RELATION OF EARLY PREGNANCY BMI WITH MATERNAL AND FETAL OUTCOME: A PROSPECTIVE STUDY

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ABSTRACT

This prospective study was conducted at a tertiary health care setup in rural central India over a period of three and half years over 300 primigravidas with singleton pregnancies without h/o any medical disorders, and who had enrolled prior to 8 weeks of gestation. The cases were classified according to their BMI in to underweight, normal, overweight and obese categories. The maternal outcome noted was abortion, PIH, gestational diabetes and cesarean rates. The fetal outcome was incidence of FGR, macrosomia, low APGAR scores, and perinatal death. The tests applied were Chi square test and paired t test. Out of 300 cases 38 case (12.6%) were in underweight category, 207 (69%) were in normal BMI category, 40 cases (13.33%) were overweight and 15 cases (5%) were obese. Out of these 300, 22 cases had abortions which were more common in extremes of BMI categories (p value<0.01). In rest of 278 case obese and overweight patients were more prone for development of PIH (P value<0.001), gestational diabetes (p value <0.0001) and cesarean deliveries (p value <0.0001) macrosomia (p value <0.0001) and low APGAR (P value<0.00001). The patients with low BMI had high incidence of fetal growth restrictions (p value <0.0001) and perinatal deaths (p value <0.00002). Adverse maternal and fetal outcomes are significantly related to extremes of BMI categories. Multidisciplinary approach and lifestyle changes may reduce the high prevalence of obesity in pregnancy and limit its morbidity.

KEY WORDS: BMI, Obesity, PIH, gestational Diabetes, Macrosomia.

INTRODUCTION

In last few decades obesity has emerged as pandemic in both developed and developing countries. According to WHO obesity is 'One of the most blatantly visible, yet most neglected, public health problems that threaten to overwhelm both more and less developed countries'[1]. The excess bodyweight is now the sixth important risk factor contributing to disease worldwide and increased level of obesity may result in a decline in life expectancy in the future [2]. In the countries like India due to extreme socioeconomic distribution the obesity and underweight populations are both prevalent. The low maternal BMI is associated with increased risk of abortions & fetal growth restriction which may further cause low APGAR scores and increased perinatal deaths [6,8]. The overweight and obese females are more prone for developing PIH, gestational diabetes, macrosomia and operative deliveries [5-8]. Also it is seen that low APGAR scores and perinatal deaths are more common in neonates of obese females [5-8]. In the developing countries like India very few females' turns up for pre-conceptional counseling so determining the exact correlation of obstetric or neonatal outcome with maternal pre pregnancy weight is difficult. Also the maternal hemodynamic and weight changes start occurring after 6-8 weeks of gestation. So keeping this in mind a study was conducted to correlate the early pregnancy BMI, which roughly equals to maternal pre pregnancy weight, with maternal and fetal outcome and to study the co relation of early pregnancy BMI with development of adverse maternal or fetal outcome in non high risk primigravidas in rural setup.

MATERIALS & METHODS

It was a prospective study conducted over a period of three and half year from January 2010 to July 2013 over 300 primigravidas. The hospital is a tertiary health care set up in rural middle India.

Inclusion criteria
1. Primigravida with singleton pregnancy with excellent dates & first ANC visit within 8 weeks of gestation.
2. No h/o any medical disorders.
3. No h/o smoking/alcoholism/ addiction.

Exclusion criteria
1. Multiparas
2. Cases presenting beyond 8 weeks of gestation
3. Cases with h/o medical disorders or any addictions

All the measurements of weight and height were taken by means of standard methodology as described by Lohman *et al*., 1988 [3]. BMI of each case was calculated by formula 'weight in kg/ height in meters²'. The cases were classified as underweight if BMI < 19.9 kg/m², normal if BMI was between 20-24.9 kg/m², overweight if BMI was between 25-29.9 kg/m² and obese if BMI was > 30kg/m² by WHO & NIH [4].

Outcome
Maternal outcome: Miscarriage, PIH, gestational diabetes & LSCS
Fetal outcome: FGR, macrosomia, low apgar at 5 min, perinatal death,
Miscarriage was defined as loss of fetus weighing less than 500 gm. PIH was defined as development of systolic blood pressure of ≥ 140 mm of Hg or a diastolic blood pressure of ≥ 90 mm of Hg on two separate occasions at

least 6 hrs apart with or without proteinurea of >2+ by dipstick beyond twenty weeks of gestation in a previously normotensive and nonproteinuric female. For the diagnosis of gestational diabetes 75 mg OGTT was done at 22-24 weeks of gestation. The cases were followed with the regular ANC till term and seven days postpartum. The cases lost in follow up were excluded from the study. Spontaneous labor was awaited in all the cases. Induction was done only for maternal or fetal indication. Cesarean section was also done for either maternal or fetal indication. FGR was defined as fetal weight <2.2 kg and macrosomia was fetal weight > 4kg. if the APGAR score was <7 after 5 min of birth it was defined as low APGAR. Any fetal death beyond 28 weeks of gestation and before 7 days postpartum was termed as perinatal death.

Statistical analysis

For the quantitative analysis test applied was chisquare test with probability 0.05 taken as significant. For the qualitative data paired t test was applied.

RESULTS

Out of 300 cases 207 cases with normal BMI, 38 cases were underweight, 40 cases were overweight and 15 were obese i.e. 69%, 12.67%, 13.33% and 5% respectively.
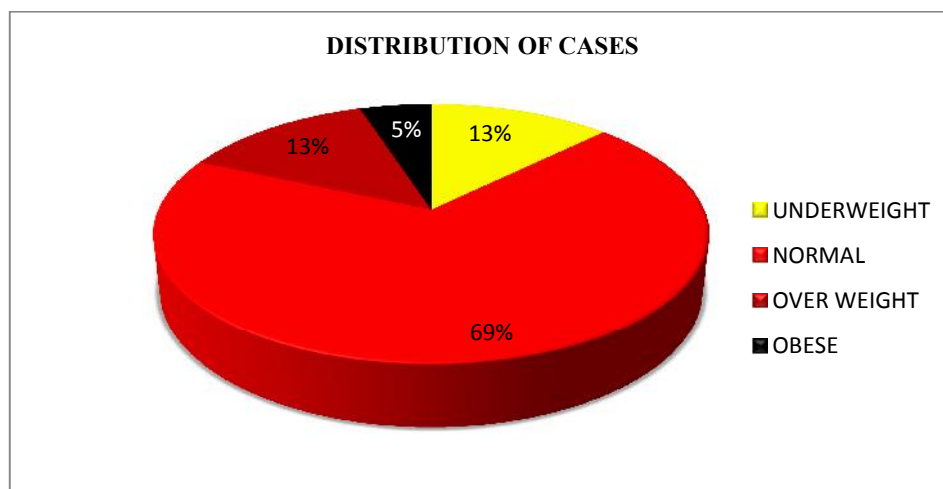

FIGURE 1: Distribution of Cases

Out of 300 cases 22 had abortions. Although most of cases were from normal BMI group but when percentage was calculated the highest incidence were in obese group *i.e.* 26.67% followed by underweight patients (13.15%). The difference observed in abortion rates was significant (p value<0.01). The rest of 278 cases were followed till term. Out of them the incidence of PIH was highest in obese group i.e. 66.67%. The incidence of PIH was also raised in underweight group (33.33%) which can be attributed to early marriages and low socioeconomic status of patients.

The p value for PIH was significant *i.e.* < 0.001. The incidence of gestational diabetes was also different in each group with highest number and percent of cases in obese group, 66.67%. There were no cases in underweight group making p value highly significant (0.0001). Majority of cases (63.63%) required LSCS in obese group; also in overweight group (24.3%) again the p value was significant. There was no correlation of gestational age with BMI classes. The p value for gestational age in different classes was 0.2.

TABLE 1: Maternal Outcome

Outcome	Under weight n (%)	Normal	Over weight	Obese	P value
Abortions	5 (13.15%)	10 (4.8%)	3 (7.5%)	4 (26.66%)	0.01
PIH	11 (33.33%)	18 (9.1%)	10 (27.02%)	6 (6.67%)	0.001
Gestational diabetese	0 (0%)	2 (1.01%)	3 (8.1%)	6 (6.67%)	0.0001
LSCS	2 (6.06%)	21 (10.65%)	9 (24.32%)	7 (63.63%)	0.0001
AVG gest age	37.4±2.2 weeks	39.2±1.5 weeks	38.3±2.4 weeks	36.2±1.4 weeks	0.2

In fetal outcomes the macrosomia was significantly associated with maternal obesity. About 88% cases had macrosomic baby in obese and overweight group and none of the case had fetal macrosomia in underweight group. Unlike macrosomia FGR was more prevalent in underweight group *i.e.* 45.45% and p value was 0.0001.

All the abnormal weight categories were associated with a higher perinatal mortality ates which were significantly raised (p value<0.00002) than normal BMI category. The low APGAR again were common in obese group *i.e.* 36.36% and also in underweight group (21.21%). The difference was statistically significant (p value <0.00001).

TABLE 2: Fetal outcome

Outcome	Under weight n (%)	Normal	Over weight	Obese	P value
Macrosomia	0 (0%)	1 (0.510%)	2 (5.71%)	5 (83.33%)	0.0001
FGR	15 (45.45%)	3 (1.52%)	6 (16.21%)	1 (9.09%)	0.0001
Perinatal death	4 (12.1%)	3 (1.52%)	4 (10.81%)	1 (9.09%	0.00002
Low APGAR	7 (21.21%)	2 (1.01%)	3 (8.1%)	4 (36.36%)	0.00001

DISCUSSION

All over the world there is rising trend in obesity especially in younger age group. Consequently there is a rise in maternal obesity in both developing and developed countries. In western countries 28% women are overweight and 11% are in obese category [9]. There is limited data on Indian population and also there are drastic rural and urban variations in lifestyles, dietary habits and socioeconomic statuses. In the study by Deepika et al., 2012 [10] there were 3.3% underweight, 24% overweight, 6% obese cases. The slight variation in all categories from the present study can be explained by rural urban variation of study settings. The distributions of cases in to different categories in present study were comparable with the results obtained by Sahu et al., 2007[6] in a prospective study. In a prospective study by Helgstrand et al., 2005 [13] over 23821 pregnant cases in their early pregnancy it was seen that risk of spontaneous abortions was very high in underweight category and in cases with BMI >25 the risk was slightly increased but was significant. In the present study PIH was significantly associated with increasing maternal obesity. Similar findings were reported by Sahu et al., 2007 [6] and Kabiru et al., 2004[5] in there prospective analysis. Scott Pillai et al., 2004[7] and Abeinham et al., 2007[8] had concluded that obesity is an independent risk factor for PIH. There is also a high incidence of PIH in the underweight category in the present study. This contradictory finding may be due to higher portion of underweight category belong to low socioeconomic statuses where early marriages and teenage pregnancies, anaemia and nutritional deficiencies are common which might have contributed to development of PIH. With the increasing maternal obesity the risk of developing gestational diabetes and macrosomia increases. In majority of western studies [5,7,8,11] obesity was found to be significantly associated with gestational diabetes and macrosomia and was also an independent risk factor for both of conditions. In a prospective study over 300 nulliparas with singleton pregnancy by Jain et al., 2012 [10] macrosomia was only present in the overweight and obese category. In the same study low birth weight babies were present in 80% of underweight class and they were also in significant proportion in overweight and obese categories combined. Similar findings were cited by Sahu et al., 2007[6] and Abeinham et al., 2007 [8]. Kabiru et al., 2004 [5] in a retrospective analysis on 5131 singleton pregnancies over a period of three years, found that high early pregnancy BMI and increase in the BMI during pregnancy was associated with significantly increased cesarean rates. Almost similar findings were achieved by the other studies over the subject [4,6,7,8,10,11].

In a retrospective analysis by Cunningham et al., 2013 [12] on 6138 pregnancies over a period of 6 years it was seen

that raised maternal BMI was significantly associated with the need of invasive fetal monitoring and NICU admissions. Similarly Scott Pillai et al., 2004[7] reported a higher rate of NICU admissions in neonates of class III obese female. In current study low APGAR was also seen in neonates of underweight females which can be attributed to high incidence of fetal growth restriction in that category. In the study by Cunningham et al., 2013 [12] perinatal deaths were more prevalent in underweight category but Scott Pillai et al., 2007[7] found increased rate of still births associated with class III obesity in mother.

LIMITATIONS

The present study was a prospective study with strict inclusion criteria so it took a long time to assimilate the sample size. Lots of cases were lost in follow up with no means for collecting obstetric end point (abortion or term delivery), those cases were excluded from study. Also after classification in to BMI categories the obese category had only 15 cases which reduced to 11 cases after 20 weeks of gestation (4 cases had abortions). So the sample size was small to make any definite conclusions

CONCLUSION

The present study shows that extremes of maternal BMI are associated with adverse obstetric and perinatal outcomes. So adequate preconceptional counseling & multidisciplinary approach is required to attain the prescribed BMI prior to pregnancy. Lastly as primordial prevention, lifestyle changes and dietary modifications should be started in early life to prevent obesity.

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