

Overweight, obesity and perceptions about body weight among primary schoolchildren in Dar es Salaam, Tanzania

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Abstract: The increasing prevalence of overweight and obesity among children has become a public health concern both in developing and developed countries. Previous research studies have shown that favourable perception of one's body weight is an important factor in weight control. This study determined prevalence of overweight and obesity and assessed perception about body weight among primary schoolchildren in Dar es Salaam, Tanzania. In this cross sectional study, nine schools were selected randomly from a list of all primary schools in Dar es Salaam. A structured questionnaire was used to collect data on socio-demographic characteristics and lifestyle information including perception about body weight. Height and weight were measured following standard procedures. Chi-square tests and multiple logistic regressions were used to determine factors which influence perceptions about body weight. A total of 446 children were included into the study. The mean body mass index (BMI) was $16.6 \pm 4.0 \text{ kg/m}^2$ (16.1 ± 4.0 for males and 17.0 ± 4.0 for females). Prevalence of overweight and obesity was 9.8% and 5.2%, respectively. The prevalence of overweight and obesity was significantly higher among girls, 13.1% and 6.3% compared to boys with 6.3% and 3.8% overweight and obese respectively ($P=0.0314$). Overall, the prevalence of overweight and obesity was 15.0% (10.1% among boys and 19.4% among girls). One-third (33.3%) of the children perceived their body weight as overweight or obese. Among overweight and obese children, 35.4% had unfavourable perception of their body weights. There was a statistically significant difference between perceived body weight and actual body weight as indicated by BMI for both boys and girls ($P<0.05$). Age of the child (AOR=0.55 95%CI 0.36-0.85) and area of residence (COR=0.64 95% CI 0.44-0.95) were found to be significant predictors of favourable perception of one's body weight. In conclusion, the prevalence of overweight and obesity is not very high in this population. However over a third of overweight and obese children, had unfavourable perception of their body weights. We recommend targeted educational programmes about overweight and obesity and the associated health effects in order to instil a behaviour of self consciousness on overweight and obesity among children in Tanzania.

Keywords: overweight, obesity, body weight, perceptions, schoolchildren, Tanzania

Introduction

The increasing prevalence of overweight and obesity in children has become a public health concern worldwide. In 2010, 43 million children were estimated to be overweight and obese worldwide, out of whom, 35 million (81.4%) were from developing countries (De Onis *et al.*, 2010). In 2010, the worldwide prevalence of childhood overweight and obesity was 6.7% and is expected to reach 9.1% in 2020. In Africa, the estimated prevalence was 8.5% and is expected to reach 12.7% in 2020 (De Onis *et al.*, 2010).

Few studies have been conducted on the prevalence of obesity among primary schoolchildren in Tanzania (Chillo *et al.*, 2009; Kafyulilo & Mafumiko 2010; Mosha & Fungo 2010). However, none of these assessed the perception about body weight. Favourable perception of

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one's own weight is important for weight control behaviour (Wang *et al.*, 2009) and probably more importantly among children and adolescents (Smolak, 2004). Perception about body weight is influenced by several factors including culture and ethnicity (Paeratakul *et al.*, 2002; Gillum & Sempos 2005). Western culture has a prevailing perception that low body weight is attractive (Nichter & Nichter, 1991) and is preferred among females (Emslie *et al.*, 2001). In developing countries particularly in Africa, overweight and obesity are preferred culturally, because overweight or obese persons are perceived as healthier than those who are of normal weight although the trend is shifting among people of higher class (Khawaja & Afifi-Sowed, 2004). As children and adolescents experience physical changes in their bodies at puberty, they become more concerned with their body shape. Boys tend to be more concerned with their chest, shoulders and arms, while girls become more concerned with hips, thighs and legs (Vander Wal & Thelen, 2000). In addition to socio-cultural factors, the HIV pandemic in Tanzania has greatly impacted on peoples' perception about thin body weight with most people preferring to look overweight or obese so as to avoid being suspected of having HIV/AIDS (Ezekiel *et al.*, 2009).

Studies among adults have shown that women overestimate and men underestimate their weight (Wardle & Griffith 2001; Emslie *et al.*, 2001; Inoue *et al.*, 2007). Our previous study among middle-aged adults in Dar es Salaam also showed that a higher proportion of women perceived their weight as obese compared to men (Muhihi *et al.*, 2012). A recent study among children and teenagers has indicated a similar pattern of more girls perceiving themselves as more overweight/obese, and consequently tend to lose weight than boys (Darshini & Rajeshi, 2013).

Although, they cannot discriminate between body size being misperceived, verbal description methods with scale ranging from "very underweight" to "very overweight" (Wardle & Marsland, 1990; Brener *et al.*, 2004; Johnson *et al.*, 2008) have been widely used in the assessment of body weight among children and adults. To complement verbal description methods, body images with known sizes are now available for assessment of body size among children (Truby & Paxton, 2002, 2008). The present study used verbal description methods to investigate perceptions of body size in comparison with actual Body Mass Index (BMI) in a representative sample of primary schoolchildren in Dar es Salaam, Tanzania.

Materials and Methods

Study design, site and participants

This cross-sectional study was conducted among children aged 6-17 years recruited from three districts of Ilala, Kinondoni and Temeke in Dar es Salaam City, Tanzania. A sampling frame of all public and private schools in Dar es Salaam was obtained from the district education authorities. A two stage cluster sampling was used to select schools to be involved in the study. Selection was made to ensure equal representation from both urban and rural settings of Dar es Salaam. Within each selected school one class (from class 1-7) was randomly selected and all children from the selected class and their parents/guardians were invited to participate into the study. Based on the criteria set by Dar es Salaam Region authority, the schools were categorized as urban if located within 15km radius from the city centre. Any school more than 15km was categorized as rural. Study questionnaire with both closed and open-ended questions was used to gather the required information from the participants. Research assistants who helped to collect the data were trained for two days on the objectives of the study and interview techniques and how to take the anthropometric measurements.

Anthropometrics

Data collection procedures for this study have already been described elsewhere (Muhihi *et al.*, 2013). Anthropometric measurements were taken early in the morning before classes began. Measurements were conducted in a dedicated room at each school with children wearing light clothes and with no shoes. Body weight was measured using a self-calibrating precision digital scale (Omron, Japan). Height was measured to the nearest 0.1cm by a fixed Shorr measuring board (Shorr Productions, Olnet, MD). BMI was then calculated as weight in kilogrammes divided by height squared in metres (kg/m^2). The Mid-Upper Arm Circumference (MUAC) was measured using a Ribone diameter tape (Ribone Birmingham, UK) accurate to nearest 0.1cm. An average of three measurements was recorded. All measurements were made while observing standard precautions (Cogill, 2003). The prevalence of overweight and obesity were defined using BMI percentiles. Children with BMI between 85th and 95th percentile for age and sex were considered overweight and children with BMI at or above 95th percentile were considered obese (Asayama *et al.*, 2003; Olden & Flegal, 2010).

Socio-demographic information

A structured questionnaire was used to collect socio-demographic information for the participating children. Important socio-demographic information such as place of residence (rural/urban) age of the child, maternal education, maternal occupation and household size were obtained from parents/guardian during the interview. The questionnaire was pretested in one of the schools which was not selected for the study and following pretesting, all questions which were thought not to be clear were reviewed before the data collection exercise started.

Perception about body size

Assessment of perception about body size was performed using verbal descriptors. Five levels of verbal description used were “much too thin”, “too thin”, “just right”, “too fat” or “much too fat” (Wardle & Marsland, 1990; Sands & Wardle, 2003; Wardle & Watters, 2004). In this study population of primary schoolchildren, perception about body size was assessed using three levels of verbal descriptors “underweight”, “normal for my age” and “overweight or obese” based on the question; “how do you perceive your current body weight?”. The researchers supervised data collection daily by checking all questionnaires for completeness and consistence. All errors found were corrected by re-interviewing the child the next day.

Data analysis

Frequency distributions, summary measures (means, median) and measures of variability were used to describe the general characteristics of the study population. The differences in the perception about one’s body weight by all predictor variables were assessed using Chi-square (χ^2) tests. Multiple logistic regressions were used to determine individual contribution of predictor variables on favourable body weight perception while adjusting for potential confounding variables. We report Odds Ratios and 95% CI interval. All statistical analyses were performed using Statistical Analysis Software (SAS 9.2, Institute Inc., North Carolina, United States) and adjustment for the cluster effect was done. P-values ≤ 0.05 were considered statistically significant.

Ethics consideration

Ethical clearance was obtained from Institutional Review Board of Muhimbili University of Health and Allied Sciences (Ref No. MU/DRP/AEC/VOL.X111/153). Permission to conduct the study was obtained from the education authorities in all the three (Ilala, Kinondoni, Temeke) district councils and head teachers of all involved schools. An informed consent from parent/guardian and assent from the child were obtained prior to participating in the study. Confidentiality of the information collected

was ensured by using unique participant identification numbers on data collection tools instead of participant name. Completed questionnaires were stored in locked cabinets at Muhimbili University of Health and Allied Sciences and computers which were used for data entry were password coded and nobody who is not part of the study team could access the data files.

Results

Socio-demographic characteristics

A total of 446 children from nine primary schools in Dar es Salaam were included into the study. Their age ranged from 6 to 17 years and their mean age was 11.1 ± 2.0 years (11.3 ± 2.1 years and 11.1 ± 2.0 years for boys and girls respectively). Most of the children were from urban (55.8%) and public (88.3%) schools. Statistically significant sex differences were observed for BMI with girls having higher mean BMI than boys ($P=0.002$) and education level of the mother ($P=0.0146$) (Table 1).

Table 1: Socio-demographic characteristics of the study participants

Variable	All (N=446) Mean±SD (n)%	Boys (N=209) Mean±SD (n)%	Girls (N=237) Mean±SD (n)%	P-value
Age in years	11.1±2.0	11.3±2.1	11.1±2.0	0.5907
Place of residence				
Rural	197 (44.2)	98 (46.9)	99 (41.8)	0.2941
Urban	249 (55.8)	111 (53.1)	138 (58.2)	
Religion				
Christian	225 (50.4)	107 (51.2)	118 (49.8)	0.7767
Muslim	221 (49.6)	102 (48.8)	119 (50.2)	
Number of adults (≥18yrs)	6.2±2.2	6.3±2.3	6.2±2.0	0.9488
Number of children (<18yrs)	3.2±2.1	3.0±1.6	3.3±2.5	0.3068
Type of school				
Private	52 (11.7)	26 (12.4)	26 (11.0)	0.6594
Public	394 (88.3)	183 (87.6)	211 (89.0)	
Ever heard about obesity				
Yes	219 (51.0)	106 (52.5)	113 (49.8)	0.5772
No	210 (49.0)	96 (47.5)	114 (50.2)	
BMI*	16.6±4.0	16.1±4.0	17.0±4.0	0.0020

*BMI = Body Mass Index

Prevalence of obesity among primary schoolchildren

The prevalence of overweight and obesity in this population of primary schoolchildren in Dar es Salaam was 9.8% and 5.2%, respectively. The prevalence of overweight and obesity was significantly higher among girls, 13.1% and 6.3% than among their peer boys 6.3% and 3.8% ($P=0.0314$). Overall, the combined prevalence of overweight and obesity was 15.0% (10.1% among boys and 19.4% among girls) (Table 2).

Table 2: Prevalence of normal weight, underweight, overweight and obesity among primary school children

Characteristic	All (N=446)	Boys (N=209)	Girls (N=237)	P-value
Underweight	65 (14.6)	36 (17.2)	29 (12.2)	0.0314
Normal weight	314 (70.4)	152 (72.7)	162 (68.4)	
Overweight	44 (9.8)	13 (6.3)	31 (13.1)	
Obese	23 (5.2)	8 (3.8)	15 (6.3)	

Perception about body weight

A total of 143 (33.3%) of the children perceived their body weight as overweight or obese. One hundred eighty-four (42.8%) perceived their weight as “normal” for their age while 97 (22.5%) perceived their weight as underweight. Although no significant sex differences were observed on the perception about body weight, more girls (35.9%) perceived their weight as more overweight/obese than boys (31.3%).

In the analysis to compare perceived and actual body weight of the children as indicated by BMI, there were significant differences between perceived and actual body weight. Overall, of the 65 overweight and obese children, 64.6% favourably perceived their weight as overweight or obese while 32.1% and 3.1% perceived their body weight as normal and underweight, respectively. Of the 62 underweight children, 43.6% favourably perceived their weight as underweight while 40.3% and 16.1% perceived their weight as normal for age and overweight/obese, respectively.

Among overweight and obese boys (n=21), majority (61.9%) favourably perceived their weight as overweight or obese while 28.6% and 9.5% perceived their body weight as normal and underweight, respectively. As for overweight and obese girls (n=44), two-thirds (65.9%) favourably perceived their weight as overweight or obese while the remaining one third (34.1%) perceived their body weight as normal and none perceived as underweight. Thirty three boys were underweight and only 37.1% of them favourably perceived their weight as underweight, 42.9% perceived as normal and 20.0% perceived as overweight/obese. Among girls, 27 were underweight and 51.9% favourably perceived their weight as underweight, 37.0% perceived as normal and 11.1% perceived as overweight/obese. The differences between perceived and actual body weight by BMI were statistically significant for both boys and girls (Table 3).

Table 3: Comparison between perceived and actual body weight as indicated by body mass index (BMI) among primary schoolchildren

BMI (kg/m ²)	Perceived body weight			P-value
	Underweight	Normal weight	Overweight/Obese	
All (n=424)				<0.0001
Underweight	27 (43.6)	25 (40.3)	10 (16.1)	
Normal weight	68 (22.9)	138 (46.5)	91 (30.6)	
Overweight/Obese	2 (3.1)	21 (32.3)	42 (64.6)	
Boys (n=201)				0.0054
Underweight	13 (37.1)	15 (42.9)	7 (20.0)	
Normal weight	27 (18.6)	75 (51.7)	43 (29.7)	
Overweight/Obese	2 (9.5)	6 (28.6)	13 (61.9)	
Girls (n=223)				<0.0001
Underweight	14 (51.9)	10 (37.0)	3 (11.1)	
Normal weight	41 (27.0)	63 (41.5)	48 (31.5)	
Overweight/Obese	0 (0.0)	15 (34.1)	29 (65.9)	

22 participants (8 boys and 14 girls) had missing information on self-perception of their body weight

Factors predicting favourable perception of one's body weight

Favourable perception of one's body weight was significantly associated with age of the child and area where the school is located. Children aged above 10 years were less likely to have a favourable body weight perception compared to those aged 10 years or less (COR=0.61 95%CI 0.4-0.92). The association remained significant even after controlling for sex, school location, type of school and whether the child had ever heard about obesity (AOR=0.55 95%CI 0.36-0.88). In Bivariate analysis, children attending urban schools were less likely to have favourable perception about their body

weights compared to those attending rural schools (COR=0.64 95CI= 0.44-0.95). However this association was not significant after controlling for other predictor variables (AOR=0.71 95CI 0.46-1.09) (Table 4).

Table 4: Factors predicting favourable perception of one's body weight

Variable	Response	N	COR (95%CI)	AOR (95%CI)
Age	<=10 yrs	136	Reference	Reference
	>10yrs	288	0.61 (0.40-0.92)	0.55 (0.36-0.85)
Sex	Boys	201	Reference	Reference
	Girls	123	1.12 (0.76-1.63)	1.13 (0.76-1.68)
Area of residence	Rural	181	Reference	Reference
	Urban	243	0.64 (0.44-0.95)	0.71 (0.46-1.09)
Type of school	Public	51	Reference	Reference
	Private	373	0.57 (0.31-1.04)	0.60 (0.30-1.18)
Ever heard about obesity	No	210	Reference	Reference
	Yes	219	0.85 (0.55-1.19)	1.07 (0.71-1.61)

22 participants had missing information on self- perception of their body weight

Discussion

To our knowledge, this is the first study to investigate perception about body weight using verbal description methods in a representative sample of primary schoolchildren in Tanzania. The combined prevalence of overweight and obesity in this study population was 15.0%. Girls showed higher prevalence (19.4%) when compared to boys (10.1%). Our findings on the prevalence of obesity and overweight was relatively higher in comparison to a previous study done in Tanzania (Kruger *et al.*, 2006).

The study has revealed significant differences between perceived body weight and actual size as measured using BMI. There was a tendency towards underestimation of body weight where one-third of overweight and obese children perceived their weight as normal or underweight. Overweight and obese boys underestimated their body weight more than girls. Underweight children on the other hand tend to overestimate their body weight. Our findings are similar to those from other studies which have also reported underestimation of true body weight and is more pronounced among overweight/obese individual (Wardle & Griffith 2001; Emslie *et al.*, 2001; Brener *et al.*, 2004; Inoue *et al.*, 2007; Johnson-Taylor *et al.* 2008). Underestimation of one's own weight is associated with increased risk of becoming overweight (Al-Sendi *et al.*, 2004) because they are more likely to attempt to gain weight (Wang *et al.*, 2009).

Western culture has a prevailing perception that low body weight is ideal and attractive (Nichter & Nichter 1991; Tovee *et al.*, 1998) and is preferred among females (Emslie *et al.*, 2001). Except for a few studies (Duda *et al.* 2007; Alwan *et al.*, 2011), majority of studies have pointed to the preference of large body size as ideal among black girls (Caradas *et al.*, 2001; Welch *et al.*, 2004; Holdsworth *et al.*, 2004). There is however a shifting trend towards preference of lean weight especially among people of higher class (Khawaja & Afifi-Sowed, 2004) and it is increasingly getting promoted through global mass media and/or health awareness campaigns. Boys find a heavier body size ideal, which they associate with physical strength and attractiveness (Maisey *et al.*, 1999). In Tanzania, people's perception about body weight has been greatly influenced by HIV pandemic (Ezekiel *et al.*, 2009).

Older children were less likely to perceive their body weights favourably than the younger ones. A similar finding was reported by Abalkhail *et al.* (2014) in a study among schoolchildren and adolescents (9-21 years) in Saudi where overestimation of height and underestimation of weight were found to be more common among children. In our study, children from urban schools were also less likely to have favourable perception about their body weight compared to the children in rural schools.

Our study did not collect information on parents' perception of their children's weight but previous studies had shown that even parents have unfavourable perceptions of their children's body weights. Parent's perception of body size of their children plays a central role in childhood weight management because they are the main gatekeepers of lifestyle changes of their children. Literature has shown that many parents of overweight/obese children do not perceive their children as obese (Young-Hyman *et al.*, 2000; Maynard *et al.*, 2003; Adams *et al.*, 2005; May *et al.*, 2007; Watkins *et al.*, 2007; Gerards *et al.*, 2014). Parents are unlikely to prevent overweight or obesity to their children if the weight status of the child is not perceived as problematic or bearing future adverse health outcomes for their children (Smolak *et al.*, 1999; Young-Hyman *et al.*, 2000). Most parents of overweight /obese children perceive their children as healthy, and may make prevention efforts more difficult.

Our study has some limitations. Its cross-sectional design does not allow drawing inferences on direction of association. Our study did not examine the perception of parents, which is important for weight control interventions in children as they are the main controllers of their children's lifestyle changes. Some strengths of our study include its population based design with a representative sample of children from public and private schools as well as rural, semi-urban and urban settings. Unlike other studies which have relied on self-reported values of weight and height to assess perception of body weight, our study used accurately measured weight and height data.

The prevalence of overweight and obesity in this population of primary school children is not very high. However, more than third of overweight and obese children had unfavourable perception of their body weights. With increasing body of evidence that childhood obesity often persist through adulthood (Garn & LaVelle, 1985; Field *et al.*, 2005; Rooney *et al.*, 2011), primary schoolchildren is an important group to target with health interventions aiming at modifying risk factors. We recommend health education programmes to primary schoolchildren about overweight, obesity and the associated health effects in order to instil a behaviour of self consciousness on overweight and obesity among children in Tanzania. Routine screening for overweight and obesity among schoolchildren coupled with early and appropriate management may decrease the potential for developing complications later in life.

Competing interests

The authors declare that they have no competing interests

Authors Contributions

RNMM Participated in study design and development of the data collection tool, supervised data collection, entry and cleaning. She did data analysis, data interpretation and developed the manuscript. AM, MAN, MM, DN SK, AA and OC participated in study design, development of the data collection tool, supervised data collection and helped with interpretation of the data and review of the manuscript. BL supervised data collection and revised the manuscript. All authors contributed to this manuscript

Acknowledgements

The study was funded by Muhimbili University of Health and Allied Sciences through SIDA SAREC capacity building grant. The authors gratefully acknowledge the contribution and participation of schools management, parents, and children who participated in this study.

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