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. 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. 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. 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 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 1year 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. 1st during first trimester before 12 weeks of pregnancy, 2nd 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 before 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)

| 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%)                     |
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.

| 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(19.9%) |
| | No | 189(95.9) | 78(80.4%) |
| Duration of hospital stay | 1-3 days | 151(76.6%) | 53(54.6%) |
| | 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/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.

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 breastfed their babies within half hour of delivery. In urban health centre while 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 1st day. These study subjects started feeding artificial from the 1st 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 6 days 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 | X²/Fishers exact | p-value |
|-------------------------------------------|----------------------|-----------------|---------|
|                                           | Less than or equal to 8 Kg | More than 8 Kg |         |
| Mode of delivery                           |                       |                 |         |
| Normal vaginal                             | 30                    | 111             | 7.284   | 0.007   |
| Instrumental / Caesarian                    | 3                     | 53              |         |         |
| Amount of blood lost                       |                       |                 |         |
| <500                                       | 28                    | 107             | 4.897   | 0.27    |
| ≥500                                       | 5                     | 57              |         |         |
| Time required for resumption of normal routine |                       |                 |         |
| 1-3 days                                   | 27                    | 145             | 1.079   | 0.387   |
| ≥3 days                                    | 6                     | 19              |         |         |
| Duration of hospital stay                  |                       |                 |         |
| 1-3 days                                   | 3                     | 2               | 6.881   | 0.034   |
| ≥3 days                                    | 30                    | 162             |         |         |
| Ability to breastfeed within 1 hour of delivery |                       |                 |         |
| Yes                                        | 26                    | 151             | 0.051   | 0.021   |
| No                                         | 7                     | 13              |         |         |
| Maternal complications                     |                       |                 |         |
| Yes                                        | 12                    | 22              | 10.132  | 0.001   |
| 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 | X²/Fishers exact | p-value |
|-------------------------------------------|----------------------|-----------------|---------|
|                                           | Less than or equal to 8 Kg | More than 8 Kg |         |
| Mode of delivery                           |                       |                 |         |
| Normal vaginal                             | 32                    | 23              | 5.896   | 0.024   |
| Instrumental / Caesarian                    | 14                    | 28              |         |         |
| Amount of blood lost                       |                       |                 |         |
| <500                                       | 33                    | 24              | 6.079   | 0.023   |
| ≥500                                       | 13                    | 27              |         |         |
| Time required for resumption of normal routine |                       |                 |         |
| 1-3 days                                   | 32                    | 37              | 0.105   | 0.824   |
| ≥3 days                                    | 14                    | 14              |         |         |
| Duration of hospital stay                  |                       |                 |         |
| 1-3 days                                   | 7                     | 46              | 54.849  | <0.001  |
| ≥3 days                                    | 39                    | 5               |         |         |
| Ability to breastfeed within 1 hour of delivery |                       |                 |         |
| Yes                                        | 28                    | 45              | 0.002   | 0.002   |
| No                                         | 18                    | 6               |         |         |
| Maternal complications                     |                       |                 |         |
| Yes                                        | 17                    | 6               | 8.485   | 0.004   |
| No                                         | 29                    | 45              |         |         |

On applying chi square/fisher's 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/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. Findings similar to our tertiary care hospital study group findings were seen in a study by Yazdanpanah 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 6.21 days 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.

References
1. Luc de Bernis, Della Sherratt R, Carla AbouZahr, Wim Van Lerbergh. Skilled attendants for pregnancy, childbirth and postnatal care. British Medical Bulletin. 2003; 67:39-57.
2. WHO, UNICEF, UNFPA, the World Bank. Trends in maternal mortality: 1990 to 2015. Geneva: World Health Organization; 2012 the Lancet Published Online November 12, 2015. http://dx.doi.org/10.1016/S0140-6736(15)00838-
3. Nutrition during pregnancy and lactation. An implementation guide by Institute of Medicine National Academy Press, 1992. www.nap.edu?openbook.php?record-id=1984;p.125.
4. Institute of Medicine (US) Committee on Nutritional Status during Pregnancy and Lactation. Nutrition during Pregnancy: Part I Weight Gain. Washington (DC): National Academies Press (US), 1990, 1, Summary.
5. Lechtig A, Yarbrough C, Delgado H et al. Influence of maternal nutrition on birth weight. Am J Clin Nutr. 1975; 28(11):1223-33.
6. Bhatia BD, Tyagi NK. Maternal determinants of birth weight-A Multivariate analysis. Indian Pediatr. 1984; 21(5):365-71.
7. Wells C, Murra EK, Weight Gain during Pregnancy: Colorado Pregnancy Risk Assessment Monitoring System (PRAMS), Colorado department of public Health and environment, 1997-2000.
8. Abrams B, Altman SL, Pickett KE. Pregnancy weight gain: still controversial 1-4 Am J Clin Nutr. 2000; 71(Suppl):1233S-41S.
9. Bracero LA, Byrne DW. Optimal Maternal Weight Gain during Singleton Pregnancy Gynecologic and Obstetric Investigation. 1998; 46:9-16.
10. Shin D, Bianchi L, Chung H, Weatherspoon L, Song WO. Is gestational weight gain associated with diet quality during pregnancy? Matern Child Health J. 2014; 18(6):1433-43. DOI: 10.1007/s10995-013-1383-x.
11. Institute of Medicine (US) Committee on Nutritional Status during Pregnancy and Lactation. Nutrition during Pregnancy: Part II Nutrient Supplements. Washington (DC): National Academies Press (US), 1990, 1, Summary.
12. Yazdanpanahi Z, Haghpanah S, Babaei AH, Hajifoghaha M. Postpartum haemorrhage and weight gain during pregnancy. Interlink Continental J Med. Med. Sci. 2014; 1(3):030-035.
13. Mamun et al. Associations of maternal prepregnancy obesity and excess pregnancy weight gains with adverse pregnancy outcomes and length of hospital stay. BMC Pregnancy and Childbirth. 2011; 11:62.