

Prevalence Of Obesity And Pattern Of Weight Gain Among Pregnant Women Attending A Tertiary Healthcare Facility In Sokoto, Nigeria.

Mohammad B. Isah^{1*}, Swati Singh², Abubakar A. Panti²,

Department Of Obstetrics And Gynecology, Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria

Abstract:

Background: Obesity is a global health problem. Over the last decade its incidence and prevalence are rising steadily throughout the world with a concomitant increase in the risk of maternal and fetal complications.

Aim: This study aimed to determine the prevalence of obesity and pattern of weight gain among pregnant women.

Materials and Methods: A prospective study was conducted among 281 pregnant women presenting consecutively at the Antenatal Clinic of Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria. Anthropometric measurement was done for the participants at booking (in addition to questionnaire administration); their weight was subsequently monitored periodically until two-weeks postpartum, while fetal assessment was done at delivery. Data were analyzed using IBM SPSS version 20 statistical computer software package.

Results: There were 75 women whose BMI were greater than 30; giving the prevalence of obesity of 28.5%. Of the 263 participants that completed the study, 2.7%, 32.2% were underweight and overweight respectively at booking. The weight gain in pregnancy ranged from 5.0 to 19.0kg (mean = 9.86 ± 2.84 kg). The mean weight gain increased progressively from 2.74 ± 1.81 kg in the first trimester to 3.79 ± 1.62 kg in the third trimester.

Conclusion: Abnormal weight gain during pregnancy is associated with both adverse maternal and fetal outcomes which were very prevalent among the participants in this study. Healthcare givers particularly antenatal care providers should consistently educate their clients on the importance of adequate nutrition and optimal weight gain in pregnancy.

Keywords: Maternal body mass index, gestational weight gain, pregnancy and prevalence

Date of Submission: 05-07-2026

Date of Acceptance: 15-07-2026

I. Introduction

Obesity is one of the most prevalent health problems worldwide, a report by the World Health Organization (WHO) in 2005 indicated that nearly 1.6 billion people were overweight and at least 400 million people were obese worldwide. In recent years, the prevalence of obesity has risen among pregnant women in both poor countries as well as affluent ones, mirroring the situation in the general population; and this has been attributed to the increased intake of energy-dense foods that are high in fat, and the increasingly sedentary lifestyle across the globe sequel to urbanization and industrialization.¹⁻⁵

The prevalence of obesity in the UK in 2002 was estimated as 23% in women and 22% in men. The Health Survey for England 2004 revealed a steady rise in the prevalence of obesity in women from 16.4% in 1993 to 23.8% in 2004.⁶

An Australian study reported that 34% of pregnant women were overweight or obese. According to a western study 28% of pregnant women are overweight and 11% are obese.⁷

In USA its incidence ranges 18.5% to 38.3%, making it one of the most frequent high-risk obstetrics conditions. Approximately 21 million people in the United States about 7 percent of the population have diabetes; 14.5 million of these people have been diagnosed with the disease, and more than 6 million have it but do not know it.⁸

Ethnicity coincides with the obesity problem with this problem being greatest among non-Hispanic black women (50%) compared to Mexican American women (45%) and non-Hispanic white women (33%).⁹

In the USA, for example, 2% of pregnant women have a BMI < 18.5 and more than 50% have a BMI > 25. Hence, BMI seems to differ across populations.¹⁰

The prevalence of obesity reported among pregnant women from developed countries range between 15% to 40%, the values from developing countries like Nigeria, Ghana and Tanzania are comparatively much lower.¹¹ 22.6% in Abakaliki south-eastern Nigeria. 14.0% in Enugu, 17.9% reported in Ghana and 9.1% in Tanzania,¹² except for Benin were 50.7%¹³ was reported.

Extreme obesity is common in more than 52% among pregnant women in Saudi Arabia.¹⁴

In developing Asian countries, such as Iran, women generally have a lower BMI and/or a smaller gestational weight gain than in developed countries. By the year 2030 there will be 185.8 million overweight or obese adults living in sub-Saharan Africa (28.7%), and 17.5% of adults will be obese.¹²

In pregnancy, obesity carries significant maternal risk. This was highlighted in the last report of Confidential Enquiries into Maternal and Child Health where obesity was identified as a risk factor for maternal death following the finding that 35% of all mothers who died were obese, representing a disproportionate number of deaths associated with obesity in childbearing women.

Maternal obesity is a growing health concern throughout the UK with approximately 1 in 20 women being obese during pregnancy, varying considerably across nations, rates of maternal obesity range from 1 in 15 women living in Wales to lower proportions of 1 in 29 women in London. Associated with increasing problems throughout pregnancy, delivery complications and poor neonatal outcomes, maternal obesity is currently one of the biggest challenges presented to maternity services in the UK.¹⁵⁻¹⁷

As with maternal obesity, excess weight gain during pregnancy places both mother and child at increased risk of serious complications during pregnancy and after delivery.¹⁴

Gestational weight gain recommendations are directly related to pre-pregnancy BMI. In Canada 23.1% (5.5 million Canadians) are obese and 36.1% (8.6 million) are overweight according to directly measured body mass index scores [(BMI) weight (kg)/height (m²)] according to Tjepkema et al. The Institute of Medicine and Health Canada suggests that the maximum weight gain for women who are obese is 9 kg. The Society of Obstetricians and Gynaecologists of Canada recommend the optimal gain for these women is 7 kg. While controlling weight gain to 7 kg or less, (including weight loss and no weight gain), has been associated with reduced rates of macrosomia, pre-eclampsia, caesarean section and other adverse outcomes, the safety of weight loss and maintenance during pregnancy is yet to be determined.^{18,19}

Similarly the Institute of Medicine (IOM) in the United States recommended limits of weight gain for women during pregnancy. This recommendation is with respect to the body mass index (BMI) prior to pregnancy. It is recommended that normal weight women (18.5-24.9 kg/m²) should gain between 11.5 and 16.0 kg, overweight women (25.0-29.9 kg/m²) between 7 and 11.5kg, obese women (≥ 30.0 kg/m²) between 5 and 9 kg, and underweight women (< 18.5 kg/m²) between 12.5 and 18 kg. There is evidence that gestational weight gain within these IOM's recommendations are associated with lower rates of adverse pregnancy outcomes including caesarean section, gestational hypertension, low birthweight (LBW), and macrosomia in Western populations.²³ A healthy pregnancy is largely dependent on maternal nutrition. There are recommendations for appropriate gestational weight gain to limit the risk of adverse pregnancy outcomes. However, the knowledge of these recommendations for gestational weight gain and adverse obstetric effects of being overweight or obese is poor in the study area, resulting in few women gaining the appropriate weight during their pregnancies.

However, it is believed that there is a critical need for effective personal and public health initiatives designed to decrease pre-pregnancy weight and optimize gestational weight gain^{20,14}. Many women are unaware of the risks of excess weight in pregnancy and appropriate weight gain for pregnancy. This may be exacerbated by the fact that a large number of women are not being weighed in early pregnancy, and that many women are not aware of their true body size, with the vast majority of overweight and obese women underestimating their body size. Although, a previous study in Sokoto, Nigeria (the study area) had established a strong positive correlation ($r = 0.607$, $p < 0.001$) between maternal BMI at booking and the birth weight of babies¹² the prevalence of obesity among pregnant women, and pattern of gestational weight gain in pregnancy have never been assessed; hence the need for this study. The findings of this study will help determine the disease burden and its impact on pregnancy and perinatal outcomes. It will also help in drawing up an appropriate management protocol for this group of patients.

II. Materials And Methods

Study Design, Population and Area A prospective study was conducted among pregnant women attending the Antenatal Clinic (ANC) of Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria, from December 2015 to November 2016. All consenting pregnant women whose gestational age was ≤ 13 weeks, and without any co-morbidity were considered eligible for enrollment into the study. Those with co-morbidities such as previous caesarean section, heart disease and diabetes mellitus were excluded.

Sample Size Estimation, Sampling Technique and Data Collection

The sample size was statistically estimated at 281 and eligible participants were selected by convenient sampling as they present consecutively at the clinic until the desired sample size was obtained. The methods of data collection comprised personal interview and physical assessment. A semi-structured interviewer administered questionnaire was used to obtain information on the research variables. Face and content validity was established to validate the instrument. The reliability of the instrument was established using the test-retest method. The questionnaire and the other instrument for the study were pretested on 30 pregnant women attending

the antenatal clinic after the training of the research assistants (nurses at the ANC and Gynaecological emergency clinics of the hospital) on the objectives of the study, selection of participants and use of survey instrument, in order to check the feasibility of use, and familiarize the research assistants with the instrument. The booking weight and height of the participants were taken and recorded. Regular monitoring of maternal weight at each visit using the traditional method of ANC was done subsequently, and they were followed up till delivery and two weeks postpartum. Weight was measured with shoes off to the nearest 0.5kg using a Salter ultra slim black glass electronic scale; it was validated with a standard weight and corrected for zero error. The participants were weighed in light clothing; coats, jackets and shoes were removed. Handbags, pockets containing money or keys were emptied and any heavy jewelry removed. Height was measured without shoes to the nearest 0.5cm using a stadiometer. Body mass index (BMI) was calculated as weight (kg) divided by height² (m²) and used as marker for abnormal BMI status¹³. Underweight was defined as BMI less than 18.5kg/m², normal weight was defined as BMI of 18.5 to 24.9kg/m², overweight was defined as BMI of 25.0 to 29.9kg/m², while obesity was defined as BMI of 30.0kg/m² and above. The study participants' body mass index was computed at 38 weeks gestation, in labour (for those that came in first stage of labour), and at 2 weeks postpartum. Also, neonatal birth weight, APGAR scores and any anomaly noted were recorded.

Data Analysis Data

were analyzed using IBM SPSS version 20 computer statistical software package. Quantitative variables were summarized using mean and standard deviation, while qualitative variables were summarized using frequencies and percentages. Frequency distribution tables were constructed; and cross tabulations were done to examine the relationship between categorical variables. The chi-square test was used to compare differences between proportions. All levels of significance were set at $p < 0.05$.

Ethical Consideration

Institutional ethical clearance was obtained from the Research and Ethical Committee of Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria. Informed consent was also obtained from the participants before questionnaire administration.

III. Results

Socio-demographic characteristics of participants Two hundred and sixty-three (93.6%) of the 281 participants recruited into the study completed it; 8 (2.8%) had spontaneous miscarriages during the antenatal period, while 10 (3.6%) did not complete antenatal care with the institution and eventually had home deliveries. The ages of the participants ranged from 17-42 years (mean = 26.84 ± 5.35 years), and majority of them (65.4%) were aged 21-30 years. Majority of participants belong to Hausa/Fulani ethnic group (73.0%), had at least secondary education (89.4%), were unemployed (63.0%), and were primigravidae (59.7%) as shown in Table 1.

Table I: Sociodemographic and Obstetrics characteristics of the respondents

Variables	Frequency(n)	Percentage (%)
Age(years)		
16-20	31	11.8
21-25	92	35.0
26-30	80	30.4
31-35	42	16.0
36-40	15	5.7
40 and above	3	1.1
Total	263	
Parity		
Primigravidae	157	59.7
Multigravidae	90	34.2
Grandmultipara	16	6.1
Total	263	
Tribe		
Hausa/Fulani	196	73.0
Yoruba	18	6.8
Igbo	16	6.1
Others	37	14.1
Total	263	
Occupational Status		
Civil Servant	54	20.5
Business Woman	16	6.1
Unemployed	166	63.1
Student	27	10.3
Total	263	

Educational Status			
Primary	17	6.5	
Secondary	93	35.4	
Tertiary	142	54.0	
Others	11	4.2	

Participants' BMI status at booking

The mean weight of the respondents at booking was 68.59 ± 16.05 kg while the mean height at booking was 158.26 ± 5.36 meters. The range of their weights and heights were 36 to 153 kg and 147 to 177 meters respectively.

The mean BMI at booking was 27.53 ± 6.57 with a range of between 14.98 to 72.10 kg/m^2 .

Among the respondents, 75(28.5%) were Obese while 7(2.7%) were Underweight. Of the Obese women 48(64%) had mild obesity, 17(22.7%) moderate obesity and 10(13.3%) had severe or morbid obesity.

	Characteristics	Frequency(n)	Percentage (%)
BMI	Underweight	7	2.7
	Normal	91	34.6
	Overweight	90	34.2
	Obese	75	28.5
	Mild Obesity	48	64.0
	Moderate	17	22.7
	Morbid or severe Obesity	10	13.3

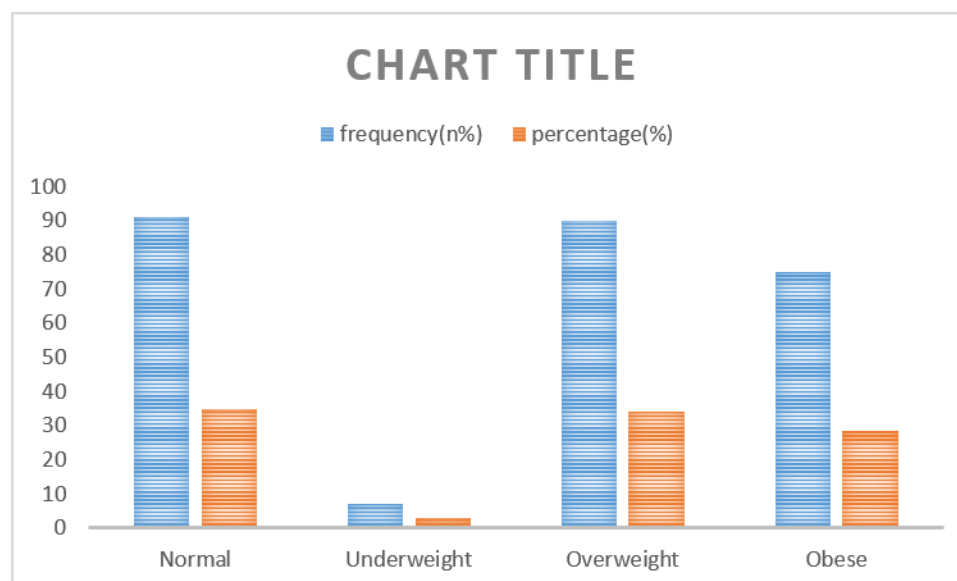


Figure 1: Participants' BMI status at booking

Weight gain in pregnancy among participants

The weight gain in pregnancy among the participants ranged from 5.0 to 19.0kg (mean = 9.86 ± 2.84 kg). The mean weight gain increased progressively from 2.74 ± 1.81 kg in the first trimester to 3.79 ± 1.62 kg in third trimester. Also, the mean weight gain in pregnancy was highest among participants with overweight (3.05 ± 0.55 kg) and least among participants with underweight (2.41 ± 0.73) as shown in Table 2.

Table 2: Mean weight gain in pregnancy among participants		
Variables		Mean $\pm$ SD
	Trimester	
First		2.74 ± 1.81
Second		3.14 ± 1.32
Third		3.79 ± 1.62
	Maternal BMI status	
Underweight		2.41 ± 0.73
Normal		3.02 ± 0.54
Overweight		3.05 ± 0.55
Obese		2.99 ± 0.76

	Primigravida	Multigravida	Grandmultipara	$\chi^2 = 14.586$ $p = 0.024$
	(n = 157)	(n = 90)	(n = 16)	
	Frequency (%)	Frequency (%)	Frequency (%)	
Underweight	5 (3.2) *	2 (2.2)	0 (0)	
Normal	66 (42.0)	20 (22.2)	5 (31.25)	
Overweight	52 (33.1)	34 (37.8) *	4 (25.0)	
Obese	34 (21.7)	34 (37.8)	7 (43.75) *	

Table 3: Distribution of respondents' BMI status by parity**BMI status Parity Test of significance**

*Statistically significant

IV. Discussion

This study determined the prevalence of obesity and assessed the pattern of gestational weight gain in pregnancy. The relatively young population of participants in this study with a mean age of 26.84 ± 5.35 years could be due to the fact that the study was conducted among women of reproductive age group; and the preponderance of Hausa/Fulani ethnic group among them essentially reflects the population distribution in the study area. The 28.5% prevalence of obesity among the participants in this study is quite high, and it is by far higher than the findings in studies conducted in many developed countries including United Kingdom (10.9%)¹⁹ and Australia (11.0%)²⁰. Although, whereas studies conducted in developing Asian countries including Iran, generally reported lower BMI as compared to developed countries, a study conducted among pregnant women in Saudi Arabia¹¹ reported > 52% prevalence of overweight, obesity and extreme obesity. The wide variations in the prevalence of obesity among pregnant women across the globe could be due to variations in dietary habits and lifestyle, and these are also influenced by socioeconomic and cultural factors. The findings of significantly higher prevalence of underweight among the primigravida, overweight among the multigravida, and obesity among the grandmultipara in this study are in agreement with the findings in other studies; and it has been found that multiparous and grandmultiparae gain more weight with each successive pregnancy, and common medical disorders in pregnancy that can cause poor appetite are commoner in primigravidae. Also, in addition to the tendency to gain weight with each pregnancy, parous women tend to retain more of the weight gained during pregnancy^{21,22}. Whereas, there was no uniform pattern in weight gain with respect to the participants' BMI status at booking, the mean weight gain increased progressively from 2.74 ± 1.81 kg in the first semester to 3.79 ± 1.62 kg in the third trimester among the participants in this study, and it could be due to the increasingly sedentary lifestyle often indulged in by pregnant women as pregnancy advances. Although, the weight gain among the participants in this study (ranging from 5 to 19kg, and with a mean weight gain of 9.86 ± 2.84 kg) is less than the 11.79 ± 5.31 kg average weight gain reported in a study by ²² and 10.7 ± 3.4 kg reported in South-East Nigeria²³, it is clearly above the 7kg optimal weight gain in pregnancy recommended by the Society of Obstetricians and Gynecologist of Canada, and slightly higher than the 9kg maximum weight gain recommended for obese women by the Institute of Medicine and Health, Canada^{24,25}. Studies have previously shown a relationship between a higher pre-pregnancy weight and excessive weight gain during pregnancy, which is in keeping with our findings²⁶. These findings confirm the relevance of regular weight monitoring in pregnancy, particularly in the developing countries, and they underscore the need for healthcare providers to provide pregnant women with comprehensive information regarding appropriate weight gain during pregnancy^{2,27,28}. However, while controlling weight gain to 7kg or less, (including weight loss and no weight gain), has been associated with reduced rates of macrosomia, pre-eclampsia, caesarean section and other adverse outcomes, the safety of weight loss and maintenance during pregnancy is yet to be determined^{24,25}.

Also, pre-conception care is considered to be very important, and it is believed that obese women may benefit from pre-pregnancy counseling regarding specific problems associated with obesity in pregnancy and advised to aim for a moderate weight loss prior to conception. Although, few data exist on the effects of pre-pregnancy weight loss on maternal and fetal outcomes, epidemiological studies have indicated that even a modest reduction of 10 pounds can reduce the risk of gestational diabetes and caesarean section among obese women.^{29,30}

It is therefore imperative for health care providers to promote healthy eating, regular physical activity, and achievement of optimal gestational weight gain among pregnant women. It has been recommended that the pre-pregnancy BMI and booking BMI should be recorded at the first visit in the first trimester, followed by regular monitoring of gestational weight gain throughout the pregnancy^{31,28}. Also, the woman should be counseled regarding the implications of obesity on the course of pregnancy and its outcome, and the proposed care plan to address the implications; and the discussion should be clearly documented. It is believed that she is likely to benefit from consistent support and advice regarding preventing excess weight gain (supported by written

information); and regular visits to the dietician, incorporating dietary and healthy lifestyle advice including exercise may also be beneficial.^{31,32}

V. Conclusion

Abnormal BMI conditions including underweight, overweight and obesity were very prevalent among the participants in this study, and with adverse maternal and fetal outcomes being more common among those with the conditions. These findings underscore the need for antenatal care providers to consistently educate their clients on the importance of adequate nutrition and optimal weight gain in pregnancy.

Acknowledgements

The authors appreciate the Management of Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria, for giving the permission to conduct the study. The Head of Department of Obstetrics and Gynecology, UDUTH, Sokoto, Nigeria, the staff of the Antenatal Clinic, and all the pregnant women that participated in the study are also appreciated for their cooperation.

Source of support

Nil.

Conflict of interest

None declared.

References

- [1]. Shaban MM, Bassiouny YA, Elzahaby IM, Hassan AA. Body Mass Index And Labour Outcome In Egyptian Women. *J Obstet Gynaecol* 2014; 34(3): 248-50.
- [2]. Rozlan N, Abd Majid HAM, Abas SS, Danis A, Isa KAM. The Association Of Gestational Weight Gain And The Effect On Pregnancy Outcome Defined By BMI Group Among Women Delivered In Hospital Kuala Lumpur (HKL), Malaysia: A Retrospective Study. *Asian J Clin Nutr* 2012; 4(4):160-7.
- [3]. World Health Organization (WHO) Obesity: Preventing And Managing The Global Epidemic. Report Of A WHO Consultation (WHO Technical Report Series 894). Geneva, Switzerland, WHO; Available At: <http://www.who.int/nutrition/publications/obesity/WHO/TRS/894/en/> 2003. [Last Accessed On 2018 August 24].
- [4]. Pasquali R, Gambineri A, Pagotto U The Impact Of Obesity On Reproduction In Women With Polycystic Ovary Syndrome. *BJOG* 2006; 113(10): 1148-59.
- [5]. World Health Organization (WHO). Obesity And Overweight. Key Facts. Geneva, Switzerland: WHO; Available From: <https://www.who.int/en/news-room/factsheet/detail/obesity-and-overweight>. [Last Accessed On 2018 August 24].
- [6]. Its American Council On Science And Health. Obesity And Health Effects. Available At: <https://www.acsh.org/news/2008/12/02/obesity-and-its-health-effects> [Last Accessed On 2018 August 24].
- [7]. Battacharya S, Campbell DM, Liston WA, Battacharya S. Effect Of Body Mass Index On Pregnancy Outcomes In Nulliparous Women Delivering Singleton Babies. *BMC Public Health* 2007; 7:168
- [8]. Morgan KL, Rahman MA, Macey S, Atkinson MD, Hill RA, Khanom A Et Al. Obesity In Pregnancy: A Retrospective Prevalence-Based Study On Health Service Utilisation And Costs On The NHS. *BMJ Open* 2013; 4(2): E003983.
- [9]. Chigbu CO, Aja LO. Obesity In Pregnancy In Southeast, Nigeria. *Ann Med Health Res* 2011; 1(2): 135-140.
- [10]. Ado VN. Body Mass Index, Weight Gain During Pregnancy And Obstetrics Outcomes. *Ghana Med J* 2010; 44(2): 64-9.
- [11]. Wahabi HA, Fayed AA, Alzeidan RA, Mandil AA. The Independent Effects Of Maternal Obesity And Gestational Diabetes On The Pregnancy Outcomes. *BMC Endocr Disord* 2014; 14: 47.
- [12]. El-Gilany A, El-Wehady A. Prevalence Of Obesity In A Saudi Obstetric Population. *Obesity Facts* 2009; 2: 271-220.
- [13]. Singh S, Shehu CE, Nnadi DC. The Relationship Between Body Mass Index And The Birthweight Of Neonates In North-West Nigeria. *Sahel Med J* 2016; 19: 185-9.
- [14]. Tsigos C, Hainer V, Basdevant A, Finer N, Fried M, Maths-Vliegen E Et Al Management Of Obesity In Adults: European Clinical Practice Guidelines. *Obesity Facts* 2008; 1(2): 106-116.
- [15]. Gaudet L, Ferraro ZM, Wen SW, Walker M. Maternal Obesity And Occurrence Of Fetal Macrosomia: A Systematic Review And Meta-Analysis. *Biomed Res Int* 2014; Volume 2014, Article ID 640291, 22 Pages.
- [16]. Usha KTS, Hemmadi J, Bethel J, Evans J. Outcome Of Pregnancy In A Woman With An Increased Body Mass Index. *BJOG* 2005; 112(6): 768-72.
- [17]. Catalano PM, Ehrenberg HM. The Short- And Longterm Implications Of Maternal Obesity On The Mother And Her Offspring. *BJOG* 2006;113(10): 1126-33.
- [18]. Ola E, Haruna M, Suzuki M, Anh DD, Tho Le H, Tam NT Et Al. Maternal Body Mass Index And Gestational Weight Gain And Their Association With Perinatal Outcomes In Viet Nam. *Bull World Health Organ* 2011; 89(2):127-36.
- [19]. Zaheri F, Shahoai R, Afkhamzadeh A, Khosravy F, Ranei F. The Effect Of Pre-Pregnancy Body Mass Index And Gestational Weight Gain On Pregnancy Outcomes. *Life Science J* 2013; 10(6s): 662-668.
- [20]. Ovesen P, Rasmussen S, Kesmodel U. Effect Of Pre-Pregnancy Maternal Overweight And Obesity On Pregnancy Outcome. *Obstet Gynaecol* 2011; 118(2 Pt 1): 305-12.
- [21]. Ali HS, Lakhani N. Effect Of Obesity And Its Outcome Among Pregnant Women. *Pak J Med Sci* (2011); 27(5):1126-28.
- [22]. Anzaku AS, Peter AA, Otuoichinma AG, Nyam YE. Prevalence And Risk Factors For Obesity In A Nigerian Obstetric Population. *Am J Health Res* 2014; 2(5): 229-233.
- [23]. Bautista-Castano I, Henriquez-Sanchez P, Aleman-Perez N, Garcia-Salvador JJ, Gonzalez-Quesada A, Garcia-Hernandez JA Et Al. Maternal Obesity In Early Pregnancy And Risk Of Adverse Outcomes. *Plos One* 2013; 8(11): E80410.