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## The Effect of Multivitamins on the Weight Gain of Pregnant Women with Singleton Pregnancy

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### ABSTRACT

One of the most effective factors during pregnancy is nutrition. Multivitamins not only supply mothers' nutrition needs but also affect the health of fetus. On the other hand, weight gain influence the normal health of both the mother and the fetus during the process of pregnancy. The present research intended to investigate the effect of multivitamins on the weight gain of pregnant women with singleton pregnancy, possessing different socio-economic status, as well as the effects of socio-economic factors on the same variable. To this end, 150 pregnant women were studied from week 17 through 37 referring to the Perinatology clinic of Emam Hospital in Sari. The participants were randomly divided into two groups. Then, the demographic data including personal and socio-economic information were recorded. Afterwards, one group was given multivitamin pills while the other group received placebo pills in a daily manner up to week 37. Accordingly, their weight gain was recorded and data were analysed using SAS statistical software. In order to compare the Mean of the aforementioned variables, t-student test and Least Square (LS) means were used. Generalized Linear Model (GLM) analysis method was used to investigate the effect of studied factors on the aforementioned variables. Furthermore, Pearson Correlation between the variables was calculated. According to the results, the weight gain of mothers in control and case (experimental) groups indexed 13.63 and 9.39 kilograms respectively during 20 weeks indicating that there was a statistically significant difference ( $P < 0.05$ ) between the groups. The results of Linear Model showed that none of the variables had any statistically significant effect on weight gain of pregnant mothers. However multivitamin consumption, fathers'

occupation and salary were more effective variables. The Pearson Correlation between the variables was calculated showing that there was a statistically significant correlation between mothers' BMI and weight gain. Consequently, weight gain during pregnancy, in mothers with normal BMI who took multivitamins, was less in comparison to the placebo group. It seems that multivitamins prevent abnormal weight gain in pregnant women by regulating energy and other nutrients metabolism.

**KEYWORDS:** Weight Gain; Pregnancy; Multivitamins; Body Mass Index (BMI).

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## INTRODUCTION

Several various factors affect pregnancy process and outcomes. One of the most effective factors during pregnancy is mothers' nutrition (Shabert, 2004). Nutrition affects not only mothers' health but also the pregnancy process and fetal growth [1-4].

Mother's weight should increase as the fetus and its placenta grows during pregnancy. The degree of mothers' weight gain during pregnancy is calculated with respect to their BMI before pregnancy (The American college of obstetricians and gynecologists, 2011). In a singleton pregnancy with normal BMI (18.5-24.8), the weight gain is 11.5 – 16 kg that is this degree is 0.4 kg per week from week 12 onwards. Mothers' BMI and weight gain is associated with infants' birth weight [4-6].

A healthy diet ensures the health of mother and fetus as well as a successful delivery for mothers [7]. A healthy diet includes sufficient energy, protein, mineral and vitamins gain whose deficiency, excess or imbalance would cause adverse effects. A pregnant woman needs to receive more vitamin during pregnancy. The effect of some vitamins such as Folic Acid before pregnancy has been proven to reduce the degree of Neural Tube Defects (NTD) during pregnancy. Prescribing vitamin supplements are necessary for pregnant women at risk such as pregnant adolescents, multiple pregnancies, short inter-pregnancy intervals/spacing, low weight birth, vegetarian diet, and nutrient deficiencies [1,7]. Routine use of multivitamins is not recommended for all pregnant women since all essential vitamins are supplied with a sufficient nutrition and healthy diet. The increase of some vitamins especially fat soluble vitamins have adverse effects on the health of mother and fetus. The high intake of some vitamins such as vitamin A has teratogenic effects.

On the other hand, taking multivitamins and essential minerals can decrease the adverse effects of pregnancy. Zerfu found that the intake of trace minerals reduces low birth weight [8]. Multivitamin intake in women with low BMI can enhance fetal condition and high birth weight by improving energy metabolism as well as protein and mineral absorption [9].

A study on pregnant women with HIV showed that multivitamin intake during pregnancy leads to mothers' weight gain and high birth weight while it can decrease the risk of intrauterine fetal death; this effect was attributed to the improved immunological profile [10,11].

Considerable attentions, nowadays, have been given to the role of multivitamins on weight loss programs. Yli found that the intake of multivitamins and minerals causes weight loss and regulates lipid profile as the result of regulating the lipid and energy metabolism [12]. Consequently, the current research was an attempt to investigate the effect of multivitamins on the weight gain of pregnant women with singleton pregnancy, the results of which were compared with the control group.

### METHODOLOGY

This study was a clinical-trial research which studied pregnant women referring to Gynecology Clinic in Sari from July 2011 to September 2012. According to the preceding studies and statistics experts, 150 pregnant women were studied during their early 10 weeks of pregnancy who participated in this study after the purpose of the project had been explained to them and ensuring them the confidentiality of the information. The exclusion criteria included multiple pregnancy, age below 16 and above 40, disease such as diabetes, cardiovascular disease, blood pressure, drug use, addiction to smoking and inter-pregnancy spacing less than 18 months.

Nonetheless, the pregnancy status, previous pregnancies, infertility, and the number of pregnancies were recorded as well. All the pregnant women received regular prenatal care. The subjects (pregnant women) were randomly assigned to group A and B from week 17. Furthermore, group A was given multivitamin pills while the group B received Placebo pills for a daily intake from week 17 to 37 of pregnancy. Multivitamin pills contained essential vitamins according to FDA whose compound is presented Table 1. The subjects of the study referred to the clinic every four weeks up to week 28 and both the mother and the fetus were weighed and received prenatal cares.

The subjects were excluded from the study if either the mother or the fetus suffers from complications such as Pre-eclampsia, premature/pre-labor rupture of membranes (PROM) and fetal anomalies. The prenatal cares were given to the subjects every two weeks from week 28 to 36, and every week from week 36 onwards. Meanwhile, if the subjects endured weight gain higher than 0.5 kg per week, they were sent for pre-eclampsia examinations and were followed up; in case of pre-eclampsia, the subjects were excluded from the study. In addition, the demographic information such as age, number of pregnancies, number of children, parent's education and occupation, father's second job, salary, place of residence (urban or rural), housing status (private or leased) were recorded.

Since there were not any standard definition for qualitative variables to categorize economic status, a definition was given to these items, as follows, with the help of epidemiology and statistics experts. It was assumed that families with two children or less, steady job, private housing and sufficient monthly income had a good economic status; whereas, families with more than two children, with no steady job and no private housing and insufficient income had poor economic status. Families falling between these two categories were considered to have a moderate economic status. Other qualitative variables including education, occupation and place of residence were ranked.

Data were statistically analyzed using SAS statistical software after being entered in MS Excel [13]. The effects of multivitamins and placebo pills on the weight gain of pregnant women were compared using t-test; then, LS-means method was used to compare the means of the aforementioned variables. Generalized Linear Model (GLM) analysis method was used to investigate the effect of studied factors on the aforementioned variables. To this end, with respect to the correlation between the variables, some were considered as main variables while others were regarded as covariate variables; accordingly, those variables with significant effects were compared using LS-means method [13,14]. Pearson correlation between mother's age and BMI before pregnancy and mother's weight gain during pregnancy, and other variables were calculated, the significance level of each was, hence, determined.

**Table -1: The Compound of Multivitamin Pills**

Vitamin	Unit	Quantity
A	I.U.	5000
D <sub>3</sub>	I.U.	400
E	I.U.	30
C	mg	60
Thiamine	mg	1.5
Riboflavin	mg	1.7
Niacin	mg	20
B <sub>6</sub>	mg	2
Pantothenic Acid	mg	10
Biotin	mcg	50
Folic Acid	mcg	400
B <sub>12</sub>	mcg	6

## RESEARCH RESULTS

The mean and the standard deviation of age and BMI of the subjects are presented in Table 2 hereunder:

**Table-2: The Mean of Main Characteristics of the Subjects**

Variables	Mean $\pm$ SD
BMI	25.83 $\pm$ 5.006
Age (year)	26.95 $\pm$ 4.861

The results of the comparison between the BMI and the Mean of mother's weight gain are given in Table 3 below. The weight gain of mothers in control group was significantly higher than the mothers in case group who took multivitamin ( $P < 0.05$ ).

**Table-3: The Comparison between the BMI and the Mean of mother's weight Gain (Kg.) in both Control and Case Groups.**

Variable	Control Group	Case Group	Sig. Level
	Mean $\pm$ SD	Mean $\pm$ SD	
BMI	24.93 $\pm$ 0.87	25.07 $\pm$ 0.93	0.08 <sup>ns</sup>
Mother's Weight Gain	13.63 <sup>b</sup> $\pm$ 0.81	9.39 <sup>a</sup> $\pm$ 0.84	0.03 <sup>*</sup>

\*The unlike letters indicate the statistically significant difference.

The results of Linear Model analysis of the effect of studied variables on mother's weight gain is presented in Table 4. In this model, some variables, independent of characteristics, were considered as the main variables while mother's BMI and age which correlated with weight gain were accounted as covariate variables.

**Table 4: The Effect of Studied Variables on the Weight Gain during Pregnancy.**

Variables	Sig. Level
<b>Main Variables</b>	
Multivitamin Intake	0.0953
Number of Pregnancy	0.7773
Number of Children	0.8998

Education	0.4766
Occupation	0.2616
Father's Education	0.5000
Father's Occupation	0.8680
Father's Second Job	0.5832
Place of Resident	0.1771
Housing Status	0.7242
Salary/income	0.2020
<b>Covariate Variable</b>	
Age	0.6594
BMI	0.1860

According to the results given above, none of the aforementioned variables had any statistically significant effect on weight gain during pregnancy. Pearson Correlation between mother's age, BMI, weight gain, and other variables is presented below in Table 5.

**Table-5: The Correlation between Studied Variables and their Significance Level.**

Variable	Pregnancy Weight Gain		Age		BMI	
	Correlation	Sig. Level	Correlation	Sig. Level	Correlation	Sig. Level
Age	-0.106	0.422	1		0.78	0.555
Mother's BMI	-0.263*	0.043	0.78	0.555	1	
Number of Pregnancy	-0.188	0.151	0.392**	0.002	0.162	0.217
Number of Children	-0.227	0.81	0.462 **	0.001	0.254 *	0.05
Education	0.010	0.938	0.149	0.256	-0.138	0.293
Occupation	0.021	0.875	-0.119	0.0367	0.085	0.518
Father's Education	0.037	0.777	0.140	0.285	0.039	0.766
Father's Occupation	0.021	0.872	0.251	0.053	0.001	0.995
Father's Second Job	0.040	0.761	-0.258 *	0.027	-0.104	0.429
Salary	0.163	0.212	0.414 **	0.001	0.051	0.699
Place of Residence	-0.43	0.742	-0.119	0.366	-0.164	0.211
Housing Status	0.013	0.920	0.158	0.227	0.038	0.772
Pregnancy Weight Gain	1		-0.106	0.422	-0.263*	0.043

\*Indicates significance level of 0.05 and \*\*Indicates significant level of 0.10

The correlation between mother's age and other variables namely the number of pregnancy, the number of children, salary, and father's second job is statistically significant. The correlation between mother's BMI is statistically significant with the number of children, pregnancy weight gain. However, there is a statistically significant negative correlation between pregnancy weight gain and mother's BMI.

### DISCUSSION AND CONCLUSION

Results showed that the mean of the weight gain in mothers in control group was significantly higher than the mean of weight gain in multivitamin group (case group) i.e. ( $P < 0.05$ ). This considerable difference was about 4.270 kg. The results of the present study were not consistent with the findings of several preceding researchers who found that multivitamins intake leads to weight gain [6,15]. This dissimilarity is justifiable in that the preceding research studied pregnant women with low BMI while the present research studied pregnant women with normal BMI, the mean of which was 25.83. On the other hand, Nachtigal et al found that the long-term intake of multivitamins in obese women decrease the process of weight gain [16]. Nonetheless, Yli found that the intake of multivitamins and trace minerals causes weight loss and regulates lipid profile as the result of regulating the lipid and energy metabolism [12], these findings [16], are consistent with the results of the present study.

It seems that, according to Genevive, taking multivitamins and minerals with appetite control and energy balance are more effective in the regulation of nutrient absorption and weight control. This would prevent abnormal weight gain (in women with normal BMI) and enhance the living condition of mother and fetus [17].

Results of the Linear Model (GLM) and the effect of the studied factors on weight gain showed that none of the factors had any statistically significant effect on this variable. However, among the factors, multivitamin intake, mother's BMI, and salary had the most effect on the aforementioned variable.

According to the results of Table 5, the correlation between the pregnancy weight gain and other variables is not significantly high; the only significant correlation, in this regard, is between weight gain and BMI which is a negative correlation indicating that pregnant women with higher BMI had less weight gain than those with lower BMI during the study.

To conclude, pregnant women with normal BMI experienced less weight gain during pregnancy than women with low BMI. Furthermore, the intake of multivitamin, prevents abnormal weight gain in these pregnant women by regulating energy and another nutrients metabolism.

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