Original Article

Association of Breastfeeding and Childhood Asthma; A Case Control Study from Sialkot

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Abstract

Background: A rapid surge in air pollution is paralleled by a rapid rise in allergic respiratory disorders like asthma especially in vulnerable population like children. The only approach to curb this issue is to increase the protective post-natal exposures like breast feeding.

Objective: To determine the association of breastfeeding and childhood asthma in children presenting in Pediatric Department of Allama Iqbal Memorial Teaching Hospital, Sialkot.

Methods: In this matched case-control study a calculated sample of 72 pairs of children aged 4-12 years were recruited through non probability purposive sampling after matching for gender, age, and socioeconomic characteristics. Data was collected on a structured questionnaire. Statistical analysis was performed using SPSS version 27. Odds ratio and 95% confidence intervals were calculated for cases and controls to assess the association between breastfeeding and childhood asthma. p-value ≤0.05was considered significant.

Results: The majority of participants (61%) were male with median age of 7.1 (IQR 3.8) years. Odds of having childhood asthma was 2.71(CI 1.23-5.997) times higher in children who were breastfed <12months. Exclusive breastfeeding for 6 months was also found to be protective against childhood asthma OR 0.482(CI 0.248-0.936). Determinants of childhood asthma such as preterm birth, birth order, family history of asthma and associated allergies were significantly associated with an increased risk of childhood asthma.

Conclusion: Study suggested that prolonged and exclusive breastfeeding significantly reduces the risk of asthma in children.

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Introduction

Rapid industrialization and urbanization in the recent decade have deteriorated the air quality greatly. Due to brisk upswing in air pollution, allergic respiratory disorders (e.g. allergic rhinitis, childhood asthma etc.) have raised serious public health concerns. The most vulnerable age group affected by this climate change is of children. Childhood asthma is a chronic respiratory condition characterized by reversible inflammation and narrowing of the airways. Globally 22 million children are affected by asthma and allergic disorders.[1] Majority of affected children are living in

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lower- and middle-income countries where poverty and indoor allergens further worsens the situation.[2] In Pakistan the 15 million children are suffering from asthma.[3] Asthma exacerbation can lead to hospitalization, socio-economic burden, school absenteeism and impaired quality of life. Although the onset of childhood asthma has genetic predisposition but it is largely influenced by early life experiences and practices like breastfeeding. Breastfeeding is considered as a gift for the baby. Ideally it should be initiated within first hour of life because the colostrum, rich in immunoglobulins, protects the newborn against many infectious and immunological disorders. Human milk is now considered as biological system which not only meet the nutritional demands of the baby but also significantly contributes to maturation and regulation of immune system.[4] Through human milk live microbes are introduced in the intestine of infants which restores gut flora diversity and protects against many immune mediated and allergic disorders like asthma. Furthermore, Sucking strengthens the respiratory muscles which in turn may further reduce the risk of respiratory disorders.[5] World Health Organization (WHO) advocates that exclusive breastfeeding for a period of 6 months and continued feeding for a period of 2 or more years. The association between breastfeeding and the incidence of asthma has been explored in various studies, yet findings remain mixed. Some researches indicate that breastfeeding may reduce the risk of asthma, while other studies failed to find significant relationship.[6,7] This discrepancy highlights the need for further analytical studies, particularly in lower-middle class countries like Pakistan. The present case control study is planned to determine the association of breastfeeding and childhood asthma among children presenting in the pediatrics department of Allama Iqbal Memorial Teaching Hospital (AIMTH), Sialkot.

Methods

The present case control study was conducted at outpatient department of Allama Iqbal Memorial teaching hospital Sialkot between April to October 2024. Using WINPEPI, Continuity-corrected REQUIRED SAMPLE was 132 (66 cases, 66 controls) rounded off to 72, with 95% CI for difference between proportions, 80% power of study, taking proportion of exclusively breast-fed children among cases about 50% (reference) and assuming at least 75% controls to be exclusively breast-fed[8]. After taking ethical approval from institutional ethical review committee (letter no 25/REC/KMSMC), children aged 4-12 years of both genders having asthma, diagnosed by a certified pediatrician and followed up for at least 6 months were recruited through non probability purposive sampling as cases. The asthmatic children having co morbidities or congenital anomalies were excluded. The children of same age, gender and socio-economic characteristics, visiting the outpatient department for a health issue other than asthma were recruited as controls.

Children who were fed on human milk only for at least the first six months of life without any other food, water, or other fluids, (although vitamin and mineral supplements or medicine syrups were allowed) were considered as exclusively breastfed. Feeding inclusive of other sources and breastfeeding for less than six months was considered non-exclusive breastfeeding. After obtaining written informed consent, the researcher himself collected data on a structured questionnaire consisting of 2 parts.[9] The first part contained Socio-demographic characteristics of the participants. The second part had pertinent questions regarding breast-feeding history, duration and exclusivity of breastfeeding, timing of birth, mode of delivery, maternal, paternal and sibling asthma, associated allergies, maternal and paternal smoking, exposure to passive smoke and presence of fungus/mold at their homes. Cases and controls were matched for age, gender and socioeconomic characteristics. Confidentiality of the study participants was strictly maintained.

Data was entered and analyzed by using SPSS version 27. Categorical variables like mode of delivery, exclusiveness of breastfeeding, associated allergies etc. were dealt with percentages and frequencies. Kolmogorov test of normality showed the non-normal distribution of quantitative variables like age and duration of breast feeding so median and Interquartile range (IQR) was taken as measure of central tendency. Association between asthma and breastfeeding was assessed by using odds ratio and 95% confidence interval. chi-square test was used to compare various determinants of asthma between cases and controls. p value of ≤ 0.05 was considered significant.

Results

In this sample of 144 cases and controls male predominance (61%) was observed. Median age of participants was 7.1 (IQR 3.8) years. More than half of the controls (52.7%) while less than half of the cases have ventilated kitchen (47.3%). Regarding the medical and family history of participants, majority of the cases (69.4%) were of birth order[1]. Regarding the timing of delivery about one quarter of cases were born before term as compared to 6.9% of controls. About half of the cases

were delivered through cesarean section (48.6%) versus 37% 0f controls. (Table 1).

Table 1: *Medical &Family History of Participants*

Characteristics	Case	Control
Birth Order		
1 &2	50 (69.4%)	39 (54.1%)
	22 (30.6%)	33 (45.9%)
Time of Birth		
Term	55 (76.3%)	67 (93.0%)
Pre-Term	17 (23.7%)	5 (6.9%)
Mode of Delivery		
C-Section	35 (48.6%)	27 (37.5%)
SVD	37 (51.4%)	45(62.5%)
Maternal Asthma		
Yes	12 (16.6%)	1 (1.38%)
No	60 (83.4%)	71(98.61%)
Paternal Asthma		
Yes	18 (25%)	3 (4.16%)
No	54 (75%)	69 (95.8%)
Sibling Asthma		
Yes	24 (33.3%)	4 (9.7%)
No	48 (66.6%)	68 (90.2%)
Associated Allergy		
Yes	34 (47.2%)	8 (11.1%)
No	38 (52.7%)	64 (88.8%)
Paternal Smoking		
Yes	29 (40.2%)	20 (27.7%)
No	43 (59.7%)	52 (72.2%)
Passive Smoke Exposure		
Yes	35 (48.6%)	25 (34.7%)
No	37 (51.3%)	47 (65.2%)
Presence of Fungus		
Yes	17 (23.6%)	12 (16.6%)
No	55(76.3%)	60 (83.3%)

Table 2: *Practices Regarding Breastfeeding*

Practices	Case	Control	OR (95% CI)	p value
Breastfed			0.099	
Yes	63(87.5%)	71(98.61%)	(0.012-0.8)	0.009*
No	9(12.5%)	1(1.38%)		
Duration of Breastfeeding			2.717	0.011*
<12 months	25(34.7%)	12(16.6%)	(1.235-5.977)	
≥12months	46(65.2%)	60(83.3%)		
Exclusiveness of Breastfeeding			0.482	
Yes	30(41.6%)	43(59.72%)	(0.248-0.936)	0.030*
No	42(58.3%)	29(40.2%)		

** donates significant results.*

The median duration of breast feeding was significantly lower in cases (12 months, IQR 16) than controls (18 months, IQR 12). Only around 40% of the cases were exclusively breastfed for 6 months as compared to 60% of controls. Majority of controls continued breastfeeding beyond 12 months (83.3%). Exclusive breastfeeding proved protective against childhood asthma with odds ratio of 0.482 and 95% confidence interval of 0.248-0.93 (p= 0.03). (Table 2).

Table 3: *Determinants of Childhood Asthma*

Variable	OR (95% CI)	P-Value
Housing	1.398	0.317
Rural &Suburban	(0.725–2.696)	
Urban &Industrial		
Type of Kitchen	0.628	0.239
Ventilated	(0.288-1.367)	
Ill-Ventilated		
Birth Order	1.923	0.05*
1 &2	(0.971-3807)	
≥3		
Time of Birth		0.001*
Term	0.141*	
Pre-Term	(0.039-0.505)	
Mode of Delivery		0.178
C-Section	1.577	
SVD	(0.811-3.063)	
Maternal Asthma	14.2*	0.001*
Yes	(1.794-112.391)	
No		
Paternal Asthma	7.667*	0.001*
Yes	(2.146-27.384)	
No		
Sibling Asthma	8.5*	0.001*
Yes	(2.77-26.081)	
No		
Associated Allergy	7.158*	0.001*
Yes	(3.003-17.06)	
No		
Father Smoking	1.753	0.113
Yes	(0.872-3.525)	
No		
Exposure to Passive Smoke	1.778	0.091
Yes	(0.910-3.476)	
No		
Presence of Fungus	1.545	0.299
Yes	(0.678-3.525)	
No		

** donates significant results.*

Odds of developing the asthma was significantly higher for those who have Preterm birth, associated allergies, maternal asthma, paternal asthma, sibling asthma and 1st and 2nd birth order. While mode of delivery, exposure to passive smoking and presence of mold at home showed no association with childhood asthma. Odds ratio and 95% confidence interval of cases and controls are given in Table 3.

Discussion

An alarming rise in allergic respiratory disorders due to breakneck escalation of atmospheric pollution has underscored the necessity of modifiable post-natal exposures like breast feeding. Breastfeeding establishes a lifelong foundation for the health and wellbeing of infant. It has anti-inflammatory and immune-modulatory properties which are protective against allergic and immune mediated disorder.

WHO recommends the exclusive breastfeeding for 6 months which is thought to acclimatize the gut microbionta resulting in a reduction in allergic disorders. Our study established a protective effect of exclusive breastfeeding on childhood asthma (OR 0.099, p value = 0.009). Our findings are consistent with a study done by Chen et al[10] which manifested that exclusively breastfed for 4-6 months reduces the risk of asthma in preschool children (aOR, 0.69; 95% CI, 0.48–0.98). Similarly, a study conducted by Eogbu et al 11 evidenced the inverse association between exclusiveness of breastfeeding and childhood asthma (AOR 0.72; 95% CI: 0.54-0.97; p = 0.03). Eobgu et al further elaborated that early introduction of formula feeding before 6 months of age is associated with asthma.

WHO and American Academy of pediatrics (AAP) emphasizes the continued breastfeeding for 2 years or beyond along with introduction of weaning foods at 6 months of age. Our study determined the beneficial role of longer duration of breastfeeding on childhood asthma (OR 2.717, p = 0.011). Our findings are in line with a study conducted on three racially and geographically distinct pregnancy cohorts by Wilson et al[12] which revealed, the longer the duration of breastfeeding, the greater the protection against childhood asthma. Similar finding of protective role of longer duration and exclusiveness of breastfeeding is evidenced by a metanalysis and systematic review conducted by xue and his colleagues (OR 0.84, 95% CI 0.75–0.93; I2 = 62.4%).[13] Another study conducted by Di Filippo and colleagues demonstrated protective and beneficial role of duration and exclusivity of breast feeding on respiratory airways (β = 0.04, CI 95% (0.02–0.09) but failed to establish a significant association between allergic airway inflammation and breast feeding.[14]

Our study findings that, 1st and 2nd birth order (OR 1.932, p =0.05) and family history of asthma (OR 8.5.p= 0.001) were significantly associated with childhood asthma are harmonious with research performed by Yabin et al[15] who envisioned that being the only child in household and family history of asthma are important predictors for childhood asthma (1.16 ,95% CI: 1.03, 1.32), 2.99, 95% CI: 2.65, 3.36 respectively). Preterm birth (before 37 weeks of gestation) is associated with sustained inflammation which predisposes the infant to asthma and other chronic inflammatory conditions. Our study findings suggested that Preterm birth increases the odds of developing asthma in children which is in agreement with a nation-based survey conducted by cha and colleagues[16] which proved that preterm birth is a risk factor for asthma in children (an adjusted hazard ratio 1.24 (95% CI: 1.22–1.26). Another study conducted by Pulakka and his colleagues in Finland and Norway established the preterm birth as a risk factor for asthma (OR 2-4.21) and chronic obstructive pulmonary disease later in life.[17]

One of the remarkable findings of our study, the significant association between history maternal asthma and childhood asthma (OR 14.2, p= 0.01), is further authenticated by the study conducted by Deng.[18] Deng pointed out that maternal allergies during pregnancy is an important risk factor for childhood asthma (adjusted OR = 2.13, 95% CI 1.10–4.10). The other significant exposures identified by Deng were molds in bedroom, use of air conditioner and recurrent respiratory infections.

Childhood asthma is also modified by the mode of delivery because the Gut micro biome, which has a protective role against allergic disorders, is modified by Antibiotic prophylaxis during cesarian section, predisposing the newborn to allergic disorders. Our study did not show any significant association with mode of delivery but study conducted by Yabin et al[15] established significant association between delivery by cesarean section and childhood asthma (OR 1.12).

Exposure to second hand smoke predisposes the child to allergic and inflammatory disorders. In our study no significant association was observed between second hand smoke and childhood asthma (p=0.09) while a hospital -based case control study by Zhang revealed the role of indoor environmental pollutants like smoke (OR 2.115,95%-CI 1.275–3.508), benzene and formaldehyde in the pathogenesis and recurrence of childhood asthmatic attacks. This study also identified the breast-

feeding as a major protective factor to asthma (adjusted OR: 0.368, 95%CI]: 0.216–0.627).[19] The role of second-hand smoke in pathogenesis of childhood asthma is also elaborated by another study conducted in India by peri and Devgan9 which concluded higher odds of developing childhood asthma in children whose father's smoke (OR 1.44,95%CI 0.22-0.86) P=0.02).

Our study did not reveal any significant association between household molds and childhood asthma (p= 0.29) while Obgu and colleagues proved the molds as being a significant risk factor childhood asthma (p= 0.001). Obgu further demonstrated higher odds of asthma in children who have indoor and outdoor exposure to smoke as compared to children with no exposure to smoke.[20] This contrast may be due to difference in study design, sample size and operational definitions.

The strength of our strong is its matched case control design. While major limitation of our study is that is a single centered study conducted in a public sector tertiary hospital while private sector, having a major contribution in health care delivery in Pakistan was not included in this study. Another limitation was the non-representativeness nature of the cases because they were selected through non probability purposive technique. Similarly, mothers reported the practices regarding breastfeeding which maybe a source of recall bias in our study although many studies proved that validity and reliability of maternal recall regarding feeding practices for infant is high.[15] To overcome these limitations, we multi-centered longitudinal studies with large representative sample using should be carried out. Based on our study findings, we strongly recommend to implement the policies regarding early initiation of breastfeeding within one hour after delivery, exclusive breastfeeding for six months and continued feeding for two years. Feeding bottles must be discouraged and Baby friendly hospital initiative (BFHI) must be fostered in all institutions.

Conclusion

Our study findings suggest that prolonged and exclusive breastfeeding significantly reduces the risk of asthma in children. In addition, Preterm birth, associated allergies and family history of asthma predisposes the childhood to asthma. In contrast, mode of delivery, exposure to passive smoking and presence of fungus or mold at home showed no significant association with childhood asthma.

Ethical Approval: The Research Ethics Committee, Khawaja Muhammad Safdar Medical College, Sialkot approved this study vide letter No. 28/ REC/ KMSMC.

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Author's Contribution

RB: Conception & design, acquisition of data, analysis & interpretation of data, drafting of article

FL: Analysis & interpretation of data, critically revised it for important intellectual content, final approval of the version to be published

AK: Acquisition of data, drafting of article

TI: Acquisition of data

UFD: Acquisition of data, critically revised it for important intellectual content

SHZ: Acquisition of data, critically revised it for important intellectual content

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