Special Communication

Assessment of Nutrient Intake in Cleft Lip and Palate Children After Surgical Correction

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Abstract

This research aimed to compare the nutrient intake of children with cleft lip and palate (CLP) with that of normal children (without CLP) in the same age groups. The study was conducted at the School of Dental Sciences, Universiti Sains Malaysia, Kelantan, Malaysia. A total of 139 children, of both sexes, from two to six years of age, either with CLP (40 children) or without CLP (99 children), were selected. The CLP and non-CLP children were grouped according to age, which is a key determinant of nutrient intake. Children in subgroup I were between the ages of 2 and 4 years, the group comprising 48 normal children of mean age 39.85 months (SD 7.1), and 20 CLP children of mean age 37.05 months (SD 5.9). Children in subgroup II were those over 4 years and up to 6 years old, and the group comprised 51 normal children, of mean age 64.16 months (SD 7.9), and 20 CLP children of mean age 56.75 months (SD 9.9). A comparative cross-sectional study was conducted to evaluate nutrient intake in subgroups I and II, using a 24 hours diet recall method. The nutrient intake of CLP children was shown to have no significant differences from that of normal children. A comparison of intake per day with Recommended Dietary Allowances (RDA) for Malaysian children showed that the consumption of nutrients was inadequate in both the normal and CLP children, in both age sub-groups.

Keywords: *cleft lip, cleft palate, growth, nutrition*

Introduction

Cleft lip (CL) and cleft palate (CP) occur due to a failure of the skeletal components of the mid-face to fuse. Cleft lip and palate (CLP) is the most common congenital abnormality, and according to epidemiological studies conducted on the incidence of CLP in Malaysian pre-school children, cleft lip, and cleft palate have an incidence of 1:1304 and 1:1594, respectively (1). However, international data has shown that craniofacial anomalies occur in approximately 1 in 500 live births (2).

CLP children can be undernourished due to feeding difficulties after birth (3). The growth problems of children with CLP have largely been attributed to inadequate nutrition (4). We have previously reported that children with CLP, in the age groups 2 to 4 years, and 4 to 6 years, even after surgical correction of the defect, measured significantly lower on the height-growth curve at their six month growth measurement than children without CLP (5). In view of this finding, there is a clear need to compare the nutritional intake of CLP children with that of children without CLP. This study aims to determine whether the growth deficiency observed in CLP children subsequent to correction of the cleft defect is due to inadequate nutritional intake.

The present study was undertaken at the Hospital Universiti Sains Malaysia (HUSM), Kelantan, Malaysia, in order to compare the nutrient intake of children with CLP with that of children without CLP, in the age group 2 to 6 years. The adequacy of nutrient intake in all these children was then evaluated against the Malaysian Recommended Dietary Allowances (RDA).

Materials and Methods

This study was conducted at the School of Dental Sciences, Universiti Sains Malaysia, Malaysia. A comparative cross-sectional study was conducted on a total of 139 Malaysian children, aged two to six years, of both sexes, either with CLP or without CLP. The distribution of the sample in relation to age is shown in Table 1. The children were split into sub-groups by age: subgroup I included children between the ages of 2 and 4 years, and subgroup II included children above 4 years up to 6 years of age. There was almost an equal distribution of samples in relation to gender in both groups.

The inclusion criteria for the CLP children were that they were CLP patients, but without

other systemic or congenital abnormalities. Children, who had been operated on for CLP at the HUSM were healthy and were aged between two and six years, were selected for the study. Subjects with untreated or incomplete repair of CLP were excluded. In the non-CLP group, healthy children, aged two to six years, were selected from nurseries, kindergartens, and primary schools in Kubang Kerian, Kelantan, Malaysia.

In the present study, nutritional intake in subgroups I and II was evaluated, using 24 hours dietary recall, by asking the parent of the child to list everything they had consumed from the previous day to the present. The results of an earlier study by Jackson et al., using 24 hours recall, recommended the application of this method to compare the dietary intake of different groups (6). Calculation of dietary energy and nutrient intake was carried out using Nutrical, version 1.01 (United Kingdom). This diet software calculates nutritional requirements against the calorie content of different foods. The database was based on the nutritional composition of Malaysian foods. Malaysian RDA (7) was used as the standard to estimate each child's nutrient intake status.

The per day mean macronutrient, mineral, and vitamin intakes of children in the age range 2 to 6 years, either with or without CLP, were compared, using independent sample *t* tests. The Malaysian RDA was used as an index to evaluate the mean nutrient intake of children, with or without CLP, in the two age ranges, 2 to 4 years, and above 4 up to 6 years. Data were analysed using the Statistical Package for the Social Sciences (SPSS) statistical package (Chicago, IL, USA) version 11. *P* values of less than 0.05 were deemed statistically significant.

Result

We assessed the macronutrient and micronutrient status of CLP children in the sample group, and compared this with the status of the children without CLP. Macronutrient consumption, generally, showed no significant difference. The only exception was fat intake, which was higher in CLP children (Table 2). There was no significant difference in the children's mineral intake, with the exception of potassium, which was higher in the CLP children (Table 3). Vitamin intake showed no significance between the groups (Table 4), but the levels of carotene and vitamin C intake were lower in the CLP children.

The adequacy of the daily nutrient intake of all groups of children, those with CLP and those without CLP, and those in the 2 to 4 years age group (Table 5) and those above 4 and up to 6 years (Table 6), was evaluated against the Malaysian recommended dietary allowances (RDA). In the 2 to 4 years age group, children both with and without CLP, had lower intakes of energy foods, calcium, iron, niacin, and vitamin C than the RDA, whereas protein, retinol, thiamine, and riboflavin intake were all higher than the RDA (Table 5). In the over 4 to 6 years age group, both

Table 1: The age and distribution of normal, and cleft lip and palate (CLP) patients

Normal		CLP	
Mean (SD)			
n = 48	*n* = 51	*n* = 20	*n* = 20
Sub group I	Sub group II	Sub group I	Sub group II
39.85 (7.1)	64.16 (7.9)	37.05 (5.9)	56.75 (9.9)

Sub group I: 2 –4 years, and Sub group II: Above 4 up to 6 years.

Table 2: The mean macronutrient intake of normal and, cleft lip and palate CLP (2 to 6 year-old)

Nutrient	Normal		CLP		*t* stat	*P* value
	Mean (SD)					
Energy (Kcal)	1165.58	(378.29)	1337.57	(872.00)	0.012	0.215
Protein (g)	42.05	(27.97)	49.49	(31.73)	0.983	0.163
Fat (g)	34.26	(16.54)	45.08	(28.17)	0.069	0.021
Carbohydrate (g)	168.03	(52.08)	182.08	(136.86)	0.005	0.513

CLP and non-CLP children had lower intakes of energy foods, calcium, iron, thiamine, riboflavin, niacin, and vitamin C than the RDA, while protein and retinol intake were both higher than the RDA (Table 6). Overall, comparing the daily consumption of nutrients of Malaysian children with the RDA, it was apparent that both CLP and non-CLP children, in both age sub-groups, have an inadequate daily consumption of several major nutrients.

Discussion

The present study assessed the nutritional intake of children, aged 2 to 6 years, with and without CLP, in Kubang Kerian, Kelantan, Malaysia. For all children energy foods are required to support physical activity, growth and development, and the requirements are identified as total energy expenditure data (8). Children also need a complex supply of macro- and

Table 3: The mean mineral intake in normal, and cleft lip and palate (CLP) children (2 to 6 years old)

Nutrient	Normal		CLP		*t* stat	*P* value
	Mean (SD)					
Calcium (mg)	248.06	(139.08)	317.83.83	(234.86)	0.005	0.072
Phosphorus (mg)	786.31	(553.60)	941.56	(515.23)	0.749	0.117
Iron (mg)	8.36	(7.48)	8.67	(6.45)	0.494	0.809
Sodium (mg)	744.11	(537.32)	904.66	(686.24)	0.079	0.135
Potassium (mg)	877.67	(457.82)	1054.08	(532.38)	0.380	0.046

Table 4: The mean vitamin intake in normal, and cleft lip and palate (CLP) children (2 to 6 years)

Nutrient	Normal		CLP		*t* stat	*P* value
	Mean (SD)					
Retinol (µgRE)	413.08	(400.81)	455.65	(365.80)	0.340	0.549
Carotene (µg)	507.14	(629.07)	353.69	(1151.64)	0.939	0.309
Thiamine (mg)	0.547	(0.269)	0.540	(0.344)	0.184	0.885
Riboflavin (mg)	0.775	(0.420)	0.885	(0.553)	0.041	0.224
Niacin (mg)	6.61	(3.72)	7.61	(4.91)	0.338	0.181
Vitamin-c (mg)	13.98	(18.81)	12.50	(22.85)	0.983	0.686

Table 5: The mean nutrient intake in the normal, and cleft lip and palate (CLP) children age between 2 and 4 years old and the Malaysian Recommended Dietary Allowances (RDA)

Nutrient	Normal		CLP		Malaysian RDA
	Mean (SD)				
Energy (Kcal)	1258.4	(348.311)	1077.1	(361.74)	1360
Protein (g)	49.4	(29.16)	51.5	(34.05)	23
Calcium (mg)	284.5	(129.95)	309.3	(164.05)	450
Iron (mg)	9.4	(8.13)	8.3	(5.91)	10
Retinol (µgRE)	596.0	(473.42)	488.9	(352.1)	250
Thiamine (mg)	0.6	(0.26)	0.05	(0.36)	0.5
Riboflavin (mg)	0.8	(0.39)	0.8	(0.51)	0.8
Niacin (mg)	6.9	(3.32)	6.2	(93.42)	9.0
Vitamin C (mg)	11.3	(10.76)	11.5	(30.18)	20

micronutrients if they are to develop optimally (9). While assessing the macronutrient intake of 2 to 6 year old children, it was shown that, with the exception of fat, CLP children have no significant differences in intake compared to children without CLP (Table 2). The study also compared macronutrient intake with the RDA for Malaysian children, and found that energy intake in both CLP and non-CLP children, aged 2 to 4 years old and over 4 to 6 years old, was lower than the RDA. However, intake of protein was much higher than RDA in both age groups.

Micronutrients support lean muscle mass growth and prevent nutrition-related chronic diseases (10). The vitamin and mineral intake of children, both with and without CLP, was assessed in this study (Tables 3,4). Although micronutrient intake was approximately the same across the groups (with the exception of potassium), we compared this further with the RDA for Malaysian children aged 2 to 4 years old, and 4 to 6 years old (Tables 5,6). The results of our study showed that calcium and iron intake was lower than the RDA for the 2 to 6 year olds, including both CLP and normal children. Since calcium is the main mineral component of bone tissue, low intake or absorption of calcium may limit statural growth (11). Previously, while assessing the height growth curve for an equivalent sample, we had observed that CLP children measured significantly lower (5), which could be attributed to the lower calcium intake noted in the present study. Iron intake, which was also low in both groups in the present study, has also been reported to affect child development (12).

In the present study, the daily intake of vitamins, as shown in Table 4, showed no significant differences between the CLP children and the children without CLP ($P > 0.05$). However, when compared with the RDA for 2 to 6 years old children, we found that all children in the sample (those with CLP and those without) had a higher consumption of retinol, a nutrient that is important for physical growth (13). Daily consumption of other water soluble vitamins, except for thiamine and riboflavin, was lower in the study sample than the RDA (Tables 5,6). Hence, the results of the present study showed that the daily intake of most vitamins was not satisfactory in either the CLP or the normal children. Vitamins are organic substances required for many basic physiological functions, and are significantly important for infant growth (14). The deficient vitamin intake found in the children of the present study could compromise growth. Previous studies have also demonstrated that normal growth is affected if children suffer from vitamin deficiencies (15).

The present study reported that the nutrient intake of CLP children was little different from that of their normal counterparts. This could be attributed to the implementation of adequate nutritional intake in hospitals before and after surgical intervention to facilitate healing and growth, and this would also facilitate parental education and their motivation regarding the importance of good nutrition (16).

Inadequate intake of nutrients relative to the RDA was reported in both the CLP and non-CLP children between 2 and 6 years of age. The authors assessed the growth parameters of the study sample, and showed that the CLP children measured significantly lower on the height-growth curve at their six month growth measurement (5). Although both groups of subjects had a deficient

Table 6: The mean nutrient intake in the normal, cleft lip and palate CLP children age above 4 up to 6 years old and the Malaysian Recommended Dietary Allowances (RDA)

Nutrient	Normal		CLP		Malaysian RDA
	Mean (SD)				
Energy (Kcal)	1074.9	(393.71)	1270.9	(575.15)	1830
Protein (g)	35.7	(25.35)	41.6	(27.06)	29
Calcium (mg)	204.9	(133.99)	298.3	(277.46)	450
Iron (mg)	7.5	(6.86)	8.2	(5.66)	10
Retinol (µgRE)	395.3	(343.65)	464.6	(354.70)	300
Thiamine (mg)	0.5	(0.26)	0.5	(0.29)	0.7
Riboflavin (mg)	0.7	(0.43)	0.8	(0.46)	1.1
Niacin (mg)	6.2	(4.15)	8.1	(5.72)	12.1
Vitamin C (mg)	16.6	(24.38)	15.5	(18.32)	20

nutrient intake in the present study, the reasons for the lower height increment in the CLP children is not clear. This could be attributed to genetic, hormonal or psychosocial factors, or to chronic infection after the cleft restoring operation (17,18).

The present report emphasises the importance of macronutrients and micronutrients in a child's diet. A paediatric dentist could play an important role in improving the nutritional status of all children by incorporating diet recall and analysis as a part of everyday history taking when examining each child encountered in the practice.

Conclusion

With the exception of fat and potassium intake, nutritional intake in children with CLP was not significantly different from that of children without CLP. In general, the consumption of nutrients in both the CLP and normal children in the age group studied was below recommended limits, and this could affect child development. Therefore, there is a need to improve the quality of care delivered to all children by raising awareness of the importance of adequate nutritional intake.

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Conflict of Interest

None.

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