

ANTI-OXIDANT VITAMIN (VIT C, VIT E) LEVELS OF SELECTED NORMOTENSIVE AND PRE-ECLAMPTIC WOMEN IN BANGLADESH

KHAN NA¹, ISLAM K², NAHID N³, HOQUE MM⁴, SAIFULLAH M⁵, RAFIQUZZAMAN M⁶, DATTA PK⁷, MORSHED GM⁸, MASUM AA⁹, CHOWDHURY PP¹⁰

Abstract:

Pre-eclampsia is a disorder of 2nd half of pregnancy, which is characterized by a combination of hypertension, proteinuria and edema, secondary to decreased placental perfusion. Clinical studies suggest that antioxidant vitamins, such as Vit C and Vit. E can stabilize reactive free radicals, which are produced due to placental hypo perfusion, thereby preventing the development of pre-eclampsia. Pre-eclampsia remain a major cause of infant and maternal mortality and morbidity. In developing countries, pre-eclampsia causes an estimated 50,000 maternal deaths per year. Only a small number of studies have however, been conducted in Bangladesh.

Objective: *To compare the serum levels of antioxidants in selected pre-eclamptic and normotensive pregnant women.*

Methods: *220 pregnant women were selected with inclusion and exclusion criteria from 3 different medical colleges and divided into 2 groups – A study group, consisting of 110 pre-eclamptic women and a control group consisting of 110 normotensive pregnant women. Dietary information was collected by 7 days food frequency questionnaire and food score was determined. Anthropometric and biochemical tests were performed. Biochemical analysis such as serum vitamin C levels were measured by spectrophotometric method, and serum vitamin E levels were measured by HPLC (High Performance Liquid Chromatography) method.*

Results: *The mean serum levels of Vit. C and Vit E were found to be significantly lower in the study group, compared to the control group. Anthropometric study revealed that the babies born to pre-eclamptic mothers had lower birth weight than those born to normotensive mothers.*

Conclusion: *Therefore, low antioxidant levels do play a key role in the development of pre-eclampsia in pregnant women.*

DOI: <https://doi.org/10.3329/jdmc.v29i1.51172>
J Dhaka Med Coll. 2020; 29(1): 53-58

Introduction:

Pre-eclampsia is a multi system disorder of unknown etiology characterized by development of hypertension to the extent of 140/90 mmHg or more with proteinuria after 20th week of gestation in a previously normotensive woman. Pre-eclampsia has been associated with intrauterine growth retardation, preterm birth, maternal and perinatal death.¹ The incidence

of pre-eclampsia is 2-10%, and it occurs in 4-7% of pregnant women worldwide.³

The etiology of pre-eclampsia is still unknown, although a number of hypothesis have been accepted. Four hypotheses currently accepted are: 1) the placental ischemia hypothesis 2) genetic hypothesis 3) the immune maladaptation 4) hypothesis of the imbalance between free

1. Dr. Nahid Ahmed Khan, Associate Professor, Dept. of Anatomy, Holy Family Red Crescent Medical College.

2. Prof. Khaleeda Islam, Professor, Institute of Nutrition and food Science, University of Dhaka.

3. Dr. Nuzaira Nahid, Honorary Medical Officer, working in BMCH

4. Dr. Mohammad Mahfuzul Hoque, Assistant Professor of Medicine, Dhaka Medical College, Dhaka

5. Dr. Md. Shaifullah, Assistant Professor of Medicine, Dhaka Medical College, Dhaka

6. Dr. Md. Rafiquzzaman, Indoor Medical Officer, Dhaka Medical College

7. Dr. Ponkaj Kanti Datta, Assistant Professor of Medicine, Dhaka Medical College, Dhaka

8. Dr. Md. Golam Morshed, Junior Consultant, Department of Medicine, OSD, DGHS, Dhaka

9. Dr. Abdullah Al Masum, Department of Internal Medicine, BSMMU, Dhaka

10. Dr. Partho Protim Chowdhury, Assistant Professor of Medicine, Dhaka Medical College, Dhaka

Correspondence: Dr. Nahid Ahmed Khan, Associate Professor, Dept. of Anatomy, Holy Family Red Crescent Medical College, E-mail: nahidmelia@gmail.com Mobile No: 01914222818

Received: 10-01-2020

Revision: 19-01-2020

Accepted: 21-03-2020

oxygen radicals and scavengers in favour of oxidants.

Pre-eclampsia is a disorder of the second half of pregnancy. It is a 2 stage disease. Stage 1 is decreased placental perfusion. Stage 2 is the maternal syndrome of pre-eclampsia comprising of hypertension, proteinuria and edema.⁴ One theory suggests that the linkage between the 2 stages is the generation of mediators of oxidative stress in the intervillous space.⁴ Dysfunction of vascular endothelium and inadequate trophoblastic invasion, leads to high resistance and low uteroplacental circulation that causes placental ischemia and hypoxia.

Hypoxia causes production of reactive oxygen species or free radicals like superoxide, which are capable of damaging proteins, DNA and inducing lipid peroxidation, ultimately resulting in widespread endothelial damage.⁴

Pre-eclampsia is a leading cause of infant and maternal, with an estimated 50,000 maternal deaths per year in developing countries like Bangladesh mortality.⁴

It has now been suggested that deficiency of antioxidant can lead to the development of pre-eclampsia. Antioxidant vitamins like Vit C, Vit E with their ability to stabilize highly reactive free radicals, act as the first line of defense against superoxide attack and lipid peroxidation⁵.

Therefore in this study we tried to evaluate the serum levels of antioxidants in pre-eclamptic and normotensive pregnant women of Bangladesh.

Materials and Method

A comparative cross sectional study was done for three years from June 2015 to May 2018. Study groups were selected from three major tertiary hospitals located in Dhaka City: Dhaka Medical College and Hospital, Sir Salimullah Medical College and Mitford Hospital and Holy Family Red Crescent Medical College and Hospital. To calculate the prevalence and proportion of pre-eclampsia, we followed the standard procedure. A total number of 10,800 pregnant patients, admitted

in Gynae and Obs Department of aforesaid hospitals from June, 2015 to May, 18 were selected. Amongst them, a total of 1800 were complicated with pre-eclampsia. So, Sample size was calculated, n=217. Selection of cases was based on strict inclusion and exclusion criteria: In case of pre-eclamptic women age groups: 18 to 40 years, Pregnancy status: third trimester of pregnancy, Blood Pressure: Diastolic Blood Pressure above 90 mm of Hg. Clinically oedema of legs present; Proteinuria: Confirmed by biochemical tests. Exclusion Criteria: Less than 18, greater than 40; No oedema; No proteinuria; Normal Blood Pressure (diastolic < 90 mm of Hg). A questionnaire was developed to obtain relevant information regarding socio economic status, age, obstetric history, monthly income, living area, family size, education, type of jobs and usual habit of food before admission to hospital. Ethical permission has been obtained from Ethical review committee of Bangladesh Medical and Research Council (B.M.R.C). Written consent was taken from both pre-eclamptic and normal pregnant women. Haematological and BioChemical Assays: CBC, HB%, ESR and Fasting Blood Sugar, serum Vit C and serum Vit E, Urine for Albumin: assessed by Heat Coagulation Test were measured. Nutritional Status: measured by Mid Upper Arm Circumference (MUAC), using a measuring tape (in cm). Dietary Information: Dietary information was measured by 7 days food frequency questionnaire. Measurement of weight: Body weight was measured by bathroom scale, to the nearest 0.5 kg. Measurement of height: A wooden height scale was used to record height with bared heels, standing in upright position, height was measured to nearest 0.1 cm. Blood Pressure Measurement: The blood pressure was measured by sphygmomanometer machine and stethoscope. Birth weights of new born babies: Birth weights of new born babies were recorded to the nearest 20 grams after delivery without clothes on a beam balance (Dedecto medic, Delecto scale inc., U.S.A.)

Results:

Table-I
Distribution of respondents according to Hospital

Hospitals	Pre-eclamptic Women (Study Group A) N=110		Normal Pregnancy (Control Group – B) N = 110	
DMCH	70	63.64%	70	63.64%
Mitfor	30	27.27%	30	27.27%
HFRCMH	10	9.09%	10	9.09%
Total	110	100%	110	100%

Table 1: shows 63% respondents were from DMCH, 27% from Mitford, and 9% from HFRCH

Table II
Anthropometric and clinical indices

N=220	Pre - Eclamptic (Group-A) n= 110 (Mean ± STD.)	Normal Pregnant Women (Control - B) n = 110 (Mean ± STD.)	P. Value
Weight (Kg.) of the Patient	66.65±5.34	66.9±2.05	0.65
Height (cm.) of the Patient	154.06±3.58	156.003±3.36	0.62
MUAC (CM)	23.5±2.64	25.1.1±2.24	0.001
Systolic Blood Pressure (mm/Hg)	125.14±28.34	117.27±4.47	0.001
Diastolic Blood Pressure (mm/Hg)	98±5.55	79±3.51	0.001
Wt. of Babies (Kg.)	2.09 ± 0.13	2.80 ± 0.12	0.001

Table 2, shows mean MUAC, systolic and diastolic BP, wt of new born Babies of Study and Control Group were different, it was statistically, significant.

Table-III
Distribution of the respondents by Food Consumption score

Food Consumption Score	Pre-eclamptic Women (Study Group A) n=110		Pregnancy (Control Group – B) n=110	
Poor Food Consumption	13	11.82%	4	3.64%
Borderline Food Consumption	26	23.64%	38	34.54%
Low Acceptable Food Consumption	53	48.18%	42	38.18%
Highly Acceptable Food Consumption	18	16.36%	26	23.64%
Total	110	100%	110	100%

Table 3 shows, 11% of pre-eclamptic women were in poor food consumption group compare to normal pregnancy, where only 3% women were in the poor food consumption score.

Poor food consumption: 0 to 28

Borderline food consumption: 28 to 42

Acceptable food consumption: > 42

Lower acceptable food consumption: 42-51

High acceptable food consumption: >52

Table-IV
Nutritional status of respondents by MUAC

N=220	Pre - Eclamptic (Group - A) n= 110		Normal Pregnant Women (Control - B) n = 110	
normal MUAC>23.9	78	70.91%	92	83.62%
Malnourished MUAC<23.9	32	29.09%	18	16.36%
Total	110	100%	110	100%

Table-IV : shows 29% of Preeclamptic women were malnourished compare to normal pregnancy it was only 16%.

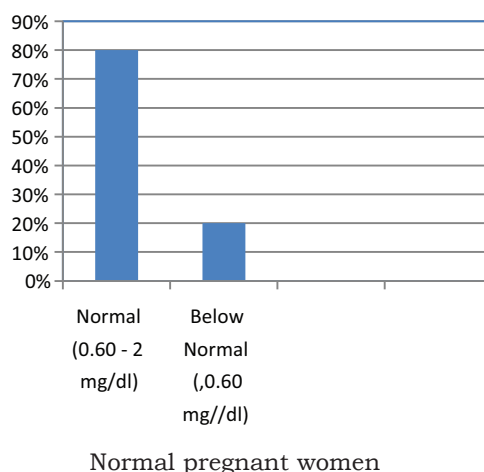
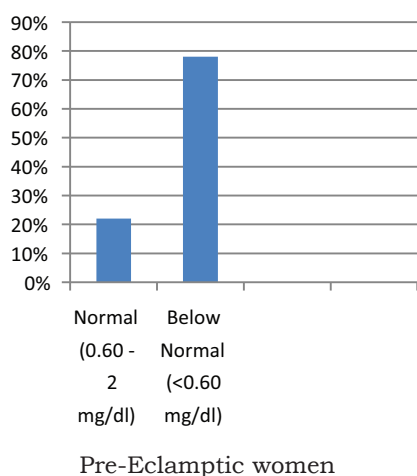


Table - V
Serum Vit C levels of the respondents

N=220	Pre-eclamptic Women n=110		Normal Pregnant Women n=110	
Normal (0.60 – 2 mg/dl)	24	21.82%	88	80%
Below Normal(<0.60 mg/dl)	86	78.18%	22	20%
Total	110	100%	110	100%

Table 5, shows 78% of pre-eclamptic women serum Vit C was below normal compare to normal pregnancy it was only 20%.

Table VI
Mean Levels of Serum Vitamin C of the respondents

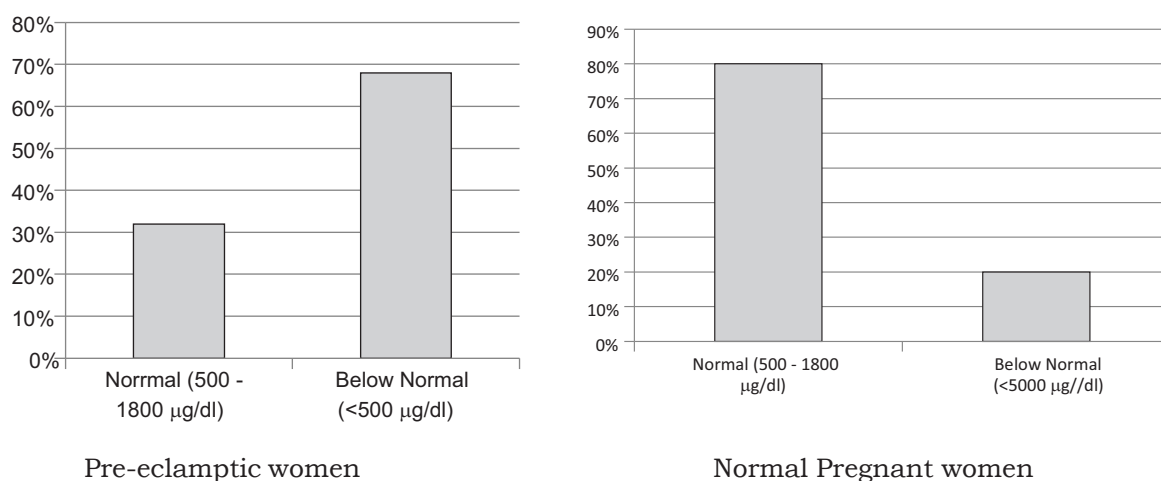
N=220 Vitamin C	(Mean ±SD)	P. value
Pre-eclamptic Women (Study Group – A) mg/dln=110	0.49 ± .12	0.001
Normal Pregnant Women (Control Group – B) mg/dln=110	1.24 ±.39	

Table 6 shows mean serum Vit C is lower in case of pre-eclamptic women.

Table-VII
Distribution of Level of Serum Vitamin E of the respondents

N=220	Preeclamptic Women n=110		Normal Pregnant Women n=110	
Normal (500-1800ug/dl)	34	30.91%	88	80%
Below Normal (<500 ug/dl)	76	69.09%	22	20%
Total	110	100%	110	100%

Table 7 shows serum Vit E was below normal in 69% of pre-eclamptic women compare to normal pregnant women it was only 20%.



Pre-eclamptic women

Normal Pregnant women

Table-VIII
Distribution of Mean Serum Vitamin E levels of the respondents

N=220	Vitamin E (Mean ±SD)	P. Value
Pre-eclamptic Women (Study Group – A) µg/dln=110	359.95±139.27	0.001
Normal Pregnant Women (Control Group – B) µg/dln=110	815.64±281.17	

Table 8 shows mean serum Vit E level is below normal in pre-eclamptic women.

Discussion:

The present study was conducted amongst 220 pregnant women to see the effect of antioxidants (Vitamin C and Vitamin E) on pre-eclampsia. Agarwal et al., 1983; and others (Menawat et al., 1985; and Stewart et al., 1989; reported that inadequate supply of nutrients during pregnancy can be responsible for pre-eclampsia.

Serum Vit C was below normal in 78.18% of pre-eclamptic women compared to normal pregnant women, where it was below normal

in only 20% cases. In this study, mean serum vit C was (0.49 + .12) mg/dl in the study group, and (1.24+.39) mg/dl in the control group. Suryakant Nagtilak., (2014); observed that mean serum vit C was significantly lower in pre-eclamptic women than normal pregnant women⁶. A study was conducted by Lucy C Chappell (1999) and others (Paul T seed, Annette Briley) where they observed low levels of Vit C in pre-eclamptic women⁷.

In this study, serum Vit E was below normal in 69.09% of pre-eclamptic women compared to

normal pregnant women which was only 25.45%. Mean Vit E levels was lower (359.95µg/dl) in study group than in the control group (815.64µg/dl).

Suryakant Nagtilak., (2014); observed that mean serum Vit E levels was lower (660+260) µg/dl in study group than in control group (820+260) µg/dl.⁶

Many studies confirm that levels of antioxidants such as vitamin C ,Vitamin E ,and other antioxidants are reduced in the sera and placenta of pre-eclamptic women ^{8,9,10}. Sagol et al¹¹ observed impaired antioxidant activity in women with pre-eclampsia.

Conclusion:

This was a comparative study to evaluate the serum levels of antioxidants vit C and vit E in pre-eclampsia Pre-eclampsia is thought to be caused by build-up of oxidative stress in the chorionic vill., which leads to endothelial dysfunction.

It was revealed that most of the pre-eclamptic women did not consume sufficient amount of food rich in Vit C and Vit. E and their corresponding blood levels of Vit C and vit E were also lower.

This study therefore indicates an association between deficiency of anti oxidants in blood and development of pre-eclampsia .

References:

1. Sibai B, Dekker G, Kupfermanc M. Pre-eclampsia. *Lancet*. 2005;365(9461):785-99. [PubMed] [Google Scholar]
2. Geographic variation in the incidence of hypertension in pregnancy. World Health Organization International Collaborative Study of Hypertensive Disorders of Pregnancy. *Am J Obstet Gynecol*. 1988;158(1):80-3. [PubMed] [Google Scholar]
3. Landau R, Irion O. Recent data on the pathophysiology of preeclampsia and recommendations for treatment. *Rev.Med Suisse*.292-95.[PubMed] [Goole Scholar].
4. James M. Roberts, Paul Speer : Anti Oxidant Therapy to Prevent Pre-eclampsia.Seminars in Nephrology 557 – 559.
5. Kharb S. Vitamin E and C in[pre-eclampsia. *Eur J Obstet Gynecol Reprod Biot* 2000;93(1):37-9.
6. Nagtilak, S. (2014). Oxidative stress and antioxidants levels in normotensive and Pre eclamptic pregnant women in their third trimester pregnancy. *International Journal of Basic Medicine and Clinical Research*, Vol 1, Issue 1, May 2014. Page 24-27.
7. Lucy C Chappell, Paul T Seed, Annette L Briley. Effect of antioxidants on the occurrence of pre-eclampsia in women at increased risk: a randomised trial. *Nutrition in Clinical Practice* · April 2000.
8. Kharb S. Vitamin E and C in pre-eclampsia. *Eur J Obstet Gynecol Report Biot* 2000; 93(1):37-9.
9. Sharma JB, Mittal S. Oxidative stress and pre-eclampsia. *Obstet Gynaecol Today* 2004;9:551-4.
10. Williams MA, Woelk GB, King IB, Jenkins L, Mahomed K. Plasma carotenoids, retinol, tocopherols, and lipoproteins in pre-eclamptic and normotensive pregnant Zimbabwean women. *Am J Hypertens* 2003;16(8):665-72.
11. Sagol S, Ozkinay E, Ozsener S. Impaired antioxidant activity in women with pre-eclampsia. *Int J Gynecol Obstet* 1999;64(2):121-7.