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Preconception exposure to over-the-counter medications and antibiotics and the risk of childhood asthma in Lebanon: A cross-sectional study

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Abstract

Objective: The aim of this study was to elucidate the relationship between the mother's use of over-the-counter (OTC) medications during pregnancy and asthma in Lebanese children.

Methods: A cross-sectional study was conducted on Lebanese students in both public and private schools, between January and September 2017, involving 1000 children aged between 4 and 17 years.

Results: The intake of any medication as an independent variable throughout pregnancy reveals that being in a public school compared to a private one (Beta=0.344) and breastfeeding (Beta=0.51) were highly associated with lower odds of asthma, while having a positive family of allergic rhinitis (Beta=2.129) and the intake of any medication during pregnancy (Beta=7.052) were highly associated with higher odds of asthma.

A second logistic regression, taking as the dependent variable asthmatic versus healthy children and taking each OTC drug as an independent variable, showed that taking paracetamol once per week during pregnancy (Beta=4.66) and proton pump inhibitors (PPIs) once per month (Beta=3.498) compared to no intake were significantly correlated with higher probability of asthma.

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Conclusion: Our findings showed that the intake of paracetamol, vitamin C, and PPIs during pregnancy is strongly correlated with asthma in the offspring. Since these factors are avoidable, it is necessary to raise awareness among healthcare professionals to reduce the prevalence of asthma in children.

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INTRODUCTION

Asthma is the main reason why children miss school days and the third major cause of their hospitalization. It is the most common chronic inflammatory childhood disease in which many elements play a role in the hyperresponsiveness of the airways, leading to recurrent wheezing episodes, shortness of breath, tightness in the chest, and coughing, mostly at night or in the early morning.^{1,2} Many risk factors are involved in the increased propensity of asthma development in children, such as young age, male gender, low socioeconomic status, and private schools.³ It is well established that asthma is more prevalent in childhood, as wheezes are extremely common in the first year of life⁴ due to small airway narrowing, bronchoconstriction, and the presence of multiple recurrent viruses associated with cough and sputum production.⁵ Scientific evidence indicates that childhood asthma is more common in males since they have increased allergic inflammation and serum IgE levels, and smaller airway diameters, making boys more likely to develop asthma symptoms compared to girls.⁶ Another factor that may increase the risk of asthma development in children is the low socioeconomic status, which translates into the high exposure to stress, higher infection rates, increased risk of an atopic profile, and lower medical referral and regular follow-ups.⁷ Private schools also show a higher prevalence of asthma as children may be living in wealthy families, thus highly exposed to a variety of foods known to trigger asthma.⁸

Moreover, some of the known factors of childhood asthma include a family history of asthma in one or both parents, smoking, exposure to pesticides, and the use of medications during pregnancy.⁹ However, the etiology of childhood asthma remains unclear despite numerous studies within populations seeking to explain why some people develop asthma and other allergy-related diseases rather than others.^{10,11}

The relationship between medication use during pregnancy and asthma in children has been widely studied and involves several drug classes. The increase in antibiotic use went hand in hand with an increase in asthma in children,¹² triggering the investigation of the harmful effect of this class during the prenatal period^{13,14} and early childhood.¹⁴⁻¹⁶ It is noteworthy that some antibiotics are dispensed as over-the-counter (OTC) drugs in Lebanon, although the law classifies them as prescription only drugs.¹⁷⁻¹⁹ Paracetamol, an analgesic and antipyretic frequently used during pregnancy and in childhood, has been linked with the increased incidence of asthma.²⁰⁻²² Moreover, as a pleiotropic mediator that leads to pulmonary health, vitamin D seems to play a key role: children with asthma happen to be at increased risk of insufficient vitamin D. Epidemiological evidence suggests that low vitamin D levels in the serum of children

with asthma are associated with additional symptoms, exacerbations, reduced function of the lung, and increased use of medications.²³ Prenatal exposure to proton pump inhibitors (PPIs) and H2-blockers is a serious concern that may raise the risk of allergic disease in the offspring by increasing the risk of Th2-mediated conditions like asthma and allergies.²⁴⁻²⁶ Finally, non-steroidal anti-inflammatory drugs (NSAIDs) used during pregnancy are also involved in causing asthma in children, as the use of ibuprofen in the second and third trimesters and infant asthma at 18 months.²⁷

To our best knowledge, no studies have assessed the effect of medication intake during pregnancy and asthma in children in Lebanon. Therefore, this study aims to elucidate the relationship between the mother's use of medications during pregnancy and asthma in children.

Methods

General study design

This cross-sectional study, conducted between January and September 2017, enrolled Lebanese students from public and private schools. Schools were randomly selected based on the list of the Lebanese Ministry of Higher Education. A total of 34 schools were contacted from all the Lebanese regions: 17 public schools (5 in Beirut, 3 in South Lebanon, 1 in Nabatieh, 2 in Mount Lebanon, 5 in North Lebanon, and 1 in Beqaa) and 17 private schools (6 in Beirut, 6 in Mount Lebanon, 2 in North Lebanon, 1 in Nabatieh, and 2 in Beqaa). Eight schools (1 public and 7 private schools) declined to participate, and 26 out of 34 (76.47%) schools agreed to participate and thus the questionnaires were distributed to students between grades 1 and 9. All students aged 4-17 years were eligible, except those with chronic respiratory conditions or whose parents refused to participate.

A standardized questionnaire was distributed to participants to document asthma status and evaluate respiratory symptoms using validated International Study of Asthma and Allergies in Childhood (ISAAC) items. Students were asked to take it home, fill it out by their parents, and return it to school. The questionnaires were then collected back anonymously.

Sample size calculation

A sample of 886 patients was targeted to allow an adequate power for bivariate and multivariable analyses to be carried out according to the Epi-info sample size calculations, since paracetamol use during pregnancy was associated

with an increased risk of wheezing in the offspring in a previous study²¹ (adjusted odds ratio=2.10 and with a 95% confidence interval). A total of 1300 questionnaires were distributed to take into account refusals and loss of participants at follow-up, and gather all possible drug intake during pregnancy.

Data collection

The questionnaire used was self-administered, anonymous, in Arabic (the native language in Lebanon) and required around 25 min to complete. It assessed the sociodemographic characteristics, including age, gender, actual weight and height, the number of younger and older siblings, parents' level of education, and medical history (asthma, eczema, and rhinitis) of parents and siblings, in addition to questions assessing behaviors during pregnancy, that is, smoking (cigarette and waterpipe), alcohol consumption, and OTC medication use. It also included questions related to environmental conditions during early childhood, such as home humidity assessed by the presence of humidity and molds seen on walls, heating system in the household, and childhood history of recurrent otitis, or cardiac issues. Previous studies can show more details about the questionnaire.²⁸⁻³⁶

The questions that assessed OTC medications used during pregnancy encompassed the most studied medications that showed a correlation with an asthma diagnosis, that is, antibiotics,¹¹⁻¹⁴ paracetamol,¹⁵ vitamin D,²⁰⁻²¹ anti-reflux and acid-suppressive drugs,²⁴⁻²⁶ ibuprofen,²⁷ and vitamin C.³⁷ The frequencies of intake were divided into the following: never or occasionally, once every month, one-three times every month, once every week, two to four times a week, and more than five times a week. In some drugs variables, the frequencies were collapsed into several levels where cells do not contain 0.

This last section was translated into Arabic from the standardized and validated respiratory disease questionnaire of the American Thoracic Society.³⁸

The completed questionnaires were placed in sealed envelopes at the end of the collection process and sent for data entry.

The sample was divided into two groups: 1) a control group of healthy children with neither a physician-diagnosed respiratory illness nor respiratory symptoms (wheezing, coughing, and dyspnea), and 2) a group of children diagnosed asthma with symptoms (chronic wheezing, cough, and dyspnea), and an affirmative answer to the question "did your doctor ever tell you that your child has asthma?" Children were excluded from the analysis if they had respiratory symptoms without a physician's diagnosis of asthma.

Statistical analysis

A study-independent person analyzed the collected data using Statistical Package for Social Sciences (SPSS) software, version 23.0. Since missing data constituted less than 10% of the total data, it was not replaced in the database. Continuous variables are presented as mean and standard deviation and categorical variables as frequencies. Parametric tests were used since the variables showed normal distribution. Correlations between medication use

during pregnancy and asthma diagnosis were obtained by the Pearson chi-square test or the Fisher test when needed. Two multivariable logistic regressions took the presence vs. absence of asthma as the dependent variable and used independent variables showing a $p < 0.2$ in the bivariate analysis to protect against residual confounding. In the first regression, the intake of any medication was taken as an independent variable, while in the second regression, each OTC drug was taken as an independent variable. A value of $p < 0.05$ was considered statistically significant.

Results

Sociodemographic and other characteristics of the children

Out of the 1300 distributed questionnaires, 1000 (76.92%) were collected back from the children or their parents in schools. No comparison could be done between those who participated and those who did not since no data were available about those who did not participate. [Table 1](#) summarizes the sociodemographic and socioeconomic features of the children and their parents. Our results showed that the mean age of children was 10.34 ± 3.96 years (49.6% of boys and 50.4% of girls), with nearly the same distribution among governorates. Around 31% of these children had humidity at home, while 11.2% had a history of recurrent ear infections, and 1.2% had a history of heart problems.

Bivariate analysis of factors associated with asthma diagnosis

A remarkably higher percentage of asthmatic children were born to mothers who took any OTC medication (all classes included) during pregnancy (60.7% vs. 17.6%; $p < 0.0001$) compared to children whose mothers did not take any medication during pregnancy. Compared to children whose mothers did not take any medication during pregnancy, a substantially higher percentage of children with asthma were born to mothers who took paracetamol 1-3 times per month (31.8% vs. 2.2%) and once weekly (4.6% vs. 1.9%), respectively, and ibuprofen 1-3 times per month (13.1% vs. 1.9%) during their pregnancy. The same applies for the intake of acetylsalicylic acid once per month or more (23.4% vs. 0%), amoxicillin/clavulanic acid once a month (18.7% vs. 0%), vitamin C 2-4 times per week (19.6% vs. 3.8%), PPIs once per month or more (24.3% vs. 2.8%).

Furthermore, a significantly higher proportion of asthmatic children were born to mothers who took any OTC medication (all classes included) during lactation (4.8% vs. 0%), went to private schools (17.8% vs. 6.8%), and were delivered by C-section (57.9% vs. 45.7%). Finally, a higher proportion of children with asthma had a positive family history of asthma, eczema, allergic rhinitis, and allergy ([Table 2](#)).

Multivariable analysis

A first logistic regression considered children with diagnosed asthma versus healthy children as the dependent variable and the intake of any medication during

Table 1 Characteristics of the children who underwent study enrollment and their parents who completed the questionnaire.

Variable	Children	Mother	Father
Age, years (m±SD)	10.34±3.96	-	-
Weight in kg (m±SD)	54.04±11.67	-	-
Height in m (m±SD)	1.59±0.12	-	-
Gender: no (%)		-	-
Male	496 (49.6)		
Female	504 (50.4)		
Place of baby residence: no (%)			
Beirut	143 (14.3)	-	-
Mount Lebanon	139 (13.9)	-	-
South	149 (14.9)	-	-
North	138 (13.8)	-	-
Bekaa	121 (12.1)	-	-
Nabatieh	150 (15.0)	-	-
Akkar	160 (16.0)	-	-
School type: no (%)		-	-
Private	80 (8.0)	-	-
Public	920 (92.0)	-	-
Child vaccinations: no (%)			
No	153 (15.3)	-	-
Yes	847 (84.7)	-	-
Method of baby delivery: no (%)			
Normal	530 (53.0)	-	-
C-section	470 (47.0)	-	-
Asthmatic diagnosis: no (%)	107 (10.7)	-	-
Child still suffering from asthma: no (%)			
No	44 (4.4)	-	-
Yes	63 (6.3)	-	-
Smoke regularly: no (%)	-	357 (35.7)	503 (50.3)
Level of education			
Illiterate	-	25 (2.5)	28 (2.8)
Primary school	-	43 (4.3)	194 (19.4)
Complementary	-	187 (18.7)	325 (32.5)
Secondary school	-	482 (48.2)	345 (34.5)
University	-	263 (26.3)	108 (10.8)
Smoking			
Cigarettes	-	215 (21.5)	369 (36.9)
Waterpipe	-	135 (13.5)	108 (10.8)
Others	-	7 (0.7)	7 (0.7)
Family history of asthma			
Sister	2 (0.2)	-	-
Brother	25 (2.5)	9 (9.0)	57 (5.7)
Others	26 (2.6)	-	-
Family history of eczema			
Sister	8 (0.8)	11 (1.1)	7 (0.7)
Family history of allergic rhinitis			
Sister	11 (1.1)	15 (1.5)	7 (0.7)
Brother	26 (2.6)		
Others	23 (2.3)		
Kindergarten child attendance	180 (18.0)		

(Continued)

Table 1 Continued

Variable	Children	Mother	Father
Number of siblings older than child			
No	199 (19.9)	-	-
1-2 siblings	533 (53.3)	-	-
>3 siblings	268 (26.8)	-	-
Number of siblings younger than child			
No	381 (38.1)	-	-
1-2 siblings	511 (51.1)	-	-
>3 siblings	108 (10.8)	-	-
Intake of medication during pregnancy		222 (22.2)	
Humidity in the home	34 (31.8)	-	-
Fuel for heating		-	-
Gas	49 (45.8)		
Oils	9 (8.4)		
Firewood	25 (23.4)		
Electricity	16 (15.0)		
Central heating	8 (7.5)		
Smoking during pregnancy	29 (27.1)	-	-
Alcohol intake during pregnancy	7 (6.5)	-	-
Children recurrent history of ear infections	60 (7.4)	21 (24.4)	12 (11.2)
Children history of heart problems	7 (0.9)	0 (0.0)	2 (1.9)

pregnancy as an independent variable. The results showed that attending a public school (compared to a private one) (Beta=0.344) and breastfeeding (Beta=0.51) were significantly correlated with lower odds of asthma, whereas having a positive family history of allergic rhinitis (Beta=2.129) and the intake of any medication during pregnancy (Beta=7.052) were significantly correlated with higher odds of asthma (Table 3, Model 1).

A second logistic regression, taking asthmatic versus healthy children as the dependent variable and the intake of each OTC drug as an independent variable, showed that attending a public school compared to a private one (Beta=0.332) was significantly associated with lower odds of asthma, whereas taking paracetamol once per week during pregnancy (Beta=4.66) and PPIs once per month (Beta=3.498) compared to no medication intake were significantly associated with higher odds of asthma (Table 3, Model 2).

Discussion

This cross-sectional pilot study is the first to assess a potential correlation between maternal medication intake during pregnancy and childhood diagnosed asthma among Lebanese schoolchildren. It showed that the intake of some specific medications (paracetamol and PPIs) and a positive family history of allergic rhinitis were significantly linked to higher odds of

Table 2 Bivariate analysis of factors associated with asthma diagnosis.

Variable	Healthy	Diagnosed asthma	Pearson chi-square	P-value
Intake of any medication during pregnancy	157 (17.6%)	65 (60.7%)	103.085	<0.001
Intake of drug in pregnancy trimester			7.686	0.053
First	16 (10.2%)	11 (16.9%)		
Second	30 (19.1%)	17 (26.2%)		
Third	11 (7.0%)	0 (0.0%)		
All trimesters	100 (63.7%)	37 (56.9%)		
Paracetamol intake during pregnancy			295.318	<0.001
Never or occasionally	702 (78.6%)	41 (38.3%)		
Once per month	122 (13.7%)	9 (8.4%)		
One to three times per month	20 (2.2%)	34 (31.8%)		
Once per week	2 (1.9%)	41 (4.6%)		
Two to Four times per week or more	8 (0.9%)	21 (19.6%)		
Ibuprofen intake during pregnancy			41.422	<0.001
Never or occasionally	830 (92.9%)	91 (85.0%)		
Once per month or more	41 (4.7%)	2 (2.2%)		
One to three times per month	17 (1.9%)	14 (13.1%)		
Once per week or more	5 (0.6%)	0 (0%)		
Propranolol intake during pregnancy			2.946	0.099
Never or occasionally	869 (97.3%)	107 (100.0%)		
Once per month or more	24 (2.7%)	0 (0.0%)		
Acetylsalicylic acid intake during pregnancy			205.422	<0.001
Never or occasionally	891 (99.8%)	82 (76.6%)		
Once per month or more	0 (0.0%)	25 (23.4%)		
Amoxicillin/clavulanic Acid intake during pregnancy			258.355	<0.001
Never or occasionally	889 (99.6%)	75 (70.1%)		
Once per month	0 (0.0%)	20 (18.7%)		
One to three times per month	0 (0.0%)	9 (8.4%)		
Once per week or more	4 (0.4%)	3 (2.8%)		
Vitamin C intake during pregnancy			66.647	<0.001
Never or occasionally	766 (85.8)	74 (69.2)		
Once per month	27 (3.0)	3 (2.8)		
One to three times per month	0 (0.0)	2 (1.9)		
Once per week	43 (4.8)	7 (6.5)		
Two to four times per week	34 (3.8)	21 (19.6)		
More than five times per week	23 (2.6)	0 (0.0)		
Fish oil intake during pregnancy			1.825	0.177
Never or occasionally	878 (98.3%)	107 (100.0)		
Once per month or more	15 (1.7%)	0 (0.0%)		
Probiotics intake during pregnancy			2.196	0.138
Never or occasionally	875 (98.0)	107 (100.0%)		
Once per month or more	18 (2.0%)	0 (0.0%)		
Proton pump inhibitors intake during pregnancy			174.056	<0.001
Never or occasionally	868 (97.2%)	81 (75.7%)		
Once per month or more	125 (2.8%)	26 (24.3%)		
Vitamin D intake during pregnancy			29.687	0.996
Never or occasionally	809 (90.6%)	97 (90.7%)		
Once per month or more	84 (9.4%)	10 (9.3%)		
H ₂ blockers intake during pregnancy			1.578	0.657
Never or occasionally	880 (98.5%)	107 (100.0%)		
Once per month or more	13 (1.5%)	0 (0.0%)		
Intake of any OTC medication during lactation	0 (0.0%)	5 (4.8%)	43.149	<0.001
Gender			3.337	0.082
Male	434 (48.6)	62 (57.9)		
Female	459 (51.4)	45 (42.1)		

(Continued)

Table 2 Continued

Variable	Healthy	Diagnosed asthma	Pearson chi-square	P-value
Place of baby residence -			1.717	0.788
Beirut	126 (14.1%)	17 (15.9%)		
Mount Lebanon	124 (13.9%)	15 (14.0%)		
North	264 (29.6%)	34 (31.8%)		
South	267 (29.9%)	32 (29.9%)		
Bekaa	112 (12.5%)	9 (8.4%)		
School type			15.498	<0.001
Private	61 (6.8%)	19 (17.8%)		
Public	832 (93.2%)	88 (82.2%)		
Method of baby delivery			5.761	0.018
Normal	485 (54.3%)	45 (42.1%)		
C-section	408 (45.7%)	62 (57.9%)		
Breastfeeding (yes)	717 (80.3%)	67 (62.6%)	17.626	<0.001
Father level of education			23.007	0.167
Illiterate	28 (3.1%)	0 (0.0%)		
Primary	171 (19.1%)	23 (21.5%)		
Complementary	295 (33.0%)	30 (28.0%)		
Secondary/university	399 (44.7%)	54 (50.5%)		
Mother level of education			22.667	<0.001
Illiterate	24 (2.7%)	1 (0.9%)		
Primary school	40 (4.5%)	3 (2.8%)		
Complementary	151 (16.9%)	36 (33.6%)		
Secondary school	447 (50.1%)	35 (32.7%)		
University	231 (25.9%)	32 (29.9%)		
Positive family history				
Asthma	51 (5.7%)	75 (70.1%)	359.656	<0.001
Eczema	4 (0.4%)	22 (20.6%)	170.114	<0.001
Allergy	213 (23.9%)	90 (84.1%)	164.292	<0.001
Allergic Rhinitis	69 (7.7%)	15 (14.0%)	133.868	<0.001

childhood asthma, contrary to a recent Lebanese study³⁴ that did not find any correlation. However, the literature is full of evidence regarding the relationship between mother's intake of medications during pregnancy and childhood asthma.^{39,40}

Effect of paracetamol on asthma

The use of paracetamol 2-4 times per week during pregnancy was associated with higher childhood asthma, in agreement with previous studies.^{20,21,41-43} Many possible mechanisms can explain the causal link between paracetamol and asthma, the most common being the oxidant/antioxidant imbalance, as described by Koniman et al.⁴¹

Effect of proton pump inhibitors on asthma

Our findings revealed that the use of PPIs more than five times per week was associated with a high probability of asthma in the offspring. There is a controversy concerning this association; some studies did not find any link between the two variables,^{37,44} while others confirmed it.^{25,45}

Effect of vitamin D on asthma

The intake of vitamin D during pregnancy was not involved in childhood asthma. A cohort study⁴⁶ showed

that maternal intake of vitamin D in the first three months and up to 32 weeks gestation increased the risk of childhood wheezing at the age of 5. However, other research found that vitamin D supplementation from 27 weeks gestation did not decrease wheezing or asthma in 3-year-old children.⁴⁷ The results of these two trials suggest that vitamin D supplementation during the first and second trimesters (before 27 weeks of gestation) may be more appropriate.

Effect of antibiotics on asthma

Our findings showed no correlation between antibiotic consumption during pregnancy and childhood asthma. There is limited and inconsistent evidence regarding the role of some antibiotics in the development of asthma.^{39,48-50} No specific antibiotics used by the mother during pregnancy were linked to asthma in the offspring.³⁹ The mechanism by which antibiotics could influence the development of asthma in children is that they cross the placenta and enter the fetal bloodstream, causing neonatal microflora alterations, including the proliferation of resistant bacteria and immune developmental changes.⁵¹⁻⁵⁵ The postponed colonization of the gut microbiota of the child impairs the maturation of the immune system of the child and therefore affects asthma development.

Table 3 Multivariable analysis.

Model 1: Logistic regression 1 taking controls versus diagnosed asthma as the dependent variable and the intake of any medication during pregnancy as an independent variable

Factor	P-value	OR	95% confidence interval	
			Lower limit	Upper limit
School type (public vs. private*)	0.001	0.344	0.185	0.640
Breastfeeding (yes vs. no*)	0.004	0.510	0.322	0.808
Family history of allergic rhinitis (yes vs. no*)	0.020	2.129	1.129	4.017
Intake of any OTC medication during pregnancy (yes vs. no*)	<0.001	7.052	4.556	10.918

Variables entered in the model: intake of any medication during pregnancy, gender, school type, method of baby delivery, breastfeeding, mother's and father's level of education, and positive family history.

Model 2: Logistic regression 2 taking controls versus diagnosed asthma as the dependent variable and taking each OTC medication as an independent variable

Factor	P-value	OR	95% confidence interval	
			Lower limit	Upper limit
School type (public vs. private*)	0.002	0.332	0.166	0.664
Paracetamol intake during pregnancy once per week compared to no intake*	<0.001	4.660	1.922	11.301
Proton pump inhibitors intake during pregnancy once per month or more compared to no intake*	0.01	3.498	1.356	9.023

Variables entered in the model: paracetamol, ibuprofen, propranolol, acetylsalicylic acid, amoxicillin/clavulanic acid, vitamin C, fish oil, and proton pump inhibitors, gender, school type, method of baby delivery, breastfeeding, mother's and father's level of education, and positive family history.

OR, odds ratio.

*Reference group; Numbers in bold indicate significant p-values.

Limitations and strengths

This study presents some potential limitations. Its cross-sectional design, and thus a low level of evidence, cannot infer causality. Because this study is retrospective, the possibility of recall bias may exist, leading to the overestimation of effects. Moreover, many variables, but not all factors that might have a risk on the development of asthma, were considered. The nonparticipation bias is also possible since we had a 23% refusal rate. Although the sample was recruited from all Lebanese governorates, the results are not generalizable to the whole population. The medical history of mothers was not reviewed in coordination with the asthma exacerbation in children. Residual confounding bias might also be possible since some variables (health insurance coverage, birth weight, prematurity, and early childhood bronchiolitis) were not taken into account in this study. Consequently, prospective studies taking into account these limitations are needed, mainly to get unbiased information on drug use, either by interviewing pregnant women or by checking medical records or registers of prescribed medications. The strengths of this study include the numerous subjects recruited from all geographic areas of Lebanon, in addition to the diagnosis of asthma that was defined according to international criteria.

Conclusion

The use of medications during pregnancy seems to be a risk factor of asthma among schoolchildren in Lebanon. Our findings showed that the intake of paracetamol, vitamin C, and PPIs during pregnancy is strongly correlated with asthma in the offspring. Because these factors are avoidable, it is necessary to raise awareness among healthcare professionals to reduce the prevalence of asthma in children. Further prospective studies overriding the recall bias are warranted to confirm the accuracy of the results of this study.

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Competing interests

The authors declare that they have no competing interest.

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None.

Ethical consideration

The study protocol was approved by the Faculty of Pharmacy's Institutional Review Board at Lebanese

International University, based on the fact that it was an observational study that respected the autonomy and confidentiality of the participants and caused minimal harm to them. All parents who agreed to participate in the study provided a written informed consent.

Authors' contribution

The surveys were conceived and designed by DM, SH and PS. The data collection and entry were carried out by DM, DM, SH, and PS were involved in interpreting data and analyzing statistics. The manuscript was written by SH and DM. For intellectual content, all authors have critically revised the manuscript. The final manuscript was read and approved by all authors.

Availability of data and materials

There is no public access to all data generated or analyzed during this study to preserve the privacy of the identities of the individuals. The data set that supports the conclusions is available from the corresponding author upon request.

Consent to publish

Not applicable.

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