Original Article

Feto-maternal Outcome in Fetal Macrosomia : A Case-Control Study

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Abstract

Background : Macrosomia may adversely affect feto-maternal outcomes and needs its risk factors to be evaluated during pre-conceptional and antenatal work up.

Materials and Methods : An analytical case control study was conducted for one and half years in a Tertiary Referral Centre of India with mothers (n=47) giving birth to macrosomic babies weighing 4000 gm or above and they were compared with controls (n=47) with babies weighing between 2500-3999 gm in relation to the risk factors and pregnancy outcomes. Aim of the study was to determine the risk factors increasing the chance of macrosomia to happen and to compare the incidence of adverse feto-maternal outcomes in macrosomia with babies born with normal birth weight.

Results : Maternal pre-pregnancy BMI and weight gain during pregnancy appeared to be strong risk factors ($p<0.001$) independently for macrosomia. Incidence of diabetes in pregnancy and morbidity related to Caesarean Sections (CS) were also high among cases ($p=0.007$ in both). Regarding neonatal complications higher incidence of neonatal hypoglycemia was reportedly found ($p=0.010$).

Conclusion : Due to significantly adverse feto-maternal outcomes due to macrosomia, Obstetricians should keep vigilant regarding the risk factors prior to delivery to promote healthy pregnancy outcomes.

Key words : Macrosomia, Caesarean Section, Obesity.

Fetal macrosomia is defined as an infant weight above 4000 gm or 4500 gm irrespective of gestational age, sex and ethnicity[1,2]. This weight threshold varies among countries due to insufficient and different academic and medical reporting. Macrosomia is associated with both short and long term feto-maternal adverse outcomes. Immediate complications include birth trauma, perinatal asphyxia, hypoglycaemia for the baby on the other hand mothers are at risk of increased operative morbidity, perineal trauma, prolonged labour, haemorrhage[3,4]. In later life macrosomic babies commonly develop child hood obesity, type1 and type 2 diabetes where mothers of macrosomic fetus likely to suffer from type 2 diabetes during post pregnancy period[5-7]. Risk factors for developing macrosomia include high parity, pregnancy with postmaturity, male gender of the fetus, pre-gestational and gestational diabetes, excessive gestational weight gain as per data mostly obtained from Western/Caucasian population and that might vary in Asian population. Even the risk of adverse outcomes may also differ in different ethnic background specially with low average birth weight, if the usual cut-off used to define macrosomia is applied[2]. In this study we aimed to estimate the prevalence of adverse outcomes of macrosomia affecting feto-maternal well-being and to determine the risk factors for developing those adverse outcomes in the study group with the pregnancy with normal baby weight.

Editor's Comment :

- Fetal Macrosomia has been shown to be associated with multiple intranatal, postnatal and neonatal complications. Hence, adequate and routine antenatal care is recommended for every antenatal mother for prevention, early detection and timely intervention in cases of fetal macrosomia so as to avoid complications and improve feto-maternal outcomes.

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Materials and Methods

This was a case control study done in the Department of Obstetrics and Gynecology of R G Kar Medical College and Hospital, India from December, 2022 to May, 2024 over a period of 18 months after being approved by Institutional Ethics Committee . Sample size was calculated to be 30-40 as 5 cases of macrosomic babies were found over a period of 2months in the proposed place of research in a pilot study. Total 94 participants including both cases and controls were included either from antenatal Clinic or in Patient Department. During the study period 47 macrosomic babies were delivered , so equal number of controls were recruited. Cases and controls were divided as Group A and Group B respectively. Mothers giving birth to babies 4000 gm and above at term gestational age were selected as cases where next delivery following a case without macrosomia weighing between 2500-3999 gm was considered as control. Pregnancy with mal-presentation, preterm labour, multi-fetal gestations, congenital malformations and intra uterine fetal deaths were excluded from the study. Demographic data including.

Statistical Analysis :

The data was entered in the Microsoft Excel spreadsheet and the final analysis was done using Statistical Package for Social Sciences (SPSS) software, IBM manufacturer, Chicago, USA, version 21.0. Categorical variables were presented in the form of number and percentage (%) and quantitative variables were presented as the means ± SD and median with 25th and 75th percentiles (IQR = Interquartile Range) and range. The univariate logistic regression method was used to calculate odds Ratio as well as to identify significant associations of various risk factors and outcomes of Macrosomia. P value of less than 0.05 was considered as statistically significant.

Result Analysis :

Group A (cases) and Group B(controls) were comparable to each other on the basis of demographic variables including age, parity, gravidity, religion and residence (Table 1). Risk factors for macrosomia (Table 2) were compared with controls and both pre-pregnancy BMI and maternal weight gain during pregnancy were found to be independent risk

Table 1 — *Demographic Parameters*

Parameters	Control (n=47)	Case (n=47)	ODD Ratio	Confidence Interval	P-Value
Age (mean±SD)	26(6)	28.8(4.7)	0.99	0.92-1.07	0.840
Religion :					
Muslim	23(48.9%)	26(55.3%)	1.29	0.57-2.90	0.840
Hindu	24(51.1%)	21(44.7%)			
Gravida :					
Primigravida	21(44.7%)	17(36.2%)	1.425	0.623-3.260	0.401
Multigravida	26(55.3%)	30(63.8%)			
Residence :					
Rural	36(76.6%)	34(72.3%)	1.25	0.49-3.17	0.271
Urban	11(23.4%	13(27%)			

Table 2 — *Comparison of Maternal Risk factors*

Parameters		Control (n=47)	Case (n=47)	ODD Ratio	Confidence Interval	P-Value
Pre-pregnancy BMI	Overweight (>25kg/m^2)	6 (12.8%)	35 (74.5%)	19.93	6.78-58.62	<0.001
	Underweight (<18kg/m^2)	41 (81.2%)	12 (25.5%)			
Maternal weight gain (Mean SD)		7.5 (1.2)	9.8 (1.8%)	2.98	1.86-4.77	<0.001
Gestational Diabetes Mellitus	Yes	7 (4.9%)	19 (40.4%)	3.88	1.44-10.45	0.007
	No	40 (85%)	28 (59.6%)			
Pregnancy Induced Hypertension	Yes	5 (10.6%)	10 (21.3%)	2.27	0.71-7.25	0.166
	No	42 (89.4%)	42 (78.7%)			
Mode of Delivery	Vaginal (Normal/Assisted)	28 (49.6%)	15 (31.9%)	3.145	1.349-7.299	0.007
	LUCS	19 (40.4%)	32 (68.1%)			
Prolonged Labour	Yes	2 (4.3%)	5 (10.6%)	2.68	0.49-15.56	0.254
	No	45 (95.7%)	42 (89.4%)			
Shoulder Dystocia	Yes	47 (100%)	46 (97.9%)	0.00	0.00-0.00	0.999
	No	0 (0%)	1 (2.1%)			
Post-partum Haemorrhage	Yes	47 (100%)	46 (97.9%)	0.00	0.00-0.00	0.999
	No	0 (0%)	1 (2.1%)			
Past history of Macrosomia (Multigravida)		n=26	n=30	5.14	1.00-26.58	0.050
	Yes	2 (7.7%)	9 (30.0%)			
	No	24 (92.3%)	21 (70.0%)			

factors for macrosomia to happen with strong statistical significance (p <0.001). Higher incidence of gestational diabetes (p=0.007) was found among cases, however incidence of hypertensive disorders in pregnancy was not significantly raised. Operative morbidity rate due to caesarean delivery was very high among cases (p=0.007) when compared with that of vaginal delivery including both normal and assisted vaginal deliveries. Incidence of other maternal complications like prolonged labour during second stage of labour, post-partum haemorrhage, shoulder dystocia was marginally high in Group A without statistically significance. Clinical information and medical records showed incidence of macrosomia in previous pregnancy among multi parous mothers in case group was higher and just at the level of statistical significance with p value=0.05. Neonatal complications (Table 3) including Apgar scores at 5minute and 7 minute, Sick New-born Care Unit (SNCU) admission, perinatal asphyxia, neonatal death were comparable without statistical significance between two groups except higher rate of neonatal hypoglycaemia among macrosomic babies (p=0.010).

Discussion

Macrosomia, defined as birth weight 4000 gm or above with a prevalence rate of 10% worldwide was found to be associated with adverse maternal and neonatal complications as reported in multiple studies but no clear recommendations from professional bodies regarding management and plan of delivery were made yet probably due to ineffective antenatal measures to predict macrosomia, the inadequate evidence about appropriate management and the significant variation or heterogeneity in the literature regarding exact estimates of maternal and fetal complications[8-10,11]. Macrosomia is a related term and its diagnosis is based on an absolute birth weight threshold where gestational age , ethnicity are not considered but the term large for gestational age/ LGA (refers to an infant born above the 90th/95th percentile for weight at gestational age) reflect a better information about growth pattern according to gestational age and it takes into account ethnicity additionally, depending on the population or growth charts used to calculate growth centiles[1,8]. Harvey et al. evaluated risk factors in Asian countries and reported high pre-pregnancy BMI is strongly associated with subsequent occurrence of macrosomia/LGA in their meta analysis[2]. We too found high pre-pregnancy BMI as an independent predictor for macrosomia in subsequent pregnancy. Recurrence of macrosomia among multiparous women was at significance level (p=0.05) in our study. This similar finding was reported by many studies probably due to elevated BMI at the time of conception and increased weight gain during pregnancy and in between pregnancies[12-16]. Several randomised trials reported maternal hyperglycaemia increases the chance of fetal macrosomia similar to our study where we found 40.4% participants in case group were affected with diabetes while compared with controls (p=0.007)[17-20]. In our study operative morbidity was significantly increased (p=0.007) and 68% mothers in group B underwent CS while intra-partum complications like prolonged second stage of labour, shoulder dystocia, post partum haemorrhage were not significantly raised. This was probably due to the reason, the study was done in a referral centre where decision of CS was made much earlier for labor complications before onset of second stage of labour in emergency situations nullifying the chance of those labor complications. Said et al also reported 61.1% CS rate to deliver macrosomic fetus[12] in their study. The only significant neonatal complication while comparing with controls in our study was neonatal hypoglycemia (p=0.10). Such metabolic disturbance is 3 times common in new-borns with birth weight equal or above 4000 gm[4]. Limitation of our study was poor sample size over a short period of 1.5 years only. However we tried to find out feto-maternal complications in pregnancies with macrosomia fixing the gestational age at term. Literature reported highest

Table 3 — *Neonatal Outcome Comparison*

Parameters	Control (n=47)	Case (n=47)	ODD Ratio	Confidence Interval	P-Value
Apgar Score 1 min (SD)	6.95 (1.1)	7.02 (1.1)	1.06	0.73-1.53	0.226
Apgar Score 5min (SD)	7.98 (1.1)	8.04 (1.1)	1.06	0.73-1.55	0.770
Birth Asphyxia :					
No	40 (85%)	41 (87.2%)	1.19	0.37-3.86	0.765
Yes	7(14.9%)	6 (12.8%)			
SNCU Admission :					
Yes	4 (8.5%)	7 (14.9%)	1.88	0.51-6.91	0.341
No	43 (41.5%)	40 (85.1%)			
Neonatal hypoglycemia :					
Yes	2 (4.3%)	12 (25.5%)	7.71	1.62-36.74	0.010
No	45 (95.7%)	35 (74.5%)			
Perinatal death :					
Yes	0 (0%)	2 (4.3%)	0.00	0.00-0.00	0.999
No	47 (100%)	45 (95.%)			

prevalence of macrosomia (>10%) was in China and Pakistan where highest prevalence of LGA was found in China, Bangladesh, India, Japan, Thailand and Vietnam and if we consider the latter countries, they traditionally experience higher prevalence of low birth weight or small for gestational age at term. Such data reinforce the assumption that countries affected with low birth weight problem might suffer from consequences of high birth weight births as well[2,20]. So we need larger trials or analytical studies involving bigger sample size over prolonged period of time specially in Asian zones where data are sparse because it accounts for 60% of World's population and many of its countries including India are undergoing rapid economical changes necessitating to find out the exact incidence of macrosomia /LGA in these countries to implement preventive measures.

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