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The Effect of Dietary Habits on Calcium Level in Nephrotic Patients of Pediatric Population

Q. RIAZ[1], A. IQBAL†, N. BHATTY, A. MUZAFFAR AND ROBINA RASHID‡
Departments of Rural Home Economics, †Livestock Management, and ‡Biochemistry, University of Agriculture, Faisalabad–38040, Pakistan
[1]Corresponding author's e-mail: uafannieryk@hotmail.com

ABSTRACT

The study was planned to determine the incidence of calcium deficiency in nephrotic patients of pediatric population and its level as a result of their dietary habits. The project comprised of total 74 cases, 37 diseased and 37 age-matched healthy controls belonging to Allied Hospital, District Headquarter Hospital, Faisalabad and Junior Laboratory School, University of Agriculture, Faisalabad. The blood sera of children were analyzed for calcium by direct colorimetric method using Cresolphtalein complexone (Cpx) reagent kit. The mean value of total calcium in control group was 8.98 ± 0.81 mg/dL and 6.30 ± 0.97 mg/dL in diseased group. Statistical analyses revealed highly significant difference between the groups. The males were found more susceptible to nephrotic syndrome, while male to female ratio was 2:1 in the occurrence of this problem. However, sex wise there were no significant differences. Interestingly, an inverse relationship was observed between age, weight and total calcium profile of the children. Regarding dietary aspects, a combination of buffalo and human milk was most probably found the best feeding package for maintaining normal calcium level in the children.

Key Words: Calcium level; Dietary habits; Nephrotic syndrome; Pediatric population

INTRODUCTION

Calcium is the most abundant mineral and constitutes about 1.5 - 2.0% of human body weight. Most of the calcium (99%) is found in bones and teeth with the remaining (1%) in the soft tissues and watery parts of the body. Maintaining balanced blood calcium is essential to life especially for cardiac function (Anonymous, 1989; Whitney & Rolfes, 1996). Calcium deficiency in conjunctions with high sodium intake is related to high risk of hypertension. It also causes extreme nerve sensitivity, muscles spasms and leg cramps (called tetany) at very low level in the blood (Mc Carron *et al.*, 1987; Mc Carron & Reusser, 1991). Beside these, symptoms such as pregnancy toxemia anxiety, hyper kinesis, otoselerosis and alcoholism also arise as a result of its deficiency. In United States the annual incidence of nephritic syndrome in children (< 16 years) is 2 per 100,000 children and its cumulative prevalence 16 per 100,000. In Pakistani population, on yearly basis an average of 20,000 per 100,000 children (< 18 years of age) are seen per year as a new patient suspected of having nephrotic syndrome. Nephrotic syndrome can present at any age but 74% of children with minimal change nephrotic syndrome have onset of their disease between ages 2 - 7 years of age with a male to female ratio of 2:1. In adolescents and adults this ratio is almost 1:1. Actually the defect in the filtering mechanism that allows the excess proteins to escape in the urine resulting into loss of calcium binding proteins may lead to hypocalcaemia (James *et al.*, 1976). Nephrotic syndrome is associated with calcium deficiency is reported mostly in children aged 1 - 5 years and 15 times more common in children than in adults (Haneef *et al*., 2000). Thus, realizing the significance of the problem, the present study was planned to determine the incidence of calcium deficiency in nephrotic patients and impact of dietary habits on protein bound calcium level of a pediatric population.

MATERIALS AND METHODS

The blood samples measuring about five cc were collected individually from 37 age-matched healthy controls and 37 nephrotic patients (aged 2 - 12 years) irrespective of their age/sex from Junior Laboratory School, University of Agriculture, Faisalabad, Out Patient Department (OPD), Hassan Ward, Allied Hospital, Faisalabad and Out Patient Department, District Headquarter (DHQ) Hospital, Faisalabad. The samples were centrifuged for serum and stored at 20^0C for further analyses by Direct Colorimetric Method (Anonymous, 2004) using Cresolphtalein complexone (Cpx) reagent Kit (Wiener Laboratories, 2000 Rasario Argentina).

The data were computed for means and standard errors of means. Student's t-test was applied to compare the means (Cochran, 1977).

RESULTS AND DISCUSSION

The demographic data are given in Table I, while their calcium profiles are presented in Fig. 1. The mean age of control and diseased children was almost similar as reported

by James *et al*. (1976). The mean value of weight for control children was lower than that quoted by Vijayalakshmi *et al*. (1987), who reported the body weight of healthy children in India, where the mean value was found to be 28.524 ± 4.91 kg for lower income group. This difference in value might be attributed to their different nutritional habits. Differences in the weights of control and diseased groups might be due to presence of edema in nephritic syndrome. Differences between the weights of diseased group and value observed by Vijayalakshmi *et al*. (1987) may be due to severity of disease and persistence of hypocalcemia.

The mean value of total calcium in control group was 8.98 ± 0.81 mg/dL, while it was 6.30 ± 0.97 mg/dL in diseased group (Fig. 1). These results were similar to the findings of Brenner (2000), who found mineral disturbances specially in calcium due to the loss of calbidin protein (albumin) in the urine of nephrotic patients.

Sex wise, 27 male and 10 female children were suffering from nephrotic syndrome with almost 2:1 male to female ratio. This finding is exactly similar to the findings of McEnery and Strife (1982) in nephrotic children. Irrespective of group, the mean total calcium content in male and females was 7.45 ± 1.67 mg/dL and 7.99 ± 1.45 mg/dL, respectively. No significant difference was found between both the sexes. This might be due to the same calcium requirement/metabolism both in girls and boys. This fact is further confirmed by Srilakshmi (1993), who reported 600 mg/day calcium as recommended allowance for both girls and boys aged 2 - 12 years.

The mean total calcium of buffalo milk fed diseased children was 6.44 ± 1.19 mg/dL The children fed on buffalo milk along with breast feeding had comparatively better calcium profile than exclusively breast fed or cow milk fed or artificial formula alone. This might be due to high calcium content of buffalo milk as compared to other milk.

On comparing the values of weight of children fed on different types of milk, the lowest was obtained in artificially fed children, while the highest in children receiving buffalo milk. These results are in agreement to the findings of Black *et al*. (2002), who observed that in nephrotic children, long term avoidance of buffalo milk is associated with small stature and poor bone health.

The correlation of total calcium with age and weight of disease children are presented in Fig. 2 and 3, respectively. There was an inverse relationship between the age and total calcium of the children. This finding is in agreement with that of Passmore and Eastwood (1989). It might appear that as children grow, their calcium requirements increase and whenever the diet is free from cow or buffalo milk, it resulted in weight reduction. These findings are in accordance with Stanfield and Hui (2000), who reported that whenever the diet is inadequate in calcium, it results in abnormal growth curves and weight loss in growing children. Similar trend was noticed between weight and total calcium of the children. These results are in accordance with the findings of Behrman *et al*. (2001). They stated that in growing children, calcium requirement increases with increase in weight while blood calcium level shows the reverse trend. Of the total diseased children, 89% belonged to rural areas while the rest 11% from urban areas. Moreover, a direct relationship was found between financial status and food habits of the individuals.

Table I. Demographic parameters of respondents

Parameter	Control		Diseased	
	Mean	±SD	Mean	± SD
Age (years)	6.40	2.64	7.09	2.87
Weight (kg)	20.59	8.05	23.45	9.41
Height (cm)	101.35	33.61	122.84	18.40
Monthly income (Rs.)	5864.86	3870.41	4329.44	2847.12
Weaning age (years)	1.88	0.61	2.02	0.46

Fig. 1. Calcium profile of control and diseased groups

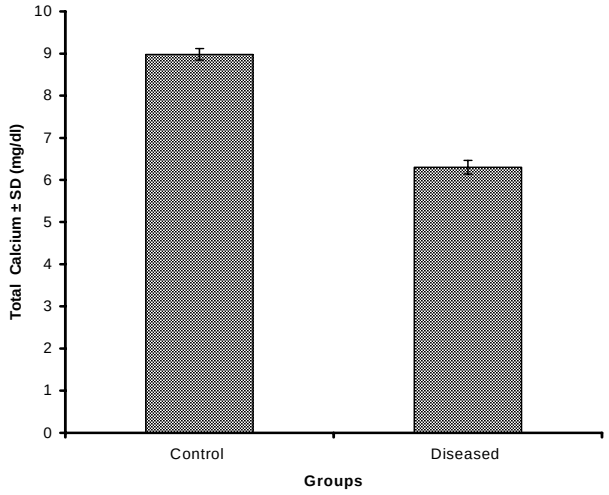


Fig. 2. Correlation between age and total calcium of disease children

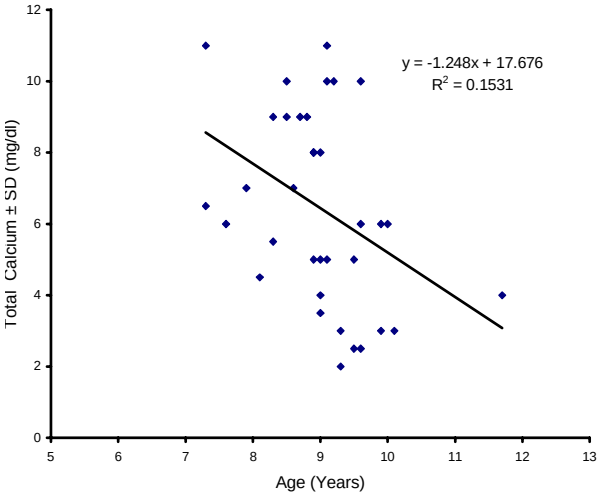
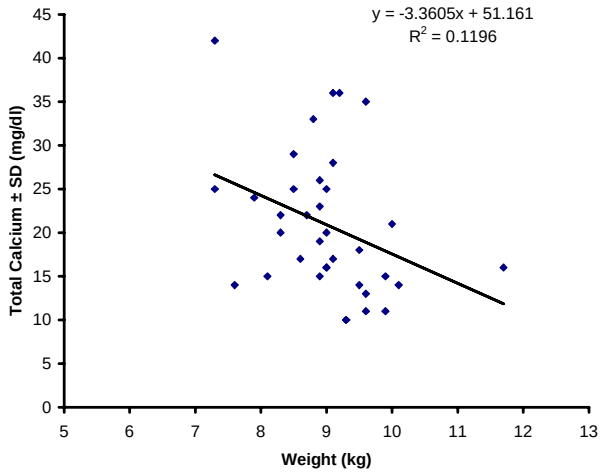


Fig. 3. Correlation between weight and total calcium of diseased children



CONCLUSION

It was concluded that combination of buffalo milk coupled with breast feeding was found to be most probably the best feeding package for maintaining the normal blood calcium level. An inverse relationship was observed between age, weight and total calcium of the children.

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