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Original Research Article

A Population-Based Cohort Study Evaluating Asthma Exacerbations during Pregnancy at a Tertiary Care Teaching Hospital, Telangana

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Abstract

Background: Asthma is one of the most common chronic respiratory disorders complicating pregnancy and is associated with adverse maternal and foetal outcomes when poorly controlled. Pregnancy-related physiological and hormonal changes may influence asthma severity and increase the risk of exacerbations. Understanding the pattern and determinants of asthma exacerbations during pregnancy is essential for improving maternal and neonatal health outcomes.

Objective: To evaluate the incidence, risk factors, and maternal-foetal outcomes associated with asthma exacerbations during pregnancy using a population-based cohort approach.

Methods: A population-based cohort study was conducted among pregnant women diagnosed with asthma, identified through hospital records and antenatal care databases. Participants were followed throughout pregnancy to assess the occurrence of asthma exacerbations, defined as episodes requiring emergency visits, hospitalization, or systemic corticosteroid therapy. Demographic characteristics, smoking status, body mass index, medication adherence, comorbidities, and obstetric variables were analysed. Maternal and neonatal outcomes, including preterm birth, low birth weight, caesarean delivery, and gestational complications, were compared between women with and without exacerbations. Statistical analysis was performed using multivariable regression models to identify predictors of exacerbations and associated outcomes.

Results: Asthma exacerbations occurred in a substantial proportion of pregnant women, with higher rates observed during the second and third trimesters. Poor medication adherence, obesity, smoking exposure, previous severe asthma, and respiratory infections were significant predictors of exacerbation risk. Women experiencing exacerbations had an increased likelihood of adverse pregnancy outcomes, including preterm delivery, low birth weight infants, and pregnancy-induced hypertension. Adequate asthma management and regular antenatal monitoring were associated with reduced exacerbation frequency and improved pregnancy outcomes.

Conclusion: Asthma exacerbations during pregnancy remain a significant clinical concern and are associated with unfavourable maternal and neonatal outcomes. Early identification of high-risk women, optimized asthma control, and continuous antenatal follow-up may help reduce exacerbations and improve overall pregnancy outcomes. Further large-scale prospective studies are recommended to strengthen evidence-based management strategies for asthma in pregnancy.

Keywords: Pregnancy, Asthma Exacerbations, Respiratory Disorders in Pregnancy, Maternal Health, Neonatal Health.

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Introduction

Asthma is one of the most common chronic respiratory diseases affecting women of reproductive age and is a significant medical condition complicating pregnancy. [1,2] It is characterized by chronic airway inflammation, reversible airflow obstruction, and bronchial hyperresponsiveness, leading to symptoms such as wheezing, dyspnoea, chest tightness, and cough. The prevalence of asthma during pregnancy has increased globally, affecting approximately 4-12% of pregnant women worldwide. [3] Pregnancy induces several physiological, hormonal, and immunological changes that may alter asthma severity and control. [4] Increased oxygen consumption, elevated progesterone levels, mucosal oedema, and altered immune function can

influence airway responsiveness during gestation. Clinical observations indicate that asthma symptoms worsen in approximately one-third of pregnant women, improve in another one-third, and remain unchanged in the remaining women. [5]

Asthma exacerbations during pregnancy are episodes of worsening respiratory symptoms requiring additional treatment, emergency care, or hospitalization. Common triggers include respiratory tract infections, allergen exposure, smoking, obesity, stress, and poor adherence to prescribed medications. [6] Uncontrolled asthma and recurrent exacerbations may compromise maternal oxygenation, thereby affecting foetal oxygen supply and growth.

Several studies have reported associations between maternal asthma exacerbations and adverse pregnancy outcomes, including preeclampsia, gestational hypertension, preterm birth, low birth weight, intrauterine growth restriction, and increased caesarean delivery rates. [7,8] Furthermore, inadequate asthma management during pregnancy remains a challenge because many women discontinue or reduce medication use due to concerns about foetal safety. [9]

Population-based cohort studies are valuable for understanding the epidemiology and determinants of asthma exacerbations during pregnancy. These studies enable researchers to evaluate large populations over time and identify risk factors and clinical outcomes associated with poor asthma control. Improved understanding of asthma exacerbations in pregnancy can inform the development of evidence-based antenatal care strategies to reduce maternal and neonatal complications.

Therefore, the present population-based cohort study was undertaken to evaluate the incidence, determinants, and maternal-foetal outcomes associated with asthma exacerbations during pregnancy.

Aim

To evaluate the incidence, risk factors, and maternal-foetal outcomes associated with asthma exacerbations during pregnancy among women attending the Government General Hospital, Karimnagar.

Objectives

1. To determine the prevalence of asthma exacerbations among pregnant women with bronchial asthma.
2. To assess the trimester-wise occurrence and severity of asthma exacerbations during pregnancy.
3. To identify demographic, clinical, and environmental risk factors associated with asthma exacerbations during pregnancy.
4. To evaluate the association between asthma exacerbations and maternal outcomes such as pregnancy-induced hypertension, preeclampsia, hospitalization, and mode of delivery.
5. To assess neonatal outcomes, including preterm birth, low birth weight, intrauterine growth restriction, and neonatal intensive care unit admissions among women with asthma exacerbations.
6. To analyze independent predictors of asthma exacerbations using multivariate statistical analysis.
7. To emphasize the importance of adequate asthma control and antenatal monitoring in improving pregnancy outcomes.

Methodology

Study Design: The present study was designed as a hospital-based population cohort study to evaluate asthma exacerbations during pregnancy among women attending a tertiary care teaching hospital in Telangana.

Study Area: The study was conducted at Government General Hospital, Karimnagar, a tertiary-care teaching hospital affiliated with the Government Medical College, Karimnagar. The hospital serves as a major referral centre for maternal and respiratory healthcare services in northern Telangana and caters to both urban and rural populations.

Study Population: The study population consisted of pregnant women diagnosed with bronchial asthma who attended the antenatal outpatient department or were admitted to the obstetrics and gynaecology wards during the study period.

Study Duration: The study was conducted over a period of 1 year from April 2025 to March 2026.

Inclusion Criteria

- Pregnant women of any gestational age diagnosed with bronchial asthma before or during pregnancy.
- Women aged 18 years and above.
- Patients willing to participate and provide informed consent.
- Women attending regular antenatal follow-up at the study hospital.

Exclusion Criteria

- Pregnant women with chronic pulmonary diseases other than asthma, such as chronic obstructive pulmonary disease or pulmonary tuberculosis.

- Women with major systemic illnesses such as severe cardiac disease, renal failure, or autoimmune disorders.
- Women unwilling to participate in the study.
- Incomplete medical records or loss to follow-up.

Sample Size: The sample size was calculated based on the prevalence of asthma exacerbations during pregnancy reported in previous studies using the standard formula:

$$n = \frac{Z^2 X p X q}{d^2}$$

Where:

- n = required sample size
- Z= standard normal deviate at 95% confidence interval (1.96)
- p = expected prevalence of asthma exacerbations
- q = 1 − p
- d = allowable error

Accordingly, a total of 271 pregnant women with asthma were included in the study.

Data Collection: Eligible participants were enrolled after obtaining written informed consent. Detailed demographic, clinical, obstetric, and socioeconomic information was collected using a predesigned and pretested questionnaire.

The data, such as age, residence, educational status, socioeconomic status, gravidity and parity, gestational age, history and duration of asthma, frequency of asthma symptoms, medication history and adherence, smoking exposure and environmental triggers, presence of comorbidities, and previous hospitalization due to asthma, were recorded.

Clinical examination and relevant laboratory investigations were performed as required.

Pulmonary function assessment and oxygen saturation were recorded whenever indicated.

Outcome Measures

Maternal Outcomes: The maternal outcomes measured were the frequency of asthma exacerbations, hospitalization, pregnancy-induced hypertension, preeclampsia, mode of delivery, and maternal complications.

Foetal and Neonatal Outcomes: The foetal and neonatal outcomes measured were the preterm birth, low birth weight, intrauterine growth restriction, Apgar score, neonatal intensive care unit admission, and perinatal complications.

Statistical Analysis: The collected data were entered into Microsoft Excel and analysed using Statistical Package for Social Sciences (SPSS) version 26. Descriptive statistics such as mean, standard deviation, frequencies, and percentages were used to summarize the data. Associations between asthma exacerbations and maternal-foetal outcomes were analysed using the chi-square test, Student's t-test, or Fisher's exact test, wherever appropriate. Multivariate logistic regression analysis was performed to identify independent predictors of asthma exacerbations during pregnancy. A p-value of <0.05 was considered statistically significant.

Ethical Considerations: Ethical clearance for the study was obtained from the Institutional Ethics Committee of Government Medical College, Karimnagar. Written informed consent was obtained from all participants before enrolment. Confidentiality and privacy of participant information were strictly maintained throughout the study.

Results

A total of 271 pregnant women diagnosed with bronchial asthma were included in the study and followed throughout pregnancy at the Government General Hospital, Karimnagar.

The mean age of the participants was 26.8 ± 4.3 years. Most participants were in 21-30 years, age group (68.3%). The majority were multigravida women (57.2%), and a higher proportion of participants were from rural areas (61.6%). Asthma exacerbations during pregnancy were observed in 79 participants (29.2%). Among these, most exacerbations occurred during the second and third trimesters. Mild exacerbations were noted in 41 women (15.1%), moderate exacerbations in 27 women (10.0%), and severe exacerbations requiring hospitalization in 11 women (4.1%). Figure 1 explains the prevalence of asthma exacerbations during pregnancy.

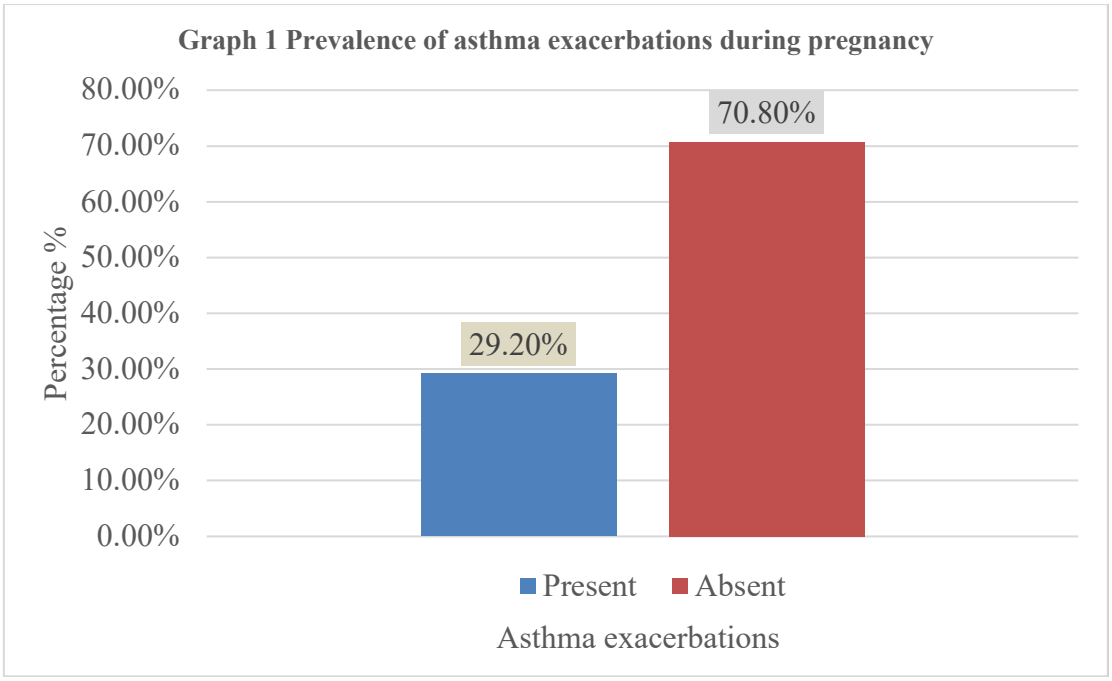

Figure 1:

Previous history of severe asthma, respiratory tract infections, poor adherence to inhaled corticosteroid therapy, obesity, and exposure to environmental tobacco smoke were significantly associated with increased risk of asthma exacerbations ($p < 0.05$).

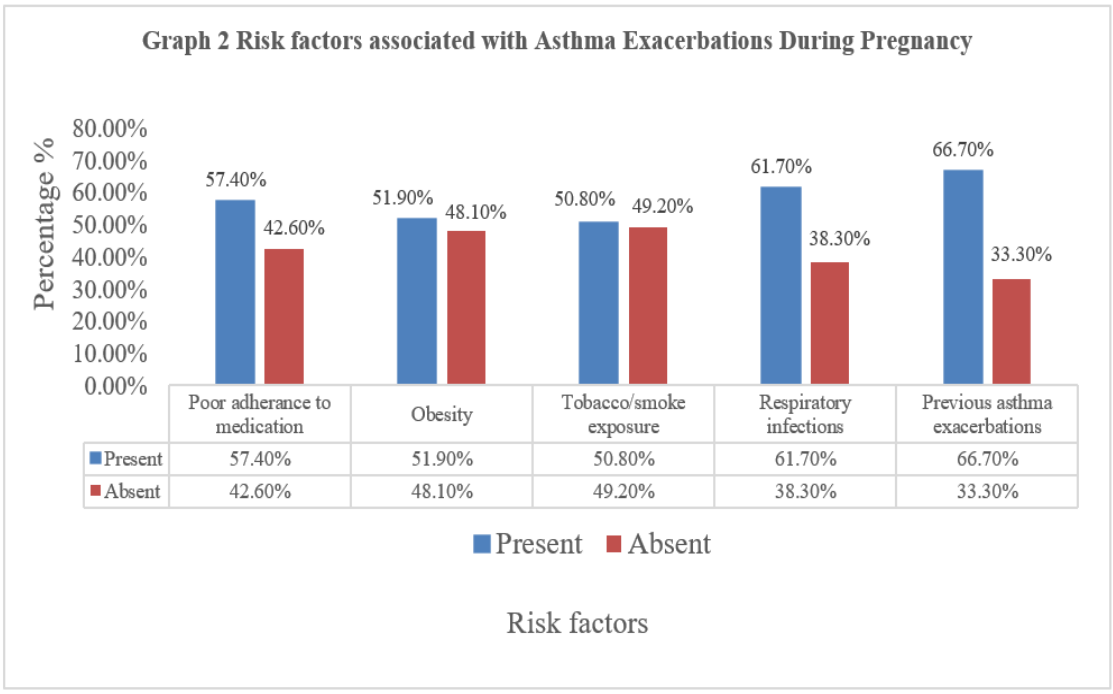

Figure 2:

Women who experienced asthma exacerbations had significantly higher rates of adverse maternal outcomes, including pregnancy-induced hypertension (14.0%), preeclampsia (9.1%), and caesarean section delivery (38.0%) compared to women without exacerbations. Regarding foetal outcomes, preterm birth was observed in 18.9% of women with asthma exacerbations compared to 8.3% among women without exacerbations.

Low birth weight infants were more common in the exacerbation group (21.5%), and neonatal intensive care unit admissions were also significantly higher among these neonates ($p < 0.05$).

Table 1: Multivariate logistic regression analysis of predictors of asthma exacerbations during pregnancy

Predictor Variable	Adjusted Odds Ratio (AOR)	95% Confidence Interval	p-value
Poor medication adherence	2.8	1.5 – 5.1	0.002*
Obesity	2.1	1.2 – 3.8	0.011*
Tobacco/smoke exposure	1.9	1.1 – 3.4	0.026*
Respiratory infections	3.4	1.8 – 6.2	<0.001*
Previous severe asthma	2.7	1.4 – 5.0	0.003*

***= P value is statistically significant**

Multivariate logistic regression analysis identified poor medication adherence, obesity, and respiratory infections during pregnancy as independent predictors of asthma exacerbations.

Discussion

The present population-based cohort study, conducted at the Government General Hospital, Karimnagar, evaluated the occurrence, risk factors, and maternal-foetal outcomes associated with asthma exacerbations during pregnancy. Asthma remains one of the most common chronic medical disorders complicating pregnancy and significantly influences both maternal and neonatal health outcomes.

In the present study, the majority of participants were aged 21-30 years, consistent with the reproductive age distribution reported in previous studies by Kwon et al. and Murphy et al. [3,10] The higher proportion of multigravida women observed in this study may be attributed to increased healthcare access and repeated antenatal follow-up among women with previous pregnancies.

Asthma exacerbations were observed in 29.2% of pregnant women in the current study. This finding is comparable to earlier reports by Schatz et al. and Murphy et al., who documented exacerbation rates ranging from 20-45% during pregnancy. [5,10] The increased frequency of exacerbations during the second and third trimesters observed in the present study may be related to progressive physiological changes during pregnancy, including elevated oxygen demand, reduced functional residual lung capacity, and hormonal influences that affect airway responsiveness. [11]

The study demonstrated that poor medication adherence was significantly associated with asthma exacerbations. Similar findings were reported by Lim et al., who observed that many pregnant women intentionally reduced or discontinued asthma medications due to fear of foetal harm. [9]

Inadequate use of inhaled corticosteroids may contribute to poor asthma control and increased exacerbation frequency, and these results were consistent with those of Lee et al. [12] This highlights the importance of patient counselling regarding the safety and necessity of asthma medications during pregnancy. Obesity and exposure to tobacco smoke were also identified as significant predictors of asthma exacerbations, and these results were consistent with Robijn et al. [13] Previous studies by Namazy et al. and Mendola et al. similarly reported increased asthma-related complications among obese pregnant women and those exposed to smoking. [7,8] Obesity may worsen respiratory mechanics and systemic inflammation, thereby increasing susceptibility to exacerbations.

Respiratory tract infections emerged as one of the strongest predictors of asthma exacerbations in the present study. Viral respiratory infections are recognized triggers for airway inflammation and acute worsening of asthma symptoms during pregnancy. The findings are consistent with those of Murphy et al., who documented higher hospitalization rates among pregnant women experiencing respiratory infections. [14]

Maternal complications such as pregnancy-induced hypertension, preeclampsia, and increased caesarean section rates were more common among women with asthma exacerbations in this study. These observations agree with findings reported by Li et al., who demonstrated a significant association between poorly controlled maternal asthma and adverse outcomes. [15] Chronic hypoxia and systemic inflammation resulting from uncontrolled asthma may contribute to placental dysfunction and hypertensive disorders during pregnancy. The present study also demonstrated significantly higher rates of preterm birth, low birth weight, and neonatal intensive care unit admissions among women experiencing asthma exacerbations. Similar results have been documented in a study by Jinyu et al. [16] Reduced maternal oxygenation during exacerbation episodes may compromise foetal growth and increase neonatal morbidity.

Multivariate logistic regression analysis identified poor medication adherence, obesity, respiratory infections, and previous severe asthma as independent predictors of exacerbations during pregnancy. These findings emphasize the multifactorial nature of asthma control during gestation and support the need for multidisciplinary antenatal care involving obstetricians, pulmonologists, and primary healthcare providers.

The strengths of the present study include its cohort design, adequate sample size, and evaluation of both maternal and neonatal outcomes in a tertiary

care setting. However, certain limitations should be considered. The study was conducted at a single tertiary care hospital, which may limit generalizability to the broader population.

In addition, self-reported medication adherence and environmental exposure could have introduced recall bias. Overall, the findings of the present study highlight the clinical importance of early identification and effective management of asthma during pregnancy. Regular antenatal monitoring, patient education, avoidance of known triggers, and adherence to prescribed therapy are essential to reduce asthma exacerbations and improve pregnancy outcomes.

Conclusion

The present population-based cohort study conducted at Government General Hospital Karimnagar, demonstrated that asthma exacerbations during pregnancy are a significant clinical concern associated with adverse maternal and neonatal outcomes. Nearly one-third of pregnant women with asthma experienced exacerbations, with higher occurrence during the second and third trimesters. Poor medication adherence, obesity, respiratory tract infections, tobacco smoke exposure, and previous severe asthma were identified as important risk factors contributing to asthma exacerbations during pregnancy. Women experiencing exacerbations showed increased rates of pregnancy-induced hypertension, preeclampsia, caesarean section delivery, preterm birth, low birth weight infants, and neonatal intensive care unit admissions.

Overall, optimal asthma control during pregnancy is essential to ensure maternal well-being and favourable foetal outcomes. Further multicentric prospective studies with larger populations are recommended to strengthen evidence-based guidelines for the management of asthma during pregnancy in a tertiary healthcare setting.

Author Contributions: Dr. Narender Sayini has planned, designed the concept of the manuscript, and drafted the manuscript. Dr. Suhasini and Dr. Deepa Polepaka has supported in drafting and collecting the reference articles.

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