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Research Article

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Pre-pregnancy Body Mass Index and Perinatal Outcomes in Tripoli Medical Center/Tripoli 2015-2016

Najwa Eljabu[@1,2] **and Zainab Aborig**[1]

Department of Gynaecology and Obstetrics, Tripoli University Hospital [1]
Department of Gynaecology and Obstetrics, Faculty of medicine, University of Tripoli, Libya [2]

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ABSTRACT

In Libya, high prevalence of obesity and overweight has been reported among women in reproductive age group, with estimates reaching as high as around 40%. The high pre-pregnancy BMI was considered as a risk factor for pregnancy and obstetric complications. The main objective of this study was to examine the association between .pre-pregnancy maternal BMI and perinatal outcome. It is cross sectional study of 200 Libyan pregnant women

This study was conducted in Tripoli University Hospital, Tripoli-Libya during the period 2015-2016. The 200 pregnant women who came to the hospital in labour were included. They were asked about their weight before pregnancy, and their height were measured during the day of admission. Pre-prepared information sheet were filled . up that included patient's detailed history, any complications, maternal and neonatal outcome after delivery

Out of two hundred cases, 6 cases (3%) were under weight, 70 cases (35.4%) have normal BMI, 122 (61.6%) were overweight and obese, and two cases (1%) excluded due to incomplete data. The mean age of the patients was 31.4 years, 72% of the patients were between para 1 and para 3. 26.2% of the overweight and obese group developed pre-eclampsia. 23% of the overweight and obese group developed diabetes. Longer hospital stay up to 7 days seen more in overweight and obese group (21.3%), (21.3%) of the overweight and obese had their pregnancies complicated by preterm delivery. (70.5%) of the overweight and obese had caesarean delivery. 23% of women in the . overweight and obese group have babies admitted to NICU

According to our results, the prevalence of overweight and obesity in women at reproductive age is relatively high. Obesity should be considered as risk to pregnancy outcome, owing to increased incidence of pre-eclampsia, GDM, .macrosomia, IUFD and caesarean delivery

.***Key wards***- *Obesity; Pregnancy Outcome; Perinatal outcome; Gestational weight gain*

INTRODUCTION

In Libya, high prevalence of obesity and overweight has been reported among women in reproductive age group, with estimates reaching as high as around 40%[1], indicating that women commence their pregnancy with a high body mass index (BMI).[2] The high pre-pregnancy BMI was considered as a risk factor for pregnancy and obstetric complications, such as miscarriage, pre-eclampsia, gestational diabetes and caesarean deliveries.[3] Additionally, adverse neonatal outcomes such as macrosomia, congenital anomalies and increased perinatal outcomes.[4] Further, pre-pregnancy BMI was considered as one of the factors that influence gestational weight gain (GWG) which may affect the child's growth pattern and risk of adulthood diseases later in life.[5] In 2009, the institute of medicine issued the revised GWG guidelines, which recommend a certain weight gain depending on pre-pregnancy BMI categories.[6] Reduced GWG imply the risk of low birth weight, impaired fetal growth and preterm births.[7] While excess GWG was associated with pre-eclampsia, gestational diabetes, macrosomia and complicated deliveries.[8]

Recently, life style changes resulted in global increase in overweight and obesity among women and are considered as a major public health problem.[9] According to WHO, "obesity and overweight are defined as abnormal or excessive fat accumulation that causes a risk to health" and in general, obesity is morbid health problem and is a risk factor for many health problems like diabetes, cardiovascular and cancers.[9,10]

Now a days, the epidemic of obesity is not limited to developed countries, however, it becomes growing problem in middle and low income countries.[10] The body mass index (BMI) which is person's weight (in kilograms) divided by square of the height (in meters) is used to measure obesity and overweight. BMI equal or more than thirty is classified as obese, and BMI equal to or more than twenty five is classified as over weight.[11,12] BMI is considered as the best measure of overweight and obesity at population-level, as it is not different among women and men and among different age group of adult.[11,12] The aetiology, epidemiology and cultural significance of overweight and obesity are likely to vary from population to another. Therefore, in the present study we

@Author to whom correspondence should be addressed: Dr. Najwa Eljabu;Email:eljabunajwa@gmail.com; Tel. 00218 91 371 6210

sought to assess the effect of pre-pregnancy maternal BMI on pregnancy and perinatal outcomes in Tripoli Medical Center-Tripoli. The aim of the study was to examine the association between pre-pregnancy maternal BMI and perinatal outcome.

MATERIALS AND METHODS

Study design: It is cross sectional study of 200 Libyan pregnant women.

Study setting: This study was conducted in Tripoli Medical Center, Tripoli/Libya.

Study period: 2015-2016.

Study population:

This study was conducted in Tripoli Medical Center, two hundred pregnant women came to the hospital in labour were included. They were asked about their weight before pregnancy, and their height were measured during the day of admission. We filled the pre-prepared information sheet that included patient's detailed history, any complications, maternal and neonatal outcome after delivery.

Statistical analysis:

Statistical analysis was computerized using the statistical program for social sciences (SPSS version 16), that used for data entry and analysis. Descriptive statistics were used and all results are presented as frequencies, means ± standard deviation and percentages. Categorical data were compared using the Chi-square test and Fisher's exact test if appropriate. A *P*-value of less than or equal to 0.05 was considered statistically significant.

RESULTS

Out of two hundred cases, 6 cases (3%) were under weight, 70 cases (35.4%) have normal BMI, 122 (61.6%) were overweight and obese, and two cases (1%) excluded due to incomplete data. The underweight women and those with incomplete data were excluded from the study. The mean age of the patients was 31.4 years, 72% of the patients were between para 1 and para 3. Regarding BMI classification for the population of study, 3% of the patients were underweight (low BMI), 35% were normal BMI and lastly 61% were overweight or obese (Table 1,Fig.1)..

Table 1: Body mass index of the study group

BMI	Number of patients No.	Percentage (%)
Underweight	6	(3%)
Normal	70	(35%)
Overweight and obese	122	(61%)
Total	198	(100%)

For normal BMI group 34.3% of the patients were in the age group 20-25 years, and 31.4% were in the 26-30 years of age) (Table 2,Fig.2)..

Table 2: Age distribution of the study group

Age distribution	Normal BMI patients No. (%)	Overweight and obese patients No. (%)	Total
20-25 years	0 (0%)	2 (1.6%)	2 (1%)
26-30 years	24 (34.3%)	8 (6.6%)	32 (16.7%)
31-35 years	22 (31.4%)	32 (26.2%)	54 (28.1%)
36-40 years	14 (20%)	30 (24.6%)	44 (22.9%)
41-45	10 (14.3%)	40 (32.8%)	50 (26%)
>45	0 (0%)	10 (8.2%)	10 (5.2%)
Total	70 (100%)	122 (100%)	192 (100%)

Among patients with normal BMI, 88.6% of women have 1 to 3 children, 11.4% have 4 to 6 children and 0% has seven or more. In the overweight and obese group 67.2% have 1 to 3 children, 27.9% have 4 to 6 and 4.9% have 7 or more. Apparently, increased BMI is associated with increased parity, *P* value = 0.003 (Table 3,Fig.3).

Table 3: Parity of the study group

Parity	Normal BMI patients No. (%)	Overweight and obese patients No. (%)	Total
1-3	62 (88.6%)	82 (67.2%)	144 (75%)
4-6	8 (11.4%)	34 (27.9%)	42 (21.9%)
≥ 7	0 (0%)	6 (4.9%)	6 (3.1%)
	70 (100%)	122 (100%)	192 (100%)

Maternal complications

In the normal BMI group, 14.3% of the patients complicated by pre-eclampsia, on the other hand, 26.2% of the overweight and obese group developed pre-eclampsia. This makes overweight and obese patients more likely to have pregnancies complicated by pre-eclampsia than women with normal BMI, *P* value = 0.05 (Table 4,Fig.4).

Table 4: Pre-eclampsia among the study group

Pre-eclampsia	Normal BMI Patients No. (%)	Overweight and obese patients No. (%)	Total
No	60 (85.7%)	90 (73.8%)	150 (78.1%)
Yes	10 (14.3%)	32 (26.2%)	42 (21.9%)
	70 (100%)	122 (100%)	192 (100%)

In the normal BMI group, 8.6% of the patients complicated by diabetes, on the other hand, 23% of the overweight and obese group developed diabetes. This makes overweight and obese patients more likely to have pregnancies complicated by diabetes than women with normal BMI, *P* value = 0.01 (Table 5,Fig.5).

Table 5: Gestational Diabetes Mellitus among the study group

Diabetics	Normal BMI Patients No. (%)	Overweight and obese patients No. (%)	Total
No	64 (91.4%)	94 (77%)	158 (82.3%)
Yes	6 (8.6%)	28 (23%)	34 (17.7%)
	70 (100%)	122 (100%)	192 (100%)

Two cases (2.9%) in the normal BMI group were admitted to ICU, contrary, there was no admissions to ICU from overweight and obese group, this means there is no association between maternal BMI and admission to ICU, *P* value = 0.06 (Table 6,Fig.6).

Table 6: Maternal admission to ICU among the study group

Admission to ICU	Normal BMI patients No.(%)	Overweight and obese patients No. (%)	Total
No	68 (97.1%)	122 (100%)	190 (99%)
Yes	2 (2.9%)	0 (0%)	2 (1%)
	70 (100%)	122 (100%)	192(100%)

The majority of patients (94.2%) in the normal BMI group stayed 1 to 3 days; on the other hand, (67.2%) among overweight and obese stayed 1 to 3 days, but longer hospital stay up to 7 days was seen more in overweight and obese group (21.3%), showing a strong association between increase in BMI and increase in duration of hospital stay. This means overweight and obese patients stay longer in the hospital than patients with normal BMI, *P* value = 0.001 (Table 7,Fig.7)..

Table 7: Average length of hospital stay

Average length of hospital stay	Normal BMI patients No. (%)	Overweight and obese patients No. (%)	Total
1-3	66 (94.2%)	82 (67.2%)	148 (77%)
4-7	2 (2.8%)	26 (21.3%)	28 (14.5%)
>10	2 (2.8%)	14 (1.1%)	16 (8.3%)
Total	70 (100%)	122 (100%)	192 (100%)

Among the normal BMI group (14.3%) had preterm deliveries, on the other hand, (21.3%) of the overweight and obese had their pregnancies complicated by preterm delivery. This means increased BMI increases the risk of preterm delivery, *P* value = 0.001 (Table 8,Fig.8)..

Table 8: Gestational age at delivery

Gestational age at delivery	Normal BMI .Patients No (%)	Overweight and obese .patients No (%)	Total
Term	(85.7%) 60	(78.6%) 96	(81.2%) 156
Preterm	(14.3%) 10	(21.3%) 26	(18.7%) 36
Total	(100%) 70	(100%) 122	192 (100%)

Among the normal BMI group (42.9%) had caesarean deliveries, on the other hand, (70.5%) of the overweight and obese had caesarean delivery. This means increased BMI increases the risk of operative delivery, *P* value = 0.000 (Table 9,Fig.9).

Table 9: Mode of delivery.

Mode of delivery	Normal BMI patients No. (%)	Overweight and obese patients No. (%)	Total
NVD	40 (57.1%)	32 (26.2%)	72 (37.5%)
C/S	30 (42.9%)	86 (70.5%)	116 (60.4%)
Total	70 (100%)	122 (100%)	192 (100%)

There is no mortality among participants in this study (Table 10,Fig.10)..

Table 10: Maternal mortality

Maternal mortality	Normal BMI patients No. (%)	Overweight and obese patients No. (%)	Total
No	70 (57.1%)	122 (26.2%)	192 (37.5%)
Yes	0 (0%)	0 (0%)	0 (60.4%)
Total	70 (100%)	122 (100%)	192 (100%)

Neonatal outcome

In the normal BMI group (20%) of the patients had low birth weight babies, and only (8.5%) had good size babies (>4kg). However, among the overweight and obese patients, (31.1%) gave birth to small babies (<2.5kg), and (18%) of them delivered good size babies (>4kg). This means overweight and obese women are more likely to have more extremes of birth weight babies, *P* value = 0.018 (Table 11,Fig.11)..

Table 11: Birth weight among the study group

Birth weight	Normal BMI patients No. (%)	Overweight and obese patients No. (%)	Total
<2.5kg	14 (20%)	38 (31.1%)	52 (27.1%)
2.6-4kg	50 (71.4%)	62 (50.8%)	112 (58.3%)
>4kg	6 (8.5%)	22 (18%)	28 (14.9%)
Total	70 (100%)	122 (100%)	192 (100%)

In this study only 8.6% of the normal BMI group had their babies admitted to NICU, whereas, 23% of women in the overweight and obese group had babies admitted to NICU. This reflects that there is association between increase in BMI and neonatal admission to ICU. Meaning, babies of overweight and obese women are more likely to be admitted to ICU than babies of women who have normal BMI, *P* value = 0.012 (Table 12,Fig.12).

Table 12: Neonatal admission to NICU

Neonatal admission to NICU	Normal BMI patients No. (%)	Overweight and obese patients No. (%)	Total
No	64 (91.4%)	94 (77%)	158 (82.3%)
Yes	6 (8.6%)	28 (23%)	34 (17.7%)
Total	70 (100%)	122 (100%)	192 (100%)

All of these neonatal complications are not associated with increase in maternal BMI, *P* values are 0.816, 0.230, 0.492, 0.517, 0.699, 0.872 respectively. This implies no difference between women with normal BMI and overweight and obese women regarding these neonatal outcomes (Table 13,Fig.13).

Table 13: Neonatal complications

Complications	Normal BMI		Overweight and obese		*P* value
	Yes	No	Yes	No	
IUFD	4 (5.7%)	66 (94.3%)	8 (6.6%)	114 (93.4%)	0.816
Preterm	10 (14.3%)	60 (85.7%)	26 (21.3%)	96 (78.7%)	0.230
SGA	2 (2.9%)	68 (97.1%)	6 (4.9%)	116 (95.1%)	0.492
IUGR	8 (11.4%)	62 (88.6%)	18 (14.8%)	104 (85.2%)	0.517
LGA	10 (14.3%)	60 (85.7%)	20 (16.4%)	102 (83.6%)	0.699
SD	2 (2.9%)	68 (79.1%)	4 (3.3%)	118 (96.7%)	0.872

There is no reported neonatal mortality among participants in this study (Table 14,Fig.14).

Table 14: Neonatal death

Neonatal mortality	Normal BMI patients No. (%)	Overweight and obese patients No. (%)	Total
No	70 (57.1%)	122 (26.2%)	192 (37.5%)
Yes	0 (0%)	0 (0%)	0 (60.4%)
Total	70 (100%)	122 (100%)	192 (100%)

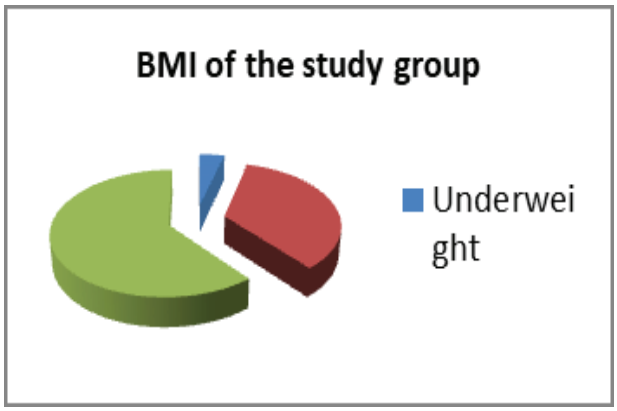

Figure 1: Body mass index of the study group

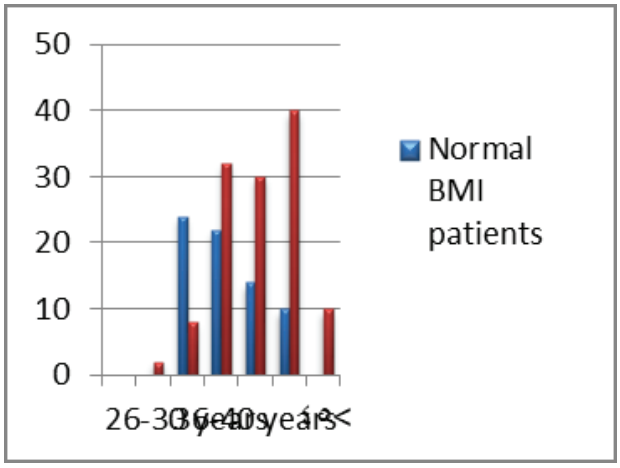

Figure 2: Age distribution of the study group

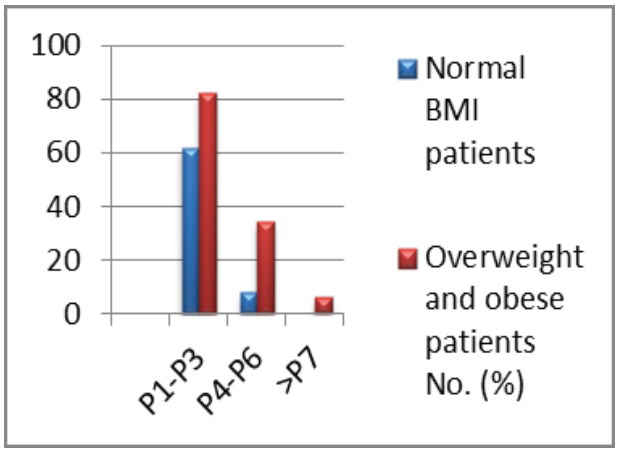

Figure 3: Parity distribution of the study group

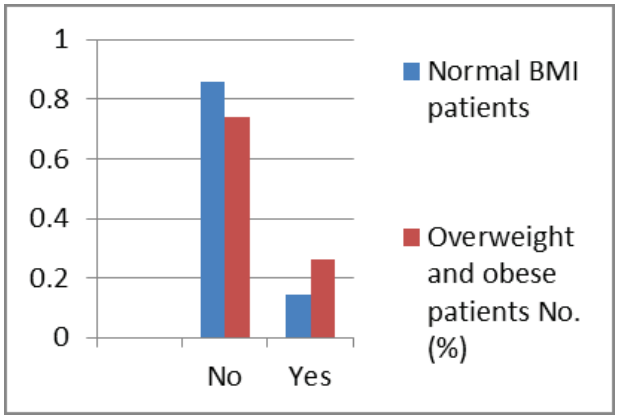

Figure 4: Pre-eclampsia among the study group

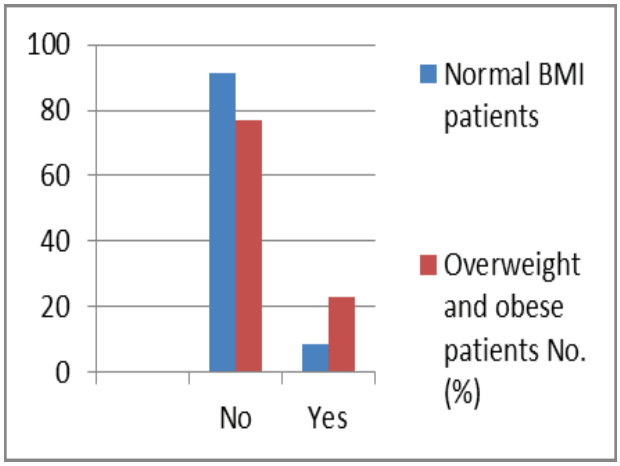

Figure 6: Maternal admission to ICU among the study group

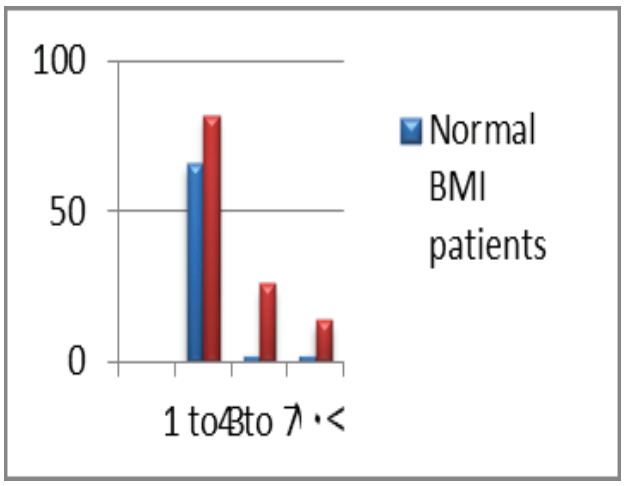

Figure 7: Average length of hospital stay

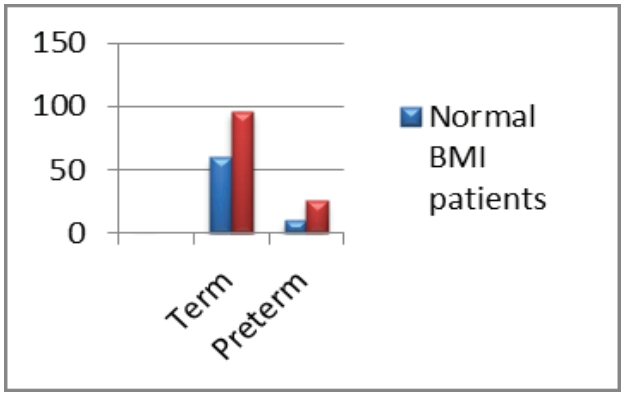

Figure 8: Gestational age at delivery

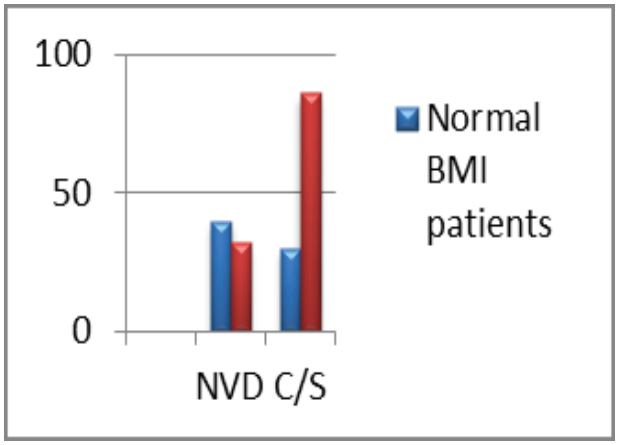

Figure 9: Mode of delivery

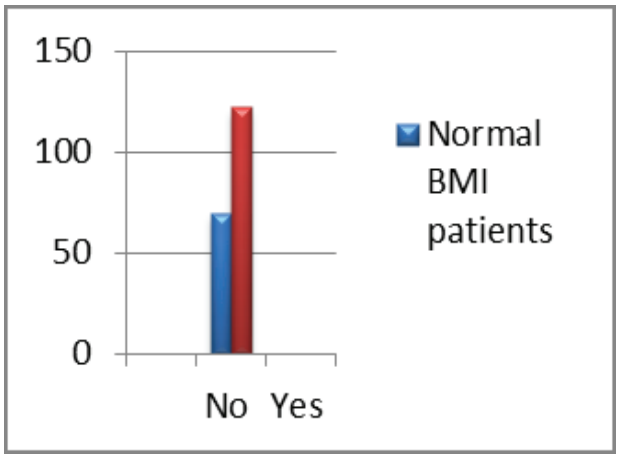

Figure 10: Maternal mortality

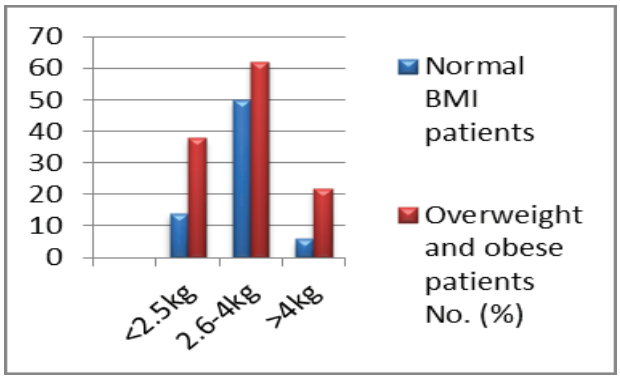

Figure 11: Birth weight among the study group

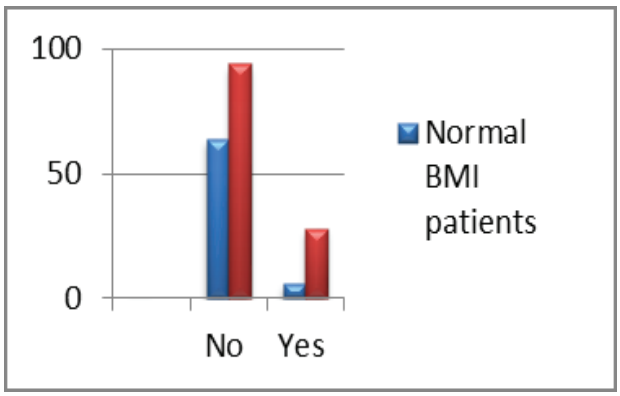

Figure 12: Neonatal admission to NICU

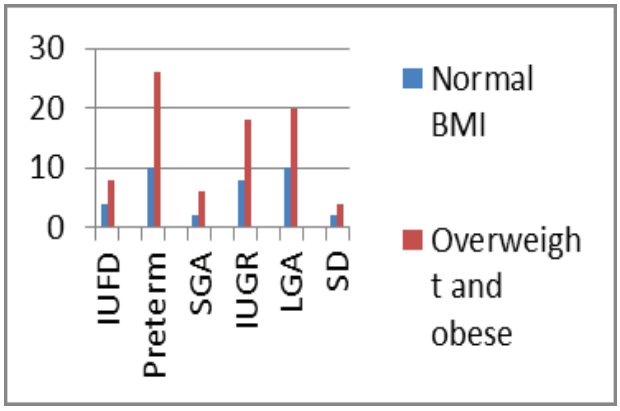

Figure 13: Neonatal complications

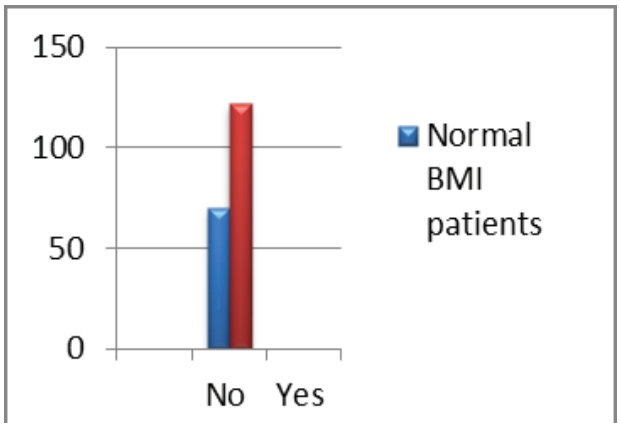

Figure 14: Neonatal death

DISCUSSION

There is expanding body of evidence proving that obesity, risks women's pregnancy and predisposes to obstetric complications. In this study, it is found that increasing BMI gives rise to adverse maternal and neonatal outcomes. In the population of the current study, 61% of the pregnant women were overweight and obese, Bhattacharya S et al, found the prevalence of obesity in his study 30.2%, Pakniat H et al, reported the prevalence of obesity in her study 44.3%.[13,14] The comparison of the sociodemographic characteristics of the study group showed that the average age of women in our study is (31.4 years), in Pakniat H et al.[14] study, the average age was (28.4 years). Additionally, it is apparent that the subjects in the normal BMI group were significantly younger in comparison to the overweight and obese group, who were significantly older than women with normal BMI. Also, a significant correlation was found between parity and pre-pregnancy BMI. Apparently, increased BMI is associated with increased parity. *P value = 0.003*.From the pre-existing evidence, there is strong association between higher BMI and hypertensive disorders of pregnancy[15], a meta-analysis on the risk of pre-eclampsia associated with pregnancy BMI, showed that the risk of pre-eclampsia increased twice with each 5-7 kg/m2 increase in pre-pregnancy BMI.[16] In our study, 26.2% of the overweight and obese group developed pre-eclampsia in comparison to 14.3% in the normal BMI group, this makes obese and overweight group more likely to develop pre-eclampsia.

The incidence of GDM in our study were 23% among overweight and obese group and 8.6% among normal BMI, this reflects the increased risk of GDM with increasing body weight. Similar studies by Doherty (2006), Ducarme (2007), Athukorala (2010) and Benedetto (2011) showed the increased risk of GDM with increased body weight (BMI).[17-20] Preterm delivery is a recognized adverse outcome of obese pregnancies, in this study (21.3%) of the overweight and obese had preterm delivery, in contrast, 14.3% in the normal BMI gave birth prematurely. Ducarme, showed that the risk of preterm delivery may increase in obese and overweight women, however, may also increase in lower BMI women, this was explained by the occurrence of comorbidities.[18] In the current study, the rate of caesarean delivery was significantly higher in the overweight and obese group compared to the normal BMI group (42.9% VS 70.5%), *P* value = 0.000. A meta-analysis (1996-2007) demonstrated that the rate of caesarean section was significantly higher among overweight and obese women.[21] The higher rate of caesarean section in obese women has been explained by the presence of frequent pregnancy complications, such as pre-eclampsia, GDM and macrosomia. A number of studies conducted investigations on the relationship between maternal obesity and fetal growth; they demonstrated that obese women have an 18-26% increased risk of having macrosomia babies even if GDM was excluded.[22] In our study, 18% of overweight and obese group have given birth to babies >4kg, in contrast, only 8.5% of normal BMI group had good size babies. Additionally, 6.6% of the overweight and obese group had

IUFD. Several epidemiological studies have demonstrated an increased risk of IUFD among obese pregnant women; this was explained by maternal hyperinsulinaemia along with placental insufficiency.[23] In this study, (31.1%) of the overweight and obese group have smaller babies (<2.5kg) and 20% of the normal BMI group delivered small babies. In 2013, a meta-analysis demonstrated that lower BMI is associated with smaller infants.[24] It is obvious that all pregnancies in obese women should be regarded as high risk and be managed following strict protocols. The management should comprise pre-pregnancy counseling regarding weight reduction and early antenatal care for management of possible complications. One of the limitations of the current study was the small sample size, as this study was conducted at one hospital in short period of time.

CONCLUSION

According to our results, the prevalence of overweight and obesity in women at reproductive age is relatively high. Obesity should be considered as risk to pregnancy outcome, owing to increased incidence of pre-eclampsia, GDM, macrosomia, IUFD and caesarean delivery.

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