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Role of family relationship status and nutritional factors on body mass index (BMI) of children

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Abstract

Malnutrition in early childhood is associated with significant functional impairment in adult life. School age is considered as a dynamic period of growth and development because children undergo physical, mental, emotional and social changes. The unsatisfactory nutritional status in school going children may not be entirely due to economic condition of the family. Early published literature suggested that other family related factors like household structure, internal relationships between the family members also have important consequences. The Caregiver's ability and motivation is important for nutritional consequences of the children. The present study focuses on the role of family relationship considering nutritional factors in determining the nutritional status of the children. A cross sectional study was conducted in urban areas of a North 24 Parganas district of West Bengal, India; by using systematic randomized sampling method to select 150 school going children (boys), aged 10-12yrs. The information related to food consumption and family relationship status were retrieved by using food frequency questionnaire, 3days dietary recall and the family relationship scale respectively. Height and weight were measured to calculate BMI. The mean family relationship score (54.98 ± 7.98) was "good" according to manual of family relationship scale. The average daily intake of energy, protein, fat and Vitamin C was adequate as compared with standard daily dietary recommendation by Indian Council of Medical Research for Indian Children (10-12yrs). Whereas, the mean intakes of other nutrients like calcium iron, carotene, B- vitamins was less than the recommended allowances. Average BMI for age (17.35 ± 2.6) of the sample was normal according to WHO standard. Family relationship score accounted for most statistically significant independent variable other than nutritional factors in multiple regression analysis. The present study showed that good relation between parents and children have good nutritional outcomes in terms of BMI among children, along with daily adequate intake of essential macronutrients like energy, protein and fat, but micronutrients consumption was less compared to the recommended allowances excluding vitamin C and thiamin. So, it can be concluded that Family functioning is of central significance when determining a child's nutritional well-being.

Keywords: Family relationship status, Nutritional factors, BMI, School going children.

1. Introduction

The family is the primary social institution influencing young children ^[1]. According to traditional developmental psychologists, parenting styles (parental attitudes and styles of interacting with children that could result in individual differences among children in key outcomes) and parenting practices (specific behavioural strategy employed by parents to socialize their children) are key components for children's behavioural development ^[2]. An individual's social environment, including the social relationships an individual makes within it, can also have a profound impact on the quality of parenting, which in turn affects a child's health development and future achievements. There is a considerable body of evidence demonstrating that an individual's social environment influences their health status, although the mechanisms by which it does so are not yet fully understood ^[3]. Malnutrition in early childhood is associated with significant functional impairment in adult life, reduced work capacity and decreasing economic productivity. The unsatisfactory nutritional status in school going children may not be entirely due to economic condition of the parents, other family related factors like household structure, internal relationships between the family members also have important consequences as suggested by various studies ^[4]. It had been documented in the early published literature that even resource-poor households demonstrated successful child growth, and rich households showed failure in child growth.

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Parents create environments for children that may foster the development of healthy eating behaviours and weight, or that may promote overweight and aspects of disordered eating. Several studies have shown that a child's eating behaviour is strongly influenced by the family environment [5, 6, 7, and 8]. According to Hair and colleagues (2009), adolescents whose parents have a high-quality relationship and who have a good parent-adolescent relationship with both parents consistently had the best outcomes. Overall, poor relationships consistently undermine mental health, physical health, and substance use [9]. Till the literature on the parent-child relationship quality and child physical health, specially related to obesity is even less extensive. So, the present study was designed to assess family relationship status and dietary habits of the children of that particular families and to identify association between the family relationship status and nutritional factors on BMI of the children.

2. Materials and Methods

A cross sectional study was conducted in urban areas of a North 24 Parganas district of West Bengal, India. Systematic randomized sampling method was used to select 150 school going children (boys), aged 10-12yrs. The study participants were selected only on the basis of their willingness, neither socioeconomic status nor religion-caste they belongs to. Primary data (collected by interview schedule and observation) as well as secondary data [Recommended Dietary Allowances [10], Balanced Diet Chart [10]; Nutritive value of Indian foods published by National Institute Of Nutrition(NIN), ICMR[11]; WHO GROWTH REFERENCE 5-19YRS, BMI-for-age (5-19 years) for boys[12] were used for this study. Four tools were used in this study: (i) Anthropometric Assessment for BMI calculation (ii) 3days Dietary recall method (iii) Food frequency questionnaire for daily nutrient intake assessment (iv) Family relationship scale. [13]

(i) Anthropometric Assessment: Height & weight was measured to calculate Body Mass Index.

(ii) 3days Dietary recall method: It is providing information(quality and quantity) related to 3days (two working days+ one holiday) dietary recall in terms of early morning, breakfast, mid-morning, lunch, evening tea, dinner, at bed time, eat out/ festive foods.

(iii) Food frequency questionnaire: It gives an estimate of the frequency of the various food groups(cereal, pulse, green leafy vegetables, roots & tubers, other vegetable, fruit, milk and milk products, meat_fish_egg, fat_oil and sugar_jaggery) consumed by the respondents.

(iv) Family relationship scale: This scale has been constructed

to assess intrapersonal personal relationship between family members, specially parents and children. There are 40 statements showing either good or bad relationships. Every statement has three alternative (Always/ Sometimes/Never) response. Marks allotment for scoring as follows: For Good relation: 2 marks for Always, 1 marks for Sometimes, 0 marks for Never. For Poor relation: 0 marks for Always, 1 marks for Sometimes, 2 marks for Never.

The collected data was analyzed by SPSS version 20. To explain the study participants in relation to the relevant variables, descriptive statistics (frequency, percentage, mean and standard deviation) were used. The association between dependent and independent variables were identified by multiple regression.

3. Results

A. Assessment of Family Relationship Status

The family relationship status was assessed by the family relationship scale (Table 1): out of 150 study participants, 80 boys having excellent, 55 maintaining good and 15boys having moderate family relationship. The mean score of all study participants was 54.98 ± 7.98 , which was indicating that all of them having good family relationship in general.

Table 1: Family relationship status

Family Relationship status	Standard Score	No of Participants
Excellent	56 and above	80
Good	46-55	55
Moderate	36-45	15
Poor	26-35	Nil
Very poor	25 and less	Nil

B. Assessment of Body Mass Index (BMI)

Table 2: BMI status of study participants

BMI Status	Number	%
Underweight	22	14.66
Normal	98	65.33
Overweight	30	20

According to Table 2, Out of 150 study participants, 98 boys having normal BMI while 22 boys were underweight and 30 boys were overweight. Whereas, average BMI for age (17.57 ± 2.6) of the 150boys were almost normal according to WHO standard.

C. Assessment of Dietary Intake

Table 3: Intake of food groups by study participants in frequency percentage

FOOD GROUPS	DAILY	1-3 TIMES/ WEEK	4-7 TIMES/ WEEK	ONCE/WEEK	NEVER/RARE
Cereal	100	0	0	0	0
Pulses	16	43	29	12	0
Green Leafy Veg	14	28	15	43	0
Other Veg	26	40	11	11	12
Roots & Tubers	73	11	16	0	0
Fruits	11	29	16	33	11
Milk & Milk Products	11	19	13	40	17
Fish/Egg/Meat	38	22	32	05	03
Sugar/Jaggery	100	0	0	0	0
Oil	100	0	0	0	0

Table 3 showing that all the students consumed cereals in the form of rice, wheat, bread etc. daily. Pulses were consumed

by only 16% of the students, 43% were consuming 1-3 times/week. Green leafy vegetables were consumed by 43%

students once in a week, only 14% of the students consumed green leafy vegetables daily. 26% of the students consumed other vegetables daily, whereas 40% students consumed other vegetables 1-3 times/week. Roots and tubers are consumed by 73%.of the students mainly in the form of potato, yam etc. daily. Only 11% of the students consume fruits daily. Majority students (33%) consumed fruits once/week. The commonly eaten fruit was banana. Only 11% students

consumed milk/milk products daily, whereas 40% consumed once in a week. 38% students consumed animal protein daily in the form of fish, egg or meat; whereas chicken or meat consumption was occasional. Sugar was consumed by 100% students daily with either tea/milk or cooked food. The visible fats commonly used are mustard oil sunflower oil and ghee/butter. Visible fat in the form of cooking oil was consumed by 100% students daily.

Table 4: Intake of daily Nutrients compared with recommended value by ICMR

Nutrient Intake	Recommended by ICMR	Daily Consumption (mean± SD)
Energy(Kcal/day)	2190	2159.72±152.95
Protein (g/day)	39.9	41.169±4.485
Visible fat (g/d)	35	37.33±5.47
Calcium (mg/d)	800	340.29±435.28
Iron (mg/d)	21	7.76±1.36
Vitamin A (ug/d)	4800	257.05±198.13
Thiamin (mg/d)	1.1	1.23±0.131
Riboflavin (mg/d)	1.3	0.44±0.119
Niacin (mg/d)	15	19.45±1.55
Pyridoxine (mg/d)	1.6	1.47±0.277
Vitamin C (mg/d)	40	39.36±37.94
Folic Acid (ug/d)	140	63.49±8.68

According to Table 4, Energy, protein and fat and vitamin C intake was adequate compared to RDA values. Other micronutrients intake was not adequate compared to the recommended intake according to ICMR.

D. Association between the family relationship status and nutritional factors on BMI of the children

Table 5.1: Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.426a	0.182	0.097	2.6747

a. Predictors: (Constant), Folic acid, Family Relationship score, Pyridoxine, Fat, Iron, Calcium, Vit C, Carb, Protein, Riboflavin, Vit A, Thiamin, Niacin, Energy
 b. Dependent Variable: BM

Table 5.2: ANOVA^a

Model	Sum of Squares	Df	Mean Square	F	Sig
Regression	182.569	14	13.041		
1 Residual	821.935	135	6.088	2.142	.013 ^b
Total	1004.503	149			

a. Dependent Variable: BMI

Table 5.3: Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
1	(Constant)	7.957	3.740		2.128	.035
	Family Relationshi p score	.114	.028	.332	4.095	.000
	Energy	.012	.010	.681	1.217	.226
	Carb	-.053	.035	.678	1.515	.132
	Protein	-.083	.078	-.143	-1.055	.293
	Fat	-.087	.096	.183	.903	.368
	Calcium	8.282E-005	.001	.014	.146	.884
	Iron	.208	.298	.109	.699	.486
	Vit A	-.001	.002	-.039	-.290	.772
	Thiamin	3.653	4.058	.184	.900	.370
	Riboflavin	-.069	2.660	-.003	-.026	.979
	Niacin	.213	.336	.127	.635	.527
	Pyridoxine	-.596	.951	-.064	-.626	.532
	Vit C	.007	.009	.097	.704	.483
	Folic Acid	-.048	.068	-.159	-.700	.485

a Dependent Variable: BMI

b Predictors: (Constant), Folic acid, Family Relationship score, Pyridoxine, Fat, Iron, Calcium, Vit C, Carb, Protein, Riboflavin, Vit A, Thiamin, Niacin, Energy

Table 5.1, 5.2, 5.3 showing that all independent variables are accounted statistically significant, with variation of ($r=.426$, $r^2=.182$) with BMI ($F=2.142$, $p=.013$). Among other independent variables, family relationship score accounted for most statistically significant ($t=4.095$, $p=000$).

4. Discussion

The present study showed that good relation between parents and children have good nutritional outcomes in terms of BMI among children. Similar observation reported by Hair and colleagues (2009). They concluded that both parental marital quality and positive parent-adolescent relationships are important to health outcomes later in adolescence and in early adulthood [9]. In a limited sample study of children averaging 10 years old, researchers found that parent verbal marital conflict was negatively related to overall child health and positively related to digestive problems and fatigue, whereas parent physical marital conflict was positively related to fatigue and chronic illness [14].

The present study also highlighted in terms of daily nutrient intake that study participants were consuming adequate amount of essential macronutrients like energy, protein and fat; but micronutrients consumption was less compared to the recommended allowances excluding vitamin C and thiamin. Along with that, 65% study participants having normal BMI, 20% were overweight and 15% was underweight. But average BMI was not below, it was towards higher in comparison to BMI standard according to WHO. From these findings, we can conclude the boys having good family relationship, somehow enjoying indulgent feeding styles and consuming calorie-dense but nutrient-less food as per their urban lifestyle. The conclusions drawn by the Hughes and colleagues (2005) can be documented in support of our observation that children of parents using indulgent feeding styles had higher weight status scores compared to children with authoritarian parents [6].

But overall, more than 65% the study participants with good family relationship were maintaining normal nutritional health status in terms of standard BMI. These observation add support to previous observations by other researchers. Lissau and Sorensen (1994) reported that neglected children had a greater risk of onset of malnutrition [15]. Similar observation reported by Shroff *et al.* (2009) [16], where they concluded that maternal autonomy was inversely related to child stunting in India [16]. According to Family relationship scale manual used for the present study, Good family relationship implies cordial relationship between parents and mother has a decision making power. Autonomy and control of resources gives caregiver's ability to play a role in decisions made within the household and the community. Allowing the mother whom in most cases is the caregiver to gain control of, and access to resources and makes her more likely to provide effective child nutrition and ultimately impact child growth. Researchers determined on basis of a Sub-Saharan African study that women's decision-making power had a significant, positive effect on height-for-age, weight-for-height, and weight-for-age [17]. Another researcher also highlighted that if family is empowering mothers with control over purchase of dietary items can take care of their children more effectively which is reflected in better nutritional status of their children [18]. Previous researchers [19] also suggested that greater levels of women's autonomy would have a significant effect on children's health under conditions of resource constraint, but less of an effect on their children's health when resource availability was high.

5. Conclusion

Good family relation enhances personal attraction, vitality and endurance. Parents must be preventive and corrective in such a way the children will be feeling happy, cheerful and contribute to social acceptance. Poor family relations tend to make the children socially maladjusted and thus lead to rejection or neglect or unhappiness, which leave physiological and psychological scars on young children's development.

Good relation between parents gives intra-household bargaining power to the mother who in turn allocates food resources to the family members. Caregivers of most of the families are mothers. Mother's care can be supportive and beneficial for the children, when following resources and factors will be available: caregiver knowledge, education, and beliefs; health and nutritional status of caregiver; mental health, lack of stress, and self-confidence of caregiver; caregiver's autonomy and control of resources; and social support received from family and community. Hostile marital relation can compromise the quality of parental care giving and ultimately children's developmental growth. So, it can be concluded cordial family relationship can attribute to develop the eating behavior that will direct to meet adequate nutrients for growth and wellbeing.

6. Recommendations

It has been clearly documented that parent's attitude and behaviors are one of the key component for developing nutritional health status of children. Due to Nutrition transition, India nowadays suffering from over-nutrition as well as under-nutrition. To implement any obesity related interventions, obese children along their parents has to be considered as a target population. Inequalities within the family members specially between father-mother has a large cost in terms of child malnutrition. By improving the status of the woman in terms of woman autonomy will lead to substantial decline from the sufferings of children any type of malnutrition. Policy-makers and public health professionals may want to look into avenues by which maternal autonomy can be enhanced. Further research should focus on culturally-acceptable means of increasing awareness regarding the importance of maternal decision-making power for her children's healthcare. Along with nutrition educator, family counselors has to emphasis on cordial relationship between parents for the sake of country's battle against malnutrition of young children.

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