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Original Research Article

Maternal Serum Vitamin D and Beta Carotene Levels in Preeclampsia Women

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Abstract: Preeclampsia (PE) is a pregnancy specific syndrome characterized by new onset hypertension and proteinuria. The pathogenesis of preeclampsia involves a number of biological processes that may be directly or indirectly affected by antioxidants, vitamin D and beta carotene. We have estimated the role of vitamin D and beta carotene in 30 patients of preeclampsia (Group III) compared with 30 non pregnant (Group II) and 30 pregnant females (Group I). Beta carotene was estimated by spectroscopic method of Sobel and Snow and vitamin D was measured by High pressure liquid chromatography (HPLC). The levels of beta carotene (134.2+9.75 µg/dl vs 165.1+64.9 µg/dl and 173.1+51.7 µg/dl) and vitamin D (16.8+2.14 µg/l vs 31.6+9.33 µg/l and 32.4+7.34 µg/l) were significantly lower in group III as compared to group II and I [p< 0.001]. Also positive correlation between vitamin D and beta carotene patients was found in group III (correlation coefficient r=0.179294). Hence we concluded that PE patients had lower vitamin D and beta carotene levels and assessment of these parameters in pregnant women could be useful in the early identification of preeclampsia.
Keywords: Preeclampsia, pregnancy, antioxidants, vitamin D, beta carotene

INTRODUCTION

Preeclampsia (PE) is a pregnancy specific syndrome characterized by new onset hypertension and proteinuria that adversely affects the mother by vascular dysfunction and the fetus by intrauterine growth retardation. It affects 5-8% of all pregnancies [1].It has been suggested that free radicals are likely promoters of maternal vascular malfunction. Markers of lipid peroxidation have been noted to be increased in the serum of women with preeclampsia [2] and reactive oxygen species, particularly superoxide anions, evoke endothelial cell activation [3].The pathogenesis of preeclampsia involves a number of biological process that may be directly or indirectly affected by antioxidants, vitamin D and beta carotene, including immune dysfunction, placental implantation, abnormal angiogenesis, excessive inflammation, and hypertension [4-7]. Antioxidants, such as carotenoids and tocopherols, due to their capacity of scavenging free radicals and their function as inhibitors of reactive oxygen species, are of increasing interest among investigators studying preeclampsia.

Results of previous studies of maternal serum carotenoid and vitamin D concentrations have been inconsistent, with some showing altered carotenoids and vitamin D in preeclampsia women [8-9], and others showing no difference [10-12]. Hence the aim of the present study was to assess the correlation between beta carotenoid and vitamin D levels in preeclampsia patients.

MATERIALS AND METHODS

The present study was carried out as a case control study conducted in the Department of Biochemistry, NKP Salve Institute of Medical Sciences and research center, Nagpur. The patients were recruited from women attending outpatient clinics and those hospitalized in Obstetrics and Gynaecology ward. The study was conducted with permission from institutional Ethics Committee in year June 2013 with reference number IEC/ NKPSIMS-74/2013. A total of 30 patients of preeclampsia (Group III) in the age group ranging from 18-35 years irrespective of socio-economic status were included in the study. They were age matched with 30 normal healthy pregnant (Group II) and 30 normal healthy non pregnant females (Group I). Patients suffering from preexisting hypertension, diabetes mellitus, renal disease, multifetal gestation, intrauterine fetal death were excluded from the study.

5ml of venous blood samples were collected in plain bulb from patients with preeclamsia, pregnant females without preeclampsia and non-pregnant

females. Serum samples were centrifuged for 15 minutes and stores at -20ºC. Beta carotene was measured by spectrophotometer by modified sobel and snow method [13] and vitamin D were analysed by High Performance Liquid Chromatography.

The mean and standard deviation were determined for each variable in all groups. All the results were expressed as mean + SD. Comparison of data of both preeclampsia patients and control groups were done by applying student t-test using Epi info software. P-value< 0.05 was considered significant. Correlation coefficient was assessed by using Microsoft XL window.

OBSERVATION AND RESULTS

Descriptive statistics of parameters in group I, group II and group III are presented in Table 1&Table 2.

Table 1: Showing characteristic of enrolled women (Mean+S.D.)

Characteristics	Group I (n=30)	Group II(n=30)	Group III (n=30)
Age (years)	26.2+3.02	27.9+ 2.70	27.4+2.97 NS
Systolic Blood Pressure (mmHg)	118.2+6.50	120.6+6.08	168.3+ 12.7**
Diastolic Blood Pressure (mmHg)	75.6+ 4.42	75.7+4.47	103.8 + 10.4**

NS= not statistically significant

** Statistically significant from Group I and Group II (p-value < 0.001)

Serum vitamin D and beta carotene was significantly lower in preeclamptic (GIII) compared with normal pregnant and non-pregnant females (GI& GII) [P < 0.001 for both]. Amongst the 30 PE patients 11 patients had vitamin D levels in the range of 12-16 µg/l and 19 patients in range of 16.1to 20µg/l. Beta carotene levels in 16 PE patients were in range of 118-135 µg/dl and 14 patients in 136-150 µg/dl range.

No statistically significant differences in the mean serum concentrations of beta carotene, and vitamin D between normal pregnant cases and non-pregnant controls were observed.

Table-2: Serum activity of Vitamin D and Beta carotene (Mean + S.D.)

Parameters	Group I(n=30)	Group II(n=30)	Group III(n=30)
Vitamin D(µg/l)	32.4+7.34	31.6+9.33	16.8+2.14
Beta carotene(µg/dl)	173.1+51.7	165.1+64.9	134.2+9.75

Also positive correlation between vitamin D and beta carotene patients was found in group III.(correlation coefficient r=0.179294)

DISCUSSION

The present case control study demonstrates decreased beta carotene and vitamin D concentrations in women with preeclampsia compared with normotensive pregnant women. Cullin Zhang concluded that relative risk of preeclampsia decreased across increasing quartiles of serum vitamin D and beta carotene concentrations [10].

Results from previous studies of maternal serum beta carotenoids and vitamin D in preeclamptic and normotensive women have been inconsistent. Our results are in agreement with the findings reported by Ziari *et al.;* [14] who reported that the mean serum beta carotene concentration among preeclamptic women were 40% less as compared with the mean concentration in normotensive pregnant women . Mikhail MS *et al.;* [2] and Palan *et al.;* [8] suggested that lower beta carotene levels in preeclampsia may be because of greater extent of dietary antioxidant influencing on the pathophysiology of preeclampsia.

Our results however did not corroborate with the findings reported by Cullin Zhang [10], Jendryczko and Dro´zd´z [15] who reported that serum concentrations of β-carotene were similar for preeclamptic women and normotensive pregnant women.

The results of the present study confirmed previous observations [1, 9] regarding the lower maternal serum concentrations of vitamin D in PE

women compared with those in normal pregnant and non-pregnant controls. They concluded that Insulin like growth factors (IGF) is low in PE and theseIGF-1 stimulate renal and placental vitamin D and is considered an important regulator of fetal growth. Low IGF lead to less stimulation of vitamin D and biochemical changes in preeclampsia appear to involve vitamin D metabolism which may cause vasospasm of eclampsia. Along with that in preeclampsia activity of enzyme 1alpha hydroxylase is reduced to one tenth and did not respond to IGF-1when compared with normal placenta [16].

CONCLUSION

In conclusion assessment of beta carotene and vitamin D in pregnant women could be useful in the early identification of preeclampsia. Both beta carotenoid and vitamin D are safe to consume and its levels are highly reduced in preeclampsia and eclampsia and supplementation of these in early weeks of pregnancy might improve maternal and perinatal outcome as results of various studies are very encouraging and has been found to be very effective insignificantly reducing the occurrence of preeclampsia and IUGR. Still large multi-centric studies are recommended to confirm the findings of the present study, which if proved will be a significant landmark in the prevention of PE and also to verify the relationship between placental transfer of antioxidant vitamins in preeclamptic and normotensive pregnancy.

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