The association between Body Mass Index and the spontaneous abortion in the first trimester of pregnancy

Eman Ali Slayman [*], **Sahar Taher Hassan** [*]

Department of Obstetrics and Gyncology, Tishreen University, Faculty of Medicine, Lattakia, Syria.

Abstract- **Background:** Pre-pregnancy Body Mass Index is believed to be an important indicator of pregnancy outcomes. Being underweight or overweight before pregnancy may affect negatively on pregnancy in multiple complications, and first trimester miscarriage is one of these negative complication. Because of there is not any search that has been suddied this subject in Syria before, we planned to perform this study on a sample of women who experienced first trimester miscarriage.

Objective: evaluation the association between Body Mass Index and the first trimester miscarriage.

Material and methods: This prospective observational study was conducted at Department of Obstetric and Gyncology in Tishreen University Hospital in Lattakia, Syria and was started in February 2021 and ended in February 2022. We measured BMI of women prior to pregnancy, and we followed pregnant women during first trimester , then we contrasted two groups (the first included women who have experienced first trimester miscarriage , and the second included women who haven't experienced it)

Result: The incidence of underweight, overweight and obesity was higher in group with miscarriage versus the group without it, p value =0.0001, 0.02, 0,001 respectively

Material and methods: This prospective observational study was conducted at Department of Obstetric and Gyncology in Tishreen University Hospital in Lattakia , Syria and was started in February 2021 and ended in February 2022. We measured BMI of women prior to pregnancy, and we followed them during this period , then we contrasted two groups (the first included women who have experienced first trimester miscarriage, and the second included women who haven't experienced it) .

Result: The incidence of underweight, overweight and obesity was higher in group with miscarriage versus the group without it, p value =0.0001, 0.02, 0,001 respectively.

Index Terms- first trimester miscarriage, BMI, underweight , overweight, obesity.

I. INTRODUCTION

First Trimester)early pregnancy loss was described by national organizations as a nonviable, intrauterine pregnancy within the first trimester (up to 12+6 weeks using date of last menstrual period). [1] It is a wide terminology that includes anembryonic pregnancy and pregnancy with embryo or fetus with negative cardiac activity.[1]The incidence rate of early pregnancy loss is high as 31% of pregnancies, while It decreases to 10% in clinically diagnosed pregnancies. [2] Chromosomal abnormalities are found in 60% of miscarriages ,and the most frequent type is autosomal triploidy .[3]Maternal age, BMI and black ethnicity are risk factors of miscarriage.[3] This association is because advanced age increases in the frequency of embryonic trisomies, particularly trisomies on chromosomes 13, 14, 15, 16, 18, 20, 21, and 22.[3] Abnormal Body Mass Index have been shown to increase the risk of miscarriage in a number of studies.[4-5] Because there is not any Syrian search has been evaluated the association between BMI and early pregnancy miscarriage, we planned to study this subject on a sample of women in Tishreen University Hospital in Lattakia , Syria.

II. MATERIAL AND METHODS:

The current study has been designed to be prospective observational study including 270 women who recruited in the first trimester of pregnancy. Information regarding age , parity, previous abortion and smoking has been obtained from all participiants. In addition ,height and weight of each women was obtained in order to calculate pre-pregnancy Body Mass Index according to formula $bmi=weight\ (kg)/height\ (m)^2$. Then we followed them during this period , 210 women have not experienced miscarriage and 60 women have experienced it. We conducted this study at the Department of Obstetric and Gyncology in Tishreen University Hospital, Lattakia, Syria ,from February 2021 to February 2022.We approved this study by institutional ethical approval committee and after obtaining verbal consent from all women subjected to the current study following full illustration of the purpose and methodology of current study. Data were then transferred into an SPSS (version 20) spread sheet for statistical analysis .Microsoft Office Excel 2010 was also used for this purpose. We expressed variables were as mean, standard deviation ,whereas, categorical variables were expressed by number and percentage .To evaluate association between categorical variables ,Chi-square and Fischer exact tests were used. Difference in mean between two groups was evaluated using independent sample t- test.

III. RESULT AND DISCUSSION:

Distribution of women in two study groups (women with first trimester miscarriage and women without miscarriage) according to BMI, previous abortion exhibited significant difference (p value 0.0001,0.001) respectively. table 1-2

However, distribution according to the parity (nulliparous, multiparous) did not exhibit significant difference pvalue=0.6.(Table 3)

Distribution according to age exhibited significant difference (p value=0.005), especially age up to 35 year.(Table 4)

These results confirm that maternal age , previous spontaneous abortion are risk factors of spontaneous abortion. In addition confirming that abnormal pre-pregnancy BMI (underweight, overweight and obesity) has a significant risk of the early pregnancy miscarriage.

Table(1-2)

BMI	Abortion group	Non abortion group	P value	P value
<18.5kg/m2	4(6.7%)	7(3.3%)	0.0001	
18.5-24.9kg/m2	26(43.3%)	155(73.8%)	Refrence group	0.001
25-29.9kg/m2	18(30%)	31(14.8%)	0.02	
>30 kg/m2	12(20%)	17(8%)	0.001	

Search group	Abortion group	Non abortion group	P value
Previous abortion	52(86.7%)	77(36.7%)	0.0001
No previous abortion	8(13.3%)	133(63.3%)	

Table3

Search group	Abortion group	Non abortion group	P value
Nulliparous	20(33.3%)	72(34.3%)	0.6
Multiparous	40(66.7%)	138(65.7%)	

Table4

Age range (year)	Abortion group	Non abortion group	P value
18-25	18 (30%)	77 (36.7%)	
25-35	35(58.3%)	130(61.9%)	0.005
>35	7(11.7%)	3(1.5%)	
Mean SD	31.9+-3.7	26.2+-4.2	0.02

Multiple studies have studied the association between Body Mass Index and the risk of miscarriage. A large Chinese study that included 536 098 pregnant ladies, it was found that both obesity and underweight associated significantly with

miscarriage.[4]These findings support the finding of the current study. Another case-control study in Al-Diwania , Iraq on 100 pregnant women found the incidence rates of underweight and overweight were significantly higher in abortion group(study group) versus control group(women with uneventual pregnancies that is at near or full term),10% versus 1.7% and 40% versus 23.3% respectively (p-value<0.05).[6]We agree with Iraqi study that underweight and overweight are risk factors of spontaneous miscarriage. A systemic review and meta-analysis on association of pre-pregnancy underweight and miscarriage , in Spain 2016 found that the risk of clinical miscarriage increased slightly in underweight and overweight women, but was higher in obese women.[7]We agree with Spanish study. The exact mechanism of obesity that increase the risk of miscarriage is unknown. One mechanism is that obesity is associated with unfavourable milieu that affect endometrium, and oocyte.[8] One potential mechanism for oocyte organelle damage in obesity is lipotoxicity. [9]Also, chronic Immunological changes that are linked to obesity play a role in miscarriage. For example, elevated C-reactive protein (CRP) and interleukin-6(IL-6) in obese women with miscarriage ,[10-11] and this chronic inflammation causes impairing implantation and placentation, in addition to pregnancy complications[12].

On other hand, underweight women are prone to nutritional deficiencies that may increases maternal susceptibility to infection because of less optimum immune responses.[13]As well as, low leptin levels in underweight women play a role in increased miscarriage risk.[14]

Lastly we believe that we need more researches to study this correlation between pre-pregnancy BMI and first trimester miscarriage and its mechanisms. Also, we need to encourage women to modify their weight to be in the normal range as possible to maintain healthy reproductive system.

IV.   CONCLUSION:

Abnormal Body Mass Index is an important risk factor of early pregnancy miscarriage.

REFERENCES

[1]   1-National Institute for Health and Clinical Excellence. Ectopic pregnancy and miscarriage: diagnosis and initial management. NICE Clinical Guideline 154. Manchester (UK): NICE; 2012. www.nice.org.uk/guidance/cg154 (Accessed on March 12, 2019).)

[2]   2-Magnus MC, Wilcox AJ, Morken NH, et al. Role of maternal age and pregnancy history in risk of miscarriage: prospective register based study. BMJ 2019; 364:l869.

[3]   3-Hardy K, Hardy PJ, Jacobs PA, Lewallen K, Hassold TJ. Temporal changes in chromosome abnormalities in human spontaneous abortions: results of 40 years of analysis. Am J Med Genet A 2016; 170: 2671–80.

[4]   4-Pan, Yi, et al. "Investigating the association between prepregnancy body mass index and adverse pregnancy outcomes: a large cohort study of 536 098 Chinese pregnant women in rural China." BMJ open 6.7 (2016): e011227.

[5]   5-Helgstrand S, Andersen AM. Maternal underweight and the risk of spontaneous abortion. Acta Obstet Gynecol Scand. 2005;84:1197–1201.

[6]   6-Mutar Al-Gassar, Suad Abdulzahra, Nibras Naser Hasan, and Lina Muhssen Atyia. "The Association between Abnormal Body Mass Index and First Trimester Spontaneous Abortion in Iraqi Women: Case Control Study." Indian Journal of Public Health Research & Development 10.6 (2019).

[7]   7-Balsells, Montserrat, Apolonia García-Patterson, and Rosa Corcoy. "Systematic review and meta-analysis on the association of prepregnancy underweight and miscarriage." European Journal of Obstetrics & Gynecology and Reproductive Biology 207 (2016): 73-79.

[8]   8-Cheong, Y., Sadek, K. H., Bruce, K. D., Macklon, N. & Cagampang, F. R. Diet-induced maternal obesity alters ovarian morphology and gene expression in the adult mouse offspring Fertil. Steril. 102, 899–907 (2014).

[9]   9-Sorensen TI, Virtue S, Vidal-Puig A. Obesity as a clinical and public health problem: is there a need for a new definition based on lipotoxicity effects? Biochim Biophys Acta 2010;1801:400–4.

[10]   10-Giannini, D. T., Kuschnir, M. C. C., de Oliveira, C. L. & Szklo, M. Waist-to-height ratio as a predictor of C-reactive protein levels. J. Am. Coll. Nutr. 36, 624–630 (2017).

[11]   11-Sindhu, S. et al. Obesity is a positive modulator of IL-6R and IL-6 expression in the subcutaneous adipose tissue: Significance for metabolic inflammation. PLoS ONE 10, 0133494. https:// doi. org/ 10. 1371/ journal. pone. 01334 94 (2015).

[12]   12-Triunfo, S. & Lanzone, A. Impact of overweight and obesity on obstetric outcomes. J. Endocrinol. Investig. 37, 323–329(2014).

[13]   13-Allen LH. Biological mechanisms that might underlie iron's effects on fetal growth and preterm birth. J Nutr 2001;131:581S–9S.

[14]   14-Bolumar F, Olsen J, Rebagliato M, Saez-Lloret I, Bisanti L. Body mass index and delayed conception: a European Multicenter Study on Infertility and Subfecundity. Am J Epidemiol. 2000;151(11):1072–9

AUTHORS

First Author – Eman Ali Slayman, Department of Obstetrics and Gyncology, Tishreen University, Faculty of Medicine, Lattakia, Syria., Eaman.obs@gmail.com, +963 932 632 589.
Second Author – Sahar Taher Hassan, Department of Obstetrics and Gyncology, Tishreen University, Faculty of Medicine, Lattakia, Syria.