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POLICY BRIEF

PUBLIC HEALTH & EPIDEMIOLOGY AXIS - ASTHMA

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Title: Factors associated with asthma, asthma control and quality of life in Lebanese children

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SUMMARY

Asthma is a chronic disease characterized by recurrent attacks of breathlessness and wheezing, chest tightness, and cough, which vary in severity and frequency from person to person as defined by the World Health Organization and the Global Initiative for Asthma (GINA) guidelines. Childhood asthma is one of the most important diseases of childhood, causing substantial morbidity^{1,2}.

Based on evidence from multiple research conducted on asthma in children, INSPECT-LB produced recommendations regarding several aspects of the disease, starting from the factors associated with the disease, including but not limited to smoking, alcohol drinking, detergents, pesticides and drugs exposure during pregnancy, as well as factors associated with asthma control and quality of life. Furthermore, an Asthma Risk Factors Scale (ARFS) score was created to screen for the presence of asthma in Lebanese children.

POLICY IMPLICATIONS/MAIN RECOMMENDATIONS TO THE MINISTRY OF PUBLIC HEALTH

- Endorse the utility of the translated Mini-Pediatric Asthma Quality of Life Questionnaire and Asthma Control Test in Arabic-speaking patients suffering from asthma among health care professionals. Based on our studies, health care professionals and researchers can readily use both scales among Lebanese asthmatic children as a routine screening test to identify the quality of life and asthma control in asthmatic children.
- Spread awareness about some factors related to a poorer quality of life in asthma children. The identification of risk factors, some of which are amenable to intervention especially uncontrolled asthma, could lead to an improvement in the situation of asthmatic patients.
- Spread awareness about factors related to asthma, a worse asthma control and a worse quality of life in asthmatic children. The most significant were waterpipe smoking during pregnancy and cigarette smoking during breastfeeding.
- Spread awareness about some types of diet, as well as the intake of over-the-counter drugs during pregnancy were also associated with higher odds of asthma in children. Adopting a healthy diet rich in fruits, fish and natural antioxidants is inversely related to current asthma.
- Organize educational programs for parents, physicians and pharmacists about asthma in children; spreading awareness among health care professionals, as well as reinforcing health education among parents in general and pregnant women in particular, seem to be an important step toward a better asthma control.

SUMMARY OF THE RESEARCH FINDINGS

Introduction

Although genetic predisposition and environmental exposure are thought to lead to the development of these conditions, the nature of such associations remains unclear. There is convincing evidence that maternal smoking during pregnancy and breastfeeding, leading to in utero and perinatal exposures to environmental tobacco smoke, are associated with increased risk of asthma³. However, in utero and young childhood exposures to these toxics have not been fully

assessed in Lebanon. While it is known that these exposures are common during pregnancy among Lebanese women ⁴, the association of exposure to toxic substances in utero and during infancy (alcohol, tobacco including cigarette and waterpipe smoke, pesticides, and detergents) with asthma has not been evaluated.

Background and Outcomes

We conducted a pilot study, with its objective to assess such associations among children aged less than 16 years old in schools in Beirut and Mount Lebanon. The results from questionnaires collected from 527 parents showed that a significant association was found between waterpipe smoking and diagnosed asthma in children ($p = 0.003$; $OR_a = 13.25$; 95% CI 2.472–71.026). Alcohol during pregnancy, waterpipe smoking during pregnancy and parents respiratory problems significantly increased the risk of respiratory problems by approximately 5 times, 6 times and 2 times respectively ($p = 0.016$; $OR_a = 4.889$; 95% CI 1.339–17.844, $p = 0.021$; $OR_a = 6.083$; 95% CI 1.314–28.172, $p = 0.004$; $OR_a = 1.748$; 95% CI 1.197–2.554 respectively) ⁵.

We wanted to confirm the results of the pilot study by conducting a case-control study. Out of 1680 questionnaires distributed in schools, 1503 (89.46%) were collected back from parents of the children aged between 3-16 years old. There were missing values in our results since not all questions were answered by all parents. The sample included 527 children had respiratory problems (35.1%; 95% CI 32.65-37.48), with 300 having diagnosed asthma (20%; 95% CI 17.937-21.983) and 227 having probable asthma (15.1%; 95% CI 13.29-16.92) respectively. The results showed that children living in North and South Lebanon and the child living in an area with frequent pesticides use had an increased risk of asthma ($OR_a = 1.625$, CI 1.034-2.554, $p = 0.035$, $OR_a = 13.65$, CI 3.698-50.385; $p < 0.001$ and $OR_a = 3.307$, CI 1.848-5.918, $p < 0.001$ respectively). Smoking WP during pregnancy and cigarette smoking during lactation by the mother would increase the risk of asthma in children ($OR_a = 6.11$; CI 1.244-30.008; $p = 0.026$ and $OR_a = 3.44$; CI 1.024-11.554; $p = 0.046$ respectively) ⁶.

Eating dairy products less than twice a week, 3-6 times per week and daily were significantly and inversely associated with asthma, as compared to never eating dairy product ($p=0.02$, $OR_a=0.285$, CI 0.099-0.821; $p<0.001$, $OR_a=0.140$, CI 0.052-0.378 and $p<0.001$, $OR_a=0.161$, CI 0.061-0.422), whereas eating red meat daily compared to never, was associated with asthma significantly ($p=0.037$, $OR_a=2.051$, CI 1.046-4.024). Eating nuts less than twice weekly as compared to never, was significantly and inversely associated with asthma ($p=0.035$, $OR_a=0.597$, CI 0.369-0.965). The age category 7-10 and 11-13 years were significantly associated with asthma as compared to the 3-6 years category ($p<0.001$, $OR_a=3.359$, CI 1.869-6.038 and $p=0.008$, $OR_a=2.191$, CI 1.228-3.909 respectively), while male gender was significantly more prone to asthma ($p=0.014$, $OR_a=0.686$, CI 0.507-0.926) ⁷.

We were able to validate the mini-PAQLQ questionnaire construct validity among 300 children aged between 7-16 years (51.6% boys and 48.4% girls). In the Lebanese population, an exploratory factor analysis was launched for the 13 items of the questionnaire, using the principal component analysis technique. Cronbach's alpha was recorded for reliability analysis. The correlation coefficients for factor 1 (symptoms and emotions) and 2 (activities) were similar to that of the original scale. High Cronbach's alphas were found for factor 1 (0.914), factor 2 (0.888) and the full scale (0.921). Uncontrolled asthma ($p<0.001$; $Beta=-1.54$; CI -1.722- -1.311), the child's respiratory problems before the age of 2 years ($p<0.001$; $Beta=-6.846$; CI -9.785- -3.907) and the presence of pets at home ($p=0.032$; $Beta=-5.364$; CI -10.256- -0.472) were significantly associated with lower children's asthma-related quality of life ⁸.

We were also able to validate the asthma control test among those children as well. The factor analysis for the asthma control questionnaire was run over the sample of healthy individuals and asthmatic patients (Total $n = 1503$). The asthma control items converged over a solution of one factor that had an Eigenvalue over 1, explaining a total of 66.34% of the variance. A Kaiser-Meyer-Olkin measure of sampling adequacy of 0.900 was found, with a significant Bartlett's test of sphericity (P

<0.001). Moreover, a high Cronbach's alpha was found for the full scale (0.959). We calculated the regression equation between the FEV1 and the whole scale. We obtained the equation: ACT score = 50.49 – [(0.5*FEV)] with $r = -0.682$ and $p < 0.001$. The better the FEV1 (higher scores), the better the asthma control (lower scores) ⁹.

The results of the first regression conducted on these asthmatic children, with the risk factors as independent variables showed that the low mother's educational level as well as the history of asthma in the mother and the father would significantly increase the risk of uncontrolled asthma by 1.862, 3.534 and 1.885 points respectively ($p = 0.001$; Beta = 1.862; CI 0.766-2.958; $p < 0.001$; Beta = 3.534; CI 2.324-4.744 and $p < 0.001$; Beta = 1.885; CI 0.978-2.793 respectively). Cigarette smoking by the mother during breastfeeding, as well as waterpipe smoking by the mother during pregnancy, were both significantly associated with a lower asthma control by 2.105 and 2.325 points respectively ($p = 0.005$; Beta = 2.105; CI 0.646-3.565 and $p = 0.041$; Beta = 2.325; CI 0.093-4.558 respectively). On the other hand, the high mother's level of education was significantly associated with more asthma control by 0.715 points ($p = 0.008$; Beta = -0.715; CI -1.241- -0.189).

An Asthma Risk Factor Scale (ARFS) was created to screen if the symptoms of the disease may vary with the number of risk factors the child has. The ARFS was created by combining the following risk factors: pesticide exposure of the child (presence at home of a person working with pesticides, living in an area sprayed with pesticides, use of pesticides at home); detergent mixing; alcohol drinking during pregnancy and breastfeeding; number of cigarettes per day or number of smoked waterpipes per week during pregnancy and breastfeeding; any drug intake during pregnancy and breastfeeding; the paternal and maternal smoking status and history of asthma; and the types of food the child eats (red meat, fast-food, nuts, dairy products, chocolate, milk, pastry, fish, legumes, fruits, olive oil, fried food, chips, caffeinated beverages). The diagnostic score for asthma (DS-asthma) was computed using the following equation: Asthma risk factors scale = (respiratory infections \times 10) + (playing in dust \times 2) + (playing on carpets \times 2) + (pulmonary problems in the child in the last 2 years \times 25.5) + (respiratory problems in the child before 2 years of age \times 13.5) + (humidity in the house \times 2.1) + (asthma in mother \times 6.3) + (asthma in both parents \times 9) + (history of reflux in the child \times 2.9) + (living in pesticides region \times 2.6) + (red meat daily \times 2.8) + (nuts <2 times/week \times 0.4) + (nuts 3–6 times/week \times 0.4) + (dairy products <2 times/week \times 0.3) + (dairy products 3–6 times/week \times 0.2).

In this formula, the presence of the variable is replaced by 1. If both parents have asthma, then replace that variable with 1 and replace asthma in the mother by 0. For nuts and dairy products consumption, choose the higher frequency of eating the type of food and replace the variable by 1. The scale has a minimum of 0 and a maximum of 73.1 points. In the sample, the minimum was 0 and the maximum was of 64.6. We divided the continuous score into 4 categories based on a 15-point increment (divided in quartiles) as follows: category 1 reflects the control group (0–14.99), category 2 (15–29.99) and category 3 (30–44.99) for undiagnosed/probable asthma and category 4 (more than 45) for diagnosed asthma ¹⁰.

A cross-sectional study was conducted on 1000 children recruited from public and private schools in Lebanon. Of the total enrolled participants, 107 children were diagnosed with current asthma and were analyzed. The food frequency questionnaire was used to assess participants' dietary habits. Adhering to Mediterranean diet (occasional, >3 times weekly and daily) was associated with lower odds of current asthma compared to never consuming Mediterranean diet ($p = 0.002$; ORa = 0.23; CI 0.09-0.956 and $p = 0.222$; ORa = 0.22; CI 0.079-0.667 respectively). The occasional consumption of bread was associated with higher odds of current asthma ($p < 0.001$; ORa = 8.27; CI 3.356-14.563), whereas daily consumption was significantly associated with lower odds ($p = 0.036$; ORa = 0.336; CI 0.121-0.978). Moreover, the occasional, ≥ 3 times weekly and daily consumption of meat were associated with higher odds of current asthma ($p < 0.001$; ORa = 9.6; CI 3.170-20.386; $p = 0.001$; ORa = 5.1; CI 1.982-12.322 and $p = 0.004$; ORa = 4.5; CI 1.617-9.611) respectively. An occasional

consumption of junk food was associated with lower odds of current asthma ($p < 0.001$; ORa=0.044; CI 0.012-1.051), whereas daily consumption ($p < 0.001$; ORa=14.685; CI 5.837-20.02) was associated with higher odds¹¹.

Furthermore, the intake of any medication during pregnancy ($p < 0.001$; ORa=7.05; CI 4.556-10.918) and a positive family history of allergic rhinitis ($p = 0.02$; OR=2.129; CI 1.129-4.017) were significantly associated with higher odds of asthma. Being in a public school ($p = 0.001$; ORa=0.344; CI 0.185-0.640) and being breastfed ($p = 0.004$; ORa=0.510; CI 0.322-0.808) were significantly associated with lower odds of asthma. The intake of paracetamol once weekly ($p < 0.001$; OR=4.66; CI 1.922-11.301) and the intake of proton pump inhibitors once per month during pregnancy ($p = 0.01$; ORa=3.498; CI 1.356-9.023) were significantly associated with higher odds of asthma in children.

Conclusion

All aforementioned projects were conducted by the public health axis of INSPECT-LB; many other projects are already submitted to peer reviewed journals and some are still ongoing.

Members of INSPECT-LB public health axis are ready to discuss any of these suggestions with the Ministry of Public Health, and present all needed documents. Hoping that these efforts would optimize the patient's health.

REFERENCES & PUBLICATIONS

1. Asher MI, Keil U, Anderson HR, Beasley R, Crane J, Martinez F, et al. International Study of Asthma and Allergies in Childhood (ISAAC): rationale and methods. *Eur Respir J*. 1995;8(3):483-491.
2. Worldwide variations in the prevalence of asthma symptoms: The International Study of Asthma and Allergies in Childhood (ISAAC). *Eur Respir J*. 1998;12(2):315-335.
3. Selgrade MK, Blain RB, Fedak KM, Cawley MA. Potential risk of asthma associated with in utero exposure to xenobiotics. *Birth Defects Res C Embryo Today*. 2013;99(1):1-13.
4. Rachidi S, Awada S, Al-Hajje A, Bawab W, Zein S, Saleh N, et al. Risky substance exposure during pregnancy: a pilot study from Lebanese mothers. *Drug Healthc Patient Saf*. 2013;5:123-131.
5. Hallit S, Salameh P. Exposure to toxics during pregnancy and childhood and asthma in children: A pilot study. *J Epidemiol Glob Health*. 2017;7(3):147-154.
6. Hallit S, Raheison C, Waked M, Salameh P. Association between Caregiver Exposure to Toxics during Pregnancy and Childhood-onset Asthma: A Case-control Study. *Iran J Allergy Asthma Immunol*. 2017;16(6):488-500.
7. Hallit S, Raheison C, Abou Abdallah R, Hallit R, Salameh P. Correlation of types of food and asthma diagnosis in childhood: A case-control study. *J Asthma*. 2017:1-9.
8. Hallit S, Raheison C, Waked M, Hallit R, Layoun N, Salameh P. Validation of the mini pediatric asthma quality of life questionnaire and identification of risk factors affecting quality of life among Lebanese children. *J Asthma*. 2019;56(2):200-210.
9. Hallit S, Raheison C, Waked M, Salameh P. Validation of asthma control questionnaire and risk factors affecting uncontrolled asthma among the Lebanese children's population. *Respir Med*. 2017;122:51-57.
10. Hallit S, Raheison C, Malaeb D, Hallit R, Waked M, Kheir N, et al. Development of an asthma risk factors scale (ARFS) for risk assessment asthma screening in children. *Pediatr Neonatol*. 2019;60(2):156-165.
11. Malaeb D, Hallit S, Sacre H, Malaeb B, Hallit R, Salameh P. Diet and asthma in Lebanese schoolchildren: A cross-sectional study. *Pediatr Pulmonol*. 2019.