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Role Of Ascorbic Acid In Normal Pregnant Women: A Cross Sectional Study.

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ABSTRACT

Pregnancy is a period in which metabolic as well as physiological changes takes place. Various factors including stress, hypertension may develop during this phase of life. Vitamin C or ascorbic acid, having an antioxidant property may be altered in pregnancy period. So the aim of this study was to investigate the level of vitamin C in pregnant women. Total 60 women were enrolled for the study in which 30 women were pregnant who were compared with 30 normal women. The age group criteria for the study population were 20 to 35 years. Fasting blood sugar and serum creatinine level were investigated by GOD-POD method and Jaffe's method respectively. Serum concentration of vitamin C was estimated by 2, 4-dinitrophenylhydrazine method. Level of vitamin C was investigated in every trimester of pregnant women. Significant results were obtained in this study. Serum concentration of fasting blood sugar and serum creatinine were significantly different between the groups. Level of vitamin C was significantly (<0.01) lower in pregnant women when compared to normal women. There was constant decrease in the level of vitamin C in first trimester to third trimester. Constant decrease concentration of serum vitamin c in pregnant women may lead to development of oxidative stress with the progression of pregnancy. Vitamin C supplementation is strongly advocated.

Keywords: Pregnancy, ascorbic acid, oxidative stress

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INTRODUCTION

Pregnancy is a period of increased metabolic needs, due to physiological changes of the pregnant woman and needs of the fetus. Vitamins, minerals and trace elements, commonly known as micronutrients such as calcium, iron, zinc, magnesium, vitamins B9 and vitamin C are major determinants of the health of the pregnant woman and her fetus [1]. Micronutrient status in foetal and early life may alter metabolism, vasculature, and organ growth and function, leading to increased risk of cardio metabolic disorders, adiposity, altered kidney function, and, ultimately, to type 2 diabetes and cardiovascular diseases. A number of hypotheses and pathways have been suggested through which maternal micronutrient deficiencies may lead to developmental impairments in the foetus [2].

Vitamin C or ascorbic acid, an essential water-soluble micronutrient, necessary for normal growth & development, has been reported to play a significant role in progression of pregnancy as well as embryogenesis [3]. Ascorbic acid is useful for repair of tissues, building healthy bones, skin, wound repair and also fight infection for mother and baby [4]. Ascorbic acid, an antioxidant, can be synthesized by most of the animals from glucose via uronic acid pathway which humans can't do due to lack of enzyme L-gluconolactone oxidase.[5] So the main objective of this study was to investigate the serum concentration of vitamin C in pregnant women.

MATERIAL AND METHODS

This cross sectional study was carried out in Department of Biochemistry, Teerthankar Mahaveer Medical College & Research Centre, Moradabad. This study was consisted of 30 pregnant women who were compared with age matched 30 non pregnant women. The group of pregnant women was termed as case while the group of normal women was termed as controls. The age group criteria were kept between 20 to 35 years old. All the participants voluntarily participated to being a part of the study. The study was ethically approved by the institutional ethical committee.

Exclusion Criteria

Pregnant women having history of diabetes mellitus, hypertension, cardiovascular disorder, renal disorders were excluded from the study.

Inclusion Criteria

Age and sex matched 20 to 35 years old pregnant and non pregnant females were enrolled for the study.

Methods

Fasting blood sample was collected from each participant before performing the biochemical parameters. Fasting Vitamin C level was measured in pregnant as well as non pregnant women by 2,4-dinitrophenylhydrazine method.[6] Fasting blood sugar was investigated in each participant by GOD-POD method[7] and serum creatinine was also estimated by means of Jaffe's reaction[8].

Statistical analysis

All the parameters were expressed in Mean \pm SD. Student's t test was used for differentiate between the groups of pregnant women and non pregnant women. The one way ANOVA was performed to differentiate the level of vitamin C in every trimester of pregnant women. A p value <0.05 was considered statistically significant. All the statistical analysis was performed by using IBM SPSS version 20.0.

RESULTS

In this study the level of fasting blood sugar and serum creatinine was under the normal range in both the groups. The findings were statistically significant (<0.01) between the groups. The mean value of vitamin C was decreased in pregnant women compared to normal women. The level was statistically significant (<0.01)

between the groups. (Fig.-1) (Table-1) There was constant decrease in vitamin C level from first trimester to third trimester of pregnant women . These findings were statistically significant (<0.01) among the trimesters. (Table-2)

Table 1: Baseline Parameters Between Case And Control Group

S. No.	Parameters	Case Group	Control Group	P value
1.	Fasting blood sugar	107.10±02.11	99.26±10.71	<0.001
2.	Serum Creatinine	0.59±0.09	0.69±0.10	<0.001
3.	Vitamin C	0.46±.09	0.54±.080	<0.001

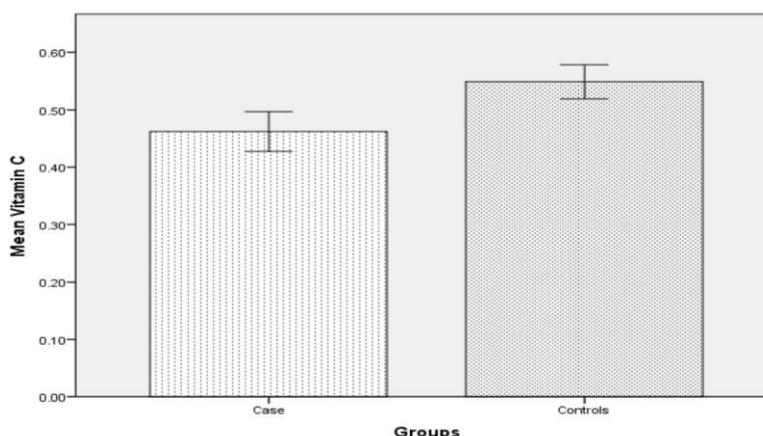
¶ by using student’s t test. p value <0.05 was considered statistically significant.

Table 2: Vitamin C Level In Every Trimester Of Pregnant Women

S. No.	Parameter	1 st trimester	2 nd trimester	3 rd trimester	p value
1.	Vitamin C	0.55±0.04	0.47±0.04	0.35±0.03	<0.001

¶ by using One way ANOVA. p value <0.05 was considered statistical significant.

Figure 1: Level of Vitamin C between Case and control group.



DISCUSSION

Pregnancy, a condition which is characterized by physiological and metabolic changes in the body for the development of the fetus subsequently increases metabolic requirements.[9] In order to maintain these process oxygen consumption increased due to which highly toxic reactive species produced and further leads the level of oxidative stress.[10] Ingestion of vitamin C may reduced the deleterious effects of pregnancy on the activity of glutathione peroxidase since declined activity of glutathione peroxidase was found to be associated with pregnancy [11] which might be the reason of decreased concentration of vitamin C in pregnant women when compared with normal women.

In support to this Awoyelu CO et al also observed the decreased concentration of vitamin C in pregnant women compared to normal women.[12] furthermore Nwagha et al concluded that ascorbic acid is strongly advocated in pregnancy after observing lower concentration of ascorbic acid in pregnant women compared to normal women in Nigerian population based study to support this finding.[13] similarly Rao et al also supported the finding of this study when they reported a significant decrease in vitamin C level in pregnant women compared to normal women.[14] since in this study pregnant women were free from any complication i.e. diabetes, hypertension or any renal disorder, etc, so the decreased level of vitamin C in the pregnant women was the reason of pregnancy itself. Having an antioxidant property ascorbic acid may work as first line defense mechanism so when the level of oxidative stress elevated during the pregnancy ascorbic acid may be consumed as a defense against oxidative stress. [15]

In addition to this Hassan GI supported the findings of this study after observing significant decline in vitamin C level during pregnancy with every trimester since in this study there was constant decrease in every trimester in pregnant women. [16] although a hospital based study from northwest Nigeria also observed similar results while observing significant reduction in vitamin C throughout the period of pregnancy. However they observed the highest concentration of vitamin C in second trimester instead of first trimester. [17] In spite of this Ghate J et al supported these findings of this study and concluded the significant rise in oxidative stress with progression of pregnancy. [18]

CONCLUSION

The outcome of this study reveals the declined concentration of vitamin C in pregnant women in every trimester which may leads to oxidative stress along with the progression of pregnancy. So adequate supplementation of ascorbic acid may be suggested to these pregnant women to reduce future complications. Although the sample size of this study was small therefore more study should be conducted with large sample size and other establishes parameter to explore the fact.

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