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### Gender difference in nutrition among primary school children (6 to 12) year in Hosangabad

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#### Abstract

Nutrition in children has an important influence on health both in primary school children 6 to 12 years. Actions aimed at improving children's nutrition are essential, not only to the children and their families, but also to the whole society. The aim of the study was to present the results of nutrient intake before starting a nutrition and physical activity intervention programme, to investigate gender differences in nutrient intake and to discuss whether the preschoolers' nutrient intake is similar to the intake of their peers from other countries. Nutrient intake was estimated from seven-day weighed food records kept by parents and preschool staff individually for 6 to 12-year-old children who attended two preschools. Nutrient intake was calculated using Diet a 4.0 computer programme including water intake and intake of nutrients from dietary supplements. Statistical analysis was performed using the IBM SPSS Statistics computer programme, version 21.0, according to gender. The study was approved by the Bioethics Committee of the Bhopal University of Medical Sciences.

**Keywords:** Preschool children, nutrient intake, energy, macronutrients, vitamins, minerals, intervention, nutrition, diet

#### Introduction

Dietary adequacy is crucial for children to support healthy growth and development and prevent nutrition-related diseases later in life. However, existing international data indicate that many children fail to achieve dietary recommendations for multiple nutrients. Thus, abundant research has been conducted to understand factors that could influence eating behaviours and dietary intake of children.

Recent studies suggest that dietary intake and preferences of children are influenced by gender, but findings in this regard were mixed. Lytle *et al.* observed similar dietary patterns for boys and girls in the India. In M.P., several studies reported that girls tend to consume more fruits than boys and have a stronger preference for vegetables, whereas boys tend to have a greater preference for meat, processed meat, eggs and high-sugar and energy-dense foods than girls. In a study conducted among Polish pre-school child, significant gender differences in multiple nutrients were observed, such as protein, saturated fat and carbohydrate. However, research studies investigating gender differences in nutrient intakes among school-aged children are scarce.

Children are particularly vulnerable to dietary inadequacy due to higher requirements associated with physiological development and growth. Furthermore, many children demonstrate a strong preference for some foods, while rejecting others. In particular, school-aged children tend to demonstrate independence in selecting food choices. These dietary behaviours may limit dietary variety and, therefore, affect dietary adequacy. In the Middle East, children's diet has been shifted from traditional dietary patterns to a Westernised diet characterised by high intakes of fast-food, energy-dense snacks and sugar-sweetened beverages. Alongside, nutrient inadequacies have been documented, with suboptimal intakes of fibre, iron, zinc, calcium and vitamin D and excessive intakes of sugar, fat and saturated fat. However, dietary intake studies in the Gulf countries, particularly in Saudi Arabia, are scarce. In fact, the need for dietary data in Saudi Arabia has been previously suggested. Hence, the present study aimed to (1) evaluate the nutrient intake of Hosangabad children in relation to dietary recommendations and (2) investigate gender differences in nutrient intake. Our findings will inform policies and guide intervention programmes aimed at promoting healthy dietary habits early in life.

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**Research Methodology**

We aimed to recruit at least 176 boys and 176 girls based on the sample size calculation method suggested by Hulley *et al.*, with 95% confidence level, 80% power, mean energy intake of 1200±350 kcal/d with a minimum of 10% difference in energy intake between boys and girls (obtained from a pilot of 36 children which has been excluded from the total sample) and standardised effect size of 0.34. Data were collected between October 2020 and February 2021. Mothers of school-aged children (6-12 years old) were invited to participate in the present study using social media channels. An online link included information on study objectives and protocol and consent for participation. The mothers were requested to answer questions on the socio demographic characteristics of the child (age, gender, region of residence, maternal and paternal education status, maternal age and employment status, and paternal involvement in child feeding). We also asked the mothers about the appropriate date and time for communication to collect the dietary data of the child. Data of healthy Hosangabad children aged 6-12 years were included. The exclusion criteria include other area children and children with food allergy or any medical health condition. The final analyses included data of 424 Hosangabad children.

**Analytical of food intake**

The assessment of dietary data was conducted using a single 24-h dietary recall within 2 weeks from survey data collection. A sub sample of 168 children (39.6%) was randomly selected to report three non-consecutive 24-h recalls (two weekdays and one weekend day). The within-person mean of the three 24-h dietary recalls was calculated and used along with the single 24-h recall data for the other children to estimate the mean intake of the total sample. We aimed in the present study to evaluate nutrient intake from dietary food sources. Thus, we did not collect data pertaining to supplement use. A reminder text message has been sent to each mother a day before the scheduled time. During the telephone interview, mothers were educated on how to

express the amount and type of food consumed by the child. We also shared pictures of serving tools to further assist in estimating the portion size of each food consumed. Mothers were requested to have the child and persons responsible for child feeding nearby and participate in the interview.

**Analysis of static tools**

Descriptive statistics were expressed as frequency (percentage), median (Interquartile range) and mean±standard deviation. The Mann-Whitney test was used to compare the intakes of nutrients for children reporting single 24-h dietary recall with the intake of children reporting three 24-h dietary recalls and to examine differences in energy and nutrient intakes by gender. The  $\chi^2$  test was used to evaluate gender differences in socio demographic characteristics and proportions of children with nutrient intake at or above the DRI requirements (EAR or AI). To evaluate gender differences in socio demographic characteristics,  $\alpha = 0.050$  was used to infer significance. Bonferroni adjustments for multiple testing in dietary intake was performed; gender differences in dietary intake were determined to be significant at  $\alpha = 0.003$ , whereas gender differences in proportions of children meeting the DRI requirements were set at  $\alpha = 0.007$ . All statistical analyses were performed using two-sided tests carried out by the Statistical Packages for Social Sciences (SPSS) version 24.

**Results**

**Socio demographic characteristics of children**

Approximately half of the children were boys (49.5%, *n* 210). Socio demographic characteristics of the sample are presented in Table 1. The mean age of boys and girls included in the present study were 8.58±1.86 and 8.76±1.84 years old, respectively. Three-quarters of the mothers (75.2%, *n* 319) and two-thirds of fathers (63.2%, *n* 268) had a college degree or higher. The majority of fathers were involved in child feeding (76.9%, *n* 223). No significant gender difference was observed in the proportion of children by the groups of socio demographic variables ( $P > 0.050$ ).

**Table 1:** Socio demographic characteristics of children

Characteristic	Boys, <i>n</i> 210 (49.5%)	Girls, <i>n</i> 214 (50.5%)	Total, <i>n</i> 424 (100%)	<i>P</i> -value
Age in years	6-8	108 (51.4)	101 (47.2)	0.383
	9-12	102 (48.6)	113 (52.8)	
Region of residence	Western	119 (56.7)	123 (57.5)	0.552
	Central	24 (11.4)	32 (15.0)	
	Eastern	28 (13.3)	25 (11.7)	
	Southern	28 (13.3)	20 (9.30)	
Maternal age in years	Northern	11 (5.20)	14 (6.50)	0.770
	<31	35 (16.7)	41 (19.2)	
	31-40	119 (56.7)	120 (56.1)	
Maternal education	>40	56 (26.7)	53 (24.8)	0.115
	High school/diploma or less	45 (21.4)	60 (28.0)	
Paternal education	College degree or higher	165 (78.6)	154 (72.0)	0.452
	High school/diploma or less	81 (38.6)	75 (35.0)	
Maternal employment status	College degree or higher	129 (61.4)	139 (65.0)	0.394
	Unemployed	120 (57.1)	131 (61.2)	
Paternal involvement in child feeding	Employed	90 (42.9)	83 (38.8)	0.405
	Yes	93 (44.3)	108 (50.5)	
Monthly household income in Saudi Riyal	Sometimes	64 (30.5)	61 (28.5)	0.882
	No	53 (25.2)	45 (21.0)	
	<4000	16 (7.60)	13 (6.1)	
	4000-6000	30 (14.3)	32 (15.0)	
	6001-10 000	51 (24.3)	53 (24.8)	
	10 001-15 000	50 (23.8)	58 (27.1)	
	>15 000	63 (30.0)	58 (27.1)	121 (28.5)
	10 001-15 000	50 (23.8)	58 (27.1)	108 (25.5)

### Dietary intake of children

Intakes of nutrients for children reporting single 24-h dietary recall and children reporting three 24-h dietary recalls were all similar ( $p > 0.050$ ). The mean energy intake of the total sample was  $1312 \pm 348$  kcal, with a median intake of 1247 kcal (1079-1482 kcal). Mean energy intake of boys aged 6-8 years old ( $1329 \pm 342$  kcal) did not statistically significantly differ than that of girls ( $1298 \pm 333$  kcal),  $P = 0.645$

### Conclusion

The study was approved by the Bioethics Committee of the Bhopal University of Medical Sciences. Boys, in comparison to girls, were found to have statistically significantly higher intakes of total protein, total protein per kg of body weight, saturated fatty acids, total carbohydrates, available carbohydrates, lactose, sucrose, total water, vitamin A, beta-carotene, vitamin B2, vitamin B12, vitamin C, calcium, phosphorus, and magnesium. Statistically significantly higher percentage of girls than boys had intakes of vitamin E below AI. Gender was a significant factor of nutrient intake in the studied preschool children. The main nutritional concerns in the studied preschoolers' diets, irrespective of gender, are typical of the diets of preschool children from various parts of Indian and indicate the need to work out common nutritional strategies to improve preschoolers' nutrition across Indian to reduce future burden of diet-related diseases to the Indian societies.

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