Energy and Mineral Nutritional Status of Non – Resident Students of Dhaka University

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Abstract

Energy and mineral nutritional status of 50 male and 50 female non – resident students of Dhaka University were investigated. Energy, protein, calcium, iron, zinc, copper and phytate intake of the participants were calculated using dietary records of three consecutive days. Zinc and copper levels in hair and serum of the participants were also estimated. Male and female participants consumed 1984 Kcal ±371 (86.26% of RDA) and 1547 Kcal ± 298 (77.35% of RDA) respectively. Both the sex fulfilled the RDA of protein and calcium. Male participants consumed 110% and female consumed 51.38% of RDA of iron. Zinc intake of the participants was found deficient to some extent. Male participants consumed 86% and female participants consumed 96% of RDA of zinc assuming 30% absorption. But they met normative requirements of zinc which are 4.7 mg / day for adult male and 3.33 mg / day for adult female according to WHO. The participants of the present study consumed copper that was comparable to average intake of other countries. Calculated phytate to zinc molar ratio of the diets of the participants indicated 30% absorption of zinc. Zinc and copper levels in hair and serum of the participants did not reveal any deficiency of these minerals. Eight female participants had energy intake below 1200 Kcal per day. In this group, daily mean intake of all the nutrients were found significantly lower than females consuming more than 1200 Kcal per day.

Key Words: Non – Resident Students, Minerals, Nutritional Status, RDA.

Introduction

Minerals are essential as structural component of our body as well as in many vital processes of the cell. Only recently the essential roles of many of these minerals have been understood. In recent years, there has been much concern about mineral deficiencies because of their low content in modern diet. Several studies in western countries have revealed high prevalence of low iron, zinc, copper and calcium

Bangladesh Journal of Nutrition. Vol 16 December 2003. Institute of Nutrition and Food Science, University of Dhaka-1000, Bangladesh

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intake[1,2,3]. Studies in India also showed that their diet is deficient in some of the essential minerals [4]. In all the three surveys [5,6,7] carried out by Institute of Nutrition and Food Science, University of Dhaka only two minerals, namely calcium and iron status were studied on Bangladeshi population. It was found that majority of our population are deficient in calcium intake but iron intake was sufficient. The nutritional adequacy of minerals depends on both their amount and bioavailability in the diet. Low energy consumption of the population of the developing countries usually results in low intake of minerals. Flesh foods are rich sources of iron and zinc. However, the content of flesh food in the diet of many developing countries is often too low. Their diets are plant based. Plant based diet often contains a high level of phytate which inhibit the absorption of iron and zinc.

University students represent a unique segment of the population. They assemble for higher studies from different family background. Dietary pattern of non –resident students is based on individual food selection. This age group is crucial, since it has an impact on the structure of the society. Unfortunately, most of the studies conducted on the students of the University were resident students and little attention is given to non-resident students. This study has been designed to assess the energy and mineral nutritional status of non-resident students of Dhaka University. The assessments include a) estimation of dietary intake of energy, protein, calcium, iron, zinc and copper, b) estimation of concentration of zinc and copper in hair and serum and c) phytate content of diet and its effect on zinc bioavailability.

Materials and methods

Study population

The present study was conducted on non-resident students of Dhaka University, where both male and female students of the University voluntarily participated.

Selection of subjects and sample size

A total of 100 students participated in this study, out of which 50 were male and 50 were female. They were randomly selected. They were aged between 18-30 years and were not suffering from any serious disease. The participants were informally invited by personal contact and the purpose of the study was explained to them. Those who were interested and agreed to give hair and blood samples were included in study.

Dietary data

Dietary intake of the participants was assessed by recording their food intake during three consecutive days. The participants were explained about the recording form and were shown various standard utensils such as measuring cups, spoons, glasses and also models of different sizes of chapattis and bread slices by which they could measure their food intake. Information about serving sizes and serving numbers were also given to them. They were instructed to be very specific about the measurements while including the food items in the dietary forms. The participants kept these records for three consecutive days and returned the forms. The forms were examined in the presence of the participants and any discrepancies noted were clarified at that time.

Blood and hair samples

Three milliliters of venipuncture blood were drawn from each subject in the morning between 0800 to 0900 hours after an overnight fast. Each blood sample was placed separately in an acid washed centrifuge tube and allowed to stand at room temperature for approximately 2 hours. After centrifugation at 1000 g for 10 minutes, serum was separated, frozen at -20^0 C until further analysis.

Hair sample from each subject was collected according to the instruction given by Analysis Standardization Board [8]. Hair samples, about 3 to 4 cm long, were cut close to the scalp of the occipital region of the head by using a stainless scissors. Only the proximal 1.5- 2.0 cm portions were retained for analysis. The outer length of the hair strands was discarded. Hair samples were then stored in polythene bags prior to analysis.

Analytical technique

Estimation of hair and serum zinc and copper

Hair samples (weighing 50-100 mg) were washed with washing agents (n-hexane and ethanol) several times and then wet ashed in 18 M sulfuric acid, 12 M perchloric acid, 16 M nitric acid (0.5: 1.0: 0.5 by volume) [9]. The concentrations of zinc and copper were determined by the use of an atomic absorption spectrophotometer [10]. An aliquot of 0.4 ml of serum was diluted to 1.0 ml with deionized water and mixed. The concentration of zinc and copper were determined by the use of an AAS[10].

Dietary intake

The three days dietary data were averaged to calculate the mean 24- hour dietary intake of each participant. The quantities in gram were multiplied by the food values of each `food items [11, 12, 13] and then they were added together to estimate the calorie, protein, calcium, iron, zinc, copper and phytate content.

Statistical Analysis

The differences between the mean concentration of zinc and copper in hair and serum of the participants were evaluated by two- tailed students'- t- test. Also, the difference between mean nutrient intake of female consuming > 1200 Kcal and < 1200 Kcal were compared by students' – t- test. The statistical package (SPSS, X, Inc. Chicago, Illions, U.S.A.) was used for analysis.

Results

The calculated mean values of daily energy, protein and mineral intake of the participants are presented in Table 1. Average energy intake of male was 1984 Kcal (± 371) and of female 1547 Kcal (± 298). The male fulfilled 86.26 percent and female 77.35 percent of RDA. The mean value of daily protein intake of both sex greatly exceeded their requirements. Analysis of the mean mineral intake of the participants showed that male participants were deficient in zinc intake and the females were deficient in iron and zinc intake. However, participants of both the sex met the RDA for calcium. There is no set requirement of intake of dietary copper. The intake of copper of male and female was found 1.39 mg (± 0.4) and 1.16 mg (± 0.42) respectively.

Table 1. Mean daily intake of nutrients of non–resident students of Dhaka University

Variables	Male (N = 50)			Female (N =50)		
	Mean ±SD	RDA	% of RDA*	Mean ± SD	RDA	% of RDA*
Energy (K cal.)	1984 ±371	2300	86.26	1547 ± 298	2000	77.35
Protein (gm)	65 ± 13.2	52	125	53 ± 11.97	40	132.5
Calcium (mg)	523 ± 164	450	116	473 ± 137	450	105
Iron (mg)	11.08 ±2.4	10	110	9.25 ± 4.58	18	51..38
Zinc (mg)	7.77 ±1.9	9.4	83	6.37 ±1.57	6.5	96
Copper (mg)	1.39 ± 0.4	**	**	1.16 ± 0.42	**	**

± SD = Standard deviation. * Ref no 7, 13, 15. ** No RDA for copper.

Table 2. Mean daily intake of phytate and phytate : zinc molar ratio in the diets of the non – resident students of Dhaka University

Variables	Male (n = 50)	Female (n = 50)
Phytate (mg)	976 ± 258.39	705 ± 205.37
Phytate to Zinc molar ratio	12.3 ± 3.0	11.0 ± 2.18

± SD= Standard deviation.

Table 3. Mean zinc and copper levels in hair and serum of non- resident students of Dhaka University

Variables	Male (n = 50)		Female (n = 50)		Level of significance
	Mean± SD	Range	Mean± SD	Range	
Hair zinc (μg/ g)	230 ± 65.84	111 - 362	175 ± 40.05	78 - 249	S (p < 0.001)
Hair copper (μg/ g)	17 ± 7.61	5 - 38	16 ± 4.15	10 -26	NS
Serum zinc (μg/ dl)	72 ± 16.95	42 -146	66 ± 13.11	39 -120	NS
Serum copper (μg/ dl)	106 ± 17.56	70 -155	130 ± 29.56	83 -210	S (p < 0.001)

± SD = Standard deviation. S = Significant, NS = not significant, p= values calculated by students' t- test.

Table 4. Comparison of nutrients intake between female participants who consumed < 1200 Kcal and > 1200 Kcal per day respectively

Variables	Energy intake < 1200 Kcal (n = 8)	Energy intake > 1200 Kcal (n = 42)	Level of significance
	Mean ± SD	Mean ± SD	
Average energy intake (Kcal/ person/ day)	1107 ± 101	1630 ± 244	S, (p< 0.001)
Average protein intake (gm / person / day.)	38±5.10	55 ± 10.88	S, (p< 0.001)
Average calcium intake (mg / person / day)	351± 78.78	496 ± 130.87	S, (p< 0.001)
Average iron intake (mg / person / day)	6.14 ±2.29	9.45 ± 4.5	S, (p< 0.001)
Average zinc intake (mg / person / day)	4.89 ± 1.60	6.65 ± 1.42	S, (p< 0.001)
Average copper intake (mg / person / day)	0.73 ±0.27	1.24 ± 0.40	S, (p< 0.001)
Average phytate intake (mg / person / day)	420 ±84.57	760 ± 174.09	S, (p< 0.001)

± SD = Standard deviation, S = Significant, p = Values calculated by student's t- test.

Mean daily dietary intake of phytic acid and mean millimolar ratio of phytate to zinc of the participants were calculated and are presented in Table 2. Mean phytic acid consumed by male and female participants was found 976 mg (± 258.39) and 705 mg (± 205.37) per day respectively. Mean values of phytate to zinc molar ratio were 12.3 and 11.0 for male and female participants respectively.

Zinc and copper levels in hair and serum of the participants are presented in Table 3. The mean zinc levels of hair of male and female participants were found 230 $\mu g/g$ (± 65.84) and 175 $\mu g/g$ (± 40.05) respectively. The mean copper level of the male was 17 $\mu g/g$ (± 7.61) and in female 16 $\mu g/g$ (± 4.15). Mean hair zinc concentration of male was found significantly higher than ($p<0.001$) female participants. The mean zinc level in serum of the male and female was found 72 $\mu g/dl$ (± 16.95) and 66 $\mu g/dl$ (± 13.11) respectively. The mean level of copper in serum of male participants was found 106 $\mu g/dl$ (± 17.56). For the female participants, the value was 130 $\mu g/dl$ (± 29.56) and was found significantly higher ($p< 0.001$) as compared to male.

Of the 50 female participants in the study, 8 had energy intake below 1200 Kcal per day. For all the nutrients, daily mean intake in this group were found lower than compared with females consuming more than 1200 Kcal per day as shown in Table 4.

Discussion

The present dietary survey demonstrated that in terms of current nutrition recommendation, the diets of non- resident university students are deficient in energy. Protein intake was found adequate. The results are in agreement with those reported by previous nutrition surveys of Bangladesh [5,6,7]. Intake of calcium of the participants of the present study fulfilled their RDA. But frequency distribution (not shown) showed that 15 male and 20 female (out of 50 each) failed to meet the RDA. Calcium is often found in an amount below RDA, as found in nutrition surveys of Bangladesh. Analysis of dietary iron intake indicates that male participants were fulfilling their requirements. But high prevalence of low iron intake was found in female participants. Bangladesh National Nutrition Survey (1995-1996) also reported the same[7]. In this study, zinc intakes of male and female participants were found 7.77 mg (±1.93) and 6.37 mg (±1.57) respectively. Estimates of zinc requirements have been developed by several expert committees, including WHO [15]. The WHO committee estimated the physiological zinc requirements of adult as the sum of the amounts of needed for tissue growth, maintenance, metabolism, and replacement of endogenous losses. The so-called basal requirement of 1.0 mg / day in adult male and 0.7 mg / day in adult female refer to balance the aforementioned physiological requirements of the individuals who are fully adapted to low zinc intake. Because this level of intake leaves no reserve for adaptation to any further decrease in intake, a second estimate was developed to provide a greater margin of safety and added 40 percent more to the basal need and termed as normative zinc requirements. Hence, normative zinc requirement was set at 1.4 mg / day for adult male and 1.0 mg / day adult female. Once the normative zinc requirement is applied to a particular category of individuals, the dietary requirement must be adjusted by percentage of zinc absorption from the diet (dietary requirement = normative requirement / % absorption from usual diet). The WHO committee further suggested that population dietary recommendations should be established at a level such that individuals who consume 2 SD less than the population average intake would be able to satisfy their normative requirement. The committee assumed a coefficient of variation in dietary intake of 25 %, that is 50 % (or 2 SD) more must be added to the normative dietary requirements to set the RDA of the population. RDA for zinc of this age group is 15 mg for male and 12 mg for female assuming 20 percent absorption on the basis of phytate to zinc molar ratio of the diet [14].

In this study, zinc bioavailability of the diets of the participants was also calculated on the basis of phytate to zinc molar ratio. Average phytate to zinc molar ratio of the diets of male and female participants were 12.3 and 11.0 respectively. So, bioavailability of zinc from this diet is to be considered medium, that is 30% to 35% of intake according to WHO recommendation [15]. RDA of zinc of these age group may be considered as 9.4 mg for male and 6.5 mg for female assuming 30 percent absorption according to WHO recommendation [15]. So, male and female participants of this study consumed 83 percent and 96 percent of RDA respectively. Data on zinc intake of Bangladeshi population is unavailable. Recent surveys [16] in America indicate that American males consume 90% and females consume 81% of RDA for zinc.

The estimated copper intake of the participants was found comparable to other findings. There is no set requirement for intake of dietary copper (no RDA). Actual intake of copper by human adults on self-selected diets has been variously estimated at slightly more than 1 mg / day, on average, but vary considerably (0.6- 1.6 mg / day) [17]. Male and female participants of the present study consumed 1.39 mg ±0.4 and 1.16 mg ± 0.42 respectively. Zinc and copper concentration in hair and serum have been estimated for a number of years to assess the nutritional status. Strain et al suggested hair zinc level below 70 μg/ g is an indication of zinc deficiency [18]. None of the participants in this study had hair zinc concentration below 70 μg/ g. Normative zinc requirements of individual of this age group is 4.7 mg for male and 3.33 mg for female assuming 30 percent absorption according to WHO [15]. And most of the participants in this study met the normative requirements and is reflected in hair zinc concentration, which is found normal. Also in this study, the mean zinc concentration in hair of male was found to be significantly higher ($p < 0.001$) than that of female and in agreement with those reported by Mckenzie [19]. Copper concentration in hair of both male and female participants was found higher than reported by Mckenzie [19] and Reinold [20].

Mean zinc concentration in serum was found normal in both male and female participants as their diets fulfilled the normative requirements for zinc. Both male and female participants in this study were found having normal serum copper concentration while the female had significantly higher value ($p< 0.001$). Mckenzie

[19]and Gabrieli [20] also found that mean concentration of copper in female was higher than male and this is apparently an estrogenic effect [21].

In this study, out of 50 female participants, 8 had energy intake below 1200 Kcal per day where the mean value was 1107 Kcal per day. All nutrient intakes in this group were found significantly lower than in the female consuming more than 1200 Kcal (Table 4). A study in U.S.A. on College students who consumed less than 1200 Kcal also had markedly reduced intake of many nutrients [22]. As low energy group had not reported of trying to loose weight, therefore, the low intake represent their stable pattern of consumption. A clear guidance is needed for this segment of university students to increase their energy consumption and to select nutrient dense food.

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Correlation between Vitamins (E, C & A) and Blood Pressure in Pregnant and non-Pregnant Women

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Abstract

The aim of this study was to determine serum concentrations of vitamin E, C and A of pregnant and non-pregnant women, and to examine their relation with blood pressures and maternal characteristics. The serum vitamin E, C and A levels of the pregnant women were found to be 23.54±8.5, 14.0±8.2 and 0.85±0.24 μmol/L respectively, while for the same were 13.70±6.2, 30.83±20.4 and 0.99±0.20μmol/L respectively with non-pregnant ones. Major ($P<0.05$) variations were demonstrated in the concentrations of the vitamins in both pregnant and non-pregnant women. Significant correlation's were observed within vitamin C and diastolic blood pressure (r= -0.301, P= 0.039), and between vitamin E and parity (r= 0.272, P= 0.057) in the case of pregnant women. It was also turned out to be significant between vitamin C (r= 0.348, P= 0.030) and vitamin A (r= 0.352, P= 0.028) and systolic pressure, and vitamin E and diastolic pressure (r= 317, P= 0.044) in the case of non-pregnant women. It came out from linear regression analysis that regression co-efficient β= -0.301 with P=0.079 and t= 1.814 for vitamin C and diastolic pressure, and β= -0.272 with P= 0.115 and t= 1.621 for vitamin E and parity for pregnant mothers category. While the regression co-efficient β= 0.348 with P= 0.059 and t= 1.966 for vitamin C and systolic pressure, β= 0.352 with P=0.056 and t = 1.990 for vitamin A and systolic pressure, and β= 0.317 with P= 0.088 and t= 1.769 for vitamin E and diastolic pressure were recorded for non-pregnant women.

Keywords: Vitamins E, C and A, Blood pressure, Pregnant mother, non-pregnant women.

Bangladesh Journal of Nutrition. Vol 16 December 2003. Institute of Nutrition and Food Science, University of Dhaka-1000, Bangladesh

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Introduction

The antioxidant vitamins act as the first line of defense against free radicals attack and lipid peroxidation[1,2]. Alpha-tocopherol, ascorbic acid and β-carotene (pro-vitamin A) are all known as a powerful antioxidants[3-5]. Vitamin E (α-tocopherol) is the major lipid-soluble antioxidant, which protects cells against lipid peroxidation. Vitamin C is a quencher of free radicals as well as singlet oxygen. It also regenerates the vitamin E. Beta-carotene, by quenching singlet oxygen, also functions as an antioxidant.

The antioxidant vitamins have an important role in regulation of blood pressure[6]. The NO (Nitrous Oxide) is the most important endothelium dependent vasodilator and is highly susceptible to oxidative damage. Its oxidative damage is protected by mechanisms inhibiting the formation of free radicals. Vitamin C and vitamin E inhibit the oxidation of NO, and thus maintain the vasodilator status of blood vessels. The β-carotene also plays the same function. It is reported that vitamin C seems to have a direct acute effect on the inhibition of the constrictor response of resistance arteries to a variety of stimuli. It is also reported that there are synerism between the actions of vitamin E and vitamin C, and between vitamin E and β-carotene[6]. We have studied here to evaluate correlation between serum vitamin E, C and A, blood pressure and maternal characteristics in pregnant and non-pregnant women.

2. Materials and Methods

Study population

This study was performed prospectively in the Dhaka Medical College Hospital and Bangabandhu Sheikh Mujib Medical University. The study included 30 pregnant women of 28 to 42 weeks of singleton gestations, and thirty non-pregnant women of childbearing age. The subjects were selected under defined criteria. The exclusion criteria included history of any associated medical disorders, antioxidant vitamin therapy during last one year and smokers.

Serum analysis

Retinol and α-tocopherol. Reversed phase HPLC (LC-10AD, SHIMADZU, HPLC 1991, Model-7125, Kyoto, Japan) was used for simultaneous determination of retinol and α-tocopherol in the sera as described by Islam et al[7]. The retinol and α-tocopherol were isolated by liquid-liquid extraction, concentrated under nitrogen stream and reconstituted with HPLC grade ethanol. The reconstituted sample (50μl) was injected into a C_{18} shim pack column with methanol water mobile phase. The retinol and α-tocopherol were detected spectrophotometrically at 291nm.

Ascorbic acid. The concentration of ascorbic acid in the sera was determined by spectrophotometric method using phenyl hydrazine indicator (Sigma Chemical Co) as described by Islam et al[7]. Absorbance was measured against a reagent blank at 520nm by a Spectrophotometer (UV-1201, UV-VIS, Shimadzu, Kyoto, Japan).

Statistical analysis

SPSS software package (version 10.0, SPSS Inc. Chicago, USA) was used to analyse the data. Descriptive statistics were calculated for all variables. Values were expressed as percentage and mean±SD. Comparison of serum vitamin E, C and A concentration between subjects and controls were performed by cross table variables and independent sample t test. Linear regression analysis was performed to find correlation between blood pressure and the vitamin levels.

Results

Table 1 shows clinical characteristics and concentrations of vitamins in both pregnant and non-pregnant women. The mean maternal age for pregnant and non-pregnant women were found to be 24.11±4.93 and 28.57±6.15 years respectively. The difference of which was insignificant (P>0.05). Gestational age for pregnant was 37.23 ± 2.64 weeks. Primi parae were present in 12(34%) and multi parae were in the range of 18(66%) in the pregnants. Systolic and diastolic pressures were 109.86 ± 9.27 mmHg and 73.43 ± 8.81 mmHg for the pregnant mothers, and these were 103.73 ± 7.73 mmHg, and 66.67 ± 5.33 mmHg, for non-pregnant women.

Table 1: Clinical characteristics and serum vitamins E, C, A concentrations of Pregnant and non-Pregnant women

Parameters	Pregnant^{a}	Non-pregnant^{b}
Clinical characteristics		
Maternal age (year)	24.11 ± 4.93	28.57 ± 6.15
Gestational age (wk) at sampling	37.23 ± 2.64	
Parity in no (%): primi	12(34)	
multi	23(66)	
Systolic blood pressure (mmHg)	109.86 ± 9.27	103.73 ± 7.73
Diastolic blood pressure (mmHg)	73.43 ± 8.81	66.67 ± 5.33
Antioxidant vitamin (μmol/L)		
Vitamin E	23.54±8.5	13.70±6.2
Vitamin C	14.0±8.2	30.83±20.4
Vitamin A	0.85±0.24	0.99±0.20

Values were expressed as mean±sd.

^{Eab}: t=5.2, P=0.000; ^{Cab}: t=4.4, P=0.000; ^{Aab}: t=2.5, P=0.014

^{ECAab}; t=2.5-5.2, P=0.014-0.00

Descriptive Statistics: frequencies, descriptive, crosstables

Compare means: Independent-samples t-test

Table 2: Correlation (r) between clinical characteristics and antioxidant vitamins

Clinical characteristics	Pregnant women§			Non-pregnant women†		
	Vitamin E	Vitamin C	Vitamin A	Vitamin E	Vitamin C	Vitamin A
Age	-0.182 (0.148)	0.155 (0.187)	-0.251 (0.073)[a]	0.196 (0.150)	-.058 (0.381)	0.283 (0.065)d
Gestational age	0.088 (0.307)	0.226 (0.096)	0.299 (0.092)[b]	-	-	-
Parity	0.272 (0.057)*	0.164 (0.173)	-0.222 (0.100)	-	-	-
Systolic pressure	-0.041 (0.408)	-0.061 (0.363)	-0.264 (0.063)[c]	0.238 (0.103)	0.348 (0.030)*	0.352 (0.028)*
Diastolic pressure	0.054 (0.379)	-0.301 (0.039)*	-0.146 (0.202)	0.317 (0.044)*	0.253 (0.089)[e]	0.234 (0.107)

Figure in parenthesis is p-value.

*significant P>0.05.

a,b,c,d,e: significance at 06% to 10% (P= 0.06 to 0.10) level.

Linear regression values :

*§: β= -0.272 with P= 0.115 and t= 1.621 for vitamin E and parity; β= -0.301 with P=0.079 and t = 1.814 for vitamin E and diastolic.

*†: β= 0.348 with P= 0.059 and t= 1.966 and β= 0.352 with P=0.056 and t = 1.990 for vitamin C and A respectively, and β= 0.317 with P= 0.088 and t= 1.769 for vitamin E and diastolic.

The serum vitamin E, C and A levels for the pregnant were 23.54±8.5, 14.0±8.2 and 0.85±0.24 μmol/L, while for the non-pregnants these were 13.70±6.2, 30.83±20.4 and 0.99±0.20μmol/L respectively. It was noted that there were significant ($P<0.05$) variations in the serum concentrations of vitamins E, C and A between the pregnant mothers and non-pregnant women. As compared to non-pregnant, blood pressures in pregnant mothers were shown to be high, but within normal range.

Table 2 shows that there were significant correlations between vitamin E and parity ($r= 0.272$, $P= 0.057$), and vitamin C and diastolic blood pressure ($r= -0.301$, $P= 0.039$) in the pregnant mothers. In non-pregnant women, significant correlations were also observed between vitamin C ($r= 0.348$, $P= 0.030$) and vitamin A ($r= 0.352$, $P= 0.028$) and systolic pressure, and vitamin E and diastolic pressure ($r= 317$, $P= 0.044$). Based on these outcomes, linear regression analysis was performed, which exhibited regression co-efficient $\beta= -0.272$ with $P= 0.115$ and $t= 1.621$ for vitamin E and parity; $\beta= -0.301$ with $P=0.079$ and $t = 1.814$ for vitamin C and diastolic pressure in the pregnant mothers. It indicated regression co-efficient $\beta= 0.348$ with $P= 0.059$ and $t= 1.966$ and $\beta= 0.352$ with $P=0.056$ and $t = 1.990$ for vitamin C and A respectively, and $\beta= 0.317$ with $P= 0.088$ and $t= 1.769$ for vitamin E and diastolic pressure in non-pregnant women.

Discussion

Results showed that vitamin E was found to be significantly higher in the pregnant mothers than that in the non-pregnant, while the vitamin C and A were shown to be reversed. The higher serum vitamin E in pregnant mothers might be to meet the increased need of antioxidant to fight against the oxidative stress that experienced during pregnancy. The rise of vitamin E in pregnancy is in agreement with reports as noted elsewhere[8-10]. The deficiencies of vitamin C and A during pregnancy may be associated with anaemia, which is caused by multiple nutrient deficiencies[11]. Correlation between vitamin E and parity could not be ascertained. But the negative correlation between vitamin C and diastolic blood pressure in the pregnant women may be because of utilization of vitamin C to prevent oxidation of endothelial dilator NO[6]. Similar finding regarding negative correlation of vitamin C with diastolic pressure was also reported by others[12]. The reason for correlation between antioxdant vitamins and blood pressures in non-pregnant women is not clear.

This study shows that antioxidant vitanims have some function in regulation of blood pressures during pregnancy. Maternal characteristics do not have much influence on the antioxidant vitamins.

Acknowledgement

The authors thank the Ministry of Science and Information & Communication Technology, the Government of Peoples' Republic of Bangladesh for awarding a NSICT fellowship.

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