

# Trends in the development of obesity in elderly day care attendees in Sharpeville, South Africa, from 2007-2011

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## Abstract

**Objective:** Obesity, a global epidemic and risk factor for many noncommunicable diseases, has become a public health concern in South Africa, especially in the elderly. This study investigated the trend of development of obesity in a group of urban elderly individuals from 2007-2011.

**Design:** This was a cross-sectional or cohort design.

**Setting and subjects:** The study took place in Sharpeville, Gauteng, on 208 purposively selected elderly individuals aged 60-104 years.

**Outcome measures:** Measurements included anthropometric variables, i.e. weight, height and waist circumference, measured biennially from 2007-2011 using standard techniques. Collected data were analysed using Statistical Package for Social Sciences®, version 20.0. Descriptive analysis was performed for the variables, as well as Student's t-test, analysis of variance, correlation analysis and bivariate logistic regression.

**Results:** The mean body mass index (BMI) of the elderly participants ranged from 30.7 kg/m<sup>2</sup> in 2007 to 31.1 kg/m<sup>2</sup> in 2011, with a slight decrease in 2009 (29.5 kg/m<sup>2</sup>) in the women, and a reduction from 27.2 kg/m<sup>2</sup> to 24.2 kg/m<sup>2</sup> in the men. The combined prevalence of overweight and obesity increased from 72.9% in 2007 to 83.3% in the women, whereas it decreased from 66.7% to 42.8% in the men. The prevalence of central obesity fluctuated in the women (it decreased from 84.5% in 2007 to 72.0% in 2009, and then increased to 87.0% in 2011), while it decreased consistently in the men from 46.2% in 2007 to 28.6% in 2011. Overweight and obese elderly individuals (BMI ≥ 25 kg/m<sup>2</sup>) were more likely to be centrally obese than those with a BMI < 25 kg/m<sup>2</sup>.

**Conclusion:** The trend of obesity was consistently high in the study population from 2007-2011. However, a significant difference in the prevalence of total and central obesity was not noted, although it apparently increased in the women and decreased in the men. Appropriate and timely intervention is urgently required.

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## Introduction

Obesity is an established and important risk factor for many noncommunicable diseases.<sup>1</sup> It was once regarded as a sign of affluence, but according to the World Health Organization (WHO),<sup>2</sup> it has now become a growing global epidemic,<sup>3</sup> affecting over 1.3 billion adults worldwide. Obesity can be defined as excess total body fat with a body mass index (BMI) of more than 30 kg/m<sup>2</sup>, while a BMI of 25-29.99 kg/m<sup>2</sup> is regarded as overweight.<sup>3</sup> Obesity is a health challenge that cuts across the lifespan, starting in childhood.<sup>4</sup> With the number of elderly individuals rapidly increasing globally, the prevalence of obesity is also advancing simultaneously,<sup>5</sup> accompanied by a massive and rapidly changing burden of ill health.<sup>6</sup> Defined as persons aged 60 years<sup>7</sup> and older, the elderly constitute 7.7% of the South African population, and this number is projected to reach 13% by 2050.<sup>6</sup>

Data from developed countries have demonstrated that over 75% of individuals aged 60 years and older are either overweight or obese.<sup>8,9</sup> This is not very different to reports from African countries. It was found in a study on 771 Yaoundé adults in Cameroon that two thirds (67%) of the residents aged 60-75 years were overweight or obese.<sup>10</sup> The WHO nationwide survey, conducted on 5 000 Ghanaian adults aged 18 years and older, reported a lower combined prevalence of 22.6%, 13.5% and 15%, in the elderly aged 61-70 years, 71-80 years and 80+ years, respectively.<sup>11</sup> The first South African Demographic and Health Survey (SADHS), conducted in 1998, reported that 29.2% of men and 56% of women aged 15-95 years were either overweight or obese, while central obesity was reported in 9.2% and 42% of men and women, respectively.<sup>12</sup> The average BMI of South African adults aged 45+ in the overweight category was 24.4-29.9 kg/m<sup>2</sup>, and was higher than the average BMI of other African

men and women (16.7-27.2 kg/m<sup>2</sup>).<sup>12</sup> The recent South African National Health and Nutrition Examination survey (SANHANES) reported that 70% of elderly women and 53.5% of elderly men aged 65 years and older were either overweight or obese.<sup>13</sup>

Studies on the interrelationship between morbidity, mortality and obesity in the elderly have been controversial.<sup>5,14</sup> However, a significant association between obesity and all-cause mortality, when compared with those with a normal weight, was found in a systematic review and meta-analysis of association of all-cause mortality with overweight and obesity involving 97 studies and 2.88 million individuals.<sup>15</sup> Although this association derived from studies conducted on the general population, the implications for the elderly population are similar.

A positive association between obesity and hypertension was reported in the elderly in Cuba,<sup>16</sup> Brazil,<sup>17</sup> Nigeria,<sup>18</sup> China<sup>19</sup> and India<sup>20</sup> in the few studies that considered the association between obesity and cardiovascular risk. The prevalence of these associated noncommunicable diseases is sufficient in supporting the view of obesity as a primary disease that requires immediate attention.<sup>14</sup>

An earlier study conducted in 2004 on the elderly living in Sharpeville<sup>21</sup> reported a combined overweight and obesity prevalence of 83.6% in the women. Therefore, this study investigated the prevalence and trend of overweight (BMI  $\geq$  25 kg/m<sup>2</sup> to < 30 kg/m<sup>2</sup>) and obesity (BMI  $\geq$  30 kg/m<sup>2</sup>)<sup>22</sup> and central obesity in attendees at an elderly day care centre in Sharpeville from 2007-2011.

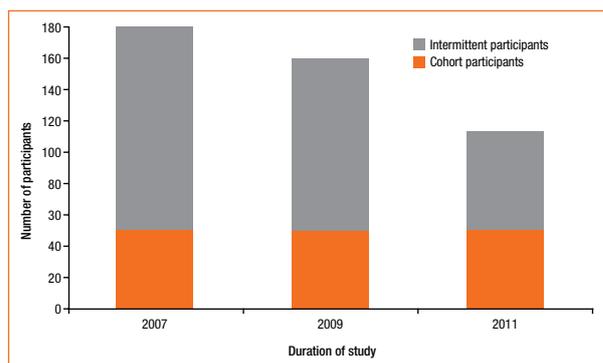
## Method

### Study design

The study design was both cross-sectional and cohort. The study was conducted from 2007-2011 on attendees at an elderly day care centre daily in Sharpeville, South Africa. Prior to the study, introductory visits were made to the day care centre in Sharpeville. The purpose of these visits was to introduce the researchers and to explain the objectives of the project to the participants. During these visits, informed written consent was obtained from the elderly for the project. Ethical approval was granted by the University of the Witwatersrand Medical Ethics Committee for Research on Human Beings (M040835 and M070126). The research was conducted according to the World Medical Association Declaration of Helsinki and the South African Medical Research Council guidelines for research on human beings.

### Sample size

A convenience sample of 208 elderly (176 women and 32 men) participated voluntarily and completed the demographic questionnaire. The number of participants varied each year, and only 46 elderly individuals participated throughout (Figure 1). In this study, they are henceforth referred to as cohort participants, while those who attended the elderly day care centre intermittently are referred to as cross-sectional or intermittent participants. The intermittent or cross-sectional subjects participated once or twice, while the cohort subjects participated thrice during the study period. This brings the



**Figure 1:** Distribution of the elderly participants (n = 208) during the study period from 2007-2011

frequency of participation during the study to 398, namely 163 in 2007, 144 in 2009 and 91 in 2011.

### Socio-demographic data and anthropometric measurements

A structured questionnaire was used to obtain information on the age, employment status and monthly household income of the participants. Anthropometric measurements included body weight and height, measured according to standard procedures.<sup>23</sup> A calibrated Philips HF350<sup>®</sup> electronic scale (135 kg/100 g) with two-point decimal precision was used to measure the weight. The height was measured using a Scales 2000<sup>®</sup> stadiometer. The measurements were taken twice and the average thereof recorded. The BMI was calculated and categorised according to the WHO classification of overweight or underweight.<sup>22</sup>

Waist circumference (WC), the anthropometric measurement used to assess the risk of the development of chronic diseases of lifestyle,<sup>18</sup> was measured at the umbilicus level using a Seca<sup>®</sup> inflexible tape. A WC > 88 cm for women and a WC > 102 cm for men indicates a greater risk of acquiring chronic diseases of lifestyle.<sup>24</sup>

### Statistical analyses

Statistical Package for Social Sciences<sup>®</sup> version 20.0 was used to analyse the data collected in this study. Descriptive analysis was performed for all of the variables. Student's t-test and analysis of variance were utilised to compare means. Bivariate logistic regression was employed to obtain a possible association between central and total obesity.

## Results

### Socio-demographic characteristics and health status of the participants

Two hundred and eight elderly women and men (176 and 32, respectively) aged 60-104 years participated biennially in the study and provided complete demographic data. The mean age ranged from 74.7  $\pm$  6.7 years to 79.2  $\pm$  7.1 years in women and 73.7  $\pm$  6.2 years to 78.6  $\pm$  6.3 years in men from 2007-2011. All of the participants were black pensioners with a monthly income of less than R1 000 (\$99.31). The majority of the participants were widowed (70.4%), women (84%) and lived with other family members (95%).

**Table I:** Demographic information and selected anthropometric indices of attendees at an elderly day care centre in Sharpeville aged 60-104 years, measured biennially from 2007-2011 (n = 208)

	Women				Men				Men and women			
	60-69 years	70+ years	Total	p-value*	60-69 years	70+ years	Total	p-value*	60-69 years	70+ years	Total	p-value*
<b>n</b>	<b>30</b>	<b>109</b>	<b>139</b>		<b>6</b>	<b>18</b>	<b>24</b>		<b>36</b>	<b>127</b>	<b>163</b>	
BMI (kg/m <sup>2</sup> )	32.9 ± 6.0	30.0 ± 6.4	30.7 ± 6.4	0.031	29.8 ± 5.6	26.4 ± 5.6	27.2 ± 5.7	0.209	32.5 ± 6.0	29.5 ± 6.4	30.2 ± 6.4	0.012
WC	105.5	97.4	99.5	0.038	108.7	94.7	97.9	0.112	105.9	97.0	99.2	0.011
	± 12	± 14.8	± 14.4		± 8.0	± 13	± 13		± 10.8	± 14.5	± 14.1	
<b>2009</b>												
<b>n</b>	<b>12</b>	<b>109</b>	<b>121</b>		<b>2</b>	<b>21</b>	<b>23</b>		<b>14</b>	<b>130</b>	<b>144</b>	
BMI (kg/m <sup>2</sup> )	31.6	29.3	29.5	0.798	26.6	25.5	25.6	0.043	31.6	28.6	29	0.033
	± 4.8	± 5.6	± 5.6		± 2.3	± 5.5	± 5.2		± 5.1	± 5.8	± 5.7	
WC	98.6	92.6	93.2	0.913	95.3	94.2	94.3	0.071	97.6	92.9	93	0.093
	± 10.0	± 11.4	± 11.3		± 6.7	± 11	± 12.9		± 9.3	± 11.7	± 11.4	
<b>2011</b>												
<b>n</b>	<b>1</b>	<b>76</b>	<b>77</b>		<b>1</b>	<b>13</b>	<b>14</b>		<b>2</b>	<b>89</b>	<b>91</b>	
BMI (kg/m <sup>2</sup> )	34.5	31.1	31.1	0.0506	24.7	24.1	24.2	0.896	28.4	30.1	30.1	0.639
		± 5.8	± 5.7			± 4.2	± 4.1		± 5.7	± 6.1	± 6.0	
WC	104.5	100.8	100.8	0.619	92	93.8	93.6	0.876	100.3	99.7	99.7	0.926
	± 3.5	± 12.5	± 12.4			± 10.7	± 10.3	± 7.6	± 12.7	± 12.4		

BMI: body mass index, WC: waist circumference

\*: A p-value of &lt; 0.05 was considered to be significant

Only a few exercised regularly (14.5%). The socio-demographic profile did not change during the years. However, the prevalence of those receiving antihypertensive medication increased to 42.2% in 2011.

#### Anthropometric variables

Table I shows the gender-specific means and standard deviation of the biennial anthropometric variables of the study population. The mean BMI of the study population ranged from 30.7 kg/m<sup>2</sup> in 2007 to 31.17 kg/m<sup>2</sup> in 2011, with a slight decrease in 2009 (29.5 kg/m<sup>2</sup>) in the women, while it reduced from 27.2 kg/m<sup>2</sup> to 24.2 kg/m<sup>2</sup> in the men. The BMI was significantly higher (p-value < 0.05) in the younger age group (< 70 years) than in the older age group (≥ 70 years) for both men and women in 2007 and 2009.

The mean WC decreased from 99.2 cm in 2007 to 93.0 cm in 2009, and again increased to 99.7 cm in 2011. The mean WC fluctuated in the women, but reduced consistently in the men.

The anthropometric values of the cohort of elderly (38 women and eight men) followed-up from 2007-2011 are presented in Table II. The weight ranged from 72.4-73.7 kg, height 156.3-156.7 cm, BMI 29.6-30.3 kg/m<sup>2</sup> and WC 94.3-98.7 cm. As observed in the cross-sectional data, a significant difference (p-value > 0.05) was not noted in the anthropometric values from 2007-2011.

#### Prevalence and trend of total and central adiposity

The anthropometrical status of the attendees at an elderly day care centre in Sharpeville is presented in Table III. The majority (77.1%) of

the elderly participants were either overweight or obese, while ideal weight was recorded in a fifth only (21.6%). The anthropometrical status of the younger elderly individuals (< 70 years) was not significantly different from that of the participants in the older age group (≥ 70 years).

As shown in Table III, the prevalence of obesity was irregular in the women during the study period. It decreased from 82.7% in 2007 to 76.7% in 2009, and increased to 83.1% in 2011. It decreased by 23.9% from 2007-2011 in the men.

The prevalence of central adiposity was 73.9%, thus only 26.1% of the elderly had a normal WC. There was no significant difference in the prevalence of central adiposity in the younger elderly individuals (< 70 years) and the older elderly participants (≥ 70 years).

The trends of overweight and obesity and central adiposity from 2007-2011 are presented in Figures 2 and 3. While the trend fluctuated in the women, it was downward in men. The overall trend also fluctuated, which could be owing to the ratio of men to women.

A significant change was not found with respect to the anthropometrical status of the cohort of elderly individuals from 2007-2011 (Table IV). Central obesity followed the same trend as the prevalence of overweight and obesity in both genders, i.e. it fluctuated in the women, but consistently decreased in the men. It decreased by 19.0% from 2007-2009, and by 38.0% from 2007-2011, in the men. However, the changes in central obesity during the study period were significant in the cohort women only (p-value 0.018).

**Table II:** Anthropometric indices of the cohort of attendees at an elderly day care centre in Sharpeville (n = 46) aged 63-97 years, measured biennially from 2007-2011

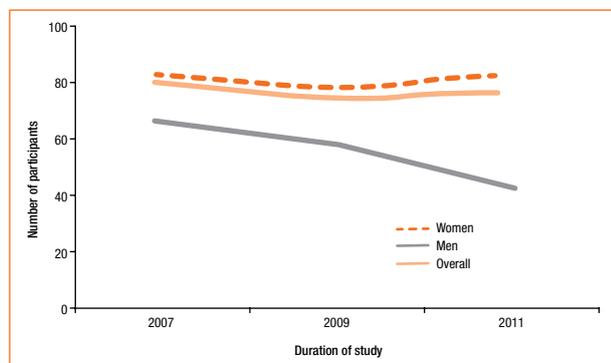
Anthropometric indices	2007	2009	2011	p-value*
	n = 46	n = 46	n = 46	
Weight (kg)	73.7 ± 13.3	72.4 ± 12.0	72.68 ± 12.6	0.878
Height (cm)	156.3 ± 8.4	156.7 ± 8.3	156.6 ± 8.5	0.974
Body mass index (kg/m <sup>2</sup> )	30.3 ± 5.7	29.6 ± 5.1	29.8 ± 5.5	0.817
Waist circumference (cm)	98.2 ± 17.9	94.3 ± 10.0	98.7 ± 11.9	0.227

\*: A p-value of < 0.05 was considered to be significant

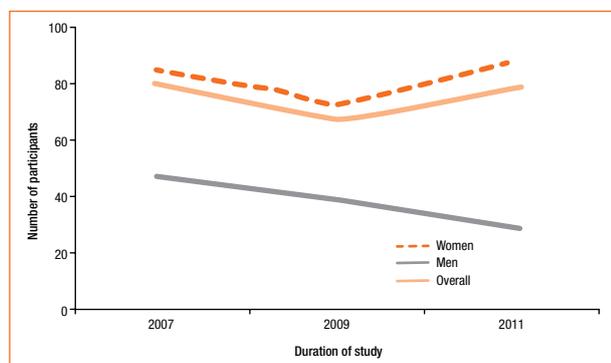
**Table III:** The anthropometrical status of attendees at an elderly day care centre in Sharpeville aged 60-104 years, by age group from 2007-2011

Anthropometrical status	60-69 years	≥ 70 years	Overall	p-value*
	n = 52	n = 346	n = 398	
<b>Weight status</b>				
Underweight (%)	0.0	1.4	1.3	0.075
Ideal weight (%)	11.5	23.1	21.6	
Overweight (%)	26.9	31.5	30.9	
Obese (%)	61.5	43.9	46.2	
<b>Waist circumference</b>				
Normal (%)	16.2	28.8	26.1	0.073
Central adiposity (%)	83.8	71.2	73.9	

\*: A p-value of < 0.05 was considered to be significant



**Figure 2:** Trend in the prevalence of overweight and obesity in attendees at an elderly day care centre in Sharpeville aged 60-104 years from 2007-2011 (n = 208)



**Figure 3:** Trend in the prevalence of central obesity in attendees at an elderly day care centre in Sharpeville aged 60-104 years from 2007-2011 (n = 208)

With reference to the 2007 and 2011 data, the women were more likely than the men to be centrally obese [odds ratio (OR) 6.45, 95% confidence interval (CI): 1.79-23.43, p-value 0.004] and overweight and obese (OR 6.67, 95% CI: 1.79-22.46, p-value 0.000). Compared with respondents of normal weight, overweight and obese respondents were more likely to be centrally obese, as observed in 2009 (OR 34.83, 95% CI: 11.41-106.34, p-value 0.000) and 2011 (OR 14.63, 95% CI: 4.51-47.46, p-value 0.000).

### Discussion

This study investigated the prevalence of total and central obesity in 208 elderly persons biennially. The anthropometric status of the cohort and cross-sectional subjects was similar. This reflects the homogeneity of the elderly attending a day care centre for the aged in Sharpeville, South Africa, from 2007-2011. The slight increase observed in the height measurements of the cohort group was attributable to peculiar problems of erectness and the ability of elderly participants to stand firm when having their height measured. It may also be owing to different people taking the measurements and the lapse of two years inbetween measurements.

The high prevalence of combined overweight and obesity (77.1-80.4%) that was obtained corroborated with the findings from SANHANES 2013,<sup>13</sup> and is similar to the prevalence of 71.6-86.6% reported in the US elderly aged 60 years and older.<sup>8</sup> This prevalence is higher than that in reports on the elderly from Cameroon,<sup>9</sup> Ghana,<sup>10</sup> Senegal<sup>25</sup> and Ecuador.<sup>26</sup> The consumption of cheaper energy-dense food has often been identified as a major cause of obesity.<sup>27,28</sup>

An earlier study on this group of elderly participants living in Sharpeville reported a high prevalence of food insecurity, as most of them consume a carbohydrate-based diet, with very few portions of fruit and vegetables.<sup>21</sup> The most recent South African Social Attitudes Survey revealed that the majority of South African adults consume a diet with low dietary diversity.<sup>29</sup> While 100% of the adults consumed

**Table IV:** Anthropometrical status of the cohort of attendees at an elderly day care centre in Sharpeville (n = 46) aged 63-97 years from 2007-2011

Anthropometric status	2007	2009	2011	p-value*
	n = 46	n = 46	n = 46	
Underweight (%)	0	0	0	0.531
Ideal weight (%)	18.4	18.4	23.9	
Overweight (%)	26.1	41.3	30.4	
Obese (%)	54.3	37.5	46.7	
<b>Waist circumference</b>				
Normal (%)	28.0	30.4	23.9	0.779
Central obesity (%)	72	69.6	76.1	

\*: A p-value of < 0.05 was considered to be significant

cereal, and roots and tubers, less than a quarter consumed  $\beta$ -carotene-rich fruit and vegetables, and legumes and nuts. There was also a low living standard mean with respect to the majority (73%).<sup>29</sup> The poor dietary intake observed in the adults exacerbates their nutritional vulnerability. Sitting for hours, irrespective of walking time, and physical inactivity, were associated with total and central obesity in elderly women in Spain.<sup>30</sup> These considerations may partially explain the consistent prevalence of obesity in the studied population.

A higher OR for central obesity in overweight and obese elderly women, as demonstrated in this study, was similar to the findings in SADHS,<sup>11</sup> and in Brazil<sup>18</sup> and Nigeria.<sup>19</sup> The prevalence of central adiposity was similar to the combined overweight and obesity prevalence. A higher prevalence of central obesity is often reported in populations with a high prevalence of overweight and obesity, and vice versa.<sup>19</sup> It is interesting to note that approximately half (51%) of the elderly with a BMI < 25 kg/m<sup>2</sup> were at risk of central obesity with an excessive WC (> 88/102 cm). Research has shown that the ageing process causes the redistribution and centralisation of fat, thereby increasing the WC, without an increase in BMI.<sup>31</sup> Central adiposity has been shown to be more strongly associated with metabolic and cardiovascular problems than total obesity.<sup>32</sup> The increased use of antihypertensive drugs in the elderly indicates that more of them have been diagnosed as hypertensive. This implies that the measurement of WC, together with that of the BMI, should be promoted in clinical practice.<sup>33</sup>

The trend of overweight and obesity and central obesity was found to be downward in the men and to fluctuate in the women. The reason for this irregularity with respect to the women is unclear. However, the drop in body weight and BMI observed in 2009 may be owing to irregular food consumption. During that period, the global price crisis probably impacted negatively on the food choices, dietary habits and diet quality of the elderly study participants.<sup>14</sup> Members of food-insecure households tend to adjust their food restriction when there is a food shortage.<sup>14,34</sup>

Several responsible factors may have contributed to the consistent weight loss in the men, i.e. a reduced food intake owing to a reduced appetite, financial restraints or swallowing problems; depression; isolation and other social problems.<sup>35</sup> Involuntary weight loss may be an important prognostic indicator in the elderly, and a useful marker of physical decline and mortality risk.<sup>36</sup> Regular assessment of weight is required to monitor involuntary weight loss, especially in men, and to improve their health status.<sup>37</sup> More research is needed to investigate the factors responsible for weight loss in the elderly men.

Frequent walking and engaging in an appropriate vocation that ensures healthy bodily exercise are ways to reduce obesity in the elderly. However, care must be taken to ensure the loss of fat, and not muscle or bone mass,<sup>37</sup> through diet modification. This should include protein of a high biological value, such as small portions of animal protein sources (dairy and eggs) and plant protein sources (legumes and soy products), as well as fruit and vegetables, and

accompanied by a reduction in fat and starch.<sup>37</sup> Nutrition education and health promotion must also be provided at the day care centre.

### Limitations of the study

The study was limited as the sample size was not representative of the elderly population in South Africa, and was confined to elderly individuals attending a day care centre in Sharpeville. Accordingly, the results cannot be generalised. In addition, different participants and very few men were involved in the biennial study.

### Conclusion

A high prevalence of overweight, obesity and central obesity was found in attendees at an elderly day care centre in Sharpeville during the study period. The trend of obesity was found to be consistently high in the study population from 2007-2011. A significant difference was not found in the prevalence of total and central obesity throughout the study period, although it apparently increased in the women and decreased in the men. Appropriate and timely intervention is urgently required.

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