ORIGINAL ARTICLE

Association between Maternal Obesity and Large for Gestational Age Infants in Pre-Eclampsia: A Prospective Cohort Study, Bahawalpur

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ABSTRACT

Objective: To determine the association between maternal obesity and large infants in pre-eclampsia.

Study Design: Prospective, cohort study.

Place and Duration of Study: This study was conducted at the Department of Obstetrics and Gynecology, Combined Military Hospital, Bahawalpur, Pakistan from 11th January 2020 to 10th July 2020.

Methods: Overall, 94 pre-eclamptic women of 18-35 years of age with a single gravidity of >28 gestational age were included. Women who were identified with diabetes, chronic high blood pressure, and alcoholism were excluded. All women with a BMI >30kg/m2 should be in group A, and those with a BMI 2 ≤30 kg/m2 in group B. Cases were tracked until delivery, and productive variables like a large for gestational age infant were noted. A numerical breakdown was executed using SPSS version 20.0. Age, gestational Age, parity, gravidity, and BMI were described as average and standard deviation. Occurrence and ratio were considered for qualitative variables like socioeconomic status (poor/middle/upper), and large for gestational age newborns (yes/no) in respective groups. Outcome transformers like Age, gestational Age, parity, gravidity, and socioeconomic status were precisely stratified, and post-stratification chi-square was used to observe the result on consequence. *P*-value ≤0.05 was measured as substantial. Relative risk was calculated, and >1 was taken as significant.

Results: The average age of females in Group A was 27.06±3.15 years, and in Group B, it was 27.34±3.07 years. Widely, the patients 76 (80.85%) were between 18 and 25 years of Age. The frequency of LGA in Group A (exposed group) was 21 (44.68%), whereas in Group B (unexposed group), it was 9 (19.15%), which showed a *P*-value of 0.013.

Conclusion: This research determined that maternal obesity in pre-eclampsia is linked with higher chances of large for gestational age newborns.

Keywords: *Infants, Maternal Obesity, Pre-Eclampsia.*

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Introduction

Preeclampsia is a high blood pressure disorder of pregnancy established in association with proteinuria after 05 months of pregnancy.[1] A weakened placental attachment appears to play a significant part in the pathophysiology of preeclampsia, with narrow incursion of the placental cytotrophoblast and resultant decreased placental blood flow.[2] inadequate placental blood flow causes this condition to be accompanied by decreased fetal development. However, large for gestational age babies have been reported in pre-eclampsia.[3] These annotations elevated the query that pre-eclampsia is

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linked with multiple etiologies.

Not only preexisting obesity but also gestational obesity are associated with deprived conclusions and poor outcomes. The latter results explicitly in the delivery of a macrosomia baby.[4] Now it is said that Otero placental insufficiency during pregnancy in preeclampsia is relative owing to disparity amongst limited utero-placental perfusion and augmented embryonic requirements for supplements. As obesity leads to increase fetal size and increased fetal nutrient demand for that macrocosmic fetus thus resulting in augmented occurrence of preeclampsia in full term pregnancies.[5]

Maternal overweight alone is one of the greatest menace factors for both preeclampsia and LGA infants. A study conducted by Choudhary et al. reveals a higher incidence of pre-eclampsia in obese pregnant women compared to nonobese women in a proportion of 35% vs. 20%, respectively. We theorized that the described additional threat of having an LGA infant in women with preeclampsia might be attributable to obesity.[6] Literature review reveals the higher incidence of large for gestational age newborns (>90*percentile) in Pre-eclamptic obese females compared to pre-eclamptic non-obese women, i.e., 46.37% vs. 19.47%, respectively.[7,8] In a study, the SGA children had increased death rates (40% vs 22%, *P*=0.006), and increased disease rates in relation to hyperbilirubinemia (67% vs 51%, *P*=0.02) and hypocalcemia (24% vs 10%, *P*=0.02).[9,10]

There is a lack of epidemiological studies on the association between overweight and additional embryonic development in preeclampsia in our setting. So the rationale of my study is to determine the risk of LGA infections in obese pre–eclamptic women as compared to non-obese, their prevalence, and the most common risk factors in CMH Bahawalpur, Southern Punjab. Based on these outcomes, a practice might be considered for multidisciplinary prenatal management in the high-risk group patients to address their high-risk needs and to ensure healthy pregnancies.

Methods

This Prospective Cohort study has been conducted in the Department of Obstetrics & Gynecology, Combined Military Hospital, Bahawalpur, from 11th January 2020 to 10th July 2020.

The intended sample size was 94, i.e., 47 for each respective group, with a 95% confidence interval, 80% power of the study, taking a percentage of large for gestational age infants in the exposed group as 46.37% and in the unexposed group as 19.47%. The WHO calculator is used to calculate the sample size. A non-probability, consecutive sampling technique was employed for this study. All pre-eclamptic women aged 18-35 years with a BMI >30 kg/m² (including morbidly obese) were the exposed group, while all pre-eclamptic women aged 18-35 years with a BMI ≤30 kg/m² were the unexposed group.

Patients aged 18 – t35 years, Gestational Age > 28 weeks (assessed on LMP), Parity 0 to 4, Gravida 1 to 5 are included in this study. While all the patients with previously raised blood pressure; preexisting diabetes (type 1 or type 2) as assessed on history and medical record; ex-smokers or drinkers; and females with kidney disorder, were excluded from this study.

Afterwards, consent from the Ethical Review Committee of the hospital vide letter no: ERC Serial No. 77 held on 1st January 2020. A total of 74 pre-eclamptic females reported to the Department of Gynecology of Bahawalpur Victoria Hospital, Bahawalpur, who met the standards were designated. Informed written permission was obtained, and the cases were divided into two groups, i.e., A and B. Group A (the exposed group) included all pre-eclamptic women aged 18-35 years with a BMI >30 kg/m², while Group B (the unexposed group) included pre-eclamptic women aged 18-35 years with a BMI ≤30 kg/m².

A numerical breakdown was executed using SPSS version 20.0. Age, gestational Age, parity, gravidity, and BMI were described as average and standard deviation. Occurrence and ratio were considered for qualitative variables like socioeconomic status (poor/middle/upper), and large for gestational age newborns (yes/no) in respective groups. The resultant variables, i.e., large for gestational age newborns, of each research group were compared for differences using the Chi-Square test, and a *P*-value ≤ 0.05 was considered significantl. Relative risk was considered, and >1 was considered significant. Outcome variables, such as age, gestational Age,

parity, gravidity, and socioeconomic status, were precisely stratified, and a post-stratification Chi-Square test was used to observe the results on the consequence. *P*-value ≤0.05 was measured as substantial. Relative risk was calculated, and >1 was taken as significant.

Results

The ages ranged from 18 to 35 years, with an average age of 27.12 ± 3.16 years. The average age of females in group A was 27.06 ± 3.15 years, and in group B was 27.34 ± 3.07 years. Widely held cases 76 (80.85%) were amongst 18 to 25-year-olds as expressed in table-1. The average gestational Age was 35.67 ± 3.43 weeks. The mean gestational Age in group A was 35.36 ± 3.43 weeks, and in group B was 36.26 ± 3.43 weeks. Most of the patients, 66 (70.21%), were 35 – 41 weeks of gestational Age as expressed in table-1. The average BMI in group A was 34.32 ± 3.59 kg/m2, and in group B was 27.81 ± 4.64 kg/m2. Mean parity was 2.34 ± 1.11. The average parity in group A was 2.45 ± 1.14 and in group B was 2.28 ± 1.08. (Table-1). Mean gravidity was 3.34 ± 1.11. The mean gravidity in group A was 3.45 ± 1.14 and in group B was 3.28 ± 1.08. (Table-1). The percentage of patients according to socioeconomic status in both groups is expressed in table -1.

Table-2 express the stratification of LGA in relation to patient age and gestational age, respectively. Correspondingly express the stratification of LGA with regard to parity and gravidity. (Table-2). The stratification of LGA in relation to socioeconomic status. (Table-2).

Table-1: Dispersal of variables

	Age (years)	**Group A (n=47)**		**Group B (n=47)**		**Total (n=94)**	
Age dispersal		**No of patients**	**% Age**	**No of patients**	**% Age**	**No of patients**	**% Age**
	18-25	39	82.98	37	78.72	76	80.85
	26-35	08	17.02	10	21.28	18	19.15
	Mean ± SD	27.06 ± 3.15		27.34 ± 3.07		27.12 ± 3.16	
Dispersal of cases in relation to gestational age	Gestational Age (weeks)	Group A (n=47)		Group B (n=47)		Total (n=94)	
		No of patients	% Age	No of patients	% Age	No of patients	% Age
	28-34 weeks	16	34.04	12	25.53	28	29.79
	35-41 weeks	31	65.96	35	74.47	66	70.21
	Mean ± SD	35.36 ± 3.43		36.26 ± 3.43		35.67 ± 3.43	
Distribution of cases conferring parity	Parity	Group A (n=47)		Group B (n=47)		Total (n=94)	
		No of patients	% Age	No of patients	% Age	No of patients	% Age
	0-2	23	48.94	27	57.45	50	53.19
	3-4	24	51.06	20	42.55	44	46.81
	Mean ± SD	2.45 ± 1.14		2.28 ± 1.08		2.34 ± 1.11	
Distribution of cases conferring to gravidity	Gravidity	Group A (n=47)		Group B (n=47)		Total (n=94)	
		No of patients	% Age	No of patients	% Age	No of patients	% Age
	1-3	23	48.94	27	57.45	50	53.19
	4-5	24	51.06	20	42.55	44	46.81
	Mean ± SD	3.45 ± 1.14		3.28 ± 1.08		3.34 ± 1.11	
Dispersal of cases conferring to SES	SES	Group A (n=47)		Group B (n=47)		Total (n=94)	
		No of patients	% Age	No of patients	% Age	No of patients	% Age
	Poor	11	23.40	11	23.40	22	23.40
	Middle	17	36.17	17	36.17	34	36.17
	Upper	19	40.43	19	40.43	38	40.43

Table-2: Stratification of Variables

	Age (years)	**Group A (n=47)**		**Group B (n=47)**		***P*-value**	***RR***
Stratification of LGA in relation to Age		**LGA**		**LGA**			
		Yes	**No**	**Yes**	**No**		
	18-25	17	22	05	32	0.009	3.23
	26-35	04	04	04	06	0.675	1.21
	GA (weeks)	Group A (n=47)		Group B (n=47)		*P*-value	*RR*
Stratification of LGA in relation to gestational Age		LGA		LGA			
		Yes	No	Yes	No		
	28-34	05	11	03	12	0.483	1.56
	35-41	16	15	06	26	0.013	2.75
Stratification of LGA in accordance with parity	Parity	Group A (n=47)		Group B (n=47)		*P*-value	*RR*
		LGA		LGA			
		Yes	No	Yes	No		
	0-2	08	15	05	22	0.202	1.88
	3-4	13	11	04	16	0.040	2.71
	Gravidity	Group A (n=47)		Group B (n=47)		*P*-value	*RR*
Stratification of LGA in accordance with gravidity		LGA		LGA			
		Yes	No	Yes	No		
	1-3	08	15	05	22	0.202	1.88
	4-5	13	11	04	16	0.040	2.71
Stratification of LGA in relation with socioeconomic status	SES	Group A (n=47) LGA		Group B (n=47) LGA		*P*-value	*RR*
		Yes	No	Yes	No		
	Poor	08	03	04	07	0.115	2.00
	Middle	06	11	04	13	0.458	1.50
	Upper	07	12	01	18	0.056	7.00

Discussion

Maternal obesity appears to play a part in the pathophysiology of pre-eclampsia. Gathering indications shows that outcomes of poorly perfused placenta, together with anti-angiogenic factors, might cause endothelial dysfunction resulting in the medical exhibition of pre-eclampsia.[11-13] Furthermore, it is anticipated that, due to the partial blood supply of the placenta, fetuses usually exhibit limited growth.[14-17] Additionally, embryonic development constraints might antecede the analytical conclusions of pre-eclampsia in the gravidity, as established by research demonstrating that embryonic developmental limitations with reduced blood supply are linked with a several-times amplified hazard of pre-eclampsia.[18]

In several other studies, additional large-for-gestational-age (LGA) embryos have been described in pre-eclampsia and have confronted the proposition that placental dysfunction is the sole cause of ailment in pre-eclampsia.[19-21] This research is done to evaluate the association of maternal obesity and large for gestational age infants in pre-eclampsia. Age in this research ranged from 18 to 35 years, with an average of 27.12 ± 3.16 years. The average age of females in group A was 27.06 ± 3.15 years, and in group B was 27.34 ± 3.07 years. Widely, the females 76 (80.85%) were amongst 18 to 25 years of Age. The frequency of LGA in Group A (exposed group) was 21 (44.68%) while in Group B (unexposed group) it was 09 (19.15%), which shows a *P*-value of 0.013. In a meta-analysis, it was seen that pre-eclamptic females delivering at full-term had an augmented risk of LGA newborns.

In a current study, the occurrence rates of embryonic macrosomia were 13.3% and 14.6% for overweight

and morbidly overweight females, respectively, compared with 8.3% for the standard weight control group. In America, the average birth weight increased from 3423g to 3431g in white people and from 3217g to 3244g in blacks between 1985 and 1998.

An organized analysis and research approach has shown that maternal overweight is linked with embryonic development, which is contrary to standards. The probabilities of a disproportionately large child are amplified: for large for gestational age newborns (≥90th percentile) by 142%, for birth weight ≥4000 g by 117%, and for birth weight ≥4500 g by 277%.

Conclusion

This research determined that maternal obesity in pre-eclampsia is linked with higher chances of larger for gestational age newborns.

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Author Contributions

ZN: Conception and design of the work
SI: Data acquisition, curation, and statistical analysis
MSA: Manuscript writing for methodology design and investigation
RG: Revising, editing, and supervising for intellectual content
SP: Validation of data, interpretation, and write-up of results
ZW: Writing the original draft, proofreading, and approval for final submission