

THE INFLUENCE OF PRENATAL SUPPLEMENT INTAKE ON WEIGHT GAINED DURING PREGNANCY AND BIRTH WEIGHT

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Abstract: Objectives: The aim of this paper is to analyze the benefits of supplement intake in pregnant women on the evolution of their pregnancies and status of their babies at birth. Materials and methods: Retrospective observational study, covering the period between October 2015 and February 2016, conducted on a group of 100 female subjects. The data has been collected by means of an interview consisting of 20 open questions. Results: No significant associations have been observed between the intake of a single type of supplement and the weight gained during the pregnancy or the birth weight of newborns. Combining supplements such as iron, folic acid and vitamin complexes is a risk factor for the abnormality of anthropometrical data of newborns and inadequate weight gain in mothers. Conclusion: The intake of nutritional supplements is a risk factor for delivering babies with an abnormal birth weight and mothers gaining an abnormal amount of weight during their pregnancy.

INTRODUCTION

A healthy lifestyle and balanced nutrition can fulfil the micronutrient needs of healthy individuals, including pregnant women, with the mention that during this physiological state there is an increase in the overall micro and macronutrient need.

If during the first trimester, the caloric intake does not suffer any changes, during the second and third trimester it should be increased by 340 kcal during the second trimester and, respectively, by 420 kcal during the last trimester.(1) Maintaining a balanced diet generally assures that the nutrient need is covered, though in some cases supplementation is recommended.(2,3,4)

The most common nutritional supplements used by pregnant women are vitamin/mineral combinations, iron, calcium+vitamin D complex, and folic acid. These are recommended on a large scale by qualified personnel (physician, dietician) for treating specific deficiencies, preventing anomalies in the fetus, insuring maternal health and normal pregnancy evolution.

PURPOSE

The goal of this paper is to analyze the effects of prenatal supplements on pregnancy evolution, Apgar score and birth weight.

MATERIALS AND METHODS

The study is retrospective, observational, conducted between October 2015 – February 2016 in Tîrgu-Mureș, Romania, on a sample of 100 subjects.

The inclusion criteria were: mothers who gave birth during July and August 2015, who did not suffer from chronic illness or had been diagnosed with nutritional deficits, who had a single fetus pregnancy and reside in Mureș County, Romania.

The exclusion criteria for the study were: mothers with multifetal pregnancy, suffering from chronic illness or taking chronic medication.

The necessary data for the study has been collected by

the means of an interview consisting of 20 open questions, about the mother's age, place of residence, educational status, pre-pregnancy weight and weight gained during pregnancy. The questions covered the delivery method (vaginal or cesarean section), gestational age at birth, Apgar score at 1 and 5 minutes and birth weight of the newborn. Additional data has been gathered, about the types of supplements ingested, dosage and intake duration.

The weight gained by mothers during pregnancy has been analyzed according to the body mass index (BMI) at the beginning of the pregnancy, while the newborn's weigh has been analyzed according to the interval 2500g -4000g, which is considered normal.(5,6)

The statistical analysis has been done using the GraphPad Prism 5.0 software, using the Fisher's exact test, the Pearson correlation, the Spearman correlation, error, mean, median, minimum/maximum and standard deviation. The data was considered to be statistically significant if the resulting p value was smaller than 0.05. The confidence interval used for all tests and correlations was 95%.

RESULTS

The research has been done on subjects from different backgrounds, as follows: 77% lived in urban areas and 23% in rural ones. The sample of subjects has been divided into categories, according to their educational level: 6% were only secondary school graduates, 38% graduated from high school or a vocational school, 45% graduated from a university and the remaining 11% acquired a post university education.

Another classification of the subjects was done according to their monthly, individual income, as follows: 4% earned an income lower than 300 RON/month, 17% earned between 300 and 500 RON/month, 46% earned between 500 and 1500 RON/month, 29% earned between 1500 and 5000 RON/month while an income per person higher than 5000 RON/month was earned by the rest of 4% of subjects.

35% of the subjects gave birth through cesarean

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section and 65% through vaginal birth.

Analyzing the supplement intake in pregnant women, it has been observed that 26% of the subjects have not used any kind of supplements while 74% of the subjects ingested at least one kind of supplement during the entire period of the second and third trimester of pregnancy.

The most common supplements used by pregnant women were: iron, used by 38% of the subjects, vitamin mineral complexes, used by 48% of subjects and folic acid, used by 42% of the women included in the study. The administered doses

respected the daily recommended intake (DRI) for pregnant women in 100% of the cases.

In order to highlight the impact of supplement intake on the evolution of pregnancy and birth weight of newborns, the study analyzed the effects of independent use of iron, mineral and vitamin complexes and folic acid, versus combined intake.

Significant or insignificant correlations have been discovered between the type of supplementation in relation to the mother's age, education, environment and BMI (table no. 2.)

Table no. 1. Descriptive statistical data of the analyzed sample

		Percentage %	Mean	Median	Minimum	Maximum
Mother's age	<20	3	27.64	27	18	36
	21-30	60				
	>31	37				
Mother's BMI	Underweight	7	21.64	20.56	17.64	35.94
	Normal weight	76				
	Overweight/Obese	17				
Gestational age	Premature	23	37.91	39	27	43
	At term	75				
	Postmature	2				
Newborn's weight	Small	2	3.41	3.32	2.3	4.6
	Normal	80				
	Big	18				

Table no. 2. Correlation between supplement intake and mothers' characteristics

		Mother's age	Level of education	Living area	Budget	BMI
Iron	r	0.002	0.100	-0.134	0.241	-0.004
	CI 95%	-0.200 to 0.204	-0.104 to 0.296	-0.327 to 0.06	0.041 to 0.423	-0.206 to 0.197
	p value	0.983	0.322	0.183	0.015	0.960
	Significant?	No	No	No	Yes	No
Vitamin complex	r	0.111	0.041	0.093	0.171	-0.200
	CI 95%	-0.093 to 0.306	-0.161 to 0.241	-0.111 to 0.241	-0.032 to 0.360	-0.387 to 0.001
	p value	0.271	0.679	0.356	0.088	0.045
	Significant?	No	No	No	No	Yes
Folic Acid	r	0.017	0.226	-0.128	0.273	-0.111
	CI 95%	-0.185 to 0.219	0.025 to 0.409	-0.321 to 0.076	0.076 to 0.451	-0.306 to 0.092
	p value	0.861	0.023	0.204	0.005	0.268
	Significant?	No	Yes	No	Yes	No
Supplements combination	r	0.02	0.139	-0.001	0.427	-0.080
	CI 95%	-0.182 to 0.221	-0.064 to 0.332	-0.203 to 0.201	0.247 to 0.579	-0.278 to 0.123
	p value	0.838	0.165	0.991	<0.0001	0.425
	Significant?	No	No	No	Yes	No

By applying Fisher's exact test, a significant risk has been calculated for an abnormal weight gain (lower or higher birth weight than the one predicted by the mother's BMI at the beginning of the pregnancy) in the case of regular, combined intake of iron, vitamin and minerals and folic acid. The risk is not significant for independent use of a single type of

supplement. Table no. 3 shows the statistical results obtained by applying the test.

The intake of a single type of supplement is not a significant protective factor for the gestational age at birth, in comparison to the combined intake of the above mentioned supplements $p=0.796/0.816/0.761/0.750$.

Table no. 3. Results concerning risks posed by supplement administration on weight gained during pregnancy and newborn's birth weight

		Supplements combination	Iron	Vitamin Complex	Folic Acid	
Weight gain during pregnancy	OR	2.991	1.425	1.646	2.09	
	CI 95%	1.078 to 8.299	0.629 to 3.225	0.741 to 3.655	0.927 to 4.710	
	p value	0.037	0.412	0.233	0.1	
	Significant?	Yes	No	No	No	
	Sensitivity	0.853	0.428	0.547	0.523	
	CI 95%	0.708 to 0.944	0.277 to 0.590	0.387 to 0.701	0.364 to 0.680	
	Specificity	0.339	0.655	0.5763	0.6552	
	CI 95%	0.220 to 0.473	0.518 to 0.775	0.440 to 0.704	0.518 to 0.775	
	Predictive value	Positive	0.473	0.473	0.4792	0.523
		CI 95%	0.355 to 0.592	0.309 to 0.641	0.332 to 0.628	0.364 to 0.680
		Negative	0.769	0.612	0.6415	0.655
		CI 95%	0.563 to 0.910	0.480 to 0.734	0.498 to 0.768	0.518 to 0.775
Newborn's weight	OR	3.857	1.439	2.389	1.932	
	CI 95%	1.829 to 17.95	0.533 to 3.881	0.936 to 6.093	0.718 to 5.196	
	p value	0.028	0.607	0.104	0.212	
	Significant?	Yes	No	No	No	
	Sensitivity	0.9	0.45	0.64	0.55	
	CI 95%	0.683 to 0.987	0.230 to 0.684	0.425 to 0.820	0.315 to 0.769	
	Specificity	0.3	0.637	0.573	0.612	
	CI 95%	0.202 to 0.412	0.522 to 0.742	0.453 to 0.686	0.497 to 0.719	
	Predictive value	Positive	0.243	0.236	0.333	0.261
		CI 95%	0.151 to 0.356	0.114 to 0.402	0.204 to 0.484	0.138 to 0.420
		Negative	0.923	0.822	0.8269	0.844
		CI 95%	0.748 to 0.990	0.704 to 0.908	0.696 to 0.917	0.725 to 0.926

DISCUSSIONS

The results obtained by applying the tests on the sample of subjects show an obvious difference between the risk values for the intake of single supplements such as iron, vitamin and mineral complexes and folic acid in comparison to the intake of a combination of these supplements, during the second and third trimester of pregnancy.

Iron supplementation during the second and third trimester of pregnancy has not been associated with a risk of abnormal weight gain during pregnancy, or with having a baby with an abnormal birth weight. Iron supplementation is widely used among pregnant women, independent of the presence of iron deficiency anemia, (7) Shankar et al stating in their paper that weekly iron supplementation during pregnancy is just as efficient as taking daily doses of this supplement. They found a positive correlation between iron consumption and birth weight of newborns, but also a higher risk of delivering by cesarean section.(8)

This study has not found negative correlations between vitamin intake during pregnancy and abnormal weight in neither the mothers or the newborn babies, fact supported by a number of studies that show that consuming one type of vitamin does not prevent or increase the occurrence of certain pathological states such as preeclampsia, eclampsia or pregnancy induced hypertension.(9)

Though our findings do not show any negative effects of vitamin intake on the birth weight of newborns, there are studies that prove that a high vitamin intake can affect the baby's birth weight; high intake is achieved in cases when the supplements are taken as prevention rather than to treat an underlying deficiency and the mother in question has a balanced nutrition during her pregnancy.(10)

There are numerous studies that show the risks of micronutrient deficiencies in pregnant women, and their effect on how the pregnancy evolves and the baby's health, but none of these studies recommend supplements for treating these deficiencies. Vitamin deficiency affects various systems and the consequences translate into risk of preterm delivery, intrauterine growth delay, small birth weight, congenital malformations, anemia and/or bone fragility.(11-14)

Our study has not found any significant correlations between folic acid intake and the weight gained during pregnancy or newborns' birth weight. Though neural tube defects are a clear cause of infant mortality, folic acid supplementation in pregnant women remains a topic of debate, researchers dividing themselves into two opposing sides.(15) The discussion revolves around two main topics: how preventive folic acid supplementation can mask a serious illness and its effects in certain types of cancer.(16-22). The pro-supplementation researchers consider that folic acid

supplementation can prevent neural tube defects, correlation which has been clearly demonstrated over time, on considerable sized samples of subjects, in different geographical locations.(23,24,25)

We consider that folic acid supplements are important in correcting an existing deficit and in order to avoid possible side effects and unwanted pathological responses, we support supplementation only where it is strictly necessary, in the cases where the deficit has been exposed through biochemical determinations.

We consider the use of supplements for correcting certain deficits to be important, but the recommendations have to be based on medical tests, that prove the existence of the deficits, an important prevention method against supplement intake without medical prescription being the education of the population.(26)

CONCLUSIONS

The intake of a single type of supplement, like iron, mineral and vitamin complexes and folic acid is not a risk factor for inadequate weight gain during pregnancy or for giving birth to a baby with a higher or lower weight than the standard birth weight.

Significant risk of abnormalities in these anthropometrical variables is shown in the case of combined intake of these supplements during the second and third trimester of pregnancy.

Supplement intake shows no significant correlation with the gestational age at birth in neither of the cases, therefore it is not a risk factor for this particular variable.

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