REVIEW

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Maternal and Neonatal Outcomes among Obese Pregnant Women in King Abdulaziz University Hospital: A Retrospective Single-Center Medical Record Review

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ABSTRACT

Intoruction: Pregnancy results in different physiological changes to the pregnant body resulting in weight gain. This added weight can result in poor pregnancy outcomes in obese women. **Aim:** To assess the adverse maternal and neonatal outcomes among obese pregnant women. **Methods:** This is a retrospective record review conducted on obese pregnant women who delivered in the last five years attending King Abdulaziz University Hospital, Jeddah, Saudi Arabia. Therefore, for analysis we used the following; 1- descriptive analysis, 2- Chi-square test, Pearson correlation, independent t-test, and one-way ANOVA to test the difference in obese and adverse pregnancy outcomes. Advance statistics such as binary, and multinomial logistic regression were used to examine the relationship between obesity and all adverse pregnancy outcomes. **Results:** A total of 1037 obese pregnant women were enrolled in our study including 620 (59.8%) obese in class I (30-34.9), 262 (25.3%) obese in class II (35-39.9), and 155 (14.9%) obese in class III (40). About 74.73% of the population were Saudis. The average age was 31.96 (5.79) years. Out of 1037 obese pregnant women, 449 did develop undesired antepartum outcomes, while 729 and 163 had adverse neonatal, and postpartum outcomes. Antepartum variables such as preeclampsia, gestational diabetes mellitus, impaired glucose tolerance test, antiphospholipid syndrome, premature rupture of membranes, placenta previa, anemia, urinary tract infection, and oligohydramnios, and rate of Cesarean section were significantly associated with obesity (P<0.05). Postpartum variables such as vaginal laceration, perianal laceration, postpartum hemorrhage, and endometritis were also significantly associated with obesity (P<0.05). Moreover, adverse neonatal outcomes such as low APGAR scores at 1 and 5 minutes, birthweight, gestational age, admission to neonatal intensive care unit, intrauterine fetal death, and neonatal death, were significant significantly associated with obesity (P<0.05). **Conclusion:** As our study demonstrated, maternal obesity resulted in adverse outcomes for the mother and fetus. Hence, to yield a better outcome for these women and their offspring, periconceptional counseling, conducting health education, and comprehensive plan prior to their pregnancy should be enforced.

Keywords: Obesity, Maternal, Neonatal, Pregnancy Outcomes, Saudi Arabia.

1. INTRODUCTION

Obesity is defined as an increase in the adipose tissue of the body. There are many ways to measure obesity such as Skinfold thickness, body mass index (BMI) or waist-hip ratio. BMI can be measured by weight in kilograms/height in meters. According to World Health Organization (WHO), BMI is divided into four major classes; underweight (less than 18.5 kg/m2), normal weight (18.5 - 24.9 kg/m^2), overweight (25 - 29.9 kg/m^2), and obesity (more than 30 kg/m2) (1). Moreover, obesity it is furtherly classified into three classes: Class I (30-34.9), Class II (35-39.9), and Class III (greater than 40) (1).

In recent years, obesity has increased significantly to reach an epidemic proportion in the middle as well as the low incomes countries (1). Data from 16 countries in the Eastern Mediterranean Region showed high numbers of obese adults aged 18 and beyond, more specifically in Egypt, Bahrain, Jordan, Kuwait, Saudi Arabia (SA) and the United Arab Emirates (1). In SA, prevalence of obesity is found to be 35.5% in the

general population, while in females it was reported to be 44% based on a community-based national epidemiological survey (2). Moreover, a cross-sectional study conducted in Western region of Saudi Arabia showed that 22% of their female participants are obese (3). Obesity can be a significant risk factor for many diseases such as hypertension, heart diseases, type 2 diabetes, joint diseases, gallbladder disease and certain types of cancers, e.g. endometrial carcinoma (4).

Pregnant obese women are predisposed to many pregnancy complications such as gestational diabetes mellitus, pregnancy-induced hypertension, preeclampsia, induction of labor, preterm labor, preterm birth, increase rate of cesarean section, postpartum hemorrhage, anemia, urinary tract infection, wound infection, and prolonged pregnancy (5-9). Additionally, it can in be associated with increased risk for shoulder dystocia, fetal macrosomia, perinatal death, fetal birth defects and admission to neonatal intensive care unit (6, 10, 11).

A systematic review was conducted to examine the relationship between maternal BMI and risk of adverse and health outcomes on forty-two studies from multiple countries; especially in Asia and found out that obesity is associated with greater risk of unhealthy maternal outcomes (12). Several studies were conducted in SA to address this issue. A study was conducted in Eastern Province showed that 28.7% of their population were obese, while in Abha and Burdiah it found to be 33.4% and 30% respectively (6, 13, 14).

Increase in weight during pregnancy can lead to a change in pregnant BMI class's and it can be related to an increase risk of antepartum, intrapartum and postpartum complication (15). A study conducted in the USA showed that 50.2% out of 5131 pregnant women had a change in their initial BMI when it was measured again before delivery and it revealed to be associated with adverse pregnancy outcomes (15).

2. AIM

Despite all these studies none of them were done in the western region of SA which encourages us to conduct our research. This study aims to assess the adverse maternal and neonatal outcome of obese pregnant women in King Abdulaziz University Hospital (KAUH), Jeddah, SA.

3. METHODS

This is a retrospective record review study used data from obese pregnant women electronic medical file records, who delivered between January 1st, 2013 and May 31st, 2018 in KAUH. These electronic records were obtained from the hospital's Medical Records Department. Subjects with a twin pregnancy and missing electronic files were excluded (=1333). Of the 9,095 pregnant women, 2,235 were found to be obese and 1,037 were included for further analyses in the study. Height and weight were taken for the majority from their first clinic visit at the time of the screening test for fetal anomaly, 50 gram oral glucose challenge tests. According to WHO, BMI is divided into four major classes; underweight (less than

18.5 kg/m2), normal weight (18.5 - 24.9 kg/m^2), overweight (25 - 29.9 kg/m^2), and obesity (more than 30 kg/m2) (1). Moreover, obesity it is furtherly classified into three classes: Class I (30-34.9), Class II (35-39.9), and Class III (greater than 40) (1). We chose BMI at first clinic visit because weight and height could be verified. To compare our findings, we took pregnant with normal BMI data from Haseeb et. al study and used their frequency and Odds Ratio (OR) (22). Gestational age during pregnancy was determined by last menstruation period, or craniocaudal length calculated by ultrasound during the first trimester of pregnancy. Gestational age at birth was defined as the number of completed weeks of gestation based on the delivery date in the clinical record. All of the adverse pregnancy outcomes were defined according to the American College of Obstetrics and Gynecology (ACOG) latest guidelines in 2013 (16). The study was approved by the Institutional Review Board and the Research Ethics Committee of KAUH.

Adverse pregnancy outcomes

Adverse antepartum variables included the following: Pregnancy induced hypertension (PIH), preeclampsia, antiphospholipid syndrome (APS), impaired glucose tolerance test (IGTT), gestational diabetes mellitus (GDM), pre-premature rupture of membrane (PPROM), premature rupture of membrane (PROM), antepartum hemorrhage (Abruptio Placenta, Placenta Previa, Placenta accrete and low lying placenta), and maternal mortality. Fetomaternal complications (Oligohydramnios, Polyhydramnios, Placental Hematoma, and cord prolapse), preterm labor (PTL), induction of labor, mode of delivery (Spontaneous Vaginal Delivery(SVD) or Cesarean section (CS)), type of CS (emergency or elective), rate of Cesarean section, failure to progress (FTP), cephalo-pelvic disproportion (CPD), anemia, and Urinary Tract Infection (UTI). Adverse postpartum variables included the following: Postpartum hemorrhage (PPH), endometritis, vaginal laceration, perianal laceration 1st, 2nd, 3rd degree, internal hemorrhoids, Surgical Site Infection (SSI), and wound dehiscence.

Adverse neonatal outcomes included the following: Preterm, post-term, birth weight, fetal sex, fetal presentation, APGAR score at 1 and 5 minutes, admission to Neonatal Intensive Care Unit (NICU), birth defects and injuries, Intrauterine Fetal Demise (IUFD), stillbirth, and neonatal death. We used the Statistical Package for Social Sciences (SPSS; Release 23.0.0.0, IBM, USA). Analysis of data was conducted using SPSS for Windows software. Demographic, antepartum, and postpartum data were examined. The independent t-test and correlation tests were used for comparison of quantitative variables. The chi-square test was used as a test of significance for comparison of categorical variables. $P \leq .05$ was chosen as the level of statistical significance. Also, binary and multinomial logistic regression were used to examine the relationship between obesity and all adverse pregnancy outcomes. A note to emphasize on; all of the calculated odds ratios were calculated for obesity in general against adverse pregnancy outcomes.

		Obese class I	Obese class II	Obese class III
		(30-34.9)	(35-39.9)	(>40.0)
		N=620	N=262	N=155
Age[a]	Mean (SD)	31.75 (5.83)	31.85 (5.78)	32.97 (5.61)
Height	Mean (SD)	156.21 (6.20)	155.83 (5.81)	156.32 (6.60)
Weight	Mean (SD)	78.67 (6.97)	89.58 (7.08)	107.55 (12.39)
BMI[a]	Mean (SD)	32.20 (1.38)	36.89 (1.38)	44 (4.07)
Nationality	Saudi (n=755)	440 (70.96%)	199 (75.95%)	116 (74.84%)
	Non-Saudi (n=282)	180 (29.03%)	63 (24.05%)	39 (25.16%)
Parity (n=1035)	None	65 (10.52%)	33 (12.59%)	12 (7.74%)
	One	162 (26.21%)	50 (19.01%)	33 (21.29%)
	Two	142 (22.97%)	57 (21.76%)	32 (20.65%)
	Three	117 (18.93%)	62 (23.66%)	26 (16.77%)
	More than three	132 (21.36%)	60 (22.90%)	52 (33.55%)
First trimester[a]	(n=121)	71 (58.68%)	28 (23.14%)	22 (18.18%)
Second trimester[a]	(n=214)	119 (55.61%)	62 (28.97%)	33 (15.42%)
Third trimester[a]	(n=394)	231 (58.63%)	104 (26.39%)	59 (14.97%)
Labor day[a]	(n=308)	197 (63.96%)	70 (22.73%)	41 (13.31%)

Table 1. Socio-demographic characteristics of the pregnant women, aP<0.05

Co-Morbidity	Obese class I	Obese class II	Obese class III	
N=177	(30-34.9)	(35-39.9)	(>40.0)	Frequency
	N=620	N=262	N=155	
Hypertension	21 (3.38%)	11 (4.19%)	5 (3.23%)	37
Diabetes Mellitus Type 1	3 (0.48%)	3 (1.15%)	4 (2.58%)	10
Diabetes Mellitus Type 2	5 (0.81%)	9 (3.44%)	7 (4.52%)	21
Polycystic ovarian syndrome	2 (0.32%)	0	0	2
Systemic lupus erythematosus	1 (0.16%)	0	0	1
Hypothyroidism	32 (5.16%)	21 (8.02%)	12 (7.74%)	65
Genetic disease	2 (0.32%)	0	0	2
Neurological Disorder	2 (0.32%)	3 (1.15%)	0	5
Psychiatric illness	1 (0.16%)	1 (0.38%)	1 (0.65%)	3
Hyperlipidemia	3 (0.48%)	0	0	3
Bronchial Asthma	6 (0.97%)	5 (1.91%)	5 (3.23%)	16
Crohn's Disease	2 (0.32%)	0	0	2
Irritable Bowel Syndrome	0	1 (0.38%)	0	1
APS	2 (0.32%)	0	0	2
Rheumatic Heart Disease	2 (0.32%)	2 (0.76%)	0	4
Cardiac Arrhythmias	1 (0.16%)	0	1 (0.65%)	2
GERD	1 (0.16%)	0	0	1

Table 2. Comorbidities among obese pregnant

4. RESULTS

This study aimed to assess the adverse maternal and neonatal outcomes among obese pregnant women. Table 1 presents the socio-demographic characteristics of the participants. Most of them were Saudi 755 (74.7%). More than one-third of Saudi pregnant women (39.3%) presented to the clinic and had their BMI measurements in the third trimester. In the other hand, non-Saudi pregnant women presented to the clinic and had their BMI measurements in the third trimester and labor day; 33.7% and 34.4% respectively.

Table 1 also shows the prevalence of obesity in our sample. The majority were in class I with 620 pregnant women (59.8%) while class II was (25.3%), and class III was (14.9%). Most of Saudi pregnant women were classified as class I (70.9%). Also, the mass of Non-Saudis pregnant women were class I (29%). The bulk of our sample had their BMI measurements in the third trimester (38%).

Maternal Morbidity	Normal BMI*	Obese class I	Obese class II	Obese class III	Odds ratio (95% CI)	Frequency
N=449	(18.5-24.9)	(30-34.9)	(35-39.9)	(>40.0)		
	N=300	N=620	N=262	N=155		
Maternal Mortality	0	0	0	0	-	0
PIH	8 (2.5%)	16 (2.58%)	1 (0.38%)	3 (1.94%)	1.05(0.9-1.1)	20
GDM[a]	1 (0.03%)	76 (12.26%)	40 (15.27%)	29 (18.71%)	1(0.94-1.02)	145
Impaired GTT[a]	-	3 (0.48%)	2 (0.76%)	0	1.07(0.83-1.39)	5
GERD	-	0	1 (0.38%)	0	0.44(0.04-4.55)	1
APS[a]	-	0	0	1 (0.65%)	-	1
Mild Preeclampsia[a]	8 (2.5%)	13 (2.09%)	2 (0.76%)	4 (2.58%)	1(0.91-1.09)	19
Severe Preeclampsia[a]	8 (2.5%)	6 (0.97%)	4 (1.53%)	2 (1.29%)	1(0.88-1.08)	12
PROM[a]	-	17 (2.74%)	1 (0.38%)	1 (0.65%)	1.19(1.01-1.42)[a]	19
PPROM	-	1 (0.16%)	0	0	-	1
Abruptio Placenta	-	4 (0.65%)	0	1 (0.65%)	1(0.84-1.2)	5
Placenta Previa[a]	-	12 (1.94%)	11 (4.19%)	1 (0.65%)	1.04(0.94-1.14)	24
Placenta Accreta	-	3 (0.48%)	2 (0.76%)	0	1.18(0.86-1.62)	5
Low Lying Placenta	-	1 (0.16%)	0	1 (0.65%)	0.52(0.1-2.7)	2
Induction of labor	-	78 (12.58%)	29 (11.07%)	19 (12.26%)	1(0.96-1.04)	126
PTL	-	17 (2.74%)	5 (1.91%)	3 (1.94%)	1.06(0.96-1.17)	25
Oligohydramnios[a]	-	6 (0.96%)	1 (0.38%)	4 (2.58%)	0.91(0.82-0.99)	11
Polyhydramnios	-	6 (0.96%)	4 (1.53%)	0	1.05(0.89-1.24)	10
Cord Prolapse	-	1 (0.16%)	0	0	-	1
Placental hematoma	-	0	1 (0.38%)	1 (0.65%)	0.25(0.04-1.7)	2
CPD	-	2 (0.3%)	2 (0.8%)	0	1.04(0.26-4.09)	4
FTP	-	7 (1.1%)	3 (1.1%)	1 (0.6%)	1.01(0.89-1.15)[a]	11

Table 3. Maternal morbidities among obese pregnant. CI = Confidence Interval.Odds Ratio was calculated for obesity in general against adverse pregnancy outcomes. *These data were taking from Haseeb et. al study for comparison between obese and non-obese. [a]P<.05

Regarding Table 2, a total of 177 out of 1037 (17.1%) suffers from chronic diseases. Most of them were in obese class I with 85 cases in comparison to 56 and 35 cases; in obese class II and III respectively. Hypothyroidism showed the highest rate compared to the other comorbidities with 65 cases, most of them are in obese class I. HTN was also found to be more common among pregnant in class I; with 37 cases. Out of 177, a total of 21 cases were diagnosed with DM type 2 most of them were classified as obese class II compared to DM type 1 as they were 10 (5%) and were distributed equally among obesity classes. Bronchial Asthma was one of the most frequent comorbidities in our sample with 16 cases were distributed equally within the classes.

Table 3 demonstrates, a total of 449 out of 1037 developed undesired outcomes while they were pregnant, most of them were in class I with 269 cases (43.4%) compared to class II 109 cases (41.6%) and class III 71 cases (45.8%). GDM had the highest rate compared to the other morbidities with 145 cases, most of them were classified as class I (12.3%). To compare our findings with normal BMI pregnant, it also appeared to be higher, 145 (14%) vs 8 (0.03%) with OR of 1 vs 4.24; respectively. Placenta Previa had the second highest rate after GDM with 24 cases; 12 of which were in class I compared to 11 cases in class II and one in class III. Most of the patients with PROM were classified as obese class I. PIH was relatively high with 20 cases (1.9%). In terms of preeclampsia (n=31), they were divided into mild and severe: 19 of which were mild with a high percentage in class I in relation to class II and class III. Most of the pregnant women with severe preeclampsia were in class I. Additionally, in comparison to normal BMI pregnant we found higher frequency 31(3%) vs 8 (2.5%) with OR of 1 vs 2.2 respectively. Regarding antepartum hemorrhage, five patients had abruptio placenta, 4 of them were found in class I and one were found in class III. Moreover, placenta accrete presented only in obese class I with 4 cases.

Regarding neonatal outcomes in table 4, we found that 730 (70.4%) of our sample did develop complications. The most frequent were preterm, low APGAR score at 1 and 5 minutes, NICU admissions, macrosomia, and low birthweight. Most of the macrosomic neonates were found in class I. Similarly, low birthweights, low APGAR scores, and NICU admissions were also found in the same group. Regarding preterm, in relation to normal BMI pregnant we found higher frequency 124 (12%) vs 21 (7.1%) with OR 1 vs 2.3; respectively. Additionally, macrosomia in normal BMI pregnant appeared to be less frequent than in obese pregnant 45 (15%) vs 117 (11.3%) with OR 5.08 vs 1, respectively.

Tables 5 demonstrates the majority of pregnant women diagnosed with anemia and UTI were found to be in class I. In terms of delivery, most of our sample had deliv-

Neonatal Outcomes N = 729	Normal BMI* (18.5-24.9) N=300	Obese class I (30-34.9) N=620	Obese class II (35-39.9) N=262	Obese class III (>40.0) N=155	Odds ratio (CI)	Frequency
NICU admission[a]	-	57 (9.19%)	11 (4.19%)	0	1.01(0.95-1.06)	68
Birth Injury	-	3 (0.48%)	1 (0.83%)	0	0.75(0.1-7.24)	4
Birth defect	-	18 (2.90%)	1 (0.83%)	1(0.65%)	1.01(0.92-1.12)	21
Cardiac anomaly	-	1 (0.16%)	3 (1.14%)	0	0.7(0.2-2.4)	4
Clift lip and palate	-	1 (0.16%)	1 (0.83%)	0	1.1(0.16-7.51)	2
Anencephaly	-	4 (0.64%)	0	0	-	4
Spina bifida[a]	-	1 (0.16%)	1 (0.83%)	0	1.14(0.15-9.01)	2
Hydrocephalus	-	4 (0.64%)	0	0	-	4
Ambiguous genetalia	-	1 (0.16%)	0	0	-	1
IUFD[a]	-	6 (0.96%)	2 (0.76%)	0	0.94(0.83-1.07)	8
Neonatal death[a]	-	7 (1.12%)	1 (0.83%)	0	1.01(0.86-1.17)	8
Low APGAR at 1 min[b]	-	68 (10.96%)	33 (12.59%)	23 (15.33%)	0.99(0.95-1.03)	124
Low APGAR at 5 min[b]	-	60 (9.67 %)	25 (9.54%)	14 (9.33%)	1(0.96-1.05)	99
Low birthweight[b]	-	70 (11.29%)	26 (9.92%)	15 (10%)	1(0.67-1.95)	111
Macrosomia[b]	45 (15%)	75 (12.09%)	24 (9.16%)	18 (12%)	1(0.63-1.49)	117
Preterm birth[b]	21 (7.1%)	74 (11.9%)	31 (11.83)	19 (12.66%)	1(0.5-1.7)	124
Postterm[b]	-	21 (3.38%)	3 (1.14%)	4 (2.66%)	1.3(0.22-1.81)	28

Table 4. Adverse neonatal outcomes among our sample.. CI = Confidence Interval. Odds Ratio was calculated for obesity in general against adverse pregnancy outcomes. *These data were taking from Haseeb et. al study for comparison between obese and non-obese. [a]P<.05, [b]P<.001

	Normal BMI* (18.5-24.9) N=300	Obese class I (30-34.9) N=620	Obese class II (35-39.9) N=262	Obese class III (>40.0) N=155	Odds ratio (CI)	Frequency
Anemia (Hb < 11g)[a]	-	365 (58.9%)	156 (59.5%)	95 (61.3%)	0.99(0.97-1.02)	616
UTI[a]	-	176 (28.4%)	82 (31.3%)	48 (30.9%)	0.99(0.96-1.02)	306
SVD[b]	-	224 (36.1%)	55 (20.9%)	32 (20.6%)	-	311
CS[b]	45 (15%)	396 (63.9%)	207 (79%)	123 (79.4%)	1.08(1.04-1.12)[b]	726
Emergency CS[b]	-	207 (33.4%)	105 (40.1%)	63 (40.6%)		375
Elective CS[b]	-	189 (30.5%)	102 (38.9%)	60 (38.7%)	-	351
Male neonates	-	301 (48.5%)	144 (54.9%)	89 (57.4%)	-	534
Female neonates	-	265 (42.7%)	108 (41.2%)	63 (40.6%)	-	436
Cephalic presentation	-	333 (53.7%)	154 (58.8%)	79 (50.9%)	-	566
Breech presentation	-	55 (8.9%)	27 (10.3%)	21 (13.5%)	1.02(0.98-1.05)	103

Table 5. Various characteristics of the pregnant women and their neonates. CI = Confidence Interval. Odds Ratio was calculated for obesity in general against adverse pregnancy outcomes. *These data were taking from Haseeb et. al study for comparison between obese and non-obese. [a]P<.05, [b]P<.001

ered by CS 70% while 30% of them had SVD. Equivalently in comparison to pregnant with normal BMI, we found higher frequency 726 (70%) vs 45 (15%) with OR 1.08 vs 2.5; respectively. Majority of those who had CS, their delivery was emergent 51.7%. A total of 126 (12.2%) pregnant had induction of labor, most of them were found in obese class I. In terms of postpartum outcomes, Table 6 illustrates that a total of 163 out 1037 had complications, most of them were in class I with 92 cases. Vaginal lac-

eration (tear) had the highest rate compared to the other injuries with 60 cases (5.8%), the majority were found in class I with 46. Furthermore, in comparison to pregnant with normal BMI we found higher frequency 12 (1.16%) vs 6 (2%) with OR 1.03 vs 4.1; respectively. Perianal laceration 1st degree was second most frequent with 37 cases (3.6%), with highest frequency in obese class I. Perianal laceration 2nd degree, SSI, postpartum hemorrhage were relatively more frequent than the rest.

	Normal BMI*	Obese class I	Obese class II	Obese class III		
	(18.5-24.9)	(30-34.9)	(35-39.9)	(>40.0)	Odds ratio (CI)	Frequency
	N=300	N=620	N=262	N=155		
Vaginal laceration[a]	-	46 (7.4%)	9 (3.4%)	5 (3.2%)	1.13(1.04-1.23)[a]	60
Perianal laceration[a] 1st	-	29 (4.7%)	4 (1.5%)	4 (2.6%)	1.1(1-1.23)	37
Perianal laceration[a] 2nd	-	17 (2.7%)	4 (1.5%)	2 (1.3%)	1.17(1.01-1.36)[a]	23
Perianal laceration[a] 3rd	-	1 (0.2%)	1 (0.4%)	0	0.95(0.14-6.67)	2
SSI	-	10 (1.6%)	3 (1.1%)	5 (3.2%)	0.94(0.87-1.02)	18
PPH[a]	3 (1%)	8 (1.3%)	2 (0.8%)	2 (1.3%)	1.03(0.9-1.18)	12
Endometritis[a]	-	4 (0.6%)	1 (0.4%)	1 (0.6%)	1.01(0.85-1.21)	6
Wound dehiscence	-	2 (0.3%)	1 (0.4%)	1 (0.6%)	0.76(0.23-2.53)	4
Internal hemorrhoids	-	1 (0.2%)	0	0	-	1

Table 6. Frequency of postpartum complications in our sample. CI = Confidence Interval. Odds Ratio was calculated for obesity in general against adverse pregnancy outcomes. *These data were taking from Haseeb et. al study for comparison between obese and non-obese. [a]P<.05, [b]P<.001

Surprisingly, we found age and maternal comorbidity to have a significant association with adverse pregnancy outcomes (P<0.05) when we ran multivariate logistic analysis. Conversely, obesity showed no significant association with adverse pregnancy outcomes except for PROM, FTP, emergency CS, vaginal laceration and perianal laceration.

5. DISCUSSION

This study assessed the adverse maternal and neonatal outcomes among obese pregnant women in KAUH, Jeddah, SA. Obesity in SA is on the raising (1). Moreover, in the recent years Saudi women are suffering from obesity in higher rates in comparison to men (2, 3). It can unfortunately increase their risk to develop adverse outcomes during pregnancy. Our study showed that Saudi pregnant women had high percentage of obesity; accounting for 74.7%, which showed high frequency than previous study conducted in Buraida and Eastern province; 30% and 28.6% respectively (6, 14).

Most of our sample had their anthropometric measurements taken during their third trimester 38% in comparison to first, and second trimester visits. This can be attributed to lack of awareness towards obesity during pregnancy among these pregnant. According to a recent study conducted in Najran among pregnant women, they found that 63% of their sample showed poor awareness (17). Nevertheless, these women were more susceptible to adverse pregnancy outcomes and it showed significant association with adverse maternal and neonatal outcomes (P<0.05). This association between maternal trimester visit and pregnancy outcomes wasn't addressed before in previous literature. Maternal age was found to be negatively correlated with gestational age (P<0.05) which corresponds to previous studies conducted in the United States (18-21).

Our results also showed 43.3% of our sample developed undesired antepartum outcomes. The majority suffered from GDM; a total 145 cases, showing higher frequency than previous study conducted within our kingdom; 19 cases (6). Which showed significant association (P<.05) with adverse pregnancy outcome supporting previous studies (8, 14, 23, 24). It believed to be seen in this group of women due to their metabolic change which resulted in peripheral and hepatic insulin resistance (25). Moreover, preeclampsia was also high in comparison to other outcomes and it had higher frequency than the aforementioned studies (6). Antiphospholipid syndrome, IGTT, PROM, placenta previa, oligohydramnios, and rate of Cesarean section were also significantly associated (P<0.05) with obesity similarly correlating with the literature (6, 8, 14, 23, 24). On the contrary, PIH, polyhydramnios and abruptio placenta appeared to be not significantly associated (P>0.05) in our study comparing it to the literature (6).

Also, our results showed the majority of our sample did deliver by CS. This result comes as no surprise since the literature showed that obese pregnant are at increased risk to have macrosomic neonates. This risk was accounted to be greater than 30% among them (8, 25-31). On the other hand, we found that 66.8% of our sample did develop anemia at some point during their pregnancy. This high frequency among obese pregnant was similar to El-Gilany et al. study (6). Likewise, the frequency of UTI was 29.5%. According to previous studies, infectious complications such as postoperative wound infections, endometritis and UTIs are most consistently associated with obesity (8, 27). Regarding postpartum outcomes, the study showed 15.7% of our sample developed unfavorable postpartum outcomes. Sixty pregnant had vaginal laceration which can be attributed that most of them had delivered macrosomic neonates which are known to result in such injury. Vaginal laceration, perianal laceration, postpartum hemorrhage, and endometritis were significantly associated with (P<0.05) similar to these studies (15, 22). The study also showed the majority of our sample developed undesired neonatal outcomes. Preterm birth and macrosomia higher frequency than any previous studies conducted in the Kingdom. Interestingly, low birthweight neonates in our sample were less frequent than the study conducted by El-Gilany et al (6). Admission to neonatal intensive care unit, intrauterine fetal death, neonatal death, low APGAR scores at 1 and 5 minutes, birthweight, and gestational age were

significantly associated with raised BMI (P<0.05) were coincide to previous studies.

According to a study conducted by Hui et al. revealed that the introduction of lifestyle interventions and modification, while they are pregnant, has a promising effect on the outcomes (31). Also, proper awareness of obesity before the pregnancy is going to prevent these outcomes (32).

A limitation to our study that it only included women attending KAUH in the western region of Saudi Arabia. Weight and height were taken from the first antenatal visit booking during the pregnancy for the majority; which correspond with the third trimester. Those who had their measurements in the second and third trimester, according to previous studies their gestational BMI have similar predictive values as pre-pregnancy BMI (33).

6. CONCLUSION

As our study showed, obese pregnant women, are prone to adverse maternal and neonatal outcomes. In the epidemic era of obesity in our country, this study suggests implanting a comprehensive plan targeting diet and physical activity with a proper health education prior to their pregnancy are going to reduce such effect among them. This study also adds to the previous literature, that obesity during pregnancy is related to a tremendous maternal and neonatal risk. Finally, we recommend a population-based cohort study to provide more accurate knowledge about prevalence and impact not only of obesity but also other BMI categories on pregnancy outcomes.

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