prevalence of asthma in urban people than rural has been reported.<sup>42</sup> Such a case, given the lack of industry in the studied region and considering that the air is not polluted, and fine dusts are spreading similarly in urban and rural areas in recent years were common factors in studied subjects, and the lack of relationship could be justified.

In the present study, no significant association was found between having been exposed to cigarette smoke and asthma occurrence that can result from common risk factors in both groups, which is consistent with the results of some studies.<sup>30,43</sup> However, other studies reported that the contact with cigarette smoke is effective on asthma incidence.<sup>12,24,41,44</sup> In this respect, Bilan and Shiva study showed that the risk of asthma development with exposure to secondhand cigarette smoke increases approximately 2-times.<sup>27</sup>

Such differences between various studies may be due to different genetic factors influence and environmental factors in the different regions.

In this study, more than half of the children with asthma and only 15% of subjects in the control group had a positive family history of asthma, and the statistical test showed a significant difference between the two groups; such a result is quite consistent with other studies.<sup>12,27</sup> Adkinson *et al.* considered positive family history as the most important risk factor for asthma regarding atopic diseases.<sup>19</sup> Thus, this emphasizes more on the necessity to pay attention to perfect prenatal cares, avoiding other risk-making environmental factors for asthma development, encouraging the breastfeeding and the need for regular follow-up for early diagnosis of children asthma in such families.

One of the limitations of the study was a low number of samples due to the limited number of patients in the research area. Furthermore, according to the retrospective nature of the study, and the possibility of different biases, especially recall bias, and considering the importance of asthma and its prevalence in children, performing more extensive studies with a larger sample size and cohort planning to determine the relationship between asthma and various other factors, including the type of mother's diet during pregnancy or duration of breast-feeding is recommended.

## Conclusion

The study findings indicate birth-related factors such as preterm and family history of asthma were related to the incidence of asthma. Therefore, it seems positive family history of asthma requires a closer follow-up and observation after birth. Furthermore, providing appropriate care in pregnancy could prevent asthma, which should be considered in providing nursing care for mothers and infants.

## Conflict of Interests

Authors have no conflict of interests.

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