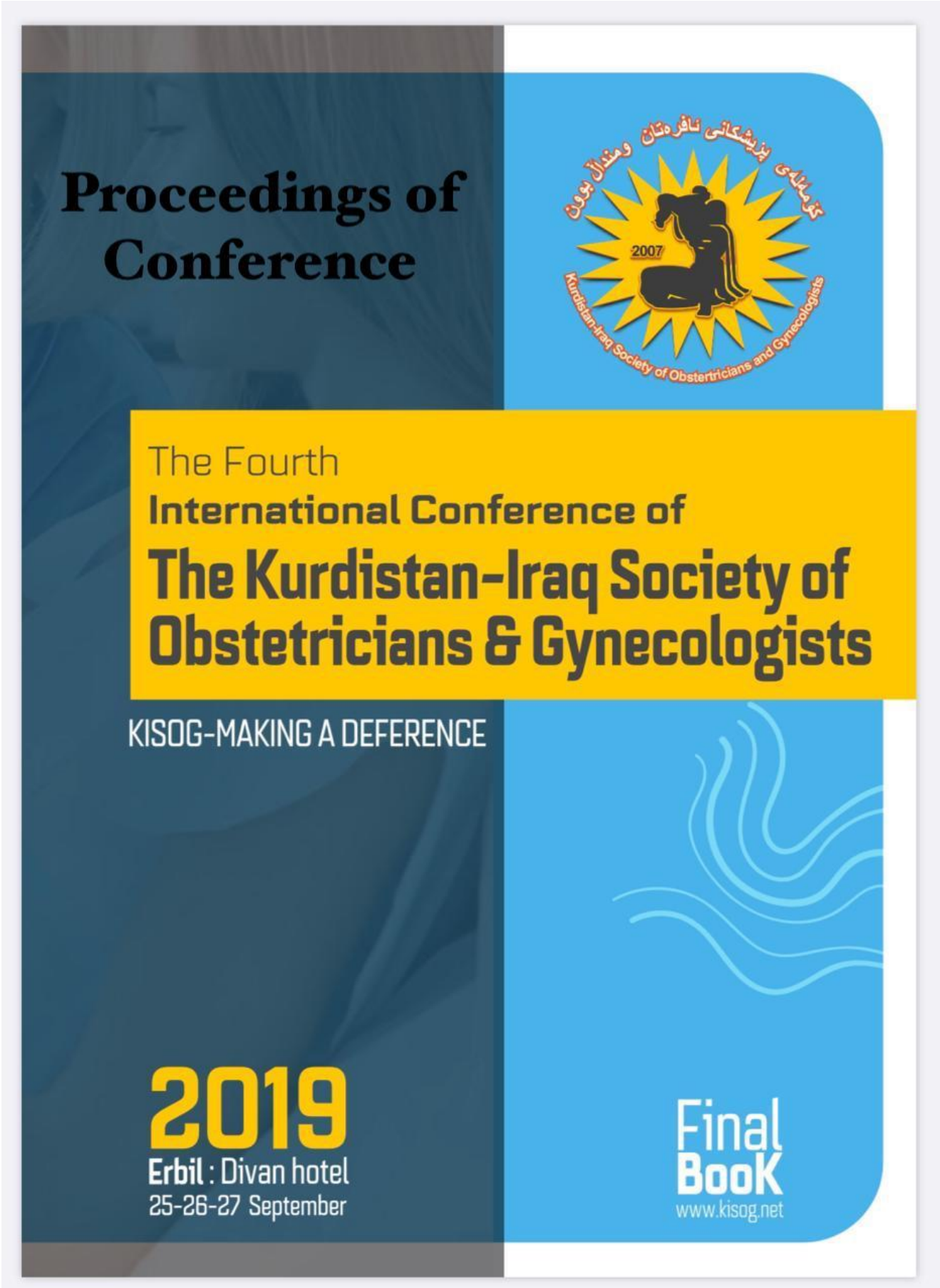
Proceedings of Conference
2007
Kurdistan-Iraq Society of Obstetricians and Gynecologists
The Fourth
International Conference of
The Kurdistan-Iraq Society of Obstetricians & Gynecologists
KISOG-MAKING A DEFERENCE
2019
Erbil : Divan hotel
25-26-27 September
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The relationship between excessive maternal weight gain and development of hypertension in third trimester of pregnancy

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ABSTRACT:

Background: A healthy weight gain during pregnancy is usually 10-12 kg. Excessive gestational weight gain may associated with hypertension, this may be reflection of excessive water retention, greater maternal fat deposition and inflammation which has also associated with development of hypertension in pregnancy.

Aim of the Research: The aim of this study was to determine the relationship between weight gain and development of hypertension and severity of hypertension in 3rd trimester of pregnancy.

Materials and Methods: Study conducted at Sulaimani Maternity Teaching Hospital, from 1st June of 2018 to 1st March of 2019. Study included single tone pregnancy, hypertension diagnosed first time in pregnancy with or without proteinuria while twin pregnancy, diabetes in pregnancy, polyhydromnia, chronic hypertension, heart disease or any other medical illness in pregnancy were excluded.

RESULT: There is close relationships between high weight gain acquired in third trimester of pregnancy and development of hypertension Mean±SD (91.8±7.8) as compared with controlled group Mean±SD (87.1±9.1), weight gain also have significant effect on severity of.

Conclusion: Pregnant women with gestational hypertension and those with normal blood pressure were significantly different in terms of third trimester weight, BMI, and weight gain. A significant relationship was observed between BMI and development of gestational hypertension.

Introduction

Gaining weight in pregnancy time has been related to biologic processes and metabolic changes which maintain the development of fetal programming. Different women experience various compositions of weight gained during pregnancy, for normal weight women (BMI of 18.5 - 24.9 kg/m^2), normal weight gain during pregnancy is recommended to be11 – 16 kg. However, it is 7 - 11 kg, for overweight (BMI of 25 - 29.9 kg/m^2) women and for obese 5 – 9 kg (BMI of > 30 kg/m^2) women (1). During third trimester of pregnancy, the baby undergoes rapid changes so as to support the growth of the fetus. Changes are same in the first and second trimesters, while they are often worse in third trimester because childbirth is getting closer during this period (2).

There has been an exponential increase in prevalence of obesity in pregnancy, approximately 15 to 20% of women become pregnant while they have a BMI number which is defined as obese. A significant relationship has been reported between adverse outcomes in pregnancy with mother and child obesity (3). Gestational diabetes and hypertensive may develop during pregnancy, which might cause preterm delivery, stillbirth, or miscarriage (4, 5).

The term pregnancy-induced hypertension is often defined as hypertension that is caused by but unrelated to other pathology accompanied with the pregnancy whose diagnosis is difficult to make until the pregnancy ends (6) and the term “gestational hypertension” is utilized by the International Society for the Study of Hypertensivein Pregnancy (ISSHP) to include all women with PIH whether they are proteinuric or not as long as they were previously normotensive and not proteinuric, and once proteinuria has developed, it will be assumed to be preeclampsia (7).

Risk of preeclampsia 3 to 5 times more at overweight and obese pregnant women in comparison with normal weighted pregnant women. Also, in the first antenatal visit obese and overweight pregnant women has also consistently been reported to be associated with higher risk of hypertensive disorders of pregnancy (HDP) (2). Gestational hypertension pregnant women have been stated to develop after the 20thweek of pregnancy. Meanwhile, no extra protein in the urine or other signs of organ damage can be seen. Also, gestational hypertension in some women finally leads to development of preeclampsia (3).

Community monitoring for preeclampsia should be provided for women with BMI >35 and no additional risk factors at a minimum of 3 weekly intervals between the 24th and 32nd weeks of gestation and 2 weekly intervals from the 3rd week. Furthermore, all pregnant women in community with BMI >30 should be screened for gestational diabetes (8).

Materials and Methods

The present study was carried out in Sulaimani Maternity Teaching Hospital from 1st June 2018 to 1st march 2019. The study was approved by the Committee of Obstetrics and Gynecology of the Maternity Teaching Hospital.

To conduct the study, 2 groups of pregnant women in 3rd trimester of pregnancy with different degrees of weight gain ranging from 10 to > 20kg were recruited. The first group consisted of 75 pregnant women who had weight gain without development of hypertension. All of them were met in the hospital and recruited as the study participants by the researcher.

The second study group consisted of 75 pregnant women with normal weight gain, overweight, and obesity during the 3rd trimester of their pregnancy who referred to the hospital with an increase in blood pressure ≥ 140/90 and with or without protein urea. The pregnant women were divided into three groups: Group (A) with normal weight gain, Group (B) without weight gain and Group (C) with obesity.

Their weight was measured by using a weighing device, their height by tape measure, and their blood pressure by a mercury sphygmomanometer recorded during the third trimester.

The study inclusion criteria were singleton pregnancy, hypertension diagnosed first time in pregnancy and with or without proteinuria and the exclusion criteria were twin pregnancy, diabetes in pregnancy, polyhydromnia, chronic hypertension, heart disease, or any other medical illness in pregnancy.

The blood pressure was measured, when women rested for 15 minutes, in ideal setting at 45 degree angle or in a left lateral position with the device cuff was of appropriate size to measure blood pleasure, the cuff was put in the mid arm of the women. At the level of the heart, there is fluctuation

in the blood pressure in normal circumstances, so multiple readings are needed to confirm the diagnosis.

A questionnaire was designed which included information about maternal age, parity, gestational age, past medical history especially renal and heart disease either before or during previous pregnancies, symptoms of severe preeclampsia and blood pressure, and fetal heart rate on admission.

The physical examination was done by assessment of blood pressure, and fundal height laboratory evaluation was carried out for all patients which included; quantitative assessment of urinary protein excretion with a dipstick, complete blood count and coagulation profile, renal function test: Blood urea, serum creatinine and uric acid and liver function tested by Serum aspartate aminotransferase, alanine aminotransferase and total serum bilirubin.

Gestational age was determined by 1 trimester ultrasound. And, fetal heart rate was measured by sonic aid.

Results

According to the collected data in the present study, the number of the patients in the two age groups was equal, such that 50.7% of them belonged to the age group 20-30 years and 49.3% to the age group 30-40 years (Figure 1).

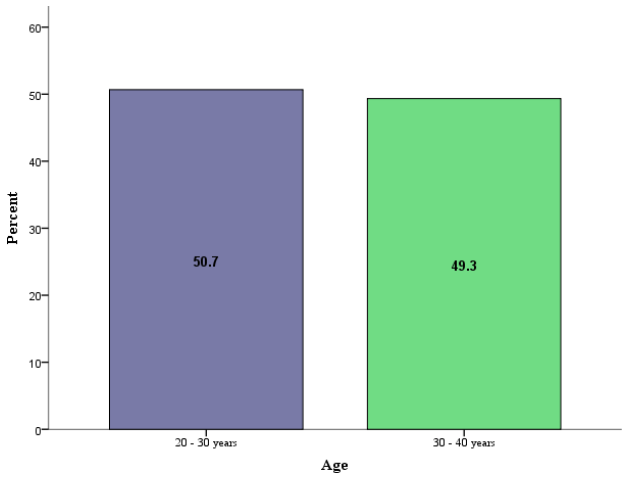

Figure 1 Distribution of the patients' age

Analyzing the collected data in the present study also revealed that most of the patients resided urban areas (66.67%) and 33.33% of the were from rural regions (Figure 2).

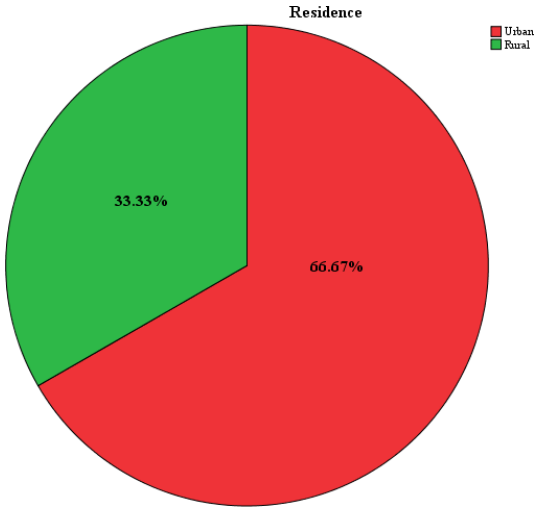

Figure 2 the distribution of patient's place of residence

The results of the study indicated that the mean gestational age in the gestational H.T and control groups was respectively 36±0.9 and 36.3±1.3 weeks, mean age was 28.8±5.1 and 28.2±5.6 in the gestational H.T and control groups, mean weight 72.2±7.6 kg in the gestational H.T and 72.4±9.1 control groups and the relationship between those variables in gestational age group and the gestational H.T group were non-significant (See Table 3).

Moreover, the results indicated that there was not a significant difference between the two groups in terms of their parity (P-value 0.9), such that most of them (38 in the gestational H.T group and 38 in the control group) had 2 and more para, 20 patients in each groups had 1 para, and 17 in the gestational H.T group and 16 in the control group had primiparous (Table 3).

Regarding the occupation, the results indicated that the two groups were not significantly different (P-value 1.0). As indicated in Table 3, most of the women were housewives (53 women in each group) and employee (22 in each group). The results also showed that the two groups were not significantly different in terms of their place of residence (P-value 0.4), such that most of the women (50 in the gestational H.T group and 54 in the control group) lived in urban areas, and the rest in the rural regions (Table 3).

However, the results showed that there was a significant difference between the two groups regarding their third trimester weight at a p-value of <0.0001, such the third trimester weight was 91.8±7.8 and 87.1±9.1 kg in the gestational H.T and control groups respectively (Table 3).

As indicated in Table 3, the two groups were also significantly different in terms of their BMI at a P-value of 0.009, such that 36 women in the gestational H.T group were obese, while 21 in the control group were obese, and 28 women in the gestational H.T group and 29 in the control group were overweight, and 11 women in the gestational H.T group and 25 in the control group had a normal weight (Table 3).

Table 3 Difference between the gestational H.T and control groups regarding the studied variables

		Group		Total	P-value
		Gestational H.T	Control group		
Gestational age by week (Mean±SD)		36.4±0.9	36.3±1.3		0.6
Age (Mean ± SD)		28.8±5.1	28.2±5.6		0.5
Booking weight (Mean ± SD)		72.2±7.6	72.4±7.6		0.8
Third trimester weight (Mean ± SD)		91.8±7.8	87.1±9.1		< 0.001
BMI	Normal weight	11 (30.6)	25 (69.4)	36 (100.0)	0.009
	Overweight	28 (49.1)	29 (50.9)	57 (100.0)	
	Obese	36 (63.2)	21 (36.8)	57 (100.0)	
	Total	75 (50.0)	75 (50.0)	150 (100.0)	
Parity	Para 1	20(50.0)	20(50.0)	40(100.0)	0.9
	Para 2 and above	38(49.4)	39(50.6)	77(100.0)	
	Primi parity	17(51.5)	16(48.5)	33(100.0)	
	Total	75(50.0)	75(50.0)	150(100.0)	
Occupation	Housewife	53(50.0)	53(50.0)	106(100.0)	1.0
	Employee	22(50.0)	22(50.0)	44(100.0)	
	Total	75(50.0)	75(50.0)	150(100.0)	
Residence	Urban	50(48.1)	54(51.9)	104(100.0)	0.4
	Rural	25(54.3)	21(45.7)	46(100.0)	
	Total	75(50.0)	75(50.0)	150(100.0)	

Table 4 shows the women's weight gain, the two groups were significantly different in terms of their weight gain (P-value<0.001), the gestational H.T group gained 19.1±6.3 kg, while the control group gained 15.1±5.3 kg. Furthermore, the two groups were significantly different regarding their weight gain in different ranges of weight gain (i.e. 0-10, 10-20, and over 20 kg) at a P-value of 0.005 (Table 4).

Table 4 The difference between the gestational H.T and control group regarding their weight gain

		Group		Total	P-value
		Gestational H.T	Control group		
Weight gain (Mean±SD)		19.1± 6.3	15.1±5.3		< 0.001
Weight gain	0 - 10 kg	15(20.0)	33(44.0)	48(32.0)	0.005
	10 - 20 kg	32(42.6)	26(34.6)	58(38.6)	
	More than 20 kg	28(37.4)	16(21.4)	44(29.4)	
	Total	75(100.0)	75(100.0)	150(100.0)	

Regarding the relationship between hypertension and BMI in the gestational H.T group, the results of the current study revealed that these two variables were significantly correlated at a P-value of 0.02 (Table 5).

Table 5 The association between hypertension and BMI in the gestational H.T group

		Hypertension		Total	P-value
		Mild ≥ 140/90	≥ 160/110		
BMI	Normal weight	9(26.4)	2(4.8)	11(14.6)	0.02
	Overweight	12(35.3)	16(39.1)	28(37.4)	
	Obese	13(38.3)	23(56.1)	36(48.0)	
Total		34(100.0)	41(100.0)	75(100.0)	

Discussion

The present e study was carried out in order to compare the effect of normal weight gain and high weight gain on the hypertension development during third trimester of pregnancy. For this purpose, 75 pregnant women with hypertension (25 with normal weight, 25 with overweight, and 25 with

obesity) and 75 pregnant women without hypertension (25 with normal weight, 25 with overweight, and 25 with obesity) were selected and assigned in a gestational H.T group and a control group. Also, analyzing data show that gestational BMI has a significant relation on development of hypertension.

The reason for selecting women of this age (20 to 40 years) because according to the reports of the WHO, the age of 15 to 44 years is appropriate reproductive age (9). Therefore, selection of the studied age group can be justified. Most of the women in the present study (66.67%) were from urban regions and 33.33% of women resided in rural areas, might be attributed to fact that most of the population are nowadays living in urban areas.

As indicated by the results of the present study, there was no significant difference between the women with gestational hypertension (HT) and the control group in terms of their gestational age by week, for example the gestational age was 36.4 weeks in the gestational hypertension and 36.3 in the control group. This result shows that the two groups were significantly homogeneous regard to their gestational age. The results of current study can be reliable because it is not affected by the women's gestational age which is an important factor in pregnancy.

The current study results shows that women in the both groups gestational HT and the control women (without gestational hypertension) had almost equal weight. This can be attributed to the fact that women of almost equal weight were recruited in the present study. The results also indicated that the two groups of pregnant women were not significantly different regarding their parity, which was in line with the study conducted by Amoakoh-Coleman (2017) (7). The two groups were also similar regarding their occupation and place of residence. Therefore, it can be stated that the two groups were almost homogeneous with regard to these maternal and individual characteristics, which enhances the reliability and rigor of the obtained results in comparative studies because confounding variables are highly minimized (6).

However, as indicated by the results, there was a significant difference between the women with gestational hypertension and those with normal blood pressure regarding their third trimester weight ($p<0.001$). This finding is almost in line with those of the study carried out by Macdonald-Wallis (2013) who pointed out that women with normal pregnancy and maternal characteristics have a higher weight gain during their first trimester which declines with increased gestational age (10). However, Lei (2016) have stated that the association between blood pressure and trimester-specific

gestational weight gain during pregnancy is not well known (3). Therefore, the influence mechanism of high blood pressure and weight gain particularly during third trimester needs to be studied in details.

The results of the present study revealed that the two studied groups, especially in women with normal weight and obesity, were significantly different regarding their BMI at a p-value of 0.009. This finding is in line with the results reported by Mrema (2018) who observed that pregnant women with hypertension had a higher BMI (11). This finding is almost in line with other studies carried out on the relationship between BMI and development of gestational hypertension (9, 12).

It was observed that the women with gestational hypertension experienced a higher level of weight gain compared to those without high blood pressure, and the difference between the two groups in this regard was significant (P-value <0.001). The results also revealed that the two groups were significantly different regarding their weight gain during pregnancy in different weight groups at a P-value of 0.005. This finding is in line with those of the study carried out by Nelson (2010) who stated that gaining higher weight during pregnancy in women with high blood pressure can be related to the influence of greater maternal pregnancy adiposity acquisition on blood pressure (13).

According to the results of the current investigation, it was concluded that there was a significant relationship between BMI and hypertension in the pregnant women in the gestational H.T group at a P-value of 0.02. This finding is similar to those of the studies carried out by who reported that there is a significant association between pre-pregnancy BMI and development of hypertension during pregnancy (12, 14, 15).

Conclusion

Pregnant women with gestational hypertension and those with normal blood pressure were significantly different in terms of third trimester weight, BMI and weight gain. A significant relationship was observed between BMI and development of gestational hypertension.

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