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## A study to assess correlation between maternal weight gain and maternal outcome among primigravidae

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### Abstract

**Background:** About 210 million women in the world become pregnant each year with 30 million (15%) developing complications, resulting into over half a million maternal deaths.

**Aim and objectives:** to assess the social and demographic factors affecting weight gain of pregnant women and determine the correlation between maternal weight and maternal outcome.

**Methodology:** Prospective observational study carried out in two different groups and settings of populations, one enrolled in antenatal clinic of tertiary care hospital (sample size 197) and other is antenatal clinic of urban health centre located in suburban slum community (sample size 97) of a same metro city.

**Result:** Significant association was found between maternal weight gain and maternal outcomes in the form of mode of delivery, maternal complications, duration of hospital stay, Ability to breastfed within an hour of delivery in both groups.

**Keywords:** Maternal, correlation, outcome, primigravidae

### Introduction

About 210 million women in the world become pregnant each year with 30 million (15%) developing complications, resulting into over half a million maternal deaths<sup>[1]</sup>.

Annually, an estimated 5,15,000 women die of causes related to pregnancy and childbirth; of which 99% occur in developing countries. In developing regions of world Maternal Mortality Ratio (MMR) averages to 450 per lakh population.

Developing regions account for approximately 99% (302 000) of the global maternal deaths in 2015, with sub-Saharan Africa alone accounting for roughly 66% (201 000), followed by Southern Asia (66 000). At the country level, Nigeria and India are estimated to account for over one third of all maternal deaths worldwide in 2015, with an approximate 58 000 maternal deaths (19%) and 45 000 maternal deaths (15%), respectively<sup>[2]</sup>.

Pregnancy and childbirth have an enormous impact on the physical, mental, emotional, and socioeconomic health of women and their families. Three most important phases of nutrient requirement determining an individual's life long health and nutrition status are – pregnancy, lactation and infancy. Nutrition is a major factor which determines gestational weight gain and which in turn determines maternal and foetal outcomes. Maternal weight gain is amongst the important parameters to be assessed during the antenatal care and easily recorded.

As pregnancy is common clinical situation where the caregiver has at least two patients, the mother and the foetus, balancing the amount of weight gain needed to optimize the size of the baby without jeopardizing the health of the mother both in the short and long term is essential. The balance has proven challenging. Adequate weight gain and optimal nutrition in pregnancy are important for securing, protecting and promoting the health of women and newborns. Nutrient intake and weight gain during pregnancy are the two main modifiable factors influencing maternal and infant outcomes<sup>[3]</sup>. In any community the mother and the child have always been considered as one unit-be it biologically, socially or culturally. Several factors such as mother's genetic characteristics, socio cultural, demographic, behavioural factors, pre pregnancy body mass index, gestational weight gain etc. contribute to foetal wellbeing. Maternal weight status both before and during pregnancy is an important determinant of birth outcome.

'Gestational weight gain is a fundamental measure of maternal health and foetal welfare<sup>[4]</sup> excessive gestational weight gain, aside from contributing to postpartum weight retention.

and risks of future obesity, may also contribute to poor pregnancy outcomes. It is associated with increased risk of caesarean section delivery, haemorrhage, hypertensive syndromes in pregnancy, and foetal macrosomia.

In developing countries like India the nutritional status of women in the reproductive age group is not at all satisfactory. Their diets are deficient in calories and many other essential nutrients from early childhood to adulthood and their fertility rates are high. This long term nutritional deprivation results in poor body size of mother [5, 6].

Inadequate prenatal weight gain is a significant risk factor for intrauterine growth restriction, preterm delivery, and low birth weight among infants. Obesity and excessive weight gain on the other hand can lead to adverse maternal and foetal outcomes. These have led to suggestions for optimal weight gain to ensure the best outcomes [7, 8, 9].

Maternal weight gain is amongst the important parameters to be assessed during the antenatal care and easily recorded. As pregnancy is common clinical situation where the caregiver has at least two patients, the mother and the foetus, balancing the amount of weight gain needed to optimize the size of the baby without jeopardizing the health of the mother both in the short and long term is essential. The balance has proven challenging. Adequate weight gain and optimal nutrition in pregnancy are important for securing, protecting and promoting the health of women and newborns [10].

The recommended weight gain for a woman of normal built, (BMI 18.5-24.99) is 11.5 kg; for women with lower BMI (<18.5) is 12.5-19.8 kg; whereas for woman with high BMI (>25) is 7-11.5 kg [11].

A metropolitan city has a double burden of ill health as two very different types of populations are living in it. On one hand, there is a population living in high-end areas of the city with modern health facilities and there are others who live in the slums, not being able to access even the basic health facilities. Undoubtedly, the urban poor or the slum population is a deprived lot, facing the maximum brunt of the inequity in the cities.

This study is a Prospective observational study carried out to know the social and demographic factors affecting weight gain of pregnant women and determine the correlation between maternal weight gain and maternal outcome in two different groups and settings of populations, one enrolled in antenatal clinic of tertiary care hospital and other is antenatal clinic of urban health centre located in suburban slum community of a same metro city.

**Objectives**

1. To study the socioeconomic and demographic profile of the pregnant women.
2. To study pattern of weight gain among primigravidae in antenatal clinics enrolled for study
3. To assess and compare maternal outcome and determine relationship between maternal weight gain & maternal outcome among primigravidae in antenatal clinic.

**Methodology**

A observational prospective community based study was conducted in two groups; group 1 in tertiary care hospital ANC clinic and group 2 in urban health centre ANC clinic for 1 year and 6 months (August 2015-May 2016) The sampling method used was convenient sampling i.e. all women registered in that duration were included in the study. Sample size of group 1 was 197 and group 2 was 97. Pregnant women registered within 12 weeks of pregnancy in antenatal clinic of Naigaon maternity hospital were included in the study. A pre-validated semi-structure questionnaire was prepared in accordance with the study objectives. After obtaining informed consent and establishing rapport the interviews were conducted in the commonest spoken local language in that area. Information regarding socio-demographic characteristics, marital details, antenatal care, Nutrition, weight and height was obtained from participants on a predesigned questionnaire. Weight measurements were done at 2 ANC visits viz. 1<sup>st</sup> during first trimester before 12 weeks of pregnancy, 2<sup>nd</sup> during third trimester when the women came for delivery. Maternal weight gain was defined as the difference between the maternal weight recorded for each woman at the delivery unit and the maternal weight recorded at the first prenatal visit within 12 weeks of pregnancy. Study subjects were contacted within three days of delivery. After delivery follow up of mother and new born was done during their hospital stay in both groups. Maternal outcomes mode of delivery, maternal complications, amount of blood lost, Duration of hospital stay, time required for resumption of normal duties were recorded.

**Results**

Mean age of study subjects in tertiary care antenatal clinic was 24.38 while in suburban clinic was 23 years. The study subjects in tertiary care hospital predominantly belonged to Hindu religion 125(63.5%) while the study subjects in urban health centre predominantly belonged to Muslim religion 62(63.9%). (table1)

**Table 1: Socioeconomic and Demographic information**

Variable	Range	Tertiary care antenatal clinic	Suburban antenatal clinic
Age	<=20	20(10.2%)	21(21.6%)
	21-25	111(56.3%)	63(64.9%)
	26-30	48(24.4%)	13(13.4%)
	>30	18(9.1%)	0(0%)
Religion	Hindu	125(63.5%)	23(23.7%)
	Muslim	51(25.9%)	62(63.9%)
	Christian	12(6.1%)	7(7.2%)
	Other	9(4.6%)	5(5.2%)
Education	Primary	46(23.4%)	48(49.5%)
	Secondary	98(49.7%)	41(42.3%)
	higher secondary	30(15.2%)	2(2.1%)
	graduate and above	14(7.1%)	0(0%)
Occupation	Unskilled	27(13.7%)	16(16.5%)
	Skilled	7(3.6%)	0(0%)

	Semi-professional	5(2.5%)	0(0%)
Per capita income	<=3000	73(37.1%)	41(42.3%)
	3001-6000	101(51.3%)	53(54.6%)
	6001-9000	18(9.1%)	3(3.1%)
	>9000	5(2.5%)	0(0%)
Socioeconomic classification (kuppuswamy)	Upper Middle	15(7.6%)	0(0%)
	Lower Middle	62(31.5%)	42(43.3%)
	Upper Lower	120(60.9%)	55(56.7%)

Mean weight of study subjects in tertiary care antenatal clinic was 49.18kg with average weight gain of 10.4 kg and in suburban antenatal clinic was 46.96kg with average weight gain was 8.96kg. In tertiary care antenatal clinic 33(16.75%) women gained less than or equal to 8kg weight gain, 148(75.13%) gained weight in range of 8.1 to 16 kg

while 16(8.12) gained more than 15kg weight during pregnancy. In suburban antenatal clinic 46(47.42%) women gained less than or equal to 8 kg weight gain, 45(46.39%) gained weight in range of 8.1 to 16 kg while 6(6.19%) gained more than 16 kg weight during pregnancy.

**Table 2:** Maternal outcome at delivery in group 1 and group 2. (N1=197, N2=7)

Variable	Range	Tertiary care hospital	Urban health centre
Mode of delivery	Normal Vaginal	162(82.2%)	56(57.7%)
	Instrumental	4(2%)	21(21.6%)
	Caesarian	31(15.7%)	20(20.6%)
Amount of blood lost	Less than 500ml	135(68.5%)	58(59.8%)
	500-1000 ml	55(27.9%)	34(35.1%)
	More than 1000ml	7(3.6%)	5(5.2%)
Time required for resumption of routine	1-3 days	172(87.3%)	69(71.1%)
	4-6 days	25(12.7%)	17(17.5%)
	More than 6 days	0(0%)	11(11.3%)
Maternal complications	Yes	8(4.1%)	19(19.6%)
	No	189(95.9%)	78(80.4%)
Duration of hospital stay	1-3 days	151(76.6%)	53(54.65%)
	4-6 days	29(14.7%)	35(36.08%)
	More than 6days	17(8.6%)	9(9.27%)
Ability to breastfeed within 1 hour of delivery	Yes	177(89.8%)	75(77.3%)
	No	20(10.2%)	22(22.7%)

In tertiary care hospital, most common mode of delivery was normal vaginal i.e. 162(82.2%) respondents delivered by normal vaginal mode, only 4(2%) respondents delivered using forceps/vacuum while 31(15.7%) delivered by caesarian section. Comparatively the respondents delivered by normal vaginal mode were less 56(57.7%) in urban health centre while 21(21.6%) of respondents delivered by instrumental delivery using forceps/vacuum which was 5 times higher in urban health centre, the women delivered by caesarian section were also more 20(20.6%) in urban health centre.

Average blood loss in tertiary care hospital respondents was 479ml while in urban health centre respondents it was 482ml. The above table shows that in tertiary care hospital, maximum respondents 135(68.5%) had lost less than 500ml blood during delivery followed by 55(27.9%) who had lost 500 to 1000ml blood and 7(3.6%) had lost more than 1000ml blood. In urban health centre 58(59.8%) respondents had lost less than 500ml blood during delivery followed by 34(35.1%) who had lost 500 to 1000ml blood and 5(5.2%) had lost more than 1000ml blood. Compared to tertiary care hospital, there were more respondents in urban health centre who lost more than 500ml blood during delivery.

In tertiary care hospital, maternal complications were seen in only 8(4.1%) respondents while maximum respondents 189(95.9%) had not suffered any complications. In urban health centre, maternal complications were seen in 19(19.6%) respondents which is almost four times the

complications seen in tertiary care hospital.

In tertiary care hospital, out of 197 respondents 20(10.2%) respondents were not able to breastfeed their babies within half hour of delivery. compared to urban health centre where almost double i.e. 22(22.7%) out of 97 respondents were not able to breast feed their babies within half hour of delivery. During informal interaction 2 study subjects in urban health centre also communicated that there was cultural myth that breastfeeding should not be given to child on the 1<sup>st</sup> day. These study subjects started feeding artificial from the 1<sup>st</sup> day itself.

In tertiary care hospital out of 197 respondents 172 resumed their normal routine within 1 to 3 days after delivery while 25(12.7%) needed 4 to 6 days for resumption of normal routine after delivery. None of the respondents in tertiary care hospital needed more than 6 days for resumption of normal routine. In urban health centre comparatively less 69(71.1%) women resumed normal routine in 1 to 3 days after delivery, 17(17.5%) respondents required 4 to 6 days for resumption of normal routine and 11(11.3%) respondents needed more than 6days after delivery for resumption of their normal routine.

Average duration of hospital stay in tertiary care hospital, in normal vaginal delivery was 3.1 days, in instrumental delivery was 4.8 and in caesarean delivery it was 6.2 days. Average duration of hospital stay in urban health centre, in normal vaginal delivery was 3.7 days, in instrumental delivery was 5.1 and in caesarean delivery it was 6.6 days.

**Table 3:** Relation between maternal weight gain and maternal outcome at delivery in group 1. (N1=197)

Maternal outcome in tertiary care hospital	Maternal weight gain		X <sup>2</sup> /Fishers exact	p- value
	Less than or equal to 8 Kg	More than 8 Kg		
Mode of delivery			7.284	0.007
Normal vaginal	30	111		
Instrumental / Caesarian	3	53		
Amount of blood lost			4.897	0.27
<500	28	107		
≥500	5	57		
Time required for resumption of normal routine			1.079	0.387
1-3 days	27	145		
≥3days	6	19		
Duration of hospital stay			6.881	0.034
1-3 days	3	2		
≥3days	30	162		
Ability to breastfed within 1 hour of delivery			0.051	0.021
Yes	26	151		
No	7	13		
Maternal complications			10.132	0.001
Yes	12	22		
No	21	142		

**Table 4:** Relation between maternal weight gain and maternal outcome urban health centre. (N2=97)

Maternal outcome in tertiary care hospital	Maternal weight gain		X <sup>2</sup> /Fishers exact	p- value
	Less than or equal to 8 Kg	More than 8 Kg		
Mode of delivery			5.896	0.024
Normal vaginal	32	23		
Instrumental / Caesarian	14	28		
Amount of blood lost			6.079	0.023
<500	33	24		
≥500	13	27		
Time required for resumption of normal routine			0.105	0.824
1-3 days	32	37		
≥3days	14	14		
Duration of hospital stay			54.849	<0.001
1-3 days	7	46		
≥3days	39	5		
Ability to breastfed within 1 hour of delivery			0.002	0.002
Yes	28	45		
No	18	6		
Maternal complications			8.485	0.004
Yes	17	6		
No	29	45		

On applying chi square/fishers exact test significant association was found between maternal weight gain and mode of delivery, maternal complications, duration of hospital stay and breastfeeding within an hour of deliver in both the groups while association between maternal weight gain and amount of blood lost was positive in only suburban hospital

**Discussion**

In tertiary care hospital, most common mode of delivery was normal vaginal i.e. 162(82.2%) respondents delivered by normal vaginal mode, only 4(2%) respondents delivered using forceps/vaccum while 31(15.7%) delivered by caesarian section. Comparatively the respondents delivered by normal vaginal mode were less 56(57.7%) in urban health centre while 21(21.6%) of respondents delivered by instrumental delivery using forceps/vaccum which was 5 times higher in urban health centre, the women delivered by caesarian section were also more 20(20.6%) in urban health centre. Findings similar to our tertiary care hospital study group findings were seen in a study by Yazdanpanahi *et al.*

[12] 70.5% mother had normal delivery, 33.2% had caesarean delivery and 2.2% had deliveries with ventous. In a study by Mamun *et al.* [13] 77.7% mothers had normal delivery, 11.8% had caesarean delivery and the rest 10.4% had other deliveries including low forceps, mid forceps, ventouse, assisted breech, trial forceps and combined methods. In tertiary care hospital, maximum respondents 151(76.6%) had duration of hospital stay 1 to 3 days and 29(14.7%) had 4 to 6 days hospital stay while only 17(8.6%) had more than 6 days stay in hospital after delivery. In urban health centre there were less women with duration of hospital stay 1 to 3 days i.e. 53(54.65%) respondents had duration of hospital stay 1 to 3 days and 35(36.08%) had 4 to 6 days hospital stay while only 9(9.27%) had more than 6 days stay in hospital after delivery. In a study by Mamun A *et al.* [13] average duration of hospital stay was 4.3 days in the hospital from delivery to discharge. For normal vaginal delivery the mean length of hospital stay was 4.00 days, for caesarean delivery 6.21days and for other types of delivery it was 4.80 days.

## Conclusion

Excess weight gain during pregnancy in study subjects is correlated with greater use of assisted deliveries either with instrumentation or caesarean section including the occurrence of complications.

The variable maternal weight gain is consistently influencing the extrapolation for maternal outcomes. This implies that monitoring the maternal weight during antenatal period epidemiologically determines strength of association between maternal weight gain and maternal pregnancy outcome.

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