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# Overweight and Obesity: Prevalence and Level of Awareness among Adolescents in Selected Urban and Peri-Urban Secondary Schools in Monze, Zambia

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***Abstract***

*The purpose of this cross-sectional study was to determine the prevalence, level of awareness and associated risk-factors among adolescents in selected secondary schools in Monze, Zambia. The main objective was to establish the magnitude and level of awareness about the disease burden associated with the consumption of energy-dense foods compacted by physical inactivity among the studied population. A sample of 358 respondents was selected from a population of 2319 pupils. A 57-items structured questionnaire was used to collect data, which was analysed using SPSS 16.0. Of the 358 respondents, the prevalence of underweight was one percent, normal weight 75%, overweight or obesity 24%, and that of that of obesity alone was 5%. These rates are among the highest in sub-Saharan Africa. The results showed a significant difference between residing in peri-urban area and the urban one (ρ= .05%). Applying the Delphi experts' scores, respondents' awareness level of overweight and obesity and associated risk-factors was between moderate and low. A school-based policy to prevent overweight and obesity among adolescents in Zambia was recommended among other measures to be taken by all stakeholders.*

***Keywords****: overweight, obesity, awareness, urban, peri-urban, adolescents.*

## Introduction

Once upon a time overweight and obesity were considered as a challenge only for high-income countries. However, overweight and obesity are now on the rise even in low- and middle-income countries, particularly in urban settings (www.who.int.org media centre updated August 2014). It has been noted that adolescence is a particularly vulnerable time for the development of obesity because it is marked by a slowing of growth and corresponding decrease in physical activity levels, yet the latter being a preventive measure to the problem (Daniels 2006). In addition, Sweeting et al (1994) agreed that during this period, adolescents become more independent and have increased access to food choices apart from those available at home. It is also during the same period (adolescence), that the adolescent increases his/her social interaction with peers of similar age and develops individual eating habits and physical activity patterns. These habits and patterns may jeopardise the health of the adolescent. For example, La Fontaine (2008) and Cragg and Cameron (2006) recognised that a significant proportion of adolescents do not meet recommended physical activity guidelines, which could control and/ or prevent obesity. Yet, research has established that physically active youth have lower levels of adiposity than youth who are less active (Jansen et al. 2005; Tremblay & Willms 2003). Furthermore, Remesh (2012) highlighted that the overweight adolescents have a 70% chance of becoming overweight adults, which may increase to 80% when either of the parents is overweight or obese. This fact was established by Pi-Sunyer (1991) who stated that compared with children at a normal weight, overweight children are 70% to 80% more likely to be overweight in adulthood. In America, it has been demonstrated that since 1980, the percentage of children who are overweight has more than doubled, while rates among adolescents have more than tripled (Allison et al 2004 & Ogden et al 2002). It is noteworthy that Pakpour, Yekaninejad and Chen (2011) said that the rising rate of childhood obesity in developing countries is as high as that of developed countries. A study among Lusaka residents in Zambia, showed that overall, 14.2% of the participants (5.1% of males, and 18.6% of females) were obese (Rudatsikira et al 2012). Overweight and obesity predisposes their victims to non-communicable diseases (NCDs). Estimates suggest that conditions such as depression, diabetes, cancer, respiratory diseases, and

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cardiovascular disease will grow from about 40% of the health burden in developing countries in 2002 to nearly 75% in 2020, all these emanating from obesity (US Centre for Disease Control http://ww.cgdev.org March 2007). These diseases are preventable: up to 80% of heart disease, stroke, and type 2 diabetes and over a third of cancers could be prevented by eliminating shared risk-factors, mainly tobacco use, unhealthy diet, physical inactivity and the harmful use of alcohol. Unless addressed, the mortality and disease burden from these health problems will continue to increase. The World Health Organisation (WHO) (2008) projected that, globally, non-communicable diseases (NCDs) deaths will increase by 17% over the next ten years. The greatest increase will be seen in the African region (27%) and the Eastern Mediterranean region (25%). Despite these findings, Africans still hold that a woman who has found comfort and enough food to eat in marriage should be of a big body. Results of Hagan (2009) showed a knowledge-problem about some aspects of obesity education such as scientific ways of determining ideal weight, and causes of obesity among the studied university students. Earlier on, Gortmaker (1993) and Steyn and Damasceno (2006) found that in many sub-Saharan Africa, the concept of "big" body is associated with health, prosperity, beauty, and prestige competitiveness within-group; the big body is taken as a social identity, while thinness is perceived to be a sign of ill-health or poverty. The advent of HIV and AIDS has even worsened the belief of big body, whereby people avoid losing any weight as the resulting body-shape may be associated with the sickness. According to Wechsler, McKenna, Lee and Dietz (2004), the obesity epidemic is one of the greatest public health, social, and economic challenges of the 21st century. Without a strong contribution from schools, we are not likely to reverse the epidemic (Wechsler et al 2004 http://ww.wpdd.org). It has been noted that increasing awareness and preventative strategies is crucial in developing countries. Moreover, the Morbidity and Mortality Weekly Report (2011) stressed that schools play a particularly critical role by establishing a safe and supportive environment with policies and practices that support healthy behaviours. Schools also provide opportunities for students to learn about and practice healthy eating and physical activity behaviours. In addition, Murray and Lopez (1996) stated that Nearly 90% of the world's total disease burden occurs in developing countries, while only 10% of health expenditures are allocated there. Furthermore, Adesina et al (2012) established that because of negative health outcomes associated with the double burden of malnutrition, overweigh/t and obesity, it is important to fully understand its prevalence among other factors in school-aged adolescents especially on a local level. Adolescence is not only a pivotal time in the life of a child, being as it is the gateway to adulthood, but also a stage of life in which the world must invest more attention, resources and efforts today. Otherwise, we will suffer tomorrow the social and economic consequences of a generation ill-equipped to become fully contributing members of global society (UNICEF, 2012b).

During the 2010 Population and Housing Census, it was found that at 25% adolescents, Zambia has one of the highest proportions of adolescents in the world, above the Sub-Saharan African average of 23%. Adolescence and young adulthood represent a period of experimentation and identity formation. It is also a time when lifelong behaviour patterns are typically initiated or established, which may compromise health. Childhood overweight and obesity have detrimental health consequences during childhood and adulthood (Reilly & Kelly 2011). In order to plan services for the provision of care and to evaluate the impact of policy strategies it is important to monitor the prevalence of obesity (De Onis & Lobstein 2010). Literature scrutiny shows a significant proportion of adolescents in the Zambian population, the threat of the overweight and obesity epidemic, but there was no study concerning overweight/ obesity prevalence and awareness level in Zambian schools, particularly in Monze. Therefore, the researcher purposed to investigate the topic: "overweight and obesity: prevalence, level of awareness among adolescents in selected urban and peri-urban secondary schools in Monze, Zambia".

This study answered the following research questions:

1. What is the magnitude of overweight and obesity disease burden among adolescents in selected Monze urban and peri-urban secondary schools?
2. Is there any gender difference in rates of overweight and obesity among adolescents from selected Monze urban and peri-urban secondary schools?
4. To what extent are adolescents from selected Monze urban and peri-urban secondary schools aware of overweight and obesity risk-factors?

## Material and methods

The study followed a cross-sectional design and took place in Monze, a town of about 30,000 in the Southern Province of Zambia, about 180 km south-west of Lusaka. It is the administrative centre of Monze District. The main industry in the district is agriculture with maize being the most important crop (www.wikipedia.org). According to the District Investment Profile, agriculturally, Monze is known to be the "bread basket" belt of the nation, an area that produced the bulk of the national annual cereal requirement. Monze is located in the middle of Namwala District (district rich in livestock production), Gwembe District (endowed with abundant stocks of fresh Kariba breams), Mazabuka and Choma, which could afford a socio-economic status that, may be favourable to problems of overweight and obesity. Monze District has a total population of 195,921 according to the Central Statistics Office 2010 Census Preliminary Report. This represents about 12.1% of the total population of the Southern Province (1,606,793). Of this population, 49% (96,141) is male and 50.92 % (99,780) is female.

The population of study comprised of secondary school students in Monze-urban and peri-urban, registered and present at the time of data collection. According to Monze District Education Board of the Ministry of Education, the total population of students in secondary schools from grade eight to 12 are 2319 both males and females combined. The study sample was calculated to be 352 participants.

Simple random sampling technique was used to collect data from each selected school. The study used primary data collected using a questionnaire. The researcher distributed the questionnaires to individuals who consented to participate in the study and collect the completed forms the next day. The data were collected in September 2015. After explanation about the study and how it was to going to be conducted, those who consented to be part of the sample were considered for weight and height and filling in of a questionnaire that the researcher provided. The researcher first selected schools to be included in the sample, then, with help of one of the teachers, questionnaires were given to willing prospective respondents.

A structured questionnaire was used to collect data on the food eating habits and lifestyle of the studied population. The questionnaire comprised of demographic data, information of eating habits and that of physical activity practice.

Pertaining to ethical considerations, permission to conduct the study was sought from the Ministry of Education and health in Zambia, which was granted. Provincial and district authorities were also informed. Selected schools' authorities were approached to plan on modalities of data collection. Data collected from participants has been kept confidential and will remain anonymous as no identifiers were used. Data will not be shared with any other person or institution and will used only for the purpose of this study. Explanation of the research procedures and other related issues was given to participants, which included that participation in the study was voluntary, and no rewards would be given. The study is not invasive as no biochemical tests will be carried out – only the body mass index indicators will be taken from participants. For anonymity purposes, schools were named as A, B, C, D, E and F. The first three schools were considered as peri-urban, while the last three were urban.

Data was analysed using SPSS (statistical package for social sciences). The analysis included descriptive and inferential analysis of the data collected. The Children's BMI Tool for Schools, which is an Excel spreadsheet intended for use by school, child care, and other professionals who want to compute Body Mass Index (BMI)-for-age for a group was used. This calculator computes BMI and BMI percentiles for individual children in a group using height and weight measurements, sex, date of birth, and date of measurement information. It provides a group summary of children's BMI-for-age categories and graphs for Prevalence of Overweight and Obesity, and Prevalence of Overweight and Obesity by Sex. SPSS also produced frequency tables, prevalence and level of awareness about overweight and obesity. Cross-tabulations was done to investigate associations between demographic and other variables such as physical activity/ inactivity, lifestyle behaviours, dietary habits and knowledge about overweight and obesity risk-factors. The Delphi experts' score, all participants who get a $< 50\%$ of the questions correct will be considered low, $\geq 50 – 80\%$ moderate, and high for getting $\geq 80\%$ of all the questions. Multivariate logistic regression was used to determine significant risk-factors associated with overweight and obesity. Chi square test was performed for analysis of statistical significance among overweight and obesity risk-factors. A $\rho$-value of less or equal to 0.05% was considered statistically significant.

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## Results and discussion

### Results on demographic characteristics

For ethical purposes (anonymity), names of schools were omitted and letters of alphabet used: A, B, C, D, E, and F. School A had 54 (15.1%), B had 76 (21.2%), C had 61 (17%), D had 58 (16.2%), E had 46 (12.8%) and F had 63 (17.6%) respondents respectively. Of the total sample (n=358), the following were respondents' distribution of year of study (grade): grade 12 (2.5%), 11 (27.3%), 10 (24.5%), 9 (21.4%), and 8 (24%). The distribution of gender was 151 (42.2%) and 207 (57.8%).

**Table 1.** Sample description

| Factor | Total | Male | Female |
|---|---|---|---|
| | n (%) | n (%) | n (%) |
| Age (years) | | | |
| <14 | 49 (13.7) | 23 (15.2) | 26 (12.6) |
| 14 | 69 (19.3) | 27 (17.9) | 42 (20.3) |
| 15 | 94 (26.3) | 43 (28.5) | 51 (24.6) |
| 16 | 73 (20.4) | 27 (17.9) | 46 (22.2) |
| 17+ | 73 (20.4) | 31 (20.5) | 42 (20.3) |
| Gender | | | |
| Male | 151 (42.2) | - | - |
| Female | 207 (57.8) | - | - |
| Residence | | | |
| Rural | 106 (29.6) | 24 (15.9) | 82 (39.6) |
| Urban | 252 (70.4) | 127 (84.1) | 125 (60.4) |
| Profession | | | |
| Salaried | 220 (61.5) | 98 (64.9) | 122 (58.9) |
| Farming | 87 (24.3) | 29 (19.2) | 58 (28.0) |
| Business | 51 (14.2) | 24 (15.9) | 27 (13.0) |
| Factor | Total | Male | Female |

**Table 1.1**

| Body Mass Index for age (Percentile) | n (%) | n (%) | n (%) |
|---|---|---|---|
| <5 | 5 (1.4) | 4 (2.6) | 1 (0.5) |
| 5-84.9 | 268 (74.9) | 114 (75.5) | 154 (74.4) |
| 85-94.9 | 68 (19.0) | 27 (17.9) | 41 (19.8) |
| 95+ | 17 (4.7) | 6 (4.0) | 11 (5.3) |

A total of 358 respondents participated in the survey, out of which 151 (42.2%) were males. About a quarter (26.3%) of the participants were of age 15 years and the mean- age was 16 years. Significantly more males (84.1%) than females (60.4%) resided in urban areas ($p<0.001$). Most (61.5) of the parents' professions were salaried. Overall 17 (4.7%) of the respondents were obese with no gender difference (4.0% of males compared with 5.3% of females, $\rho= 0.736$). No significant difference in proportion of students who were overweight between gender was observed (17.9% of males and 19.8% of females, $p=0.747$). Altogether, 23.7% of respondents (21.9% of males and 25.1% of females; $\rho= 0.554$) were either overweight ($\geq 85^{th}$ but below $95^{th}$ percentiles) or obese ($\geq 95^{th}$ percentile).

**Table 2.** Distribution of percentiles (n = 358)

| Real class limits | Frequencies | Percentage |
|---|---|---|
| 97.5 – 104.5 | 7 | 1.95 |
| 90.5 – 97.5 | 33 | 9.21 |
| 83.5 – 90.5 | 52 | 14.52 |
| 76.5 – 83.5 | 38 | 10.61 |
| 69.5 – 76.5 | 32 | 8.93 |
| 62.5 – 69.5 | 26 | 7.26 |
| 55.5 – 65.5 | 30 | 8.37 |
| 48.5 – 55.5 | 24 | 6.70 |
| 41.5 – 48.5 | 22 | 6.14 |
| 34.5 – 41.5 | 18 | 5.02 |
| 27.5 – 34.5 | 19 | 5.30 |
| 20.5 – 27.5 | 17 | 4.74 |
| 13.5 – 20.5 | 20 | 5.58 |
| 6.5- 13.5 | 12 | 3.35 |
| 0.5 - 6.6 | 8 | 2.23 |
| Total | 358 | 100 |

The interpretation of BMI-for-age percentiles for adolescents follows the standards by the World Health Organisation (WHO) experts: underweight: < $5^{th}$ percentile; normal BMI: between $5^{th}$ percentile and $85^{th}$ percentile; overweight: ≥ $85^{th}$ percentile to $95^{th}$ percentile. One is counted among the obese when his/ her BMI is ≥ $95^{th}$ percentile. Using children's BMI calculator, the next figure shows results displayed in bar charts of the distribution of overweight and obesity per gender. Solid bar represents males, while the hashed represents females.

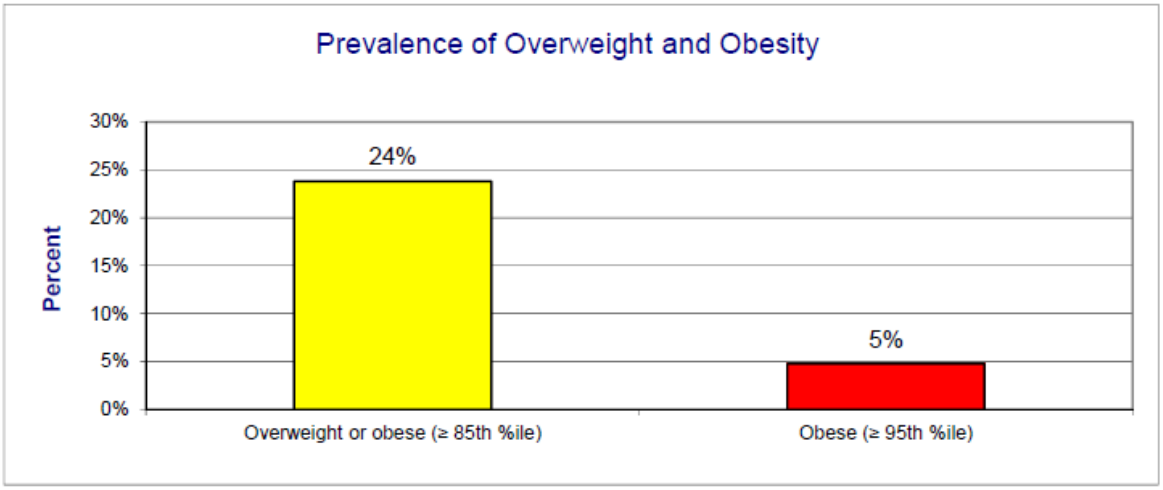


**Figure 1.** Prevalence of overweight and obesity (n= 358)

Figure 1 shows that the prevalence of overweight and obese amount to 24% (n= 358), while the rate of obesity amounted to 5% (n= 358).

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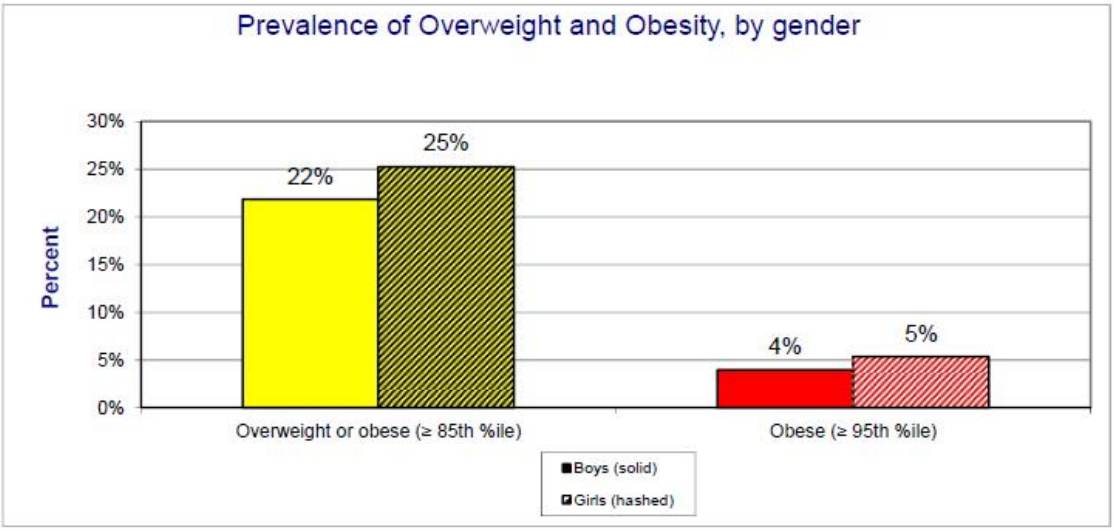


**Figure 2.** Prevalence of overweight and obesity by gender (n= 358)

Figure two presents on one hand the prevalence of overweight and obesity distinguishing between genders. Girls were more overweight/ obese (25%), while boys represented 22% of the sample studied (n= 358). On the other hand, figure seven shows that obesity was slightly higher among females (5%) than in males (4%) in a sample of 358 respondents.

**Table 3.** Summary of Children's BMI for age

**Summary of Children's BMI-for-Age**

| | Boys | Girls | Total |
|---|---|---|---|
| Number of children assessed: | 151 | 206 | **357** |
| Underweight (< 5th %ile) | 3% | 0% | **1%** |
| Normal BMI (5th - 85th %ile) | 75% | 74% | **75%** |
| Overweight or obese (≥ 85th %ile)* | 22% | 25% | **24%** |
| *Obese (≥ 95th %ile)* | *4%* | *5%* | ***5%*** |

*Terminology based on: Barlow SE and the Expert Committee. Expert committee recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity: summary report. Pediatrics. 2007;120 (suppl 4):s164-92.

A cross tabulation of age, grade (year of study), parents' profession showed that from salaried parents, there were two underweight respondents and were studying in grade eight, and one from grade 10. From farming parents, there were one underweight who was in grade eight, and one in grade 12. With regards to overweight and obesity, from salaried parents, there were 56 respondents, 19 respondents came from farming parents, while 10 came from the business community. Having observed these variations, it became important to explore the significance of socio-demographic and economic factors associated with overweight and obesity as presented in table four.

**Table 4.** Awareness about risk-factors of overweight or obesity per gender

| | Male | Female | ρ value |
|---|---|---|---|
| Factor | n (%) | n (%) | |
| Fruits/ vegs prevent | | | |
| False | 26 (17.2) | 45 (21.7) | 0.355 |
| True | 125 (82.8) | 162 (78.3) | |
| Fibre decreases risk | | | |

| | | | |
|---|---|---|---|
| False | 69 (45.7) | 86 (41.5) | 0.500 |
| True | 82 (54.3) | 121 (58.5) | |
| Inherited | | | |
| False | 104 (68.9) | 160 (77.3) | 0.096 |
| True | 47 (31.1) | 47 (22.7) | |
| Junk increases risk | | | |
| False | 33 (21.9) | 52 (25.1) | 0.554 |
| True | 118 (78.1) | 155 (74.9) | |
| Largely preventable | | | |
| False | 30 (19.9) | 65 (31.4) | 0.020 |
| True | 121 (80.1) | 142 (68.6) | |
| Sugar increases | | | |
| False | 61 (40.4) | 99 (47.8) | 0.198 |
| True | 90 (59.6) | 108 (52.2) | |
| Min exercise time decreases risk | | | |
| False | 19 (12.6) | 38 (18.4) | 0.184 |
| True | 132 (87.4) | 169 (81.6) | |
| Big body is healthy | | | |
| False | 131 (86.8) | 178 (86.0) | 0.958 |
| True | 20 (13.2) | 29 (14.0) | |
| Same rates in poor/ rich countries | | | |
| False | 126 (83.4) | 150 (72.5) | 0.021 |
| True | 25 (16.6) | 57 (27.5) | |
| Adolescents become adults | | | |
| False | 49 (32.5) | 89 (43.0) | 0.056 |
| True | 102 (67.5) | 118 (57.0) | |
| Low fat decreases risk | | | |
| False | 29 (19.2) | 45 (21.7) | 0.651 |
| True | 122 (80.8) | 162 (78.3) | |
| Alcohol drinking is a risk factor | | | |
| False | 69 (45.7) | 97 (46.9) | 0.912 |
| True | 82 (54.3) | 110 (53.1) | |
| People should eat primarily for health | | | |
| False | 32 (21.2) | 34 (16.4) | 0.312 |
| True | 119 (78.8) | 173 (83.6) | |

Table 4 shows that while 45 (21.7%) of females were not aware that consumption of fruits and vegetables has a preventive effect to overweight and obesity, 69 (45.7%) of males were not aware that foods rick in fibre could decrease the risk of overweight and obesity.

Of the total respondents (n= 358), 104 (68.9%) of males and 160 (77.3%) females were not aware that NCDs might be inherited and a quarter of females 52 (25.1%) were not aware that consumption of junk foods/ drinks increases the risk of non-communicable diseases.

Furthermore, 65 (31.4%) of females were not aware that overweight and obesity are largely preventable. This awareness factor was significant at the level of significance of 0.05%. A good number of males 61 (40.4%) and 99 (47.8%) of females were not aware that sugary foods/ drinks increase the risk to overweight and obesity. Concerning respondents' awareness about the relationship of PA and

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overweight and obesity, 19 (12.6%) of males and 38 (18.4%) of females were not aware that spending a minimum time in PA could prevent overweight and obesity.

However, it was noted that the majority of males 131 (86.8%) and that of females 178 (86%) did not consider a physical bid body as being healthy. Nevertheless, 126 (83.4%) of males and 150 (72.5%) of females were not aware that the prevalence of non-communicable diseases is the same both in rich and poor countries.

**Table 5.** Awareness about overweight/ obesity as predisposing factor to the five major killer diseases per gender

| **Factor** | **Male** | **Female** | **ρ** |
|---|---|---|---|
| Stroke | | | |
| False | 43 (28.5) | 52 (25.1) | 0.556 |
| True | 108 (71.5) | 155 (74.9) | |
| Diabetes | | | |
| False | 45 (29.8) | 78 (37.7) | 0.151 |
| True | 106 (70.2) | 129 (62.3) | |
| Cancer | | | |
| False | 120 (79.5) | 148 (71.5) | 0.111 |
| True | 31 (20.5) | 59 (28.5) | |
| Depression | | | |
| False | 49 (32.5) | 63 (30.4) | 0.771 |
| True | 102 (67.5) | 144 (69.6) | |
| Heart disease | | | |
| False | 12 (7.9) | 17 (8.2) | 1.000 |
| True | 139 (92.1) | 190 (91.8) | |
| High blood pressure | | | |
| False | 31 (20.5) | 35 (16.9) | 0.463 |
| True | 120 (79.5) | 172 (83.1) | |
| Pulmonary | | | |
| False | 49 (32.5) | 77 (37.2) | 0.414 |
| True | 102 (67.5) | 130 (62.8) | |

Concerning the awareness on the five worldwide major killing diseases, a quarter of females 52 (25.1%) were not aware that overweight and obesity predisposes to stroke against 43 (28.5%) males.

A good number of female respondents 78 (37.7%) were not aware that overweight and obesity predispose to diabetes as compared to 45 (29.8%) males. Of the total number of respondents, 120 (79.5%) of males and 148 (71.5%) of females were not aware that overweight and obesity predispose to cancer. The majority 139 (92.1%) of males and 190 (91.8%) of females were aware that overweight and obesity are risk-factors to heart diseases. Finally, 31 (20.5%) of males and 35 (16.9%) of females were not aware that overweight and obesity predispose to high blood pressure.

## Discussions of results

The purpose of this study was to determine overweight and obesity: prevalence, level of awareness and associated risk-factors among adolescents in selected urban and peri-urban secondary schools in Monze, Zambia.

The results of the study showed that the mean age was 16. It is a crucial age as the onset of risk-behaviours predisposing to NCDs often occurs in children and adolescents (Shafey 2010). For the latter group, it is around age 16. It has been evidenced in the findings of Rao et al (1981), in which it was noted that among Zambian children, the growth spurt commenced at the age of nine years in girls. The accelerated growth continued until the age of fifteen years after which the rate of growth was very small. In boys, the growth spurt commenced a year later and continued until the age of seventeen years. These results agree with Kumah et al (2015) who found the overall mean age to be 15.91 ± 1.78 years (16.00 ± 2.00 years for the males and 15.00 ± 2.00 years for the females). According to WHO facts sheet, promoting healthy practices during adolescence, and taking steps to better protect young people from

health risks are critical for the prevention of health problems in adulthood, and for countries' future health and social infrastructure. There is clear evidence that risks for later life non-communicable diseases are spreading rapidly worldwide, with the highest rates of tobacco use and overweight, and lowest rates of physical activity, predominantly in adolescents living in low-income and middle-income countries (Patton et al, 2012). Therefore, it is important for health care service providers to invest enough among adolescents who constitute in considerable ratio in the Zambian population. Adolescence is particularly important because of the rapid physical and psychosocial changes that take place during this period which facilitate the development of risk factors for obesity (Silva, 2002).

Results on gender ratio of 42.2% male and 57.9% females reflected a high number of females against males documented in the Zambia 2010 population and housing census, where males represented 49.01% and females 50.9% of the 13,046,508 population. However, these findings did not tally with the Zambia 2004 Global School Health Survey, that found males 54.2% and females 45.8%. Nevertheless, interventions towards alleviating overweight and or obesity health problems of adolescents should put more emphasis on females.

The prevalence of overweight and obesity of 24 and 5% respectively were higher than the findings of Kumah et al (2015), in which the prevalence of overweight, and obesity was 12.20%, and 0.80%, respectively; yet closely identical to those of Peltzer and Pengpid (2015) whose results indicated a prevalence of overweight or obesity of 24.3% and obesity of 6.1% in the six pacific Island countries. However, the 1% underweight result was low compared to Kumah et al findings of 7.40%. While the prevalence of normal weight in this study was of 74%, Kumah et al results were of 79.60%. This finding confirmed Peltzer and Pengpid (2011) who stated that the prevalence of overweight and obesity continues to remain low in many lower income countries, but it seems to be changing in some middle income countries. Furthermore, findings of the present study were higher than studies done in South Africa in which the prevalence of obesity among South African 3 to 16 years old children was found to be 3.2% for boys and 4.9% for girls, and overweight 14% for boys and 17.9% for girls (Armstrong et al 2006). Another study found 7.8% of school children aged 10 to 15 years were overweight or obese (Kruger, Kruger & Macintyre 2006), and yet a recent study in rural South Africa Kimani-Murage et al (2011) found that the combined overweight and obesity was higher in girls (15 %) than boys (4 %), as was central obesity (15% and 2%, respectively). Muthari (2014) also found that body composition measures and the proportions of overweight/obesity were proportionally higher in girls than in boys. Comparable to other studies done in middle and low-income countries this study showed that the prevalence rate of overweight was higher among female respondents than male respondents. Such results include Manyanga et al (2014) who found unadjusted rates of being underweight varying from 12.6% (Egypt) to 31.9% (Djibouti), while being overweight ranged from 8.7% (Ghana) to 31.4% (Egypt). Obesity rates ranged from 0.6% (Benin) to 9.3% (Egypt). Females had a higher overweight prevalence for every age group in five of the countries, exceptions being Egypt and Malawi. Like in Manyanga et al (2014), The results of this study were also higher than the 2025 projection of overweight in Africa as reported by (Black et al 2013): overall, our findings demonstrated a high prevalence of overweight status among African adolescents, surpassing the 11% overweight projection for the year 2025. However, results of the present study were lower than those of Al-Hazzaa (2014) in Arab countries where across all ages, overweight and obesity ranged from 39.9% to 45.6% in males and from 30.4% to 38.7% in females.

Findings of this study showed a seemingly difference in prevalence of overweight between females and males (5% for females against 4% for males). While some studies (Puoane, Tsolekile & Steyn 2010) attributed the gender differences of overweight and obesity to cultural beliefs, that obese females considered putting on weight as a sign of affluence, happiness and good health, Zellner et al (1999) in a study over food liking and cravings found that sweet cravings could be classified more females and more males craved savouries than sweets. Sugar-added food and drinks contribute to weight gain, thus, those who like them would be more vulnerable to overweight and obesity. Results of this study showed that 66 (18.4%) took soft drinks daily, which is a risk-factor for overweight and obesity. The assertion was supported by Wang and Bleich (2008) in Frieden et al (2010) as follows: sugar-sweetened beverages - a prime contributor to weight gain and obesity … each additional daily serving of sugared soda increases a child's risk of obesity by 60 percent. Frequent soda consumption is most common in

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demographic groups at high risk of developing obesity. Drinking water instead of sugar-sweetened beverages would reduce caloric intake among youth.

The findings of this study showed the presence of a double burden of underweight and overweight and obesity, 1%, 24%, and 5% respectively. These results appeared discordant with the Malawi ones (a neighbouring nation), which were (underweight) 12.4, 24.4; (overweight) 14.4, 15.9 and (obesity) 1.1, 1.6% for males and females respectively. However, they demonstrated the reality of the existence of the double burden of malnutrition among adolescents in developing countries (Manyanga et al 2014). Diverse factors contributed to the scenario, which include the nutrition transition and globalisation. As the transition advances, traditional diets high in complex carbohydrates and fibre are replaced with diets high in fats and sweeteners. This has led to the classic pattern of epidemiologic transition characterised by a shift from high mortality and fertility patterns to lower mortality followed by lower fertility. Improvements in water and sanitation, and more effective public health services such as immunisation resulted in an associated shift in disease burden from high rates of infectious disease to increasing non-communicable diseases (Kennedy, Nantel & Shetty 2006). Tzioumis and Adair (2014) explained gave the following explanation: improvements in social economic status in low income countries initially increase rates of overweight and decrease rates of underweight. However, these improvements leave considerable inequality; underweight continues to be commonplace among the poor whereas overweight initially develops in the wealthy. Over time, energy-dense/nutrient-poor diets become the norm in low-income groups and as a result they struggle with the dual burden of malnutrition. The World Health Organisation (2004) stated that underweight and obesity are both among the top ten leading risk factors for the global burden of disease.

A sizeable number of the overweight and obese respondents (77.6%) were from urban areas. The results are similar to those of Bhagyalaxmi, Atul and Shikha (2013) who found that the prevalence of overweight and obesity was observed to be high among urban men and women in all age-groups compared to rural men and women. One of the reasons given for urban high prevalence of overweight and obesity is acculturation; it can affect obesity by encouraging the abandonment of traditional beliefs (foods) and behaviours (physical activity) that increase the risk of overweight (Caprio et al 2008). McGarvey (1991) stated that key features of the modernisation process are diets that contain more fat, particularly animal fat, and lifestyles that are increasingly sedentary. Interventions that reverse these trends are likely to reduce the prevalence of obesity as well as having a beneficial effect on other CHD and diabetes risk factors (Willet 1997). Other reasons include globalisation through travel; trade: production and distribution of high-fat, energy-dense foods and drinks and flow of investment in food processing and retail across borders); communication (promotional food marketing); increased gap between rich and poor; and the epidemiologic transition in global burden of disease (Chopra, Galbraitha & Darnton-Hill 2002).

The results showed that the majority (5%) had a moderate level of awareness on key important aspects in the prevention and control of overweight and obesity: consumption of fibre-rich foods decrease the risk; the diseases can be inherited; junk foods and drinks increase the risk and the idea that the rates of overweight and obesity are the same both in poor and rich countries ($\geq 50 - 80\%$ Delphi experts scores). The findings are related to those of Jyothi et al (2015) who found the poor knowledge of adolescent girls on overweight. A low level of awareness does not motivate an individual to take action as he/ she will be still at the pre-contemplation stage of the trans-theoretical theory. One needs a high level of awareness to take action to stop some risk-behaviours (consumption of junk or getting engaged in regular physical activity). This finds support in the fact that one of the key elements in Prochaska's Trans-Theoretical Model is that people move through the change process in a variety of situations and environments including within the therapeutic/ education session and without the therapeutic/education session, with support and without it, prior to receiving therapy, education, or support and subsequent to receiving therapy, education, or support (Gurman & Messer, 1995). Furthermore, Clement, Schmidt, Bernaix, Covington and Carr (2004, p. 291) found that, the participants whose scores fell in the higher stages of the Trans-Theoretical Model reported greater levels of physical activity, consumption of more fruits, vegetables and water, and less consumption of high-fat/high-calorie foods." The results were comparable to findings reported by Ade (2014) in which 23.5% students were aware about 4 to 7 risk factors of NCDs, so these students comprise students with medium level

of awareness group and only 3% had good level of knowledge regarding the lifestyle risk factors. Awareness of risk factors of non-communicable diseases and knowledge regarding prevention aspects of NCDs was also low among rural school children. Only 127(37.4%) students felt non-communicable diseases are preventable. A cross tabulation between overweight/ obese and not overweight/ obese showed a significant influence ($\rho$= 0.029) of the awareness that eating foods rich in fibre decrease the risk on overweight and obesity prevalence. In addition, these results showed that an awareness that junk foods and drinks increase the risk had a significant effect ($\rho$= 0.051) on overweight and obesity prevalence. As it is commonly said, knowledge is power, for example, awareness that transnational corporations that manufacture and market unhealthy food and beverage commodities, including Coca-Cola, PepsiCo, and Cadbury Schweppes, are among the leading vectors for the global spread of NCD risks (Wiist 2010, Wiist 2006 & Beaglehole and Yach 2006) might lead someone to avoid such food and drink products that could contribute to his/ her becoming obese. Thus, those who were aware, were less likely to be obese.

## Conclusions

The purpose of this study was about overweight and obesity: the prevalence, level of awareness and associated risk-factors among adolescents in selected urban and peri-urban secondary schools in Monze, Zambia.

Of the total population (n= 358), the prevalence of underweight was 1%, normal weight 75%, overweight or obesity 24%, and that of obesity was 5%. Therefore, the rate of overweight and obesity is among the highest in Sub-Saharan Africa. This was supported by Muthuri et al (2014): the weighted averages of overweight/obesity proportions in boys and girls was 7.6% and 15.4% respectively, while obesity proportions in boys and girls was 2.0% and 3.9% respectively. Recently, Kumah et al (2015) established that the prevalence of overweight, and obesity was 12.20%, and 0.80%, respectively.

Applying, the Delphi experts' scores, respondents' awareness level of overweight and obesity and their associated risk factors was found to be neither good nor bad (moderate to low). This cannot motivate to cognitive senses of a human being to move to action that will prevent or control overweight and obesity.

## Recommendations

Considering the results of the prevalence of underweight, overweight and obesity among adolescents in secondary schools in Monze, it is recommended that the Ministries of Health and Education, in partnership with other stakeholders do the following:

1. Develop and enforce the implementation of a national policy that requires schools to create a conducive environment in and around school premises for the prevention and control of overweight and obesity.
2. Eliminate provision and sale of junk foods and drinks and replace them by healthy ones such as water.
3. Run awareness campaigns in schools through all forms of media communication to call adolescents and parents to take urgent preventive measures (increase the overall awareness and understanding of the influences of dietary habits and physical activity on health, longevity and academic performance). Examples: billboards, posters, organise awareness events at house of parliament, chiefs, newspaper and radio/ television adverts highlighting the dangers and impact of overweight and obesity and their risk-factors especially towards adolescents.
4. Conduct public health education on the importance of regular physical activity.
5. Streamline non-communicable diseases information in schools with emphasis on overweight and obesity pandemic in low and middle income countries.

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