



Risk-Factors Associated with Overweight and Obesity Among Adolescents in Selected Urban and Peri-Urban Secondary Schools in Monze, Zambia

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DOI: 10.31080/ASNH.2022.06.1101

Received: June 29, 2022

Published: July 27, 2022

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Abstract

This research article was part of a dissertation that explored overweight and obesity: prevalence, level of awareness and associated risk-factors among adolescents in selected secondary schools in Monze, Zambia. A total of 358 respondents participated in the cross-sectional study. Risk-factors identified included: inadequate time in physical activity, consumption of sugar-sweetened beverages, eating fast foods, snacking, irregularity in fruits and vegetables intake, insufficient sleeping hours, skipping breakfast, lack of school-policy to regulated sale and consumption of energy-dense foods and drinks in and around school premises as well as insufficient awareness about overweight and obesity risk-factors among the studied population. It was recommended that schools, parents and other education stakeholders should among other interventions develop and enforce the implementation of a national policy that require schools to create a conducive environment for the prevention and control of overweight and obesity such as Nourishing: based on the understanding that food policies to prevent obesity should aim to improve dietary behaviours by improving the availability, affordability and acceptability of healthy diets and decreasing the availability, affordability and acceptability of unhealthy diets or food and beverage dietary guidelines respectively.

Keywords: Overweight; Obesity; Risk-Factors; Adolescents

Introduction

While traditionally, overweight and obesity were public health challenges only for high-income countries, it is believed that the rise of obesity in developing countries is likely to create a tremendous public health burden [26], because obesity in children and adolescents is strongly associated with much comorbidity [7,28,34]. However, overweight and obesity are now on the rise even in low- and middle-income countries, particularly in urban settings [56]. What could have contributed to the rise? Research [9,19] has established that physically active youth have less levels of body fat than youth who are less involved in physical activity [17,39].

Furthermore, Remesh [33] established that the overweight adolescents have a 70% likelihood of becoming overweight adult-

hood, which may reach 80% when one of the parents is overweight or obese. Likewise, results of [34] showed that overall, 14.2% of the participants (5.1% of males, and 18.6% of females) among Lusaka residents were obese. It has been noted that non-communicable diseases are mainly found among people who are overweight and/or obese. Statistical inferences hinted those conditions such as depression, diabetes, cancer, respiratory diseases, and cardiovascular disease would increase from 40% of the health burden in developing countries in 2002 to nearly 75% in 2020, all these emanating from obesity [58]. Regrettably, up to 80% of heart disease, stroke, and type 2 diabetes and over a third of cancers can be stopped by reducing common risk-factors, such as smoking tobacco and related substances, unhealthy foods and drinks, physical inactivity and the alcohol abuse. Unless prevented, the morbidity and mortality from these health problems will never stop to increase as data

from the World Health Organisation (WHO) (2008) clearly showed NCDs' deaths increased by 17% over the succeeding 10 years. The highest statistics were observed in the African region (27%) and Asia (25%). Evidence-based conclusions [11,30,42] show that obesity has reached epidemic proportions and remain one of the paramount public health challenge and affects the social, and economic aspects of health in the contemporary society. Without a robust school-based public health interventions, it will most likely be impossible to inverse the epidemic upward prevalence rates [42]. In an article on addressing the social determinant of health in youth people, the Lancet observed that more females from lower-income nations consistently reported feelings of inadequate physical and mental health and less involvement in physical activity than their male counterparts from the developed countries. These socio-economic health inequalities will persist and increase, unless addressed rapidly stated the report.

Study results [11,20] found that homes and schools environments are the most significant foci for overweight and obesity primary prevention strategy among children and adolescents. A scrutiny of variables that influence energy balance to the identification of more proximal influences on those variables has been found to be very effective. This strategy may help to narrow the interventions necessary to prevent or treat childhood obesity. For example, since more than four hours television viewing affects both energy intake and energy expenditure, an effective intervention should logically target time spent watching television.

Strategies that would increase levels of awareness about overweight and obesity health effects and preventative interventions are essential in developing countries. Lessons can be drawn from for instance the United States: to control calorie imbalances, people have been encouraged to reform from energy-dense to nutrient-dense foods and drinks [53]. Schools play a mainly significant role by establishing a safe and supportive environment with rules and practices that create and maintain healthy behaviours. Schools have the potential to offer learning opportunities for not only learners but also teachers and surrounding communities about practicing a healthy promoting lifestyle [53]. Furthermore [6] emanating from development and urbanisation, there is an increase in prevalence of obesity in children, adolescents, and adults, especially women. Sadly, observations show that there has been an unreasonably small importance in national economic expenditures

targeting increasing consciousness of the devastating healthcare negative health effects of obesity. For example, [27] stated that the world's large portion (90%) of diseases burden occurs in low- and middle-income nations, while only 10% of health expenditures have allocated them. Importantly, [2] recommended that due to the bad health outcomes linking over-nutrient and under-nutrition, overweight and obesity, it is vital to fully know its prevalence rates and underlying risk-factors in school-aged adolescents. Adolescence is the transition stage to adulthood, and a period of life in which the world needs to pay more attention, means and determination today. Or else, in the future, the world will suffer social and economic consequences of a generation ill-equipped to become fully contributing members of global society [55]. Public health practitioners should advocate for a sustainable development lifestyle that targets improving the adolescents' health if current plans take the future generations in consideration.

During the 2010 Population and Housing Census, Zambia was found to have 25% of the population as adolescents, putting the country to one of the highest proportions of adolescents in the world, above the Sub-Saharan African average of 23%. The way a society handles adolescents in line with education, health care and equality defines not only their future but also the futures of countries. Therefore, what occurs in adolescence might either permit or hamper adolescents in adulthood [56].

Adolescence and early adulthood characterise a period of experimentation and identity foundation. In addition, during this stage, lifelong behaviours are begun or established, which may compromise or improve health. Considering the significant percentage of adolescents in the Zambian population, the worldwide threat of the overweight and obesity pandemic, and the scarcity of literature about overweight/obesity and associated risk-factors in Zambian schools; and taking cognisance that many research studies [14,47] recommended that identifying risk factors associated with overweight and obesity in school children would help to develop appropriate interventions to reduce the future burden of overweight and obesity among young population, the researchers examined: "risk-factors associated with overweight and obesity among adolescents in selected urban and peri-urban secondary schools in Monze, Zambia". The study answered the following research questions

- What are the risk-factors associated with the problem of overweight and obesity among adolescents from selected Monze urban and peri-urban secondary schools?
- To what extent do respondents meet the Global School Health Survey PA guidelines of one hour per day?

Materials and Methods

Research design

This study followed a cross-sectional design to achieve its objectives. Such a design is concerned with how what is or what exists is related to some preceding event that has influenced or affected a present condition or event [8].

Study area and population

Monze, in the Southern Province of Zambia, is close to 180 km south-west of Lusaka, the capital city. Monze 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). The population of study comprised of secondary school participants in Monze-urban and peri-urban registered and present at the time of data collection. The population of learners in secondary schools in the eighth grade to 12 were 2319. The study sample was six schools (3 urban and 3 peri-urban) out of 12 in total.

Sample size and sampling method

$Z = 1.96$ [95% confidence interval]

$P = 30\%$

$Q = 100\% - p = 70$

$e = 5\%$

$n =$

$n = 352$

A sample size of 352 respondents was chosen. A randomised sample technique was used in data collection from the sampled institutions. Research tools in the form of questionnaires were distributed to respondents who accepted to be part of the study. Details about the purpose and objectives of the study and how it was

to going to be conducted were made clear to participants. Statistics regarding whether a selected school offers a favourable environment to prevent obesity were collected from the school leadership. Data concerned policy, physical activity practices, frequency of the activities, and health education focused on overweight and obesity prevention. The following are characteristics of physical activity supportive school-environment: physical activity: walking and cycling space, sports and recreation facilities and equipment.

- **Food:** food-based guidelines, reduction of salt level, use of trans-fatty acids products, saturated fats' use, limiting free sugars.
- **Education:** Existence of literature on healthy diets, importance of regular physical activity, health education and promotion. Streamlined lessons on chronic non-communicable diseases.

Research tool

An organised survey form was used to get information on the food eating behaviours and lifestyle of the respondents. The questionnaire included of demographics, information of eating behaviours and that of frequency of physical activity practice. A pilot study was done to ensure that tool is clear and reliable and valid.

Ethical considerations

From the Ministry of Education and health in Zambia, authority to conduct the study was sought and granted. Approval letters from the above-named ministries were used to inform provincial and district authorities, while schools' authorities were contacted to plan together on modalities of collecting data. Collected information has been kept confidential and will remain anonymous as no individual codes were used. Findings will be used only for the purpose of this study. All research procedures which included voluntary participation, no invasiveness, and no rewards given were intimated to participants. To ensure anonymity, schools were tagged A, B, C, D, E and F. The first three schools were peri-urban, whereas the last three were urban.

Data analysis

To analysed data, the statistical package for social sciences (SPSS) was used. The analysis computation brought about both de-

scriptive and inferential information about the population of study. The body mass index (BMI) Tool for School children, which is an Excel spread sheets used in childcare and other professions to calculate the BMI-for-age for a group was used. The spread sheet computes body mass index and the BMI percentiles for each respondent from the height and weight indicators by gender, date of birth, and the date at which the measurements were performed. Results of cross-tabulations showed relations between demographics and other variables such as physical activity/inactivity, way of life, dietary behaviours and level of knowledge about overweight and obesity risk-factors. The level of knowledge was determined through the Delphi experts' score: participants who scored less than 50% of the questions were classified low, ≥ 50 - 80% moderate, and high for scoring ≥ 80% of all the questions items.

To determine significant risk- factors associated with overweight and obesity, the statistician used the multivariate logistic regression analysis. A Chi square test was applied to analyse any statistical significance among overweight and obesity risk-factors. To establish statistical significance of the variables under study, a ρ-value of less or equal to 0.05% adopted.

Results

Results on demographic characteristics

For anonymity purposes, no names of schools were used in data analysis and presentation of results, thus alphabet letters: A, B, C, D, E, and F served the purpose. Of the total number of participants (n = 358), A represented 15.1% (54), B: 21.2% (76), C: 17% (61), D: 16.2% (58), E: 12.8% (46) and F represented 17.6% (63) respondents respectively. Respondents' descending distribution per grade of study was as follows: 2.5%, 27.3%, 24.5%, 21.4%, (24%. Respondents' distribution per gender was 151 (42.2%) and 207 (57.8%) males and females respectively.

Information from Table ones show that the total number of respondents was 358, of which 151 (42.2%) were males. Of great significance a good number of males (84.1%) than females (60.4%) were urban dwellers (p < 0.001). The majority of parents (61.5%) were salaried professionals. Generally, 4.7% (17) of the participants were found obese. There was no significant gender difference 4.0% for males vis a vis 5.3% for their females counterparts, ρ = 0.736). The latter observation was made in terms of overweight

Factor	Total n (%)	Male n (%)	Female 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)
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)

Table 1: Sample description.

findings: 17.9% of males versus 19.8% for females, p = 0.747). Altogether, 23.7% of respondents (21.9% of males and 25.1% of females; p = 0.554) were either overweight (≥ 85th but below 95th percentiles) or obese (≥ 95th percentile).

The findings of this research study showed that more females were overweight/obese 25%, than males (22%), (n = 358). Furthermore, figure seven portrayed that obesity epidemic was a bit higher among females (5%) than males (4%). Considering the high prevalence of overweight and obesity in the studied population, one would want to know the social-demographic and economic factors associated with the problem at hand. The following table summarises these factors as in table number two.

	Overweight/ obese	Not overweight/ obese	
Factor	n (%)	n (%)	p-value
Age (years)			
< 14	12 (14.1)	37 (13.6)	0.386
14	20 (23.5)	49 (17.9)	
15	19 (22.4)	75 (27.5)	
16	21 (24.7)	52 (19.0)	
17+	13 (15.3)	60 (22.0)	
Gender			
Male	33 (38.8)	118 (43.2)	0.554
Female	52 (61.2)	155 (56.8)	
Residence			
Rural	19 (22.4)	87 (31.9)	0.123
Urban	66 (77.6)	186 (68.1)	
Profession			
Salaried	55 (64.7)	165 (60.4)	0.779
Farming	19 (22.4)	68 (24.9)	
Business	11 (12.9)	40 (14.7)	

Table 2: Socio-demographic and economic factors associated with overweight or obese.

^a Obtained by Yates' corrected Chi-square.

Results of socio-demographic and economic factors associated with overweight, or obesity shows that there seemed to be an equal distribution of body mass index-age percentile across ages (< 14 to ± 17 years (13.6, 17.9, 27.5, 19 and 22%) respectively. Of the overweight/obese, males constituted a higher ratio (61.2%) against 38.8% females. The majority (77.6%) of the overweight and obese were from town. The larger proportion (64.7%) of the overweight/obese respondents had salaried parents and respondents from salaried parents constituted 60.4% of the overweight or obesity group. It was noteworthy that none of these factors was significant p-value 0.05%.

Since salaried people have a high social-economic status, with modern means of transport, which leads to less physical movement, it was pertinent for the research to identify physical activity or inactivity factors associated with overweight or obesity. Table 9 offers a summary of the factors

	Overweight/ obese	Not over- weight/obese	
Factor	n (%)	n (%)	p value
Time in PA			
1	81 (95.3)	239 (87.5)	0.068
2	4 (4.7)	34 (12.5)	
Time in moder- ate PA			
1	83 (97.6)	254 (93.0)	0.189
2	2 (2.4)	19 (7.0)	
Time in high intensity PA			
1	76 (89.4)	246 (90.1)	1.000
2	9 (10.6)	27 (9.9)	
Time in self-de- fence PA			
1	82 (96.5)	267 (97.8)	0.773
2	3 (3.5)	6 (2.2)	
Time in body- building PA			
1	84 (98.8)	273 (100.0)	0.537
2	1 (1.2)	0 (0)	

Table 3: Physical activity/ inactivity factors associated with overweight or obese.

The majority (> 80%) of respondents spent less or equal to one-hour in general physical activity, moderate physical activity, high intensity, self-defence and body-building physical activities (95.3%, 97.6%, 89.4, 96.5% and 98.8% respectively). None of the factors was significant at 0.05% level of significance. In addition to activity/inactivity of respondents, it was important to highlight their lifestyle factors that influence overweight or obesity

Of those who watched television during weekdays and/or weekends for less or equal to two hours represented 18.8% were from the overweight group. During weekends, those who played digital games 23.5% were overweight or obese, while during weekdays, 12.9% of those who used digital games were overweight or obese.

During weekdays, of those who slept for less than two hours per night 282 (78.8%) were either overweight or obese, while during

Factor	Overweight/ obese	Not overweight/ obese	p value
TV weekdays			
1	69 (81.2)	215 (78.8)	0.743
2	16 (18.8)	58 (21.2)	
TV week ends			
1	69 (81.2)	215 (78.8)	0.743
2	16 (18.8)	58 (21.2)	
Digital games week ends			
1	65 (76.5)	215 (78.8)	0.768
2	20 (23.5)	58 (21.2)	
Digital games weekdays			
1	74 (87.1)	236 (86.4)	1.000
2	11 (12.9)	37 (13.6)	
Hours slept weekdays			
1	67 (78.8)	194 (71.1)	0.205
2	18 (21.2)	79 (28.9)	
Hours slept week ends			
1	39 (45.9)	136 (49.8)	0.610
2	46 (54.1)	137 (50.2)	

Table 4: Respondents’ lifestyle behaviours that affect overweight/obesity.

weekends, they represented 164 (45.9%). However, none of these significant at the level of significance of 0.05%.

Results on respondents’ dietary habits

The results of this study showed that only 2.2% did not take breakfast, while 237 (66.2%) took breakfast daily. The remaining 28% took breakfast between one and five times per week. When it came to snacking, 61.7% acknowledged eating-in-between meals (snacking), while 38.3% did not snack.

Pertaining to the frequency of taking sugary drinks (soft drinks), 75 (20.9%) did not take any soft drinks, while 66 (18.4%) took soft drinks daily. Results showed that 225 (62.8%) did not take energy

drinks (such as red bull, Monster energy, Energade, Proburst, Burn, Score or any other), while 23 (6.4%) took such drinks daily. The remainder 110 (30.8%), took energy drinks between one and six time per week.

The frequency of eating vegetables was such that 28 (7.6%) did not consume them at all. Of the total sample (n = 358), 178 (49.7%) ate vegetables daily, while 42.5% consumed vegetables between one and six times per week, of which 11.5% ate them three times. For fruits, 99 (27.7%) did not eat fruits at all, while 45 (12.6%) consumed fruits on a daily basis. It has been discovered that 214 (59.7%) ate fruits between one and six times, of which 45 (12.6%) ate them twice and 80 (22.3%) ate fruits three times a week.

Results of the study further showed that of the total number of respondents (n = 358), 112 (31.3%) did not consume dairy products at all, while 58 (16.2%) consume them on daily basis. The remaining 188 (52.6%) took dairy between one to six times a week, of which 49 (13.7%) one, 42 (11.7%) twice, 31 (8.7%) three times and 35 (9.8%) four times per week.

Fast foods were not eaten by 107 respondents (29.9%), while 15 (4.2%) consumed fast foods daily. In the same vein, 65 (18.2%) consumed fast foods once, 66 (18.4%) twice, and 64 (17.9%) thrice a week consumed fast foods. Four, five and six times were represented by 19 (5.3%), 15 (4.2%) and 7 (2%) respectively.

Responses on television influence on respondents’ food choices, 226 (63.1%) said yes, television does influence their foods/drinks choices, while 36.9% said television does not influence their foods/drinks choices. The majority of respondents 269 (75.1%) acknowledged that sometimes parents restrict them from consuming healthy foods/drinks, but 89 (24.9%) were not restricted.

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Of the total respondents (n = 358), of those who did not regularly take breakfast 126 (35.3%) were either overweight or obese, while those who snacked were 54 (63.5%). Of those who consumed sugary/soft drinks (Coke, Pepsi, 7 up, sports drinks), 68 (80%) were overweight or obese, while 34 (40%) took energy drinks (Red bull, Monster energy, Energade, Proburst, Burn, etc....).

Results of this study showed that of those who did not eat regularly vegetables 44 (51.8%) and fruits 71 (83.5%) were overweight or obese. Furthermore, 58(68.2%) who ate fast foods were overweight or obese ate fast foods, while 53 (62.4% acknowledged be-

ing influenced by television adverts in their food choices. It was found that 66 (77.6%) of respondents who had parental restrictions to consume unhealthy foods were either overweight or obese.

Factor	Overweight/obese	Not overweight/obese	ρ value
Breakfast days			
1	30 (35.3)	91 (33.3)	0.840
2	55 (64.7)	182 (66.7)	
Snacking			
1	31 (36.5)	106 (38.8)	0.793
2	54 (63.5)	167 (61.2)	
Taking sugary drinks (soft drinks)			
1	17 (20.0)	58 (21.2)	0.925
2	68 (80.0)	215 (78.8)	
Taking energy drinks			
1	51 (60.0)	174 (63.7)	0.621
2	34 (40.0)	99 (36.3)	
Frequency of eating vegetables			
1	44 (51.8)	136 (49.8)	0.850
2	41 (48.2)	137 (50.2)	
Frequency of eating fruits			
1	71 (83.5)	242 (88.6)	0.291
2	14 (16.5)	31 (11.4)	
Frequency of dairy products			
1	66 (77.6)	234 (85.7)	0.111
2	19 (22.4)	39 (14.3)	
Eating fast foods			
1	27 (31.8)	80 (29.3)	0.776
2	58 (68.2)	193 (70.7)	
TV influence in food choice			
1	32 (37.6)	100 (36.6)	0.967
2	53 (62.4)	173 (63.4)	
Parents restrict unhealthy foods			
1	19 (22.4)	70 (25.6)	0.639
2	66 (77.6)	203 (74.4)	

Table 5: Dietary habits that impact overweight and obesity.

Factor	AOR (95% CI)
Time spent in physical activity (hours)	
≤ 1	2.16 (1.04, 4.46)
> 1	1
Awareness that junk foods and drinks increases the risk of overweight or obesity	
False	0.66 (0.46, 0.97)
True	1

Tale 6: Factors associated with overweight or obesity in a multivariate logistic regression analysis.

To factors found during the univariate analysis to be significant using underweight/normal and overweight/obese as the dichotomous as dependent variables, a multivariate binary logistic regression models were applied only and Table 12 above presents results. Participants who spent less or equal to one hour in physical activity were twice more likely to be overweight or obese. In addition, results showed that those who were not aware that consumption of junk foods and drinks increases the risk of overweight and obesity had a 6.6% likelihood of become overweight or obese.

Discussion of Results

Concerning to lifestyle behaviours with regard to presence of absence of overweight/obesity, the majority (81.2%) watched television during weekdays for less or equal to two hours per day. The remaining 18.8% percent watched television for more or equal to two hours. Comparable results found television viewing on an average school day exceeded two hours/day among 43% of students. These findings were consistent with [21] who found that overweight is associated with being sedentary, eating insufficient fruits and vegetables and watching television more than two hours per day. Various studies have identified risk-factors associated with childhood obesity: increase in screen-time, for example watching television and playing computer games among others [5]. Tough these results were found among children; they can be inferred to adolescents.

Investigators have suggested that the positive association between television viewing and child overweight may be owing to decreased physical activity, increases in caloric intake or a reduction in resting metabolic rate [16]. This explanation holds for digital games where the findings indicated that 23.5% and 12.9% played

the games during weekends and weekdays respectively. This is contrary to the American Academy of Paediatrics guidelines that Limit children’s total media time (with entertainment media) to no more than 1 to 2 hours of quality programming per day [59].

The majority (78.8%) reported sleeping less than 8 hours per night during weekdays. However, the percentage regressed to 45.9% during weekends. Similarly, two studies [23,36] have demonstrated that children aged between nine to 12 years who received less than 10 hours of sleep per night were more likely to be obese. In addition [18] highlighted that sleep helps to maintain a healthy balance of the hormones that make one feel hungry or full. Sleep deprivation can cause changes in hormones that increase appetite - sleep deprivation triggers increased levels of ghrelin and decrease leptin, leading to more hunger sensation and appetite in both children and adults [15].

Results of this study showed that 35.3% of the overweight and obese respondents did not regularly take breakfast; 63.5% used to snack, while 40% used to take energy drinks. Furthermore, 83.5% of the overweight and obese respondents did not eat regularly fruits and 68.2% used to consume fast foods. Finally, 62.4% were influenced by television advertisements and 22.4% did not face any parental restrictions toward consumption of unhealthy foods/drinks. These findings were similar to previous studies: [5] found eating fast foods more than twice per week increased the risk of becoming obese by 86%. It has been found [22] that there is a significant association between overweight and obesity and urban dwelling - living in towns makes dwellers more prone to overweight and obesity than were: urban dwelling (odds ratio (OR): 4.0, 95% confidence interval (CI): 2.7-6.0); less participation in sports activities at school (OR: 1.7, 95% CI: 1.1-2.6); homes with high income (OR: 1.7, 95% CI: 1.1-2.6); having parents who control kids’ snacks (OR: 1.5, 95% CI: 1.03-2.0); more than four times per week consumption of soft/sugary drinks (OR: 1.6, 95% CI: 1.02-2.5). In addition, [13] discovered that of the total number of respondents (n = 475), about one third of both males and females were overweight (28.6% and 30.4%) respectively; the highest frequencies of both males and females never or sometimes had breakfast and took only one meal per day (64.3% and 51.7% and 55.7% and 60%).

Results of the present study are correlate with [4] who established that a good number of adolescents who made the sample did

not eat regularly fruits and vegetables: In their findings (n = 431), 27.4% consumed fruit more than four days per week, while the majority (248) participants consumed fruits from one to three times per week, and the outstanding 13.5% of respondents did partake of any fruits. The sample study of this research was made of urban and peri-urban secondary schools, among which private school. Furthermore, [12] found that adolescents in non-government schools might have less control on food and snack selections paralleled with government schools. The possible reason adolescents in non-government run schools usually mainly come from families with high socioeconomic groups (give pocket money to children, which is spent on snacks, which is a risk-factor in non-communicable diseases). The findings of this study support [51] who found that income of the family (> 30,000 Rs./month) and socioeconomic status (upper class) was significantly dependent on the amount of money received by children ($p < 0.05$).

This research's results further showed that those who spent less than one hour per day in physical activity were twice more expected to be overweight or obese. This is consistent with those of [22] who reported low physical activity (OR: 2.0, 95% CI: 1.1-3.8) to be linked to overweight/obesity. It is noteworthy that respondents self-reported being physically active. However, some do not commit enough time to burn extract energy consumed, thus, contributing to overweight or obesity high prevalence. That is why; the United State of America College of Sports Medicine recommends that children and adolescents should spend at least 60 minutes of physical activity daily. This can be part of transportation to school, physical education, sport activities, free play and planned exercises. These activities should be a blend of moderate and vigorous intensity, increase breathing, sweating, and heart rate [59].

This research showed that respondents without enough knowledge that unhealthy foods and drinks increase the risk of overweight and obesity had 6.6% chance of becoming victims of overweight and obesity. The finding affirmed results of [24] in which concerns were raised about high intakes of sweetened beverages and their possible risk-factor association to increased prevalence of overweight and obesity among children. Even [22] had discovered that high energy intakes (OR: 1.8, 95% CI: 1.1-2.9) were risk factor to overweight and obesity.

Pertaining to awareness of risk-factors of overweight and obesity by gender presented in table eight, results of the study presented that out of 20 variables measured, females scored low 10 times (50%), while males did seven times (35%) - suggesting that the females had a low level of awareness about overweight and obesity risk-factors. Overall, results showed 30% high, 55% moderate and 15% low levels of awareness respectively. Therefore, it will be appropriate for prevention and control interventions to focus on females. Factors "overweight and obesity are largely preventable" and "overweight and obesity have the same rates both poor and rich countries" were significant ($p = 0.005$). It meant that respondents who were not aware that the diseases are preventable did not mind their lifestyle (foods and drinks consumption, as being regularly active) and were more susceptible to accumulate more weight. We noted that the awareness level of 30% was higher than that established among Indian adolescents of 3% [1].

The present results indicated that there was almost same lack of awareness about alcohol abusive consumption and the ever-increasing prevalence of overweight and obesity (45.7% for males against 46.9% for females). Importantly, the findings go hand in hand with the image portrayed in the Zambia 2004 Global School-based Student Health Survey (GSHS), which pointed out that among 13 to 15 years teenagers were as high as 38.7% among gentlemen, and 45.1% among ladies [59]. The GSHS' results were doubled those of adults: [29] noted a prevalence of alcohol consumption alcohol of 20.7% (37.9% of gentlemen and 12.2% of ladies). Nevertheless, the researchers observed that [29]'s results were higher than those of [37]: 29% of the 4,339 respondents, who had no knowledge about the health effects of alcohol abuse.

Conclusion

Various risk-factors associated with overweight and obesity among adolescents in peri-and urban secondary schools in Monze, Zambia include: inadequate time in physical activity, consumption of sugar-sweetened beverages, eating fast foods, snacking, television viewing and use of digital games, irregularity in consumption of fruits and vegetables, sleeping less than eight hours per night, skipping breakfast, lack of parental support and insufficient awareness about risk factors. These are modifiable risk-factors in the prevention and control of non-communicable diseases. Results of

this study showed that there was a significant difference between residing in peri-urban area and urban area ($\rho = 0.05\%$).

Recommendations

- Enact and implement a national policy that reduce overweight and obesity the risk-factors among adolescents
- Make physical activity compulsory for all adolescents in schools.
- Increase consumption of fruits, vegetables, and other fibre-rich foods in schools.
- Stop foods and beverages television adverts that target children and adolescents.
- Monitoring/supervision of the sleeping times for adolescents.
- Limit/control the use of digital games.

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