Social , Behavioral and Food Environmental Determinants of Obesity in School Children: Evidence from a Mixed Methods Study in India

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BACKGROUND

- Fueled by unfavorable nutrition transition and obesogenic food environments, childhood obesity rates are escalating in low middle income economies, particularly in urban communities.
- Obesity prevention is complex and driven by interactions between multiple social, familial and environmental factors.
- A comprehensive investigation of determinants of obesity risk in children can help identify targets for culturally appropriate behavior change interventions.

OBJECTIVES

1) To explore the perceptions of risk factors of obesity and the readiness to practice healthy lifestyle behaviors among the key stakeholders using focus group discussions and in depth interviews.

2) To determine the social, behavioral and food environmental factors of selected adiposity measures among 10– 15 years old school children in Mumbai, India.

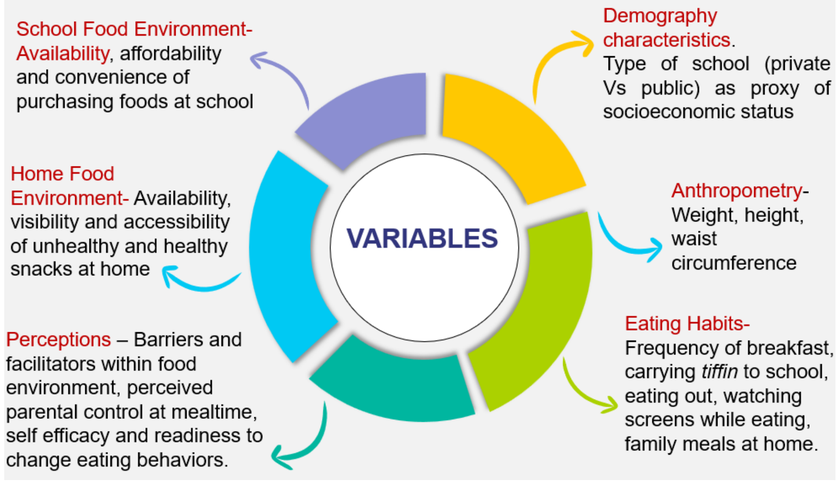
METHODS

Study Design- Concurrent mixed methods

Qualitative Data- Focus group discussions (n=8) with children (n=36) and parents (n=16) and in- depth interviews (n=6) with teachers.

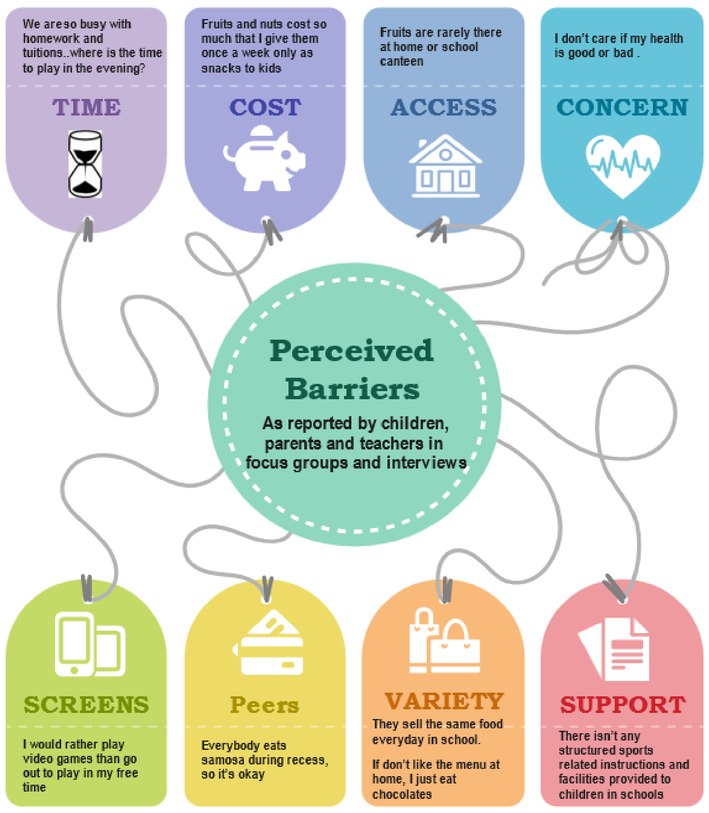
Quantitative Data- Cross sectional survey of 10-15 years old children (n=772) attending six purposively selected private and public schools in Mumbai.

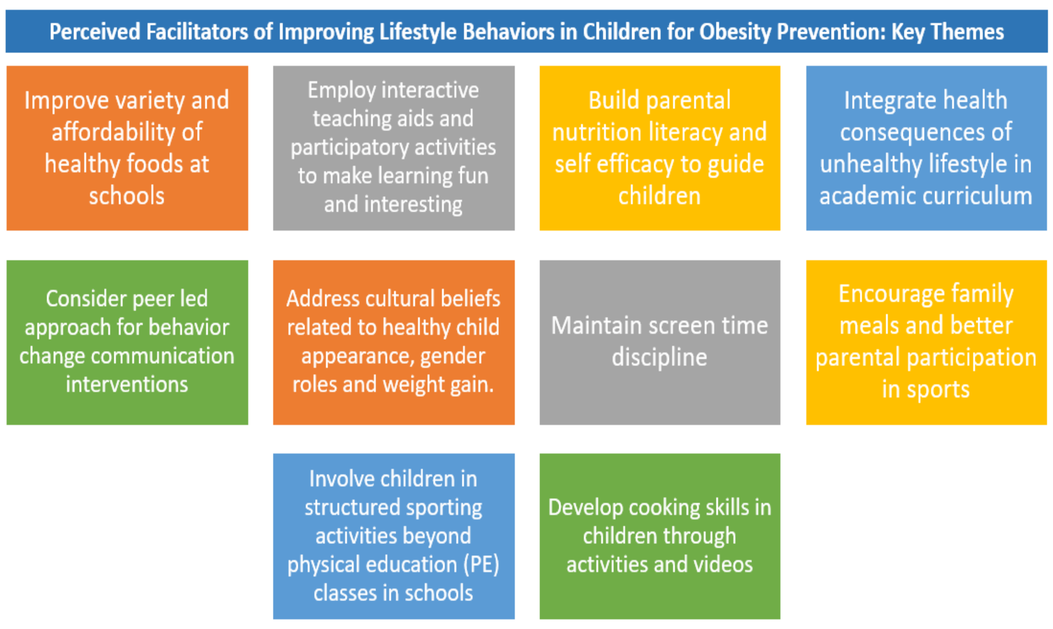
Ethical Consideration: Informed written consent from adults and informed assent from children were obtained. The study protocol received ethics committee approval.



Data Analysis -a) Thematic analysis of transcribed data based on the constructs of Health Belief Model, study objectives and observed patterns and themes.
b) Age and sex specific BMI z scores and Waist to height ratio cut off values as measures of general and central adiposity respectively.
c) Social (attitudes within social contexts), behavioral (eating habits) and environmental (school and home food) factors were investigated.
d) Logistic regression models were performed to determine associated factors of adiposity.

RESULTS





The prevalence of **overweight, and obesity were 27.8, and 10.5%** respectively and **42.2% had WHtR > 0.5**. Girls (46.0%) reported **higher prevalence of central adiposity** as compared to boys (38.6%, p 0.021)

- Qualitative analyses revealed **inadequate knowledge** about causes and consequences of obesity, F&V serving and physical activity recommendations and **low perceived susceptibility and severity** of obesity related health issues in children.

- Easy **access to unhealthy foods** in school canteens, **limited parental control** during mealtime, **negligible focus on nutrition literacy** in academic curriculum, **few play areas** at school and neighborhoods, **lack of variety** in school and home menu, excessive **screen usage** and **stigmatization** and minimal **social support** were **perceived as barriers to** improving lifestyle habits.

Table 1: Eating habits and food environment characteristics of children (n=712)

Characteristics	Never	Sometimes	Often	Frequently	Always
Eating habits [a]					
Have breakfast at home before leaving for school	**205 (28.8)**	**188 (26.4)**	115 (16.2)	110 (15.4)	94 (13.2)
Carry Snacks (*Tiffin*) to School	32 (4.5)	**365 (51.3)**	119 (16.7)	132 (18.5)	64 (9.0)
Carry fruits to school (Yes)	**159 (22.3)**	**267 (37.5)**	139 (19.5)	108 (15.2)	39 (5.5)
Carry unhealthy snacks to school	55 (7.7)	111 (15.6)	212 (29.8)	293 (41.2)	41 (5.8)
Watch television/ screens while eating at home	30 (4.2)	71 (10.0)	108 (15.2)	312 (43.8)	191 (26.8)
School food environment [b]					
Frequency of purchasing any food/beverage at school	79 (11.1)	91 (12.8)	**312 (43.8)**	**118 (16.6)**	112 (15.7)
Frequency of availability of specific foods at school					
a. Fruits, fruit juices	**326 (45.8)**	156 (21.9)	129 (18.1)	-	101 (14.2)
b. Healthy Snacks (*poha, upma, sandwich, roti /rice*)	**289 (40.6)**	187 (26.3)	134 (18.8)	-	102 (14.3)
c. Unhealthy Snacks (*samosa/ vada pav/ pav bhaji*)	19 (2.7)	45 (6.3)	36 (5.1)	-	**612 (86.0)**
Frequency of purchasing specific foods at school					
a. Fruits, fruit juices	**331 (46.5)**	212 (29.8)	141 (19.8)	-	28 (3.9)
b. Healthy Snacks (*poha/upma/ sandwich/ roti/rice*)	**286 (40.2)**	211 (29.6)	171 (24.0)	-	44 (6.2)
c. Unhealthy Snacks (*samosa/ vada pav/ pav bhaji/*)	204 (28.7)	188 (26.4)	172 (24.2)	-	**148 (20.8)**
Home Food Environment [a]					
Availability of foods at home					
a. Fruits	110 (15.4)	94 (13.2)	101 (14.2)	254 (35.7)	**153 (21.5)**
b. Healthy snacks	**168 (23.6)**	155 (21.8)	132 (18.5)	176 (24.7)	81 (11.4)
c. Unhealthy snacks	19 (2.7)	58 (8.1)	102 (14.3)	**221 (31.0)**	**312 (43.8)**
d. Carbonated beverages	202 (28.4)	191 (26.8)	145 (20.4)	110 (15.4)	64 (9.0)
Accessibility and Visibility of foods at home					
a. Fruits	**222 (31.2)**	**185 (26.0)**	113 (15.9)	109 (15.3)	83 (11.7)
b. Healthy snacks	166 (23.3)	153 (21.5)	138 (19.4)	**172 (24.2)**	83 (11.7)
c. Unhealthy snacks	23 (3.2)	67 (9.4)	96 (13.5)	**228 (32.0)**	**298 (41.9)**
d. Carbonated beverages					

[a] Response Options- Never (0 days), Sometimes (1-2 days), Often (3-4 days), Frequently (5-6 days), Always (6-7 days). [b] Response- Never (0 days), Sometimes (1-2 days), Often (3-4 days), Almost always (5-6 days

Table 2: Regression analyses of social, behavioral and environmental factors of adiposity measures

Independent (Predictor) Variables	Girls (n= 378)		Boys (n= 394)	
	BMI z scores > 1 (n = 136) OR (95% CI)	WHtR > 0.5 (n = 174) OR (95% CI)	BMI z scores > 1 (n = 160) OR (95% CI)	WHtR > 0.5 (n = 152) OR (95% CI)
Demographic characteristics				
Age (Ref: 10-12 years)	1.01 (0.92-1.08)	**1.54 (1.31-1.76)** **	**1.11 (1.03-1.22)** *	**0.88 (0.82-0.96)** *
Mother' education (Ref: < 12th Pass)	**0.88 (0.79-0.95)** *	1.14 (0.98-1.36)	0.92 (0.88-1.05)	0.95 (0.87-1.02)
Mother' occupation (Ref: Unemployed)	1.03 (0.99-1.11)	**1.12 (1.03-1.28)** *	1.03 (0.95-1.16)	**1.10 (1.04-1.23)** *
Family income (Ref: <30,000 INR)	1.22 (0.92-1.30)	**1.78 (1.22-2.24)** **	**1.18 (1.03-1.29)** *	0.99 (0.93-1.08)
Type of School Attended (Ref: Public)	**1.08 (1.02-1.14)** *	**2.02 (1.92-2.13)** **	**1.28 (1.21-1.35)** *	**1.63 (1.04-1.99)** *
Eating habits				
Breakfast before school (Ref: <3 d/ week)	0.99 (0.91- 1.10)	0.96 (0.90- 1.08)	**0.78 (0.72-0.85)** **	0.99 (0.86- 1.21)
Carry Snacks (*Tiffin*) to School (Ref: <3 d/ week)	**0.81 (0.78-0.86)** *	0.91 (0.80- 1.06)	0.94 (0.90 – 1.06)	0.92 (0.83- 1.05)
School Food Environment				
Availability of fruits (Ref: <3 d/ week)	1.01 (0.88-1.12)	1.11 (0.96- 1.25)	0.99 (0.95-1.04)	1.06 (0.93- 1.19)
Availability of healthy snacks (Ref: <3 d/ week)	1.11 (0.79-1.42)	**0.82 (0.78-0.91)** *	1.10 (0.88-1.23)	1.08 (0.99-1.16)
Availability of unhealthy snacks (Ref: <3 d/ week)	**1.56 (1.35-1.67)** *	**1.18 (1.04-1.38)** *	**1.73 (1.26-2.91)** **	**2.08 (1.28-4.19)** **
Reasons for purchasing snacks – Taste (Ref: No)	1.01 (0.78-2.05)	1.34 (0.73-1.92)	**1.44 (1.25-1.62)** *	1.32 (0.68-2.93)
Home Food Environment (Ref: <3 d/ week)				
Availability of fruits at home	**0.72 (0.65-0.82)**	1.03 (0.96-1.17)	1.13 (0.86-1.24)	1.34 (0.98- 1.45)
Availability of unhealthy snacks at home	1.05 (0.99-1.19)	**2.19 (1.89-2.26)** **	**2.33 (2.98-3.22)** **	1.03 (0.96-1.17)
At least a meal at the dining table	0.89 (0.82-1.06)	1.11 (0.83- 1.54)	**0.72 (0.66-0.83)** **	1.16 (0.93-1.26)
Evening meals together as family	1.11 (0.93-1.29)	1.01 (0.84-1.48)	**0.88 (0.80-0.94)** *	1.22 (0.95- 1.40)
Eating out in restaurants	**2.88 (2.56-2.90)** **	1.03 (0.94 -1.11)	**1.97 (1.24-2.58)** **	**1.18 (1.08-1.25)** *

Abbreviations: BMI, Body Mass Index; WHtR, Waist to Height Ratio; OR, Odds Ratio; CI, Confidence Interval; ***p value< 0.05, ** p value < 0.001**

- Majority reported that **unhealthy snacks were 'always/ frequently' available at school (86.0%) and home (74.8%).**
- **Only 13.2%** would **'always' have breakfast** at home and almost half reported that **fruits/ healthy snacks were 'never/ sometimes' available at home**.
- Overall, **the odds of central adiposity** were associated with age, family income, availability of unhealthy snacks at school and home and frequency of eating out.
- Higher maternal education, having breakfast before school and evening meals with family, greater availability of healthy snacks at school and fruits at home and better readiness to adopt healthy habits and self efficacy scores emerged **as protective factors of obesity risk in participants.**

FUTURE RESEARCH

- Develop **broader and integrated interventions** that optimize social and environmental exposures to foster health-promoting lifestyle habits and reduce risk of obesity in children in India as elsewhere.

CONCLUSION

- Improving **access and affordability of healthy snacks** at schools, encouraging **family meal and play times**, and inculcating **self-efficacy** skills to adopt healthy eating habits in parents and children emerged as targets for future interventions.

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