Body weight perception is associated with socio-economic status and current body weight in selected urban and rural South Indian school-going children

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Abstract

Objective: To evaluate the current and ideal body weight perceptions of school-children in relation to their actual body weight and socio-economic status (SES).
Design: Baseline evaluation of schoolchildren from January 2008 to April 2008 as part of a 3-year longitudinal study.
Setting: City and non-city locations, Karnataka State, South India.
Subjects: Schoolchildren (*n* 1877) aged between 8 and 14 years.
Results: Girls, children of more educated parents and city dwellers were more likely to be overweight ($P < 0.001$). Younger children aged <10 years and those of lower SES were more likely to perceive themselves as underweight (adjusted OR = 1·63, 95 % CI 1·25, 2·11 and adjusted OR = 1·87, 95 % CI 1·32, 2·65). Underweight children were ten times more likely to overestimate their current weight status, while overweight children were four times more likely to underestimate it. The odds of children of lower SES underestimating their weight, as well as desiring a higher weight, were higher than those of higher-SES children.
Conclusions: SES is associated with body weight perception. Underweight children are more likely to overestimate their weight status and overweight children more likely to underestimate it.

Overweight and obesity are emerging problems in developing countries where undernutrition and underweight continue to be highly prevalent. Thus, overweight/obesity in affluent school-going children in India has been reported to be as high as 30 %[1,2], while relatively recent national-level data indicate that 48 % of children under 3 years of age are stunted and 43 % are underweight[3]. There is also an understanding that interventions that address overweight/obesity and its associated clinical sequelae need to be targeted at younger individuals, since health-related behaviours such as physical activity often track from childhood into adulthood[4]. While there are some data in India that have related diet[5] and physical inactivity[6] to childhood overweight, there is a paucity of literature across much of the developing world regarding other associated social and behavioural factors. One of these poorly studied associations is that of perceived body weight and childhood overweight/obesity, particularly in the context of a developing country with a high prevalence of children who are underweight.

Body image, the way in which an individual perceives his/her appearance in terms of shape, size and other characteristics[7], could conceivably be associated with acceptability of weight gain. There are societies where obesity is seen as a measure of prosperity and social standing[8–10]; something quite acceptable, or even to be aspired to. Thus people who are poor may be more likely to accept being overweight as an indication of social mobility. This has implications in societies where there are large numbers of poor people who may, as a result of improved economic conditions, undergo a nutrition transition with reduced underweight in the short term and increased overweight in the long term. In countries such as India, the nutrition transition is underway[11], although there are large regional differences in the extent to which this has evolved[3].

Misperception of weight status is reported in both adults[10] and children[12–15], particularly among those overweight[16]. It has been reported that children and adolescents tend to underestimate their weight[16,17]. Children of different ethnic origins, too, have different weight perceptions[14,18]. Native Americans perceive heavier weights as normal, compared with Caucasians, while African Americans and Asian girls are less likely to perceive lower weights as being normal. African-American girls underestimate their weight and resort to weight gain compared

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with Hispanics and Latina girls, who perceive themselves as being overweight and try to lose weight. In the current analysis we studied the extent to which school-going children, studying in low and higher socio-economic schools and residing in city and non-city environments, perceived their current body weight and whether individuals of poor socio-economic status (SES) tended to perceive themselves as being thinner than they actually were (i.e. they underestimated their actual body weight status) and were more likely to aspire to a 'fatter' body image.

Methods

Participants

Out of 2083 eligible children between the ages of 8 and 14 years, 1907 children (895 boys and 1012 girls) from seven schools in the state of Karnataka, South India, consented for the study at baseline, as part of a long-itudinal study with a projected follow-up of 2 years to monitor growth indices in rural and urban children. Out of these, 1877 children (875 boys and 1002 girls) partic-ipated in the study. The present analyses are derived from the baseline survey conducted between January 2008 and March 2008. The sample recruited was found to have adequate power (above 80 %) to identify significant sociodemographic predictors for perception of body weight in the present study and to detect overestimation/ underestimation of at least 10 % in 1907 children at 5 % level of significance.

Convenience sampling of seven schools of city and non-city (rural and small rural towns) children provided a mix of SES (based on school fees linked to the language of instruction). Thus, two schools were located in villages, three in small towns and two in Bangalore city. All schools were co-educational, non-residential and open to all children irrespective of caste, religion and mother tongue (language spoken at home). The schools in which Kannada, the regional state language, was the language of instruction received government support and had annual tuition fees of Rs 250 to 500, whereas schools with English as language of instruction did not receive government support and had annual tuition fees above Rs 6000. Hence the language of instruction in schools was used as an indicator of SES. Three schools (one each in a village, small town and city) had Kannada as the language of instruction, while four schools (one in a village, two in small towns and one in the city) had English as the language of instruction.

Prior to enrolment, ethical approval was obtained from the Institutional Ethics Review Board of St John's Medical College. The study protocol was explained to the principal of each school and permission obtained to conduct the study. The protocol of the study was explained to each eligible child and consent forms were sent via the child to the parents. Consent was obtained from the parents and assent from each child.

Body weight perception assessment

A simple questionnaire in both Kannada and English languages was framed for young children. There were no open-ended questions. The questionnaire captured the children's body weight perceptions with regard to their current weight and their perceived ideal body weight, i.e. the weight they wished to achieve. The questionnaire was piloted on sixty children of the same age group to check if the questions were simple and easy to answer. The questionnaire was first distributed. The investigator then read each question out aloud together with its options to a group of children, and provided explanations when asked in the local languages such that all children could comprehend the question and tick their answers. Doubts were clarified and adequate time given to all children to answer the question on their individual questionnaires before proceeding to the next question. Responses on the questionnaires were obtained prior to obtaining the anthropometric measurements.

For the present analysis, current body weight percep-tion was obtained with the statement 'I think my body weight/appearance is…' with options 'too thin', 'a little thin', 'normal', 'a little fat' or 'too fat'. Perception of ideal body weight was obtained with the statement 'I want to be…' with options 'a lot fatter', 'slightly fatter', 'as I am at present', 'slightly thinner' or much thinner'.

For analysis of current body weight perceptions, 'too thin' and 'little thin' were combined for 'perceived thin-ness' and 'a little fat' and 'too fat' for 'perceived fatness'. Similarly, for ideal body weight perception, responses of 'as I am at present' were considered as 'want to be as I am', 'slightly thinner' and 'much thinner' were combined as 'want to be thinner' and 'slightly fatter' and 'a lot fatter' were combined as 'want to be fatter'.

Anthropometry

Height was measured using a fibreglass tape on children without footwear, to 0·2 cm. Weight was measured in school clothing but without shoes using a calibrated digital scale (Home Health, model 8604; Dr Morepen Lab, Hong Kong) to the nearest 100 g. BMI was computed and the BMI-for-age Z-score values[19] were obtained using Anthroplus software version 1·0·2 (WHO, Geneva, Swit-zerland). The recent WHO (2006) growth reference is based on data collected on children in the Multicentre Growth Reference Study and extrapolated on to the Centers for Disease Control and Prevention (2000) height and weight values[19]. These data also included children from India. These standards have also been used in other studies[20,21]. Children were then categorized by weight status as overweight ($> +1$ SD), normal weight (-2 SD to $+1$ SD) and underweight (< -2 SD).

While consent was obtained for a larger number of children, data were not obtained on all as some children (8·4 %) were absent on the day of data collection. Among those who consented, 1·5 % did not participate again

due to absenteeism. The proportion of absenteeism was equally distributed across classes in all of the schools.

Thus, final data were obtained on 1902 children for anthropometry and on 1877 children for the questionnaire.

Statistical analyses

Age of the children was categorized as ≤10 years and >10 years[22]. Location of the school was categorized as city and non-city (villages and small towns), while language of instruction was categorized as Kannada and English and used as a surrogate for SES. Maternal and paternal education were categorized as ≤7th grade and >7th grade based on gross enrolment ratio in secondary education in India of about 50 %[23]. Spearman rank's correlation was used to find the correlation between BMI Z-score and perception of current body weight. Perception of current body weight was cross-tabulated with weight status of the children. Discordance of perception with weight status was categorized as either underestimation (perception of being thinner compared with the current weight status) or overestimation (perception of being fatter compared with the current weight status).

Analysis was done using the SPSS statistical software package version 17 (SPSS Inc., Chicago, IL, USA). Categorical variables are reported as number and percentages. The χ^2 test was used to find the association between sociodemographic characteristics and weight status of the children. The association of perception of current body weight as well as ideal body weight with various sociodemographic factors was also assessed using the χ^2 test, and the unadjusted odds ratio is reported. Multinomial logistic regression analysis adjusted for age, gender, weight status of the children and sociodemographic factors was performed to identify the factors associated with under- and overestimation (reference: correct estimation) of current and ideal body weight perception. A level of significance (two-sided) less than 5 % was considered statistically significant.

Results

Table 1 summarizes the characteristics of the children stratified by their actual weight status. Girls were more likely to be overweight and less likely to be underweight than boys ($P < 0.001$). Older children (>10 years) were more likely to be underweight than younger children (≤10 years; $P < 0.010$). Children in cities were more likely to be overweight and less likely to be underweight compared with their non-city counterparts ($P < 0.001$). Children in English-language schools were more likely to be overweight than children from Kannada-language schools ($P < 0.001$), while mothers and fathers who were more educated were more likely to have overweight children ($P < 0.001$). The correlation between the actual BMI Z-score and the perception of body weight was found to be significant ($r = 0.359$; $P < 0.001$).

Table 2 assesses the perception of current weight by actual weight status for the entire study group. Multinomial logistic regression analysis was performed to identify the factors associated with under- and overestimation (reference: correct estimation) of current body image and the adjusted odds ratios (AOR) are reported. Across the sociodemographic variables of gender, age group, location,

Table 1 Sociodemographic characteristics and weight status of the participants: schoolchildren aged 8–14 years, Karnataka State, South India, January–March 2008

	Weight status						
	Underweight (n 476)		Overweight (n 181)		Normal weight (n 1245)		
	n	%	n	%	n	%	P*
Gender							
Male	271	30·3	74	8·3	548	61·4	<0·001
Female	205	20·3	107	10·6	697	69·1	
Age category							
≤10 years	153	21·3	67	9·3	498	69·4	0·010
>10 years	323	27·3	114	9·6	747	63·1	
Location							
Non-city	357	29·0	98	8·0	776	63·0	<0·001
City	119	17·7	83	12·4	469	69·9	
Language of instruction							
Kannada	132	25·3	22	4·2	367	70·4	<0·001
English	344	24·9	159	11·5	878	63·6	
Education of mother	(n 374)		(n 141)		(n 1020)		
≤7th grade	121	28·5	16	3·8	288	67·8	<0·001
>7th grade	253	22·8	125	11·3	732	65·9	
Education of father	(n 414)		(n 161)		(n 1101)		
≤7th grade	101	24·3	23	5·5	292	70·2	0·003
>7th grade	313	24·8	138	11·0	809	64·2	

*P value obtained through Pearson's χ^2 test.

Table 2 Concordance and discordance: perception of current body weight across sociodemographic and weight status categories among schoolchildren aged 8–14 years, Karnataka State, South India, January–March 2008

	Correct estimation		Underestimation						Overestimation					
Variable	n	%	n	%	Unadjusted OR	95% CI	Adjusted OR†	95% CI	n	%	Unadjusted OR	95% CI	Adjusted OR†	95% CI
Gender														
Boys	392	46·4	213	25·2	0·90	0·72, 1·14	0·96	0·74, 1·25	240	28·4	1·16	0·92, 1·46	0·90	0·67, 1·21
Girls†	452	47·0	272	28·3					238	24·7				
Age category														
≤10 years	307	45·1	217	31·9	1·42**	1·12, 1·79	1·63***	1·25, 2·11	157	23·1	0·86	0·67, 1·09	0·84	0·62, 1·14
>10 years‡	537	47·7	268	23·8					321	28·5				
Location														
Non-city	528	45·1	301	25·7	0·98	0·77, 1·24	1·04	0·79, 1·36	342	29·2	1·51**	1·18, 1·92	1·24	0·91, 1·70
City‡	316	49·7	184	28·9					136	21·4				
Language of instruction														
Kannada	201	40·4	164	32·9	1·63***	1·27, 2·11	1·87***	1·32, 2·65	133	26·7	1·23	0·95, 1·60	1·45	0·98, 2·14
English‡	643	49·1	321	24·5					345	26·4				
Education of mother														
≤7th grade	167	40·4	126	29·1	1·41**	1·06, 1·87	1·08	0·77, 1·53	120	29·1	1·38**	1·03, 1·83	1·01	0·69, 1·47
>7th grade‡	527	48·6	282	25·4					275	25·4				
Education of father														
≤7th grade	165	40·6	138	34·0	1·66***	1·26, 2·18	1·37	0·96, 1·95	103	25·4	1·14	0·86, 1·53	1·09	0·72, 1·64
>7th grade‡	601	48·8	303	24·6					328	26·6				
Weight status														
Underweight	115	25·4	39	8·6	0·67***	0·46, 0·98	0·72	0·46, 1·11	298	65·9	10·10***	7·65, 13·19	10·50***	7·70, 14·44
Overweight	58	33·7	107	62·2	3·65***	2·58, 5·16	4·66***	3·10, 7·03	7	4·1	0·47	0·21, 1·04	0·69	0·30, 1·59
Normal weight‡	671	56·7	339	28·7					173	14·6				

**P ≤ 0·01, ***P < 0·001.
†Adjusted for age, gender and weight status of children and sociodemographic factors.
‡Reference group.

Table 3 Body weight satisfaction: perception of 'ideal' body weight across sociodemographic and weight status categories among schoolchildren aged 8–14 years, Karnataka State, South India, January–March 2008

Variable	Want to be as I am		Want to be thinner						Want to be fatter					
	n	%	*n*	%	Unadjusted OR	95 % CI	Adjusted OR†	95 % CI	*n*	%	Unadjusted OR	95 % CI	Adjusted OR†	95 % CI
Gender														
Boys	437	49·9	200	22·9	0·72**	0·57, 0·90	0·69**	0·53, 0·90	238	27·2	1·11	0·88, 1·40	0·97	0·75, 1·26
Girls‡	470	47·0	300	30·0					230	23·0				
Age category														
≤10 years	341	48·3	174	24·6	0·89	0·70, 1·12	0·79	0·61, 1·04	191	27·1	1·14	0·91, 1·45	1·16	0·89, 1·51
>10 years‡	566	48·4	326	27·9					277	23·7				
Location														
Non-city	598	48·8	295	24·1	0·74***	0·59, 0·94	0·86	0·66, 1·13	332	27·1	1·26	0·98, 1·62	1·14	0·86, 1·51
City‡	309	47·5	205	31·5					136	20·9				
Language of instruction														
Kannada	275	53·8	94	18·4	0·53***	0·40, 0·69	0·45***	0·31, 0·66	142	27·8	1·00	0·78, 1·29	0·81	0·58-1·14
English‡	632	46·3	406	29·8					326	23·9				
Education of mother														
≤7th grade	217	50·8	92	21·5	0·72**	0·54, 0·96	1·01	0·72, 1·44	118	27·6	1·13	0·85, 1·49	1·15	0·83, 1·59
>7th grade‡	543	48·3	320	28·4					262	23·3				
Education of father														
≤7th grade	198	47·3	102	24·3	0·90	0·68, 1·20	1·43	0·99, 2·07	119	28·4	1·23	0·94, 1·62	1·27	0·89, 1·80
>7th grade‡	620	48·6	353	27·7					302	23·7				
Weight status														
Underweight	224	49·3	85	18·7	0·71***	0·53, 0·95	0·63***	0·45, 0·88	145	31·9	1·38	1·07, 1·80	1·25	0·93, 1·67
Overweight	60	35·3	83	48·8	2·59***	1·78, 3·77	2·51***	1·65, 3·81	27	15·9	0·96	0·58, 1·59	1·13	0·65, 1·91
Normal weight‡	590	50·0	315	26·7					276	23·4				

**P ≤ 0·01, ***P < 0·001.
†Adjusted for age, gender and weight status of the children and sociodemographic factors.
‡Reference group.

language of instruction and education of parents, less than 50 % of children correctly perceived their current weight status. Even among children of normal weight, only 56·7 % felt they were of normal weight. Among underweight children only 25·4 % perceived their body weight status correctly, while the percentage was 33·7 % among overweight children. Younger children were more likely to underestimate their current weight status, i.e. perceive themselves to be thinner than they actually were (AOR = 1·63, 95 % CI 1·25, 2·11; $P < 0·001$), than older children. Likewise, children from Kannada-language schools (lower SES) were more likely than those from the English-language schools to underestimate their current weight status; this underestimation of current body weight was significant even after adjusting for all other factors, including current weight status (AOR = 1·87, 95 % CI 1·32, 2·65; $P < 0·001$). The strongest associations of discordance of body weight perception and actual body weight were with current anthropometric status; thus children who were underweight were more than ten times more likely to overestimate their weight status, i.e. perceive themselves to be heavier than they actually were (AOR = 10·50, 95 % CI 7·70, 14·44; $P < 0·001$), while overweight children were about four times more likely to perceive themselves to be thinner than they actually were (AOR = 4·66, 95 % CI 3·10, 7·03; $P < 0·001$).

Children's perception of their 'ideal' body weight (Table 3) across sociodemographic and anthropometric categories was analysed. Across sociodemographic categories approximately 50 % of children wanted to remain within their current weight category. Some 49·3 % of underweight children and 35·3 % of overweight children also wished to remain within the same weight category. Boys were less likely to want to be thinner, even after adjusting for other factors including current anthropometric status (AOR = 0·69, 95 % CI 0·53, 0·90; $P \leq 0·01$). Children of less educated mothers and from outside the city were also less likely to want to be thinner, but these were no longer significant when adjusted for other factors. Children from schools with Kannada as language of instruction (low SES) were less likely to want to be thinner, even after adjusting for other factors (AOR = 0·45, 95 % CI 0·31, 0·66; $P < 0·001$) including actual weight status. Children who were currently overweight were two times more likely to want to be thinner (AOR = 2·51, 95 % CI 1·65, 3·81; $P < 0·001$), while underweight children were less likely to want to be thinner after adjusting for other factors (AOR = 0·63, 95 % CI 0·45, 0·88; $P < 0·001$).

Discussion

The present data suggest that SES is one of the major factors associated with current perception of body weight, which reflects perception of body image. The most important factor associated with a different desired body weight appeared to be current weight status. There were also important gender differences.

In countries like Pakistan, Brazil, Malaysia and India, the prevalence of overweight and obesity is comparatively higher in children residing in urban compared with rural areas[24–28]. Similar findings are noted in our data. In contrast to studies that have reported a greater prevalence of overweight individuals in economically and socially disadvantaged families in developed countries[28,29], our data indicate that overweight is a problem of the higher socio-economic group (using language of instruction as a surrogate). There is now an increasing body of evidence suggesting that overweight in adults and adolescents is beginning to increase in the urban poor[2,30]. This may be a reflection of the phase of the nutrition transition.

Body image represents an individual's subjective experience with his/her body and the manner in which he/she organizes this experience[31]. Although attitude towards body image appears in girls as young as 5–6 years of age[32–34], a larger number become aware of it during adolescence and young adulthood[35]. Perception of one's body image can be influenced by self-esteem, self-evaluation and evaluation by others[36]. Satisfaction with body image depends on whether the body form of an individual conforms to the desired body image. Our data on perception of weight in children indicate that younger children perceive themselves to be thinner than their actual weight compared with older children. This may be because fewer younger children have developed an attitude towards body image due to lower cognitive development[35]; other possible reasons need to be explored further. Overweight children had higher odds of perceiving themselves to be thinner than they actually were; this implies that awareness of their overweight status is lacking. Similar findings are reported among certain ethnic populations where overweight is viewed positively and considered normal, and this probably reflects their culturally accepted ideal body image[37,38]. Socio-culturally desired body weight in India needs to be examined and must be taken into account while designing interventions to combat overweight and obesity in Indian children. Likewise, the very high odds of underweight children perceiving themselves to be much heavier than they actually are could have other potential adverse consequences; for instance, participation in school meal programmes[39,40] aimed at addressing the issue of undernutrition.

While our study did not show significant differences in perceived current body weight between boys and girls, perceived body image dissatisfaction has been observed in both males and females in children and adolescents[41]. When perceived image differs from the ideal image there can be varied levels of distress. Very low body image distress or concern may evoke either little or no motivation to change body weight, while those with very high

body image distress are more likely to use unhealthy weight-correction methods[42,43]. Our data do indicate, however, that boys are less likely to want to be thinner than they currently are. It would be interesting to determine which of these variables – desired body image perception or actual body weight status – is more closely associated with dietary and physical activity patterns, actual weight gain or decrease over time and personal interventions aimed at weight control, if any.

In India 34 % of men and 36 % of women between 15 and 49 years of age are underweight[3]. Although underweight and overweight coexist in developing countries, in the last two decades overweight has increased and underweight has decreased among school-going children[24,44]. In the future, underweight is predicted to reduce further by one-third while overweight/ obesity may continue to increase[45]. In India, the transition from underweight has been slower; data from the two cross-sectional National Family and Health Surveys conducted in 1998–1999 and 2005–2006 indicate that in children less than 3 years of age, underweight and stunting have reduced from 42·7 % and 51·0 % to 40·4 % and 44·9 %, respectively[3]. This high burden of underweight and the discordance of perceived body weight and actual weight status suggest that feedback on weight status to students may be important. Currently, schools do measure heights and weights of students on an annual basis, but there is little feedback provided to students or parents.

Body image perception and dissatisfaction has emerged as a health issue among a large section of young individuals[41] in certain populations. Accurate perception of weight is important in both underweight and overweight individuals. Dissatisfaction within these groups can worsen malnutrition along with the consequences of disease related to it[10,46]. This is particularly true in the specific context of India where the prevalence of underweight is still very high. The result that children who were underweight were more than ten times more likely to perceive themselves to be heavier than they really are is worrisome because it can hamper the implementation of measures to prevent and control malnutrition. The mistaken perception on the current weight of both underweight and overweight children suggests that the dissatisfaction with body weight that was observed in 50 % of individuals could be worse if they had the correct perception about their nutritional status. The challenge would be to find cost-effective, easily implementable and scalable ways to improve the perception of current weight and acceptance of one's body, thus minimizing the risks of an inadequate diet for weight correction. Intervention at school may be the first choice in an attempt to improve body weight perception in preadolescents and adolescents. Adequate training is necessary to prepare personnel at schools so that they can promote a healthy and positive body image[47].

Strengths and limitations of the study

The present study is an exploration of perceived body image in schoolchildren using simple questions. Greater insights may be obtained in future by employing qualitative methods to explore the themes that have emerged as findings in our study. SES was determined using language of instruction as a surrogate; this is clearly only one indicator and may reflect issues other than economic status, such as greater knowledge about weight status and health in general. Anthropometric assessment was limited to height and weight. In future studies it will be useful to also include additional measures of central adiposity e.g. waist and hip circumference, since an increased propensity towards central obesity is a particular problem of South Asians[48]. Dietary and physical activity patterns were not captured at the time of the current assessment; this would be important to study in future work, in order to determine the extent to which body image perception *v.* actual body weight is associated with these behaviours. It would also be important to determine in longitudinal studies whether desired body image is associated with later weight gain or weight loss.

Conclusions

Overall, the present data indicate that SES influences body weight perception of children, with children from schools with Kannada as language of instruction being more likely to underestimate their current weight status, as well as being less likely to want to be thinner, than children studying in schools with English as language of instruction. In general, only about 50 % of children correctly perceived their current weight status whether they were of normal weight, underweight or overweight. Underweight children were more likely to overestimate their weight status and overweight children more likely to underestimate it. Body weight perception of children has to be taken into account when designing and implementing programmes to combat both underweight and overweight in children.

Acknowledgements

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