REVIEW ARTICLE

Determinants of overweight and obesity among adolescents in Zimbabwe: A scoping review

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Abstract

Background: Childhood obesity is a growing public health concern worldwide. Unfortunately, the health interventions remain biased towards addressing undernutrition. **Aims**: The study aimed to summarize the evidence on the determinants of obesity among adolescents in Zimbabwe. **Methods:** The Bronfenbrenner socio-ecological model (SEM) was used to classify these determinants: individual, social, environmental, and economic or government policies. The five-stage Arksey and O'Malley review methodology was used to formulate research questions, systematically search, and screen for relevant studies done between 2010 and 2020, data extraction, and summarizing the evidence. Google, PubMed, Google scholar, and United Nations websites were searched to identify relevant studies. The search yielded 22 results. Anthropometric indicators and the determinants assessed in each study were extracted. **Results:** Only 10 studies explored the determinants of obesity among adolescents in Zimbabwe. The risk of obesity was higher among older adolescents (16-19 years), particularly girls who reside in urban settings. Interestingly, girls had higher nutrition knowledge compared to boys. At the environmental level, fast food consumption, unhealthy snacking, low dietary diversity, carrying a packed lunchbox to school, and using non-active forms of transport to school was associated with obesity. In addition, having formally employed parents, and a small family size increased the odds of obesity. At the societal level, high family income and Christianity increased the rate of obesity. Economic instability appears to drive the availability and consumption of cheap unhealthy foods, particularly within the school environments. **Conclusions**: Adolescence is a critical stage where obesity starts to increase especially in girls as they graduate into adulthood. Sedentary lifestyles and the adoption of unhealthy dietary decisions appear to be exuberating this obesity problem in urban areas. School-based, family-oriented obesity prevention interventions which address gender discrepancies in eating habits and physical activity are recommended in these and related settings.

Keywords: Adolescents, obesity, socio-ecological model, malnutrition, Zimbabwe.

1   Introduction

Obesity has been known to be a contributing factor to the development of non-communicable diseases (NCDs) which include diabetes, hypertension, and coronary heart diseases [1]. Recent evidence is indicating that obesity is now prevalent in low to medium-income countries (LMICs) and nutrition transition, economic transition, and urbanization are major driving forces behind the increase in levels of obesity in LMICs, despite the persistence of undernutrition [2]. Undernutrition and obesity may coexist in countries and even smaller communities and households, being referred to as the double burden of malnutrition [3].

Zimbabwe has undergone complex health and demographic transition resulting in the double burden of malnutrition [4]. Nevertheless, the high levels of undernutrition persist in relation to the high levels of food insecurity [5]. On the other hand, a rapid nutrition transition characterized by a shift from staple foods towards an energy-dense diet is occurring alongside urbanization[6]. The changing food systems in urban areas result in easy access to ultra-processed foods and a general shift from traditional cuisine and active lifestyles [7]. Although Zimbabwe has not been spared from these effects of obesity and associated non-communicable

diseases [8], less effort has been placed on addressing overweight and obesity, especially among adolescents. Adolescents' nutrition has been neglected in Zimbabwe, and this is supported by the limited data on adolescents' nutrition and very few researchers have targeted this age group [9].

WHO defines adolescents as individuals in the 10-19-year age group and "youth" as the 15-24- year age group [10]. Obesity in children and adolescents aged 5–19 years is defined as body mass index (BMI) for- age- Z-score above +2 standard deviations, according to WHO age- and gender-specific growth reference charts [10,11]. Childhood and adolescent obesity often result from complex relationships which can be categorized at various levels based on the Socio-Ecological Model (SEM) [12,13]. This model provides a framework to understand the factors that impact an individual's health [12].

The SEM in obesity research suggests that obesity is influenced by factors across multiple levels: individual and family characteristics, as well as characteristics of the home, society, region, and country [14]. Macro-level factors including social norms, economic policies, and advertising have an indirect influence on behaviors as they provide unhealthy environments

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which make it difficult for individuals to adopt healthy eating behaviors that prevent overweight and obesity [15]. However, despite the rising obesity burden in low-income countries like Zimbabwe, the risk factors for overweight and obesity are still not known [16]. It is important to use the SEM to identify and categorize the risk factors in these low-income settings.

Therefore, this review aims to summarize evidence of the determinants of obesity among adolescents in Zimbabwe using the SEM. The findings of the review will be useful in informing policy and programming decisions in the country.

2 Methods

This scoping review followed the five-stage review methodology proposed by Arksey and O'Malley [17]. This approach involved (1) identifying the research questions, (2) identifying relevant studies, (3) study selection, (4) charting the data, and (5) collating and summarizing the data.

Stage 1: Identifying the research questions

This study's research questions arose from the need to identify which SEM level of adolescence obesity determinants have been studied in Zimbabwe, and to identify the gaps in the literature. Furthermore, the questions intended to verify the affected population, exposure, prevalence, distribution, and the risk factors of adolescents' obesity in Zimbabwe. The main review question was: *Which SEM levels of determinants of adolescent obesity have been studied in Zimbabwe?*

Stage 2: Identifying relevant studies

Relevant literature on the burden of adolescents' obesity in Zimbabwe was identified through a thorough search on Google, PubMed, and Google scholar regardless of publication status (published, unpublished, press, and conference articles). However, enough relevance to answer the research questions was required. Grey areas in literature were also searched using Google as well as websites from International Organizations for example the World Health Organization. This search was done targeting literature written between 2010 to the current search date. Specific keywords were used in the thorough search. These words included *obesity, overweight, BMI, youth, prevalence, adolescents, distribution, burden, incidence, risk factors, and Zimbabwe.* Boolean operators (and, or not) were used to combine keywords and thus broaden or narrow the search.

Stage 3: Study selection

A pre-set inclusion and exclusion criterion was used to screen studies for eligibility. The included studies showed evidence of studies and reports from National surveys conducted in Zimbabwe conducted from 2010-2020. These studies should have presented evidence of the prevalence and determinants of obesity among adolescents between 10-19 years [18]. To avoid duplication, we excluded African studies with Zimbabwean data. We excluded studies with participants outside the 10-19 years age range.

Stage 4: Charting the data

The primary outcomes considered in this review were overweight, obesity, and central obesity. Obesity in children and adolescents aged 5-19 years is defined as body mass index (BMI) for- age- Z-score above +2 standard deviations, according to WHO age- and gender-specific growth reference charts. BMI cut points by age and sex for overweight and obesity for children aged 2 to 18 correspond to adult BMI of 25 kg/m^2 (overweight) or 30 kg/m^2 (obesity) [10,19].

Studies were screened to identify which SEM level of childhood obesity determinants were addressed. The SEM levels of the variables analyzed in each study were identified considering the description of each SEM level presented as follows, and not according to the conceptualization of such aspects made by each study. The SEM levels used in this scoping review were based on the Bronfenbrenner theory [20] : (1) the individual level that includes all factors intrinsically related to the child such as age, gender, biological and anthropometric information as well as personal beliefs and behaviors; (2) the environmental level that comprises the characteristics of parents, close relatives, and peers such as, educational level, home, and school settings among others; (3) the social level which is mostly associated with the social associations, socioeconomic status religious groups or other groups that the adolescent is integrated into; (4) the economic and government policies level, that is comprised of factors of a broader dimension such as economy, legislation, and policies documentation.

Stage 5: Collating and summarizing the data

The results are presented in the figure and table format. Figure 1 summarizes the number of identified papers, screened papers, and papers included in this study. While, Table 1 shows the detailed characteristics of the selected studies including the author(s), year of publication, the aim of the study, and the percentage prevalence of obesity. Table 2 shows the SEM levels and the respective
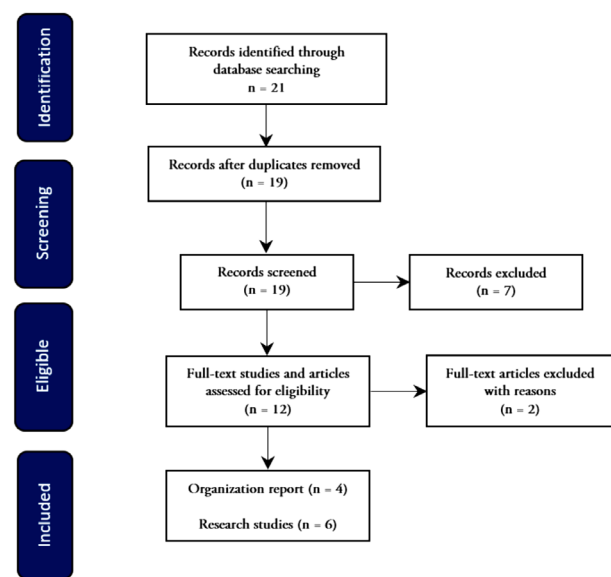

Figure 1: Flow chart showing the review process of the articles included in this study

Table 1: Descriptions of the selected studies and national surveys involving adolescents' obesity

Author(s) and year	n	Age in years	Study design and Anthropometric indicators	Aim of study	Prevalence of obesity	SE factors identified
Muderedzwa and Matsungo, 2020 [21]	368	9-14	Cross-sectional BMI	To determine the nutritional status, physical activity levels, and associated nutritional knowledge of primary school learners.	Boys- 24.1% Girls-27.3%	-Individual factors
Mangemba and San-Sabastian, 2020 [22]	8904	15-29*	Cross-sectional BMI	To determine the socioeconomic risk factors for overweight in non-pregnant women in Zimbabwe.	Girls- 5.84%	-Individual factors -Environmental factors -Societal factors
Mukora-Mutseyekwa et al., 2019 [27]	9066	15-19	Cross-sectional BMI	To investigate the trends and demographic, socioeconomic, and behavioral risk factors for overweight and obesity among Zimbabwean women of reproductive age.	Girls 15.5%- (2010-2011) 13.7%- (2015)	-Individual factors -Environmental factors -Societal factors
UNICEF Zimbabwe, 2019 [23]		15-19	Report	To provide the most comprehensive assessment yet of 21st century child malnutrition in all its forms	Girls-13%	-Individual factors -Environmental factors
Kambodo and Sartorious, 2018 [16]	990	10-12	Cross-sectional BMI and MUAC	To identify prominent risk factors for obesity, over fat, and overweight among primary school children.	Boys -7.34% Girls- 8.02%	-Individual factors -Environmental factors -Societal factors
Zimbabwe Nutrition Profile, 2018 [24] [1]		12-18	Desk review BMI	To capture the Country's Nutrition Profiles the burden of malnutrition at the global, regional, subregional, and country levels.	Not reported	-Economic factors
Scaling Up Nutrition, 2018 [25]		10-19	Baseline review	To monitor, evaluate, the drivers of nutrition and reduce the high prevalence of anemia, overweight/obesity, diabetes, and hypertension among women.	Girls-15%	-Individual factors -Environmental factors
Mufunda and Makuyana 2016 [8]	96	18-35*	Cross-sectional BMI	To investigate the youth's perception of obesity.	13% both Boys and Girls	-Individual factors
ZDHS, 2016 [26] [a]		15-19	Cross-sectional BMI	Not reported.	Girls-35%	Not reported
GNR, Zimbabwe, 2020 [a]		5-19*	Desk review and self-evaluation	To provide information on adult, adolescent, and child diet, the burden of malnutrition, nutrition strategies and financing, and social determinants of nutrition.	6.0% both Boys and Girls	Not reported

* Data was not segregated by the 10-19 years age group.

[a] ZDHS-Zimbabwe Demographic Health Survey and 2 GNR- Global Nutrition Report

variables discussed in the reviewed studies and a socioecological model was designed to summarize the risk factor levels (Figure 2).

2.1 Characteristics of the included studies

A total of five papers and one national survey reviewed in this study included participants from both boys and girls. (Table 1). Two papers and two national surveys focused on girls only. None of the included studies or national surveys focused on boys only. None of the studies had the specified age range of 10-19 years, however, were possible, segregated data for the targeted age range was extracted from the studies. Most of the studies were done in the urban areas and national health surveys were done in both urban and rural areas and two studies were conducted in

universities; hence it is unclear whether the participants were from a rural setting or urban setting.

3 Results

The search generated 21 results and based on the eligibility criteria only ten studies were included in the review (Figure 1). Seven studies were included because they focused on the 10-19 age range or part of the age range, and they presented evidence on the prevalence of adolescents' obesity supported by SEM factors. Three reports/articles were also included in this review. According to the data evidence presented by the reports and the studies, the evidence from the studies was easy to analyze since the data was segregated by age in most cases and SEM determinants could be extracted easily.

Table 2: Studies on the individual, environmental, societal, and economic determinants of adolescents' obesity in Zimbabwe

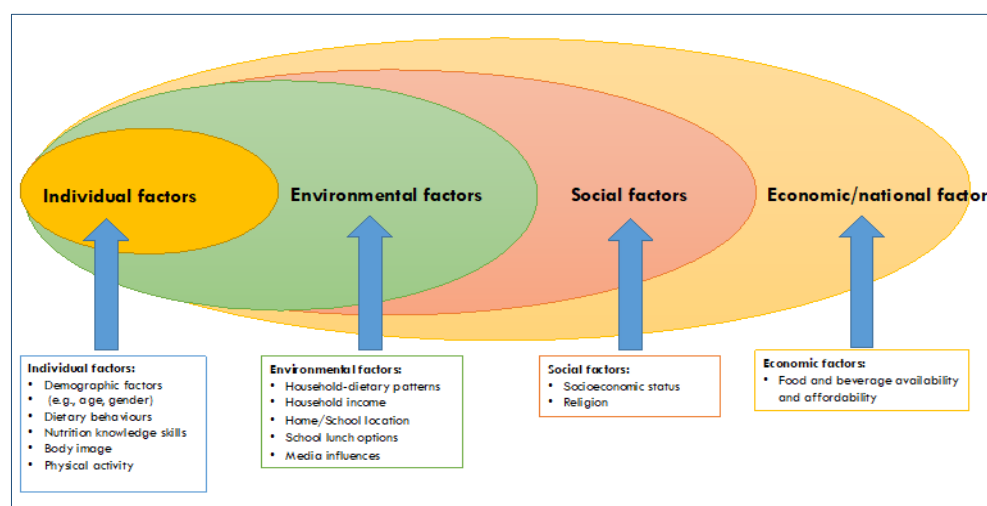| SEM level	Variables	Key findings	References
Individual	Age	- Obesity was common in the younger adolescent age group (< 16 years) compared to the older adolescents.	23
	Sex/gender	- Girls are at a higher risk of obesity - There was a 4% increase in obesity over 4 years.	23, 24, 25, 26 27
	Diet	- There was a positive association between the consumption of fast foods, unhealthy snacks, and obesity. - An inadequate dietary diversity score as a determinant of overweight.	23, 24, 26 21
	Nutrition knowledge	- Girls had more knowledge than boys and older adolescents were more knowledgeable than younger adolescents. - A knowledge gap was identified regarding nutrition knowledge and eating right. - Knowledgeable students were more likely to be obese than those who did not receive the information. - Parents were the source of information on healthy diets.	8 23 21
	Physical activity	- Students who used non-active forms of transport were likely to be obese.	21
	Perceptions towards obesity	- Respondents said obesity was not a problem and they were not worried about it because that is how they are. - Obesity is an ideal body weight preferred by the opposite sex.	8
Environmental	Home	- There is access to fruits and vegetables. - Small household sizes (1 child) were associated with a greater risk of obesity.	25 16, 26
	School	- Students were exposed to and purchased unhealthy processed foods. - Students cannot buy fruits and vegetables at school. - Guardians, peers, and teachers have very little influence on what students ate at school - Students who frequently purchased unhealthy foods at the tuck-shop were prone to obesity	23 24
	Parent's occupations	- Formally employed parents were associated with increased odds of being overweight/obese	16
	Urban or Rural settings	- Attending school or living in an urban area was associated with a greater risk of obesity	23, 16, 26, 27
Societal	Religion	- Christianity increases the rate of obesity.	26
	Socio-economic status	- The prevalence of overweight and obesity was associated with an increase in wealth.	16, 27
Economic/ national		- Economic instability has led to food insecurities	22

Figure 2: A Socio-ecological model summarizing the risk factors for adolescents' obesity in Zimbabwe

Figure 2 shows that various authors focused on different SEM level determinants and various variables. The most studied SEM level was the individual level followed by the environmental level. None of the reviewed studies researched all the factors (individual, environmental, societal, and economic determinants of adolescent obesity in Zimbabwe. Under the individual-level factors, diet and nutrition knowledge was the most studied, and only one study researched on physical activity [21]. The least studied SEM levels were the social and economic levels factors. Only one national survey briefly discussed the economic instability in Zimbabwe but further information on how this is contributing to adolescents' obesity was not provided [22].

Table 1 shows the summary of the characteristics of the eligible studies and national reports involving adolescents' obesity that were used in this review. None of the studies researched on the exact 10-19 years age range but they covered part of it.

Table 2 shows the variables discussed within each SEM level. Diet and nutritional knowledge were the most studied variables under the individual-level factors and many authors studied the association between urban or rural residence and obesity under the environmental level factors.

4   Discussion

The objective of this review was to explore the determinants of overweight and obesity among adolescents in Zimbabwe utilizing the socioecological model. Adolescents obesity literature is abundant in other countries by comparison to Zimbabwe. However, in Zimbabwe, obesity research is still an upcoming area of study as indicated by the limited studies presented by this review. Available evidence has shown that individual and environmental factors have been studied the most while few studies investigated the social and economic factors in the Zimbabwean context.

Some limitations were noted as follows: one of the studies targeted the specific 10-19 years adolescent age group and because of the various age ranges of the studies, analysis of the data was challenging. In addition, their methodologies focused more on determining the prevalence and distribution of the rate of obesity and they did not involve research on barriers to healthy eating or the self-efficacy of the adolescents to shift to healthier diets, both of which are instruments of nutritional interventions. Considering that most of the evidence reviewed was subnational studies, new studies that investigate the determinants of adolescent obesity at the national level are warranted. Nevertheless, the limited data available on this topic remains relevant to facilitate a deeper understanding of adolescents' obesity dynamics in Zimbabwe. In the proceeding sections, we discuss the individual, environmental, societal, and policy-related factors regarding obesity for this age group.

Individual factors

Girls were more likely to be obese than boys in the reviewed studies [8, 23, 24]. Similar results have been reported in systematic reviews which studied adolescents' obesity in Sub-Saharan

African studies [28, 29], and also in South African studies [30, 31]. Possible reasons include different levels of physical activity between boys and girls, the adoption of a sedentary lifestyle as girls grow older, and watching television for more than three hours a day [32]. In addition, participation in physical activity and sports, both in and out of school, decreases during adolescence, particularly for girls [33].

Furthermore, the adolescents are exposed to ultra-processed foods [23]. This agrees with available evidence from the USA which showed that the consumption of processed foods increased with time in adolescents [34]. This increased consumption of processed foods may be a result of food promotion and market targeting this age group [35]. These results are a direct cue for policymakers to introduce policies that protect children from unhealthy food marketing taking into consideration that children may not understand how marketing influences purchasing and eating habits.

Varying results were presented on the aspect of nutritional knowledge. Adolescents indicated that parents were the major source of information on healthy diets [21]. In addition, older adolescents were more knowledgeable than younger adolescents [8]. However, a knowledge gap was identified around obesity-related complications, predisposing factors, diet, and food preferences [8]. Furthermore, girls generally had higher k-nutrition knowledge scores (KNS) compared to boys [21]. This difference has been attributed to their dominant roles in food purchasing and preparation or lower interest in nutrition by boys [36, 37].

Interestingly, one study indicated that knowledgeable participants ate unhealthy foods regardless of the efforts done to help them eat right [23]. This implies that nutritional knowledge is not always translated to practice or dietary behavior changes [38]. This makes sense considering that adolescents in most households are not responsible for making decisions on food purchases and preparation [36]. Studies have shown that involving adolescents in food preparation increases diet quality and better-eating patterns [39] and is a good way to pass down food traditions [40]. Public health programs should encourage the involvement of adolescents in food purchase, preparation, and the use of digital platforms like YouTube and Cookpad to learn new food preparation techniques and increase dietary diversity. Interestingly, the review highlighted that although adolescents had a negative perception towards obesity [8], in most African settings, weight gain is acceptable as a sign of beauty, wealth, good health, and power [41]. This means that there is a need for intervention programs that target social norms and beliefs at the society level and body image perceptions and overall health on the individual level.

Environmental factors

Results showed that adolescents residing in urban settings had higher chances of becoming obese than their rural counterparts [24]. These results corroborate with other African studies which showed an association between urban settings and high BMI [42, 43]. However, contrary to this finding, Ghana reported higher rates of obesity in rural settings compared to urban settings [44].

The high rates of obesity in urban settings can be attributed to low physical activity and the use of non-active forms of transport in urban areas [21, 24]. In addition, obesogenic environments (media influences, food adverts, modernization of traditional markets) which foster easy access to high-calorie food choices are equally responsible for weight gains among urban dwellers [23, 45]. The finding that rural areas tend to have lower cases of obese adolescents is partially explained by the availability of healthier food options from "nutritional gardens" and the forests [36]. Whereas, in urban areas, the consumption of fruits and vegetables has declined due to the adoption of the Western diet [8, 38].

In some settings regardless of availability and affordability, healthier food options are shunned due to consumer perceptions of them being "poor people's foods", tasteless or bitter, and tedious in preparation [36, 46-48]. To increase the consumption of healthy foods in various settings, food policies should aim to increase the affordability, accessibility, and marketing of healthy foods [49]. Furthermore, intervention programs should aim to support food heritage and the transmission of food culture from parents or knowledgeable members of society to adolescents [39].

Social factors

Socioeconomic status (SES) and economic insecurity were hypothesized to be some of the key contributory factors to the increasing obesity prevalence and associated non-communicable diseases like diabetes mellitus and hypertension [50]. In the reviewed studies, family wealth and parental education were positively associated with obesity [16, 27]. Furthermore, our review showed that low parental education and self-employment or unemployment were found to be protective against obesity [16]. This contradicts the results of recent studies which reported that adolescents from families with low socioeconomic status (SES) were exposed to poorer diets [51]. This makes sense, considering that healthy foods tend to be expensive and out of reach of lower-income households [36, 52].

Regarding obesity and religion, one study reported an association between obesity and religion where church members were more likely to be overweight [22]. This is an odd result and difficult to explain. Although there are instances where food is part of religious gatherings, like the Seventh Day Adventist Church's vegetarian traditions [53]. Therefore, future studies are recommended to investigate the relationship between religion and obesity, particularly in adolescents.

Policy and economic factors

Overall, we observed that there is a gap in the study of the role of economic factors as determinants of obesity in Zimbabwe. This will have to be prioritized in future studies, including investigating the effect of economic factors and the affordability of healthy and nutrient-dense foods. However, some studies briefly mentioned that Zimbabwe has faced political and economic problems that disrupted its standing as a prosperous and resilient country [22]. This is supported by a recent situational analysis which revealed that the deepening economic crisis has caused soaring inflation and economic instability which has threatened the country's food

security by making obesogenic foods affordable [9, 52]. In 2020, COVID-19 induced lockdown caused food price increases and shortages which resulted in the reduction of healthy food options in many families [52]. When the price of staples goes up, research shows that the diet proportions, quality, and budget dedicated to micronutrient-rich foods go down [53, 54]. Although affluence and wealth, the effects of urbanization are mainly implicated as the reason behind the gradual rise of obesity in Zimbabwe (as suggested by this review) food insecurity may be another factor to consider at the other end of the socio-economic spectrum [55].

It is now recognized that political will as reflected in supportive policies is responsible for creating an enabling environment to support the adoption of healthy food choices needed for policy implementation [56]. In Zimbabwe, there is no data for the restrictions on the marketing of food and beverages to children[25]. However, some countries have already implemented these restrictions, for example, Ghana restricted the supply of fatty meat in the food chain [57], and in 2016, South Africa launched the soft drinks taxation system to reduce the harm caused by consuming these beverages [58]. Australia and New Zealand banned and restricted the marketing and selling of unhealthy foods to children [59]. In addition, the Japanese government introduced the school lunch program which reduced the percentage of overweight and obesity among Junior high school students [60]. These innovative policy actions can be adapted to deal with the emerging obesity problem among children and adolescents. However, there is evidence of the political will to address malnutrition in all its forms in Zimbabwe as reflected in key policy documents like the Food and Nutrition Security Policy [61], Suggested policies for improving food security [62], National Development Strategy (NDS1 2021-2025) [63], and the Multisectoral National Food and Nutrition Security strategy. The government of Zimbabwe showed interest in nutrition matters by introducing the Food and Nutrition Security Policy [61]. However, this policy primarily focuses on malnutrition and poverty eradication, with proper emendations, it can be a powerful tool to tackle the rising issues of obesity.

Strength and limitations

The use of an ecological model to explore multiple risk factors for adolescents' obesity revealed the prevalence, affected gender, and distribution of adolescents' obesity in Zimbabwe. This model also revealed literature and research gaps on economic and national level factors of adolescents' obesity. Limitations included the unavailability of segregated data from some studies and national surveys which made it difficult to accurately compare the results. Nutrition education, intervention programs, and policies that are essential for the prevention and reduction of adolescents are not mentioned in the reviewed studies. Overall, the studies on adolescents' obesity in Zimbabwe are limited.

5   Conclusions and recommendations

The review showed that girls are at higher risk of obesity compared to boys despite having higher nutrition knowledge scores. In both boys and girls, the rate of obesity increased with age. In addition,

adolescents residing in urban settings had a higher risk of obesity than their rural-based counterparts. In this context, church-going adolescents were more likely to be overweight. While at the environmental level we found that school environments are obesogenic and congested with unhealthy foods. Interestingly, this scoping review also revealed gaps in the literature that address the economic and national level factors and nutrition interventions and policies. Furthermore, this paper provides a useful summary of evidence to inform policy and programming decisions to reduce or reverse the effects of adolescent obesity in Zimbabwe and related settings. The key recommendations based on the current findings are listed below:

1. Considering that most of the evidence reviewed was subnational studies, there is a need for adolescent nutrition indicator surveys which should address gender discrepancies in BMI;

2. A socioecological approach is recommended in the formulation of social behavior change communication (SBCC) themed interventions targeting adolescents' obesity;

3. Lastly, we recommend future studies that explore the policy and economic determinants of obesity particularly the impact of macroeconomics on diet behaviors among adolescents in low-income settings.

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