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Plasma Vitamin C Status of Adolescent Girls in a Slum of Delhi

A cross-sectional study was conducted among 775 adolescent girls (11-18 years) residing in a slum of Delhi to assess plasma vitamin C levels. The mean (SD) plasma levels of vitamin C were 0.76 (0.45) mg/dL. Overall, 6.3% and 27.6% girls had deficient (<0.2 mg/dL) and suboptimal levels (0.2-0.49 mg/dL) of plasma vitamin C, respectively.

Keywords: Nutrition, Scurvy, Survey.

Vitamin C plays a major role in synthesis of collagen, carnitine and norepinephrine besides its antioxidant activities, and role in erythropoiesis [1]. Limited information is available on the vitamin C nutriture among adolescent girls belonging to low socioeconomic status.

The study was carried out in Kirti Nagar slums of West Delhi. Door-to-door survey to identify adolescent girls was carried out in 6 out of the 10 major blocks of these slums. Apparently healthy, unmarried non-pregnant adolescent girls were enrolled for the study.

Data on prevalence of plasma vitamin C deficiency presented in this paper is a part of data from a large study which was carried out to assess the effectiveness of iron and folic acid supplementation with vitamin B12 on anemic adolescent girls (CTRI/2011/12/002217). Ethics Committee Clearance was obtained from Lady Irwin College, University of Delhi. The study was carried out during January 2012 to March 2013.

A total of 1228 adolescent girls were identified, out of which 794 volunteered for the study. Based on inclusion criteria, 775 adolescent girls were recruited. Venous blood was drawn by trained personnel and collected in ethylene diaminetetraacetate (EDTA) vials. The vials were then centrifuged at 1500 rpm for 10 minutes and plasma was separated in pre-labelled eppendorf vials. The vials were transported from the field to the laboratory in thermocol box containing dry ice and were stored at –80°C until analysis. Estimation of plasma vitamin C was undertaken in NABL accredited laboratory at our center. Plasma vitamin C was analyzed spectrophotometrically as per standard method [2]. Plasma vitamin C levels were categorized as deficient (0.2 mg/dL), suboptimal (0.2-0.49 mg/dL) or adequate (≥0.5 mg/dL) [3].

Dietary intake of vitamin C was assessed using 24-hour recall method on a subsample (n=320). The data were analyzed for the mean consumption level using 'Dietsoft' software based on Nutritive Value of Indian Foods [4]. The value thus obtained was assessed for adequacy by comparing with respective recommended dietary intake (RDA) [5].

The mean (SD) level of vitamin C among 775 adolescent girls (mean age 13.3 years) was 0.76 (0.45) mg/dL (95% CI: 0.73-0.79 mg/dL). Overall, 6.3% (95% CI: 4.6%-8.0%) girls had deficient, 27.6% (95% CI: 24.4%-30.8%) had suboptimal and 66.1% had optimum levels of plasma vitamin C. The mean (SD) dietary consumption of vitamin C was 48.3 (25.6) mg/day. When compared with RDA of 40 mg/day, approx. 50% subjects reported more than 100% dietary adequacy, 20% reported 75-100% adequacy and 30% had 50-75% adequacy.

On secondary analysis, no significant correlation of plasma vitamin C levels was found with either hemoglobin concentration (r=0.193) or serum ferritin (r=0.09).

The findings of the present study indicate that one-third of adolescent girls subjects had either deficient or sub-optimal levels of plasma vitamin C. Sporadic studies in the country have indicated the prevalence of vitamin C deficiency varying widely between 1.1% among malnourished children [6], 19.6% among Indian males [7], 12.9% among Indian females [7] to as high as 73.9% among elderly population [8]. A study carried out in children 6-16 years in Hyderabad indicated 59.6% had poor vitamin C status (<30 µmol/L) [9]. Prevalence of vitamin C deficiency (<2 µg/mL) was reported to be highest among Indians and people of South Asian origin compared to other races, except the Mexican population [10].

Keeping in view the fact that no national level data is available on plasma vitamin C status among various age groups, we recommend assessment of the status of plasma vitamin C in different age groups from diverse geographic settings in the country.

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