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THE IMPORTANCE OF PREVENTIVE MEASURES IN EARLY DIAGNOSIS AND PREVENTION OF DISEASE RECURRENCE AMONG WOMEN OF REPRODUCTIVE AGE WITH BRONCHIAL ASTHMA

Kasimova D. A.
Musurmonova M. A.
Tashkent State Medical University

Abstract:
Asthma is a common and potentially life-threatening chronic respiratory condition that frequently complicates pregnancy and poses significant risks to both maternal and fetal health when inadequately controlled. This review integrates evidence from clinical trials, observational studies, systematic reviews, meta-analyses, and international guideline recommendations to provide a comprehensive overview of asthma in pregnancy. Physiological adaptations during gestation, including changes in respiratory mechanics, immune regulation, and hormonal balance, can alter asthma severity and contribute to an increased risk of exacerbations, particularly during early and late pregnancy. Approximately two-fifths of pregnant women experience worsening asthma symptoms, which are associated with adverse obstetric and neonatal outcomes such as hypertensive disorders of pregnancy, gestational diabetes, fetal growth restriction, preterm birth, and cesarean delivery. Maternal comorbidities, including obesity, depression, and metabolic disorders, as well as environmental and nutritional factors, further modify disease control and pregnancy outcomes. Importantly, current evidence indicates that most standard asthma therapies, including inhaled corticosteroids, bronchodilators, and selected biologic agents, are safe and

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effective during pregnancy. Optimal asthma management relies on individualized treatment strategies, regular monitoring, patient education, and multidisciplinary care to minimize risks and improve both short- and long-term outcomes for mothers and their offspring.

Keywords: Asthma in pregnancy; Maternal asthma control; Pregnancy outcomes; Asthma exacerbations; Pharmacological safety; Perinatal risk factors; Childhood asthma; Multidisciplinary care

Introduction

Asthma is a frequent and potentially life-threatening disease that complicates many pregnancies. There are extensive data with regard to the diagnosis and treatment of asthma during pregnancy. Medical providers require an up-to-date summary of the critical aspects of asthma management during pregnancy. This review aimed to summarize the available data from clinical trials, cohort studies, expert opinions, and guideline recommendations with regard to asthma in pregnancy. Clinical trials, observational studies, expert opinions, guidelines, and other reviews were included. The quality of the studies was assessed, and data were extracted and summarized. Asthma worsens in;40% of pregnant women, which can be associated with maternal and fetal complications. Physiologic changes in the respiratory, cardiovascular, and immune systems during pregnancy play a critical role in the manifestations of asthma. The diagnosis and the treatment of asthma are similar to that of patients who are not pregnant. Nonetheless, concern for fetal malformations, preterm birth, and low birth weight must be considered when managing pregnant patients with asthma. Importantly, cornerstones of the pharmacotherapy of asthma seem to be safe during pregnancy [1].

This comprehensive review delves into the intricate relationship between asthma and pregnancy, specifically focusing on the challenges encountered in the first

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trimester and the ensuing impact on maternal and fetal health. Examining physiological changes during pregnancy reveals the dynamic interplay influencing respiratory function and immune responses. Key findings underscore the vulnerability to asthma exacerbations in the critical first trimester, emphasizing the potential risks to both maternal and fetal well-being. Maternal and fetal outcomes are discussed, emphasizing the associations between poorly controlled asthma and adverse perinatal outcomes. Implications for clinical practice highlight the importance of preconception care, continuous monitoring, and collaborative efforts between obstetricians and pulmonologists. Patient education emerges as a fundamental aspect to empower pregnant women in managing their condition. Emphasizes the imperative for comprehensive care, advocating for individualized treatment plans, multidisciplinary collaboration, and public health initiatives. By adopting this holistic approach, healthcare providers can navigate the complexities of asthma during pregnancy, ultimately ensuring the optimal health of both the expectant mother and her developing fetus [12].

Asthma is the most common chronic disease to affect pregnant women and can have a significant effect on pregnancy outcomes, with increased rates of preterm birth, premature delivery and caesarean section observed if poorly controlled. Pregnancy can also influence asthma control. Prescribing in pregnancy causes anxiety for patients and healthcare professionals and can result in alteration or undertreatment of asthma. Good asthma control with prompt and adequate management of exacerbations is key to reducing adverse pregnancy outcomes for both mother and fetus. The majority of asthma treatment can be continued as normal in pregnancy and there is emerging evidence of the safety of biologic medications also. The aims to summarise the current evidence about asthma in pregnancy and guide the appropriate management of this population [6].

The maternal immune system is very important in the development of the foetal immune system. Probiotics have been shown to help regulate immune responses.

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Therefore, it is possible that the administration of probiotics to pregnant women could influence the development of the foetal immune system, reducing the likelihood of infants and children developing an allergic condition. The aim of this research was to conduct a systematic review to determine whether administering probiotics to pregnant women can reduce the incidence of allergic disease in their children. Medline, CINAHL and Embase databases were searched for randomised controlled trials (RCTs) that compared supplementation of probiotics to pregnant women to a placebo control and recorded the presentation of allergic conditions in their children. Data extracted from the study reports included their characteristics and findings. Study quality and risk of bias were assessed. From a total of 850 articles identified in the search, 6 were eligible for inclusion in this review. Two studies found no effect of maternal probiotics on the outcomes measured, two studies found that the incidence of eczema or atopic dermatitis (AD) was reduced by maternal probiotics, one study found no effect on the overall incidence of atopic sensitisation, but a reduction in a subgroup of children at high hereditary risk of allergic disease, and one study found no effect in an intention to treat analysis, but a reduction in AD in complete case analysis. The results of these studies are inconsistent but demonstrate that probiotics may have the potential to reduce infant allergies when administered prenatally, particularly in children at high risk of allergy development. There is a need for further largerscale studies to be performed in order to provide a more definitive answer. Such studies should focus on at-risk groups [3].

Objective to assess the effect of obesity on the prevalence of asthma, obstetric outcomes and delivery outcomes in pregnant women with asthma. A comprehensive systematic review and meta-analysis were conducted up to 31 March 2024, using four public search engines. Following the Preferred Reporting Items for Systematic Reviews and Meta-Analysis guidelines, both quantitative and qualitative data were collected and analysed. Results We included 11 studies from 2006 to 2022 involving 77 611 386 pregnant patients (3.1% had asthma).

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Obesity increased the odds of asthma (n=2; OR 2.42, 95% CI 1.14–5.15) and increased that of uncontrolled asthma (n=6; OR 1.29, 95% CI 1.11–1.50) in pregnant women. In an adjusted pooled analysis, pregnant women with asthma were more likely to develop hypertensive disorders of pregnancy (HDP) (n=3; adjusted OR (aOR) 1.21, 95% CI 1.10–1.34), gestational diabetes mellitus (GDM) (n=3; aOR 1.14, 95% CI 1.04–1.26), fetal growth restriction (FGR) (n=2; aOR 1.18, 95% CI 1.15–1.21), preterm birth (PTB) (n=2; aOR 1.26, 95% CI 1.25–1.27), caesarean delivery (CD) (n=3; aOR 1.22, 95% CI 1.11– 1.33) and severe maternal morbidity (n=1; aOR 1.50, 95% CI 1.45–1.55). Three comparator studies that examined the effect of obesity on obstetric outcomes cited obesity as a risk factor for HDP (n=1; aOR 1.7, 95% CI 1.3–2.3), GDM (n=1; aOR 4.2, 95% CI 2.8–6.3) and CD (n=1; aOR 1.6, 95% CI 1.3–2.0) in pregnant women with asthma. Pregnancy with asthma may increase the risk of HDP, GDM, FGR, PTB and CD, and obesity has the potential to further increase the risk of HDP, GDM and CD in pregnant women with asthma [7].

Low levels of circulating 25-hydroxy-vitamin D [25(OH)D] have been shown to associate with prevalent attention-deficit/hyperactivity disorder (ADHD), but few studies have examined the association between 25(OH)D during fetal development and risk of childhood ADHD. Maternal plasma 25(OH)D was measured at 10-18 and 32-38 weeks of gestation, with sufficiency defined as 25(OH)D ≥ 30 ng/ml. Offspring ADHD status between ages 6-9 years was measured by parent report of clinical ADHD diagnosis among 680 mother-child pairs from the Vitamin D Antenatal Asthma Reduction Trial. Association between maternal 25(OH)D and child ADHD was assessed using logistic regression, adjusting for maternal age, race and ethnicity. Effect modification by offspring sex was also assessed. No associations between maternal 25(OH)D at 10-18 weeks of gestation and offspring ADHD were observed. In the third trimester, we observed associations between maternal vitamin D sufficiency and offspring ADHD [odds ratio (OR) 0.47, 95% confidence interval (CI) 0.26-0.84], in

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addition to maternal 25(OH)D sufficiency category, comparing the deficient (OR 0.34, 95% CI 0.12-0.94), insufficient (OR 0.41, 95% CI 0.15-1.10) and sufficient (OR 0.20, 95% CI 0.08-0.54) categories against highly deficient 25(OH)D, respectively. Stratified analyses revealed a protective association for sufficient maternal 25(OH)D and child ADHD among males (OR 0.47, 95% CI 0.23-0.94); the synergy index for additive effect modification of risk was 1.78 (95% CI 0.62-5.08). Higher levels of maternal vitamin D in the third trimester are associated with lower risk of ADHD in offspring, with modest evidence for a stronger effect among male offspring. However, larger studies will be necessary to confirm these findings [2].

Asthma exacerbations in pregnancy are associated with adverse perinatal outcomes. We aimed to determine whether fractional exhaled nitric oxide (FENO)-based asthma management improves perinatal outcomes compared to usual care. The Breathing for Life Trial was a multicentre, parallel-group, randomised controlled trial conducted in six hospital antenatal clinics, which compared asthma management guided by FENO (adjustment of asthma treatment according to exhaled nitric oxide and symptoms each 6–12 weeks) to usual care (no treatment adjustment as part of the trial). The primary outcome was a composite of adverse perinatal events (preterm birth, small for gestational age (SGA), perinatal mortality or neonatal hospitalisation) assessed using hospital records. Secondary outcomes included maternal asthma exacerbations. Concealed random allocation, stratified by study site and self-reported smoking status was used, with blinded outcome assessment and statistical analysis (intention to treat). Results Pregnant women with current asthma were recruited; 599 to the control group (608 infants) and 601 to the intervention (615 infants). There were no significant group differences for the primary composite perinatal outcome (152 (25.6%) out of 594 control, 177 (29.4%) out of 603 intervention; OR 1.21, 95% CI 0.94–1.56; p=0.15), preterm birth (OR 1.14, 95% CI 0.78–1.68), SGA (OR 1.06, 95% CI 0.78–1.68), perinatal mortality (OR 3.62, 95% CI

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0.80–16.5), neonatal hospitalisation (OR 1.24, 95% CI 0.89–1.72) or maternal asthma exacerbations requiring hospital admission or emergency department presentation (OR 1.19, 95% CI 0.69–2.05). FENO-guided asthma pharmacotherapy delivered by a nurse or midwife in the antenatal clinic setting did not improve perinatal outcomes [8].

The objective of this study was to explore the impact of maternal AT during pregnancy on childhood asthma and wheezing, as well as the potential effect modifiers in this association. A cross-sectional study was implemented from December 2018 to March 2019 in Jinan to investigate the prevalence of childhood asthma and wheezing among aged 18 months to 3 years. Then, we conducted a case-control study based on population to explore the association between prenatal different AT exposure levels and childhood asthma and wheezing. The association was assessed by generalized additive models and logistic regression models, and stratified analyses were performed to explore potential effect modifiers. A total of 12,384 vaccinated children participated in screening for asthma and wheezing, 236 cases were screened, as well as 1445 controls were randomized. After adjusting for the covariates, childhood asthma and wheezing were significantly associated with cold exposure in the first trimester, with OR 1.731 (95% CI: 1.117–2.628), and cold exposure and heat exposure in the third trimester, with ORs 1.610 (95% CI: 1.030–2.473) and 2.039 (95% CI: 1.343–3.048). In the third trimester, enhanced impacts were found among girls, children whose distance of residence was close to the nearest main traffic road, and children whose parents have asthma. The study indicates that exposure to extreme AT during the first and third trimesters could increase the risk of childhood asthma and wheezing [13].

Previous studies have yielded conflicting results regarding the link between maternal perinatal depression and asthma in children. To provide a clearer understanding of this relationship, a comprehensive meta-analysis was carried out to evaluate the association mentioned above. A comprehensive review of

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observational studies was conducted by searching electronic databases including Medline, Embase, and Web of Science. The data were combined using a randomized-effects model taking into account potential variations. Subgroup analyses were performed to evaluate the possible impact of study characteristics on outcomes. Ten cohort studies, which included 833,230 mother-child pairs, were examined in the analysis. Maternal depressive symptoms during the perinatal period were associated with an increased risk of asthma in offspring (risk ratio [RR]: 1.24, 95% confidence interval [CI]: 1.19 to 1.30, $p < 0.001$; $I2 = 0\%$). Further sensitivity analyses restricted to multivariate studies (RR: 1.24, 95% CI: 1.19 to 1.30, $p < 0.001$; $I2 = 0\%$) or studies where asthma was diagnosed in children aged three years or older (RR: 1.24, 95% CI: 1.19 to 1.30, $p < 0.001$; $I2 = 0\%$) revealed consistent outcomes. Subgroup analyses according to study design, methods for the diagnosis of maternal depression, timing for the evaluation of maternal depression, methods for the validation of asthma in offspring, adjustment of maternal smoking during pregnancy and of maternal asthma, or study quality score showed similar results (p for subgroup difference all > 0.05). Maternal perinatal depression appears to be significantly linked to a higher occurrence of childhood asthma in children [5].

Maternal diabetes might be related to a high risk of allergic disease in offspring. However, it remains unknown if maternal gestational diabetes mellitus (GDM) is also associated with a high incidence of childhood asthma in offspring. A systematic review and meta-analysis was performed to investigate the above association. Relevant observational studies were obtained by search of electronic databases including Medline, Embase, Cochrane Library, and Web of Science. A randomized-effects model was selected to pool the data by incorporating the influence of potential heterogeneity. The Newcastle-Ottawa Scale was used for study quality evaluation. Subgroup analyses were performed to evaluate the potential influences of study characteristics on the outcome. Ten datasets from seven moderate to high quality cohort studies, involving 523,047 mother-child

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pairs were included in the meta-analysis. Overall, maternal GDM was associated with a higher risk of childhood asthma in offspring (risk ratio [RR]: 1.22, 95% confidence interval [CI]: 1.07 to 1.39, p = 0.003; I2 = 30%). Subgroup analyses showed that the association was not significantly affected by study design, validation methods for GDM, or diagnostic strategy for asthma (p for subgroup analyses all > 0.05). The association between maternal GDM and asthma in offspring was more remarkable after adjusting maternal body mass index in early pregnancy (RR: 1.50 versus 1.06, p < 0.001), but significantly weakened after adjusting hypertensive disorders during pregnancy (RR: 1.08 versus 1.50, p = 0.001). Maternal GDM may be associated with an increased incidence of childhood asthma in offspring [4].

An increasing trend of asthma prevalence was observed in Asia; however, contributions of environmental and host-related risk factors to the development of this disease remain uncertain. This study aimed to perform a systematic review and meta-analysis for asthma-associated risk factors reported in Asia. We systematically searched three public databases (Web of Science, PubMed, and Scopus) in Feb 2021. We only included articles that reported environmental and host-related risk factors associated with asthma in the Asian population. Random-effect meta-analyses were conducted for frequently reported asthma-associated risk factors to provide an overall risk estimate of asthma development. Of 4030 records obtained from public databases, 289 articles were selected for review. The most frequently reported asthma-associated risk factor was the family history of allergy-related conditions. The random-effect asthma risk estimates (pooled odds ratio, OR) were 4.66 (95% confidence interval (CI): 3.73–5.82) for the family history of asthma, 3.50 (95% CI: 2.62–4.67) for the family history of atopy, 3.57 (95% CI: 3.03–4.22) for the family history of any allergic diseases, 1.96 (95% CI: 1.47–2.61) for the family history of allergic rhinitis, and 2.75 (95% CI: 1.12–6.76) for the family history of atopic dermatitis. For housing-related factors, including the presence of mold, mold spots, mold odor, cockroach, water damage,

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and incense burning, the random-effect pooled OR ranged from 1.43 to 1.73. Other risk factors with significant pooled OR for asthma development included male gender (1.30, 95% CI: 1.23–1.38), cigarette smoke exposure (1.44, 95% CI: 1.30–1.60), cigarette smoking (1.66, 95% CI: 1.44–1.90), body mass index (BMI)–related parameters (pooled OR ranged from 1.06 to 2.02), various types of air pollution (NO2, PM10, and O3; pooled OR ranged from 1.03 to 1.22), and pre- and perinatal factors (low birth weight, preterm birth, and cesarean section; pooled OR ranged from 1.14 to 1.32) [11].

Clinical and preclinical evidence indicate that in utero maternal asthma exposure increases progeny asthma risk. Whether maternal asthma also increases the risks of progeny allergy is unclear. To synthesise the available evidence on the relationship between in utero exposure to maternal asthma and postnatal asthma, wheezing and allergic diseases. Studies reporting asthma, wheeze and/or allergic disease in progeny of women with and without asthma or with asthma classified by control, exacerbation or severity. Double screening, selection, data extraction and quality assessment were performed, using Joanna Briggs Institute (JBI) scoring. Of 134 non-overlapping studies, 127 were included in ≥1 meta-analysis. Maternal asthma ever was associated with greater risks of asthma (65 studies, risk ratio [95% confidence interval] 1.76 [1.57–1.96]), wheeze (35 studies, 1.59 [1.52–1.66]), food allergy (5 studies, 1.32 [1.23–1.40]), allergic rhinitis (7 studies, 1.18 [1.06–1.31]) and allergic dermatitis (14 studies, 1.17 [1.11–1.23]) ever in progeny. Asthma during the pregnancy, more severe, and uncontrolled maternal asthma were each associated with greater risks of progeny asthma [10].

Conflicting literature exists regarding the risk factors for exacerbations among pregnant women with asthma. This systematic review and meta-analysis aimed to determine risk factors for asthma exacerbations during pregnancy. Electronic databases were searched for the following terms: (asthma or wheeze) and (pregnan* or perinat* or obstet*) and (exacerb* or flare up or morbidit* or attack*). All studies published between 2000 and 24 August 2021 were

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considered for inclusion if they reported at least one potential risk factor of asthma exacerbations in pregnant women with asthma. Of the 3337 references considered, 35 publications involving 429 583 pregnant women with asthma were included. Meta-analyses were conducted to determine mean difference in risk factor between exacerbation groups, or the relative risks of exacerbation with certain risk factors. Good study quality was found through the Newcastle-Ottawa Scale (median score 8, interquartile range 7–9). Results Increased maternal age (mean difference 0.62, 95% CI 0.11–1.13), obesity (relative risk 1.25, 95% CI 1.15–1.37), smoking (relative risk 1.35, 95% CI 1.04–1.75), black ethnicity (relative risk 1.62, 95% CI 1.52–1.73), multiparity (relative risk 1.31, 95% CI 1.01–1.68), depression/anxiety (relative risk 1.42, 95% CI 1.27–1.59), moderate–severe asthma (relative risk 3.44, 95% CI 2.03–5.83, versus mild) and severe asthma (relative risk 2.70, 95% CI 1.85–3.95, versus mild–moderate) were associated with an increased risk of asthma exacerbations during pregnancy. Future interventions aimed at reducing exacerbations in pregnancy could address the modifiable factors, such as smoking and depression/anxiety, and introduce more regular monitoring for those with nonmodifiable risk factors such as obesity and more severe asthma [9].

Conclusion:

Asthma during pregnancy represents a complex clinical condition influenced by physiological changes of gestation, maternal comorbidities, and environmental exposures. The collective evidence demonstrates that poor asthma control and exacerbations, rather than appropriate pharmacotherapy, are the principal contributors to adverse maternal and fetal outcomes. Continuation of evidence-based asthma treatment throughout pregnancy is essential and should not be withheld due to unfounded concerns regarding medication safety. Identification and modification of preventable risk factors—such as smoking, obesity, inadequate mental health support, and suboptimal prenatal follow-up—are

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critical components of effective management. Furthermore, growing data suggest that maternal asthma severity and control may have lasting implications for offspring respiratory and allergic health, underscoring the importance of early and sustained disease control. A patient-centered, multidisciplinary approach involving obstetricians, pulmonologists, and primary care providers is fundamental to optimizing outcomes. Future research should prioritize precision-based management, preventive strategies during pregnancy, and long-term follow-up of children exposed to maternal asthma to reduce the intergenerational burden of respiratory disease.

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