Original Research Article

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The association of maternal risk factors to macrosomia in rural areas of Haryana, India: a community based study

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ABSTRACT

Background: Macrosomia affects 1-10% of all pregnancies. The macrosomia is reportedly associated with neonatal morbidity, neonatal injury, maternal injury and cesarean delivery. The present study was aimed at finding out prevalence and assessing association of maternal risk factors with macrosomia.

Methods: This community based retrospective and cross-sectional study was carried out in 23 rural sub-centres of block Beri, district Jhajjar (Haryana, India) among 920 mothers. A predesigned pretested semistructured questionnaire was used to collect information. Univariate analysis along with logistic regression analysis was performed.

Results: The prevalence of macrosomia among live births was 1.3% (n=12). In the present study, mothers from upper and upper middle socio-economic status had six times higher odds of delivering a large baby. Diabetic mothers had seventeen times higher incidence of macrosomia as compared to non-diabetic mothers. Mothers who consumed full course of iron folic acid (IFA) tablets during antenatal period had 24% lesser chances of macrosomia in live births as compared to mothers who did not consume the full course.

Conclusions: The findings of the present study emphasize that incidence of macrosomia can be reduced by strengthening antenatal monitoring, prevention of complications, early diagnosis and appropriate and adequate management of treatable risk factors in mothers.

Keywords: Fetal, Macrosomia, Large baby, Community, Rural, Overweight baby

INTRODUCTION

Macrosomia affects 1-10% of all pregnancies. The term macrosomia is used to describe a new born with an excessive birth weight i.e. birth weight more than 4 kg or birth weight two standard deviations above the mean birth weight of that gestational age. A diagnosis of foetal macrosomia can be made only by measuring birth weight after delivery; therefore, the condition is confirmed only retrospectively i.e. after delivery of the neonate. Factors described with foetal macrosomia include genetics such as parental height and weight; duration of gestation; presence of gestational diabetes; racial and ethnic

factors.² Despite the identification and characterization of risk factors, no combination of these risk factors are known to predict macrosomia accurately. Much of the birth weight variation remains unexplained, and most macrosomic infants do not have identifiable risk factors. The macrosomia is reportedly associated with neonatal morbidity, neonatal injury, maternal injury and caesarean delivery.³ All deaths and diseases of infants during perinatal and neonatal period are strongly associated with maternal biological characteristics and with problems during pregnancy and childbirth. The present study is part of another study entitled, "a study to assess the association of maternal risk factors with fetal outcome in

rural areas of Haryana" in which all the adverse fetal outcome were studied. The present paper was aimed at finding the prevalence of macrosomia and its relationship with maternal risk factors as it is important to study this on regional basis.

METHODS

This community-based retrospective and cross-sectional study was carried out in Community Development Block, Beri (District Jhajjar) after approval from institutional ethics committee from September 2012 to August 2013. Beri block serves as the field practice area of Department of Community Medicine, Pt. B. D. Sharma Post Graduate Institute of Medical Sciences, Rohtak. Out of the 25 subcentres, two subcentres- serve the urban population and the rest 23 subcentres cater services to rural population.

Considering the prevalence of high risk pregnancy as approximately 10% and allowable error of 20% at 95% level of significance and 90% power, the sample size was calculated using the formula (n) = $Z21-\alpha/2+\beta$ p (1-p)/d2, where Z= value of area under the normal curve (1.96 for 2-sided test; 5% significance level), a= Level of significance (0.05), β = power of the study, p= prevalence (proportion- 10%), d= relative allowable error (20%) and n= sample size. ⁴ The calculated sample size came out to be 900. Mothers who delivered in the last one year were included in the study fulfilled the inclusion criteria of permanent residents of the area for at least last one year, had ANC records at subcentres and who had given informed written consent with a literate witness thereof. Women who could not be contacted even after two home visits, women who did not give consent, multiple births like twins and Maternal death were excluded from study. A list of all the 23 rural sub-centres in the study area was obtained from the concerned Community Health Centres. All mothers who delivered in the last one year and had antenatal records were enlisted from the ANC, Birth and immunization register from subcentre. Out of enlisted mothers, 40 mothers were selected by simple random sampling from each subcentre. Though the calculated sample size was 900, a total of 920 (40×23) mothers were included in the study to make the sampling procedure more convenient. The investigator herself contacted these selected mothers at their home. All the subjects were fully informed about the purpose of the study. A written informed consent was obtained from the individual before conducting the interview. A pre-tested semistructured interview schedule was used which included information on socio-demographic profile, past obstetrical, medical and contraceptive history, details of latest pregnancy like antenatal care visits, Iron Folic Acid tablets consumption, time of pregnancy registration and complications during pregnancy like hypertension, diabetes, etc. The detailed obstetric history, along with birth weight were recorded. The health records available with the mother were also reviewed. Socioeconomic status of study population was assessed using Modified Uday Parikh scale for rural areas.⁵

Data analysis

Data collected were entered in the MS Excel spread sheet, coded appropriately. Analysis was carried out using SPSS for Windows version.20.0. Categorical data was presented as percentage (%). Pearson's chi square test was used to evaluate differences between groups for categorized variables. In case, the expected cell count was less than 5 in >20% cells, Fisher's Exact test was used. Binary logistic regression analysis (stepwise method) was used to evaluate the independent associations of various factors with macrosomia. All tests were performed at a 5% level significance; thus, an association was significant if the value was less than 0.05 (p<0.05).

RESULTS

In the present study, a total of 920 mothers who delivered in the last one year were included in the study. The response rate was 100%. There were 10 twin deliveries among 920 study participants which were excluded from the analysis. The study revealed that 98.9% (900 out of 910 single deliveries) of foetal outcome was in the form of live births and rests 1.1% (10) were still births. Among 900 live births, 1.3% (12) babies were overweight. The study found that the mean age of study participants was 24.4 years. Majority (96.6%) of study subjects belonged to lower socioeconomic status (middle + lower middle+ lower socioeconomic status) while higher socioeconomic status (upper-middle + upper socioeconomic status) constituted 3.4% of study subjects.

Table 1: Distribution of risk factors among mothers (N=910).

Risk factors*	Frequency	Percentage (%)
Maternal age ≤19 years	34	3.7
Maternal age ≥35 years	15	1.6
Height ≤145 cm	8	0.9
Parity ≥4	33	3.6
Previous stillbirth	25	2.7
History of ≥3 abortions	23	2.5
Foetal mal-presentation	18	2.0
Previous birth with congenital malformations	15	1.6
Anemia during pregnancy	473	52.0
Hypertension during pregnancy	44	5.0
Diabetes mellitus during pregnancy	62	6.8

^{*}More than one risk factor may be there.

The Table 1 shows the prevalence of risk factors among mothers in the study area. The present study revealed that nearly half of the mothers were anemic during pregnancy (52.0%). The diseases like diabetes and hypertension during pregnancy with prevalence of 6.8% and 5.0% respectively were other common morbidities found among mothers. There were 3.7% teenage mothers (\leq 19 years) while 1.6 % mothers were of advanced age (\geq 35

years). Mothers with parity ≥ 4 accounted for 3.6% of the total study subjects. The history of previous stillbirth and the history of ≥ 3 abortions were present in 2.7% and 2.5% of mothers respectively. Other risk factors like foetal mal-presentation, previous history of congenital malformations and height ≤ 145 cm were found in 2.0%, 1.6% and 0.9% respectively.

Table 2: Association of mother's variables with overweight birth (macrosomia) (N=900).

Mother's variables	Birth weight ≥4 kg (N=12) n (%)	Birth weight ≥4 kg (N=12) n (%)	Chi square, p value	
Mother's age ≥35 year	0 (0.0)	14 (100.0)	0.192, p=0.661	
Mother's education				
Illiterate	4 (2.6)	150 (97.4)		
Primary	2 (1.9)	103 (98.1)		
Middle	1 (0.5)	204 (99.5)	7.271, p=0.155	
High	1 (0.4)	283 (99.6))		
Graduate and above	4 (2.6)	148 (97.4)		
Mother's occupation				
Working	4 (1.8)	211 (98.1)	0.203, p=0.653	
Socio-economic status				
Upper+upper middle	2 (6.9)	27 (93.1)	7.050 0.040	
Middle+lower middle+lower	10 (1.1)	861 (98.9)	7.050, p=0.049	
Mother's height ≤145 cm	1 (16.7)	5 (83.3)	10.795, p=0.078	
Parity ≥4	0 (0.0)	32 (100.0)	0.448, p=1.000	
Birth spacing <3 year	8 (1.3)	625 (98.7)	0.078, p=0.757	
Previous history of ≥3 abortions	0 (0.0)	22 (100.0)	0.305, p=1.000	
Anemia during pregnancy	4 (0.9)	461 (99.1)	1.637, p=0.201	
Hypertension during pregnancy	0 (0.0)	38 (100.0)	0.536, p=0.464	
Diabetes during pregnancy	6 (10.3)	52 (89.7)	38.269, p=0.000	
Early registration of pregnancy	10 (1.7)	578 (98.3)	0.187, p=0.235	
<4 ANC visits during pregnancy	7 (2.1)	319 (97.9)	2.574, p=0.133	
IFA intake during pregnancy	2 (0.5)	413 (99.5)	3.950, p=0.048	

Table 3: Independent association of variables with macrosomia (logistic regression analysis) (N=900).

Variable		aOR	Confidence interval	P value
Diabetes during pregnancy		17.46	5.23-32.27	0.000
Upper+upper	Middle	6.86	1.18-39.88	0.032
Socio-economic status		•		
IFA tablets intake	during	0.76	0.02-0.93	0.046
Pregnancy				

Table 2 depicted the association of macrosomia with maternal variables. The study found out that mothers who were in advanced age i.e. more than 35 years delivered more macrosomic babies than those mothers who were under 35 years of age. The study also found that illiterate mothers and mothers educated up to graduation and above, delivered maximum number of macrosomic babies i.e. 2.6% each. Further, it was found that mothers of higher socioeconomic group had higher occurrence of macrosomic babies than their counterparts from the lower socioeconomic group. In the present study, upper and upper middle socio-economic status mothers were found to have statistically significant relationship with

occurrence of overweight at birth. However, association of macrosomia with mother's age, education and occupation showed no statistical significance. The study reported that the diabetic mothers had significantly higher incidence of macrosomia (10.3%) as compared to non-diabetic mothers (0.7%). It was found that mothers who were non-anemic delivered more overweight babies than those mothers who were anemic. However, this association between anemia during pregnancy and overweight baby was not statistically significant (p=0.201). The study also looked into the relationship between hypertension during pregnancy and overweight birth and it was observed that there was no statistically

significant difference in occurrence of macrosomia between hypertensive and non- hypertensive mothers (p=0.464). The present study found out that mothers who consumed full course of Iron Folic Acid (IFA) tablets during antenatal period had less prevalence of macrosomia in live births as compared to mothers who did not consume the full course of IFA tablets. This relationship was found to be statistically significant (p=0.048). The present study also observed that there is no statistically significant relationship between ANC visits during pregnancy and overweight baby (p=0.133).

A step-wise logistic regression analysis was performed) (Table 3). The prevalence of overweight birth was shown to be about seventeen times more common in diabetic mothers (aOR: 17.46; CI: 5.23-32.27 p=0.000) and seven times more common in mothers who belonged to higher socio-economic status (aOR: 6.86; CI: 1.18-39.88 p=0.032). The study also revealed that consumption of full course of IFA tablets during antenatal period decreased odds of having overweight baby with odds ratio of 0.76 (CI: 0.02-0.93 p=0.046).

DISCUSSION

The present study revealed that nearly half of the mothers were anemic during pregnancy (52.0%). Similarly, NFHS- 3 data revealed that 57.9% pregnant women in India and 56% in Haryana were anaemic.⁶ Singh et al reported the overall prevalence of anemia as 42%.⁷ The prevalence of diabetes during pregnancy was 6.8% in our study. The prevalence of gestational diabetes has been reported to be in the range of 6.9 to 13.9%.⁸⁻¹⁰ Hypertension was found out to be 5.0% among pregnant women in the present study. Almost, similar observation (6.9%) was quoted by Bharti et al while Sachdeva et al and Zareen et al had reported it as 15% and 14.8% respectively among rural women in hospital-based studies.¹¹⁻¹³

The present study figured out that mothers who had advanced age i.e. more than 35 years delivered more macrosomic babies than those mothers who were below 35 years of age. Similarly, Rajaee et al in their study reported that mothers aged more than 35 years had higher chances of delivering a macrosomic baby (35-39 years: 1.8% and >40 years: 1.2%) when compared to those aged less than 35 years (1.1%). Kenny et al also observed that the risk of macrosomia increased significantly with advancing maternal age.

The present study also looked into the association of mother 's education with overweight baby and found that illiterate mothers and those educated up to graduation and above, delivered maximum number of macrosomic babies i.e. 2.6% each. However, association of macrosomia with education had no statistical significance. This is in conformity with the finding of Webb that aside from the lowest category of education, a trend of higher risk of high birth weight was observed with increasing education.¹⁶ This study revealed that mothers of higher socio-economic group had higher occurrence of macrosomic babies than lower socioeconomic group. The study observed that prevalence of macrosomia was around seven times more common in mothers who belonged to higher socio-economic status as compared to mothers of lower socio-economic status (aOR: 6.86; CI: 1.18-39.88 p=0.032). A study conducted by Webb R also reported similar findings. 16 In addition to foetal over-nutrition as an explanation, it is also possible that there is a genetic or lifestyle pre-disposition to greater BMI, greater weight at birth and obesity throughout life in babies of mothers of higher socioeconomic group. The present study reported that diabetic had significantly higher incidence macrosomia (10.3%) as compared to non-diabetic mothers (0.7%). The prevalence of overweight birth was shown to be about seventeen times more common in diabetic mothers (aOR: 17.46; CI: 5.23-32.27, p=0.000) than non-diabetic mothers. Xiong et al revealed that infants born to mothers with GDM had 1.12 higher odds [aOR: 1.12~(1.07-1.17)] of delivering a macrosomic baby. 17 A study conducted by Lawlor et al revealed an adjusted odds ratio for macrosomia of 5.50 (95% CI, 1.18-10.30) in mothers with GDM. 18 A prospective study conducted by Wahi et al revealed that the prevalence of macrosomia was significantly higher in mothers with GDM (16.2%) as compared to controls (5.7%) (p=0.03).8

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