

IMPACT OF EXCESSIVE GESTATIONAL WEIGHT GAIN IN FIRST TRIMESTER OF PREGNANCY ON EXACERBATION OF BRONCHIAL ASTHMA

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ABSTRACT

Patients with asthma have a significant burden due to this widespread chronic illness that has the potential to be dangerous on their families and the community. Obesity in mothers is linked to raise chance of asthma flare-ups during pregnancy as well as an elevated chance of asthma in the children. The same proinflammatory pathways that produce asthma in children may also have an impact on maternal asthma because of gestational weight increase during pregnancy. The goal of this research was to ascertain how much excessive weight gain during the first trimester of pregnancy affected asthma flare-ups. One hundred asthmatic patients were present in this study and split up into two groups. 50 patients with asthma who gained excessive weight during pregnancy and 50 patients with asthma who gained weight on average. Regarding weight at the conclusion of the first trimester, The study's groups that were compared showed a statistically significant difference. There is a noticeable increase in body weight among each group. Furthermore, a statistically significant difference in the percentage rise in bodyweight (much larger in the group experiencing excessive weight gain) exists between the analyzed groups, losing weight is linked to an improvement in asthma a control, a more than fifty percent decline of asthma symptoms and an enhancement in lung function. In conclusion, pregnancy-related asthma exacerbations are linked to increase of weight in first three months of pregnancy.

Keywords: Bronchial Asthma, Gestational Weight Gain (GWG)

INTRODUCTION

Asthma is a prevalent chronic illness that interferes with regular daily activities. Depending on the severity of the disease there is a significant public health issue that has an impact on the health-economic costs for medical services (Venkatesan, 2023).

The most frequent chronic illness affecting pregnant women is asthma. Uncontrolled asthma and the frequency of exacerbations are the major causes of the risks of complications related to asthma for the mother, the fetus, and the pregnancy (Stoup, 2021).

Most women normally gain weight somewhere by 11.5 to 16 kilograms along pregnancy. Pregnant women with a body mass index above 25 are more likely to experience difficulties becoming pregnant and are more likely to experience miscarriage and stillbirth than women with a body mass index between 20 and 24.99 (Langley-Evans et al., 2022).

Asthmatic women during their pregnancy who experience an exacerbation at least one third of the time and severe exacerbations are linked to poor pregnancy outcome in addition during the past few decades there has been a rise in the prevalence of asthma and obesity during pregnancy (Wang et al., 2020).

An acute asthma attack is linked to a poor pregnancy outcome and a minimal one-third of asthmatic expectant mothers experienced worsening symptoms during pregnancy. Obesity in mothers is linked to a rise of the chance of asthma flare-ups during pregnancy as well as an increased incidence of asthma in the offspring (GINA, 2017).

SUBJECTS AND METHODS

(1) Study design

cohort prospective study

(2) Study setting

chest outpatient clinic in police hospital Nasr city.

(3) Duration of the study

Three months duration.

(4) Sample size calculation

This study included 100 asthmatic patients proved by spirometry.

(5) Study population

50 patients with asthma who gained excessive weight during pregnancy and 50 patients with asthma who gained weight on average.

(6) Ethical consideration

Before being enrolled in the trial, each patient provided informed written consent.

(7) Statistical analyses

The social sciences' statistics package, or SPSS, version 26, was used to analyze the data. The chi square test, fisher exact test, and, when necessary, the Monte Carlo test was used to compare the categorical variables, which were defined using their absolute frequencies. Depending on the type of data, their means were used to characterize the quantitative variables, standard deviations, median, and interquartile range. Quantitative data from two groups were compared using the Mann Whitney and independent sample t tests, depending on whether the data was regularly distributed or not. Spearman rank correlation coefficients (for data that is not regularly distributed) were applied to assess the direction and extent to which two continuous variables are linked. $P < 0.05$ served as the threshold for statistical significance. If $p \leq 0.001$, there was a noticeable difference was present.

RESULTS

Table (1) Comparing the baseline statistics between the groups under study

Regarding age, place of residence, and family history of asthma, Parity, gravidity, abortion, and having multiple pregnancies are statistically not different across the groups that are the subject of the study.

	EXCESSIVE GESTATIONAL WEIGHT GAIN GROUP	NORMAL GESTATIONAL WEIGHT GAIN GROUP	T	P
	Mean \pm SD	Mean \pm SD		
Age (year)	32.54 \pm 4.67	31.72 \pm 5.02	0.845	0.4
	Median (IQR)	Median (IQR)	Z	P
Parity	1(0 – 3)	1 (0 – 2)	-0.213	0.832
Gravidity	3.5(1 – 4)	3(1.75 – 4)	-0.225	0.822
Abortion	0(0 – 1)	0(0 – 1)	0	>0.999
	N=50 (%)	N=50 (%)	χ^2	P
Multiple pregnancy	3 (6%)	4 (8%)	Fisher	>0.999
Family history of asthma	10 (20%)	8 (16%)	0.271	0.603
Residence Urban	21 (42%)	23 (46%)	0.162	0.867
Rural	29 (58%)	27 (54%)		

T test for independent samples Z Mann Whitney examination χ^2 Chi square analysis

Table (2) Comparison of the weights of the two groups under study at baseline and after three months, as determined by the initial visit:

There is statistically non-significant difference between the studied groups regarding baseline weight. There is statistically significant difference between the studied groups regarding weight by the end of first trimester within each group, there is significant increase in body weight.

WEIGHT BASELINE /WEIGHT IN THIRD MONTH	EXCESSIVE GESTATIONAL WEIGHT GAIN GROUP	NORMAL GESTATIONAL WEIGHT GAIN GROUP	T	P
	Mean ± SD	Mean ± SD		
Weight baseline	71.3 ± 6.19	69.94 ± 9.11	0.874	0.385
Weight in third month	76.3 ± 6.6	72 ± 8.96	2.733	0.008*
Patient time	<0.001**	<0.001**		

Independent sample t test: *p<0.05 indicates statistical significance; **p≤0.001 indicates highly substantial statistical significance t test for paired samples

Table (3): Comparing of the spirometry results between the groups under study (FEV1):

There is noticed non considerable difference between the tested groups regarding baseline FEV1 there is statistically significant difference between the studied groups regarding FEV1 in second and third months (significantly lower in excessive weight gain group) within EWG group, there is notable decline in FEV1 when comparing each two points of time. Within normal weight gain group, there is non-significant change in FEV1 when comparing each two points of time.

PREDICTED FEV1	EXCESSIVE GESTATIONAL WEIGHT GAIN GROUP	NORMAL GESTATIONAL WEIGHT GAIN GROUP	T	P
	Mean ± SD	Mean ± SD		
First month	76.8 ± 7.61	78.38 ± 7.24	-1.604	0.29
Second month	70.9 ± 9.33	78.6 ± 10.24	-3.931	<0.001**
Third month	69.52 ± 8.76	78.88 ± 11.32	-4.624	<0.001**
P1	<0.001**	0.895		
P2	<0.001**	0.189		
P3	<0.001**	0.784		

*p<0.05 is statistically significant; **p≤0.001 is statistically very significant in the t independent sample t test. The first and second month's FEV1 were compared using a paired sample t test. between the second and third month, p2 paired sample t test between the first and third month, p3 paired sample t test

Table (4): Evaluation of spirometry data in relation to the groups under study (FVC):

Between the groups under study, there is a statistically insignificant difference regarding baseline FVC or FVC at second month of gestation, there is a significant difference between the studied groups regarding FVC in third month of gestation (significantly lower in excessive weight gain group) within EWG group, there is significant decrease in FVC when comparing each two points of time. Within normal weight gain group, there is non-significant change in FVC when comparing each two points of time.

PREDICTED FVC	EXCESSIVE GESTATIONAL WEIGHT GAIN GROUP	NORMAL GESTATIONAL WEIGHT GAIN GROUP	T	P
	Mean ± SD	Mean ± SD		
First month	80.52 ± 8.78	82.4 ± 9.93	-1.003	0.318
Second month	79.68 ± 8.32	82.62 ± 10.66	-1.546	0.126
Third month	76.78 ± 6.68	82.9 ± 11.56	-3.24	<0.001**
P1	0.011*	0.379		
P2	0.001**	0.109		
P3	<0.001**	0.185		

**p≤0.001 is statistically extremely significant, and *p<0.05 is statistically significant in the independent sample t test. Comparing the FEV1 in the first and second months, p1 paired sample t test 2nd and 3rd month p2 paired sample t test A paired sample t-test was conducted between the first and third month.

There is statistically non-significant difference between the studied groups regarding baseline FEV1/FVC. There is statistically significant difference between the groups under study regarding FEV1/FVC in second and third month of gestation (significantly lower in excessive weight gain group). Within EWG group, there is significant decrease in FEV1/FVC when comparing baseline value with value at second and third months. Within normal weight gain group, there is non-significant change in FEV1/FVC when comparing each two points of time.

Table (5): Comparing between the studied groups regarding spirometry data (FEV1/FVC):

FEV1/FVC	EXCESSIVE GESTATIONAL WEIGHT GAIN GROUP	NORMAL GESTATIONAL WEIGHT GAIN GROUP	T	P
	Mean ± SD	Mean ± SD		
First month	96.22 ± 12.52	96.45 ± 14.75	-0.086	0.934
Second month	89.19 ± 8.74	95.17 ± 3.26	-4.531	<0.001**
Third month	90.34 ± 5.14	95.17 ± 3.68	-5.409	<0.001**
P1	<0.001**	0.541		
P2	0.182	0.998		
P3	0.002*	0.559		

t independent sample t test *Statistical significance is defined as $p < 0.05$; statistical significance is defined as $p \leq 0.001$ P1 paired sample t test comparing the first and second month's FEV1 p2 paired sample t test in the third and second months P3 paired sample t test for the first and third months

In terms of exacerbation incidence, there is a statistically insignificant difference between the groups under study. (four patients within EWG group versus only one patient within NWG group had exacerbation during follow up period). There is statistically significant difference between the studied groups regarding need for rescue inhaler (Nine patients within EWG group versus only one patient within NWG group needed rescue inhaler during follow up period).

Table (6): Comparing between the studied groups incidence of exacerbation and rescue inhaler use:

	EXCESSIVE GESTATIONAL WEIGHT GAIN GROUP	NORMAL GESTATIONAL WEIGHT GAIN GROUP	X ²	P
	N=50 (%)	N=50 (%)		
Exacerbation	4 (8%)	1 (2%)	Fisher	0.362
Rescue inhaler	9 (18%)	1 (2%)	Fisher	0.016*

* $p < 0.05$ indicates statistical significance in the χ^2 Chi square test.

A statistically significant inverse relationship exists between percent of weight gain and each of FEV1, and FEV1/FVC on second and third months and FVC at second month. A statistically insignificant inverse relationship exists between percent of weight gain and either baseline FEV1, FVC or FEV1/FVC or FVC at third month.

Table (7) Correlation between percent weight gain and predicted (FEV1, FVC) and predicted FEV1/FVC:

FEV1, FVC OR FEV1/FVC OR FVC AT THIRD MONTH	R	P
FEV1 at first month	-0.194	0.053
FEV1 at second month	-0.23	0.021*
FEV1 at third month	-0.284	0.004*
FVC at first month	-0.168	0.095
FVC at second month	-0.217	0.03*
FVC at third month	-0.17	0.091
FEV1/FVC at first month	-0.061	0.546
FEV1/FVC at second month	-0.24	0.016*
FEV1/FVC at third month	-0.438	<0.001**

* $p < 0.05$ indicates statistical significance in the Spearman rank correlation coefficient, and ** $p \leq 0.001$ indicates statistically significant results.

DISCUSSION

By the end of the first trimester, there is a statistically significant difference in weight between the groups under investigation in this study. Within each group, there is significant increase in body weight. Additionally, there is a statistically significant variation between the groups under study with respect to percent increase in body weight (significantly higher in excessive weight gain group) **Ali et al. (2018)** Stated that The body mass index (BMI), total and first-trimester GWG, and maternal age were associated with the incidence of an asthma exacerbation and based on the eight-year study period, 1283 pregnancies involving 1208 women were enrolled, with a mean gestational age of 14 weeks at the initial outpatient clinic visit. There were 468 recorded asthma exacerbations, of which 273 (58%) were mild and 195 (42%) were severe. In 33 (3%) pregnancies, there was more than one exacerbation noted. The first trimester GWG was 5.1 ± 3.4 kg, the overall GWG was 12.5 ± 5.8 kg, and the mean pre-pregnancy BMI was 24.2 ± 4.5 .

There was a dose-dependent relationship between first trimester GWG and the chance of an exacerbation during pregnancy as the risk was minimal in pregnant women with less than five kg weight gain and increased with each subsequent gained kilogram. A higher

chance of an asthma flare-up was found to be substantially connected with a mother's first-trimester weight increase of more than five kilograms and a total weight gain during pregnancy of more than thirteen kilograms. (Ali *et al.*, 2018).

Within our research regarding FEV1, there is statistically significant difference between the studied groups regarding FEV1 in second and third months (significantly lower in excessive weight gain group). Within EWG group, when comparing any two points in time, there is a discernible drop in FEV1.

Regarding FVC, there is a statistically significant variation in FVC between the groups under investigation. in third month of gestation (significantly lower in excessive weight gain group). Within EWG group, there is significant decrease in FVC when comparing each two points of time.

In terms of FEV1/FVC, there is a statistically noticeable difference (much lower in the group with excessive weight increase) between the tested groups in the second and third month of gestation. FEV1/FVC significantly decreased in the EWG group when comparing baseline to second- and third-month values.

A statistically significant negative connection was seen in our study between the percentage of weight gain and FEV1, FEV1/FVC in the second and third months, and FVC in the second month. However, there is a statistically insignificant negative connection between the third month FVC, FEV1/FVC, or baseline FEV1, FVC, and the percentage of weight increase.

There has never been an explanation of a connection between gestational weight gain and mother asthma control. Murphy *et al.* (2005) shown in a prospective cohort research involving 146 women that pregnant women experiencing severe asthmatic exacerbations gained far less weight than those who did not experience such exacerbations.

Murphy (2022) discovered a correlation between parity and asthma manifestation: There is no parity was linked to a decreased incidence of asthma exacerbations throughout pregnancy. This could be a result of nulliparous women's increased focus on their health, which could lead to better asthma control.

Additionally, our results indicating a significant weight loss following childbirth is linked to a decreased chance of a postpartum aggravation. This is consistent with research showing that among obese asthmatic patients, losing weight is linked to an improvement in asthma control, a remission of symptoms more than 50% and an improvement in lung function. According to Polinski *et al.* (2022) there is a dose-dependent linkage between increased gestational weight gain in the first three months of pregnancy and a higher chance of asthma flare-ups through-out pregnancy.

CONCLUSION AND RECOMMENDATIONS

This study suggests that there is a link between higher first trimester GWG and total GWG and a higher incidence of asthma flare-ups during pregnancy. Over five kg of GWG during the first trimester was linked to a higher chance of an asthmatic attack. Our results underline the significance of giving pregnant women advice on GWG, with a focus on its value in the first trimester, to prevent potential asthma-related pregnancy problems. In order to prevent potential difficulties related with asthma exacerbations during pregnancy, future research should be established to minimize the increase of GWG in the first trimester may decline the incidence of maternal asthma flare-up.

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تأثير الزيادة المفرطة في الوزن في أواخر الحمل الثلاثة الأولى على تفاقم الربو القصبي

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المستخلص

الربو هو مرض مزمن شائع وخطير ويشكل عبئا كبيرا على المرضى وأسرهم والمجتمع. وترتبط سمنة الأم بزيادة خطر تفاقم الربو أثناء الحمل وأيضاً مع ارتفاع خطر الإصابة بالربو في النسل. قد تؤثر زيادة الوزن أثناء الحمل على ربو الأم من خلال نفس الآليات الالتهابية التي تسبب الربو في مرحلة الطفولة. كان الهدف من هذه الدراسة هو تحديد تأثير الزيادة المفرطة في وزن الحمل في الأشهر الثلاثة الأولى على تفاقم الربو. شملت هذه الدراسة 100 مريضة ربو تم تصنيفها إلى مجموعتين: 50 مريضة ربو تعاني من زيادة مفرطة في وزن الحمل و50 مريضة ربو تعاني من زيادة متوسطة في الوزن. في هذه الدراسة، هناك فرق ذو دلالة إحصائية بين المجموعات المدروسة فيما يتعلق بالوزن بنهاية الأشهر الثلاثة الأولى. داخل كل مجموعة، هناك زيادة كبيرة في وزن الجسم. كما يوجد فرق ذو دلالة إحصائية بين المجموعات المدروسة فيما يتعلق بنسبة الزيادة في وزن الجسم (أعلى بشكل ملحوظ في مجموعة الزيادة المفرطة في الوزن). لقد وجدنا أيضاً أن الانخفاض الكبير في الوزن بعد الولادة يرتبط بانخفاض خطر تفاقم ما بعد الولادة. يتوافق هذا مع الدراسات التي وجدت أن فقدان الوزن لدى المرضى الذين يعانون من السمنة المفرطة والمصابين بالربو يرتبط بنسبة تزيد عن 50% من أعراض الربو، وتحسين السيطرة على الربو، إلى جانب زيادة وظائف الرئة. تشير النتائج التي توصلنا إليها حول زيادة خطر التفاقم اعتماداً على زيادة الوزن أثناء الحمل أو احتباس الوزن بعد الولادة إلى وجود صلة بين كتلة الدهون والالتهاب الجهازى والربو. وخلصت الدراسة إلى أن زيادة الوزن الزائد أثناء الحمل في الأشهر الثلاثة الأولى وزيادة الوزن الإجمالي أثناء الحمل ترتبط بزيادة خطر تفاقم الربو أثناء الحمل. ارتبطت زيادة وزن الحمل بأكثر من 5 كجم في الأشهر الثلاثة الأولى بزيادة خطر حدوث تفاقم.

الكلمات المفتاحية: الربو القصبي، زيادة الوزن أثناء الحمل