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Original Article

Attitude Towards Obesity, Physical Activity and Body Mass Index in Adolescents from a Public School in Lima, Peru

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Abstract - *The World Health Organization (WHO) reports that there are currently 160 million adolescents with obesity in the world. In Peru, 25% of adolescents are overweight or obese, and between 73% and 84.6% perform little physical activity. In view of this reality, the present study aimed to determine the relationship between attitude towards obesity, physical activity, and Body Mass Index (BMI) in adolescents from a public school in Lima, Peru. With a quantitative, descriptive, correlational, and cross-sectional design, a sample of 296 adolescents was intervened on, using the Obesity Attitude Scale for Adolescents, the Youth Activity Profile-Latin America (YAP-SL), and anthropometric measurements for the calculation of BMI. The results revealed that 43.39% had a neutral attitude towards obesity, 46.96% had low physical activity, and 72.64% had a normal BMI. No significant correlations were found between attitude and BMI (Rho = 0.082, p = 0.162) or between physical activity and BMI (Rho = -0.007, p = 0.911). However, the automatic linear regression model identified significant predictors (p = 0.00) with an accuracy of up to 82.3 % for each of the variables. It is concluded that in order to improve the situation of adolescents, it is essential to strengthen programs aimed at healthy eating, physical activity, and emotional self-regulation in schools, also involving teachers and parents.*

Keywords - *Attitude towards obesity, Healthy eating, Physical activity, Body Mass Index, Adolescents.*

1. Introduction

In the past, structural factors such as poverty, health, and economic crises made the presence of underweight people more frequent than that of the obese [1]. However, today's lifestyle, characterized by a sedentary lifestyle, excessive consumption of harmful foods, and other unhealthy habits, has led to an alarming increase in obesity cases, reaching approximately 900 million people worldwide [2]. This issue becomes more pronounced in the adolescent years, since being overweight not only increases risk for chronic disease, but it also affects self-esteem, emotional development, and self-identity [3]. The World Health Organization (WHO) also warns that after 30 years, obesity amongst adolescents has increased by 300%, which now totals 160 million adolescents [2]. This continual growth requires unequivocal, timely, comprehensive intervention that focuses on prevention in early childhood. According to the Pan American Health Organization (PAHO), 33% of adolescents in the Americas are overweight or obese, representing an important risk for this age group [4]. To exacerbate this situation, concerning levels of physical inactivity exist, since there is a WHO report with data that indicates that more than 80% of adolescents do not perform enough physical activity, having a relationship with higher body weight and with the development of related diseases [5]. Also, there is a psychological dimension associated with this problem; indeed, in various scientific reviews, authors have highlighted that many adolescents have developed unfavorable attitudes regarding obesity, feeling excluded or stigmatized, and this has a negative impact on their emotional health [6]. Together, they constitute a worrying scenario that goes beyond the physical and requires comprehensive or holistic action that takes into account both the physical health and the emotional dimension of the development of adolescents in order to promote their healthy and complete development. In Uruguay, while there is a strong commitment to the Sustainable Development Goal (SDG) Good Health and Well-being (SDG #3) by 2030, which includes reducing physical inactivity among youth by 15%, it is reported that 36.3% of adolescents continue to be overweight or obese [3, 7]. This continued issue, despite initiatives from a range of institutions, demonstrates that what has been put in place has not yet resolved this challenge for

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adolescents [8]. This implies that any strategies delivered should go beyond generic campaigns to consider specific determinants that relate to the school environment, dietary practices, attitudes toward obesity, daily physical activity, and sociocultural variables [9]. Hence, understanding the realities of adolescents and their lifeworlds will enable interventions to be designed with greater specificity and to be sustainable, with a focus not only on physical health but also on emotional and social well-being [10].

The United Nations Children's Fund (UNICEF) has indicated that in Peru, 25% of adolescents are overweight or obese, and Lima is reported to have the highest prevalence [11]. This is directly related to the existence of easy access to highly processed, low-nutritional foods loaded with sugars and saturated fats [12]. Moreover, there is a worrisome low level of physical activity, affecting 73% to 84.6% of adolescents across several national studies [13, 14]. Additionally, it is reported that 70.7% of adolescents in other provinces have a positive attitude towards obesity, making it especially urgent to carry out the analysis in the capital of the country [15]. This situation poses a particular challenge in Lima because structural barriers in public schools and the social environment directly affect the lifestyle habits of adolescents [16]. For this reason, addressing the problem in the capital is urgent and strategic because it allows us to see how all these variables interact at a critical time in human development, such as adolescence, especially in educational contexts, where we also still have possibilities to implement preventive interventions that allow a sustainable impact.

The World Health Organization defines obesity as a chronic disease caused by an excessive accumulation of fat in the body that markedly increases the risk of health problems (type 2 diabetes, cardiovascular diseases, or some specific types of cancer) [2]. Key to the definition of the disorder is the anthropometric measure, Body Mass Index (BMI). A BMI greater than or equal to 25 defines overweight, while a BMI greater than or equal to 30 defines obesity [17]. Likewise, there are other variables such as waist circumference and skinfold, which are also used for a more specific measurement of body fat distribution [18]. Recognizing the weight excess as a clinical phenomenon with measurable parameters helps for early identification of this scarce situation and to develop specific preventive actions, particularly for adolescents, who, as they are still developing their habits in this important stage of life (lifestyle habits), can allow more sustained changes to occur. [19].

Attitude toward obesity is the cognitive, emotional, and behavioral disposition a person holds towards living with excess weight, with respect to the implications regarding health, personal image, or social acceptance. The attitude can be assessed as positive, negative, or neutral [20]. Positive attitudes would include elements of understanding, body acceptance, and recognition of obesity as a complex phenomenon with multiple influences. In contrast, negative attitudes present stigma, shame, or rejection, and neutral attitudes would be a simple indifference or ignorance [21]. These attitudinal stances are conditioned by a number of different bargaining elements such as education, health information, cultural ideals of beauty, personal experiences, and media discourse. Negative attitudes, especially, can lead to discrimination, impact self-esteem, and impede access to health services while also perpetuating the problem altogether [22].

Physical activity encompasses all body movements that expend energy and falls into the categories of aerobic, strength, flexibility, and balance activities. Its engagement is influenced by a set of circumstances, including age, physical and social environments, availability of adequate spaces, education level, and personal motivation [23]. Non-engagement in physical activity is correlated with increased risk of developing obesity, cardiovascular disease, and metabolic disorders, along with mental health consequences, including anxiety, depression, and chronic stress [24]. The direct relationship indicative of lack of activity and deteriorating physical and emotional states shows the necessity for promoting sites that encourage daily movement, particularly for adolescents, aimed at setting healthy habits to reduce the likelihood of long-term diseases and enhance overall health from a young age [25].

Considering the dynamics of the context, the current study aims to approach various dimensions of the behavior and lifestyle of school-aged adolescents with a view to making a more rounded assessment of their risk level for obesity and possible sequela. Therefore, the present study aimed to study the association of attitudes towards obesity with levels of physical activity and Body Mass Index (BMI) among adolescents in a public school in Lima, Peru. This is salient given that the current rising prevalence levels of obesity and low levels of physical activity among Peruvian adolescents are a real concern, which threatens both their present and future health. In conclusion, by taking both variables together, it is hoped we can establish an evidence base to elucidate the determinants of the problem and provide a basis for developing the most effective prevention and intervention strategies to ultimately improve quality of life in adolescents and further foster more supportive school environments.

Despite the existing research on childhood and adolescent obesity in Peru, an important gap remains in understanding the combined interaction between attitudes toward obesity, physical activity levels, and Body Mass Index (BMI) among students in public schools in Lima. Most previous studies have analyzed these variables separately-focusing either on sedentary behavior, dietary habits, or body perception-without integrating them within the school context. Moreover, predictive approaches have rarely been used to identify which daily behaviors exert the strongest influence on these

variables. Therefore, the present study provides a novel contribution by integrating these dimensions and applying an automatic linear regression model, which offers a more objective and precise identification of predictors. This approach is particularly valuable for designing evidence-based interventions within school environments.

2. State of the Art

Doña et al. [26] carried out a study in Spain aimed at determining the personal values related to satisfaction with physical activity in adolescents. The authors used a methodological approach based on exploratory factor analysis and multiple regression models and administered a questionnaire containing the Schwartz value scale to a sample of 401 adolescents. Statistically significant values ($p<0.05$) emerged with respect to physical activity satisfaction to hedonism, achievement, and benevolence, the personal values that generated the greatest well-being in the participants. The authors concluded that promoting these values increases satisfaction related to the physical activity context, and this implies that both psychology and physical training can develop strategic interventions to reinforce the above dimensions and promote greater adherence and enjoyment of physical activity within adolescent populations.

González et al. [27] undertook a study in Spain that sought to understand the relationship between parental education level and children's nutritional status. They adopted a cross-sectional perspective and used a questionnaire that assessed factors pertaining to the family environment, eating habits, and physical activity, with the addition of anthropometric measures from a sample of 718 school children aged 9–17 years. The results show a statistically significant relationship between parents' educational level and school children's nutritional status ($p<0.041$), and more so in the maternal role. Moreover, there was a significant relationship with children's nutritional status and who was responsible for meal preparation ($p<0.001$), as well as a positive increase in BMI as sedentary leisure hours increased ($p<0.01$). The conclusion of the study highlights the need to promote healthy habits in children, while also incorporating education strategies to involve parents who play a vital role in children's health and nutrition.

Sánchez [15] carried out a study to understand knowledge and attitude towards the prevention of obesity in adolescents of a private educational institution in Huánuco. A quantitative approach and a cross-sectional design were used with a structured questionnaire applied to a sample of 75 students. The findings revealed that 81.3% of respondents had adequate knowledge about obesity, and 70.7% had a favorable attitude towards its prevention. In addition, the study found a significant relationship between the level of knowledge and the attitude oriented to prevention ($p=0.05$), suggesting that knowledge has an influence on psychological behaviours of adolescent subjects. The study concludes with an emphasis on the need for educational programs that reinforce knowledge and attitude towards obesity while also including parents as key actors in healthy habit consolidation between school and at home, respectively.

A research in the city of Cajamarca to analyze the relationship between eating habits and the nutritional status of secondary school students from two educational establishments. A cross-sectional and correlational research design was modeled, where the investigators were able to use a survey questionnaire in the study of 233 adolescents. The first school presented results of 81.7% adequate eating habits and 48.9% normal nutritional status; the second school presented results of only 55.6% adequate eating habits and only 29.2% of normal nutritional status, where 13.7% of students were classified as overweight. In both analyzes a relationship ($p=0.000$) was statistically significant concerning eating habits and nutritional status. The investigators concluded with the need to promote healthy eating in a holistic way involving adolescents, their families, and the school context.

A study was conducted by Quiñones [28] in Lima, with the goal of determining the association between sedentary behavior, physical activity, and body mass index in adolescents belonging to a private educational institution. Adopting a quantitative approach with a cross-sectional design, an adapted questionnaire was utilized along with anthropometric measurements to calculate the body mass index of 103 adolescents in secondary school. The results showed that 52% were male, and in 60% of adolescents surveyed, either overweight or obesity was reported; and in 96%, low or very low physical activity was noted. There was also a significant relationship between the study's sedentary behavior, body mass index variables ($p=0.045$), and the physical activity and body mass index ($p=0.025$) variables. Specifically, adolescents with a higher body mass index reported less physical activity and more sedentary behavior. In conclusion, promoting active lifestyles is an important strategy to prevent being overweight and manage a healthy body mass index. In the city of Lima, Tito et al. [29] did research to analyze the relationship between anthropometric nutritional status and the level of physical activity in adolescents with Down syndrome. Following a descriptive, observational, and cross-sectional design, the authors evaluated a total of 21 students aged between 6 and 16 years old through a nutritional assessment sheet and physical activity questionnaire, also considering the variables of age and sex. Results revealed that 42.8% of the adolescents presented with some degree of malnutrition, and 90.4% had a sedentary lifestyle. There was no statistically significant association between BMI and level of physical activity. The research concludes with the necessity of increasing the sample for future studies, in addition to the importance of improving both nutrition education and promoting physical activity in this vulnerable population.

3. Materials and Methods

3.1. Research Approach and Design

The present study adopts a quantitative approach, since it is based on the treatment and analysis of numerical data obtained by means of structured instruments. It is also classified as descriptive in design, since it allows the variables considered to be measured and detailed precisely, providing a clear overview of the situation studied. It is correlational, since the possible relationship between the variables is analyzed. Finally, it presents a cross-cutting approach, as it is developed in a single time section, without considering subsequent evaluations.

3.2. Population, sample, and sampling

For this research, an analysis of public institutions in Lima that provide secondary education was initially carried out, with the purpose of identifying a representative population of adolescents. After this analysis, it was determined that the public school "Nuestra Señora de Guadalupe" was the ideal institution for the application of the study, due to its historical, educational, and social relevance. Founded in 1840 in the district of Lima, this school stands out for being the first national school in the country, recognized for its academic legacy and its participation in the formation of important figures in Peruvian history. In addition, its student population adequately represents adolescents in Lima's public education system [30]. According to the enrollment records of the year 2025, the school has a total of 1,400 students at the secondary level, who are in the age range of 12 to 17 years old, the age group that constitutes the population of this study.

3.2.1. Sample

The sample size was determined using the EPIDAT statistical software version 4.2, *considering* a confidence level of 95% and a margin of error of 5%. Based on these parameters, it was calculated that the appropriate sample for the study should be composed of 296 adolescent students, which guarantees the representativeness and statistical validity of the results.

3.2.2. Sampling

Sample selection was carried out through non-probabilistic convenience sampling, in which participants were chosen based on their availability and willingness to participate in the study [31]. Likewise, defined inclusion and exclusion criteria were established in order to guarantee the representativeness of the sample within the target population, which are detailed in the following sections.

3.2.3. Inclusion criteria

- Adolescents from 12 to 17 years of age.
- Adolescents enrolled in the public school "Nuestra Señora de Guadalupe."
- Adolescents of both sexes.
- Adolescents who agree to participate in the study do so through informed assent.
- Adolescents whose parents agree to their children's participation in the study through informed consent.

3.2.4. Exclusion Criteria

- Adolescents belonging to the primary level.
- Adolescents with physical or mental conditions that limit their participation in the study.

3.2.5. Study Variables

Attitude towards obesity

Conceptual definition: It refers to the mental, affective, and behavioral positioning that an individual assumes in the face of the phenomenon of being overweight, considering its physical effects, bodily self-concept, and the social perception generated by this condition in various contexts [32].

Operational definition: Corresponds to the tendency of thought and reaction observable in adolescents regarding overweight, including its implications for physical well-being, personal identity, and interpersonal relationships within the educational and social environment.

3.2.6. Physical Activity

Conceptual definition: It is understood as the performance of bodily movements that imply caloric consumption above the resting state, which contribute positively to integral well-being, strengthen the physiological condition, and favor the emotional stability of those who practice them [33].

Operational definition: Corresponds to the level of execution of motor actions performed by adolescents that involve physical effort, considering their effects on physical and psychological health.

BMI

Conceptual definition: It is an indicator used to estimate the nutritional status of a person, establishing proportions between body mass and height, in order to determine if they have adequate weight, underweight, overweight, or some degree of obesity [17].

Operational definition: It is the result obtained by dividing the weight in kilograms by the square of the height in meters of the adolescents, which allows them to be placed within specific ranges according to standards established by international organizations to assess their nutritional condition.

3.2.7. Measuring Instruments

Obesity Attitude Scale for Adolescents

This instrument was selected to evaluate the variable attitude towards obesity; it consists of 14 items distributed in three dimensions: preference/rejection, concern/disinterest,

and will/apathy. Each item is assessed using a Likert-type scale, which allows the participant's level of agreement or disagreement with various statements related to obesity to be captured [34]. To ensure an accurate statistical interpretation, cut-off points were established by analyzing scales using the SPSS version 30.0 software, obtaining specific classifications according to the total score achieved.

- Negative attitude: 14 to 22 points
- Neutral attitude: 23 to 25 points
- Positive attitude: 26 to 28 points
- Very positive attitude: 29 to 56 points

This instrument has been previously validated and tested for reliability in different international contexts, including Chile, where it was statistically evaluated in a representative sample of adolescents [35]. However, in order to ensure its relevance in the specific context of adolescents from a public school in Lima, Peru, a validation was carried out through expert judgment, incorporating five specialists in research and health. Based on their evaluations, an Aiken V of 0.92 was calculated, a value that supports a high validity to measure the attitude towards obesity in this population. Additionally, the internal reliability of the instrument was evaluated through a pilot test applied to 20 adolescents from the selected institution, whose results allowed the calculation of Cronbach's Alpha coefficient, thus guaranteeing the statistical consistency of the instrument.

Table 1. Ronbach's alpha of the instrument "obesity attitude scale for adolescents"

Cronbach's alpha	No. of elements
.738	14

Table 1 presents the internal reliability analysis of the instrument "Obesity Attitude Scale for Adolescents", where the 14 items that make it up were evaluated. The result yielded a Cronbach's alpha coefficient of 0.738, a value that shows an acceptable reliability for its application.

The Youth Activity Profile-Latin America (YAP-SL)

This instrument was chosen to evaluate the variable physical activity; it is made up of 19 items, of which only 9 were selected, corresponding to the dimension of physical activity performance and level of enjoyment, as they are those that directly measure the practice of exercise in adolescents through a Likert scale, as required in this study. The other items were excluded because they were linked to specific habits and sedentary behavior, aspects that are not part of the main focus of this research. Subsequently, statistical tools were used to establish the corresponding scales and classifications.

- Very low physical activity: 9 to 20 points
- Low physical activity: 21 to 23 points
- Moderate physical activity: 24 to 26 points
- Intense physical activity: 27 to 45 points

This instrument has been previously validated and has reliability in several countries, especially its application in Spain, in addition to having a version adapted for Latin America [36]. However, in order to ensure its relevance to measure the variable in adolescents from Lima, Peru, an additional validation was carried out through expert judgment, in which five specialists in research and health participated. Based on the ratings issued, an Aiken V of 0.89 was calculated, which confirms its high validity in this context. The internal reliability of the instrument was determined by a pilot test and the calculation of Cronbach's alpha coefficient.

Table 2. Cronbach's alpha of the instrument "YAP-SL"

Cronbach's alpha	N of elements
.702	9

Table 2 presents the calculation of Cronbach's alpha coefficient corresponding to the "YAP-SL" instrument, considering the 9 items selected for the study. The analysis yielded a value of 0.702, which allows us to conclude that the instrument has adequate reliability to evaluate physical activity in adolescents.

BMI

According to the WHO, BMI is the main indicator used to assess the relationship between body weight, expressed in kilograms, and height, measured in meters. Its calculation is made by dividing the weight by the squared height (kg/m^2) and, depending on the value obtained, the person is classified into different nutritional categories [17].

- Low weight: <18.5
- Normal: 18.5 - 24.9
- Overweight: 25 - 29.9
- Obesity I: 30 - 34.9
- Obesity II: 35 - 39.9
- Obesity III: ≥40

In this context, BMI categories can be interpreted as follows:

- Underweight: This condition may reflect insufficient caloric intake and is linked to nutritional deficiencies, anemia, a weak immune system, risk of osteoporosis, and increased susceptibility to infections, being especially critical in vulnerable populations [37].
- Normal: Represents the healthy range for most people. In this category, the risks of metabolic, cardiovascular, and chronic diseases remain low if a balanced lifestyle is maintained [37].
- Overweight: Indicates moderate excess weight, associated with an increased risk of developing diseases. Although it is not yet considered obesity, it can progress towards it if preventive measures are not implemented [37].

- Obesity I: Classified as moderate, it represents a high risk of cardiovascular, metabolic, and degenerative diseases [37].
- Obesity II: Considered severe, it significantly increases clinical complications and reduces functionality [37].
- Obesity III: Called morbid, it has serious health consequences, including complex chronic diseases and a significant reduction in life expectancy [37].

To obtain anthropometric measurements of weight and height in adolescents, five electronic scales of the German brand SECA were used, recognized for their high precision and resistance, characteristics that make them suitable for population studies. Likewise, five fixed wood height meters were used, standardized according to the guidelines of the Ministry of Health of Peru (MINSA), which guarantees the reliability of the measurements made.

3.3. Procedure for Data Collection

3.3.1. Prior Authorization and Coordination

Considering that the study involves the adolescent population, evaluation by an ethics committee was established as an initial requirement. To this end, the corresponding application was submitted to the Ethics Committee of the University of Sciences and Humanities, obtaining its approval after an exhaustive review process. Subsequently, a formal meeting was arranged with the institutional council of the public school "Nuestra Señora de Guadalupe" and a group of parents, in order to present the objectives, procedures, and scope of the study.

During this information session, the researchers presented the ethical and methodological aspects of the project, supporting their application with the required documents, including the national identity card. As a result, official authorization was obtained from the school for the application to the study. Finally, with the support of teachers from first to fifth grade of secondary school, informed consents were distributed to parents, establishing a period of three days for students to deliver them signed and authorized, thus guaranteeing voluntary and ethical participation.

3.3.2. Application of the Instruments

Once the three-day period for the receipt of the informed consents signed by the parents had ended, the phase of application of the instruments to the adolescents was carried out. First, the informed assents were distributed to the previously authorized students, who voluntarily decided to participate. Next, organized logistics were implemented with five fixed stations, each equipped with a scale and a height meter, which allowed anthropometric measurements to be taken in an agile and accurate way, avoiding crowds and delays. At the same time, twenty individual spaces were set up for the application of the questionnaires, under direct observation, with an average duration of 10 minutes per student. During the process, personalized guidance was provided, resolving doubts that arose at the time. At the end, a booklet was delivered with recommendations based on the Dietary Guidelines for the Peruvian Population of the MINSA, in order to promote healthy habits among the participating adolescents.

3.4. Methods of Statistical Analysis

The data obtained through the instruments were manually transferred to a matrix elaborated in the Microsoft Excel program, where it was ordered and coded numerically, and then this database was transferred to SPSS version 30.0, where frequency analysis, graphing, and other specific analyses could be performed for the representation of the findings [38].

3.4.1. Automatic Linear Regression Model

This statistical method will estimate the value of a dependent variable from a set of independent variables, while relying on algorithms that will automatically identify the best combinations of predictors. The model will optimize which variables to use in all analyses, while relying on statistical criteria that are specific to the automated model, to minimize errors and bias associated with the selection of variables in typically manually conducted analyses [39]. In the context of this research, the model is particularly advantageous, as it enables clear identification of which indicators, identified as independent variables, will influence the three primary study variables more reliably and objectively, which promotes more efficient analysis that can be replicated.

3.5. Ethical Aspects

3.5.1. Principle of Autonomy

This principle acknowledges the capability for any person to freely make informed decisions and act without coercion [40]. In this study, we respected the autonomy of adolescents by providing informed assent so that each adolescent could freely choose whether to be a participant, even after having obtained parental permission.

3.5.2. Principle of Beneficence

It is claimed that researchers should always act in the best interest of the participant, acting in a way that benefits the participant and reduces risk [40]. Researchers protected beneficence in the study by providing adolescents with tailored weight and height information, verbal guidance, and certified informational material about healthy habits that contribute to enhanced consciousness of their physical health.

3.5.3. Principle of Non-Maleficence

This principle establishes the duty to avoid any action that may cause physical, emotional, or psychological harm. It was ensured that no participant was exposed to uncomfortable or harmful situations [40]. No invasive questions were asked, the privacy of the adolescents was protected, and the express authorization of parents and students was available at all times.

3.5.4. Principle of Justice

It promotes equity in treatment and equal access to the benefits of study [40]. At all times, the adolescents were treated with respect and without any discrimination. In addition, the information provided was adapted to the level of understanding of each age group, ensuring that everyone understood the purpose of the study and its implications. The Ethics Committee of the University of Sciences and Humanities reviewed and approved this study, consistent with national and international ethical standards for research with human subjects.

4. Results

4.1. Sociodemographic Data of Adolescents

These sociodemographic characteristics are relevant because they help contextualize the behavioral and attitudinal patterns observed. The predominance of students aged 14 to 15 years aligns with a developmental stage marked by increased concerns about body image and a higher tendency to adopt sedentary behaviors. Table 3 presents the sociodemographic data of the adolescents in the selected public school. In relation to sex, 114 (38.5%) were men and 182 (61.5%) were women. According to age, 19 (6.4%) were between 12 and 13 years old, 224 (75.7%) were between 14 and 15 years old, and 53 (17.9%) were between 16 and 17 years old. Regarding the level of education of the parents, 43 (14.5%) completed primary education, 114 (38.5%) secondary education, 83 (28.0%) technical higher education, and 56 (18.9%) higher university education. Finally, regarding the employment status of the parents, 259 (87.5%) indicated that they were employed, and 37 (12.5%) were unemployed.

Table 3. Sociodemographic data of adolescents in the public school of lima

Sociodemographic data	N = 296	n	%
Sex	Man	114	38.5%
	Woman	182	61.5%
Age	12 to 13	19	6.4%
	14 to 15	224	75.7%
	16 to 17	53	17.9%
Parental Instruction Degree	Primary	43	14.5%
	High school	114	38.5%
	Technical Superior	83	28.0%
	Higher University	56	18.9%
Parents' employment status	Unemployed	37	12.5%
	Employee	259	87.5%

4.2. Attitude towards Obesity in Adolescents

Figure 1 shows the attitude towards obesity among adolescents in public schools. It was observed that a neutral attitude was the most frequent in 129 (43.39 %) adolescents, followed by a negative attitude with 84 (28.47 %), a positive attitude with 80 (27.12 %), and a very positive attitude with only 3 (1.02 %).

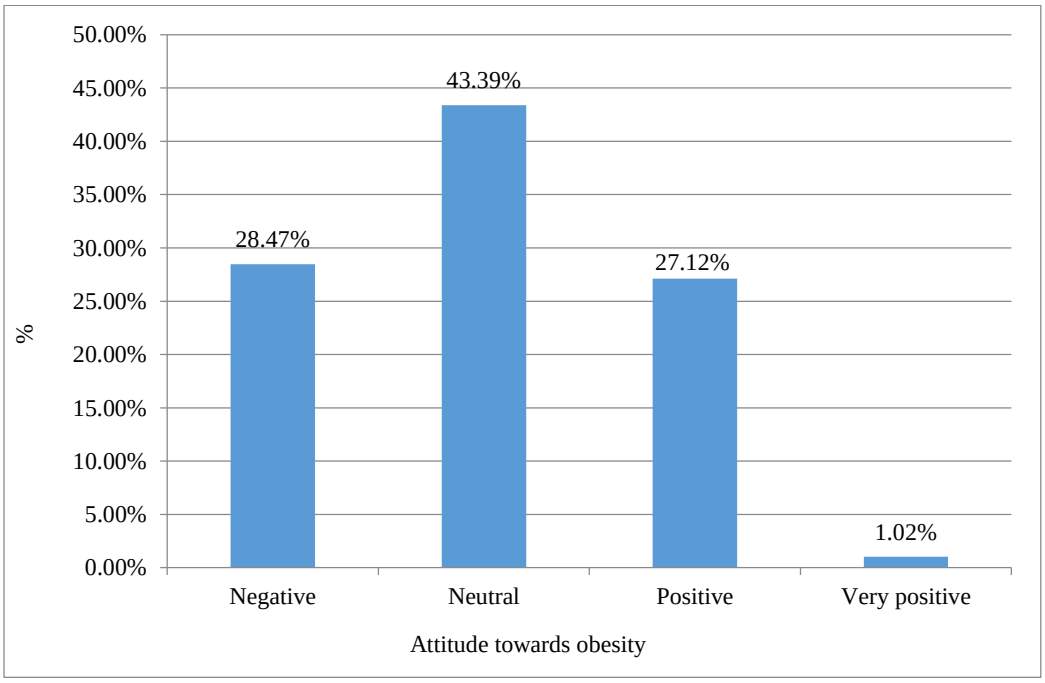

Fig. 1 Attitude towards obesity in adolescents in public schools in Lima

4.3. Physical Activity in Adolescents

Figure 2 shows physical activity among adolescents in public schools. Low physical activity predominated in 139 (46.96 %) adolescents, followed by very low activity in 91 (30.74 %). To a lesser extent, 62 (20.95%) adolescents registered moderate activity, and only 4 (1.35%) showed an intense level.

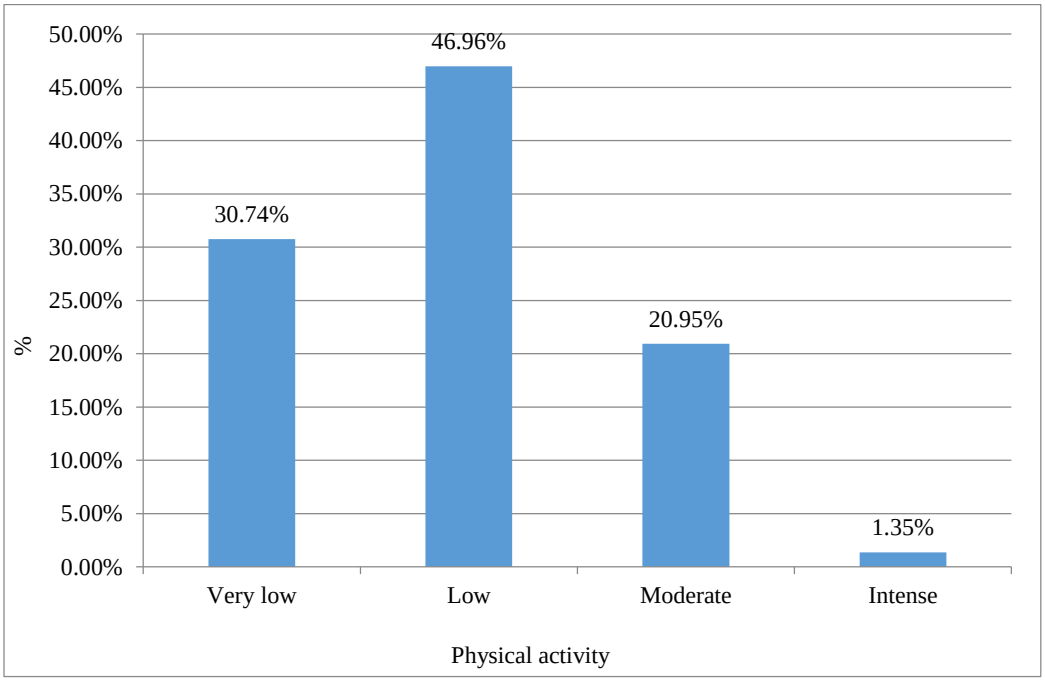

Fig. 2 Physical activity in adolescents from the public school of Lima

4.4. BMI in Adolescents

Figure 3 shows the distribution of BMI in adolescents in public schools. It was evidenced that the majority of adolescents 215 (72.64%) have a BMI within the normal range. This is followed by 42 (14.19%) who are overweight and 31 (10.47%) who are underweight. In a smaller proportion, cases of type I obesity were identified in 5 (1.69%), type III obesity in 2 (0.68%), and type II obesity in 1 (0.34%).

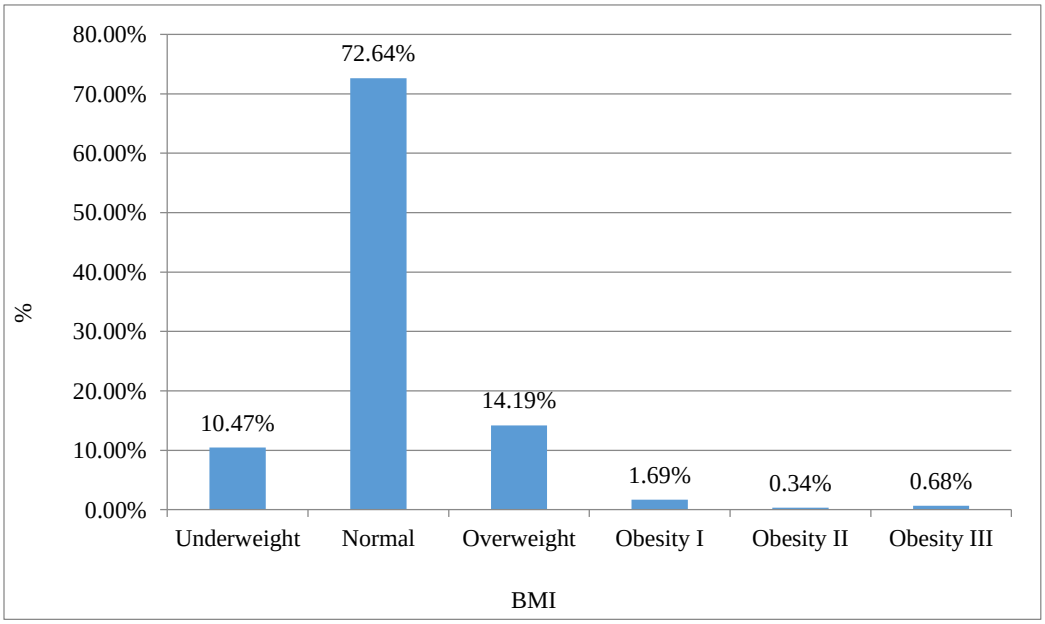

Fig. 3 BMI in adolescents from the public school of Lima

4.5. BMI and Attitude towards Obesity

Table 4 shows the cross-table of BMI and the attitude towards obesity of adolescents in public schools. It was observed that 94 (31.76 %) had a BMI within the normal range and manifested a neutral attitude towards obesity. In contrast, the 2 (0.68%) adolescents classified as having type III obesity show a negative attitude towards this condition.

Table 4. Cross-table of BMI and attitude towards obesity

N=296		Attitude towards obesity				Total
		Refusal	Neutral	Positive	Very positive	
BMI	Low weight	11	14	6	0	31
	Normal	61	94	57	3	215
	Overweight	9	18	15	0	42
	Obesity I	1	3	1	0	5
	Obesity II	0	0	1	0	1
	Obesity III	2	0	0	0	2
Total		84	129	80	3	296

4.6. BMI and Physical Activity

Table 5 shows the cross-table of BMI and physical activity of adolescents in public schools. It is evident that 100 (33.78 %) adolescents have a normal BMI accompanied by low physical activity, while 12 (4.05 %) who are overweight report very low levels of physical activity.

Table 5. Cross-Table of BMI and physical activity

N=296		Physical activity				Total
		Very low	Casualty	Moderate	Intense	
BMI	Low weight	11	13	7	0	31
	Normal	65	100	46	4	215
	Overweight	12	21	9	0	42
	Obesity I	1	4	0	0	5
	Obesity II	1	0	0	0	1
	Obesity III	1	1	0	0	2
Total		91	139	62	4	296

4.7. Correlation between Variables

Table 6 shows Spearman's correlation analysis between attitude towards obesity and BMI. The correlation coefficient results in a Rho = 0.082, which indicates a very weak positive relationship between the two variables.

However, the bilateral significance value (p = 0.162) is higher than the threshold (p = 0.05), so it cannot be stated that there is a statistically significant relationship between the attitude towards obesity and BMI.

Table 6. Correlation between obesity attitude and BMI

			Attitude towards obesity	BMI
Spearman's Rho	Attitude towards obesity	Correlation coefficient	1.000	.082
		Sig. (bilateral)	.	.162
		N	296	296
	BMI	Correlation coefficient	.082	1.000
		Sig. (bilateral)	.162	.
		N	296	296

Table 7. Correlation between physical activity and BMI

			Physical activity	BMI
Spearman's Rho	Physical activity	Correlation coefficient	1.000	-.007
		Sig. (bilateral)	.	.911
		N	296	296
	BMI	Correlation coefficient	-.007	1.000
		Sig. (bilateral)	.911	.
		N	296	296

Table 7 shows Spearman's correlation analysis between physical activity and BMI. The correlation coefficient results in a Rho = -0.007, which indicates an extremely weak negative correlation between both variables. In addition, the bilateral significance value (p = 0.911) is much higher than the threshold, indicating that the relationship is not statistically significant.

4.8. Automatic Linear Regression Model

Through this statistical model, the attitude towards obesity, the level of physical activity, and BMI were defined as dependent variables. To identify the most relevant predictors, each of the items of the instruments applied was considered as an independent variable or an indicator, along with the sociodemographic data. The objective was to determine the optimal combination of indicators that allows for explaining the behavior of the variables analyzed.

4.8.1. Attitude towards Obesity

Figure 4 shows the importance of the predictors associated with the variable attitude towards obesity. It is observed that the item "I believe I have self-control when I eat food" stands out with an importance of 0.145, being the most influential in the model, and showing a statistically significant relationship with the objective variable (p = 0.00). The model achieves an accuracy of 82.3%, which reflects an adequate level of adjustment in the prediction. Consequently, the greater the perception of eating self-control in adolescents, the more positive an attitude towards obesity is observed, a trend that is also visually confirmed in Figure 5.

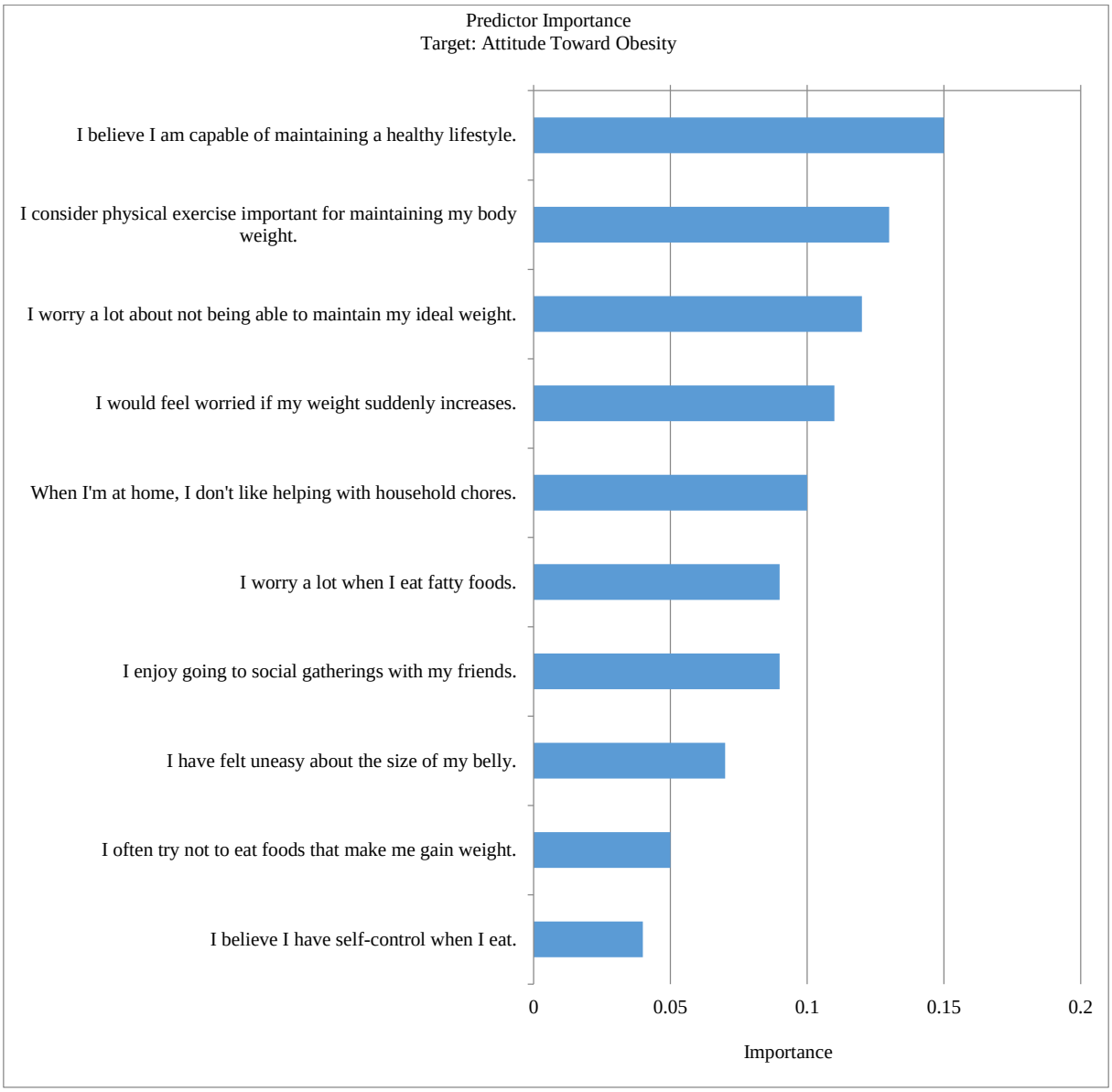

Fig. 4 Importance of the predictor of the variable attitude towards obesity

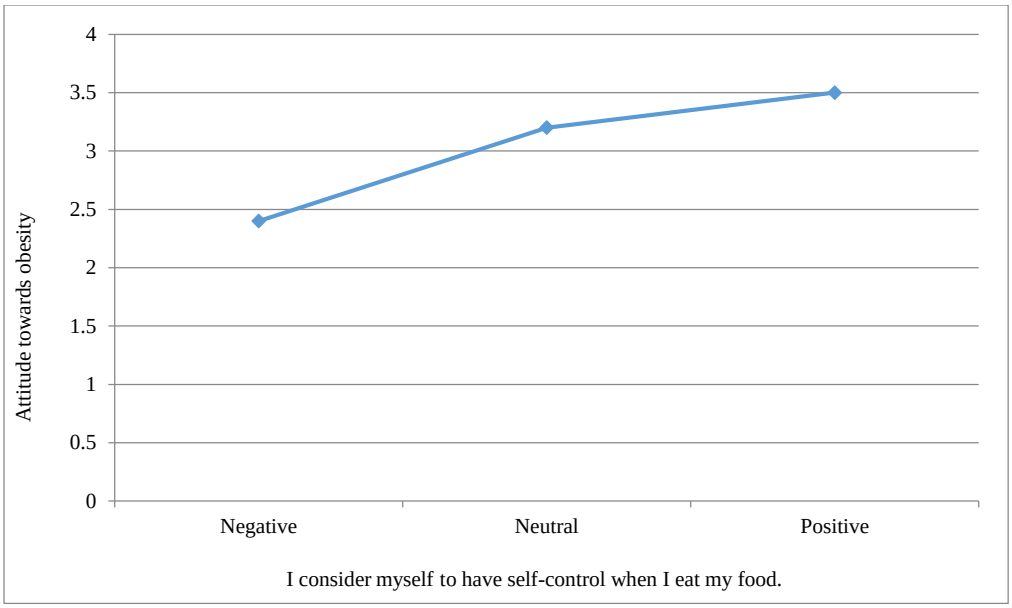

Fig. 5 Self-control when eating in the attitude towards obesity variable

4.8.2. Physical Activity

Figure 6 shows the importance of the predictors associated with the variable physical activity. The item "I do physical activity during school recess or break" obtained an importance of 0.269, being the one with the greatest influence within the model and presenting a statistically significant relationship with the physical activity of adolescents (p = 0.00).

The model achieved an accuracy of 66.4%, indicating a moderate but acceptable level of predictive fit. In this sense, it is inferred that the practice of physical activity during school recess is a key factor that increases the general levels of physical activity in adolescents, which is also graphically evidenced in Figure 7.

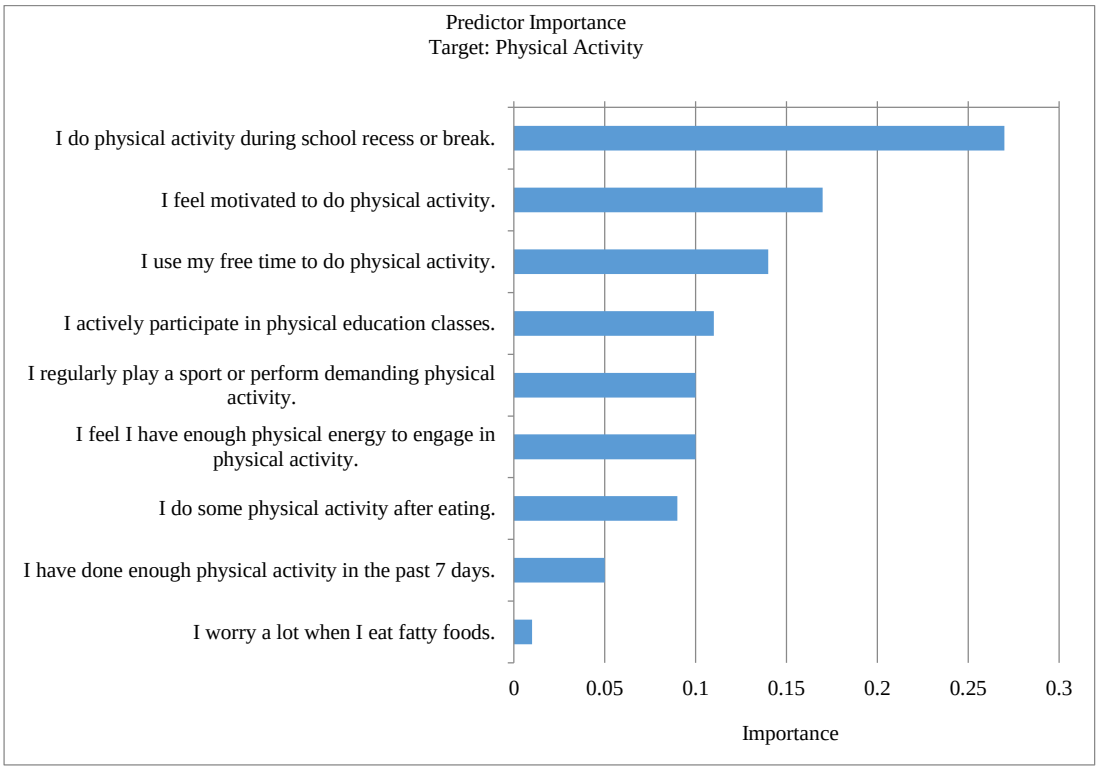

Fig. 6 Importance of the predictor of the physical activity variable

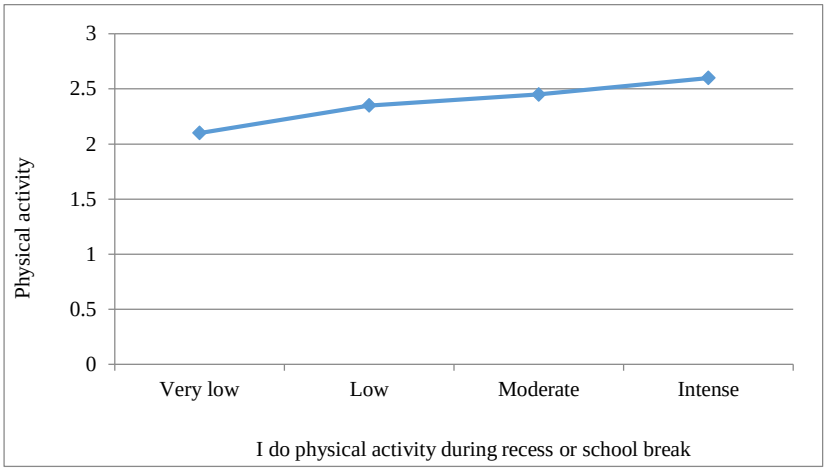

Fig. 7 Physical activity during recess or school break in the physical activity variable

4.8.3. BMI

Figure 8 shows the importance of the predictors associated with the BMI variable. It was identified that the item "When I'm at school, I prefer sitting and chatting with my friends over doing physical activity", belonging to the variable attitude towards obesity, has a prominent influence with an importance value of 0.477, even higher than that obtained in the previous models. This relationship was statistically significant (p = 0.00), and the model achieved an accuracy of 69.8%, which evidences a moderate predictive fit. Therefore, as adolescents have an attitude in which they prefer to sit and chat with their friends instead of doing physical activity at school, their BMI increases significantly, as can be seen in Figure 9.

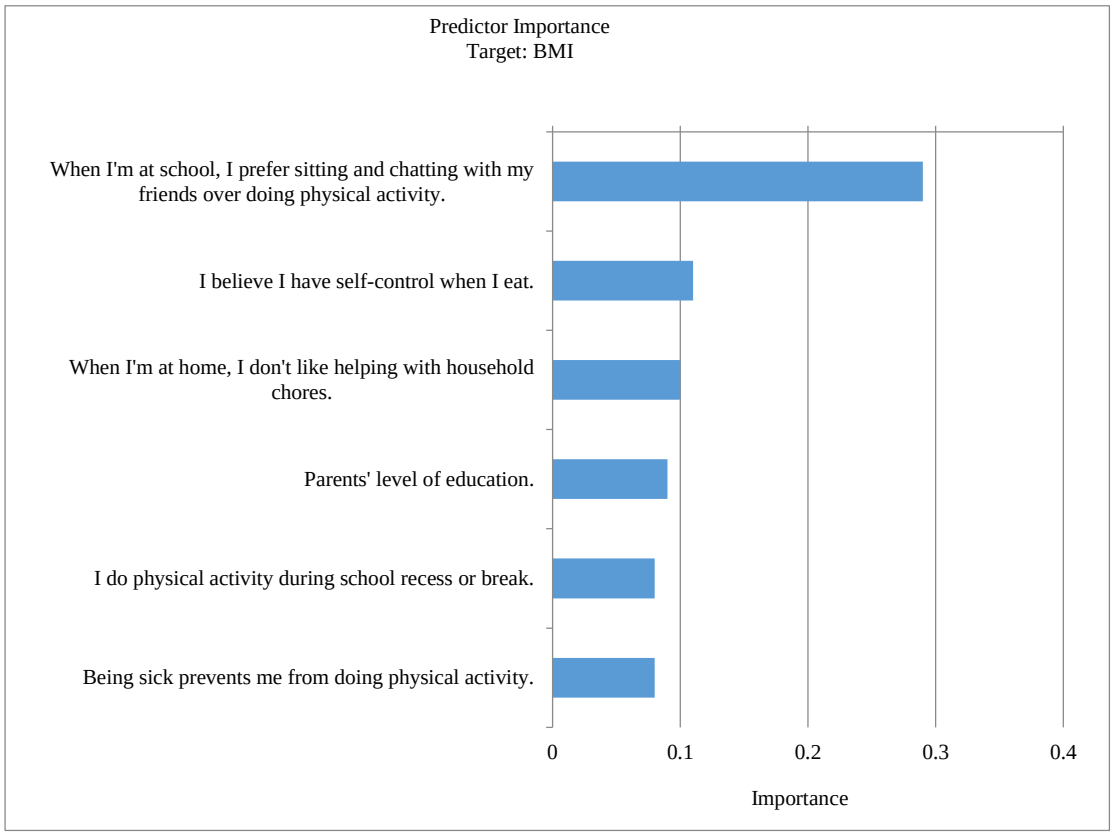

Fig. 8 Importance of the predictor of the BMI variable

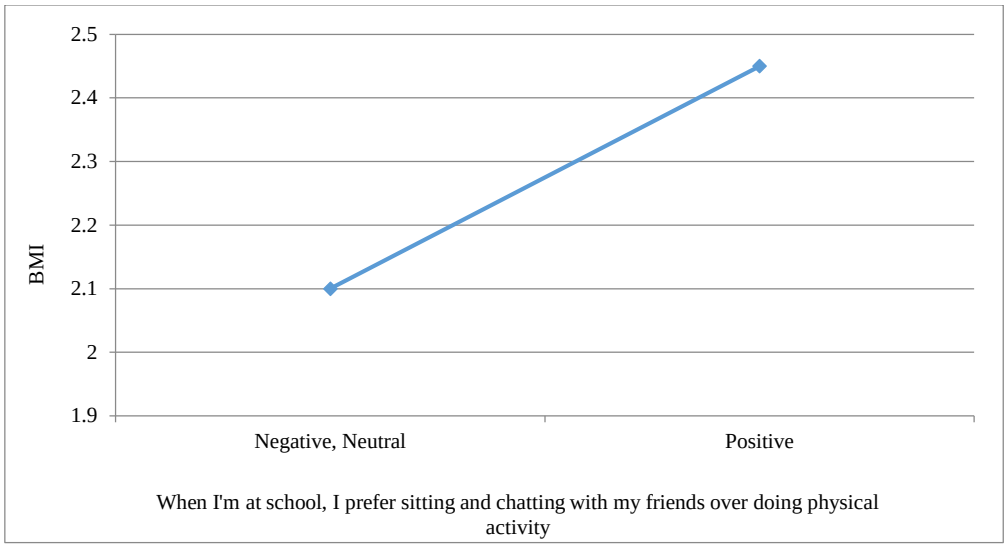

Fig. 9 Preference for sitting and chatting with friends instead of physical activity in the BMI variable

5. Discussion

This study aimed to determine the relationship among attitudes towards obesity, physical activity, and body mass index in adolescents attending a public school in Lima, Peru. The results revealed that the predominant attitude towards obesity was neutral (43.39%), followed by negative (28.47%), positive (27.12%), and, to a lesser extent, very positive (1.02%). These data contrast significantly with what was found in [15] in Huánuco, where 70.7% of adolescents had a positive attitude towards obesity. This difference could be explained, in the first place, by the higher level of knowledge on the subject in the participants of this author, since 81.3% had adequate knowledge about obesity. In addition, the geographical context can also play a role, since Huánuco, located in the Peruvian highlands, preserves traditional food practices with less access to ultra-processed products. On the other hand, Lima, as the capital city, shows a faster pace of life, wide availability of fast food, and constant exposure to idealized body models, which can reinforce stigmas about obesity and generate a more distant or negative attitude among adolescents.

In relation to physical activity in adolescent schoolchildren, the results show a predominance of low levels, with 46.96% of adolescents presenting low physical activity and 30.74% with very low levels, which together represent a worrying 77.7% of insufficient activity. Only 20.95% reach a moderate practice, and only 1.35% perform intense physical activity. This finding is especially critical, given that adolescence is a key stage for consolidating healthy habits. In addition, regular physical activity at this stage contributes to the optimal development of the musculoskeletal system, improves cardiovascular function, regulates body weight, prevents chronic diseases, and strengthens mental health, in addition to promoting active lifestyles that tend to be maintained in adulthood. This result is somewhat related to the study in [28], which found that 96% of adolescents in a private school had low or very low levels of physical activity. The difference in the percentages could be explained by the type of institution, since in the present study, a public school was evaluated, where sports practice is frequently, although in a limited way, promoted through school physical activities. These efforts, although insufficient, show some positive impact.

Regarding BMI, 72.64 % of the adolescents evaluated were within a range considered normal, while 14.19 % were overweight, 10.47 % were underweight, 1.69 % were classified as type I obese, 0.68 % as type III obese, and 0.34 % as type II obese. These results differ from the study in [28], where it was reported that 60% of adolescents in a private school were overweight or obese, in addition to having found a statistically significant association between the level of physical activity and BMI ($p = 0.025$). In contrast, in the present analysis, Spearman's correlation coefficient between both variables was negative and not significant (Rho = -0.007, $p = 0.911$). This finding suggests that, in this sample of students from a public school in Lima, low physical activity does not necessarily cause an altered BMI, as it did in private school students. However, this result is consistent with what was found in [29], where they also did not identify a statistically significant relationship between BMI and level of physical activity.

The cross-analysis of the variables allowed us to identify that 31.76% of adolescents have both a normal BMI and a neutral attitude towards obesity, which shows a poorly defined perception regarding this condition. In addition, it was observed that those adolescents diagnosed with type III obesity reflect a negative attitude towards obesity, which suggests a possible disconnect between their physical state and the way they face this reality, reinforcing the need for

interventions that integrate the psychological component. Likewise, 33.78% of adolescents with normal BMI presented low physical activity, which shows that an adequate weight is not always the result of this practice, but may be associated with eating habits and hereditary factors.

On the other hand, 4.05% of overweight adolescents showed very low levels of physical activity, revealing a worrying link between a sedentary lifestyle and excess weight. In view of these findings, it is essential that educational institutions promote not only regular exercise and a positive attitude towards obesity, but also a culture of integral well-being that includes a balanced diet, healthy self-esteem, and awareness of obesity from a formative perspective.

In the absence of statistically significant correlations between the main variables of the study, it was necessary to apply the Automatic Linear Regression Model in order to identify predictor indicators that allow for explaining the variables more accurately. In this analysis, it was identified that the item "I believe I have self-control when I eat food" presented an importance of 0.145, significance ($p = 0.00$), and a model accuracy of 82.3%, indicating that this perception directly influences the attitude towards obesity, so promoting food self-control can contribute to the development of more positive attitudes.

Likewise, it was determined that the item "I do physical activity during school recess or break" had an importance of 0.269, significance ($p = 0.00$), and an accuracy of 66.4%, positioning itself as the main predictor of the variable physical activity. Finally, the item "When I'm at school, I prefer sitting and chatting with my friends over doing physical activity" had an importance of 0.477, a significance ($p = 0.00$), and an accuracy of 69.8%, making it the most influential predictor of BMI. This finding is consistent with [27], where an increase in BMI was evidenced as the hours of sedentary leisure increased ($p < 0.01$).

A key contribution of this study is the identification of high-impact behavioral predictors, an area that remains underexplored in Peruvian research. The finding that decisions made during school recess have a stronger influence on BMI than self-reported activity levels suggests the need to reframe school-based interventions to emphasize supervised or structured recreational activities. These results open new avenues for research on how micro-level daily behaviors shape adolescents' nutritional status.

6. Conclusion

Based on the results obtained, it is concluded that adolescents from the public school of Lima predominantly have a neutral attitude towards obesity and maintain low levels of physical activity, despite the fact that most of them have a BMI within the normal range. This combination indicates an absence of a relationship between body condition and awareness of the consequences of excess body weight. Attitudinal neutrality and a lack of physical activity may also signify a lack of information, motivation, or opportunity to engage in healthy behavior. It is important, therefore, to utilize long-term pedagogical interventions that are embedded in education and have learning experiences about nutrition, self-care, and physical activity, which support the development of competencies to prevent chronic disease among young people. Promote a culture of holistic health in adolescence.

This issue is even more challenging in the education system of Peru, particularly in public education, given that there are structural limitations related to the capacity for education in health in general. With this challenge, it is necessary to develop educational interventions that go beyond physical education classes to include content focused on self-care, self-regulation of food, and a healthy notion of the body.

It is essential that these actions are coordinated with the joint work of parents and teachers, as they are important agents in the establishment of positive habits during adolescence. Not only will overcoming these barriers improve the physical and emotional health of children and adolescents, but it will also help to generate a preventive culture that supports healthier, more equitable, and likely, sustainable schools in the long term.

Although no direct correlations were identified between the main variables, the regression model allowed the recognition of relevant predictive factors, such as eating self-control and physical behavior during recess, which showed statistical significance and high precision. These findings open the possibility of intervening strategically from the school environment.

It is recommended to promote active and healthy educational spaces that integrate movement dynamics during breaks, such as organized games or recreational activities with incentives. Likewise, it is key to include in traditional education strategies of self-regulation in the consumption of food, approached with attractive methods and relevant to the reality of students in public schools, in order to generate significant learning.

Finally, it is essential to recognize that mental health, self-esteem, and positive social relationships play a decisive role in the integral development of adolescents, especially in school contexts.

These aspects influence not only their emotional well-being, but also their behavior towards health, diet, and physical activity. Therefore, it is recommended that future research include the analysis of these psychosocial factors in order to identify possible links with healthy habits and nutritional status.

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