Cardiovascular disease prevention in the slums of Kenya

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CHAPTER 5

Overweight, obesity and perception of body image among slum residents in Nairobi, Kenya

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ABSTRACT

Introduction
The increase in cardiovascular diseases in sub-Saharan Africa has been attributed in part to the changes in lifestyle which are shown in the higher prevalence of cardiovascular risk factors among urban sub-populations. The objective of this study was to determine the prevalence of overweight/obesity and perceptions of body size differentiated by sex and other determinants among slum dwellers in Nairobi.

Methods
Analysis included 4,934 adults randomly selected from the Korogocho and Viwandani slums of Nairobi. Body mass index (BMI) was measured during interviews with respondents. Choices of current and ideal body image were determined using 18 silhouette drawings of body sizes ranging from very thin to very obese. Multivariate logistic regression analysis was used to determine predictors of underestimation of body weight among overweight and obese participants.

Results
Overall, 43.4% of the females in the study population were overweight/obese compared with 17.3% of males. More than half (53%) of the individuals who were overweight/obese underestimated their weight, with females (34.6%) doing so more often than males (16.9%). In all BMI categories, over a third of females and males preferred body sizes classified as overweight/obese.

Conclusion
This study highlights the prevalence of overweight/obesity and high preference for larger body size among adults in the slums of Nairobi. Interventions to educate residents on the health risks associated with excess body weight are necessary as part of strategies to reduce cardiovascular risk factors in these settlements.
INTRODUCTION

Cardiovascular diseases (CVD) have become the leading cause of death in sub-Saharan Africa (SSA) (1). This has been linked with increasing urbanization and associated lifestyle changes that induce cardiovascular risk factors like obesity (2-3). In SSA, the rise in the prevalence of obesity in urban areas has coincided with the growth of an increasingly educated and wealthier middle class which engages in less physical activity and consumes greater amounts of calorie-dense foods than the poorer segments of the population (3-4). However, the change in lifestyle in urban SSA also profoundly affects the urban poor, and the prevalence of cardiovascular risk factors is high in resource-deprived city slums (4-5). Although it is clear from previous studies that there is a trend of growing obesity specifically among the urban poor (4), there is unfortunately limited data on the extent of the problem among city slum populations in different countries in SSA.

Cultural ideals have an influence on how individuals perceive their body image and body weight (6-7). Studies in SSA suggest that the poor tend to perceive body size and its health implications differently from individuals in the same cities with greater wealth and education (8). In some of these societies in SSA, a larger body size is commonly assumed to reflect good health, evidence of higher social status and may thus be considered desirable (8-9). In addition to culturally desired body sizes it is also relevant how people estimate their body size and weight, as underestimation of BMI is prevalent in low-income settings (10) and may predict overweight or obesity (11). Although some of the factors that influence body image perception have been studied in developed countries, this area remains largely unexplored in SSA. Studies have shown gender differences in body image perception and preferences in the US (12-13), but the effects of age and marital status remain unclear (14-15). The objective of this study was to determine the prevalence of overweight/obesity and perceptions of body size differentiated by sex and other determinants among slum dwellers in Nairobi.
METHODS

Study Participants and Design

The study was part of a cross-sectional survey designed to assess the linkages between socioeconomic and socio-cultural factors, perceived personal risk for cardiovascular disease and health behavior in the Korogocho and Viwandani slums of Nairobi. The survey was carried out between 2008-2009 in the Nairobi Urban and Health Demographic Surveillance System (NUHDSS) which is run by the African Population and Health Research Center (APHRC). The two slums are typical of the informal settlements in Nairobi although they differ in terms of community and population stability. Korogocho is populated by more settled residents many of whom have lived there for many years. Viwandani, on the other hand, has a more youthful and transient population which is drawn to the location due to job opportunities in the nearby industrial area. However, the levels of poverty are very high in both slums and incomes are substantially lower than those in non-slum areas of the city (16). Characteristics of the two slums and details of the NUHDSS and its operations are published elsewhere (16).

A total of 5,190 residents of the two slums were randomly selected and stratified by sex and age using a sampling frame which included all adults aged 18+ years in the NUHDSS. Overall response rates were 94% in Korogocho and 95% in Viwandani. All interviews and measurements were conducted by trained field workers using a structured questionnaire translated into Kiswahili. The purpose of the study was explained to each respondent and signed consent obtained prior to the interview and anthropometric measurements. The study protocol was approved by the Kenya Medical Research Institute/National Ethical Review Committee (NON-SSC Protocol No.339).

Study Variables

The participants were administered a questionnaire that included sections on socio-demographic characteristics. Age of respondents was obtained as a continuous variable in years and categorized into
age groups. Sex, marital status, and educational attainment were reported by each respondent, while socio-economic status was determined as an index based on ownership of household assets and categorized into quintiles (16). The weight and height of each respondent were measured to the nearest 0.1 kilogram and centimeter using a SECA electronic digital weighing scale and SECA portable stadiometer respectively. The reliability of all measurements between field workers was assessed during training and piloting of the questionnaire. Body mass index (BMI) was calculated as body weight in kilograms divided by the square of the height of the individual in meters (17). The BMI was categorized using the WHO classification, with BMI values ≤ 18.5 defined as underweight, values 18.6 – 24.9 defined as normal, values 25.0 - 29.9 defined as overweight, and values ≥ 30.0 defined as obesity (17).

Body image was assessed using methodology developed for studies of body image associated with eating disorders (18). The body image rating scale included 18 silhouettes of each sex, ranging from thin to very obese (Fig. 1). These body images are validated scales which are widely used and have been shown to correlate strongly with objective measures of body size (19‐20). Each figure was 16cm in height and the randomly numbered cards were displayed to participants in a random order. To determine the current body image (CBI), participants were asked ‘Which image most accurately depicts your current body size’. To determine the ideal body size (IBI), the participant was asked ‘Which image most accurately depicts the body size you would wish to have?’ The 18 images were divided into four categories by adapting the image scheme described by Madrigal et al. (11). Images 1‐5 represented subjects that were underweight, images 6‐9 represented subjects with normal weight, images 10‐13 represented overweight subjects, and images 14‐18 represented obese subjects.

Figure 1. Body image silhouettes for females and males. The numbers refer to raw scores for each image. Female images are shown at the top and male images are shown at the bottom. Images are adapted from Madrigal et al. (11)
ing from very thin to very obese (Figure 1). These body images are validated scales which are widely used and have been shown to correlate strongly with objective measures of body size (19–20). Each figure was 16cm in height and the randomly numbered cards were displayed to participants in a random order. To determine the current body image (CBI), participants were asked ‘Which image most accurately depicts your current body size’. To determine the ideal body size (IBI), the participant was asked ‘Which image most accurately depicts the body size you would wish to have?’ The 18 images were divided into four categories by adapting the image scheme described by Madrigal et al. (11). Images 1-5 represented subjects that were underweight, images 6–9 represented subjects with normal weight, images 10–13 represented overweight subjects, and images 14–18 represented obese subjects.

Data Analysis
Descriptive analysis of the BMI, CBI and IBI by sex was conducted using proportions. The proportion of subjects underestimating their weight in each BMI category was calculated for both sexes. The extent of overestimation, agreement or underestimation of the actual body size was determined by comparing the BMI category with the CBI category. To determine predictors of underestimation of BMI among overweight/obese participants, a multivariate logistic regression model was fit using socio-demographic variables which were significant at p<0.25 in the univariate logistic analysis. The dependent variable was a binary outcome of whether or not the participant underestimated his/her BMI category (Underestimation = “1”; Agreement or Overestimation = “0”). The independent variables in the model were age, sex, marital status, and education attainment. The bivariate relationship between BMI and IBI was descriptively shown using graphs. All statistical analyses were done using Stata 11 (Stata Corp.).
RESULTS

Out of the 5,190 subjects recruited into the main study, 4,934 individuals, comprising 2,669 males (54%) and 2,265 females (46%), had the data for the required variables and were included in the analysis. The mean age of the respondents was 42 years, with 45% of these aged less than 40 years and 55% aged 40 years or over. The proportion of the participants who had primary education or less was 75%, and about 2.5% had post-secondary education (Results not shown in tables). This reflects the context of the slums where education levels are lower than in the rest of the city.

Table 1 shows the proportions of the female and male participants in the different weight categories based on BMI, CBI and IBI. Overall, 43.4% of the females in the study population were overweight or obese compared with 17.3% of males. Obesity was more prevalent among the females (15.5%) than in the males (2.3%). With perception of body size measured as CBI, about half of females rated their weight as normal, but a higher proportion considered that they were underweight (14.2%) than as was shown by BMI (5.1%). Among the males, 52% considered themselves of normal weight, much lower than as shown by the BMI (72.9%). More males perceived themselves to be overweight/obese than were actually in these categories. The proportions of females that chose the different body size categories as ideal were not substantially different from the proportions with the same BMI category.

Table 1: Distribution by weight category according to BMI, CBI, and IBI in males and females.

<table>
<thead>
<tr>
<th>Categories</th>
<th>Females</th>
<th></th>
<th></th>
<th>Males</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BMI n (%)</td>
<td>CBI n (%)</td>
<td>IBI n (%)</td>
<td>BMI n (%)</td>
<td>CBI n (%)</td>
<td>IBI n (%)</td>
</tr>
<tr>
<td>Underweight</td>
<td>115 (5.1)</td>
<td>321 (14.2)</td>
<td>160 (7.1)</td>
<td>262 (9.8)</td>
<td>352 (13.2)</td>
<td>162 (6.1)</td>
</tr>
<tr>
<td>Normal</td>
<td>1,167 (51.5)</td>
<td>1,143 (50.5)</td>
<td>1,209 (53.4)</td>
<td>1,946 (72.9)</td>
<td>1,406 (52.7)</td>
<td>1,104 (41.3)</td>
</tr>
<tr>
<td>Overweight</td>
<td>631 (27.9)</td>
<td>503 (22.2)</td>
<td>562 (24.8)</td>
<td>401 (15.0)</td>
<td>554 (20.8)</td>
<td>854 (32.0)</td>
</tr>
<tr>
<td>Obese</td>
<td>352 (15.5)</td>
<td>298 (13.2)</td>
<td>334 (14.8)</td>
<td>60 (2.3)</td>
<td>357 (13.4)</td>
<td>549 (20.6)</td>
</tr>
</tbody>
</table>

All percentages are based on column totals. Percentages may not add up to 100 due to rounding off. BMI: body mass index; CBI: current body image; IBI: ideal body image.
ry, but this differed among males, with 20.6% choosing an obese image as ideal compared with 2.3% that were obese based on BMI classification.

Figure 2 shows the weight preference among males and females in the four BMI categories. The results show that in all BMI categories, over a third of females preferred body images classified as overweight/obese, and the proportion of males with a preference for overweight/obese body images was greater than that of females. Over half of females and males classified as obese indicated a preference to either remain in that weight category or gain additional weight.

Table 2 shows the extent of overestimation, agreement or underestimation of BMI among females and males in the study. The proportion of overestimation was 18.2% among females and 33% among males. Underestimation was more prevalent among females (34.6%) than among males (16.9%). Obese females accounted for 28.8% of total underestimation among females compared with 7.8% of total underestimation accounted for by obese males among all males.

Figure 2: Preferred body weight by BMI categories among females and males. Preferred body weight category was based on choices of body images considered ideal by the respondent.
A total of 1444 participants were classified as overweight or obese, of which 776 underestimated their BMI. Multivariate logistic regression analysis showed that of the key socio-demographic characteristics of the respondents, the sex of the individual was a significant determinant of underestimation of BMI among those with normal BMI, while age and sex were significant predictors among overweight and obese respondents (Table 3). Older overweight/obese respondents aged 50 years or above were less likely to underestimate their BMI. Similarly, males were less likely than females to underestimate their BMI in both categories. Marital status and education were not significantly associated with the likelihood of BMI underestimation.

**DISCUSSION**

This study was designed to investigate the prevalence of overweight/obesity, the extent of disagreement between perceived body images and BMI, and the patterns of preferred body size in two slums of Nairobi. The prevalence of overweight/obesity among females in these urban slums of Nairobi was similar to that reported for urban women in Kenya based on a national survey (4), and the gender pattern shown in this study confirms that reported in other studies in Africa (21-22). In the context of poverty and...
Table 3: Socio-demographic predictors of BMI underestimation among normal weight and overweight/obese respondents.

<table>
<thead>
<tr>
<th>Age</th>
<th>BMI Category = Normal</th>
<th>BMI Category = Overweight/Obese</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Row %</td>
</tr>
<tr>
<td>18-29</td>
<td>819</td>
<td>15.5</td>
</tr>
<tr>
<td>30-39</td>
<td>705</td>
<td>15.9</td>
</tr>
<tr>
<td>40-49</td>
<td>676</td>
<td>13.0</td>
</tr>
<tr>
<td>50-59</td>
<td>551</td>
<td>13.8</td>
</tr>
<tr>
<td>60+</td>
<td>362</td>
<td>15.2</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1167</td>
<td>17.6</td>
</tr>
<tr>
<td>Male</td>
<td>1946</td>
<td>13.0</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married/Co-habiting</td>
<td>2203</td>
<td>13.5</td>
</tr>
<tr>
<td>Never married</td>
<td>488</td>
<td>17.8</td>
</tr>
<tr>
<td>Ever married</td>
<td>422</td>
<td>17.2</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than Primary</td>
<td>681</td>
<td>17.3</td>
</tr>
<tr>
<td>Primary</td>
<td>1373</td>
<td>14.3</td>
</tr>
<tr>
<td>Secondary</td>
<td>619</td>
<td>12.9</td>
</tr>
<tr>
<td>College/University</td>
<td>72</td>
<td>15.3</td>
</tr>
<tr>
<td>SES Quintiles*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lowest (Poorest)</td>
<td>678</td>
<td>14.9</td>
</tr>
<tr>
<td>Second</td>
<td>484</td>
<td>15.9</td>
</tr>
<tr>
<td>Middle</td>
<td>551</td>
<td>14.7</td>
</tr>
<tr>
<td>Fourth</td>
<td>673</td>
<td>16.3</td>
</tr>
<tr>
<td>Highest (Least poor)</td>
<td>635</td>
<td>12.0</td>
</tr>
</tbody>
</table>

* P<0.001 from multivariate logistic regression.

Socio-economic status (SES) was excluded from the model due to low statistical significance in the univariate logistic regression analysis.

Percentages are for those individuals who underestimated their BMI based on the number in each row category.
resource deprivation in the slums, overweight/obesity remains a challenge and one of the drivers of the increasing morbidity associated with cardiovascular diseases in these urban settlements (23-25).

A major issue associated with overweight/obesity is the perception of body size in different cultural settings (26-27). In this study we used body images or silhouettes to estimate self-reported body size. Differences between objective measures of body size such as BMI and individual perception of current body image are considered suggestive of individual or societal definitions of desirable or “normal” body size which are not based on medical reasons. In this study, we found that more than half of the population who were overweight or obese underestimated their weight which suggests that the majority of these people do not acknowledge their extra weight and the related health risks.

We also determined for each respondent what their preferred or ideal body image was, and how it related to their actual BMI category. The results show that irrespective of BMI category, significant proportions of females and males preferred to have larger body sizes. More than half of the respondents who were overweight or obese preferred an ideal body image that was either overweight or obese. In slum settings, societal influences likely shape perceptions regarding food consumption and body weight. Studies have shown that families, communities and the larger societal have strong influences on perception of body image, and excess body weight has generally been associated with wealth and health, and considered a desirable attribute in many parts of SSA (6, 8, 22). The implications of excess body weight as a risk factor for non-communicable diseases (NCDs) are not readily apparent to most residents of poor settlements due to the low level of education and the lack of emphasis on NCDs in traditional health education and counseling at the community level in SSA.

In our focus on the overweight/obese participants, we sought to identify socio-demographic characteristics associated with underestimation of BMI. Over half (54%) of this sub-group underestimated their BMI, and age and sex were the only significant predic-
tors of underestimation of BMI. These results are consistent with reports of greater dissatisfaction with body image among younger adults and females (28). Although studies have found that education and income are associated with the likelihood of obesity in urban SSA (4), we could not find reports on the determinants of underestimation of BMI in this high risk sub-group.

A limitation of the study is the use of a discrete number of silhouettes to assess body image. By using this method, body size is considered a continuous variable measured from a finite number of images (29). The information lost with this discrete method can be reduced by increasing the precision of the instrument. In this study, we have attempted to reduce the coarseness of the scale by using an 18 silhouette scale developed and validated in a previous study (30). Other limitations of the study include the challenge of establishing the influence of cultural preferences and beliefs on body image in slum settlements comprising diverse ethnic groups, and the extent to which these two slums are representative of other slums in Nairobi. One strength of this study is the participation of a high number of residents of an informal urban settlement in Kenya. Although a large proportion of the urban population in SSA lives in slums there is only limited data about this growing group with regards to the increasingly relevant topic of obesity and related perceptions.

In conclusion, the results of this study have important implications for the effort to reduce cardiovascular risk factors in poor urban settings in Kenya and the rest of SSA. As the epidemiological transition continues among the low and middle income countries, the burden of obesity also increases, even among low-income groups. The high level of overweight and obesity reported in this study despite the high level of poverty found in the slums suggests that effective dietary and lifestyle interventions are needed to address this issue in the slums. Innovative strategies to ensure better appreciation and understanding of the health consequences of overweight and obesity by slum residents are required if efforts to reverse the high preference for larger body size are to be successful.
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