Trend, Associated Factors and Concordance of Obesity by Body Mass Index, Waist Circumference and Waist-Height Ratio in Adolescents. An Analysis of a 4-Year National Survey

Lisseth Mamani[1], Luisa Erika Milagros Vásquez Romero[1], Joan A. Loayza-Castro[1], Jenny Raquel Torres-Malca[1], María del Socorro Romero-Figueroa[2], Víctor Juan Vera-Ponce[1,*] and Jhony A. De La Cruz-Vargas[1]

[1]*Instituto de Investigaciones en Ciencias Biomédicas, Universidad Ricardo Palma, Lima, Perú*

[2]*Facultad de Medicina, Universidad Autónoma del Estado de México*

Abstract: *Introduction*: Regarding diagnosis, identifying reliable anthropometric measures to detect adolescent obesity is fundamental. However, in this age group has different definitions, either according to the body mass index (BMI), the waist circunference (WC) and the waist-height ratio (WHtR), making the measurement of this inaccurate.

Objective: This study analyzed the prevalence, trends, and factors associated with obesity in Peruvian adolescents using data from the Demographic and Health Survey (ENDES) for 2019-2022.

Methods: A secondary data analysis was conducted on 14,330 adolescents aged 15 to 19. The response variable was obesity, defined in three different ways. General obesity was assessed using the BMI was ≥ 2 standard deviations. 2) Abdominal obesity was defined through WC, with cutoff points ≥ 80.5 cm in men and ≥ 81 cm in women. 3) The relevant indicator for obesity was the WHtR, with a cutoff point ≥ 0.5. The associated factors to be evaluated were sex, age, natural region, marital status, education level, wealth, area of residence, alcohol consumption, and physical disability.

Results: The study found that based on BMI, WC, and WHtR respectively, approximately 12.80%, 29.72%, and 24.27% of participants were considered obese. Significant associations were found between obesity and variables such as gender, natural region, marital status, wealth index, area of residence, education level, alcohol consumption, and physical disability.

Conclusion: This research uncovered an alarmingly prevalence occurrence of obesity among adolescents in Peru with fluctuating patterns over time, emphasizing the need to tackle the interconnected issues contributing to this health concern. These findings can help inform and guide obesity prevention and control strategies in this population.

Keywords: Obesity, Body Mass Index, Waist Circumference, Waist-Height Ratio, Adolescents, Public Health (Source: MeSH NLM).

INTRODUCTION

The most alarming chronic disease of the 21st century, obesity, is characterized by what constitutes an abnormal and excessive accumulation of body fat that differs in its definitions and cutoff points depending on age and demographic group alike [1]. While the rising occurrence of this condition in teenagers proves troubling, equal cause for concern stems from its potential long-lasting consequences, especially since not only is its frequency growing, but the implications for their future remain unclear [1-3]. Many adolescents dealing with obesity faces ongoing challenges shedding excess weight into their adult years, markedly amplifying the likelihood of severe illnesses such as type 2 diabetes and cardiovascular conditions developing [4]. Childhood obesity has far-reaching repercussions on emotional health in myriad ways at this critical period, amplifying vulnerability to increased stress levels, symptoms of depression, and diminished ability in academic and occupational domains, owing to the detrimental impacts of excess weight on cognitive performance. Through a multifaceted examination, this research seeks to disentangle contemporary patterns and interconnected influences relating to excessive weight gain among today's youth, presenting an all-encompassing outlook on this prevalent public well-being issue [5].

In the last thirty years, the World Health Organization observed a shocking rise in the worldwide rate of obesity plaguing teenagers, multiplying its statistics threefold on a global scale. A 2019 national study in Peru revealed that its adolescent population experiences a lower rate of obesity than its counterparts in the United States and Mexico, with a reported prevalence of only 7.6% suffering from such a condition, according to the investigation [7]. In contrast, over one-fifth of adolescents in the US battle the issue per a 21.8% measurement [6], and Mexico sees nearly one-sixth of its youth affected at 17.2% [4], citations

*Address correspondence to this author at the Instituto de Investigaciones en Ciencias Biomédicas, Universidad Ricardo Palma, Lima, Perú;
E-mail: victor.vera@urp.edu.pe

numbering the respective data. More broadly, in Latin America, it is estimated that 3 out of every ten adolescents face overweight/obesity issues [6]. This rising prevalence underscores the urgent need to study and update data in Peru to implement suitable preventive measures.

A more profound comprehension of the multifaceted influences linked to weight problems in teenagers is imperative. Obesity, acknowledged as a nuanced condition, regularly emerges within a milieu deemed 'obesogenic' where an interplay of nutritional and external determinants hold significant sway. Every day, adolescent observations include reduced consumption of fruits, vegetables, and whole grains and diminished physical activity, replaced by increased sedentary time, especially in front of technological screens [8]. Therefore, investigating these factors in our context is vital for developing effective intervention strategies.

In terms of diagnosis, identifying reliable anthropometric measures to detect obesity in adolescents is fundamental. While various measures exist, this study will focus on Body Mass Index (BMI), Waist-to-Height Ratio (WHtR), and Waist Circumference, as they have proven effective indicators of cardiovascular risk in this population [9]. Furthermore, the suitability and success of these steps as applied within Peru will be assessed to determine their functionality regarding the nation's particular situation.

METHODS

Study Design and Context

This study is observational, non-experimental, analytical, and cross-sectional. It is a secondary Demographic and Health Survey (ENDES) analysis. During the preparation of this manuscript, STROBE guidelines (Strengthening the Reporting of Observational Studies in Epidemiology) were followed for this study [10].

Population, Sample, and Eligibility Criteria

The population consisted of Peruvian nationals registered according to ENDES during the years 2019-2022. The sample comprised individuals aged 15 to 19 years who responded to the Demographic and Family Health Survey. The sample was characterized as bi-stage, probabilistic, balanced, stratified, and independent, at the departmental level, and across urban and rural areas.

For this study, only adolescents aged 15 to 19 years were included. Pregnant individuals and those without complete data for defining obesity (weight, height, and waist circumference) were excluded.

Definition of Variables

Principal Variable

The response variable was obesity, defined in three different ways. General obesity was assessed using the Body Mass Index (BMI) (BMI = Weight/Height^2), which for the purpose of this study was considered indicative of the condition if it presented a BMI ≥ 2 standard deviations. 2) Abdominal obesity was defined through Waist Circumference (WC), with cutoff points ≥ 80.5 cm in men and ≥ 81 cm in women. 3) The relevant indicator for obesity was the Waist-to-Height Ratio (WHtR = WC/Height), with a cutoff point ≥ 0.5.

Exposure Variables

The associated factors to be evaluated were age, measured according to the number of years indicated in the survey, ranging from 15 to 19 years; sex, classified as female and male; level of education, categorized according to the degree of studies completed, including the categories of No level/Primary, Secondary, and Higher; marital status, categorized as Single and With partner. The Wealth Index, reflecting the abundance of goods, divided into five categories: Poorest, Poor, Middle, Rich, and Richest; Area of Residence, translating the current residential location classified into Urban and Rural; and the Natural Region, divided into Metropolitan Lima (capital of Peru), Rest of Coast, Highlands, and Jungle.

Data Collection and Procedure

This study was conducted using the secondary database of the Demographic and Family Health Survey (ENDES) from 2019 to 2022, which is freely accessible on the INEI website. Firstly, access was gained to the website https://www.inei.gob.pe/, within which the option for database and then the Virtual Documentation System of Statistical Research – ANDA was selected. Subsequently, the section of household surveys was entered, followed by the corresponding section of the Demographic and Family Health Survey for 2019 to 2022. Among the databases that included different groups of variables, those to be used in our study were chosen for analysis. Finally, each previously selected database was downloaded from the microdata section, containing all the required information in SPSS and PDF formats.

Statistical Analysis

For this research, R statistical software version 3.4 was used, as well as Microsoft Word 2016, to type the entire investigation. The univariate analysis processed information to calculate frequencies and percentages, while the age variable was presented in the median and interquartile range. Then, a bivariate analysis was conducted, accompanied by multivariate regression using generalized linear models of the Poisson family (initial and adjusted) with a logarithmic link and robust variance to assess the strength of associations between the variables of interest. The covariables above' crude prevalence ratio (PRc) and adjusted prevalence ratio (RPa) were obtained.

RESULTS

This study involved 14,330 Peruvian adolescents, among whom the prevalence of obesity was 12.80%, 29.72%, and 24.27% according to BMI, WC, and WHtR, respectively. Of the participants, 51.27% were male; the age range ranged from 15 to 19 years, with an average age of 17 (IQR 16.00, 18.00). Metropolitan Lima was the most represented natural region, accounting for 29.38% of participants. Regarding the area of residence, 78.34% lived in urban zones. The most common education level was secondary and higher, representing 95.83% of the sample (Table **1**).

Figure **1** shows a slight fluctuation in the obesity trend among adolescents, both overall and by gender. Additionally, it can be observed that there are discrepancies in the prevalence of obesity among females, while in males, the prevalence according to WC or WHtR appears to be similar.

In terms of obesity prevalence by BMI, a statistically significant association was found with the male gender (aRP=0.66; 95% CI 0.58-0.75), individuals from the highland regions (aRP=0.47; 95% CI 0.38-0.59), those in a relationship (aRP=1.5; 95% CI 1.22-1.82), residing in rural areas (aRP=0.71; 95% CI 0.53, 0.94), daily smokers (aRP=0.27; 95% CI 0.04, 0.88), alcohol drinkers (aRP=1.47; 95% CI 1.19-1.80), individuals with physical disabilities (aRP=2.37; 95% CI 1.51-3.53), and across various wealth groups.

Regarding obesity diagnosed by WC, a statistically significant association was found with the male gender (aRP=0.42; 95% CI 0.39-0.45), age in years (aPR=1.08; 95% CI 1.05, 1.10), those residing in the highlands (aRP=0.81; 95% CI 0.74, 0.89) and the jungle regions (aPR=0.73; 95% CI 0.65, 0.81), those in a relationship (aRP=1.33; 95% CI 1.20-1.47), and across various wealth groups.

Table 1: Descriptive Analysis of the Characteristics of the Study Population

Characteristic	n = 14,330
Sex	
Female	6,983 (48.73%)
Male	7,347 (51.27%)
Age	17 (16, 18)
Natural region	
Metropolitan Lima	4,211 (29.38%)
Resy of coast	4,062 (28.35%)
Mountain Range	3,729 (26.03%)
Jungle	2,328 (16.24%)
Educational Level	
No Level/Primary	598 (4.17%)
Secondary/Superior	13,723 (95.83%)
Civil status	
Single	13,175 (91.94%)
With a partner	1,155 (8.06%)
Wealth index	
The poorest	2,715 (20.69%)
Poor	3,243 (24.70%)
Medium	2,708 (20.63%)
Rich	2,461 (18.75%)
Richest	2,000 (15.24%)
Area of residence	
Urban	11,227 (78.34%)
Rural	3,103 (21.66%)
Daily smoking	
No	14,279 (99.65%)
Yes	51 (0.35%)
Alcohol consumption	
No	13,483 (94.11%)
Yes	843 (5.89%)
Physical disability	
No	14,210 (99.17%)
Yes	120 (0.83%)
Obesity by BMI	
Normal	12,496 (87.20%)
Obesity	1,834 (12.80%)
Obesity by WC	
Normal	10,071 (70.28%)
Obesity	4,259 (29.72%)
Obesity by WHtR	
Normal	10,852 (75.73%)
Obesity	3,478 (24.27%)

n (%); Median (IQR).

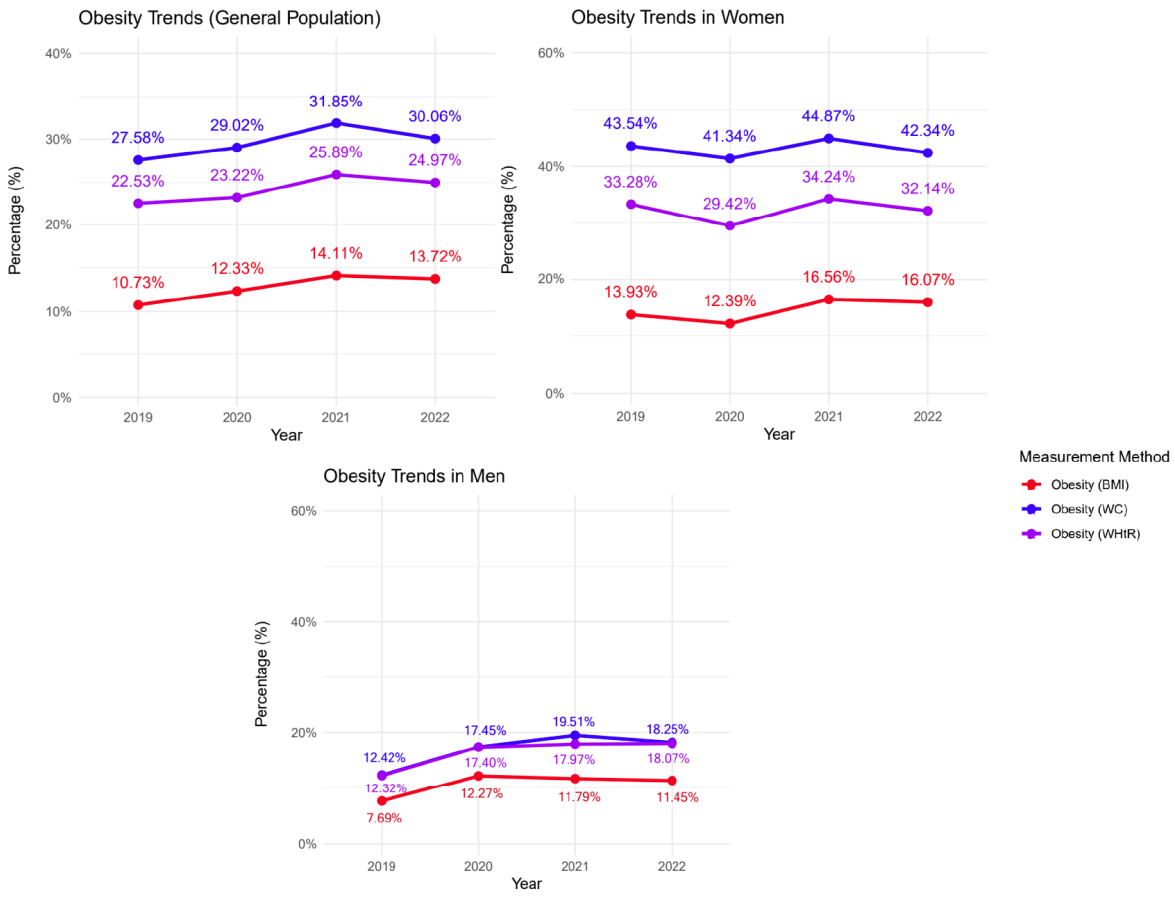

Figure 1: Trend in obesity prevalence according to BMI, WC and WHtR, generally defined and by sex.

Concerning obesity as per WHtR, differences were found according to the male gender (aRP=0.55; 95% CI 0.51-0.59), age (aPR=1.07; 95% CI 1.04, 1.09), individuals from the highlands (aRP=0.8; 95% CI 0.72, 0.89) and the jungle (aPR=0.67; 95% CI 0.59, 0.76), those in a relationship (aRP=1.51; 95% CI 1.35-1.68), and across various wealth groups.

Furthermore, a Venn Diagram was used to detail the prevalence of obesity among adolescents according to BMI, WC, and WHtR, finding that 34.4% of adolescents were obese by all three measurements. BMI alone accounted for 0.6% of obesity cases, abdominal circumference for 22.1%, and Waist-to-Height Ratio for 4.6%. Obesity as per BMI combined with WHtR was 0.4%, BMI with WC was 1.3%, and WC combined with WHtR accounted for 36.7% of obesity cases (Figure **2**).

DISCUSSION

Main Findings

The findings of this study demonstrate that the prevalence of obesity in the study population, as measured by BMI, WC, and WHtR, is 12.80%, 29.72%, and 24.27%, respectively, with a trend fluctuating from 2019 to 2022. Notably, while some significantly associated factors have differed according to the type of obesity measured, prominent factors include gender, natural region, marital status, wealth index, area of residence, education level, alcohol consumption, and physical disability.

Comparison with Other Studies

Prevalence of Obesity Based on Anthropometric Measurements

Our study revealed a high prevalence rate of obesity in adolescents compared to other studies. According to BMI, we found a prevalence of 12.80%, in contrast to Pajuelo-Rivas *et al*. [11], who reported a 12.1% obesity prevalence using the same measure. Conversely, Castiñeiras *et al*. [9] found a 23% obesity prevalence in adolescents based on WC, while our study reported 29.72%. Regarding WHtR, the survey by Zermeño-Ugarte P *et al*. [12] conducted in Mexico found 32.7% of adolescents obese by WHtR, a figure exceeding that in our study. This rise in adolescent

Table 2: Bivariate Analysis and Multivariable Regression Analysis of the Factors Associated with Adolescent Obesity

Characteristic	Obesity by BMI				Obesity by WC				Obesity by WHtR			
	Normal, n = 12,496	Obesity, n = 1,834	aPR	95% CI	Normal, n = 10,71	Obesity, n = 4,259	aPR	95% CI	Normal, n = 10,852	Obesity, n = 3,478	aPR	95% CI
Sex												
Female	5,936 (85.00%)	1,047 (15.00%)	—	—	3,968 (56.83%)	3,015 (43.17%)	—	—	4,711 (67.47%)	2,272 (32.53%)	—	—
Male	6,560 (89.29%)	787 (10.71%)	0.66	0.58, 0.75	6,103 (83.07%)	1,244 (16.93%)	0.42	0.39, 0.45	6,141 (83.58%)	1,207 (16.42%)	0.55	0.51, 0.59
Age	16 (15 – 17)	17 (16 – 18)	1.09	1.04, 1.14	16 (15 – 17)	17 (16 – 18)	1.08	1.05, 1.10	16 (15 – 17)	17 (16 – 18)	1.07	1.04, 1.09
Natural region												
Metropolitan Lima	3,486 (82.79%)	725 (17.21%)	—	—	2,703 (64.19%)	1,508 (35.81%)	—	—	2,950 (70.07%)	1,260 (29.93%)	—	—
Resy of coast	3,404 (83.81%)	658 (16.19%)	1.14	0.99, 1.31	2,703 (66.54%)	1,359 (33.46%)	1.05	0.97, 1.14	2,969 (73.08%)	1,094 (26.92%)	1	0.92, 1.09
Mountain Range	3,475 (93.18%)	254 (6.82%)	0.47	0.38, 0.59	2,839 (76.12%)	890 (23.88%)	0.81	0.74, 0.89	3,001 (80.46%)	729 (19.54%)	0.8	0.72, 0.89
Jungle	2,130 (91.52%)	197 (8.48%)	0.83	0.66, 1.02	1,827 (78.47%)	501 (21.53%)	0.73	0.65, 0.81	1,932 (83.01%)	396 (16.99%)	0.67	0.59, 0.76
Educational Level												
No Level/Primary	527 (88.22%)	70 (11.78%)	—	—	428 (71.72%)	169 (28.28%)	—	—	427 (71.42%)	171 (28.58%)	—	—
Secondary/Superior	11,960 (87.16%)	1,762 (12.84%)	1.06	0.76, 1.53	9,636 (70.22%)	4,087 (29.78%)	0.96	0.82, 1.14	10,420 (75.93%)	3,303 (24.07%)	0.77	0.66, 0.91
Civil status												
Single	11,517 (87.41%)	1,658 (12.59%)	—	—	9,460 (71.80%)	3,715 (28.20%)	—	—	10,167 (77.17%)	3,007 (22.83%)	—	—
With a partner	979 (84.76%)	176 (15.24%)	1.5	1.22, 1.82	612 (52.94%)	544 (47.06%)	1.33	1.20, 1.47	684 (59.22%)	471 (40.78%)	1.51	1.35, 1.68
Wealth index												
The poorest	2,555 (94.10%)	160 (5.90%)	—	—	2,136 (78.66%)	579 (21.34%)	—	—	2,236 (82.35%)	479 (17.65%)	—	—
Poor	2,902 (89.48%)	341 (10.52%)	1.37	1.02, 1.86	2,298 (70.85%)	945 (29.15%)	1.18	1.03, 1.34	2,531 (78.07%)	711 (21.93%)	1.03	0.89, 1.20
Medium	2,285 (84.40%)	422 (15.60%)	1.78	1.30, 2.45	1,823 (67.33%)	885 (32.67%)	1.24	1.08, 1.43	1,952 (72.09%)	755 (27.91%)	1.24	1.06, 1.46
Rich	2,016 (81.95%)	444 (18.05%)	2.02	1.47, 2.79	1,553 (63.10%)	908 (36.90%)	1.42	1.22, 1.64	1,681 (68.33%)	779 (31.67%)	1.4	1.19, 1.65
Richest	1,654 (82.73%)	345 (17.27%)	2.09	1.51, 2.91	1,274 (63.72%)	726 (36.28%)	1.38	1.19, 1.61	1,450 (72.48%)	551 (27.52%)	1.22	1.03, 1.45
Area of residence												
Urban	9,578 (85.32%)	1,649 (14.68%)	—	—	7,620 (67.87%)	3,607 (32.13%)	—	—	8,267 (73.64%)	2,960 (26.36%)	—	—
Rural	2,918 (94.02%)	186 (5.98%)	0.71	0.53, 0.94	2,451.59 (79.00%)	652 (21.00%)	0.93	0.82, 1.06	2,585 (83.29%)	519 (16.71%)	0.86	0.74, 0.99
Daily smoking												
No	12,449 (87.18%)	1,830 (12.82%)	—	—	10,034 (70.27%)	4,245 (29.73%)	—	—	10,810 (75.70%)	3,469 (24.30%)	—	—
Yes	46.91 (92.32%)	4 (7.68%)	0.27	0.04, 0.88	37.23 (73.25%)	13.59 (26.75%)	0.82	0.43, 1.40	42 (82.11%)	9 (17.89%)	0.48	0.20, 0.94
Alcohol consumption												
No	11,788 (87.42%)	1,696 (12.58%)	—	—	9,509 (70.52%)	3,974 (29.48%)	—	—	10,264 (76.12%)	3,219 (23.88%)	—	—
Yes	705 (83.56%)	139 (16.44%)	1.47	1.19, 1.80	559.47 (66.35%)	284 (33.65%)	1.02	0.89, 1.15	585 (69.36%)	258 (30.64%)	1.15	1.00, 1.31
Physical disability												
No	12,403 (87.28%)	1,807 (12.72%)	—	—	9,992 (70.31%)	4,218 (29.69%)	—	—	10,766 (75.76%)	3,444 (24.24%)	—	—
Yes	93 (77.49%)	27 (22.51%)	2.37	1.51, 3.53	79 (66.26%)	40 (33.74%)	1.12	0.80, 1.53	85 (71.30%)	34 (28.70%)	1.17	0.80, 1.62

*Each model has been adjusted for sex, age, marital status, region, educational level, wealth index, residence area, physical disability, alcohol consumption, and daily smoking.
cPR: ajusted prevalencia ratio.
95% CI: 95% Confidence Interval.

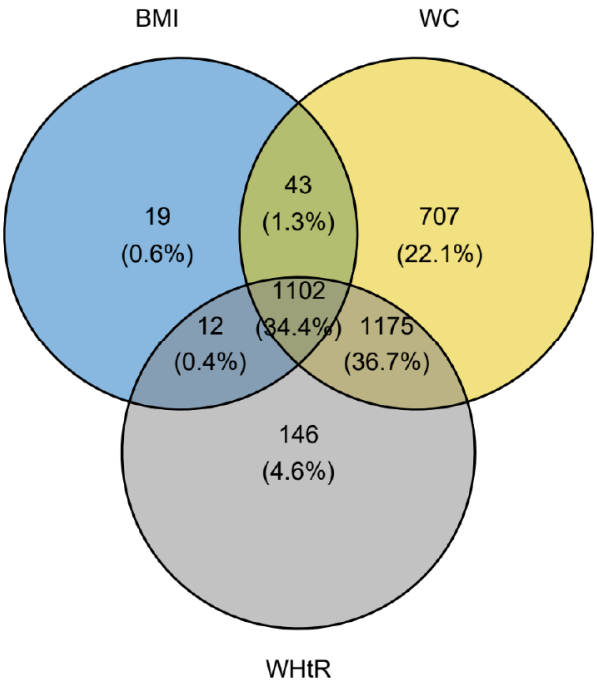

Figure 2: Venn diagram between obesity diagnoses according to BMI, WC, and WHtR.

obesity could be linked to consuming inexpensive, high-calorie foods [8] and reduced physical activity, replaced by sedentary lifestyles, including extensive use of technological devices [13].

Factors Associated with Obesity by BMI, WC, and WHtR

Regarding gender, our study found obesity more frequent in males than females. Similarly, the study by Khan MMA *et al*. [14] reported more male adolescents with obesity than females (9.9% vs 7.4%). Worku *et al*. [13] also found a higher prevalence of obesity in males (13.3%). Contrasting our study, Cho WK *et al*. [15] observed higher abdominal obesity in females (23.2%) compared to males (14.8%), as did Vizentin NP *et al*. [16], who found higher BMI and WC in females. This could be due to physiological changes in women, such as weight gain and abdominal enlargement during pregnancy [17]. However, studies showing higher obesity prevalence in males might relate to increased awareness and favorable attitudes toward obesity prevention in females, unlike their male counterparts [18].

Regarding natural regions, individuals from the Sierra were at higher obesity risk. The increase in obesity in this population could be attributed to their diet, which is rich in animal fats and typical regional foods, where higher caloric intake compensates for the intense cold of the region [19]. Nevertheless, our results differ from studies like Jo *et al*. [19], which found no prevalence of adolescent obesity in Cerro de Pasco, part of the Andean region of Peru. Another study by Pajuelo Ramirez J *et al*. [20] showed lower obesity prevalence in the Sierra. This could be due to the rugged geographic terrain requiring more physical effort and, thus, higher energy expenditure.

Regarding the wealth index, wealth was associated with obesity, akin to Pajuelo *et al*. [20] study in Peru, which revealed non-poverty status linked to obesity. However, our findings differ from Sigmund E *et al*. [21], who reported that wealthier adolescents engage in more physical activity than those from lower-income backgrounds. Similarly, Newton Suzy *et al*. [22] indicated that Brazilian women from lower socio-economic levels were more likely to be obese compared to wealthier ones.

Living in a rural region was also associated with higher obesity, contrary to Pajuelo Ramirez J *et al*. [20] study, where urban dwellers had a higher risk. Chiroque Juárez *et al*. [23] found that residing in urban areas resulted in 2.25 times more obesity than in rural areas. The higher prevalence of obesity in rural regions might relate to dietary habits and higher consumption of sugary drinks, as indicated by Shamah Levy *et al*. [4], being more common among rural adolescents.

Regarding education level, having secondary or higher education was associated with obesity. Similarly, Firouzbakht *et al*. [24] found a significant association between higher education and BMI over 25. Conversely, Das Gupta R *et al*. [25] found no significant association between education level and obesity. Other studies suggest that lacking secondary or higher education is linked to obesity due to less awareness of obesity risks, as shown by Rivas Pajuelo S *et al*. [11], who found a significant positive correlation between BMI and knowledge, attitudes, and practices regarding healthy eating in adolescents.

Our study found that alcohol consumption was associated with obesity, supported by evidence that obesity development is linked to the caloric content of alcohol (7 kcal/g) and its inhibition of fat oxidation and plasma leptin levels, an appetite-regulating hormone [26]. Martinez-Sanguinetti *et al*. [27] confirmed that alcohol consumption is a modifiable factor associated with obesity development in the Chilean population. However, a systematic review by Sanchez Carracerro D *et al*. [28] found that alcohol consumption had no significant effect on obesity risk, with an overall odds

rario (95% CI) for drinking versus not drinking being 1.05 (0.95; 1.16).

In terms of physical disability, the WHO states that individuals with disabilities are twice as likely to develop conditions like depression, asthma, diabetes, stroke, obesity, or dental health issues. They are also more prone to a lack of physical activity due to limitations [29]. Our study aligns with this, finding that physical disability was associated with obesity, similar to the survey by Martín I *et al*. [30], which reported a 44% obesity prevalence in individuals with intellectual disabilities, also related to body adiposity, dyslipidemias, and socioeconomic factors of their family environment [30]. Another study in Mexico analyzed patients over 13 and found a 35% obesity prevalence linked to family overprotection and beliefs about incapacity for sports [30]. This increase could be due to genetic factors causing reduced resting metabolic rate, excess fat mass, low muscle tone, long-term disability associated with decreased leptin, and poor diet quality due to feeding difficulties, making individuals vulnerable not only to obesity but also to metabolic syndrome [30, 31].

Regarding obesity assessments, WC captured more obese individuals than BMI and WHtR. This aligns with Fedewa M *et al*., who noted that WC was a better predictor of fat percentage than BMI in young adults [32]. The Consensus Declaration also mentions that BMI alone is insufficient to assess cardiometabolic risk associated with increased adiposity, hence the need for WC measurement in clinical settings [33].

Study Limitations

This study has several limitations. Firstly, the sample selection was based on data from the Demographic and Health Survey (ENDES) from 2019-2022, potentially introducing sample selection biases and affecting the generalization of results to the entire adolescent population in Peru. Moreover, the study relied on secondary data from ENDES, meaning results could be subject to errors or inaccuracies in original data collection and recording. Data availability and quality might vary between different years and regions, possibly affecting result validity. Since the study is observational and cross-sectional, causality between examined variables cannot be established.

CONCLUSIONS

According to the presented study, a high prevalence of obesity was found among Peruvian adolescents aged 15 to 19 years, with figures ranging from 12.80% to 29.72% based on different anthropometric measurements. In addition, fluctuating trends were observed in the years studied. Among the factors associated with obesity in Peruvian adolescents, sex, natural region of origin, marital status, wealth index, area of residence, education level, alcohol consumption, and physical disability were found to be significantly related to obesity.

In light of these findings, the need to implement preventive and control measures for obesity in Peruvian adolescents is highlighted, considering the associated factors identified in the study. These measures could include promoting healthy eating, encouraging physical activity, and educating about the risks of obesity.

ACKNOWLEDGEMENTS

A special thanks to the members of Instituto de Investigación en Ciencias Biomédicas de la Universidad Ricardo Palma, who provided valuable comments during the preparation of this study.

FINANCIAL DISCLOSURE

This study is self-financed.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

INFORMED CONSENT

Informed consent was obtained.

DATA AVAILABILITY

The data supporting the findings of this study can be accessed by the original research paper at the following link: http://iinei.inei.gob.pe/microdatos/

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Received on 04-11-2023 Accepted on 30-11-2023 Published on 31-12-2023

https://doi.org/10.6000/1929-6029.2023.12.34