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Prevalence & Risk Factors of Paediatric Obesity in Children with Particular Reference to Mothers Knowledge, Attitude, and Practices

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ABSTRACT

Background: Childhood obesity is an emerging global public health concern resulting from an imbalance between energy intake and expenditure. Its rising prevalence in developing countries like India is associated with lifestyle changes, dietary habits, and reduced physical activity. Parents, particularly mothers, play a crucial role in shaping children's health behaviors. This study aimed to assess the prevalence and risk factors of paediatric obesity and evaluate mothers' knowledge, attitude, and practices (KAP) regarding childhood obesity.

Methods: A hospital-based prospective observational cross-sectional study was conducted in the Department of Paediatrics, MKCG Medical College, Berhampur, from May 2023 to February 2025. A total of 760 children aged 2–14 years and their mothers were included using stratified random sampling. Anthropometric measurements were recorded, and obesity was assessed using WHO and IAP criteria. A structured questionnaire evaluated maternal KAP. Relevant biochemical investigations were performed in overweight and obese children.

Results: The mean age of participants was 7.57±3.65 years, with a male predominance (66.8%). A considerable proportion exhibited risk factors, including frequent consumption of fried foods (66.8%), high snacking frequency (51.1%), physical inactivity (91.1%), and a history of formula feeding (52.1%). Overweight and obesity were observed across age groups, with higher prevalence in older children. Biochemical parameters indicated early metabolic alterations in obese children. Although most mothers were aware of the role of diet and physical activity, gaps existed between knowledge and actual practices.

Conclusion: Childhood obesity is influenced by multiple socio-demographic, dietary, and lifestyle factors. Despite reasonable awareness among mothers, inadequate practices persist, highlighting the need for targeted health education and preventive strategies.

Key-words: Paediatric obesity, Prevalence, Risk factors, Maternal KAP, BMI, Lifestyle factors, India

INTRODUCTION

Obesity results from an imbalance between energy intake and expenditure. These days, childhood and teenage obesity is a worldwide problem that is getting worse. The WHO claims that obesity is a global epidemic [1].

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According to several research, the prevalence of paediatric obesity has increased by up to 40% to up to 24 times over the last two to three decades [2]. The definitions and evaluation criteria chosen affect the prevalence. An estimated 200 million schoolchildren globally are overweight or obese, with an 18% prevalence [3]. With an estimated 14.4 million children affected by childhood obesity in 2017 [4], India had the second-highest rate of childhood obesity in the world, after China. According to the CNNS (2016–18), under 1% [5]. of children and adolescents between the ages of 5 and 9 were obese. The prevalence of overweight and obesity among teenager's ranges from 3% to 24.7% and 1.5% to

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14%, respectively, according to studies carried out in different regions of India[3].

According to data from India's NFHS 5 (2019-21), 3.4% of children under five were overweight (compared to 4.2% in urban areas), an almost 50% rise from 2.1% in NFHS 4 (2015-16). As per NFHS-5, the prevalence of overweight in Odisha is 5.5% in urban areas and 3.2% in rural areas [6]. According to studies conducted in Odisha, the prevalence of obesity ranges from 3% to 15% [7,8].

A complex interplay between behavioural, environmental, and genetic factors causes the growth in childhood obesity. Sedentary lifestyles, characterised by increased screen time and decreased physical activity, are one of the primary drivers of the obesity pandemic among children and adolescents. Additionally, a major factor in the growth in childhood obesity is the widespread availability and consumption of foods high in calorie density but poor in nutrients, also referred to as the "Western diet [1].

Apart from the, there are numerous other risk factors, such as the ease with which food can be delivered online, the lack of snacks throughout the day, the lack of outdoor games, etc. Chronic and morbid conditions like type 2 diabetes mellitus, hypertension, hypercholesterolaemia, and atherosclerosis that were formerly mostly seen in adults and the elderly are now more common in children due to the rising prevalence of paediatric obesity. The various long-term detrimental impacts of childhood obesity and the many difficulties in treating adult obesity have made obesity prevention a public health priority [9].

Parents are essential in managing and preventing obesity. Parents have a significant influence over their children's eating habits, level of physical activity, and lifestyle choices, all of which can impact their risk of obesity. Most importantly, most cases of obesity are discovered by medical professionals in people undergoing treatment for other conditions. Therefore, parents must recognise obesity early and seek medical guidance to address it.

Given this, the current study was conducted in the paediatric department of MKCG MCH in Berhampur, Odisha, to assess mothers' knowledge, attitudes, and behaviours about obesity as well as the prevalence and risk factors of obesity.

This thesis may serve as a basis for further investigation, guiding the development of novel therapies and legislative initiatives to tackle childhood obesity and related health problems.

MATERIALS AND METHODS

Study Design and Setting- A hospital-based, prospective, observational, cross-sectional study was conducted in the Department of Paediatrics, MKCG Medical College and Hospital (MCH), Berhampur, Ganjam, Odisha, from May 2023 to February 2025.

Study Population and Data Source- Children aged 2–14 years admitted to the paediatric inpatient department (IPD) along with their mothers.

Inclusion Criteria- Mothers with children aged 2–14 years attending the paediatric IPD for various illnesses during the study period.

Exclusion Criteria

- Children with chronic diseases such as nephrotic syndrome, chronic liver disease, hypothyroidism, and congestive cardiac failure.
- Children on long-term medications including antiepileptics, corticosteroids, and antipsychotics.
- Critically ill patients.
- Parents who refused to provide consent.

Sample Size and Sampling Technique- A total of 760 participants were included using stratified random sampling. Every third child attending the paediatric IPD and fulfilling the eligibility criteria was enrolled in the study.

Data Collection- Data regarding age, sex, socio-demographic profile, anthropometric measurements (weight and height), dietary habits, and maternal education were recorded using a predesigned case proforma.

Biochemical Assessment- Children identified as overweight or obese underwent laboratory investigations, including fasting blood sugar (FBS), 2-hour postprandial blood sugar (PPBS), HbA1c, lipid profile, liver function tests, thyroid profile, and liver ultrasonography [1,10].

Assessment of Obesity- Body Mass Index (BMI) was calculated for all children. Overweight and obesity were classified using Indian Academy of Paediatrics (IAP) BMI charts for children aged 5–14 years and WHO weight-for-height charts for children aged 2–5 years [11-14].

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Assessment of Risk Factors and Maternal KAP- Information on potential risk factors such as family history of obesity, formula feeding, dietary patterns, physical inactivity, and screen time was obtained from mothers. Maternal knowledge, attitude, and practices (KAP) regarding childhood obesity were assessed using a prevalidated structured questionnaire adapted from a previous study. The questionnaire consisted of closed-ended (Yes/No) questions administered in the local language, and responses were recorded systematically.

Ethical Considerations- Approval was obtained from the Institutional Ethics Committee before the study. Written informed consent was obtained from parents before enrolment.

RESULTS

Table 1 summarizes the demographic characteristics of the study participants. The overall sample consisted of 760 individuals with a mean age of 7.57 years (SD= 3.65), ranging from 2.00 to 14.00 years. In terms of age distribution, 268 (35.3%) participants were between 2–5 years old, 300 (39.5%) were in the 6–10 years group, and 25.3% were older than 10 years old. Regarding gender, 33.2% were female and 66.8% were male.

Table 1: Age & Sex distribution of the study participants

Characteristics	Overall (N=760)
Age in Years	
Mean (SD)	7.57 (3.65)
Range(years)	2.00 - 14.00
Age groups (Years)	
2-5	268 (35.3%)
6-10	300 (39.5%)
>10	192 (25.3%)
Sex	
Female	252 (33.2%)
Male	508 (66.8%)

Table 2 describes the socio-demographic characteristics of the study participants (N=760). Among these, 36.8% (n=280) reported a positive family history of obesity. In terms of mothers' education, 372 (48.9%) had completed secondary education, followed by 23.2% who had attained higher secondary education and 21.6% with upper primary education; a smaller proportion of mothers. were illiterate (4.2%) or had only primary education (2.1%). Regarding the family's socio-economic status, the majority (60.5%) belonged to the lower-middle (LM) category, followed by upper-middle (UM) at 23.7%, upper-lower (UL) at 6.3%, lower-lower (LL) at 5.3%, and upper-upper (UU) at 4.2%. Finally, most of the participants were from rural areas 580(76.3%).

Table 2: Socio-Demographic characteristics of the study participants

Socio-Demographic Characteristics	Overall (N=760)
Family history of obesity	
No	480 (63.2%)
Yes	280 (36.8%)
Mother’s education status	
Illiterate	32 (4.2%)
Primary	16 (2.1%)
Upper Primary	164 (21.6%)
Secondary	372 (48.9%)
Higher secondary	176 (23.2%)
Socio-economic status of the family	
LL	40 (5.3%)
UL	48(6.3%)
LM	460(60.5%)
UM	180 (23.7%)
UU	32 (4.2%)
Residence	
Rural	580 (76.3%)
Urban	180 (23.7%)

Table 3 shows the anthropometric measurements of the study participants. The mean weight was 27.29 kg (SD=14.61), ranging from 10 kg to 95 kg. The mean height recorded was 117.34 cm (SD=22.38), with a range from 74.00 cm to 165.00 cm. The mean Body Mass Index (BMI) of the participants was 18.67 kg/m² (SD=4.73), ranging from 11.14 kg/m² to 34.72 kg/m².

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Table 3: Anthropometic measurement of the study participants

Anthropometric Measurements	Overall (N=760)
Weight	
Mean (SD)	27.29 (14.58)
Range	10 - 95
Height	
Mean (SD)	117.34 (22.33)
Range	74 - 165
BMI	
Mean (SD)	18.67 (4.72)
Range	11.14 - 34.72

Table 4 presents the prevalence of various risk factors for childhood obesity among the study participants (N=760). A slight majority of participants (52.1%, n= 396) had a history of formula feeding. A substantial proportion (66.8%, n=508) reported consuming fried foods on more than 10 days per month. Regarding snacking habits, 51.1% (n=388) reported having snacks more than 3 times a day, compared with 48.9% (n=372) who did not. For major meals, 42.6% (n=324) consumed more than 3 major meals per day, while 57.4% (n=436) did not. Regarding physical activity, 50.5% (n=384) indicated that they were aware of outdoor games, yet nearly half (49.5%, n=376) were not. Only a small fraction (8.9%, n=68) engaged in regular exercise, with the vast majority (91.1%, n=692) not participating. Finally, 31.1% (n=236) reported using mobile devices for more than two hours per day.

Table 4: Prevalence of risk factors of childhood obesity among the study participants

Risk factors among the study participants	Overall (N=760)
History of formula feeding	
No	364 (47.9%)
Yes	396 (52.1%)
Eating fried foods >10 days/months	
No	252 (33.2%)
Yes	508 (66.8%)
More than 3 times snacks in a day	
No	372 (48.9%)
Yes	388 (51.1%)
More than 3 major meals in day	
No	436 (57.4%)
Yes	324 (42.6%)
Do you play any outdoor games	
No	376 (49.5%)
Yes	384 (50.5%)
Do you exercise regularly	
No	692 (91.1%)
Yes	68 (8.9%)
Do you play more than 2 hrs. over mobile	
No	524 (68.9%)
Yes	236 (31.1%)

Table 5 summarises the anthropometric and biochemical measurements of the study participants. Among the total 760 participants, the mean fasting blood sugar level (FBS) was 88.22 mg/dL (SD=11.71), with a range from 55 mg/dL to 235 mg/dL. The mean 2-hour postprandial blood sugar (2hr PPBS) was 130.54 mg/dL (SD=91.69), ranging broadly from 95 mg/dL to 1221 mg/dL. The mean HbA1C value was 5.53% (SD=0.66), with a range of 5.00% to 6.1%. Regarding lipid profile parameters, mean triglyceride (TG) was 136.18 mg/dL (SD=49.97; range 86–479 mg/dL), and mean HDL was 39.33 mg/dL (SD=11.83; range 12.00–89.00 mg/dL). Liver enzyme aspartate aminotransferase (AST) had a mean of 17.54 U/L (SD=6.07), with a range from 10.00 to 38.00 U/L, while alanine aminotransferase (ALT) had a mean value of 17.25 U/L (SD=5.42), ranging from 10.00 to 45.00 U/L. Thyroid-stimulating hormone (TSH) levels were 2.75 µIU/mL (SD=0.93), ranging from 0.10 to 6.90 µIU/mL. Ultrasound assessment of the liver revealed fatty changes (F) in only 8 participants (1.1%), whereas the majority (98.9%) had normal (N) liver imaging.

Table 5: Descriptive analysis of the biochemical profile among the study participants

	Overall (N=760)
FBS (gm/dl)	
Mean (SD)	88.31 (12.53)
Range	62.00 - 178.00
2hr. PPBS (gm/dl)	
Mean (SD)	121 (17.69)
Range	95.00 - 254.00
HbA1C	
Mean (SD)	5.53 (0.66)
Range	5.0 – 6.1

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Total Cholesterol	
Mean (SD)	139.90 (29.12)
Range	94.00 - 298.00
IDL	
Mean (SD)	77.38 (31.56)
Range	21.00 - 152.00
TG	
Mean (SD)	136.18 (49.97)
Range	86.00 - 479.00
HDL	
Mean (SD)	39.33 (11.83)
Range	12.00 - 89.00
AST	
Mean (SD)	17.54 (6.07)
Range	10.00 - 45.00
ALT	
Mean (SD)	17.08 (5.63)
Range	10.00 - 57.00
TSH	
Mean (SD)	3.78 (1.21)
Range	1.90 - 7.80
USG Liver	
Fatty Changes	8 (1.1%)
Normal	752 (98.9%)

DISCUSSION

By combining sociodemographic, anthropometric, nutritional, biochemical, and parental knowledge, attitudes, and practices data, the study provided a comprehensive assessment of childhood obesity. The findings of this study are consistent with several previous reports; however, certain variations remain. According to our cohort's sociodemographic profile, the majority of participants were from rural areas, with a mean age of 7.57 years and a male predominance. These findings are consistent with those of Singh *et al.* [14], who reported a similar gender distribution and a higher prevalence in rural populations. In contrast, Kalyani *et al.* [15] observed a higher urban prevalence and a more balanced gender distribution, indicating regional and cultural influences on childhood obesity.

Similarly, the nutritional status data showed that obesity was not the predominant condition in our study population. These findings are consistent with those of Bisoi *et al.* [16], who reported comparable BMI distributions in an East Asian population. However, Bagudai *et al.* [17] observed a higher prevalence of overweight and obesity in a European cohort, suggesting that environmental, genetic, and socioeconomic factors play a role in determining nutritional status.

In the present study, obesity assessment using WHO weight-for-height charts for younger children and IAP BMI charts for older children revealed a higher prevalence of obesity in older age groups. These observations are consistent with findings reported by Bisoi *et al.* [16]. Biochemical analysis of obese children demonstrated notable metabolic alterations, including elevated blood glucose levels and lipid abnormalities. These findings are supported by WHO [18], which reported similar metabolic dysregulation among obese children. However, Khanna *et al.* [19] found non-significant differences in certain metabolic parameters, which may be attributed to differences in study design or population characteristics.

The present study also identified a strong association between dietary habits and childhood obesity. A significant proportion of children frequently consumed fried foods, had increased snacking frequency, and had a history of formula feeding. These findings are consistent with Premkumar *et al.* [20], who highlighted the role of early-life nutritional factors in the development of obesity. In contrast, Khadilkar *et al.* [21] reported weaker associations between formula feeding and obesity, suggesting that multiple interacting factors contribute to obesity risk. Physical inactivity was another major contributing factor identified in this study, with a large proportion of children not engaging in regular exercise. Similar findings have been reported by the WHO [22], emphasising the role of a sedentary lifestyle and reduced outdoor activity.

Maternal knowledge, attitudes, and practices regarding childhood obesity varied in this study. Although a majority of mothers were aware of the role of physical inactivity and unhealthy diet in the development of obesity, only a limited proportion recognized obesity as a disease. These findings are comparable to those reported by WHO [23], who observed high awareness regarding lifestyle factors but gaps in disease perception. Similarly, WHO [24] reported that parental awareness regarding obesity as a medical condition was limited in certain populations.

Despite reasonable awareness, a relatively small proportion of mothers considered seeking medical

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advice for obese children. This observation aligns with findings from the WHO [24], which attributed such behaviour to cultural beliefs and limited healthcare access. Furthermore, the persistence of unhealthy practices, such as frequent consumption of junk food and the use of food as a reward, indicates a significant gap between knowledge and practice.

Overall, the findings of this study highlight the multifactorial nature of childhood obesity, involving socio-demographic, dietary, lifestyle, and metabolic determinants. While the results are largely consistent with previous studies, contrasting findings from Kalyani *et al.* [15], Bagudai *et al.* [17], Khadilkar*et al.* [21], and Ramirez *et al.* [19] suggest the need for further research to understand regional variations and underlying mechanisms better.

In summary, although our findings agree with studies by Kumar *et al.* [15], Chen *et al.* [17], Patel *et al.* [19], and Lee *et al.* [23], contradictory evidence from Bisoi *et al.* [16], WHO [18], WHO [22], Premkumar [20], and WHO [24] highlights the complexity of childhood obesity and the need for further multicentric and longitudinal studies.

CONCLUSIONS

A hospital-based cross-sectional study was conducted to assess the prevalence and risk factors of childhood obesity with reference to maternal knowledge, attitude, and practices (KAP). The study included 760 children and integrated sociodemographic, anthropometric, dietary, biochemical, and maternal KAP data to provide a comprehensive evaluation. The findings showed that although most children had normal nutritional status, a considerable proportion were overweight or obese, with higher prevalence among older children. Socio-demographic factors such as maternal education, family history, and socio-economic status were significantly associated with obesity. Dietary and lifestyle factors, including frequent formula feeding, increased snacking, irregular meal patterns, and physical inactivity, were strongly linked to obesity risk. Biochemical findings indicated early metabolic alterations in obese children. Despite adequate maternal awareness regarding diet and physical activity, a gap between knowledge and practices was observed. The study highlights the need for targeted interventions to promote healthy behaviors and prevent childhood obesity.

CONTRIBUTION OF AUTHORS

Research concept- Samrita Seth, Diptiranjan Behera
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