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TITLE: A STUDY ON ASSOCIATION OF MATERNAL PRE- PREGNANCY BMI ACCORDING TO WHO ASIAN GUIDELINES AND GESTATIONAL WEIGHT GAIN IN PREGNANCY OUTCOME

INTRODUCTION

•Pre pregnancy BMI is weight of women before she conceives. Gestational weight gain is understood as the weight gained before the women cinchieves and prior to delivery.

•The pregestational body mass index (BMI) and gestational weight gain (GWG) are proved to be associated with the placental development, blood sugar control, glucose tolerance, and insulin resistance. <sup>[1]</sup>

•Inappropriate GWG are at high risk of suffering with GDM, hypertensive disorder complicating pregnancy (HDP), and other adverse pregnancy outcomes. <sup>[2]</sup>

•It is very necessary to explore the suitable GWG ranges to obtain good pregnant outcomes, and the exploration of the appropriate range of weight gain during pregnancy has been ongoing.

•The accurate weight gain before pregnancy and during pregnancy is disputable. The GWG guidelines developed by Institute of Medicine (IOM) in 1990 in USA and reviewed in the year 2009 are being used universally. <sup>[3]</sup>

•Asian women of same age and BMI are comparatively shorter in height and weigh less and have more risk of cardio metabolic diseases. Therefore, for Asian women the gestational weight gain guidelines needs to be judiciously researched upon. <sup>[4]</sup>

•There are many studies still required in predicting pregnancy outcome, thereby defining recommended weight gains in Asian Population. So, at each visit, there is need to emphasize on the importance of nutrition, exercise and diet in each BMI groups.

AIM & OBJECTIVES

•**AIM:** The association of pre-pregnancy Body mass index(BMI) and weight gain in antenatal period with maternofetal consequences.

•**OBJECTIVES:**

- To classify the patients according to pre-pregnancy BMI in groups as underweight, normal, overweight, obese (WHO Asian guidelines)
- To categorize the patient according to gestational weight gain in each BMI groups
- To assess the pregnancy outcome in relation to different BMI .
- To assess the pregnancy outcome according to weight, gain during antenatal period.
- To evaluate the pregnancy outcome in correlation with gestational weight gain in patients with different BMI groups.

MATERIAL & METHODS

• **Study design:** – A **Prospective Observational study**

• **Study setting:** – Obstetrics and Gynaecology department, TMMC & RC Moradabad

• **Study population:** - All antenatal patients aged 18 to 40 years

• **Study duration:** -18 month

• **Sample size:** – 155 Antenatal Patients

**Inclusion Criteria:**

All singleton pregnancies >18 yrs of age with normal glucose metabolism

**Exclusion Criteria:**

- Patients age <18 years (teenage pregnancy)
- Known case of diabetes mellitus and hypertension
- Multiple pregnancies.
- Pregnant women diagnosed with gestational diabetes mellitus.
- Undiagnosed congenital anomalies inevitable to life.

RESULTS

Table no. 1: Distribution of patients on the basis of gestational age (weeks)

Gestational age (Weeks)	Frequency (n=155)	Percentage
≤36	24	15.5%
37-40	122	78.7%
>40	9	5.8%
Mean±SD (minimum to maximum)	38.21±1.57 (32 to 42) Weeks	

Table no. 2: Distribution of patients on the basis of BMI

BMI (kg/m <sup>2</sup> )	Frequency (n=155)	Percentage
Underweight	31	20.0%
Normal	62	40.0%
Overweight	25	16.1%
Obese	37	23.9%
Mean±SD (minimum to maximum)	22.08±3.53 (16.0-30.5) kg/m <sup>2</sup>	

Table no. 3: Distribution of patients on the basis of weight gain during pregnancy.

Weight Gain during pregnancy (kg)	Frequency (n=155)	Percentage
5-10	35	22.6%
10.1-15	64	41.3%
15.1-20	48	31.0%
>20	8	5.2%
Mean±SD (minimum to maximum)	13.71±4.44 (4.0-24.0) kg	

Table no. 4: Association of BMI with pregnancy outcome in women who gained adequate weight.

	Underweight	Normal	Overweight	Obese	P value
Preterm Labor (n=6)	3 (50.0%)	2 (33.3%)	1 (16.7%)	0 (0.0%)	0.354
LSCS (n=32)	5 (15.6%)	21 (65.6%)	4(12.5%)	2 (6.3%)	0.432
Preeclampsia (n=3)	1 (33.3%)	1 (33.3%)	1 (33.3%)	0 (0.0%)	0.556
Macrosomia (n=2)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2(100%)	0.317
Low Birth Weight (n=8)	3 (37.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0.478
Post partum water retension (n=1)	0 (0.0%)	1 (100%)	0 (0.0%)	0 (0.0%)	0.860

Table no.5: Association of BMI with pregnancy outcome women who gained >recommended weight

	Underweight	Normal	Overweight	Obese	P value
Preterm Labor (n=1)	0 (0.0%)	0 (0.0%)	1 (100%)	0 (0.0%)	0.367
LSCS (n=33)	3 (9.1%)	5(15.2%)	5(15.2%)	20 (60.6%)	0.004
Preeclampsia (n=8)	1 (12.5%)	1 (12.5%)	3 (37.5%)	3 (37.5%)	0.002
Macrosomia (n=17)	0 (0.0%)	3(17.6%)	4 (23.5%)	10 (58.8%)	0.004
Low Birth Weight (n=1)	1 (100%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0.274
Post partum water retension (n=9)	1(11.1%)	5 (55.6%)	1 (11.1%)	2 (22.2%)	0.234

Table no. 6: Association of BMI with pregnancy outcome who gained less than recommended weight

	Underweight	Normal	Overweight	Obese	P value
Preterm Labor (n=1)	1 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0.391
LSCS (n=3)	0 (0.0%)	3 (100.0%)	0 (0.0%)	0 (0.0%)	0.301
Preeclampsia (n=0)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0.302
Macrosomia (n=1)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1(100%)	0.317
Low Birth Weight (n=25)	10(40.0%)	14(56.0%)	1 (4.0%)	0 (0.0%)	0.478
Postpartum water retention (n=0)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	-

Table no. 5: Table showing correlation between different BMI categories and pregnancy outcome.

Variables	BMI category				P Value
Pregnancy Outcome	Underweight (n=31)	Normal (n=62)	Overweight (n=25)	Obese (n=37)	
Preterm labor (n=8)	4 (50.0%)	2 (25.0%)	2 (25.0%)	0 (0.0%)	0.082
LSCS (n=68)	8 (11.8%)	9 (13.2 %)	22 (32.4 %)	29 (42.6 %)	0.035
Preeclampsia (n=11)	2 (18.2%)	1 (9.1%)	1 (9.1%)	7 (63.6 %)	0.031
Macrosomia (n=20)	0 (0.0%)	3 (15.0%)	5 (25.0%)	12 (60.0%)	0.037
Low Birth Weight (n=34)	19 (55.9%)	14 (41.2%)	1 (2.9%)	0 (0.0%)	0.061
Post-Partum Water Retention (n=10)	1 (10.0%)	6 (60.0%)	1 (10.0%)	2 (20.0%)	0.589

Table no. 6: Table showing correlation between gestational weight gain and pregnancy outcome.

	Adequate weight	Increase weight	Decrease weight	P Value
Preterm labour (n=8)	6 (75.0%)	1 (12.5%)	1 (12.5%)	0.08
LSCS (n=68)	32 (47.1%)	33 (48.5%)	3 (4.4%)	0.021
Preeclampsia (n=11)	3 (27.3%)	8 (72.7%)	0 (0.0%)	0.103
Macrosomia (n=20)	2 (10.0%)	17 (85.0%)	1 (5.0%)	0.032
Low Birth Weight (n=34)	8 (23.5%)	1 (2.9%)	25 (73.5%)	0.041
Post-Partum Water Retention (n=10)	1 (10.0%)	9 (90.0%)	0 (0.0%)	0.123

DISCUSSION

• Maternal early pre pregnancy body mass index (BMI) and weight gain during pregnancy (GWG) are associated with various maternal and neonatal outcomes. Neonatal birth weight affects the growth, development, childhood obesity, morbidity and mortality and can create a large impact on the life of neonate.

• It has been observed that with increasing obesity, there is increased birth weight, macrosomia, caesarean delivery, shoulder dystocia, and childhood obesity.

• In present study majority 122 (78.7%) of women had 37-40 weeks of gestational period. Average gestational age was 38.21±1.57 weeks of all patients. On the basis of BMI, most 62 (40.0%) of patients had normal BMI followed by 37 (23.9%) obese, 31 (20.0%) underweight and 25 (16.1%) were overweight. Findings were in collaboration with the findings of Aji AS et al who researched upon the link between pre-pregnancy body mass index and gestational weight gain and reported the mean age of the cases to be 29.7±5.6 years, 46.7% were having normal body mass index. The mean gestational age was 38.88±1.91 weeks. [5]

• In our study majority 64 (41.3%) of women have gained 10.1 to 15 kg of weight during the pregnancy. The mean weight gain during the pregnancy was 13.71±4.44 kgs, 70 (45.2%), 54 (34.8%) and 31 (20.0%) women had increased weight gain, appropriate weight gain and decreased weight gain respectively during the pregnancy. Our findings were consistent with the findings of Zhang S et al who reported 36.0% had excessive weight gain and 36.0% had adequate weight gain while 28.0% had decreased wait gain.[6]

• The correlation of BMI categories with pregnancy outcome was statistically significant (p<0.05). The findings in our study were comparable with the findings of Chen CN et al which reported that pre-pregnancy overweight and obesity increased the hazards of diabetes and hypertension during pregnancy, preeclampsia, preterm birth, caesarean section and macrosomia. Females with more GWG carries a risk of preeclampsia, delivery through caesarean section, and macrosomia. [7]. Obesity rates among pregnant women increased from 11.2% in 2012 to 13.4 % in 2018, with age related weight gain. [8]

CONCLUSION

• This study emphasizes the necessity of pre-pregnancy counseling, which is essential for appropriate weight growth throughout gestation and the preservation of a normal BMI prior to conception.

• This study concluded that in overweight/obese women who gained more than recommended weight gain were at higher risk of delivering macrosomic infants, higher risk of caesarean section and preeclampsia.

• Normal weight and overweight women who gained less weight than recommended had a protective effect.

• In underweight women who gained less than recommended had higher chances of IUGR babies.

• The absence of national criteria for gestational weight gain necessitates further research, as existing guidelines fluctuate by age group, ethnicity, and race. The pre-pregnancy weight and weight gain during the antenatal period can influence pregnancy outcomes hence, adopting a healthy lifestyle is essential for the well-being of their kids.

• Consequently, both pre-pregnancy BMI and gestational weight gain are critical determinants of the overall health of the mother and the infant.

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