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Nutritional Status, Weight Misperception and Body Weight Dissatisfaction in a Population of Young Adult Nigerians

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Abstract

Objective: Though overweight/obesity has been reported by several authors in Nigeria, weight misperception and dissatisfaction has been scarcely studied and reported. The prevalence of overweight/obesity, weight misperception and dissatisfaction was therefore investigated in 1,030 students (51% females) of a Nigerian tertiary school.

Methods: Self-reported age and perception of each subject's weight status and weight preference were recorded. Anthropometric data were collected using standard protocol and body mass index (BMI) calculated. Appropriate statistical tools were used for data analyses.

Results: A total of 21.2% (22.0% males; 20.4% females) of the population were overweight/obese; while 2.3% (1.6% males, 3.1% females) were thin. Weight misperception was found in 33.4% (33.3% females; 33.6% males) of the population while 23.8% (23.9% females; 23.8% males) had body weight dissatisfaction (BWD). Almost all (99%) of the overweight subjects, and 0.8% of the normal weight subjects, had BWD. There were no significant differences (P>0.05) in prevalence between the sexes.

Conclusion: Weight misperception and dissatisfaction are prevalent in this predominantly lean population. This is worrisome because affected subjects may adopt inappropriate weight-loss habits leading to possible deleterious consequences.

Keywords: Body shape dissatisfaction; Obesity; Prevalence; Weight misperception

Introduction

Obesity is a serious global public health problem, largely because it is associated with a decrease in quality of life [1], a predisposition to chronic diseases such as hypertension, diabetes, hypercholesterolemia, etc. [2,3], and an increased susceptibility to some infections [4]. Interestingly, prevalence data show that low and middle income countries (LMICs) have obesity burdens that are comparable to those of economically advanced countries [5]. The World Health Organization (WHO) reported that the prevalence of overweight and obesity in adults living in sub-Saharan Africa has exceeded 60% and 70% for men and women, respectively [6]. Obesity/overweight prevalence in young adult Nigerians, diagnosed using body mass index (BMI) standards, is reported to be 20.7% (17.5% males; 24.8% females) [7]. A more recent study in the same age-bracket using the same diagnostic tool reported a prevalence of 17% (13.0% males; 20.9% females) [8]. These figures are clearly lower than the 29.0% and 45.1% prevalence reported in adult male and female Nigerians, respectively [6], owing to the fact that obesity is known to increase with age [9]. However young adults are a population of choice to target for obesity related health promoting programs [10].

Generally, people underestimate their current weight and overestimate their height [11]. Consequently, proper body self-perception is an essential component of any well-designed weight-loss program as it is known that the perception of having excessive weight has a higher impact than the objective current weight on the motivation of individuals to lose weight [12]. Therefore weight misperception (WMP) and wrong weight preference leading to body weight dissatisfaction (BWD) are constructs that are central to population level and individual weight loss initiatives. WMP and BWD are reported to vary by age and sex. Young people (compared to adults) are reportedly more likely to misperceive their weights and believe they have higher body weight [13]. Females often desire to be generally thin, while males are not worried about aggregate weight, but its distribution, mostly preferring broad shoulders and thin waists [14]. WMP and BWD are known to be driven by cultural norms that identify (often through advertising) slim ladies and muscular men as standards of beauty [10,15]. One must however note that, in some cultures a larger body size is seen as a marker of prosperity [4]; and the mass media often uses images of severely obese individuals to portray obesity thereby "deceiving" some obese people into thinking they are not obese [16]. These factors confound the perception of one's body weight and this leads to deleterious consequences such as eating disorders and depression [17].

There is, to the authors' knowledge, only one paper [10] on the perception of, and satisfaction with, body weights among Nigerians. This report seeks to improve the understanding of the dynamics of these constructs in Nigeria by studying young adults in a part of Nigeria, different from the one studied by the earlier study. The findings are expected to help in the development and implementation of proper policies for tackling obesity, especially in LMICs where the budgetary competition for often meagre resources is enormous.

Subjects and Methods

Subjects

Students of the Federal College of Education, Obudu, Cross-River State, were randomly recruited for this study. The purpose and rationale of the study was explained to them and those who gave an informed consent and met the other inclusion criteria were recruited. The inclusion criteria included absence of overt ill-health, self-reported non-use of weight-loss medication, not being a current cigarette smoker, not drinking any alcoholic beverages in excess of four 600 mL bottles a week, having no history of, or present 'substance' abuse, and absence of pregnancy (in females). A total of 1030 students (51% females) met the inclusion criteria and gave informed consent were ultimately recruited. Though no honoraria were paid to the participants, they were nonetheless offered some weight-related health education.

Methods

Weight perception was determined with the question: "In your view, are you thin, normal weight, overweight or obese?" Weight misperception was diagnosed if there was discordance between the subjects' response to the above and their measured weight status. Based on this, the subjects were classified into two groups, namely those who correctly perceived their weight, and those who misperceived their weights. Subjects with weight misperception either thought they were thinner, or thought they were heavier. Weight preference was determined with the question: "Would you prefer to be thin, normal weight, overweight or obese?" Discordance in the perceived body weight and preferred body weight was used to diagnose BWD. Based on this, subjects were then classified into three groups: (1) those satisfied with their current body weight, (2) those who desired to be thinner and (3) those who desired to be heavier.

Self-reported age at last birthday for each subject was recorded. An improvised stadiometer was used to measure the heights of the subjects who were required to stand on bare feet, to the nearest 0.1 cm. The weight of each subject was measured to the nearest 0.1 kg, using a digital-display bathroom scale, with the subject dressed in light clothing, without footwear. The scales were calibrated each morning using known weights, following the manufacturer's instructions. Waist and hip circumferences were measured with an inelastic measuring tape, to the nearest 0.1 cm. The same trained personnel took all measurements. From the height and weight measurements data, the BMI for each subject was calculated as: BMI=weight (kg)/[height (m)]^2. Subjects with a BMI<18 were classified as thin, those with a BMI ≥ 25 kg/m^2 but <30 kg/m^2 were classified as overweight while those with a BMI ≥ 30 kg/m^2 were classified as obese. A BMI of 18 to 24.9 kg/m^2 was classified as normal weight. The waist-to-hip ratio (WHpR) was calculated as waist circumference divided by hip circumference; while the waist-to-height ratio (WHtR) was calculated as waist circumference divided by height.

Statistical analyses

Descriptive statistical analysis was done on the data generated. Continuous data are reported as means ± standard deviations, while categorical data are presented as percentages. Differences between means were separated by One Way ANOVA for continuous variables. Where necessary, categorical data were tested for significant differences using the Chi square test or the Fisher's exact test. For all analyses, the significance threshold was fixed at P<0.05. Data analyses were done using IBM-SPSS version 20.0 (IBM Corp. Atlanta, GA). The results are presented in Figures and a Table.

Results

The mean age of the subjects was 22 years. The boys were however significantly older (P<0.05) than the girls. The boys were similarly significantly (P<0.05) heavier and taller than the girls. Again, the boys had significantly (P<0.05) higher BMI, WC and HC compared to the girls. The WHpR and WHtR of the boys and girls were however statistically similar (P>0.05) (Table 1). A total of 2.3% of the population (3.1% females; 1.6% males) were thin. As much as 19.5% of the subjects (19.5% females; 19.6% males) were overweight, while 1.7% (1.0% females; 2.4% males) were obese. Approximately 21% of the population was overweight/obese while about 76% had normal weight BMI (Figure 1).

	Age (Yrs)	Weight (kg)	Height (m)	BMI (kg/m^2)	WC (cm)	HC (cm)	WHpR	WHtR
Total (1030)	21.8 ± 2.1	61.8 ± 6.9	1.64 ± 0.07	23.2 ± 2.6	77.1 ± 6.6	90.4 ± 6.8	0.85 ± 0.04	0.47 ± 0.04
Male (505)	22.0 ± 2.2	63.3 ± 7.0	1.65 ± 0.07	23.4 ± 2.6	77.9 ± 6.7	91.1 ± 6.8	0.86 ± 0.04	0.47 ± 0.04
Female (525)	21.7 ± 2.0	60.4 ± 6.6	1.62 ± 0.07	23.0 ± 2.6	76.4 ± 6.3	89.7 ± 6.7	0.85 ± 0.04	0.47 ± 0.04
P	0.013	<0.001	<0.001	0.015	<0.001	0.001	0.178	0.498

BMI, WC, HC, WHpR, WHtR represent body mass index, waist circumference, hip circumference, waist-to-hip ratio and waist-to-height ratio, respectively. *P* values are for comparisons between the sexes.

Table 1: Age and anthropometric characteristics of the subjects.

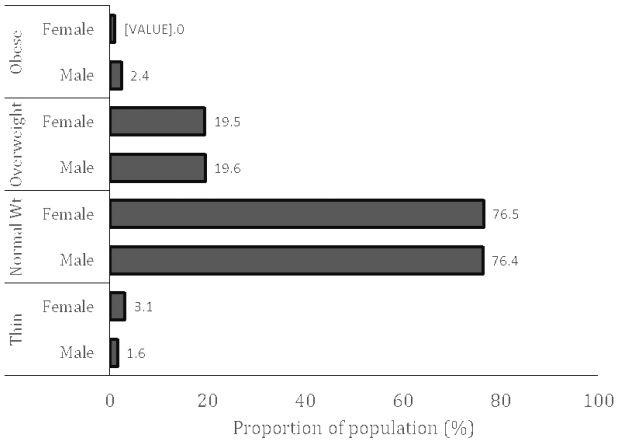

Figure 1: Nutritional status of the population as determined by BMI classifications.

Figure 2 shows that 23.8% of the entire population was dissatisfied with their body weights while 33.4% misperceived their weights. There were no significant differences (P>0.05) in the prevalence of both BWD and WMP between the sexes.

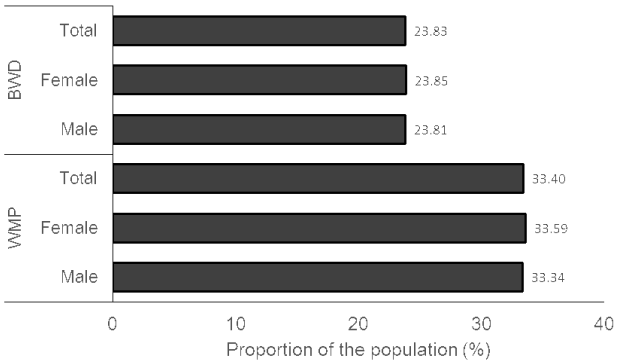

Figure 2: Weight misperception and body weight dissatisfaction in the studied population.

Whereas 67.1% (70.4% males, 64.1% females) of normal weight subjects who misperceived their weights thought they were overweight/obese, 89.6% (90.8% males, 88.6% females) of their overweight counterparts thought they had a normal weight BMI (Figure 3).

Weight misperception was significantly (P<0.001) more prevalent among overweight/obese subjects irrespective of sex. All the thin and obese subjects were dissatisfied with their body weight. As much as 99% of the overweight subjects had BWD while only 0.8% of the normal weight subjects (1.0% females; 0.5% males) had BWD. There were no significant sex differences (P>0.05) among the overweight or normal weight subjects (Figure 4). All the male overweight subjects who were dissatisfied with their body weight and 98% of their female counterparts reported a preference for normal weight.

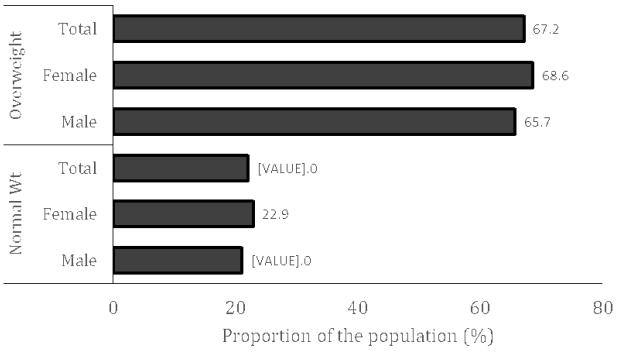

Figure 3: Prevalence of weight misperception among normal weight and overweight subjects.

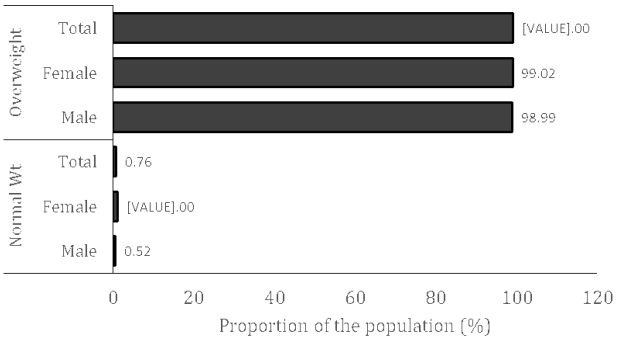

Figure 4: Prevalence of body weight dissatisfaction among normal weight and overweight subjects.

Discussion

The measurement of body habitus using anthropometric means gives some insight into the nutritional status of subjects. Despite its limitations, the BMI is still the gold standard for epidemiological studies on body composition [18]. In this study, boys were significantly (P<0.05) heavier and taller, and had significantly (P<0.05) higher BMI, WC and HC, compared to the girls. Nonetheless they had statistically similar WHpR and WHtR. The finding that boys/males have a larger body habitus compared to girls/females is consistent with reports from various cultures and societies around the world [7,13,19]. All the measures of obesity employed (BMI, WC, HC, WHpR and WHtR) show that the studied population is a lean one as the mean values for each index was within the "normal" range, irrespective of sex.

Despite the above assertion, as much as 19.5% of the subjects (19.5% females; 19.6% males) were overweight, while 1.7% (1.0% females; 2.4% males) were obese. Therefore, 21.2% (20.4% females; 22.0% males) of the population were overweight/obese while about 76% had normal weight BMI. Earlier studies in undergraduates in Nigeria reported prevalence values for overweight/obesity of 27.3% [20], 20.7% (24.7% females; 17.6% males) [7] and 17.0% (20.9% females; 13.0% males) [8]. A study conducted among University students in Tamale, Ghana reported a prevalence of 12.2% [21] while one in a similar

population in Delhi, India gave a prevalence of 16.4% for overweight/obesity [22]. Though the prevalence values reported here are close to those reported for undergraduate students in Nigeria, especially the report of Ejike et al. [7], they are nonetheless higher than values reported from other LMICs including Ghana-Nigeria's continental neighbors. Whereas these overweight/obese individuals are at higher risk of the numerous diseases associated with excess weight [3], some others (albeit a smaller fraction of the population) apparently have acute or chronic nutrient deficits.

A total of 2.3% of the population (3.1% females; 1.6% males) were thin. This is lower than the figures reported in similar studies in a different part of Nigeria where 4.1% (6.4% females; 1.8% males) [8]; and 4.9% (6.1% females; 3.9% males) [7] were reported to be underweight. Clearly the bulk of the underweight subjects were females, and this may be as a result of a more intense desire to be slim in females relative to males [10,14]. This trend is however worrisome as young adult females who would be mothers in a couple of years should not be exposed to nutrient deficits as that may impact (negatively) the health of their offspring through trans-generational epigenetic programming [23].

Many young adults are typically faced with several educational and social challenges, chief among which is choosing a partner and starting a family. Not surprising therefore, young adults spend time and resources trying to be attractive. Unfortunately, young women tend to compare themselves to extremely slim tall models and actresses shown in the media [24], often to their disadvantage as it contributes to WMP [25]. Here, we found that 33.4% of the entire population misperceived their weights while 23.8% had BWD. There were no significant differences in the prevalence of both BWD and WMP between the sexes. Ejike [10] found WMP in 26.7% (18.8% for males and 34.5% for females) of an undergraduate population in a different part of Nigeria. The prevalence of WMP in both studies is therefore close. Again, akin to the Ejike [10] report mentioned above, WMP in this study was significantly ($P<0.001$) more prevalent among overweight/obese subjects irrespective of sex.

All the thin and obese subjects were dissatisfied with their body weight. However, given the low prevalence of thinness and obesity in the population, only the normal weight and overweight population (which have larger sample sizes) sensibly permit robust deductions. As much as 67.1% of normal weight subjects who misperceived their weights thought they were overweight/obese, while 89.6% of their overweight counterparts thought they had a normal weight BMI. Implicit in this is that these subjects may engage in inappropriate behaviors to maintain, lose or gain weight albeit wrongly, resulting in deleterious consequences [26]. It has been reported that overweight and obese individuals who have WMP exhibit a lack of motivation to change their poor inappropriate lifestyle, thereby leading to sustained weight accumulation [27]. As much as 99% of the overweight subjects had BWD while only 0.8% of the normal weight subjects had BWD. All the overweight male subjects who were dissatisfied with their body weight, and 98% of their female counterparts, reported a preference for normal weight. Given the above, and the finding that all the thin and obese subjects had BWD, it is sensible to speculate that the majority of those who did not have normal weight BMI knew that a normal weight BMI was better for them. This is interesting as it suggests that with appropriate education they may be able to attain appropriate healthy weights.

The finding of an absence or sex-specific differences in the prevalence of WMP and BWD in this study is in discordance with earlier reports that show that WMP is higher in females compared to males [10,28,29]. Cultural and other exposures that modulate weight perception [30] may however account for the observed differences. What is however not altered by cultural differences is that WMP results in lowered self-confidence, increased risk of eating disorders (anorexia, bulimia) and depression [31].

The proportion of the studied general population with BWD is lower than reports of 29.7% of the males and 51.5% of the females in Iceland [32]; 33.5% and 21.4% in female and male students, respectively, of a University in Saudi Arabia [13]; 43.84% of female University students in Korea [33]; 72.2% of Ghanaian females [34]; and 76.8% and 74.5% of young adult males and females in Hong Kong [35]. BWD in young adults is expected as younger age is its predictor in both genders [13] though the desire to lose weight is said to increase with the age in males [29]. It is important to note that Li et al. [36] and Lewis et al. [14] independently argue that operationalizing WMP without a measure of body composition may be inappropriate for men of African descent who are often misclassified by BMI standards as overweight when in fact they are lean with respect to adiposity. Nonetheless, clearly BWD is lower in this population than in their counterparts from Nigeria and elsewhere around the world. This may be as a result of differences in cultural perception of ideal weight as mentioned earlier.

Though some studies have shown that BWD can be predictive of successful weight loss attempts [37,38], it is also reported that chronic BWD contributes significantly to the etiology of eating disorders [17,39]. There is as yet no consensus on whether BWD is driven by objective or subjective constructs. Whereas some studies have reported that BMI (an objective index) is an important determinant of body shape satisfaction [40], others insist that psychological constructs (such as self-esteem) rather than objective indices [41] are the key determinants of body shape satisfaction. All authors however appear to agree that sociocultural norms, socioeconomic status, education and the media, impact individuals' perception of ideal body shape [10,35]. It is however worth noting that placing emphasis on subjective assessment rather than measurable objective indicators in determining ones current body weight and desired body weight might lead to unwarranted weight reduction activities and the resultant adverse psychological distress in individuals and populations [10].

Ejike [10] found body shape dissatisfaction in 62% of the population they studied and concluded that the condition was a normative discontent since as recommended by Matthiasdottir et al. [32] it affects more than half of the population. Following from the same logic, WMP and BWD are normative discontents only among the overweight population in this study. The high prevalence of WMP and BWD among these young adult Nigerians especially coming on the heels of an earlier report of considerably similar findings in a different population of Nigerian young adults, calls for urgent public health action aimed at addressing these problems. This is even more so given the negative consequences which they portend for any nation seeking development. Given that Nigeria is currently experiencing the nutrition transition [18], it is additionally important to emphasize the need for both proper diets/nutrition and adequate exercise as means of reducing the burden of obesity, especially at the population level. Sustained weight reduction efforts coupled with proper weight perception are keys to successful normal weight achievement and maintenance.

This study is limited by a couple of factors. First, the sample size is small relative to the population of undergraduate students in Cross-

River State, thereby warranting that extrapolations to the larger undergraduate students' population can only be made strenuously. Second, the subjects represent only undergraduate students and not their age-mates in the wider society. This is important as drivers of weight perception and preference may vary between students and (say) artisans or traders. One must nonetheless note that the sample size for this study is good especially when one takes cognizance of the cultural and financial impediments that challenge these types of studies in LMICs. Third, the exclusion criteria included presence of chronic diseases because the intention was to study an apparently healthy population. Implicit in this is that the prevalence of BSD may have been underreported. Given that only about 0.5% of the population screened was excluded, we believe the impact of the exclusion would be infinitesimal. Fourth, we used single questions to diagnose weight perception and preference as against using the Stunkard scale. This was deliberate as we wanted to avoid the bias inherent in pictorial/diagrammatic scales in studies such as this which often leads to over-estimation of BWD especially in people exposed to advertising and such other factors earlier discussed. The simplicity of the questions and the fact that we studied an undergraduate students' population makes our preferred method useful.

In conclusion, the nutritional status, and prevalence of body weight misperception and dissatisfaction in young adult Nigerians were studied. The results show that though the population is essentially lean (mean BMI: 23.2 ± 2.6 kg/m^2), approximately one-fifth were overweight/obese, one-third misperceived the weights, and one-quarter had body weight dissatisfaction. About two-thirds of overweight subjects had WMP while 99% of them had BWD. Urgent public health action is required to ensure that individuals do not adopt inappropriate weight-loss habits which could lead to deleterious consequences at the individual and population levels.

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Declaration/Conflict of Interest

The results presented here were presented at the 35th Conference of the Nigeria Society of Biochemistry and Molecular Biology, November 1st-4th, 2016. The authors have nor real or potential conflicts of interests to declare.

Author Contributions

CECCE designed the study, analyzed and interpreted the data, plotted the graphs and wrote the manuscript; KCE participated in study design, and was responsible for data collection and entry; NOO contributed to study design and revising the original manuscript.

References

1. Zaninotto P, Head J, Stamatakis E, Wardle H, Mindell J (2012) Trends in obesity among adults in England from 1993 to 2004 by age and social class and projections of prevalence to 2012. J Epidemiol Comm Health 63: 140-146.
2. Mokdad AH, Ford ES, Bowman BA, Dietz WH, Vinicor F, et al. (2003) Prevalence of obesity, diabetes, and obesity-related health risk factors. JAMA 283: 76-79.
3. Dastgiri S, Mahdavi R, TuTunchi H, Faramarzi E (2006) Prevalence of obesity, food choices and socioeconomic status: A cross-sectional study in the north-west of Iran. Public Health Nutr 9: 996-1000.
4. Leung J, Burke B, Ford D, Garvin G, Korn C, et al. (2013) Possible association between obesity and Clostridium difficile infection. Emerg Infect Dis 19: 1791-1798.
5. Popkin BM, Adair LS, Ng SW (2012) Global nutrition transition and the pandemic of obesity in developing countries. Nutr Rev 70: 3-21.
6. Ono T, Guthold R, Strong K (2012) WHO global comparable estimates: Global infobase data for saving lives 2005.
7. Ejike CECC, Ijeh II (2012) Obesity in young-adult Nigerians: Variations in prevalence determined by anthropometry and bioelectrical impedance analysis, and the development of % body fat prediction equations. Int Arch Med 5: 22.
8. Ejike CECC, Ikwuegbu CE, Abalogu RC (2015) Obesity determined by different measures, and its impact on the health-related quality of life of young-adult Nigerians. Asian J Clin Nutr 7: 64-75.
9. Flegal KM, Graubard BI, Williamson DF, Gail MH (2007) Cause-specific excess deaths associated with underweight, overweight and obesity. JAMA 298: 2028-2037.
10. Ejike CECC (2015) Body shape dissatisfaction is a 'normative discontent' in a young-adult Nigerian population: A study of prevalence and effects on health-related quality of life. J Epidemiol Global Health 5: S19-S26.
11. Connor-Gorber S, Tremblay M, Moher D, Gorber BA (2007) Comparison of direct vs. self-report measures for assessing height, weight and body mass index: A systematic review. Obes Rev 8: 307-326.
12. Bhanji S, Khuwaja AK, Siddiqui F, Azam I, Kazmi K (2011) Underestimation of weight and its associated factors among overweight and obese adults in Pakistan: A cross sectional study. BMC Public Health 11: 363.
13. Al-Otaibi HH, Nassef SL, Raouf TA (2013) Body shape dissatisfaction, weight status and physical activity among a sample University students in Saudi Arabia. Food Nutr Sci 4: 616-625.
14. Lewis DW, Dutton GR, Affuso O (2015) Physical characteristics associated with weight misperception among overweight and obese men: NHANES 1999–2006. Obesity 23: 242-247.
15. Calado M, Lameiras M, Sepulveda AR, Rodriguez Y, Carrera MV (2011) The association between exposure to mass media and body dissatisfaction among Spanish adolescent. Women's Health Issues 21: 390-399.
16. Johnson F, Cooke L, Croker H, Wardle J (2008) Changing perceptions of weight in Great Britain: Comparison of two population surveys. BMJ 337: a494.
17. Johnson F, Wardle J (2007) Dietary restraint, body dissatisfaction, and psychological distress: A prospective analysis. J Abnorm Psychol 114: 119-125.
18. Ejike CECC, Ugwu CE, Ezeanyika LUS (2009) Nutritional status, prevalence of some metabolic risk factors for cardiovascular disease and BMI-metabolic-risk sub-phenotypes in an adult Nigerian population. Biokemistri 21: 17-24.
19. Janssen I, Heymsfield SB, Wang Z, Ross R (2000) Skeletal muscle mass and distribution in 468 men and women aged 18-88 yr. J Applied Physiol 89: 81-88.
20. Oghagbon K, Odili V, Nwangwa E, Pender K (2009) Body mass index and blood pressure pattern of students in a Nigerian university. Int J Health Res 2: 177-182.
21. Mogre V, Nyaba R, Aleyira S (2014) Lifestyle risk factors of general and abdominal obesity in students of the school of medicine and health science of the University of Development Studies, Tamale, Ghana. ISRN Obes 2014: 508382.
22. Chhabra P, Grover VL, Aggarwal K, Kannan AT (2006) Nutritional status and blood pressure of medical students in Delhi. Indian J Comm Med 31: 248-251.
23. Gluckman PD, Hanson MA, Beedle AS (2007) Non-genomic transgenerational inheritance of disease risk. BioEssays 29: 145-154.

24. Wronka I, Suliga E, Pawlinska-Chmara R (2013) Perceived and desired body weight among female university students in relation to BMI based weight status and socio-economic factors. Ann Agric Environ Med 20: 533-538.
25. Wilcox K, Laird JD (2000) The impact of media images of super-slender women on women's self-esteem: Identification, social comparison, and self-perception. J Res Person 34: 278-286.
26. Bauer M, Kirchengast S (2006) Body composition, weight status, body image and weight control practices among female adolescents from eastern Austria. Anthropol Anz 64: 321-331.
27. Gregory CO, Blanck HM, Gillespie C, Maynard L, Serdula MK (2008) Health perceptions and demographic characteristics associated with underassessment of body weight. Obesity 16: 979-986.
28. Tiggemann M (2004) Body image across the adult life span: Stability and change. Body Image 1: 29-41.
29. Bibiloni MM, Coll LJ, Pich J, Pons A, Tur JA (2017) Body image satisfaction and weight concerns among a Mediterranean adult population. BMC Public Health 17: 39.
30. Makara-Studzińska M, Podstawka D, Goclon K (2013) Factors influencing self-perception of overweight people. Polski Merkurius Lekkarski 35: 313-315.
31. Jansen W, Looij-Jansen P, deWilde EJ, Brug J (2008) Feeling fat rather than being fat may be associated with psychological well-being in young Dutch adolescents. J Adolesc Health 42: 128-136.
32. Matthiasdottir E, Jonsson SH, Kristjansson AL (2011) Body weight dissatisfaction in the Icelandic adult population: A normative discontent? Eur J Public Health 22: 116-121.
33. Woo J (2014) A survey of overweight, body shape perception and eating attitude of Korean female university students. J Exerc Nutr Biochem 18: 287-292.
34. Benkeser RM, Biritwum R, Hill AG (2012) Prevalence of overweight and obesity and perception of healthy and desirable body size in urban, Ghanaian women. Ghana Med J 46: 66-75.
35. Cheung YTD, Lee AM, Ho SY, Li SET, Lam TH, et al. (2011) Who wants a slimmer body? The relationship between body weight status, education level and body shape dissatisfaction among young adults in Hong Kong. BMC Public Health 11: 835.
36. Li C, Ford ES, Zhao G, Balluz LS, Giles WH (2009) Estimates of body composition with dual-energy X-ray absorptiometry in adults. Am J Clin Nutr 90: 1457-1465.
37. Cash TF, Phillips KA, Santos MT, Hrabosky JI (2004) Measuring 'negative body image': Validation of the body image disturbance questionnaire in a nonclinical population. Body Image 1: 363-372.
38. Annesi JJ (2007) Relations of changes in exercise self-efficacy, physical self-concept, and body satisfaction with weight changes in obese white and African American women initiating a physical activity program. Ethnic Dis 17: 19-22.
39. Duncan DT, Wolin KY, Scharoun-Lee M, Ding EL, Warner ET, et al. (2011) Does perception equal reality? Weight misperception in relation to weight-related attitudes and behaviors among overweight and obese US adults. Int J Behav Nutr Physic Activ 8: 20.
40. Eisenberg ME, Neumark-Sztainer D, Paxton SJ (2006) Five-year change in body satisfaction among adolescents. J Psychosom Res 61: 521-527.
41. Sheffield JK, Tse KH, Sofronoff K (2005) A comparison of body-image dissatisfaction and eating disturbance among Australian and Hong Kong women. Eur Eating Disord Rev 13: 112-124.