THE IMPACT OF MATERNAL OBESITY ON NEWBORN AND MATERNAL HEALTH STATUS

© Jwan Mohammed Hassan, Yamama Zuhir Abdulkareem, Salwa Hazim AlMukhtar*

College of Nursing, University of Mosul, Mosul, Iraq

BACKGROUND: Obesity and overweight are more common, especially among women of reproductive age. Therefore, the approach to maternal obesity requires a multidisciplinary approach, especially health professionals working in primary care preventive health services.

AIM: The aim of the study is to determine the effect of maternal obesity on maternal and newborn health in Al Khansaa Teaching Hospial, City of Mosul, Iraq.

MATERIALS AND METHODS: The study, which was planned as à case-control study, was conducted in the Al Khansa Teaching Hospital City of Mosul, Iraq.The inclusion criteria included women in postnatal period in the same Hospital, speaking and understanding Arabic, knowing her pre-pregnancy weight, not having any chronic disease (diabetes, hypertension, trioid diseases, etc.) before pregnancy, pre-pregnancy body mass index (BMI) 18.5–25, those with a BMI >29.9, and those with primary school or higher education were included. The exclusion criteria included multiple pregnancies, without any formal education, physical disability (that prevented the completion of the data collection forms), and mental health problems. Data were collected with the data collection form and Edinburgh Postpartum Depression Scale.

RESULTS. The study was completed with 286 women, 142 cases and 144 control groups. There was no statistical difference between the case and control groups in terms of family type and employment status (p>0.050). While the mean age, pregnancy and number of living children of the women in the case group were statistically higher, their educational status was found to be lower (p<0.050). It was found that women with obesity experienced health problems such as urinary tract infection, anemia, gestational diabetes, psychological problems, and preeclampsia/gestational hypertension at a higher rate than women in the control group (p<0.010), and women in the control group gained 13.94±5.29 kg (p=0.001).

CONCLUSION In conclusion, it was found that women in the case group experienced pregnancy, early and late postpartum complications at a higher rate than the control group, while there was no difference between the groups in terms of depression at the end of the sixth week postpartum.

КЛЮЧЕВЫЕ СЛОВА: Maternal; Obesity; Newborn.

RATIONALE

Over the course of history, excess weight has been perceived as a sign of health and wealth in almost all societies [1]. Considering that human beings have struggled with hunger, famine, and poverty throughout history, it seems natural to have such a perception [2]. The World Health Organization considers obesity, which is more common in women than men, as an epidemic [3–5]. At least 2.8 million people worldwide die every year due to health problems caused by being overweight or obese [6]. The World Health Organization reports that 15% of the adult female population over the age of 18 in the world in 2016 is obese [7]. Obesity, with its increasing prevalence, has become an important risk factor in pregnancy [8, 9]. Recently, there have been many studies showing the possible risks of obesity on pregnancy and childbirth. All these studies prove that obesity increases the risk of morbidity for both mother and baby [10, 11]. On the other hand, babies born to obese mothers are also at increased risk in terms of congenital anomalies, prematurity, stillbirth, macrosomia, and childhood obesity [12]. More health care resources, and additional equipment are needed both for the care of obese women during pregnancy, childbirth, and postpartum period, and for their newborns. Management of deliveries by obese women can be difficult for hospital systems and clinicians [13]. As a result, maternal obesity causes not only health problems but also high costs [14]. Obesity and overweight are more common, especially among women of reproductive age. Therefore, the approach to maternal obesity requires a multidisciplinary approach, especially health professionals working in primary care preventive health services. Counseling, care and follow-up to these women starting from the preconceptional period with a comprehensive and appropriate approach will have positive effects on maternal-fetal-neonatal health [15]. In addition, this approach can be a basis for obese women to improve not only their pregnancies, but also their future health with long-term positive effects. With the increase in studies on maternal obesity, it is thought that the importance of starting prenatal services from the preconceptional period to protect and improve maternal-fetal and neonatal health, and especially the care and follow-up of pregnant women with obesity will be emphasized and the awareness of health professionals and managers on this issue will increase.

AIM OF THE STUDY

The aim of the study is to determine the effect of maternal obesity on maternal and newborn health in Al Khansa Teaching Hospital City of Mosul, Iraq.

MATERIALS AND METHODS

Site and time of the study

Study site. This study was conducted in Al Khansa Teaching Hospital City of Mosul, Iraq. The population of the research consisted of postnatal women in the mentioned hospital.

Time of the study. This study was conducted between March 2020 and August 2020.

Study populations

Population 1 (obese / case group)
Inclusion criteria:

1. Women in postnatal period
2. 17 to 45 years old.
3. Speaking and understanding Arabic.
4. Known pre-pregnancy weight with pre-pregnancy body mass index (BMI) = 18.5–25.5.
5. Good health (without any chronic disease like diabetes, hypertension, thyroid diseases, etc. before pregnancy).
6. Availability of verifiable address and contact number.
7. Educated (primary school or higher education).
8. BMI > 29.9

Population 2 (normal weight / control group)
Inclusion criteria:

1. Same criteria 1–7 as for case group.
2. BMI = 18.5–24.9 kg/m^2

Exclusion criteria for the both populations:

1. Multiple pregnancies,
2. A physical disability that prevented the completion of the data collection forms.
3. Mental health problems diagnosed by a doctor.
4. Any chronic disease like diabetes, hypertension, thyroid, etc. before pregnancy.

Sampling method from the study population (or several sampling methods from several study populations)
Purposive sampling.

Study design
It's a single center case-control study.

The follow up was started 24 hrs before delivery and was done till 6 weeks postpartum

Methods
Data were collected with the "Data Collection Form and Edinburgh Postpartum Depression Scale". Data Collection Form: It includes questions prepared by the researcher based on the literature to identify women's socio-demographic characteristics, pregnancy, birth and puerperium periods, and newborn characteristics [16–19].

Before starting the data collection, pre-application was made with 10 puerperant women to determine the clarity of the forms and the forms were finalized. Edinburgh Postpartum Depression Scale: The scale, which was developed by Cox et al. (1987) and validated and reliable by Engindeniz et al. in 1996, determines the risk of depression in the postpartum period. The scale is in the self-assessment type, four-point Likert type and consists of 10 items. The 3rd, 5th, 6th, 7th, 8th, 9th, and 10th items of the scale show decreasing severity and

their scores are 3, 2, 1, 0. The 1st, 2nd and 4th items are scored as 0, 1, 2, and 3. The total score of the scale is obtained by adding these item scores, and the lowest possible score is 0 and the highest score is 30. It was determined that the cut-off point of the scale was 12 and the Cronbach's alpha reliability coefficient was 0.79. Scores of 12 and above as a cut-off point indicate that women are at high risk of depression.

In our country, it is recommended to examine the depression status of women by using this scale in the «Postpartum Care Management Guide» by the Ministry of Health. Edinburgh postpartum depression scale was administered to the women by telephone interview at the end of the sixth postpartum week. In this study, the Cronbach Alpha coefficient of the Edinburgh depression scale was 0.84. Data were collected in the puerperant's room while the babies were sleeping or while the companions were taking care of the babies. At the stage of filling out the data forms, the puerperant women were met, given information about the research subject, and their written consent was obtained with an informed consent form, considering the inclusion criteria of the study. The data were collected by interviewing the puerperant in the patient's room face-to-face and taking from the patient's file (interventions at birth, information about newborns, etc.). The data (continuing to breastfeed, starting complementary foods, problems experienced in the late postpartum period) were questioned and the depression scale was applied. All necessary recommendations as per CDC guidelines were made regarding prospective weight gain like why, when, and how much weight they are going to put on. It took 15–20 minutes to collect the data by face-to-face interviews with the women, and about 10–15 minutes to be interviewed by phone. All the women were tried to be reached by telephone in the seventh week after delivery. The women who could not be reached in the first call were called for the second and third times or by calling the phone numbers of their husbands and trying to reach them all. The body mass index (BMI) was obtained by dividing the body weight [20] by the square of the height (m^2) and it was used for the evaluation of obesity .

Statistical analysis
SPSS-21st version (2012) was used for statistical analysis. For evaluating the study data, descriptive statistical methods (mean, standard deviation, frequency, ratio, minimum, maximum), Student's t and chi-square tests were used. Significance was evaluated at $p < 0.05$ levels.

Power analysis was used to determine the sample size. The sample size of the study was 95% probability (α=0.05), effect power w=0.3 (moderate), Df=2 and power=0.80 (80%) for chi-square analysis G Power 3.1.10 statistical program was used, the total was calculated as 108. In order to increase the power of the research as a result of possible losses and analyzes in the data collection process, the number of samples was increased to reach 315 women [20].

Ethical expert review
Ethical Committee approval for the research protocol (final approval dated 23.12.2020 and numbered 627) and written permission from the Al Khanassa Maternity Teaching Hospitals Union General Secretariat was obtained. The puerperant women included in the study were informed verbally about the study and written consent was also obtained.

RESULTS

Total of 14 women (6 in the control group, 8 in the case group) could not be reached so these women were not included in the study. In addition, 7 women in the control group who did not want to participate in the study were not included in the study. Considering the exclusion criteria, 2 women with a pre-pregnancy body mass index below 18.5 and 6 people with pre-pregnancy chronic diseases (2 in the control group, 4 in the case group) were also excluded from the study. The study was completed with a total of 286 women who were divided into two groups as normal weight (BMI=18.5–24.9; control group n=144) and obese (BMI ≥30; case group n=142) according to their body mass index before conception. There was no statistical difference between the case and control groups in terms of family type and employment status (p>0.050). While the mean age was found to be (28.70±5.74 years with normal distribution of (18–42) in case group and 26.85±5.86 years with normal distribution of (17–43) was in control group, pregnancies 2.80±1.54 with normal distribution of (1–9) in case group and 2.34±1.29 with normal distribution of (1–7), and number of living children 2.34±1.14 (0–6) for case and 2.03±0.93 (1–5) for control were statistically higher and their educational status was found to be lower (p<0.050), (Table 1).

It was found that the rate of getting pregnant with assisted reproductive techniques in these pregnancies of the women in the case group was higher than the women in the control group (7% and 2.1%), and this difference was statistically at the limit (p=0.051). It was found that 59.2% of the case group and 25.7% of the control group had health problems during their pregnancies and this difference was statistically significant (OR:4.18) (p=0.001). It was found that women with obesity experienced health problems such as urinary tract infection, anemia, gestational diabetes, psychological problems, and preeclampsia/gestational hyper-

Table 1. Socio-Demographic and Obstetric Characteristics of Women in the Case and Control Group

Features	Case group		Control group		P
	n	%	n	%	
Age					
• 17–24	39	27.5	54	37.5	
• 25–34	80	56.3	75	52.1	0.124
• 35–45	23	16.2	15	10.4	
Age X±SD* (min-max)	28.70±5.74 (18–42)		26.85±5.86 (17–43)		
Educational level					**P**
• Primary school graduate	62	43.7	48	33.3	
• Middle school graduate	39	27.5	60	41.7	0.030
• High school/ university graduate	41	28.8	36	25	
Family type					**P**
• Nuclear family	125	88	123	85.4	0.64
• Extended family	17	12	21	14.6	
Employment status					**P**
• Working	10	7	18	12.5	0.186
• Housewife	132	93	126	87.5	
Number of Pregnancy					**P**
• First Pregnancy	32	22.5	42	29.2	
• 2	33	23.2	48	33.3	0.401
• ≥3	77	54.3	54	47.5	
Number of living children					
No children	1	0.7	0	0	
• 1	39	27.5	47	32.6	0.024
• 2	40	28.1	56	38.9	
• ≥3	62	43.7	41	28.5	
Number of pregnanciesX±SD* (min-max)	2.80±1.54 (1–9)		2.34±1.29 (1–7)		
Number of living children X±SD* (min-max)	2.34±1.14 (0–6)		2.03±0.93 (1–5)		0.008

Note: The table clearly shows the effect of education, number of pregnancy and living children in case group as compared to control. X — Mean; *SD — Standard deviation.

Table 2. Characteristics of Women in the Case and Control Group Regarding Pregnancy and Delivery

Features	Case group		Control group		P
	n	%	n	%	
Receiving treatment to conceive					
Yes	10	7	3	2.1	0.52
Having health problems during pregnancy					
Yes	84	59.2	37	25.7	0.001
Health problems experienced					
• UTI	41	28.9	9	6.3	0.000
• Anemia	30	21.1	13	9	0.005
• DM	17	12	4	2.8	0.002
• Psychological problems	17	12	2	1.4	0.001
• Preeclampsia/gestational	14	9.9	3	2.1	0.005
• Hypertension	29	20.4	28	9.5	0.784
Type of Birth					
• Normal vaginal delivery	34	23.9	41	28.5	0.384
• cesarean delivery	108	76.1	103	71.5	
Interventions at birth					
• Fundal pressure application	23	67.6	18	43.9	0.034
• artificial pain application	16	57.1	12	42.9	0.151
• Episiotomes	18	52.9	31	75.6	0.052
• Perineal tears/repair	6	35.3	11	64.7	0.414
Weight gained during pregnancy X±SD* [20]	11.71±4.19		13.94±5.29		0.001
(Min-max)	(3–25)		(3–30)		

*SD — Standard deviation.
Note: The table clearly shows that the case group shows the high incidence of health problems during pregnancy.

tension at a higher rate than women in the control group (p<0.010). Women in case group gained 11.71±4.19 kg with normal distribution of (3–25) and women in the control group gained 13.94±5.29 kg with (3–30) (p=0.001).

When the delivery types of women were examined, it was found that the cesarean section rates (76.1% vs 71.5%) were high in both groups and there was no statistical difference between the groups (p=0.384). Fundal pressure application at birth was higher in the case group (67.6% and 43.9%). (OR:2.67), p=0.034. In the case group women, artificial pain application was higher than the women in the control group (57.1% vs 42.9%), episiotomy application (52.5%, 75.6%) and perineal tears (26.5% and 36.6%).) was lower, but these differences were not statistically significant (p>0.050) (Table 2). It was found that in the early postpartum period (in the first 24 hours), the women in the case group experienced health problems at a higher rate (35.9% vs. 22.9%) than the women in the control group (OR:1.88) (p=0.016). The most common health problems in both groups are respectively, pain at the cesarean section, headache, pelvic pain and high fever. It was found that 23.2% of the case group and 17.4% of the control group also experienced breastfeeding problems in the first 24 hours after delivery, but there was no statistical difference between the groups (p=0.216).

The women in the case and control group were in the late postpartum period. The state of having health problems and the problems experienced were questioned by telephone interview in the seventh week. The case group had a higher rate of health problems in the late postpartum period (23.9%) than the women in the control group (13.9%) (OR: 1.95) (p=0.035), and severe headache, pain during urination, and constipation were all reported. It was determined that there were problems in the first order in both groups (Table 3). It was determined that women in the case group started complementary foods at a higher rate (25.4% and 18.8%) at the end of the sixth week, although not at a statistical level (p=0.103). Postpartum depression status of women was evaluated with Edinburgh postpartum depression scale, and it was determined that 21.1% of women in the case group and 12.5% of women in the control group had a risk of depression, but the difference between these two groups was not statistically significant (p=0.073).

It was found that the newborns of the women in the case group were admitted to the intensive care unit at a higher rate than the newborns of the women in the control group (OR: 2.01), (p=0.029), they were born earlier in the week (p=0.035), and the mean Apgar scores at the 1st and 5th minutes were lower. found (first minute p=0.029 and fifth minute p=0.003). The baby of one of the women in the case group died. There was no statistical difference between the groups in the mean weight of newborns at birth (p=0.266) (Table 4).

Table 3. Case and Control Group Women's Postpartum Early (In the First 24 Hours) and Late (Postpartum Sixth Week) Period Health and Breastfeeding Problem

Conditions of experiencing health problems	Case group		Control group		P
	n	%	n	%	
Early health problems					
Yes	51	35.9	33	22.9	0.016
Health problems experienced					
• Pain in the cesarean section	24	16.9	13	9	
• Headache	11	7.7	8	5.6	
• pelvic pain	9	6.3	8	5.6	0.216
• High fever	4	2.8	1	0.7	
• Other	9	6.3	13	6.1	
Having trouble breastfeeding					
The state of having a late-term health problem					
Yes	34	23.9	20	13.9	0.035
Health problems experienced					
• Headache	13	9.2	8	5.6	
• Pain when urinating	11	7.7	6	4.2	
• Constipation	6	4.2	3	2.1	
• Mastitis	5	3.5	2	1.4	
• Redness at the incision site	3	2.1	4	2.8	
Total No=141					

Note: The table clearly shows that the greater health problems in the case group in postpartum.

Table 4. Characteristics of the Women in the Case and Control Group Regarding their Newborns

Condition of admission of newborn to intensive care	Case group		Control group		P
	n	%	n	%	
Yes	27	19	15	10.4	0.029
Neonatal survival status					
No	1	0.7	0	0	
Birth week X±SD*	38.83±1.06		39.10±1.05		0.035
(Min-max)	(35–41)		(36–41)		
1-min Apgar score	8.35	0.96	8.49	1.14	0.029
(Min-max)	4–9		4–10		
5-min Apgar score X±SD	9.30±0.90		9.51±1.00		0.003
(Min-max)	(6–10)		(4–10)		
Weight of newborn X±SD* (gr)	3288,2±459,3		3228,6±444,4		
(Min-max)	(2200–4700)		(2000–4500)		

Note: The table shows birth weeks, 1st, and 5th minute average Apgar Score of the newborns of the women in the case group were statistically lower than the newborns of the women in the control group; *SD: Standard deviation

DISCUSSION

Representativeness of Samples

The result of the data indicated that the health problems during the pregnancy was found very high (59.2%) for the case group (BMI 30 and above) while significantly low (25.7%) for the control group (BMI=18.5–24.9). This huge difference may be correlated within the groups. In the Case group, education, socioeconomic status (employment status) and cultural influence (multiple pregnancy and number of living children) have played a very vital role. The large fraction of case group is from housewives, low level of education and with multiple pregnancies. The role of these factors can further be assessed and compared with other centers or part of the country.

Comparison with other publications

The prevalence of overweight and obesity in women of childbearing age in the world and in our country has increased over the years. The reason that makes obesity important is that it causes or exacerbates many diseases both

alone and together with some other factors [3, 21-23]. In our study, urinary tract infection (UTI) was found 6.08 times more in the case group than in the control group. In a retrospective study of 287213 pregnant women in London, urinary system infection was found to be 1.27 times higher in women with obesity [24]. The reason why the risk of UTI in obese women in our study was higher than in this study may be due to the perineal cleaning habits of women in our country. The findings of the study show the importance of regular urinalysis and early initiation of treatment, especially in pregnant women with obesity, due to pregnancy complications such as premature rupture of membranes brought by urinary tract infection.

In our study, the risk of anemia in women in the case group was 2.69 times higher than in the control group. Anemia is one of the most common complications in pregnancy, and iron deficiency anemia is seen in approximately 58% of pregnant women in our country. The findings of the study show the importance of more careful follow-up regarding nutrition and iron supplementation in pregnant women with obesity, although iron supplementation is given to all pregnant women.

It was found that women in the case group had a higher rate of psychological problems during their pregnancies (OR:2,18) and it has been supported by literature, which has mentioned that in addition to physiological problems, psycho-social problems such as depression, eating disorders, mental problems related to body image perception, stigma, night eating syndrome or trying to achieve psychological satisfaction by eating more and sleep disorders are more common in people with obesity [25].

The rate of experiencing preeclampsia/gestational hypertension in case group pregnancies is higher than that of control group (OR:5,14). In a study conducted in Spain, the risk of gestational hypertension was found to be 5.7 times higher in women with obesity and 2.9 times higher than those of normal weight women [26]. Similar to the findings of this study, Ramonienė et al. (2017) found that the risk of pregnancy-induced hypertension increased 8.5 times and the risk of preeclampsia 2 times increased in pregnant women with obesity in their study conducted in a tertiary health institution [27]. since obesity increases the risk of hypertensive disease during pregnancy and hypertensive diseases during pregnancy is one of the main cause of maternal mortality worldwide [28].

In our study, the incidence of gestational diabetes (GDM) was found to be higher in women with obesity (12%) than in women with normal weight (2.8%) (OR:4.7). Weiss et al. (2004) found that the risk of GDM in pregnant women with obesity was 1.9 times higher, Ovesen et al. (2011) 2.6 times, and Ramonienė et al. (2017) 5.5 times higher than in normal-weight women [16, 27]. In the case-control study of Taşdemir et al. (2015), in which normal weight women and obese women were compared, it was found that the incidence of gestational diabetes and hypertension was high in women with obesity [29]. The findings of our study are like the literature information. Since gestational diabetes carries the risk of maternal, fetal and neonatal complications, it requires careful and conscious monitoring. In line with these findings, it is known that it increases the risk of maternal, fetal and neonatal morbidity and mortality with the accompanying complications and causes the development of diabetes, cardiovascular disease and hypertension in women in the following years [24].

Women with obesity have a high risk for interventions during the birth process. This can be caused by various factors such as ineffective uterine activity. Again, fetal macrosomia reduces the progression of labor [30]. In our study, there was no difference between the groups in terms of delivery types and artificial pain application, but fundal pressure was applied to women in the case group at a higher rate (67.6% vs. 43.9%; OR: 2.67).

In our study, the mean weight gain of obese women during pregnancy was found to be lower than the control group. However, according to the Institute of Medicine [31] women with pre-BMI, BMI=>29.9 should gain 5–9 kg during pregnancy, and 11–15 kg for women with BMI=18.5–24.9 [32]. Accordingly, while the average weight of the women in the control group was normal during their pregnancy, the average weight of the women in the case group was quite high, which is thought to increase the perinatal risks for the mother and fetus.

It was found that the health problems experienced in early postpartum (first 24 hours) (OR: 1.88) and late (postpartum sixth week) (OR: 1.95) periods in women in the case group were higher than that of women in the control group. One of the postpartum problems is problem with breastfeeding. In our study, it was found that women in the case group had more problem in breastfeeding their newborns although it was not at the statistical level. In contrast it was found that as obesity delays prolactin secretion, obese women could start late breastfeeding and also experience a sense of inadequacy in breastfeeding [33, 34]. Li et al. (2003) investigated that maternal obesity and breastfeeding practices with the number of 124151 cases, they found that women who were obese before pregnancy and women who gained excessive weight during pregnancy were inadequate in starting and maintaining breastfeeding [35].

When the depression status of the women was evaluated six weeks after the birth, the depression risks of the women in the case group were found to be high, although not at a statistical level. Contrary to our study, Guelinckx et al. (2008) found that the incidence of postpartum depression is higher in women with obesity [36]. The high risk of postpartum depression suggests that obese women need more support and guidance to deal with entire duration of pregnancy.

In our study, the birth weeks, 1st, and 5th minute average Apgar Score of the newborns of the women in the case group were statistically lower than the newborns of the women in the control group, and the rate of admission to the intensive care unit was higher. In a study conducted in Spain, the 1st and 5th minute Apgar scores of newborns of mothers with obesity were found to be lower than newborns of mothers with normal weight [26]. In another study, it was reported that maternal obesity was a risk for low Apgar score [37]. In contrast to this situation, no relationship was found between Apgar score and body mass index in other studies conducted in our country [29]. More research is needed on this subject.

Taşdemir et al. (2015), reported that monitoring of infants in intensive care was found to be higher in infants of mothers with obesity and same holds true for our study also [29]. Due to the high rate of pregnancy complications in women with obesity, it is thought that the rates of follow-up in the intensive care unit may have increased due to transient tachypnea, respiratory distress and hypoglycemia in newborns. In a meta-analysis of eleven studies, it was found that the risk of early and late neonatal death increased by 1.42 times

in women with obesity [38]. Although it was of no statistical significance in our study, other study showed that obesity is a risk factor for infant mortality and still birth rates are high in obese women [8, 39]. It cannot be generalized to other centers since it was performed only in one hospital.

So, the overall study reflects that a woman has to suffer a lot due to pregnancy induced obesity. It includes various health problems like UTI, gestational hypertension, diabetes, depression as well as chances of more fetal retention in intensive care unit. The Statistical evaluation supports the data that can be revealed from above discussion.

Study limitations

The location of the hospital may be receiving a certain uniform and consistent sample population. Moreover, the result may be indicating to the influence of a specific socio-economic, ethnic and cultural environment affecting the results. And without considering these factors the data might not be directly extrapolated to any other population of the world.

Next studies

To reach normal BMI values without getting pregnant, it may be recommended to provide education and counseling to obese women. More elaborate studies need to be conducted to have clarity on this subject.

CONCLUSION

In conclusion, it was found that women in the case group experienced pregnancy, early and late postpartum complications at a higher rate than that of control group, while there was no difference between the groups in terms of depression at the end of the sixth week postpartum. Again, it was found that the newborns of the women in the case group had lower Apgar scores and higher rates of admission to the intensive care unit. In addition to the complications with obesity for both mother and her newborns it is necessary to provide appropriate antenatal and obstetric care to women with obesity. And as per the observations of the study there is need for more health care resources and additional equipment for babies born from these pregnancies.

СПИСОК ЛИТЕРАТУРЫ | REFERENCES

1. Guedes DP, Silva ALDS. Prevalence and correlates of excess body weight in university students. *Rev Bras Cineantropometria Desempenho Hum*. 2021;23. doi: https://doi.org/10.1590/1980-0037.2021v23e78433

2. Samuel-Harris SN. *Perceptions of Health and Family History Associations in African American Men at Risk for Cardiovascular Disease*. Hampton University, 2021.

3. World Health Organization, *Obesity: preventing and managing the global epidemic.* 2000.

4. James WPT. WHO recognition of the global obesity epidemic. *Int J Obes*. 2008;32(S7):S120-S126. doi: https://doi.org/10.1038/ijo.2008.247

5. Prentice AM. The emerging epidemic of obesity in developing countries. *Int J Epidemiol*. 2006;35(1):93-99. doi: https://doi.org/10.1093/ije/dyi272

6. Gupta, H., Garg, S., 2020. Obesity and overweight — their impact on individual and corporate health. *J. Public Health (Bangkok)*. 28, 211–218. doi: https://doi.org/10.1007/s10389-019-01053-9

7. Arroyo-Johnson C, Mincey KD. Obesity epidemiology trends by race/ethnicity, gender, and education: National Health Interview Survey, 1997–2012. *Gastroenterology Clinics of North America*. 2016;45(4):571. doi: https://doi.org/10.1016/j.gtc.2016.07.012

8. Sirimi N, Goulis D. Obesity in pregnancy. *Hormones*. 2010;9(4):299-306. doi: https://doi.org/10.14310/horm.2002.1280

9. Huda SS, Brodie LE, Sattar N. Obesity in pregnancy: prevalence and metabolic consequences. *Semin Fetal Neonatal Med*. 2010;15(2):70-76. doi: https://doi.org/10.1016/j.siny.2009.09.006

10. Djelantik A, Kunst A, van der Wal M, et al. Contribution of overweight and obesity to the occurrence of adverse pregnancy outcomes in a multi-ethnic cohort: population attributive fractions for Amsterdam. *BJOG An Int J Obstet Gynaecol*. 2012;119(3):283-290. doi: https://doi.org/10.1111/j.1471-0528.2011.03205.x

11. Sheiner E, Levy A, Menes TS, et al. Maternal obesity as an independent risk factor for caesarean delivery. *Paediatr Perinat Epidemiol*. 2004;18(3):196-201. doi: https://doi.org/10.1111/j.1365-3016.2004.00557.x

12. Triunfo S, Lanzone A. Impact of overweight and obesity on obstetric outcomes. *J Endocrinol Invest*. 2014;37(4):323-329. doi: https://doi.org/10.1007/s40618-014-0058-9

13. World Health Organization, World Health Organization. Reproductive Health, World Health Organization. Department of Reproductive Health. *Pregnancy, childbirth, postpartum, and newborn care: a guide for essential practice*. World Health Organization; 2003.

14. Heslehurst N, Lang R, Rankin J, et al. Obesity in pregnancy: a study of the impact of maternal obesity on NHS maternity services. *BJOG An Int J Obstet Gynaecol*. 2007;114(3):334-342. doi: https://doi.org/10.1111/j.1471-0528.2006.01230.x

15. Daniels SR, Hassink SG, Abrams SA, et al. The Role of the Pediatrician in Primary Prevention of Obesity. *Pediatrics*. 2015;136(1):e275-e292. doi: https://doi.org/10.1542/peds.2015-1558

16. Ovesen P, Rasmussen S, Kesmodel U. Effect of Prepregnancy Maternal Overweight and Obesity on Pregnancy Outcome. *Obstet Gynecol*. 2011;118(2):305-312. doi: https://doi.org/10.1097/AOG.0b013e3182245d49

17. Kahveci G, Kahveci B, Aslanhan H, Bucaktepe PGE. Evaluation of prevalence and risk factors for postpartum depression using the Edinburgh Postpartum Depression Scale: a cross-sectional analytic study. *Gynecol. Obstet. Reprod. Med*. 2021;27(3):227-233. doi: https://doi.org/10.21613/GORM.2020.1109

18. van der Zee-van den Berg AI, Boere-Boonekamp MM, Groothuis-Oudshoorn CGM, Reijneveld SA. The Edinburgh Postpartum Depression Scale: Stable structure but subscale of limited value to detect anxiety. Lupattelli A, ed. *PLoS One*. 2019;14(9):e0221894. doi: https://doi.org/10.1371/journal.pone.0221894

19. Demiröz HP, Taştan K. The effects of perceived social support on postpartum depression. *J Surg Med*. 2018;2(3):298-302.

20. Aygun N. The Relationship Of Magnesium Level With The Recovery Of Parathyroid Function In Post-Thyroidectomy Hypoparathyroidism. *SiSli Etfal Hastan Tip Bul / Med Bull Sisli Hosp*. 2021;55(1):33. doi: https://doi.org/10.14744/SEMB.2021.75983

21. Popkin BM, Adair LS, Ng SW. Global nutrition transition and the pandemic of obesity in developing countries. *Nutr Rev*. 2012;70(1):3-21. doi: https://doi.org/10.1111/j.1753-4887.2011.00456.x

22. Baird DT, Cnattingius S, Collins J, et al. Nutrition and reproduction in women. *Hum Reprod Update*. 2006;12(3):193-207. doi: https://doi.org/10.1093/humupd/dmk003

23. York DA, Rössner S, Caterson I, et al. Prevention Conference VII. *Circulation*. 2004;110(18):463-470. doi: https://doi.org/10.1161/01.CIR.0000140125.26161.49

24. Sebire N, Jolly M, Harris J, et al. Maternal obesity and pregnancy outcome: a study of 287 213 pregnancies in London. *Int J Obes*. 2001;25(8):1175-1182. doi: https://doi.org/10.1038/sj.ijo.0801670

25. Ergin AJK. Evaluation of obesity in perspective of women health and gender roles. *KASHED*. 2014;1(1):41-54.

26. Bautista-Castaño I, Henriquez-Sanchez P, Alemán-Perez N, et al. Maternal Obesity in Early Pregnancy and Risk of Adverse Outcomes. *PLoS One*. 2013;8(11):e80410. doi: https://doi.org/10.1371/journal.pone.0080410

27. Ramonienė G, Maleckienė L, Nadišauskienė RJ, et al. Maternal obesity and obstetric outcomes in a tertiary referral center. *Medicina (B Aires)*. 2017;53(2):109-113. doi: https://doi.org/10.1016/j.medici.2017.03.003

28. Majumdar A, Saleh S, Candelier CK. Failure to recognise the impact of 'moderate' obesity (BMI 30–40) on adverse obstetric outcomes. *J Obstet Gynaecol (Lahore)*. 2010;30(6):567-570. doi: https://doi.org/10.3109/01443615.2010.492434

29. Taşdemir D, Karaman E, Yıldız A, et al. The Effect of Obesity on Maternal and Fetal Outcomes in Term Pregnant Women: A Case-Control Stud. *İstanbul Kanuni Sultan Süleyman Tıp Derg*. 2015;7(2):2341-2350. doi: https://doi.org/10.5222/iksst.2015.073

30. Doğan R, Sayiner FD, Tanir MD, et al. Investigation of the Effect of Obesity and Obesity on Life Quality in Pregnancy Following Family Health Center. *Arch Health Sci Res*. 2018;5:16-23. doi: https://doi.org/10.17681/hsp.332707

31. Engel P, Fagherazzi G, Boutten A, et al. Serum 25(OH) Vitamin D and Risk of Breast Cancer: A Nested Case-Control Study from the French E3N Cohort. *Cancer Epidemiol Biomarkers Prev*. 2010;19(9):2341-2350. doi: https://doi.org/10.1158/1055-9965.EPI-10-0264

32. Institute of Medicine and National Research Council. 2009. *Weight Gain During Pregnancy: Reexamining the Guidelines*. Washington, DC: The National Academies Press.https://doi.org/10.17226/12584.

33. Lepe M, Bacardí Gascón M, Castañeda-González LM, et al. Effect of maternal obesity on lactation: systematic review. *Nutr Hosp*. 2011;26(6):1266-1269. doi: https://doi.org/10.1590/S0212-16112011000600012

34. Amir LH, Donath S. A systematic review of maternal obesity and breastfeeding intention, initiation and duration. *BMC Pregnancy Childbirth*. 2007;7(1):9. doi: https://doi.org/10.1186/1471-2393-7-9

35. Li R, Jewell S, Grummer-Strawn L. Maternal obesity and breast-feeding practices. *Am J Clin Nutr*. 2003;77(4):931-936. doi: https://doi.org/10.1093/ajcn/77.4.931

36. Guelinckx I, Devlieger R, Beckers K, Vansant G. Maternal obesity: pregnancy complications, gestational weight gain and nutrition. *Obes Rev*. 2008;9(2):140-150. doi: https://doi.org/10.1111/j.1467-789X.2007.00464.x

37. Blomberg M. Maternal and Neonatal Outcomes Among Obese Women With Weight Gain Below the New Institute of Medicine Recommendations. *Obstet Gynecol*. 2011;117(5):1065-1070. doi: https://doi.org/10.1097/AOG.0b013e318214f1d1

38. Meehan S, Beck CR, Mair-Jenkins J, et al. Maternal Obesity and Infant Mortality: A Meta-Analysis. *Pediatrics*. 2014;133(5):863-871. doi: https://doi.org/10.1542/peds.2013-1480

39. McGuire W, Dyson L, Renfrew M. Maternal obesity: consequences for children, challenges for clinicians and carers. *Semin Fetal Neonatal Med*. 2010;15(2):108-112. doi: https://doi.org/10.1016/j.siny.2009.09.005

AUTHORS INFO:

***Salwa Hazim Almukhtar**, PhD, Professor; address: College of Nursing, University of Mosul, City of Mosul, Iraq; ORCID: https://orcid.org/0000-0002-1504-0473; Scopus Author ID: 1235468755; e-mail: dr.salwa@uomosul.edu.iq

Jwan Mohammed Hassan, M.Sc. Maternal and Child Health Nursing; ORCID: https://orcid.org/0000-0001-5529-6345; e-mail: jwan.m@uomosul.edu.iq

Yamama Abdulkarim Al Yozbaki, M.Sc. Maternal and Child Health Nursing; ORCID: https://orcid.org/0000-0002-5496-584X; e-mail: yamama.zyhair@uomosul.edu.iq

*Corresponding author.