Original Article

ADVERSE PREGNANCY OUTCOME AS A RESULT OF ANAEMIA AND HYPERGLYCAEMIA WITH SPECIAL FOCUS ON TIME OF REGISTRATION AND WEIGHT GAIN DURING PREGNANCY

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ABSTRACT

Introduction: Adverse pregnancy outcome is a result of many factors related to mother that may act concomitantly. Weight gain during pregnancy is one of the important tools to assess course and outcome of pregnancy. Weight gain during pregnancy is affected by many factors; the important being anaemia and hyperglycaemia.

Methods: A prospective study was conducted on 400 antenatal women in rural area to assess adverse pregnancy outcome in women having anaemia, hyperglycaemia and to correlate it with weight gain and time of registration. Stata SE 10.1 was used to analyse data.

Result: Mean weight gain observed was just 3.96 Kg (kilogram). Anaemia, hyperglycaemia and poor weight gain were associated with various adverse pregnancy outcomes like low birth weight, preterm delivery, Caesarian section or malpresentation.

Conclusion: We need to first emphasize on adequate weight gain during pregnancy to control maternal illnesses as well as adverse pregnancy outcome.

Key-words: Anaemia during pregnancy, GDM, Weight gain during pregnancy

INTRODUCTION

As maternal and child health is backbone of any nation, the well-being of societies is linked to the health of mothers and children. Still, every day 1500 women die due to complications in pregnancy or childbirth.[1] According to NFHS-III year 2005-2006 data prevalence of anaemia in pregnant women is 57.9% in India.[2] A high risk pregnancy is that with a significant probability for a poor maternal or foetal outcome. Iron deficiency anaemia during pregnancy increases perinatal risks for mothers and neonates.[3]

Another important condition is Gestational diabetes mellitus (GDM). The purpose of identifying GDM is detection of women at risk for adverse perinatal outcomes.[4]

Among mothers who gave birth in the five years preceding the NFHS-III survey, less than half of women received antenatal care during the first trimester of pregnancy, as is recommended.[5] As per NFHS III data, antenatal care 3 checkups percentage is only 51%.[6]

Nutritional status of pre-pregnancy and pregnancy weight gain both affect the health and survival rate of the newborn.[7] The total weight gain during the course of a singleton pregnancy for a healthy woman averages 11 Kg (Kilogram).[8] Surprisingly the fact is average mean weight gain during a normal pregnancy in India is var-

ied from 5.1 to 8.3 kg,[9] while that of other countries, it is between 8.3-15.6 Kg.[10]

Hence objectives set were to study adverse pregnancy outcome if any, in women having anaemia, hyperglycaemia and to correlate it with socio-demographic profile, time of registration and weight gain in rural area.

METHODS

Study was carried out at Rural Health Training Centre (RHTC), Taluka Palghar, District Thane - a rural field practicing area of tertiary care teaching institute at Mumbai. It was an observational prospective study carried out from August 2007 to September 2008. Ethical approval was obtained from Institutional Ethics Committee of the parent institute in the month of August 2007.

Study Subjects were pregnant women registered at Rural Health Training Centre. Based on the prevalence of maternal anaemia according to NFHS-III data,[2] Sample size was calculated using sample size formula. According to the formula,[11] keeping permissible margin of error 5%, sample size worked out as 374.34. It was rounded up to 400 considering drop-outs.

Consent was obtained from each enrolled woman. With the help of predesigned, pretested proforma; preliminary data regarding socio-demographic profile of antenatal women was noted at the time of weekly antenatal clinic at RHTC. Detailed history and clinical examination was carried out.

Laboratory investigation of haemoglobin level was done at RHTC laboratory by qualified laboratory technician using Sahli's method. Those women with haemoglobin less than or equal to 11 gms% were categorized as 'anaemia present' as per Indian Council of Medical Research (ICMR) classification. Random blood sugar level estimation was done with the help of Glucometer once at the time of enrollment by the investigator as it was not being tested at the center. Blood sugar levels between 70-90 mg/dl were considered as normal on account of physiological changes during pregnancy.[3] Follow-up was done at antenatal clinic.

Statistical analysis: Anaemia has been analysed as a risk factor for adverse outcome, preterm delivery and Low birth weight. It has also been analysed separately as an outcome. The outcome variables analysed were Anaemia, Low Birth Weight, Preterm delivery and Pregnancy Outcome (Stillbirth/ Abortion/ Live birth).

For qualitative data, Pearson's chi-square test was applied to test the relationship of categorized independent and dependent variables. If expected number in the cell was below 5 in a table, Fisher's Exact Test (Exact Two sided) was used. Odds ratios (OR) and their 95% Confidence intervals (95% CI) were calculated. Binary Logistic Regression was performed to account for confounding. The fit of the mathematical model used was assessed by ROC Curve (Receiver Operating Characteristic Curve), Pseudo R^2 and Hosmer Lemeshow test.

For quantitative data, Mean and Standard Deviation were calculated. 't' test was performed for weight gain during pregnancy. A 'P' value of <0.05 is deemed statistically significant (Sig.), <0.01 as highly significant (HS) and <0.0001 as very highly significant (VHS). Stata SE 10.1 was used to analyse data.

RESULTS

The current study enrolled 400 registered pregnant women at RHTC. 23 antenatal women lost to follow-up during the course of study. These 23 women did not turn up to RHTC for delivery, where the study was conducted. This drop-out led to the final sample size of 377 antenatal women.

Out of 377 antenatal women, 219 (58.1%) were found to have anaemia and 158 (41.9%) were non-anaemic. Hyperglycaemia was detected in 33 (8.8%) antenatal women. Pregnancy Induced Hypertension was present in only 3 (0.8%) antenatal women hence it was not further analysed.

Mean weight gain observed during pregnancy was just 3.96 Kg (kilogram). Out of 377 studied antenatal women, 55 registered their pregnancy during first trimester, 294 during second trimester and 28 during third trimester of pregnancy.

Correlation of weight gain was found statistically significant with presence of anaemia. (Table 1)

Table 1: Weight gain and Anaemia during pregnancy

Anaemia	Observations	Mean (Wt gain)	Standard deviation
Present	158	4.18	1.77
Absent	113	3.73	1.56

(t = 2.172, degree of freedom = 269, P = 0.031)

Out of 377 antenatal women, pregnancy outcome in 11 women was stillbirth and in 24 women was abortion. Therefore, Low Birth Weight (LBW) was analysed in 342 women having live born babies and preterm birth was analysed in 353 women excluding 24 women having abortion as their pregnancy outcome.

Table 2: LBW in relation to socio-demographic and biological variables of antenatal women

Variables	Low Birth Weight (LBW) Yes	No	χ^2 value	'P' value
Religion				
Hindu	93 (30.7)	210 (69.3)	5.097	0.024
Muslim & Others	19 (48.7)	20 (51.3)		
Occupation of spouses				
Govt./ Private Service	23 (24.7)	70 (75.3)	-	Fisher's exact 0.018
Self Employed	31 (40.6)	42 (59.4)		
Daily wage earners	54 (31.6)	117 (68.4)		
Idle	4 (80.0)	1 (20.0)		
Calorie Intake				
Less than Adequate	86 (40.0)	129 (60.0)	13.82	<0.0001
Adequate/ Normal	26 (20.5)	101 (79.5)		
Carbohydrate Intake				
Less than Adequate	61 (44.6)	76 (55.4)	14.39	<0.0001
Adequate/ Normal	51 (24.9)	154 (75.1)		
Fat Intake				
Less than Adequate	86 (38.1)	140 (61.9)	8.513	0.004
Adequate/ Normal	26 (38.0)	90 (78.0)		
Protein Intake				
Less than Adequate	112 (33.1)	226 (66.9)	-	Fisher's exact 0.307
Adequate/ Normal	0 (0.0)	4 (100.0)		
Time of registration				
First Trimester	10 (18.1)	45 (81.8)	8.33	0.016
Second Trimester	94 (36.2)	166 (63.8)		
Third Trimester	8 (29.6)	19 (70.4)		
Weight gain (Kilogram)				
Mean	3.7	4.1	-2.0167 ('t' value)	0.045
Standard deviation	1.31	1.85		
Anaemia				
Present	84 (42.4)	114 (57.6)	19.989	<0.0001
Absent	28 (19.4)	116 (80.6)		
Hyperglycaemia				
Present	0 (0.0)	31 (100.0)	Fisher's exact	<0.0001
Absent	112 (36.1)	199 (63.9)		

Note: Figures in parentheses indicate percentages.
Low Birth Weight is birth weight less than 2.5 Kilogram.

Figure 1:

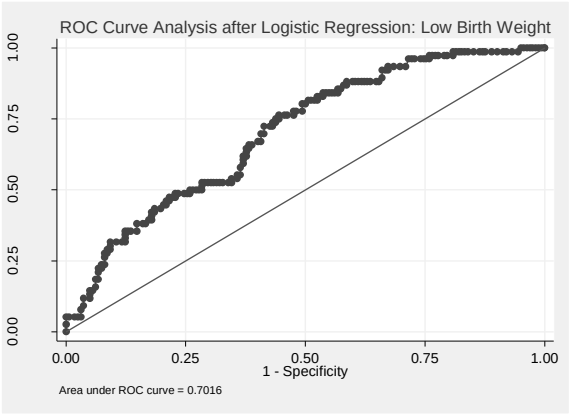


Figure 2:

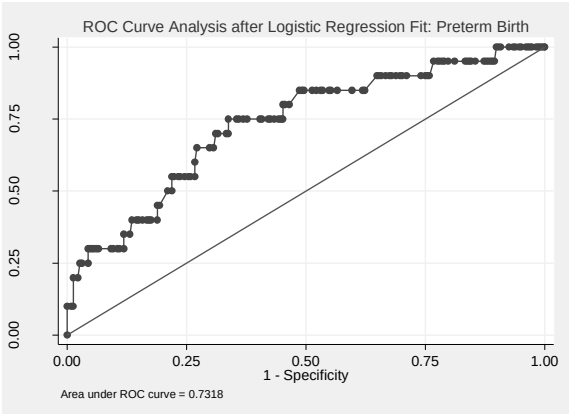


Table 3: Preterm birth in relation to Sociodemographic/biological factors of antenatal women

Variables	Preterm Birth		χ^2 value	'P' value
	Yes	No		
Religion				
Hindu	41 (13.1)	272 (86.9)	2.578	0.11
Muslim & Others	9 (22.5)	31 (77.50)		
Below Poverty Line card holder				
Yes	10 (9.3)	98 (90.7)	3.079	0.079
No	40 (16.3)	205 (83.7)		
Calorie Intake				
Less than Adequate	37 (16.7)	184 (83.3)	3.23	0.072
Adequate/ Normal	13 (9.9)	119 (90.1)		
Fat Intake				
Less than Adequate	40 (17.2)	193 (82.8)	5.084	0.024
Adequate/ Normal	10 (8.3)	110 (91.7)		
Protein Intake				
Less than Adequate	49 (14.1)	300 (85.9)	-	(Fisher's exact)
Adequate/ Normal	1 (25.0)	3 (75.0)		0.459
Time of registration				
First Trimester	5 (9.1)	50 (90.9)	3.49	0.175
Second Trimester	41 (15.2)	229 (84.8)		
Third Trimester	5(17.9)	23 (82.1)		
Iron-Folic acid intake				
Irregular	20 (19.8)	81 (80.2)	3.71	0.054
Regular	30 (11.9)	222 (88.1)		
Weight gain (Kilogram)				
Mean	3.2	4.1	-2.1258 ('t' value)	0.017
Standard deviation	1.32	1.71		
Anaemia				
Present	37 (18.3)	165 (81.7)	6.698	0.01
Absent	13 (8.6)	138 (91.4)		
Hyperglycaemia				
Present	0 (0.0)	33 (100.0)	-	(Fisher's exact)
Absent	50 (15.6)	270 (84.4)		0.008

Note: Figures in parentheses indicate percentages.

Area under ROC (Receiver Operating Characteristic) Curve was 0.7016 and 0.7318 for LBW and preterm birth respectively (Figure 1 and 2).

After applying binary logistic regression, weight gain and daily carbohydrate intake were found to be significantly associated with Low Birth weight (P= 0.046 and 0.023 respectively). In LBW analysis, Pseudo R^2 value was 0.094 and Hosmer-Lemeshow χ^2 (P value) was 10.36 (0.24). Model diagnostics, Hosmer-Lemeshow Goodness of Fit test, Pseudo R^2 and Area Under Curve shows that the mathematical model is of good fitness.

After applying binary logistic regression, only poor weight gain was found to be significantly associated with preterm birth (P = 0.014). In preterm birth analysis, Pseudo R^2 value was 0.104 and Hosmer-Lemeshow χ^2 (Pvalue) was 5.54 (0.70). Model diagnostics, Hosmer-Lemeshow Goodness of Fit test, Pseudo R^2 and Area Under Curve shows that the mathematical model is of good fitness.

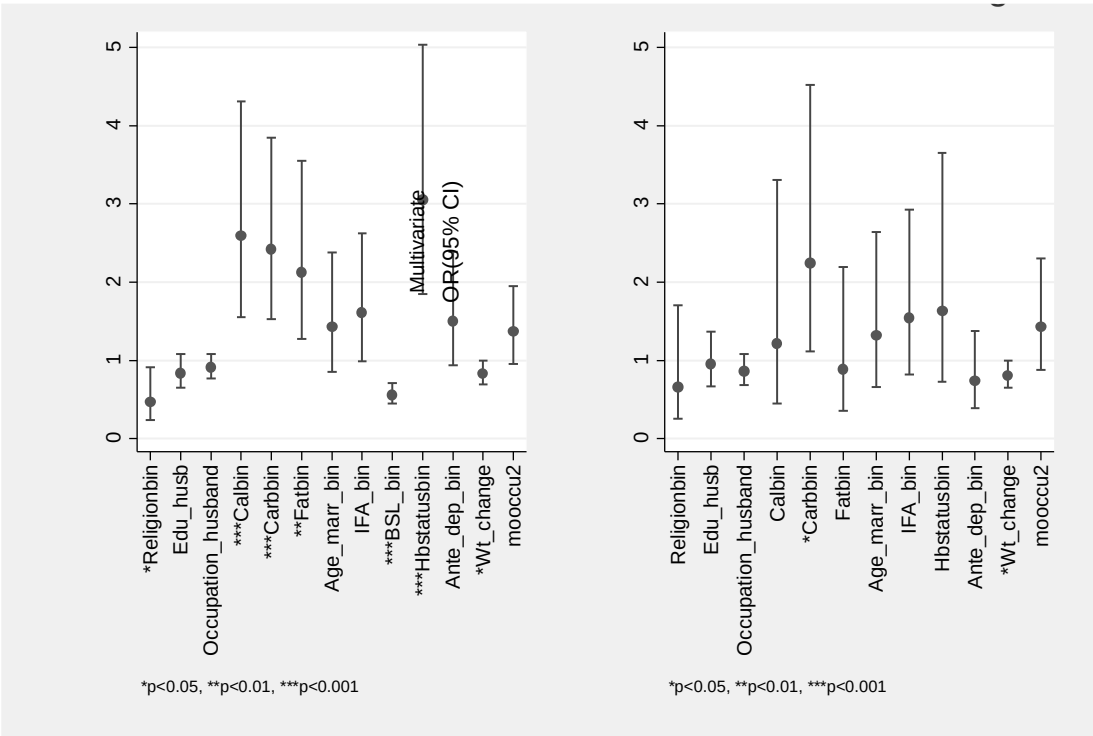
Stillbirth and Abortion did not occur in antenatal women registered early, in the first trimester of pregnancy. Out of 294 women registered in second trimester, 10 had stillbirth and 24 had abortion. One (3.6%) stillbirth was present in women registered in third trimester. This association was very highly significant (P<0.0001) after applying fisher's exact test. Anaemia and hyperglycaemia were not significantly associated with stillbirth or abortion with P values 0.156 and 0.146 respectively.

Majority of women delivered vaginally, only 8.8% women needed Caesarian section. Malpresentation like breech and transverse presentation was present in 2%. Other complications like post-partum haemorrhage and prolonged labour were seen in 2% and 3.1% respectively.

Caesarian section occurred in 42.4% of hyperglycaemic antenatal women as compared to only 5.3% of non-hyperglycaemic women. The chi-square value at 1 degree of freedom was very

highly significant (P <0.0001). This is also borne out by odds ratio, which is 13.133 and 95% CI which is 5.102 - 32.984.

Figure 3: Univariate and Multivariate Odds Ratios: Low Birth Weight



Breech presentation was present in 12.2% of hyperglycaemic antenatal women as compared to 0.6% of non-hyperglycaemic women. Correlation was highly significant (P = 0.001).

Correlation of anaemia and hyperglycaemia with post-partum haemorrhage (PPH) was found statistically non-significant (P values 0.246 and 0.132 respectively). Though the result is non-significant, odds ratios were 4.591 and 4.064 (for anaemia and hyperglycaemia respectively) indicating that anaemia and hyperglycaemia during pregnancy carries high risk of PPH.

Prolonged labour occurred in 27.3% of hyperglycaemic antenatal women as compared to only 0.6% of non-hyperglycaemic women. This difference by Fisher's exact test was also found very highly significant (P<0.0001).

DISCUSSION

The current study throws light on status of pregnant women in rural area. The study area was predominantly inhabited by Hindus, where 89.1% of antenatal women were Hindu.

The current study shows extremely poor percentage (14.6%) of early registration (during first trimester) in rural area. Status of weight gain during pregnancy was found further disappointing in this study.

Prevalence of anaemia during pregnancy was 58.1% in the study which is in accordance with NFHS-III data.[2] In current study, hyperglycaemia was present in 33 (8.8%) antenatal women. GDM occurs in ~7% (range 2-10%) of pregnancies in the United States.[12] Pregnancy is associated with marked insulin resistance; the increased insulin requirement often precipitate diabetes mellitus and lead to the diagnosis of GDM.[12]

Weight gain is an indicator of adequate food intake which reflects haemoglobin status and is an indicator of foetal growth and development. Statistically significant correlation between weight gain during pregnancy and anaemia emphasizes the importance of weight gain during pregnancy; the status of which is yet to be improved in the rural area.

It was found in this study that late registration is associated with LBW. This is probably because

there were less antenatal visits and inadequate iron-folic acid supplements during pregnancy.

Inadequate maternal weight gain during pregnancy showed correlation with poor foetal growth, lower birth weight and preterm birth. Looking at the poor conditions of weight gain and its impact on pregnancy outcome, urgent attention is needed in this perspective.

Even after so many years of efforts in maternal and child health, an easily preventable cause of poor foetal growth i.e. maternal anaemia is an important factor for LBW and preterm birth. This is very well depicted in the current study. Study also revealed that LBW and preterm birth were not present in hyperglycaemic antenatal women.

Again, time of registration came out to be determining factor for occurrence of stillbirth and abortion. Result of this study has consistently shown anaemia and hyperglycaemia during pregnancy to be the cause of many adverse pregnancy outcomes when studied in rural area.

During antenatal care, if we want to tackle complications of pregnancy like anaemia and hyperglycaemia, we first should focus on early registration of pregnancy and further adequate weight gain during pregnancy.

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