Impact of Body Mass Index on the Progress of Labor in Egyptian Women

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Abstract

Objective: To estimate the effect of the maternal BMI on the progress of labour and Neonatal outcome in the Egyptian population.

Methods: It is a cross-sectional descriptive study including 620 primiparas, with singleton pregnancy, cephalic presentation attending labour ward in Kasr Al Aini Hospitals in the first stage of labour. Patients were divided into 2 groups, group 1: Patients with BMI <30, and group 2: Patients with BMI >30. History taking and complete examination were done to all patients; data were collected and analyzed using computer programs SPSS (Statistical Package for the Social Science; SPSS Inc., Chicago, IL, USA) version 15 for Microsoft Windows.

Results: There was a statistical significant difference between group 1 (BMI <30) and group 2 (BMI >30) regarding the mode of delivery, Cesarean Section delivery rate was 21.9% in group 1, and 38.0% in group 2 (p-value <0.001). While there was no statistical significant difference regarding the cervical dilatation, cervical effacement, duration of the first and second stages, fetal outcome (neonatal body weight, Apgar score at 1 and 5minutes) between group1 and group 2.

Conclusion: Increased maternal BMI is associated with increased incidence of Cesarean delivery, however it doesn’t affect the duration of the progress of labour, neither the fetal outcome as regard the fetal weight, and the Apgar score at 1 and 5min.

Key Words: BMI – Cesarean section – Maternal obesity.

Introduction

OBESITY is defined as an increased in the body weight (or better Body Mass Index BMI) due to excessive accumulation of fat [1].

BMI is the weight in kilograms divided by the squared height in meters. Normally it is 20–<25, if from 25–<30 it is overweight, if it is 30–<35 it is obese, and >35 is morbidly obese [2].

Obesity was defined by World Health Organization (WHO) as “one of the most visible, yet most neglected public health problem that threaten both developed and underdeveloped countries, but more or less the former” [1].

Increased maternal BMI is associated with adverse pregnancy outcome both for the mother and the fetus, such as pre-eclampsia, eclampsia, preterm and post term deliveries, induction of labour, post partum haemorrhage and fetal macrosomia [3,4].

In 1990, the institute of Medicine of the National Academies in the United States suggested that maternal weight gain during pregnancy should be related to the prepregnancy BMI as such: if BMI <20, then a weight gain of 25-40 IB (12-18.5kg) is advised. If BMI 25–<30, then 15-25 IB (11.5-16kg) increase in the maternal weight is advised. If BMI >30, then an increase of 15IB (7-11.5kg) in the maternal weight is advised [8]. However in 2006, the recommendations of the Institute of Medicine conference on the impact of prepregnancy weight on the maternal and neonatal health were that: Further researches should be done to study that influence [6]. Based on this recommendation, further studies have been performed and some agreed with the initial recommendations of the Institute of Medicine about the advised maternal weight gain during pregnancy [7,8]. While recent studies suggested that lower pregnancy weight gain is advised to decrease adverse maternal and fetal outcomes [9,10].

In some developing Asian countries, such as Iran, Pakistan, generally women have low BMI and low increased weight gain during pregnancy compared with other developed countries [11,12]. While in USA, more than 50% of women present with BMI more than 25 [13].
As BMI differs across populations and so its effect on pregnancy outcomes [14], Hence there is a need to determine the effect of BMI on the outcome of pregnancy among our population, and so the aim of the present study.

**Patients and Methods**

This study is a descriptive cross-sectional study conducted in Kasr Al Aini University Hospitals and included 620 patients. Approval of the ethical committee of The Obstetrics and Gynecology Department was taken before conducting the study.

The study was done in the labour ward and included patients who presented with labour pains, they were all primiparas, housewives, aged 17-36 yrs, full term singleton pregnancy, cephalic presentation and no fetal congenital anomalies. Patients excluded from the study were those with multiple pregnancies, abnormal presentation and position, previous surgical history on the uterus, fetal macrosomia.

Upon admission, and once inclusion criteria are fulfilled, a verbal informed consent was taken from the patient, and full history taking including: age, occupation, medical surgical obstetric and gynecological history. Then examination including blood pressure, weight and height with calculation of the BMI (weight in kg)/(height in m $^2$).

Vaginal examination is done to determine degree of cervical dilatation, effacement, presentation, position, condition of membranes and station of the fetal head. Routine laboratory work up was done in the form of Rh Blood group, Complete Blood Count (CBC), Blood Sugar and urine analysis.

Partogram is used to assess the progress of labour and the condition of the fetus and detect any abnormalities. The timing of the first stage is then calculated.

Researchers attended or conducted the deliveries to determine the duration of 2 nd stage, mode of delivery, the fetal outcome, neonatal body weight and the Apgar Score at 1 and 5 minutes.

Patients were grouped into 2 groups: First group (control group) of BMI less than 30 and second group with BMI ≥30, and comparison between these two groups is done in the current study.

Data were statistically described in terms of mean±standard deviation (±SD), and range, or frequencies (number of cases) and percentages when appropriate. Comparison of numerical variables between the study groups was done using Student $t$-test for independent samples. For comparing categorical data, Chi square ($\chi^2$) test was performed. Exact test was used instead when the expected frequency is less than 5. $p$-values less than 0.05 was considered statistically significant. All statistical calculations were done using computer programs SPSS (Statistical Package for the Social Science; SPSS Inc., Chicago, IL, USA) version 15 for Microsoft Windows.

**Results**

Six hundred twenty patients were enrolled in this study; all the patients were primigravidas, housewives with full term pregnancies. Patients were grouped into 2 groups regarding their BMI: group 1: Patients with BMI <30 (their number is: 360 with a mean BMI of 26.23kg/m $^2$) and group 2: Patients with BMI ≥30 (their number is: 258 with a mean BMI: 35.2kg/m $^2$). Comparison between the 2 groups was done in the coming tables.

The age of the 2 groups ranged from 17-36yrs (with a mean of 21.6yrs in group 1, and a mean of 22.73yrs in group 2). This difference is statistically significant ($p$-value is <0.001, while not clinically significant. Table (1) shows the medical conditions of the patients enrolled in the study: 459 patients showed no medical disorders (75%), while the rest showed different medical troubles in both groups. Regarding uterine contractions; 336 patients (93.3%) showed spontaneous contractions in group1, while 237 patients (91.9%) showed spontaneous contractions in group 2 ($p$-value of 0.837).

**Table (1): Medical disorders in both groups ($p$-value <0.001).**

<table>
<thead>
<tr>
<th>Medical trouble</th>
<th>Group 1 (BMI &lt;30)</th>
<th>Group 2 (BMI ≥30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anemia</td>
<td>1 (0.3%)</td>
<td>1 (0.4%)</td>
</tr>
<tr>
<td>ASD repair</td>
<td>1 (0.3%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Cardiac</td>
<td>1 (0.3%)</td>
<td>1 (0.4%)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>1 (0.3%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Epilepsy</td>
<td>1 (0.3%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Fever</td>
<td>1 (0.3%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>HTN</td>
<td>52 (14.4%)</td>
<td>84 (32.6%)</td>
</tr>
<tr>
<td>HTN &amp; RHD</td>
<td>0 (0.0%)</td>
<td>1 (0.4%)</td>
</tr>
<tr>
<td>Marfansynd, AR</td>
<td>1 (0.3%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>RHD</td>
<td>9 (2.5%)</td>
<td>3 (1.2%)</td>
</tr>
<tr>
<td>VSD</td>
<td>0 (0.0%)</td>
<td>1 (0.4%)</td>
</tr>
<tr>
<td>NAD (No Abnormality Detected)</td>
<td>292 (81.1%)</td>
<td>167 (64.7%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>360 (100%)</strong></td>
<td><strong>258 (100%)</strong></td>
</tr>
</tbody>
</table>
Regarding spontaneous rupture of membranes; 196 patients (54.4%) showed ROM in group 1, while 145 patients (56.2%) showed ROM in group 2 (p-value of 0.665). Regarding the mode of delivery; 79 patients in group 1 delivered by Cesarean Section (CS) (21.9%), while 98 patients delivered by CS in group 2 (38%) (p-value: <0.001).

Table (2) showed the progress of labour regarding: Cervical dilatation, cervical effacement, duration of the first and second stages of labor, mode of delivery (whether NVD or CS) and fetal outcomes (fetal weight and Apgar scores at 1 and 5 minutes). Regarding the gender of the fetus; 188 (52.2%) of the patients in group 1 gave birth to males, in relation to 141 (54.7%) in group 2 (p-value of 0.551).

Table (2): Progress of labour and fetal outcome.

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th>Group 2</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cx dilatation in cm (mean±Std deviation)</td>
<td>4.61±2.4</td>
<td>3.96±2.32</td>
<td>0.001</td>
</tr>
<tr>
<td>Cx effacement in % (mean±deviation)</td>
<td>66.42±31.24</td>
<td>56.55±31.24</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>1 st stage in hrs (mean±Std deviation)</td>
<td>8.35±4.36</td>
<td>6.8±4.36</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>2nd stage in min (mean±Std deviation)</td>
<td>35.42±24.0</td>
<td>40.83±24.0</td>
<td>0.003</td>
</tr>
<tr>
<td>NBW in kg (mean±Std deviation)</td>
<td>2.96±0.43</td>
<td>3.08±0.5</td>
<td>0.002</td>
</tr>
<tr>
<td>Apgar at 1min (mean±Std deviation)</td>
<td>7.13±0.804</td>
<td>7.13±0.803</td>
<td>0.994</td>
</tr>
<tr>
<td>Apgar at 5min (mean±Std deviation)</td>
<td>9.54±0.768</td>
<td>9.57±0.885</td>
<td>0.751</td>
</tr>
</tbody>
</table>

Discussion

Obesity during pregnancy is a growing problem; it has an impact on maternal morbidity, mortality as well as increasing the cost of antenatal care and intrapartum care and cost [15]. Also the newborn to an obese woman often requires admission to NICU (Neonatal intensive care unit) more than newborn to mothers of average body mass index [16,17]. Moreover obesity carries an anestheisa risk to mothers with increasing maternal mortality [18].

So in the current research, we studied the effect of BMI on duration of labour (both first and second stages), mode of delivery (whether CS or NVD), effect of newborn (weight and Apgar scores at 1 and 5 minutes).

Six hundred twenty patients were enrolled, patients were divided according to the BMI into 2 groups; group 1 with BMI <30 (included 360 patients) and group 2 with BMI ≥30 (included 258 patients). Both groups had same age (mean age in group 1 was 21.6yrs and mean age in group 2 was 22.73 with a p-value of <0.001 between the 2 groups). Treatment allocation was the same in both groups in cases of induction by oxytocin and treatment of different medical disorders associated with pregnancy.

Medical disorders were comparable in both groups (Table 1). Anemia, and cardiac disorders, each was represented by 1 patient in each group. ASD, Diabetes, epilepsy, fever and Marfan syndrome were represented by one case in group1 while none in group 2. Hypertension with RHD (rheumatic heart disease) and VSD were represented by one case in group 2 while none in group1. There were 9 cases of RHD in group 1, while 3 cases in group 2. There were 52 cases of hypertension in group 1, while 84 cases in group 2 (this may have a clinical significant, while it is not statistically significant). There were no medical disorders in 292 patients in group1 (81.1%), while 167 with no medical disorders in group 2 (64.7%) this may have a clinical significance demonstrating the more the BMI, the more the presence of medical disorders, while it has no statistical significance.

The duration of labour didn’t differ between the 2 groups, the duration of the first stage of labour had a mean of 8.35 hrs in group 1, while it was 6.84 hrs in group 2. also the duration of the 2nd stage didn’t show a statistical significance between the 2 groups, as it was 35.42 minutes in group 1, with slight increase in duration in group 2 as it was 40.83 minutes, but this didn’t represent a statistical significance (p-value: 0.003). However other studies showed an increase in the duration of labour in cases of increased BMI [19-21].

The current study supports previous studies regarding increased incidence of Cesarean Section in cases of increased maternal BMI [20,22,23]. In the current study, there were 79 patients who delivered by CS in group1 (21.9%), while 98 patients (38%) who delivered by CS in group 2. The increased incidence of CS among obese women may be attributed to increased soft tissue in maternal pelvis in cases of obesity [20,23].

Regarding the neonatal outcome; the weight of newborns for group1 patients had a mean of 2.96kg, while the weight of newborn in group 2 patients...
had a mean of 3.08kg, both didn’t show a statistical significant difference. As regard the Apgar score at 1min: in group1 it had a mean of: 7.13, which was the same as in group2 patients. While Apgar at 5min had a mean of 9.54 in group 1, and a mean of 9.57 in group 2. So both groups didn’t show a statistical significant difference regarding the Apgar score at 1min and at 5min. these results are comparable to other studies [24,25].

From the current study, we concluded that maternal BMI doesn’t affect the duration of labour or the fetal outcome, however the higher the maternal BMI, the more common the incidence of Cesarean delivery. And women having a BMI of less than 30, are more liable to have normal vaginal delivery than the ones having a BMI of 30 or more at the time of delivery.

Based on that, an effort should be made to restore an adequate BMI before pregnancy, also proper ANC (antenatal care) is required to assure proper weight gain and prevent excessive weight gain which is attributed to more maternal complication and higher incidence of Cesarean delivery.

One of the limitations of the current study is the lack of knowledge of the prepregnancy weight and so BMI of the pregnant ladies, so we depended on the BMI at the time of delivery.

One of the strength of the current study, is that it is done in the same center with application of the same protocol and indications for cesarean delivery for all the patients enrolled in the study.

References
1- Adapted from internet: http://who.int/nut#obs (accessed 21 November 2005).
6- Committee on the impact of pregnancy weight on maternal and child health: National Research Council. Influence of pregnancy weight on maternal and child health: Work-


