

Original Research Article

Association of nutritional status with dietary and behavioural patterns among adolescents

Kandathil Eapen Elizabeth^{1*}, David Ashok Ashwin², Kesavadev Jothydev²

¹Department of Pediatrics, Sree Mookambika Institute of Medical Sciences, Kanyakumari, Tamil Nadu, India

²Jothydev's Diabetes and Research Centre, Mudavanmugal, Thiruvananthapuram, Kerala, India

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*Correspondence:

Dr. Kandathil Eapen Elizabeth,
E-mail: drelizake@gmail.com

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ABSTRACT

Background: Changing trends in dietary habits, behavioral patterns, and prevalence of overweight/obesity among adolescents is of great concern.

Methods: 6469 school children from five districts of Kerala, India were enrolled. Dietary habits and behavioral patterns were collected using a pretested questionnaire. Anthropometric measurements were recorded and compared with regional Indian Academy Pediatrics (IAP) reference charts. Data was computed and analyzed.

Results: Mean age: Boys 14.51±0.93, Girls 14.42±1.04 years. Male: Female ratio 0.92:1. Practices like missing breakfast, non-compliance to weekly Iron Folic Acid supplementation and not taking exercise >2 hours/week were more in girls. Increased consumption of junk food, screen time >2 hours/week and not sharing life events with parents were more in boys. Mean anthropometric parameters were <50th percentile of reference charts. 6.1% had low BMI (boys, 4.2% vs. girls, 7.6%), 12.3% were overweight (boys, 14.9% vs. girls, 10.2%) and 4.4% had obesity (boys, 4.7% vs. girls, 4.2%). Mean anthropometric parameters were higher in more urbanized districts. Daily consumption of junk food showed significant association with obesity and exercise >2 hours/week with normal BMI.

Conclusions: Dietary and behavioral patterns and prevalence of overweight/obesity showed variability with respect to gender and region of residence. 12% were overweight and 4% had obesity. Daily consumption of junk food showed significant association with overweight/obesity and daily exercise >2 hours/week with normal BMI. Health education addressing behavioral change is recommended for better health.

Keywords: Dietary habits, Behavioral pattern, Adolescent children, Obesity, Junk food

INTRODUCTION

Globally, there is a changing trend in dietary habits, behavioral patterns, and prevalence of overweight/obesity.¹ This is more among adolescents, especially in urbanized regions. The State of Kerala, India is an example of this rapid transition.² Overweight and obesity has a link to affluence and socio-economic status.³ Nutritional status as well as dietary and behavioral patterns of adolescent children has an impact on future health. Hence, this study was undertaken among

adolescent school children belonging to middle-income group (MIG) from Kerala.

Objectives

The objectives of the study were to assess dietary habits and behavioral pattern using a questionnaire and nutritional status by anthropometric measurements- height, weight, and BMI among adolescent school children and determine association between nutritional status and dietary/behavioral patterns.

METHODS

Adolescent school children belonging to MIG from five districts of the state of Kerala (Kasaragod, Kannur, Wayanad, Kozhikode and Thiruvananthapuram), India were enrolled during the period September 2017 to August 2018. Assuming 4% prevalence of obesity among adolescents, sample size was calculated as 1536.⁴ Consecutive sampling technique was adopted based on feasibility and willingness of trained pediatricians to participate in the study. Relevant dietary and behavioral habits were recorded using a pretested questionnaire and nutritional status was assessed by measuring weight, height and body mass index using standardized anthropometric techniques by trained pediatricians. Anthropometric measurements were compared with regional Indian Academy Pediatrics (IAP) reference charts.⁵ Institutional Ethics Committee approval, informed consent from parents and assent from the participants and permission from school authorities were obtained prior to the study. Confidentiality was maintained throughout the study. Data was computed and analyzed using SPSS Version 17 for descriptive statistics and Chi square test for associations. The prepared child questionnaire is depicted in (Figure 1).

1.	How often do you take breakfast?
	Daily
	Frequently: 4-6 days/week
	Occasionally: 1-3 days/week
	Never
2.	How often do you take Junk food (high in fat, salt & sugar) & Colas?
	Daily
	Frequently: 4-6 days/week
	Occasionally: 1-3 days/week
	Never
3.	Do you take iron folic acid (IFA) tablet every week?
	Yes/ No
4.	Do you take exercise >2 Hrs./week?
	Yes/ No
5.	Do you continuously use screen/TV/mobile/I-pad for > 2 Hrs./day?
	Yes/No
6.	Do you share all events in your life with your Mother/father?
	Yes/No

Figure 1: Child questionnaire

RESULTS

The study enrolled 6469 adolescent children. (Table 1) depicts region wise distribution of participants. Age ranged from 13-16 years and mean age- Male: 14.5±0.93 and Female: 14.42±1.04 years. Male to female ratio was 0.82:1.

Dietary and behavioral patterns showed variability with respect to gender. (Table 2) depicts gender wise distribution of dietary and behavioral patterns. Practices like missing breakfast, non-compliance to weekly Iron Folic Acid supplementation (WIFS) program and not taking exercise >2 hours/week were more in girls ($p<0.05$). Increased consumption of junk food, screen time >2 hours/week and not sharing life events with parents were more among boys ($p<0.05$).

Table 1: District wise distribution of participants in the study.

District	Frequency	Percentage
Kannur	3799	58.7
Kasaragod	335	5.2
Kozhikode	32	0.5
Thiruvananthapuram	281	4.3
Wayanad	2022	31.3
Total	6469	100

Table 2. Gender-wise distribution according to dietary and behavioral patterns.

Parameter	Male (%)	Female (%)	Total (%)
Breakfast			
Daily	87.9	84.0	85.7
Frequently 4-6 days/week	8.1	12.2*	10.4
Occasionally 1-3 days/week	2.2	1.8	2.0
Never	1.9	1.9	1.9
Junk Food			
Daily	8.2*	4.0	5.8
Frequently 4-6 days/week	68.2	70.5	69.5
Occasionally 1-3 days/week	5.1	4.1	5.4
Never	18.6	21.4	20.2
Weekly IFA intake			
No	75.9	78.4*	77.3
Yes	24.1	21.6	22.7
Exercise >2 hrs/week			
No	43.1	63.0*	54.1
Yes	56.9	37.0	45.9
Screen time >2 hrs/day			
No	51.6	63.3	58.1
Yes	48.4*	36.7	41.9
Sharing all life events with parents			
No	37.6*	20.9	28.4
Yes	62.4	79.1	71.6

* $p<0.05$ - Statistically significant

Mean anthropometric parameters were <50th percentile in comparison to regional IAP reference charts. (Table 3) summarizes region and gender wise distribution of anthropometric measurements. Mean anthropometric parameters were more in boys, except BMI. Distribution as per BMI is given in (Table 4). 6.1% had low BMI (<5th percentile), 12.3% were overweight (BMI >23rd

Equivalent) and 4.4% had obesity, BMI >27th equivalent for adult. Anthropometric parameters were highest among children from more urbanized districts of Thiruvananthapuram and Kozhikode followed by Kannur, Kasaragod and lowest from less urbanized district, Wayanad.

Table 3. Gender-wise and district-wise distribution of mean anthropometric parameters.

Parameter Mean±SD	Male	Female	Significance
Pooled total			
Height (cm)	159.96±10.35	154.18±7.76	p<0.001*
Weight (kg)	47.7±11.2	44.70±9.7	p < 0.001*
BMI (kg/m ²)	18.53±4.22	18.78±4.12	p=0.044*
Kannur			
Height (cm)	161.85±9.99	155.20 ±7.54	p<0.001*
Weight (kg)	49.23±11.65	46.61±10.03	p <0.001*
BMI (kg/m ²)	18.76±4.72	19.37±4.70	p<0.001*
Kasaragod			
Height (cm)	157.40±8.86	155.05±6.69	p=0.0068*
Weight (kg)	44.27 ± 9.99	43.96±8.80	p=0.768
BMI (kg/m ²)	17.56±3.10	18.32±3.59	p=0.046*
Kozhikode			
Height (cm)	161.21±5.41	154.17±5.81	p=0.043*
Weight (kg)	47.57±15.31	48.33±8.04	p=0.857
BMI (kg/m ²)	17.97±3.42	20.26±2.80	p=0.045*
Thiruvananthapuram			
Height (cm)	166.35±7.54	156.37±6.12	p<0.001*
Weight (kg)	56.41±14.68	49.97±10.39	p<0.001*
BMI (kg/m ²)	20.29±4.63	20.40±3.87	p< 0.861
Wayanad			
Height (cm)	155.34±9.92	152.07±8.08	p<0.001*
Weight (kg)	44.07±8.54	40.89±7.72	p<0.001*
BMI (kg/m ²)	18.21±2.74	17.65±2.84	p<0.001*

* p<0.05-Statistically Significant

Daily consumption of junk food showed significant association with obesity (p<0.05) and exercise >2 hours/week with BMI in the normal range (p<0.05). Other study variables showed no association with current nutritional status.

Dietary and behavioral patterns showed variability as per region of residence. Those taking breakfast daily; Kozhikode:100% vs. 89%, Thiruvananthapuram :94% vs. 94%, Kasaragod: 95% vs. 84%, Wayanad 88% vs. 85% and Kannur: 87% vs. 82% among boys and girls, respectively. 2% of the total admitted that they never took breakfast.

Junk food consumption was as follows; frequently, 4-6 days/week; Kozhikode:92% vs. 67%, Kannur:71% vs 77%, Wayanad:65% vs. 63%, Kasaragod:62% vs. 70% and Thiruvananthapuram:16% vs. 53% among boys and

girls, respectively. 6% of total took junk food daily and 20% reported no intake of junk food.

Non-compliance to WIFS program was high; Thiruvananthapuram: 98% vs. 98%, Kozhikode: 93% vs. 88%, Kasaragod: 93% vs. 85%, Kannur: 78% vs. 82%, and Wayanad: 68% vs. 69% among boys and girls, respectively.

Daily taking exercise >2 hours/week was variable; Kannur: 47% vs. girls 56%, Kasaragod: 42% vs. 56%, Kozhikode: 36% vs. 56%, Wayanad: 34% vs. 55%, and Thiruvananthapuram: 33% vs. 52% among boys and girls, respectively.

Screen time >2 hours/day was as follows; Kannur: 51% vs. 36%, Thiruvananthapuram: 46% vs. 42%, Kasaragod: 47% vs. 34%, Wayanad: 42% vs. 38%, and Kozhikode: 14% vs. 17% among boys and girls, respectively.

Disclosure of not sharing all life events with parents was variable; Kozhikode: 93% vs. 28%, Kannur: 42% vs. 25%, Kasaragod: 41% vs. 18%, Wayanad: 25% vs. 17%, and Thiruvananthapuram: 22% vs. 10% among boys and girls, respectively.

Table 4. Gender-wise distribution according to BMI.

BMI IAP, 2015	Male %	Female %	Total %
Low <5 th percentile	4.2	7.6*	6.1
Normal 5 th to 23 rd equivalent	76.2	77.9	72.2
Overweight >23 rd equivalent	14.9*	10.2	12.3
Obesity >27 th equivalent	4.7	4.2	4.4

*p<0.05-Statistically significant

DISCUSSION

In the present study, dietary habits, behavioral patterns, and nutritional status showed gender-wise and region-wise variability. Mean height, weight and BMI were below 50th percentile of the regional standards- Revised IAP charts.⁵ Globally, WHO 2007⁶ and IOTF standards⁷ are used for interpretation of anthropometric data. In a comparative study, Revised IAP 2015 growth standards have been reported to detect obese and overweight children, with precision comparable to WHO 2007 and more than IOTF standards.⁸

An Iranian study among 13-14 year old girls had reported higher mean height and weight compared to the present study⁹ which may be attributable to the region wise and socioeconomic status wise differences. In the present study among MIG, prevalence of overweight was 12.3%, more in female and obesity was 4.4%, comparable in male and female. A study from Kochi, central part of Kerala had reported 4% obesity: 3.0% boys vs. 5.3% girls, with variability according to socio-economic status.⁴ From high-income group (HIG), overweight and obesity was as high as 22% and 7.5% and in low-income group (LIG), it was 2.5% and 1.5%, in boys and girls, respectively.

Even though mean height, weight was more among boys, mean BMI was more among girls. Similar trend has been reported in other studies.^{5,10} National Nutrition Monitoring Bureau(NNMB), Indian Council of Medical Research, 2017 had reported the prevalence of overweight and obesity among urban Indian men and women as 34% and 44% and Kerala as 37% vs. 52% respectively.¹⁰ However, it was observed that low BMI <5th centile, indicating chronic energy deficiency(CDD), was more among girls.

More urbanized districts like Thiruvananthapuram and Kozhikode showed higher mean anthropometric

parameters compared to relatively less urbanized districts like Wayanad and Kasaragod. This is attributable to higher purchasing power, sedentary lifestyle, food availability and advertisements focusing on food items and food outlets.

Dietary habits and behavioral patterns showed variability with respect to gender and region of residence. Practices like missing breakfast, non-compliance to WIFS program and not taking exercise >2 hours/week were more in girls. Increased consumption of junk food, screen time >2 hours/week and not sharing life events with parents were more in boys. In the Iranian study among adolescents, skipping breakfast and daily consumption of sweets were reported by majority of children.⁹ In a study from Kolkata, India, as high as 53% reported missing meals and 90% reported daily consumption of street food.¹¹ In the present study 2% disclosed that they never took breakfast and 6% consumed junk food daily. Breakfast, being brain's food, it seems prudent to provide breakfast along with mid-day meals in schools. Providing healthy meals and snacks in school canteens and ban on junk food in school canteens have been recommended and the recommendation has been implemented in certain Indian schools since 2015.¹²

In the present study, >75% reported non-compliance to WIFS Program, which is part of national programs like National Iron Plus Initiative (NIPI) and Anemia Mukh Bharat, to curb anemia.^{13,14} As per NFHS 4 Survey 2016, prevalence of anemia among adolescents was 54% and 29% among girls and boys, respectively.¹⁵ The targets aimed for 2022 are 36% and 11% among girls and boys, respectively.¹⁴

In the present study, majority had suboptimum exercise and prolonged screen time. A study from Kolkata, India had reported moderate to vigorous exercise in 29% only and Cardiovascular diseases related knowledge among school children was found to be low.¹¹ This is an eye opener to address both knowledge and practice gap for prevention of lifestyle related diseases.

Sharing all life events with parents was less, more so in boys. In a study on reporting of negative life events by parent-child pair using the modified version of the Coddington Life Events Questionnaire(CLEQ), it was observed that children reported more events than parents and children with chronic ailments reported more than the healthy.¹⁶ Lack of trust on their parents among adolescents is emerging as a social issue with far reaching consequences like school dropouts, running away from home, ill health, depression and suicide. Reporting life events have significant impact on children's coping strategies and resilience.¹⁶

Healthy practices like taking breakfast daily, exercise >2 hours/week, compliance to WIFS program, sharing all life events with parents, limiting junk food and screen time were suboptimum in the present study. Significant

association was observed between daily consumption of junk food and overweight/obesity ($p=0.003$) and between daily exercise >2 hours/week and normal BMI ($p=0.039$). Other dietary/behavioral factors showed no association with current nutritional status.

CONCLUSION

Dietary habits, behavioral patterns and prevalence of overweight/obesity showed variability with respect to gender and region of residence. Practices like missing breakfast, non-compliance to WIFS program and not taking exercise >2 hours/week were more in girls. Increased consumption of junk food, screen time >2 hours/week and not sharing life events with parents were more in boys. In the study, 12% were overweight and 4% had obesity. Daily consumption of junk food showed significant association with overweight/obesity and daily exercise with normal BMI. Health education aimed at behavioural change is recommended for better health among adolescents.

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