Academic Journal of Clinicians
Published by Academic Journals Publishing Group
ISSN: XXXX-XXXX

Preconception Obesity and Risk of Gestational Diabetes among Group of Iraqi Women- A Prospective Clinical Study

Dr. Abeer Makki Salamit [1*]

1. M.B.Ch.B., D.O.G, Alkarkh maternity hospital, Baghdad – Republic of Iraq

*Corresponding Author contact email hawaes4@yahoo.com

Original Article

ABSTRACT

Background: *Obesity in women of reproductive age is becoming more frequent , complicated pregnancy and increasing the risk of diseases such as gestational diabetes mellitus (GDM).*

Objective: *To determine the risk and incidence of gestational DM according to preconception body mass index of group of Iraqi women in Baghdad, Alkarkh maternity hospital.*

Methods: *This was a prospective study, conducted during a period of 18 months (December 2017 - June 2019) at Alkarkh maternity hospital, Baghdad – Republic of Iraq. Included 68 pregnant women aged 17 - 35 years and all have normal blood glucose levels with no history of chronic DM were included in the study. All women enrolled before they got pregnant , their body mass index was calculated and followed up during their pregnancy. Fasting blood glucose was tested and reported GDM defined as an alteration of two values in the blood glucose than its normal baseline level. Data collected using a pre-constructed data sheet and all demographic and clinical data were reported , all women were followed up during their pregnancy at scheduled regular visits. Statistical analysis performed using the SPSS software and appropriate statistical tests were applied accordingly. Risk of GDM was estimated according to the calculated relative risk among each subgroup; normal, overweight and obese women using the normal BMI group as reference control group. Level of significance was set at 0.05or less to be significant.*

Results: *The mean age of the studied group was 25.3 ± 5.6 years. According to the BMI , 38.2% of the women had a normal preconception BMI, 33.8% were overweight and 27.9% were obese ,*

Out of 68 women 11 developed GDM giving an incidence rate of 16.2% . Incidence of GDM was higher in obese women, 31.6% , followed by the overweight group 13% and lower incidence was among the normal BMI group of women with 7.7%. . The risk of developing GDM according to the relative risk , obese women had the larger relative risk of 4.10 (95% CI: 2.27 – 6.31) , i.e. obese women were about four –fold more likely to develop GDM compared to normal BMI group. The overweight women had relative risk (RR) of 1.69 folds. There was a significant direct (positive) association between BMI and incidence of GDM and the cumulative risk of developing GDM.

Conclusions: *Pregnant overweight or obese women had high risk of developing GDM and impaired glucose tolerance, so it is essential to make glucose tolerance test , for diagnosis and treatment, preventing complications and reducing the risk of developing DM2*

Keywords: Preconception Obesity, Gestational diabetes, diagnosis, epidemiology, complications,

Article information:
Received: August 2019, Revised and Accepted September 2019, Published online October: 2019

1.INTRODUCTION

Obesity is a disease characterized by excess adipose tissue, defined by a body mass index (BMI) greater than or equal to 30 kg/m2. In Iraq, almost 34.5% of women over 20 years are obese and 37.4% overweight, i.e. more than 67% of Iraqi women are overweight or obese, of which 7.2% suffer from type 2 diabetes mellitus (T2DM) (1,2) . Obesity has been associated with elevated risk of gestational diabetes mellitus (GDM) (3,4). The preconception weight gain has greater association with high incidence of GDM and impaired glucose tolerance during pregnancy (5,6). Pregnancy itself is considered a diabetogenic state, and the overweight or obesity from the other side causes an increase in insulin resistance, leading to depletion in the capacity of beta cells to secrete the amount of insulin needed during pregnancy and increasing the risk of developing GDM (3,4,7). GDM complicates 2.4 to 21% of all pregnancies , in USA 7% of pregnancies complicated by GDM (3,8). Both GDM and the presence of maternal hyperglycemia are associated with perinatal complications and high risk of developing obesity and DM2, in both the mother and the child , i.e. an paradoxical correlation between pregnancy, GDM and obesity is found (3,9) Studies estimate that the risk of developing GDM in pregnant women increases significantly with increasing BMI (8). In our population, many factors carry high risk for developing DM (10) from other point of view, as well, an association between GDM and pre-pregnancy nutritional status was documented. Therefore, in the present study we tried to determine the risk of DGM and impaired glucose tolerance according to presentational weight using the body mass index as an indicator.

2. PATIENTS and METHODS

This was a prospective study, conducted during a period of 18 months (December 2017 - June 2019) at Alkarkh maternity hospital, Baghdad – Republic of Iraq. A total of 68 pregnant women aged 17 - 35 years were included in the

study. Patients with history of previous diagnosis of diabetes mellitus type 2 (DM2) were excluded from the study , additionally women those who did not complete the test or not tolerated glucose solution were also excluded. All of the study participants benefited from free medical services in both the hospital or the private clinic of the researcher during the follow up period. For each participant of the study a medical record file was performed gathering the demographic and clinical data of the woman; including age, preconception weight, height and weight , the body weight was measured using an electronic digital standardized scale (SECA) and the height measured against a wall using a stadiometer (brand 700®). Body mass index (BMI) used as an indicator and was calculated according to the standard equation as followed:

$$BMI\ (kg/m^2) = \frac{Weight\ (kg)}{(Height\ in\ meter\ )^2}$$

Other collected data were reported included family history of DM, history of chronic diseases and laboratory data results. Aditionall all prenatal data were reported such as antenatal visits and preconception weight .

According to preconception body mass index , women were categorized as ;

Normal included women with BMI of 18.5 to 24.9 kg/m2;

Overweight included women with BMI of 25 to 29.9 kg/m2; and

Obese included women with BMI of ≥30 kg/m2;.

Study protocol :

- All study participants were enrolled pregestation and followed up during their gestation regularly at scheduled visits , all were clients of the department of obstetrics and gynecology of the hospital or the private clinic and they were asked to participate in the study.
- All demographic and baseline clinical data were reported in the medical record file.

- Weight and height were measured and BMI was calculated and all were reported at each visit.
- All study participants were followed up until give birth and 60 days after delivery with scheduled regular visits.
- Women with pregestation elevated blood glucose (incidentally diagnosed DM) was excluded and were advised to be managed and all were transferred to an internal medicine specialist/consultant.
- A sample of venous blood of 5 ml was obtained from each woman under aseptic technique for biochemical laboratory testing under fasting conditions for at least 12 hours before testing.
- Fasting Blood glucose was measured before and during gestation at each visit. In those who appeared to have elevated fasting blood glucose (FBG) above normal level, the test was repeated and the woman was re-evaluated. Gestational DM (GDM) was assured when FBG level altered by two units or more than its baseline level and impaired glucose tolerance test. The blood glucose was measured by enzymatic techniques using equipment Clinical biochemical System.

Statistical analysis and data management were performed using the statistical package for social sciences (SPSS) version 24 package. Appropriate statistical tests and procedures were applied accordingly with the aid of a specialist biostatistician and epidemiologist; chi-square test used to determine differences between groups in categorical variables. Risk analysis was performed by calculating odds ratio (OR) with a confidence interval (CI) of 95%. In all statistical testing, level of significance (P. value) was set at 0.05 or less to be significant difference or correlation .

3. RESULTS

A total of 68 women were enrolled in this study with a mean age of 25.3 ± 5.6 years. The descriptive characteristics of the studied groups are shown in (**Table 1**). According to the BMI , 38.2% of the women had a normal preconception BMI, 33.8% were overweight and 27.9% were obese , (**Table 2 &Figure 1**)

During follow up period 11 women developed GDM giving an incidence rate of GDM of 16.2% , (**Figure 2**).

The distribution of women who developed gestational DM revealed that the incidence of GDM was higher in obese women, 31.6% of the 19 obese women had developed GDM among the overweight group 13% had developed GDM while lower incidence was among the 26 normal BMI group of women , these finding indicated that the incidence GDM directly associated with the BMI value The frequencies and percentage of patients with GDM across the BMI categories are shown in (**Table 3**). The risk of developing GDM according to BMI categories was assessed using the relative risk estimation by comparing the overweight and obese women from one side versus normal BMI group as control (reference group) which revealed that obese women had the larger relative risk of 4.10 (95% CI: 2.27 – 6.31) which indicated that obese women were about four folds more likely to develop GDM compared to normal BMI group of pregnant women. The overweight women was also had higher relative risk (RR) compared to normal by about 1.69 folds (RR=1.69 , 95%CI RR: 1.35 – 4.72), (**Table 4**).

From other point of view, as it is expected, the BMI of pregnant women increases with progress of pregnancy and older gestational age , (Figure 3) and there was a direct (positive) significant correlation between BMI and gestational age in weeks, ($R = 0.618$, P. value < 0.001).

Also other interesting findings was a significant direct (positive) association between BMI and incidence of GDM and the cumulative risk of developing GDM, (**Figure 5**).

Table 1. Baseline Pre-conception characteristics of the studied group (N = 68)

Characteristics		**No.**	**%**
Residence	Urban	53	77.9
	Rural	15	22.1
Gravidity	Primigravida	21	30.9
	Multigravida	47	69.1
Parity	Nulliparous	25	36.8
	Multiparous	43	63.2
History of abortion	Yes	4	5.9
	No	64	94.1
History of chronic diseases	Yes	6	8.8
	No	62	91.2
Family history of DM	Yes	13	19.1
	No	55	80.9
Family history of GDM	Yes	17	25.0
	No	51	75.0
Mean age ± SD* (year) :	**25.3 ± 5.6**		

DM; diabetes mellitus; GDM: gestational diabetes mellitus; SD: Standard deviation

Table 2. Baseline Pre-conception BMI categories of the studied group (N = 68)

Pre-conception status	**No.**	**%**
Normal	26	38.2
Overweight	23	33.8
Obese	19	27.9
Total	**68**	**100.0**

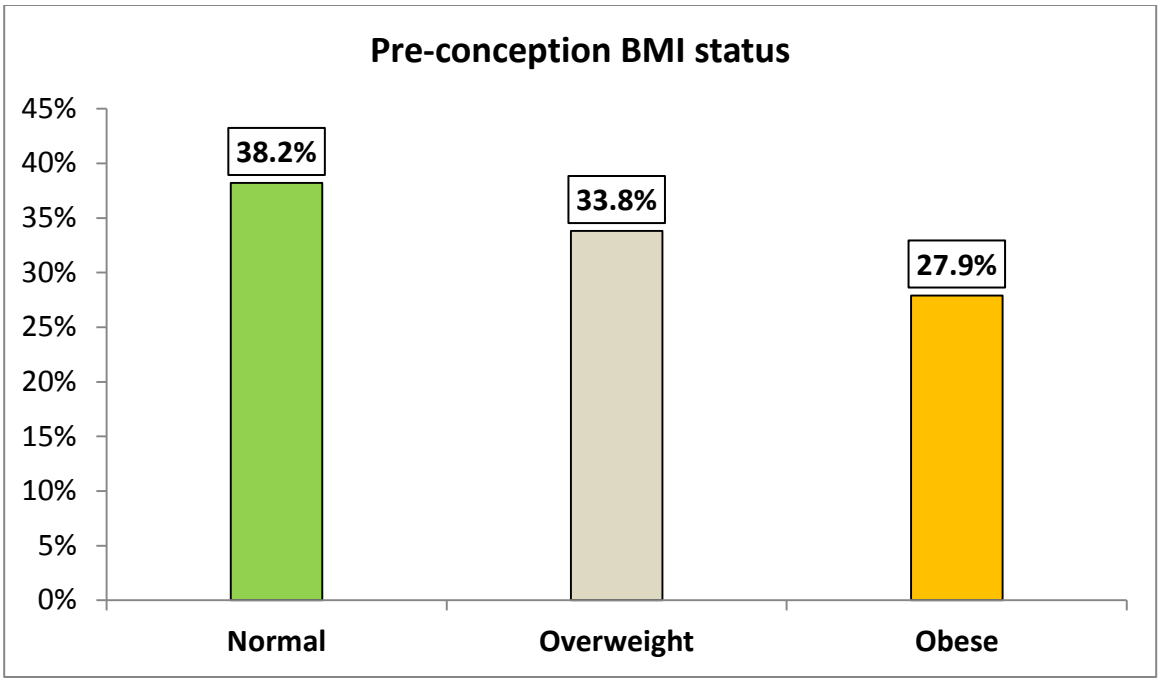

Figure 1. Proportional distribution of preconception BMI categories (N = 68)

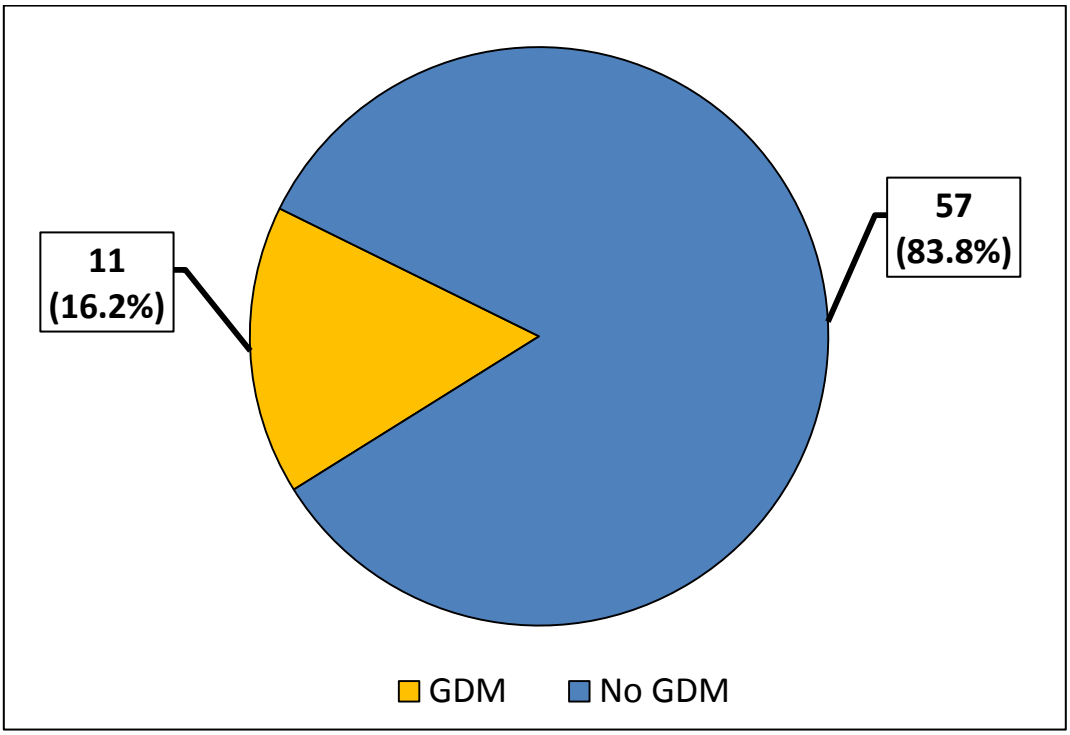

Figure 2. Incidence of gestational DM among the studied group (N = 68)

Table 3. Relationship between Pre-conception status Pre-conception BMI and incidence of Gestational DM among the studied group (N = 68)

	GDM		No GDM		Total	
Pre-conception status	**No.**	**%**	**No.**	**%**	**No.**	**%**
Normal	**2**	7.7	**24**	92.3	**26**	38.2
Overweight	**3**	13.0	**20**	87.0	**23**	33.8
Obese	**6**	31.6	**13**	68.4	**19**	27.9
Total	**11**	**16.2**	**57**	**83.8**	**68**	100.0

Table 4. Frequency distribution and relative risk values of developing GDM among the studied group (N = 68)

Pre-conception status	**GDM**	**No GDM**	**Relative Risk (RR) (95% CI)**
Normal (reference category)*	**2**	24	1
Overweight	**3**	20	**1.69 (1.35 - 4.72)**
Obese	**6**	13	**4.10 (2.27 - 6.31)**
Total	**11**	57	

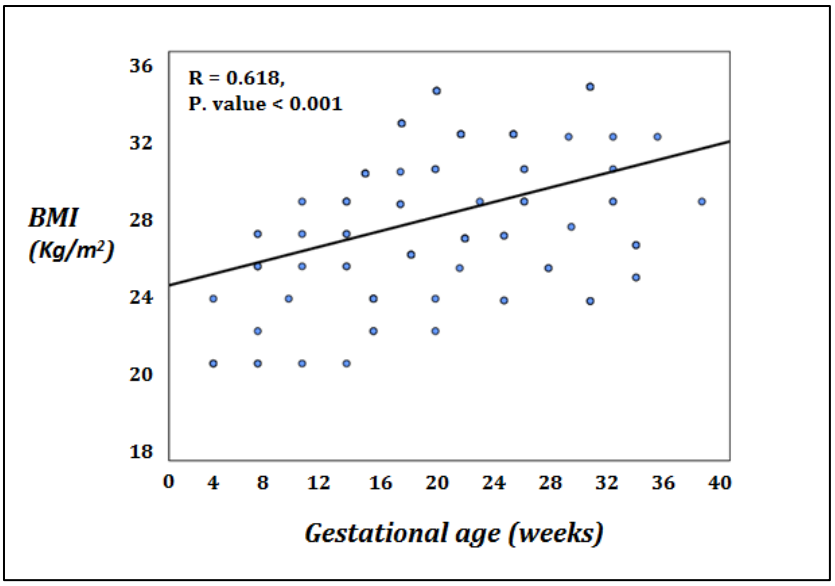

Figure 2. Curve-estimation (regression) chart showing the direct (positive) correlation between BMI and gestational age in weeks of the studied group

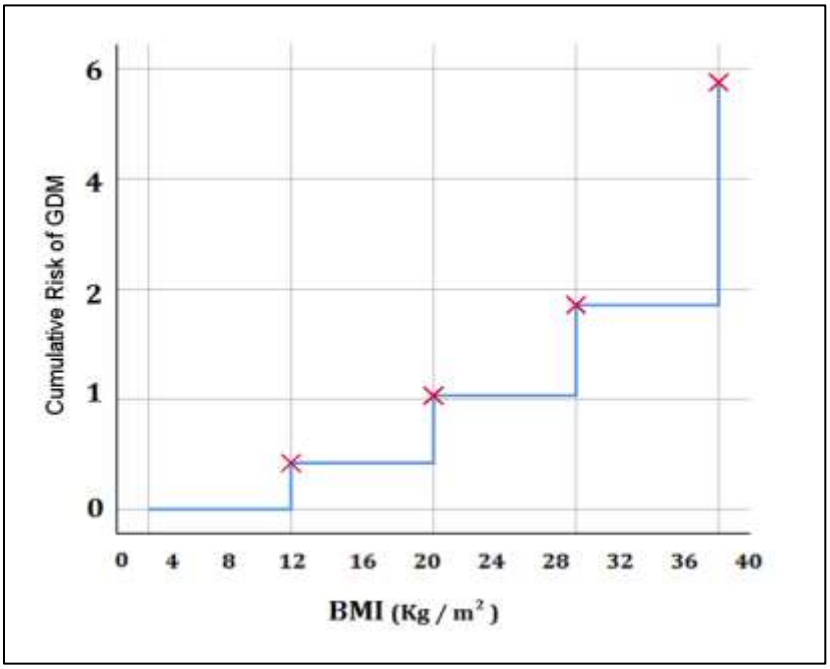

Figure 4. Cumulative risk of developing GDM among the studied group in relation to BMI

DISCUSSION

The impact of obesity during pregnancy is not fully described in the Iraqi population. Of the population included in our study, 33.8% of women had preconception overweight and 27.9% obesity i.e. more than 60% of women were overweight and obese. The average age of women who were overweight or obese was higher than that of normal BMI women , however, the difference did not reach the statistical significance . On the other hand an increased frequency of multiparity was observed in the overweight and obese women. Which matches the description of the risk factors present of GDM (11). According to our results, women with preconception obesity have 4.1-fold increased risk of GDM, and the overweight women had 1.69 times the risk of developing GDM, compared to women who start pregnancy with normal weight. The results of the study provide agreement with previous studies linking obesity as a risk factor for GDM (11–13) . In a previous study , Kim et al. (14) report that the percentage of GDM attributable to overweight, obesity or morbid obesity were 15.4%, 9.7% and21.1% respectively. Our results regarding the risk of developing GDM are similar to those reported by Chu et al. (15), however, in their meta-analysis included studies conducted exclusively in Latino population, and classify the obese into two groups (obesity and extreme obesity); our GDM relative risk for obesity was higher than that obtained by them (RR = 3.56), and the difference between both studies could be attributed to including Caucasian population considered to have lower risk of GDM(15).

The risk found in our population is similar although less than reported by El-Gilany and Hammad (16), in women with preconception obesity in Saudi Arabia (using the same classification for BMI), who describe an odds ratio (OR) of 9.3 in obese women compared with normal weight women for overweight women the OR was 4.5 (95% CI: 1.186 to 17.29). Yeung et al (17) reported that weight gain during adulthood and preconception obesity, are significant risk factor and

independent predictor associated with GDM compared to women suffering from obesity in other stages of life and other known risk factors, highlighting an increased risk when central obesity exist in adulthood. The obesity in localized areas such as abdomin was not measured in our study. One of the limitations of our study was not to have gestational weight gain in the population studied. According to the American Diabetes Associa- tion, weight gain during pregnancy is a strong risk factor for developing GDM, even in patients with pre-pregnancy obesity (18). However, Zonana-Nacach et al. (19) found that the risk of GDM in Mexican women in has no association with weight gain (OR: 1.0), but clearly it increases the frequency of impaired glucose tolerance. Our results support that prevention of GDM could be depend largely on the on preventing obesity in young women. 15 to 60% of women with GDM develop type 2 diabetes over a period of 5 to 15 years after the termination of pregnancy, and even those who only had impaired glucose tolerance , probably evolve to DM2 and metabolic syndrome (8-10). Prevention of GDM in obese women depends on effective interventions in nutrition and physical activity to achieve weight loss and diagnosis and treatment of populations at risk (11,15,19).

CONCLUSIONS

Pregnant overweight or obese women had high risk of developing GDM and impaired glucose tolerance, so it is essential to make glucose tolerance test , for diagnosis and treatment, preventing complications and reducing the risk of developing DM2. Interventions by a multidisciplinary team. The Iraqi women have an increased risk of GDM but lower than that reported in some other countries in our however, they mustt take effective preventive measures for obesity to prevent DM.

Ethical Clearance: The study protocol was approved by the scientific committee of the Iraqi Ministry of health, Alkarkh maternity hospital, Baghdad – Republic of Iraq. Signed informed consent was taken from each participant woman.

Conflict of interest: The authors declare None

Funding: Self-Funded by the author

REFERENCES

1. *Al-Ghabban SI. Prevalence of Overweight and Obesity among Students in University of Kerbala. Med J Babylon. 2013;10(1):205–18.*
2. *Sen S, Carpenter AH, Hochstadt J, Huddleston JY, Kustanovich V, Reynolds AA, et al. Nutrition, weight gain and eating behavior in pregnancy: A review of experimental evidence for long-term effects on the risk of obesity in offspring. Physiol Behav. 2012;107(1):138–45.*
3. *Rajput R, Yadav Y, Nanda S, Rajput M. Prevalence of gestational diabetes mellitus & associated risk factors at a tertiary care hospital in Haryana. 2016;137(4):728–33.*
4. *Alfadhli EM. Gestational diabetes mellitus. Saudi Med J. 2015;36(4):399–406.*
5. *Yekta Z, Ayatollahi H, Porali R, Farzin A. Pregnancy and Childbirth The effect of pre-pregnancy body mass index and gestational weight gain on pregnancy outcomes in urban care settings in Urmia-Iran. 2006;8:1–8.*
6. *Brown JE, Murtaugh MA, Jacobs DR, Margellos HC. Variation in newborn size according to pregnancy weight change by trimester. Am J Clin Nutr. 2002;76(1):205–9.*
7. *Soma-Pillay P, Nelson-Piercy C, Tolppanen H, Mebazaa A. Physiological changes in pregnancy. Hear Dis Pregnancy [Internet]. 2007;27(2):89–94. Available from: http://www.ncbi.nlm.nih.gov/pubmed/27213856%0Ahttp://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC4928162*
8. *Baptiste-Roberts K, Nicholson WK, Wang N-Y, Brancat FL. Gestational Diabetes and Subsequent Growth Patterns of Offspring: The National Collaborative Perinatal Project. Matern Child Heal J. 2012;16(1):125–32.*
9. *Byström M, Liu A, Quinton AE, Champion BL, Mann K, Peek M, et al. Gestational Diabetes Independently Increases Birth Length and Augments the Effects of Maternal BMI on Birth Weight: A Retrospective Cohort Study. Front Pediatr [Internet]. 2014;2(10):112–7. Available from:*

http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=4201105&tool=pmcentrez&rendertype=abstract

10. *Ministry of health (MOH)/Iraq Chronic Non-Communicable Diseases Risk Factors Survey In Iraq 2006, available from www.who.int/chp/steps/IraqSTEPSReport2006, accessed on July, 8, 2016. Available from: http://www.who.int/chp/steps/IraqSTEPSReport2006.pdf?ua=1*
11. *Standards of Medical Care in Diabetes 2010 Position statement of the American Diabetes Association. Dia- betes Care 2010; 33 (suppl1): 22-7.*
12. *Athukorala C, Rumbold RA, Willson K, Crowther CA. The risk of adverse pregnancy outcomes in women are overweight or obese WHO. BMC Pregnancy Child- birth 2010, 10: 1-8.*
13. *Guelinckx I, Devlinger R, K Beckers, Vansant G. Maternal Obesity: pregnancy complications, man- tational weight gain and nutrition. Obesity Reviews 2008; 9: 140- 50.*
14. *Kim SY, England L, Wilson HG, Bish C, Satten GA, Dietz P, gestational diabetes mellitus Percentage of overweight and obesity attributable to. Am J Public Health 2010; 100:1047-1052.*
15. *Chu SY, Callaghan WM, Kim SY, Schimd CH, Lau J, England LJ, Dietz P, Maternal obesity and risk of gestational diabetes mellitus. Diabetes Care 2007; 30: 2070-6.*
16. *AH-Gilany, Hammad S. Body Mass Index and Obs- Tetric Outcomes in Saudi Arabia: a prospective cohort study. Ann Saudi Med 2010; 30: 376-80.*
17. *Yeung EH, Hu FB, Solomon CG, Chen L, Louis GM, Schisterman E, et al. Life course characteris- tics weight and the risk of gestational diabetes. Diabetologia 2010; 53: 668- 78.*
18. *Bloomgarden ZT. Gestational diabetes mellitus and obesity. Diabetes . Care 2010; 33: e60-e65.*
19. *Zonana-Nacach A, Baldenebro-Preciado R, Ruiz Dorado MA. Effect of weight gain gestation tional in the mother and newborn. Salud Publica Mex 2010; 52: 220-5.*