

Original Research Article

Children's eating behaviour in relation to body mass index among 2–5-year-old children in a tertiary care centre: a cross-sectional study

Tessa Jose*, Jacob Abraham, Roshen Roy, Carol Sara Cherian

Department of Pediatrics, Pushpagiri Institute of Medical Sciences & Research Centre Thiruvalla, Kerala, India

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*Correspondence:

Dr. Tessa Jose,
E-mail: tessajose1997@gmail.com

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ABSTRACT

Background: Childhood obesity is an emerging global health concern and is associated with several metabolic, cardiovascular and psychosocial complications. Eating behaviours established during preschool years are often stable and may influence future body weight. The children's eating behaviour questionnaire (CEBQ) is a validated tool to assess appetite-related behaviours in children. Objective was to assess the relationship between children's eating behaviours and body mass index (BMI) among children aged 2–5 years attending a tertiary care centre.

Methods: A hospital-based cross-sectional study was conducted among 162 children aged 2–5 years in the Department of Pediatrics of a tertiary care centre. Data were collected using a structured proforma and the CEBQ completed by parents/caregivers. Anthropometric measurements were recorded and BMI SD scores were calculated using WHO growth standards. The CEBQ assessed eight subscales categorized into food-approach behaviours (food responsiveness (FR), enjoyment of food (EF), emotional overeating (EOE), desire to drink (DD)) and food-avoidant behaviours (satiety responsiveness (SR), slowness in eating (SE), emotional undereating (EUE), food fussiness (FF)). Spearman correlation was used to evaluate associations between BMI SD score and CEBQ subscales.

Results: The mean age of participants was 2.09 ± 0.82 years; 53.7% were females. Based on BMI SD scores, 46.9% had normal BMI, 36.4% were overweight/obese and 16.7% were underweight. BMI SD score showed strong positive correlations with EF ($p=0.786$), EOE ($p=0.717$), FR ($p=0.794$) and DD ($p=0.756$) (all $p<0.001$). Significant negative correlations were observed with SR ($p=-0.412$), SE ($p=-0.459$), EUE ($p=-0.373$) and FF ($p=-0.375$) (all $p<0.001$).

Conclusions: Preschool children with higher BMI demonstrated stronger food-approach behaviours and weaker food-avoidant behaviours. Early identification of maladaptive eating patterns and family-centred behavioural interventions may help prevent childhood obesity and undernutrition.

Keywords: Body mass index, Childhood obesity, CEBQ, Eating behaviour, Food responsiveness, Preschool children

INTRODUCTION

Childhood obesity is a major global public health challenge, with increasing prevalence in both developed and developing countries.¹ Obesity in childhood predisposes individuals to obesity in adulthood and increases the risk of non-communicable diseases such as type 2 diabetes mellitus, hypertension, cardiovascular diseases, bronchial asthma, obstructive sleep apnoea, hepatic steatosis and gastroesophageal reflux.² In addition, obesity has important psychosocial consequences including low self-esteem, stigmatization

and depression.³ BMI defined as weight in kilograms divided by the square of height in meters, is commonly used to assess adiposity.⁴ In children, BMI should be interpreted using age- and sex-specific growth charts.⁴ Preschool years represent a critical developmental period during which eating behaviours become established and often persist into later life.⁵ Eating behaviour is influenced by both internal appetite regulation and external environmental cues.⁵ Reduced satiety responsiveness and increased responsiveness to food cues have been associated with excess weight gain.⁶ Increased intake of calorie-dense foods and sugar-sweetened

beverages further contributes to obesity.⁷ Parental feeding practices, emotional feeding and role modelling also shape eating behaviour during early childhood.⁸

The CEBQ, developed by Wardle et al is a validated psychometric tool that evaluates appetite-related behaviours through parental reporting.⁹ It includes eight subscales divided into food-approach and food-avoidant behaviours.⁹

There is limited literature regarding the association between eating behaviours and BMI among Indian preschool children. Therefore, this study aimed to assess the relationship between children's eating behaviours and BMI among 2–5 years old children attending a tertiary care centre.

METHODS

This hospital-based cross-sectional study was conducted in the Department of Pediatrics at Pushpagiri Institute of Medical Sciences and Research Centre over a period of 18 months after obtaining Institutional Ethics Committee clearance. The study population included children aged 2–5 years who attended the pediatric outpatient department or were admitted to the pediatric wards during the study period. The minimum required sample size was calculated as 162, based on a previously reported correlation coefficient ($r=0.219$) between Food Responsiveness and BMI SD score in a study by Jansen et al.¹ Sampling Method and Participants. Children with chronic medical conditions that could affect growth or eating behaviour, including cardiac, renal, liver or endocrine diseases and receiving long-term steroid therapy, those with syndromic disorders and those diagnosed with eating disorders were excluded from the study.

Data collection and anthropometry

Data were collected from parents or primary caregivers using a structured proforma designed to obtain demographic and clinical details. Anthropometric measurements were obtained using standard techniques. Weight was measured in kilograms using a calibrated weighing scale and height was measured in meters using a stadiometer. BMI was calculated as weight in kilograms divided by height in meters squared (kg/m^2). BMI (SD) scores were then derived using the World Health Organization growth charts to classify the nutritional status of the children.

Assessment of eating behaviour

Children's eating behaviour was assessed using the CEBQ,¹⁵ a validated parent-reported tool consisting of 35 items. Each item was scored on a 5-point Likert scale ranging from 1 ("Never") to 5 ("Always"). The questionnaire evaluates eight domains of eating behaviour, categorized into food-approach and food-

avoidant behaviours. The food-approach behaviours included FR, EF, EOE and DD. The food-avoidant behaviours included SR, SE, EUE and FF. Mean scores for each subscale were calculated and used for correlation analysis with BMI SD scores.

Statistical analysis

Data were entered into Microsoft Excel and analysed using SPSS version 25. Qualitative variables were expressed as percentages and quantitative variables as mean±standard deviation. Spearman correlation coefficient was used to assess associations between BMI SD score and CEBQ subscales. A p value<0.05 was considered statistically significant.

RESULTS

Demographic characteristics

The mean age of the children was 2.09 years ($\text{SD}=0.82$), with a median age of 2 years. Most children belonged to the 4–5 years age group (38.3%), followed by the 3–4 years group. Among the study participants, 53.7% were females and 46.3% were males. The sex distribution was nearly equal, with a slight female predominance. (32.1%) and the 2–3 years group (29.6%). This indicates a relatively even distribution across the studied age range, with a slight predominance of older preschool children.

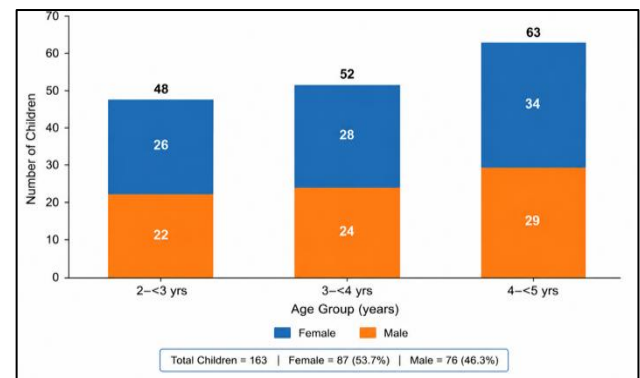


Figure 1: Age distribution of children by sex.

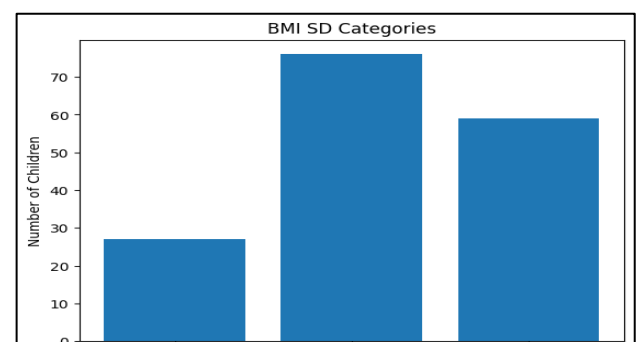


Figure 2: Distribution of children according to BMI SD categories.

Based on BMI SD scores, 46.9% of children were in the normal BMI category (-2 SD to $+2$ SD). Overweight or obese children ($>+2$ SD) constituted 36.4% of the sample, while 16.7% were underweight (<-2 SD). This shows a considerable proportion of children with elevated BMI in the study population. Spearman correlation analysis was performed to assess the association between BMI SD score and the subscales of the CEBQ. The level of statistical significance was set at $p<0.05$.

BMI SD score showed a strong positive correlation with food-approach behaviours, including enjoyment of food ($\rho=0.786$, $p<0.001$), emotional overeating ($\rho=0.717$, $p<0.001$), food responsiveness ($\rho=0.794$, $p<0.001$) and desire to drink ($\rho=0.756$, $p<0.001$). These findings indicate that higher BMI SD scores were associated with increased food-approach related eating behaviours. In contrast, BMI SD score demonstrated significant negative correlations with food-avoidant and regulatory behaviours, including satiety responsiveness ($\rho=-0.412$, $p<0.001$), slowness in eating ($\rho=-0.459$, $p<0.001$), emotional undereating ($\rho=-0.373$, $p<0.001$) and food fussiness ($\rho=-0.375$, $p<0.001$), suggesting reduced sensitivity to satiety and eating regulation with increasing BMI.

Table 1: Correlation of BMI SD score with eating behaviour.

CEBQ subscale	Spearman's rho	P value
Enjoyment of food	0.786	<0.001
Emotional overeating	0.717	<0.001
Food responsiveness	0.794	<0.001
Desire to drink	0.756	<0.001
Satiety responsiveness	-0.412	<0.001
Slowness in eating	-0.459	<0.001
Emotional undereating	-0.373	<0.001
Food fussiness	-0.375	<0.001

DISCUSSION

The present study demonstrated a significant association between eating behaviours and BMI among preschool children. Children with higher BMI exhibited stronger food-approach behaviours, including greater enjoyment of food, emotional overeating, food responsiveness and desire to drink. These findings are consistent with studies by Sleddens et al, Viana et al and Spahić et al.¹⁰⁻¹²

Food responsiveness may lead to eating in the absence of hunger in response to environmental cues. Emotional overeating may represent maladaptive coping mechanisms. Desire to drink may reflect increased consumption of sugar-sweetened beverages.¹³ Conversely, satiety responsiveness and slowness in eating were negatively associated with BMI, suggesting that these behaviours may protect against overeating by improving appetite self-regulation.^{10,11} Food fussiness and

emotional undereating were also negatively associated with BMI, indicating that leaner children may consume less during emotional stress and may be more selective eaters.¹⁴ The study also highlights the coexistence of undernutrition and obesity in the same population, reflecting the nutritional transition occurring in India and other developing countries.²

The present study has several strengths. First, it used the CEBQ a validated and widely accepted multidimensional tool for assessing appetite-related behaviours in young children.⁹ This enabled comprehensive evaluation of multiple domains of eating behaviour, including both food-approach and food-avoidant traits. Second, the study included an adequate sample size calculated based on prior literature, which improves the statistical reliability of the findings.¹ Third, by including children across the nutritional spectrum underweight, normal weight and overweight/obese the study was able to capture the dual burden of malnutrition and explore associations across a broad range of BMI categories.

However, certain limitations should be considered while interpreting the findings. The cross-sectional design of the study limits the ability to infer causality between eating behaviours and BMI only associations can be established. As the study was hospital-based, the sample may not be representative of the general population, thereby limiting the external validity and generalizability of the results.

Strengths

The present study has several strengths. First, it used the CEBQ a validated and widely accepted multidimensional tool for assessing appetite-related behaviours in young children.

Limitations

The reliance on parental self-report for the CEBQ may introduce recall bias or social desirability bias, which could affect the accuracy of reported behaviours. Furthermore, the study did not include detailed assessments of dietary intake, physical activity or screen time, all of which are important contributors to childhood obesity. Finally, multivariate analysis adjusting for potential confounding factors such as parental BMI, socioeconomic status, educational level and feeding practices was not performed, which may have influenced the observed associations.

CONCLUSION

Children's eating behaviours are strongly associated with BMI in preschool years. Food-approach behaviours were positively associated with BMI, whereas food-avoidant behaviours were negatively associated. Early behavioural screening and family-based interventions are important

strategies to prevent childhood obesity and undernutrition.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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