

ORIGINAL ARTICLE

Frequency of large for gestational age fetus in females presenting with increased maternal body mass index.

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ABSTRACT... Objective: To investigate the prevalence of large-for-gestational-age (LGA) fetuses among obese pregnant women and explore the relationship between LGA and maternal characteristics such as BMI, age, gestational age, and parity. **Study Design:** Cross-sectional study. **Setting:** Department of Gynecology and Obstetrics, HBS Medical & Dental College, Islamabad. **Period:** Six months October 1st, 2023 to March 30th, 2024. **Methods:** Ninety-five pregnant women with a gestational age of 30 weeks and above, and a BMI of 30 or higher, were recruited through non-probability consecutive sampling. Maternal demographic details, gestational age, BMI, and parity were recorded, and LGA diagnosis was made using ultrasound assessment. Data analysis was done using SPSS version 23. **Results:** Among 145 participants, 72 (49.66%) had LGA fetuses. However, no significant correlations were found between LGA and maternal age ($p = 0.810$), gestational age ($p = 0.056$), parity ($p = 0.812$), or BMI categories ($p = 0.698$). Maternal obesity emerged as a significant determinant of LGA. **Conclusion:** The high prevalence of LGA fetuses among obese pregnant women highlights the need for clinical consideration of maternal obesity's impact on pregnancy outcomes. This study emphasizes the importance of developing targeted intervention strategies to reduce maternal obesity and its effects on fetal weight.

Key words: BMI, Fetal Growth, Gestational Age, Large-for-gestational-age (LGA), Maternal Obesity, Neonatal Health, Pregnancy Outcomes, Parity, Risk Factors, Pakistan.

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INTRODUCTION

Obesity during pregnancy, especially in women with BMI greater or equal to 30 kg/m², has become one of the most pressing health issues worldwide. Obesity has become a pandemic in the last few decades, and current estimates suggest that 38% of women are overweight or obese at the first antenatal clinic attendances.¹ Such an increasing trend has a significant impact on maternal and fetal health results. One of the many other adverse outcomes associated with maternal obesity, is the elevated chance of delivering an LGA baby; a condition that is described by birth weight more than the 90th percentile based on gestational age and sex.² This paper aims at establishing the rate of LGA among obese pregnant women, an issue of concern because of the short term and long term consequences on the welfare of the mother and her baby.³

LGA fetus is known to have increased prenatal

growth rate and is on record to be causing some complications in the immediate perinatal period and in the future. The risks of short term include shoulder dystocia, fetal hypoxia, cesarean delivery and birth trauma while the long term complication include obesity during childhood, type 'k' diabetes and cardiovascular complications.^{4,5} The risk of obesity to the mother is as well and other such complications like gestational diabetes, preeclampsia, or delivery complications hence, the Neonatal outcomes will be at higher risk for poor results.^{6,7}

Multiple studies have established high concordance between maternal obesity and the risk of yielding LGA births.⁸ For example, in the clinical study led by Michels⁹, LGA birth rates were even higher and ranged from 32.3% to 40.2%; obesity and gestational diabetes were identified as independent risk factors positively associated with increased fetal size. In the same similar manner, the study conducted by Stuebe et al.¹⁰ also established a

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positive correlation between maternal obesity and fetal hyperinsulinemia, a situation that arises from maternal high blood sugar level that causes the fetal tissues to double their size.^{11,12} The metabolic interactions explain the importance of weight control in the period prior to conception and during gestation in the prevention of LGA.¹³ Tutlam and his fellows¹⁴ stated that the prevention of LGA births is possible if there is a slight decrease in maternal BMI before conception.¹⁵

Maternal obesity also has been shown to be associated with LGA, but ethnic and racial disparities exist. Published prevalence of LGA has been observed to differ in different population groups with African American and Hispanic women having the highest rates probably due to genetic markers as well as socio-environmental factors.^{16,17} These findings conform with available epidemiological evidence indicating that maternal ethnicity along with other factors influences LGA by parity and gestational weight gain.^{18,19,20}

According to past studies, efforts made towards controlling or preventing maternal obesity have been effective in preventing the occurrence of LGA births. In addition, it is equally important for the health care providers to enlighten pregnant women on consequences associated with weight gain and monitor pregnant women for compliance to the weight gain in pregnancy guidelines.^{21,22}

The findings on the prevalence of LGA among obese pregnant women are not just an issue of clinical interest only, but a reflection of other social perinatal health risks. Higher rates of obesity in reproductive-aged women due to inadequate physical activity and energy consumption require attention to maternal and neonatal health consequences.²³ In this regard, the present study makes a valuable contribution to the existing literature on the effect of maternal obesity on pregnancy and birth outcomes in LAMI countries, where research is scarce.²⁴

Specifically, in Pakistan, where maternal and child health end results are already unfavorable, the issue of maternal obesity, and its consequences, including LGA has not been well-addressed. Culturally and contextually focused interventions require such local

research endeavors. Since the nutritional, genetic, and environmental antecedents of pregnancy outcomes differ across population, the conclusions of this study intend to fill this known gap by offering localized data on the frequency and factors associated with LGA in obese pregnant.^{25,26,27}

Therefore, maternal obesity is an independent risk factor for LGA birth with implications to maternal and child health. Therefore, the findings of this study would contribute towards filling gaps identified in literature concerning frequency of LGA in obese pregnant women in a south Asian country –Pakistan.

METHODS

Cross sectional survey design was carried out in the HBS Medical & Dental College, Islamabad, Department of Gynecology and Obstetrics, which is a teaching hospital that specializes in maternal healthcare. The study took six months, from October 1st, 2023 to March 30th, 2024, and was undertaken after the institutional review board approved the research synopsis vide REF No.28/P23 dated 11.8.23.

The target population was isolated to pregnant women who were attending hospital on an outpatient basis. These criteria were used in identifying the sample; women 20–40 years of age with gestational weight gain of ≥ 30 kg/m² after the 30th week of pregnancy, parity was controlled to be less than 5s. The participant's data was collected through non-probability consecutive sampling, whereby all eligible women attending the health facilities in the study period were recruited to the study, making a total of 145 women.

To rule out potential confounding factors, women with diseases affecting fetal size, including chronic or gestational hypertension (BP of 140/90 or above), gestational diabetes (blood sugar level above 186 mg/dL), anemia (hemoglobin level of 10 g/dL or below), and polyhydramnios (amniotic fluid index of 21 cm or higher), were omitted from the analysis. These exclusion criteria made it possible to associate the observed outcomes with maternal obesity only.

Operational Definitions

Maternal obesity was defined by a BMI of 30 kg/m² or greater recorded after 30 weeks of gestation based on the patient's LMP. LGA was defined as a birth weight more than the 90th percentile according to gestational age calculated based on ultrasound data obtained by the main researcher.

The participants were first asked for informed consent then information such as name, age, gestational age, and parity among others were obtained. The obstetric part of the case history was specifically completed in order to check the compliance of the patients in terms of the inclusion and exclusion criteria. In this study, all participants agreed to an abdominal ultrasonography conducted by the researcher herself following a consistent sequence of scanning protocol. The fetal weight has been assessed and it was compared to the gestational age – percentiles to define LGA. Data was documented systematically in a pre-developed format that has been prepared in advance.

The sample of 145 participants was estimated employing 95% confidence level with 8% error margin taking an estimated prevalence of LGA at 40.2% among women with increased BMI as described in prior studies.

Analysis of data was done using the statistical package of the social sciences (SPSS) version 23. Variables which are maternal age, gestational age, and BMI are being represented as continuous data therefore the mean and standard deviations were used for this study. The categorical variables including parity and LGA status were summarized using frequency and percentage. Original data were split post-hoc to assess the relationship between LGA and features under examination (maternal age, gestational age, BMI categories, parity). All tests included chi-square tests. In this case, tests were carried out and $p < 0.05$ was considered statistically significant.

RESULTS

Age distribution of the pregnant women involved in the study was determined by computing the ages of 145 participants with a mean maternal age of 31.03 years and standard deviation of 5.77 years. These observations were captured in Table-I which also

shows the descriptive statistics of gestational age in this study. The participants were in their 34 to 38 weeks gestation, the mean gestational age of the participants being 36.15 ± 1.45 weeks. This range involves pregnancies that are almost complete, which creates a uniform time frame within which to assess fetal development.

All the participants had a BMI between 30.3 and 40.0 kg/m² with the mean of 35.09 and SD 2.89. These values support the orientation of an obese population, essential for estimating LGA risks. These results suggest that increases in BMI should be considered as a risk factor in case of LGA development, but there were no differences in the LGA proportions by BMI categories shown in this study.

TABLE-I

Descriptive statistics of maternal age, gestational age & BMI

	N	Mean	Standard Deviation	Minimum	Maximum
Age (years)	145	31.03	5.77	20	40
Gestational age (weeks)	145	36.15	1.45	34	38
BMI (Kg/m ²)	145	35.09	2.89	30.3	40.0

The parity of participants was also analyzed, and results showed that while there were 29 participants with zero parity, 30 participants had one parity, 35 participants had a parity of two, 23 had parity of three, and 28 participants had parity of four. This distribution is shown in the following Figure-1, representing the various parity experiences of the study participants. The results reveal that parity was not tainted with LGA results. Multiparity, which is associated with size of the fetal, was not an important factor as the rate of LGA was similar in both primary and multiples parity gravida.

Based on participants' self-identification of LGA, 145 of 145 participants were LGA with 72 cases (49.66%) being classified as LGA while 73 cases (50.34%) were classified as non-LGA. This almost parity accentuates the fact that a large proportion of pregnant women of obesity falls under the LGA category. Figure-2 also depicts this information showing the large percentage of pregnancies which

could be affected.

FIGURE-1
Frequency distribution of parity

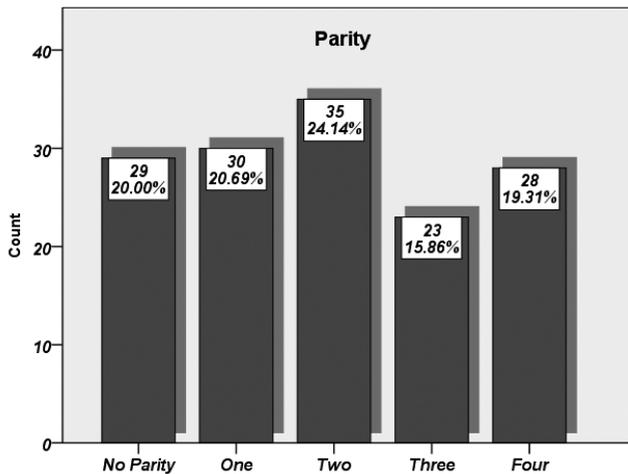


FIGURE-2
Frequency distribution of LGA

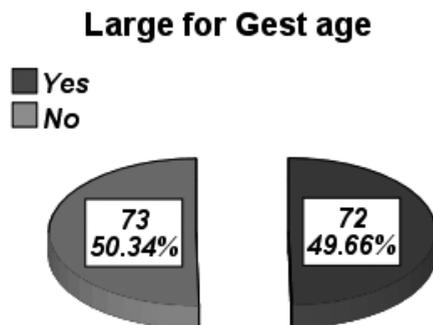


Table-II shows the relationship between the maternal age and the LGA outcomes. It also shows the relationship between LGA and gestational age

Table-III shows comparison of LGA with Parity and BMI

Thus, the present study contributes to the current literature focusing on the interaction of multiple factors that play a role in the development of LGA, especially in the case of maternal obesity, and underlines the need for the integrated approach to the enhancement of various aspects of maternal and fetal care.

DISCUSSION

The objective of this study was to identify the prevalence of LGA fetuses among obese pregnant women. It was possible to determine that 49.66% of the study population had LGA fetuses. While other antenatal factors like maternal obesity have been known to greatly increase the risk of LGA, none of the other examined maternal or fetal factors was shown to have any significant relationship with the development of LGA. These findings are in harmony with the trends marked internationally of the higher rates of maternal obesity and its potential consequences for the fetal macrosomia.

This LGA prevalence estimated in this study coincides with other studies conducted in the corresponding population.

TABLE-II
Comparison of LGA with Maternal Age & Gestational Age

		LGA		Total	%age	
		Yes	No			
Age (years)	≤ 30	32	31	63	43.4 %	Chi value=0.0510 p-value=0.810
	> 30	40	42	82	56.6 %	
Total		72	73	145		
LGA %				49.6%		
		Yes	No	Total		
GA (weeks)	34-36	43	32	75	57.3 %	Chi value=3.664 p-value=0.056
	37-38	29	41	70	41.4 %	
Total		72	73	145		
LGA %				49.6%		

TABLE-III

Comparison of LGA with Parity & BMI

	Yes	LGA		Total	%	
		No				
Parity	Primary	30	29	59	50.8 %	Chi value=0.057 p-value=0.812
	Multiple	42	44	86	48.8 %	
Total		72	73	145		
LGA %				49.6%		
		Yes	No	Total		
BMI	30-35	39	40	79	49.3 %	Chi value=2.06 p-value=0.698
	36-40	31	33	64	48.7 %	
	>40	2	0	2		
Total		72	73	145		
LGA %				49.6%		

For example, Kim et al.²⁵ acknowledged a 40.2 percent LGA prevalence among pregnant women who had elevated BMI. Another serious problem detected in obese women – LGA and its frequency according to Sneha et al.²⁶ constituted 35.5% – indicates the great impact of maternal obesity on excessive fetal growth. Overall these results supported the global trends observed for the current study population Prescribing for LGA Babies means that there is a necessity to employ appropriate strategies to deal with the problem of maternal obesity.

The impact of the mother's BMI on LGA is significant as the following studies have shown maternal obesity is one of the primary risk factors for a baby being classified as LGA.^{27,28} The physiological elucidation of this association includes factors such as maternal diabetes that contributes to hyperglycemia that in turns fosters fetal insulin secretion leading to fetal growth.²⁹ These mechanisms are supported by this study as 46% of the obese women gave birth to LGA pregnancies. On the other hand, the non-perfect correlation between BMI categories and LGA in the current study, indicates that other factors may exist that influence the effects of maternal obesity on LGA birth, such as genetic factors and lifestyles.^{30,31}

Despite the contributions that this study offers, the following limitations are worth mentioning. Cross-sectional design decreases possibilities to make

causal conclusions, and the origin from only one centre may decrease the transferability of results. To build on these findings, subsequent research should use studies of a longer duration, enabling investigators to trace the mechanisms through which maternal obesity is connected to LGA. Furthermore, recruitment of various populations and the assessment of other possible covariates, for example, gestational weight gain, and maternal metabolism would be useful.

CONCLUSION

Therefore, the present study results affirm a similarly increased proportion of LGA among obese pregnant women compared to the global literature. In the present study, there was no materially significant relationship between fetal growth and maternal age, gestational age, parity, or BMI categories; however, these concordant data suggest that thinking about the factors controlling fetal growth should take into account the consideration of maternal obesity. These findings stress the importance of an integrated approach towards understanding and combating maternal obesity with specific focus on its effects on neonates. Future studies should expand on these associations in order to contribute to the litigation of rational clinical practices and health policies.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

1	Saniya Naheed: Concept and design.
2	Anisa Saleem: Data collection.
3	Najma Ayub: Critical revision.
4	Javeria Mumtaz: Data analysis.
5	Rizwana Gul: Data analysis.
6	Ammarah Nadeem: Data interpretation.