GESTATIONAL WEIGHT GAIN AND ITS RELATION TO MATERNAL, FETAL AND NEONATAL SEQUELAE: A FUTURE DILEMMA

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ABSTRACT

OBJECTIVES

This study aimed to determine the frequency of women with gestational weight gain (GWG) from recommended values in pregnancy and to establish the association of GWG with the mode of delivery (vaginal delivery (VD), instrumental delivery(ID), cesarean section(CS) and neonatal outcomes(low birth weight (LBW), low APGAR score, macrosomia, stillbirth (SB) and neonatal intensive care unit admissions(NICU).

METHODOLOGY

The prospective study was done in the Department of Obstetrics & Gynaecology LRH Peshawar. A total of 140 women were included in this study by non-probability consecutive sampling technique. Those with congenital anomalies having known medical disorders were excluded. Ethical approval and Informed consent were obtained before the examination. Data were collected and analysed on SPSS version 22.

RESULTS

The mean age was 29.4 ± 5.1 years. The mean first trimester BMI of the study sample was 25.2 ± 3.4kg/m^{2,} while the mean BMI in 3rd trimester was 27.7± 2.3 kg/m^2. GWG was recorded in 52 (37.1%) women. The mean GWG was calculated to be 12.9 kg ± 2.5. Mode of delivery was VD in 60(42.9%) women, ID in 50 (35.7%), and CS was done in 30(21.4%0) women. LBW in 15(10.7%), low APGAR score was recorded in 32(22.9%), macrosomia in 14(10%), SB in 12 (8.6%) and NICU admission in 39(27.9%).

CONCLUSION

GWG is common in pregnant women; however, there was no statistically significant association between GWG and mode of delivery or neonatal outcomes.

KEYWORDS: *Gestational Weight Gain, Mode of Delivery, Low Birth Weight, APGAR Score, Macrosomia, Stillbirth, Neonatal ICU Care.*

INTRODUCTION

Weight gain occurs due to increased body fats, muscle mass, and fluid content and depends upon height, ethnicity, social factors, sleep and stress levels, and any underlying medical disorders.[1] Body Mass Index (BMI) in kg/m^2 is often used to classify weight into four categories according to a person's weight to height.[2] The BMI cut-points for weight categories are adopted from International Obesity Task Force (IOTF), categorising women as underweight (<18.5 kg/m^2), normal weight (18.5–24.9kg/m^2), overweight (25.0–29.9kg/m^2), and obese (≥30kg/m^2). The IOTF BMI categories have been recognised and implemented by the World Health Organization.[3] Gestational weight gain is the difference between the weight of women in 1st trimester and the last trimester just before delivery, according to the Institute of Medicine (IOM) recommendations.[4] Pre-pregnancy BMI status is important for maternal and infant health outcomes during pregnancy, independent of gestational weight gain. Obese women before pregnancy are at a greater risk of complications such as gestational diabetes, pre-eclampsia, and cesarean delivery, fetal complications like large for gestational age and macrosomia, and long-term health morbidity of child-like obesity, diabetes mellitus, and hypertension.[5] Researchers are now stressing GWG and its implications on mothers and babies. Healthcare providers must emphasise the importance of achieving a normal BMI before pregnancy and proper weight gain during pregnancy to gain better outcomes.[6] The Institute of Medicine (IOM) provides specific guidelines regarding the ideal gestational weight gain based on balancing the benefits and risks of weight gain for both the mother's and child's health. The recommended gestational weight gain ranges for underweight and normal weight remain unchanged, but strict weight gain monitoring is required for overweight and obese women as studies reveal they are more likely to exceed the recommendations.[7] However, limited data suggest lower weight gain for women with obesity class II (BMI 35–39.9), class III

(BMI 40-44.9) and class IV (BMI >45).[8] In today's obesogenic environment, most women are anticipated to have difficulty limiting weight gain to the upper limit of the new IOM guidelines because of a lack of knowledge about the implications of weight gain in pregnancy on the current pregnancy and future health the mother and child.[9] Women may need multidisciplinary input requiring dietary and physical activity advice during pregnancy to optimise appropriate GWG.[10] Healthcare providers have a primary and influential role in counselling women before, during, and even post-delivery. Holistic and individualised care in a combined antenatal clinic may solve the barriers in addressing individual concerns about gestational weight gain with the involvement of a Dietitian, Physiotherapist, Counselors, Obstetricians, Anaesthetist and dedicated staff nurses to avoid any morbidity and mortality of mother and baby.[11] We aim for this study to find the frequency of gestational weight gain and the association of GWG with maternal and fetal, and neonatal outcomes. The rationale of our study is to find out the deviation in GWG from the recommended values in our local population of KPK. The results of our research will provide local evidence and the magnitude of the occurrence of gestational weight gain. The result can further be used to introduce dietary and physical activity interventions in pregnancy to reduce excessive weight gain and the complications rate.

METHODOLOGY

The prospective descriptive study was done in the Department of Obstetrics & Gynaecology LRH Peshawar from 15th August 2020 to 16th May 2021. One hundred forty women were inducted into the study using a non-probability consecutive sampling technique. The sample size was calculated with a frequency of gestational weight gain in 23.1% of patients with a 7% margin of error and 95% confidence interval. Women, Gravida 1 to 5, Para 5, age between 18 to 40 years, with single gestation, visiting Obstetrics & Gynaecology departments for antenatal assessment in their first trimester, who agreed and consented to the study were included in the study. Gestational age was estimated from the first day of the last menstrual period or early available obstetrical ultrasound. Women with pregnancy having congenital anomalies and known medical comorbidity like chronic or pregnancy-induced hypertension, Diabetes mellitus, Hypothyroidism, and Cushing's syndrome were excluded to avoid weight gain bias as these disorders have a propensity for increased weight gain.[12,13] Data was collected after ethical approval from IRB, LRH. Informed consent was taken from the women agreeing to induction in our study. Obstetrical ultrasound was done. Data was entered on a proforma. Women were categorised based on BMI per the Institute of Medicine (IOM). The study population was followed up until delivery. The weight of the women was measured just before delivery. GWG was determined according to IOM guidelines.[14] Mode of delivery and neonatal outcomes were explored. Data analyses were done with a statistical analysis program (IBM SPSS.Version.22). Frequency and percentage were computed for each category of BMI as well as for women with excessive GWG from the recommended values. Cesarean delivery (delivery by incision on the abdominal wall and uterus), Vaginal delivery (delivery through the birth canal without instruments), Instrumental deliveries (delivery through the birth canal by assistance with vacuum or forceps), low birth weight(LBW) (less than 2.5kg), low APGAR score (less than 7 at 5 minutes), stillbirth (death of a baby before or during delivery), macrosomia (weight of the baby more than 4kg), admissions to neonatal intensive care unit (NICU) (decided by consultant paediatrician) were calculated. Mean ±SD was presented for age, BMI, Weight, height and gestational weight gain. The GWG was stratified against each type of delivery and its effect on neonates (stillbirth, admission to ICU, low APGAR score, macrosomia and low birth weight). The Chi-square test was applied to each stratification, and a P value of ≤0.05 was taken significantly. All the data was presented in the table and charts.

RESULTS

Among 140 women recruited in this study, the mean age of the sample was 29.4 ± 5.1 years. Age was divided into two groups. Women with age less than or equal to 30 years were found to be 77(55%), while 30-40 years were 63(45%). The mean gravida was 2.5 ± 1.4, and the mean para was 1.3 ± 1.2. Total number of Primi Gravida was 52(37.1%) while multigravida were 88(62.9%). The mean first trimester BMI of the study sample was 25.2 ± 3.4kg/m^2 while the mean BMI before delivery in 3rd trimester was 27.7± 2.3 kg/m^2. The BMI was categorised into normal weight in 57 (40.7%) women, overweight women 66 (47.1%) and a small number of women were found to be obese, 17(12.1%). (Table 1). GWG was recorded in 52 (37.1%) of women, while in 88 (62.9%) of women, there was no GWG (Table 2). The mean GWG was calculated to be 12.9kg ± 2.5. Mode of delivery in our study population was mostly VD in 60(42.9%) women, instrumental delivery in about 50 (35.7%) women and caesarean sections were done in 30(21.4%) women (Pie chart). With regards to neonatal outcome, low APGAR score was recorded in 32(22.9%), LBW in 15(10.7%), macrosomia in 14(10%), stillbirth in 12 (8.6%) and

NICU admission in 39(27.9%) (Table 3). We stratified the mode of delivery and neonatal outcome concerning GWG and explored their association. There was a non-significant association of GWG with any mode of delivery, P-value being 0.408 (Table 4). GWG was non-significantly associated with low APGAR score(P-value: 0.712), LBW (P-value: 0.747), macrosomia P-value of (0.103), stillbirth (P-value: 0.703) and NIICU admissions (P-value: 0.841) (Table 5).

Table 01: Categories of Body Mass Index & Frequency of Gestational Weight Gain (N = 140)

BMI Categories		F	%age
Normal weight (18.5-24.9		57	40.7%
Overweight (25-29.9)		66	47.1%
Obese (> 30)		17	12.1%
Gestational Weight Gain	Yes	52	37.1%
	No	88	62.9%

Table 2: Neonatal Outcome (N = 140)

Neonatal Outcome		F	%age
Low APGAR Score	Yes	32	22.9%
	No	108	77.1%
LBW	Yes	15	10.7%
	No	125	89.3%
Macrosomia	Yes	14	10.0%
	No	126	90.0%
Stillbirth	Yes	12	8.6%
	No	128	91.4%
NICU Admissions	Yes	39	27.9%
	No	101	72.1%

Table 03: Gestational Weight Gain and Stratification of Mode of Delivery

		VD N(%Age)	ID N(%Age)	CS N(%Age)	P-Value
GWG	Yes	24(46.2%)	20(38.5%)	08(15.4%)	0.408
	No	36(40.9%)	30(34.1%)	22(25.0%)	

Table 04: Association of Gestational Weight Gain with Neonatal

		Low APGAR Score		P-Value
Gestational Weight Gain		Yes	No	
	Yes	11(21.2%)	41(78.8%)	0.712
	No	21(23.9%)	67(76.1%)	
		Low Birth Weight		P-Value
Gestational Weight Gain		Yes	No	
	Yes	05(9.6%)	47(90.4%)	0.747
	No	10(11.4%)	78(88.6%)	
		Macrosomia		P-Value
Gestational Weight Gain		Yes	No	
	Yes	08(15.4%)		0.103
	No	06(6.8%)	82(93.2%)	
		Still Birth		P-Value
Gestational Weight Gain		Yes	No	
	Yes	04(7.7%)	48(92.3%)	0.703
	No	08(9.1%)	80(90.9%)	
		NICU Admission		P-Value
Gestational Weight Gain		Yes	No	
	Yes	15(28.8%)	37(71.2%)	0.841
	No	24(27.3%)	64(72.7%)	

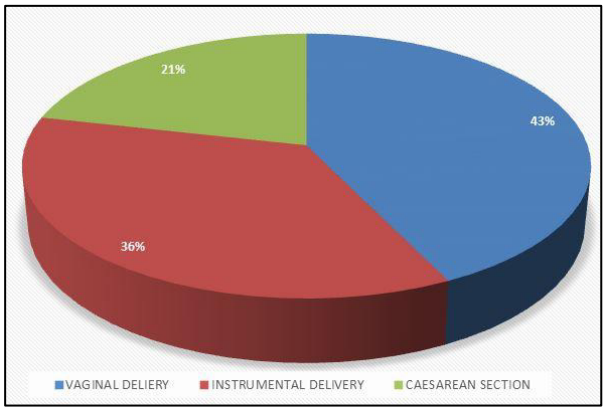

Figure 1: Mode of Delivery in Women with Gestational Weight Gain

DISCUSSION

The study included 140 women whose mean BMI at booking visit and before delivery in 3rd trimester was 25.2 ± 3.4kg/m2 and 27.7± 2. kg/m^2, respectively. This outlines that 66 women (47.1%) were overweight during pregnancy in most of our study population. Among the recruited women, the mean total GWG was 12.9kg ± 2.5 which was comparatively high to IOM guidelines for the overweight category, i.e. 6.8–11.3 kg (15–25 lb) in pregnancy.[14] A multinational study by Ismail et al. determined mean GWG for all gestational trimesters. The mean total GWG at 40 weeks was calculated to be 13.7 kg± SD 4.5, falling well above the agreed standards but close to our findings.[15] Similarly in a systemic review conducted by Goldstein et al., GWG was again found to be 47% above the agreed IOM level.[16] Overall, the number of women who failed to gain weight was more than 88 (62.9%) compared to women who gained weight. This may be attributed to the low socioeconomic status of these women affecting their nutritional quality visiting a tertiary care hospital. The IOM recommendations for GWG are also derived largely from data collected among white women, which may not represent our local Pakistani population.[17] GWG is associated with adverse maternal, fetal and neonatal sequelae, including pregnancy-induced hypertension, large for gestational age baby, macrosomia, operative vaginal deliveries in the mother and increased chances of acute respiratory distress syndrome and subsequent neonatal intensive care unit admissions.[16,18] We determined the number and percentage of vaginal delivery, instrumental delivery and Caesarean section, which were 24(46.2%), 20(38.5%) and 8(15.4%), respectively, in women who gained weight above the recommended values. However, the number of combined operative deliveries (instrumental and caesarean delivery) was more in

women with GWG than in vaginal delivery. A Korean retrospective cohort study demonstrated an increased rate of caesarean sections due to macrosomia in women who were obese before pregnancy or had GWG in early pregnancy.[19] Instrumental deliveries were not mentioned in the mentioned study. Unfortunately, the restricted objectives of our research omitted to determine the trimester-wise GWG. The neonatal outcome associated with GWG in our study showed low birth weight in 5 (9.6%) women, while 11 (21.2%) participants were seen to have a low APGAR score at 5 minutes. Jun Zhang et al. showed a prevalence of low birth weight of 2.9% and a low APGAR score of less than 0.1% in women with GWG.[20] This marked difference may show an ethnic and geographical variation in weight gain and expertise in neonatal resuscitation at Chinese health facilities. Macrosomia was found in 8(15.4%) while 44(84.6%) women had normal baby weights in our study. Evidence suggests that an increase in pre-pregnancy weight or GWG during the first half of pregnancy may be more important to determine macrosomia in babies.[21,22] We found a non-significant association between stillbirth and GWG, which was determined by a Swedish study.[23] About 15(28.8%) of neonatal intensive care unit admissions were done in our analysis, while Stotland et al. found an increase in neonatal admissions to intensive care units secondary to large for gestational age, low APGAR score at 5 minutes, meconium aspiration syndrome.[24] Generally, studies examining associations of early GWG with perinatal outcomes are few. Our study stresses proper weight gain, which is crucial to achieving pregnancy outcomes without complications. Nevertheless, it did not demonstrate a significant association of GWG in pregnant women with adverse effects.

LIMITATIONS

Early trimester weight gain represents the true body fats that may harm the mother and baby. Our study did not determine the gestational weight gain trimester-wise. NICU admission reasons were not explored to determine if GWG contributed to admissions. Departmental study results cannot be generalised, so it opens doors for further research, proposing a larger sample size and effects of dietary and exercise input to ensure proper weight gain in pregnancy for a better future.

CONCLUSIONS

Gestational weight gain is common in our population; however, in our study, we couldn't find a statistically significant relationship between gestational weight gain with a mode of delivery and neonatal outcome.

CONFLICT OF INTEREST: None

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