International Journal of Science and Research (IJSR)
ISSN: 2319-7064
ResearchGate Impact Factor (2018): 0.28 | SJIF (2019): 7.583

High Body Mass Index in Pregnancy - Its Effects on Maternal and Fetal Outcome

Dr. Ch.Rama[1], Dr. Jahnavi Esanakula[2], Dr. V.Revathi

[1]Assistant Professor, Department of Obstetrics and Gynecology, S.V. Medical College, Tirupati, India.

[2]Post Graduate, Department of Obstetrics and Gynecology, S.V. Medical College, Tirupati, India (Corresponding author)

[3]Professor, Department of Obstetrics and Gynecology, S.V. Medical College, Tirupati, India

Abstract: ***Objectives: To compare the antenatal complications, obstetric outcome and neonatal outcome in overweight women and women with normal BMI. Materials and methods: It is a prospective observational study. Subjects were selected from OPD and IPD for 6months in Government maternity hospital, Tirupati, using systematic random sampling technique after meeting the inclusion criteria. Their height, weight and BMI were noted and periodically followed on outpatient basis and results were analysed. Results: Age distribution is similar in both groups. Most of the subjects belonged to lower middle class group. 9.7% of women with normal BMI and 47.1% of overweight women developed gestational hypertension/ preeclampsia. The incidence of gestational diabetes was 17.6% in overweight women. The mean gestational age at which women developed diabetes was 30-31weeks in overweight women. Rate of induction of labor was higher in overweight women. The rate of cesarean section was 29.4% (significantly higher) in overweight women. The mean hospital stay, both before (2.96days) and after (4.19days) delivery, was significantly higher in overweight women. The mean birth weight was higher (3.05kg) in women with normal BMI. No significant difference in neonatal death rates. Conclusion: Overweight in pregnancy is associated with preeclampsia/gestational hypertension and gestational diabetes. The rates of induction of labor, cesarean section and duration of hospital stay are also high in overweight women. This substantially increases expenditure and financial burden to the family***

Keywords: Body Mass Index, Preeclampsia, Gestational diabetes, Cesarean section, induction of labor

1. Introduction

During the last two decades there has been an alarming rise in the incidence of obesity all over the world. The worldwide prevalence of obesity has nearly doubled between 1980 and 2008. In 2008, more than 1.4 billion adults, aged 20 years and older, were overweight. Of these over 200 million men and nearly 300 million women were obese. 35% of adults aged 20 years and over were overweight in 2008, and 11% were obese[1].

The National Family Health Surveys (NFHS) in India indicated an increase in the obesity from 11% in 1998-1999 to 15% in 2005-2006[2]. (Fig.1)

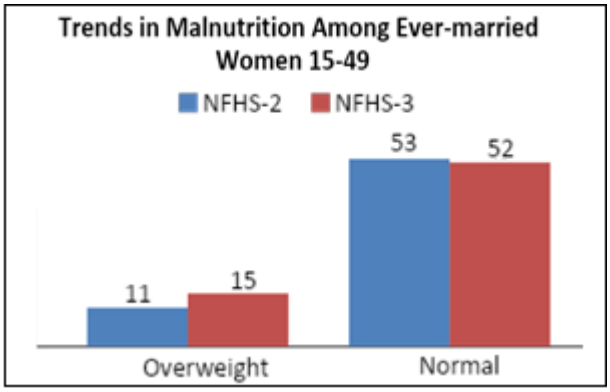

Figure 1: Trends in Malnutrition Among Ever-married Women 15-49

An increasing BMI is associated with increased incidence of cesarean delivery, pre-eclampsia, post-partum hemorrhage and macrosomic babies[3]. Where as in other study the risk of hypertensive complications, cesarean section, induction of labor and macrosomia was significantly increased in both overweight women and obese women[4,5]. The frequencies of shoulder dystocia, preterm delivery, and infant morbidity other than macrosomia were not significantly associated with maternal BMI[4]. Maternal obesity was associated with a more than doubled risk of stillbirth and neonatal death compared with women of normal weight in yet another study[6].

Purpose of this study is to evaluate the pregnancy outcome in women with high maternal BMI attending Govt. maternity hospital, Tirupati by comparing the following aspects in overweight and normal women:

- Antenatal complications such as gestational hypertension/ preeclampsia and gestational diabetes.
- Obstetric outcome in terms of abortion, preterm labor and mode of delivery.
- Neonatal outcome in terms of perinatal deaths, birth weights and admissions in neonatal intensive care units.

2. Materials and Methods

This is a Prospective observational study conducted in 18 months at Government Maternity Hospital, Tirupati. Subjects were selected from OPD and IPD using systematic random sampling technique if they meet the inclusion criteria. Maternal height and weight were recorded at booking visit in first trimester, and BMI calculated. They were periodically followed on outpatient basis or communicated through phones and their antenatal complications, obstetric outcomes and neonatal outcomes were noted and analyzed.

Inclusion criteria:

- Singleton primigravida women aged 20-35yrs attending Outpatient and Inpatient department

Exclusion criteria:

- Women with multiple pregnancies.
- Women with pre-existing hypertension or diabetes.
- Women with heart disease and thyroid disorders complicating pregnancy.
- Women whose booking height and weight are not available.
- Women who did not give the consent for the study.
- All patients were informed about the study and written consent was taken prior to their inclusion. Patients were not subjected to additional financial burden for the purpose of study. Study was approved by Institutional ethical committee.

3. Results

A total of 168 women were enrolled in the study. 134 women had normal BMI and 34 belonged to overweight group. (Fig. 2)

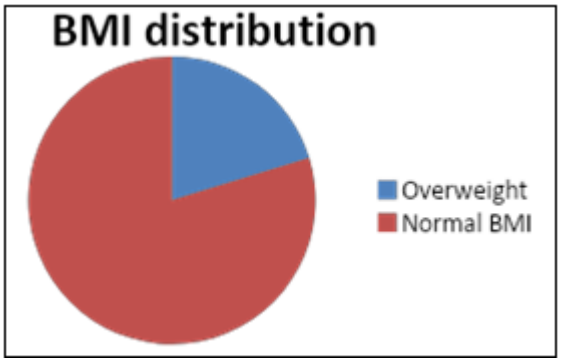

Figure 2: Distribution of Overweight women and Normal BMI women in study population.

The mean height in each group was 1.63 in normal BMI group and 1.65 meters in overweight group.

The mean weight in each group was 51.65kg in normal BMI group and 63.11 Kg in overweight group.

Table 1: Age distribution in the present study

Age	BMI		Total
	Normal BMI (18.5 – 24.9 kg/m^2)	Overweight BMI (>25 kg/m^2)	
20 & 21 yrs	86	18	104
	82.7%	17.3%	100%
22 & 23 yrs	28	13	41
	68.3%	31.7%	100%
24 & 25 yrs	20	3	23
	86.9%	13.1%	100%

Table 2: Distribution of Socioeconomic class among different BMI groups

Age	BMI		Total
	Normal BMI (18.5 – 24.9 kg/m^2)	Overweight BMI (>25 kg/m^2)	
Lower Middle class	82	22	104
	78.8%	21.2%	100%
Upper Lower class	28	6	34
	82.4%	17.6%	100%
Lower class	24	6	30
	80%	20%	100%

Most of the women were in age group of 20- 21 years and belonged to lower middle class. (Table.1, 2) The mean energy intake was 2280 Kcal/day and 2324 Kcal/day in Normal BMI group and Overweight group respectively. 73 women were anemic in normal BMI group and none were anemic in overweight group.

Table 3: Distribution of Gestational hypertension/preeclampsia among different BMI group

BMI	Gestational Hypertension or Preeclampsia	
	Yes	No
Normal BMI (18.5 – 24.9 Kg/m^2)	13	121
	9.7%	90.3%
Overweight (>25 kg/m^2)	16	18
	47.1%	52.9%

13 out of 134 women with normal BMI developed gestational hypertension/ preeclampsia. 16 women among 34 overweight women had developed gestational hypertension/ preeclampsia. The results were statistically significant with p value <0.01. (Table 3)

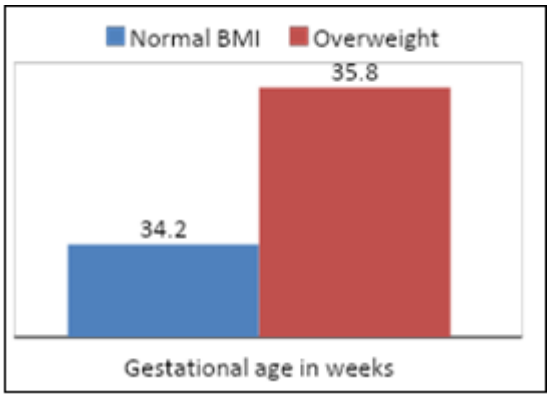

Figure 3: Mean gestational age (wks) of developing gestational hypertension/ preeclampsia in different BMI groups

The mean gestational age of development of gestational hypertension or preeclapmsia was 34.2 weeks in women with normal BMI and 35.8 weeks in overweight women. (Fig. 3)

Table 4: Gestational diabetes among different BMI groups

BMI	Gestational Diabetes	
	Yes	No
Normal BMI (18.5 – 24.9 Kg/m^2)	3	131
	2.2%	97.8%
Overweight (>25 kg/m^2)	6	28
	17.6%	82.4%

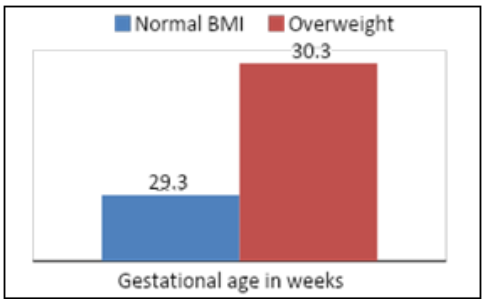

Figure 4: Mean gestational age (wks) of developing gestational diabetes in different BMI groups

The mean gestational age of developing gestational diabetes was 29.3 weeks for normal BMI and 30.3 weeks for overweight women. (Fig. 4)

Table 5: Onset of labor in Different BMI groups

BMI	ONSET		Total
	Spontaneous	Induced	
Normal BMI (18.5 – 24.9 kg/m^2)	89	42	131
	67.9%	32.1%	100%
Overweight (>25 Kg/m^2)	13	18	31
	41.9%	58.1%	100%

Of the total population, 162 pregnancies reached the period of viability and 6 of them aborted. The onset of labor was spontaneous in 89 of 131 women belonging to normal BMI group and it was 13 out of 31 women belonging to overweight group. (Table:5) The results were statistically significant with p value <0.05.

Table 6: Obstetric outcome in different BMI groups

BMI	Obstetric Outcome				
	Abortion	Cesarean Section	Instrumental Vaginal Delivery	Normal Vaginal Delivery	Preterm Labour
Normal BMI (18.5-24.9 kg/m^2)	3	18	10	81	22
	2.2%	13.4%	7.5%	60.5%	16.4%
Overweight (>25 kg/m^2)	3	10	0	18	3
	8.8%	29.5%	0%	52.9%	8.8%
Total	6	28	10	99	25
	3.6%	16.7%	5.9%	58.9%	14.9%

Table 7: Duration of hospital stay in different BMI groups

BMI	Hospital stay of the patient in days		
	Before delivery	After delivery	Total
Normal BMI	1.71	2.41	4.12
Overweight	2.96	4.19	7.15

The obstetric outcomes of the study subjects were analyzed. (Table: 6) The mean hospital stays before and after delivery was more in women with overweight – 2.96 days and 4.19 days respectively. The difference in duration of hospital stay is statistically significant. (Table: 7) Perinatal outcome of babies was analysed group wise in overweight and normal BMI women.

Table 8: IUGR in different BMI groups

BMI	IUGR	
	Yes	No
Normal BMI (18.5 – 24.9 kg/m^2)	26	105
	19.8%	80.2%
Overweight (>25 Kg/m^2)	1	30
	3.2%	96.8%

1 out of 31 new borns among overweight women had clinical, radiological or post-delivery signs of intrauterine growth restriction. The number of growth restricted babies was 26 out of 131 in women with normal BMI. (Table: 8)

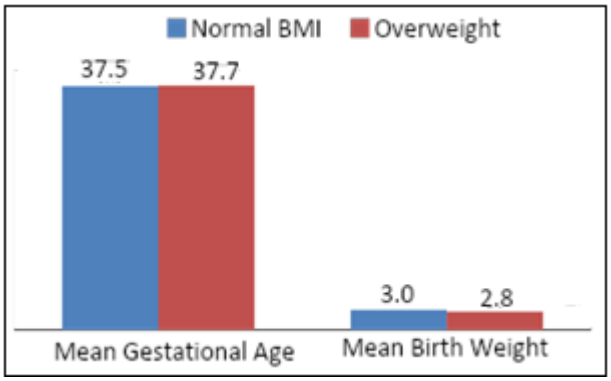

Figure 5: Mean Gestational age and Mean Birth Weight of babies among different BMI groups

The mean birth gestational age and birth weight of babies were 37.5 weeks and 3.0 kg in women with normal BMI and 37.7 weeks and 2.8 kg in overweight women. (Fig. 5) The mean APGAR scores at 1 minute and 5 minutes were 7.47 and 9.47 in normal BMI and 7.37 and 9.42 in overweight women.

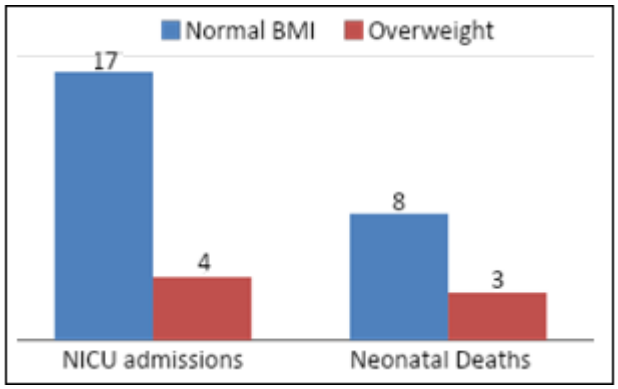

Figure 6: NICU admissions and neonatal deaths among different BMI groups.

The NICU admissions were 17 and 4 among normal BMI and overweight group. The neonatal deaths were 8 and 3 in normal BMI and overweight group. (Fig. 6)

4. Discussion and Analyses

This study found that increased maternal body mass index predisposed women to increased incidence of adverse maternal and neonatal outcomes. This adds to the growing evidence that BMI is a major determinant of obstetric outcomes.

The distribution of body mass index was similar in all age groups showing BMI in reproductive age group women may not be influenced by age of the women. In the present study, teenage pregnancies have not been included as they pose a different set of problems in the pregnancy outcome.

Bhattacharya et al[3] that showed increased risk with OR 7.2 in obese and increased risk in overweight also. The present

study also showed that there was significant association of body mass index with development of gestational hypertension/ preeclampsia (47.1%). These findings were also seen in study by Sebire et al[7] where the incidence of preeclampsia about two times in overweight and six times in obese women. Similar results were drawn from a South Indian study, by Dasgupta A et al at JIPMER[8]. However, there is difference in incidence of gestational hypertension in the two groups (Fig. 7)

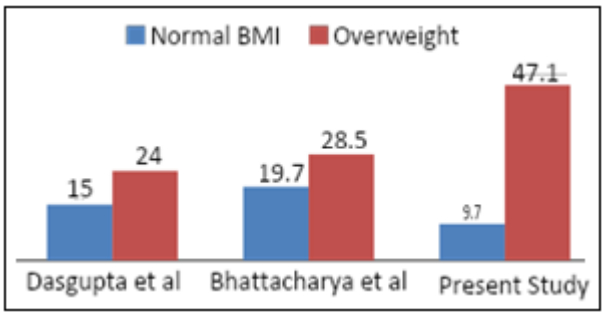

Figure 7: Gestational Hypertension/ Preeclampsia in overweight women among various studies

The present study also showed an increased risk of gestational diabetes in women with overweight (17.6%). In a study by Sebire et al[7] glucose intolerance was increased in overweight and obese women. The incidence of gestational diabetes was 1.7% in overweight women and 0.75% in women with normal BMI in that study. In JIMPER study by Dasgupta et al[8] on overweight women revealed higher incidence in gestational diabetes. (Fig. 8)

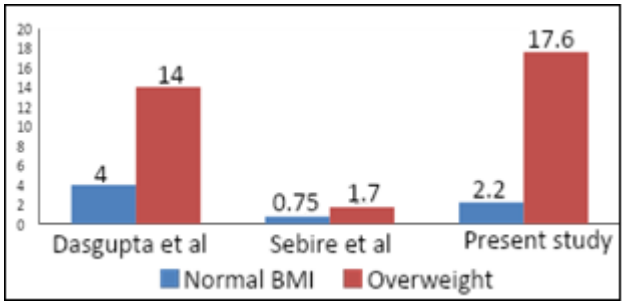

Figure 8: Gestational Diabetes in overweight women among various studies

The risk of preterm labor in overweight women is 8.8% and 16.4% in normal body mass index group. The influence of body mass index here was significant statistically. The present study findings were similar to study of Sebire et al[7] showing delivery before 32 weeks was significantly less likely in obese women with an odds ratio of 0.73 in overweight and 0.81 in obese women. In the study by Dasgupta et al[8] at JIPMER the rate of preterm delivery was more in overweight women than in normal BMI women. However, the present study did not include the multiple pregnancies unlike the study by Dasgupta et al[8], which might have altered the preterm birth rates in different groups of study. In the study by Bhattacharya et al[3] obese subjects had a twofold rise in preterm labor than normal body mass index subjects. However, in overweight subjects this difference was not noted. (Fig. 9)

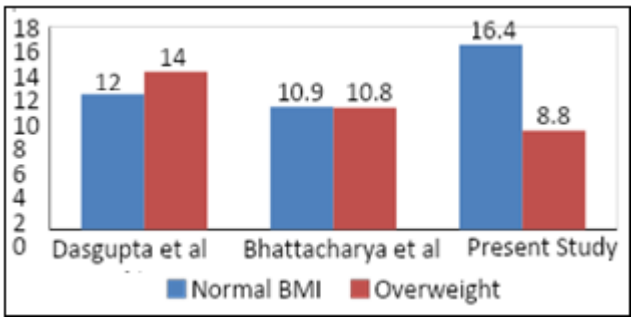

Figure 9: Preterm Labor in overweight women among various studies.

Induction of labor was 58.1% in overweight women compared to 32.1% in women with normal body mass index. This study demonstrated an increase in risk of labor induction in women with increased body mass index. The indications for labor induction also varied in the body mass index categories, particularly regarding conditions generally associated with obesity, such as hypertensive disorders of pregnancy, post term pregnancy and premature rupture of membranes. These results were consistent with previous studies which demonstrated increase in induction of labor by Sebire et al and Juhasz et al [7,9].

Several studies demonstrated increased caesarean section rates among women with overweight and obesity. The incidence of caesarean section is 29.4% in overweight women and 13.4% in women with normal BMI in this study. These results are akin to those by Batacharya et al[3] and Sebire et al[7].

The relevance of the raised cesarean section rate in this group is considerable because of their increased risk of associated complications, such as anesthetic and infectious morbidity. The increase in caesarean sections may in part have been a consequence of the increased rate of large for gestational age infants leading to cephalopelvic disproportion during labor, increased rates of induction of labor or it is possible that uterine contractility may be suboptimal in a subgroup of obese women, or there may be increased fat deposition in the soft tissues of the pelvis.

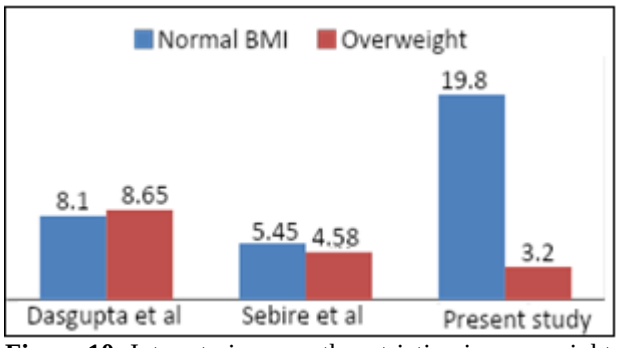

Figure 10: Intra uterine growth restriction in overweight women among various studies

About intra uterine growth restriction, incidence was 3.2% in overweight compared to 19.8% in normal body mass index group. Increased maternal body mass index was found to be protective as the frequency of intra uterine growth restriction decreased with increasing body mass index. However, in a study by Dasgupta et al[8] overweight women

had almost similar incidence of Intra Uterine Growth Restriction(IUGR) (8.1%vs 8.65%).In a study by Sebire et al[7] the percentage intra uterine growth restriction in babies was 5.45% in women with normal BMI and 4.58 in overweight women. (Fig. 10) Another independent study by Radulescu et al suggested that there is a high risk of growth restriction in women with high BMI[10] (50%).

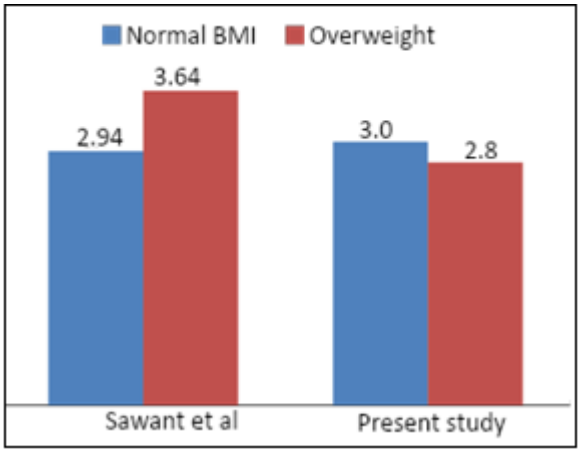

Figure 11: Mean Birth Weight in overweight women among various studies

The mean birth weight in study by Sawant et al[11] in normal BMI group is 2.94kg and in overweight group is 3.62kg. The comparison between the present study and study by Sawant et al. (Fig. 11)

Neonatal ICU admissions were high in overweight and obese women when compared to normal BMI in a study by Swant et al[11].

The study by Sebire et al[7] also showed increase in neonatal death in obese women. The combination of rapid fetal growth induced by the endogenous hyper insulinemia in obese women and the functional limitations of the placenta to transfer sufficient oxygen to meet the requirements of the fetus, was proposed as a cause to hypoxia and death in some cases.

However, in the present study there is neonatal death rate of 6.1% in normal BMI women and 9.7% in overweight women, showing a small increase in the neonatal death in overweight women but the result was not statistically significant.

5. Conclusion

Maternal BMI shows strong associations with pregnancy complications and outcome. This indicates there is a need for both preconception counselling and antenatal care to prevent the problems associated with high BMI.

Overweight in pregnancy is associated with preeclamsia/ gestational hypertension and gestational diabetes. The rates of induction of labor, cesarean section and duration of hospital stay are also high in overweight women. This substantially increases expenditure and financial burden to the family.

The mean birth weight of baby is less in overweight women. However, the difference is not statistically significant. Preconception nutritional counselling is important to avoid complications of high of maternal BMI.

References

[1] World Health Organization [internet].Global Health Observatory. Cited on 24.12.14. Available from:www.who.int/gho/ncd/risk_factors/obesity_text/en .
[2] International Institute For Population Sciences [internet]. Key indicators for India from NFHS-3 2006. Cited on 24.12.14. Available from: http://www.rchiips.org/nfhs/pdf/India.pdf.
[3] Bhattacharya S, Campbell DM, Liston WA, Bhattacharya S. Effect of Body Mass Index on pregnancy outcomes in nulliparous women delivering singleton babies. BMC Public Health. 2007 Jul 24;7:168.
[4] Jensen DM, Damm P, Sørensen B, Mølsted-Pedersen L, Westergaard JG, Ovesen P, Beck-Nielsen H. Pregnancy outcome and prepregnancy body mass index in 2459 glucose-tolerant Danish women. Am J Obstet Gynecol. 2003 Jul;189(1):239-44.
[5] Doherty DA, Magann EF, Francis J, Morrison JC, Newnham JP. Pre pregnancy body mass index and pregnancy outcomes. Int J Gynaecol Obstet. 2006 Dec;95(3):242-7.
[6] Kristensen J, Vestergaard M, Wisborg K, Kesmodel U, Secher NJ. Pre pregnancy weight and the risk of stillbirth and neonatal death. BJOG. 2005 Apr;112(4):403-8.
[7] Sebire NJ, Jolly M, Harris JP, Wadsworth J, Joffe M, Beard RW, Regan L, Robinson S. Maternal obesity and pregnancy outcome: a study of 287,213 pregnancies in London. Int J Obes Relat Metab Disord. 2001 Aug;25(8):1175-82.
[8] AnirbanDasgupta, K T Harichandrakumar, Syed Habeebullah. "Pregnancy Outcome among Obese Indians - A Prospective Cohort Study in A Tertiary Care Centre In South India". Int J Sci Stud. 2014;2(2):13-18.
[9] Juhasz G, Gyamfi C, Gyamfi P, Tocce K, Stone JL. Effect of body mass index and excessive weight gain on success of vaginal birth after cesarean delivery. Obstet Gynecol. 2005 Oct;106(4):741-6.
[10] Radulescu L, Munteanu O, Popa F, Cirstoiu M. The implications and consequences of maternal obesity on fetal intrauterine growth restriction. J Med Life. 2013 Sep 15;6(3):292-8.
[11] VasudhaSawant, Neelima Shah. Correlation of early pregnancy maternal BMI and perinatal outcome. Indian Journal of Basic and Applied Medical Research. December 2015; Vol-5, Issue-1, 164-69.