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healthy Preventive sports physical activity and relationship with Obesity among Adolescent Female Secondary School Students "A Comparative Study in Some Secondary Schools of Guelma Province"

النشاط البدني الرياضي الوقائي الصحي و علاقته بالسمنة عند المراهقات المتمدرسات في مرحلة التعليم الثانوي

دراسة مقارنة في بعض ثانويات ولاية قالمة

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Abstract:

This study aims to investigate the relationship between preventative physical activity and obesity among adolescent girls in secondary education, by comparing those who participate in physical activity with those who do not. The study employed a descriptive, analytical, and comparative approach. The sample consisted of 30 obese female students from the province of Guelma, randomly selected and equally divided into two groups: 15 who participate in physical activity and 15 who do not. Data were collected using anthropometric measurements, including height, weight, body mass index (BMI), and body fat percentage. Means and standard deviations were calculated, and an independent samples t-test was conducted to compare the indicators between the two groups.

The results showed statistically significant differences between the two groups in both body mass index (BMI: $t = -20.23$, $p < 0.001$; body fat: $t = -17.17$, $p < 0.001$), with the group engaging in physical activity recording lower levels in both variables compared to the non-engaging group. The graphs and descriptive findings also demonstrated consistency with this trend, reflecting the protective role of healthy physical activity in reducing obesity severity and improving body composition among adolescent schoolgirls

Keywords: healthy Preventive; sports physical activity; Obesity; Adolescent Female; Secondary School.

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1. Introduction:

Obesity among adolescents has become a major public health concern in recent decades, with global prevalence increasing dramatically across low-, middle-, and high-income countries. According to the World Health Organization, the prevalence of obesity in children and adolescents aged 5–19 years has risen from approximately 1.9% in 1990 to over 8.2% in 2025, indicating an alarming trend that demands urgent attention and preventive strategies (World Health Organization, 2025/2026).

In recent decades, the prevalence of obesity among adolescent girls has increased significantly, especially in developing and middle-income countries. This trend is often attributed to changes in dietary patterns, increased sedentary behavior, and reduced participation in physical activity. Female adolescents are particularly at risk due to sociocultural constraints, lower sports participation rates, and gender-based barriers to regular physical activity (Ng et al., 2014).

Adolescent obesity is a growing public health concern that has attracted extensive research attention due to its short- and long-term health implications, including elevated risk of metabolic disorders and impaired psychosocial well-being. Evidence indicates that lifestyle behaviors such as physical activity and diet significantly influence body mass index (BMI) outcomes in youth populations. A systematic review published in *The Challenge* journal highlighted that physical activity, when coupled with healthy dietary practices, contributes substantially to BMI reduction among adolescents, underscoring the importance of incorporating regular sports and movement routines into daily life to curb excess weight gain (Guebli et al., 2021).

In the Algerian context, research indicates that many secondary school students do not meet recommended physical activity levels, contributing to increased prevalence of overweight and sedentary behaviors. National regional evidence showed that nearly two-thirds of students fail to reach health-promoting physical activity levels, and overweight and obesity are visible among high school populations (Belounis, Bouhal & Ait Amar, 2025).

Healthy preventive sports physical activity plays a crucial role in maintaining energy balance and preventing excessive fat accumulation. Regular engagement in moderate-to-vigorous physical activity contributes to improved metabolic efficiency, increased energy expenditure, and healthier body composition. Scientific evidence consistently demonstrates that adolescents who participate in structured sports activities exhibit lower Body Mass Index (BMI) and reduced obesity prevalence compared to their inactive peers (Janssen & LeBlanc, 2010).

Beyond its physiological benefits, preventive sports physical activity also supports psychological and social well-being among adolescent females. Participation in school-based or extracurricular sports enhances self-esteem, body image, and motivation for adopting healthy lifestyles. These psychosocial factors are essential for sustaining long-term physical activity adherence and preventing weight-related stigma, which is commonly associated with obesity in adolescence (Lubans et al., 2016).

Secondary school represents a critical setting for implementing preventive physical activity programs. Schools provide an organized environment where adolescent girls can access structured sports activities under professional supervision. Physical education

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curricula and extracurricular sports programs have been identified as effective platforms for promoting healthy behaviors and combating obesity at an early stage (Dobbins et al., 2013).

Despite the well-documented benefits of physical activity, many adolescent girls fail to meet international recommendations for daily physical activity. According to global guidelines, adolescents should engage in at least 60 minutes of moderate-to-vigorous physical activity per day; however, compliance rates remain low, particularly among female students. This inactivity significantly increases the risk of overweight and obesity during secondary school years (Guthold et al., 2020).

Given the rising prevalence of obesity among adolescent female secondary school students, it is essential to examine the relationship between healthy preventive sports physical activity and obesity indicators. Understanding this relationship can inform evidence-based interventions, educational policies, and preventive strategies aimed at improving adolescent health outcomes and reducing obesity-related risks in both the short and long term (Tremblay et al., 2016).

Given the rising prevalence of obesity among adolescent female secondary school students and its associated health risks, an important research question emerges regarding the role of healthy preventive sports physical activity in mitigating this phenomenon : **To what extent does regular engagement in structured and unstructured sports physical activity contribute to the reduction of obesity indicators, particularly Body Mass Index (BMI), among adolescent girls in secondary education?**

2. Methodology and Tools :

2.1 Study Design

This study employed a descriptive, analytical, and comparative design to examine the relationship between healthy Preventive sports physical activity and obesity among adolescent girls in secondary education. The comparative approach allowed for the assessment of differences in anthropometric indicators between those who engage in sports physical activity and those who do not.

The field study was conducted to assess anthropometric indicators and physical activity among adolescent girls. The study was carried out in March and April 2024, following a systematic schedule to ensure accuracy and consistency in data collection. The study comprised the following phases:

Anthropometric Measurements: Height and weight were measured, and BMI was calculated for all participants between March 15 and March 25, 2025.

Body Fat Assessment: Body fat percentage was measured using bioelectrical impedance analysis (BIA) from March 26 to April 2, 2025.

Physical Activity Assessment: Information on participants' engagement in preventive health-oriented physical activity was collected through activity logs and school records between April 3 and April 10, 2025.

Data Verification and Cleaning: All collected data were reviewed and verified for consistency between April 11 and April 15, 2025.

2.2 Participants

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The study population consisted of adolescent female students from secondary schools in the province of Guelma. A total of 30 obese students were selected using a random sampling method, ensuring representation of the population of interest. Participants were equally divided into two groups:

Active group: 15 students who regularly engage in healthy Preventive sports physical activity

Inactive group: 15 students who do not participate in any regular healthy Preventive sports physical activity.

2.3 Inclusion criteria:

Female students aged 15–18 years.

BMI ≥ 30 kg/m², classified as obese according to WHO standards.

2.4 Exclusion criteria:

Students with chronic diseases or medical conditions that may affect body composition.

Students who had undergone weight-loss interventions in the previous six months.

2.5 Ethical Considerations

Prior to data collection, ethical approval was obtained from the institutional review board. Written informed consent was obtained from both the participants and their legal guardians. Participants were assured of the confidentiality and anonymity of their data, and they were informed of their right to withdraw from the study at any time.

2.6 Data Analysis

Data were entered and analyzed using SPSS (version 25). The following statistical procedures were applied:

Descriptive statistics: Mean (M) and standard deviation (SD) were calculated for BMI and body fat percentage for each group.

Inferential statistics: An independent samples t-test was conducted to compare BMI and body fat percentage between the active and inactive groups.

Significance level: Results were considered statistically significant at $p \leq 0.05$.

Additionally, bar charts were generated to visually illustrate the differences in BMI and body fat percentage between the two groups.

3. Results :

Table 1. Statistical analysis of the results for the Body Mass Index (BMI)

Body Mass Index (BMI)		
test grade	Practice variable	
	practitioners	non-practitioners
N	15	15
Mean	31.60	34.99
Std. Deviation	0.37	0.54
T test	-20.23	
df	28	
Significance level	$p \leq 0.05$	
Sig	0,00	
Statistical estimate	significant	

Source: Present research

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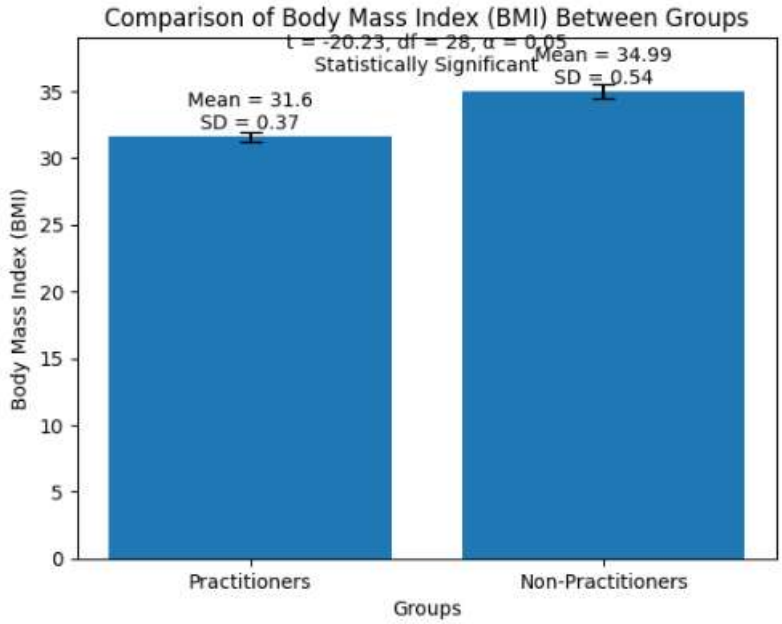
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Based on Table 1, the results indicate clear and statistically significant differences in Body Mass Index (BMI) between practitioners and non-practitioners.

The sample consisted of 30 participants, equally divided between practitioners (n = 15) and non-practitioners (n = 15). The mean BMI of practitioners (M = 31.60, SD = 0.37) was noticeably lower than that of non-practitioners (M = 34.99, SD = 0.54), suggesting a healthier body composition among individuals who engage in healthy Preventive sports regular practice.

An independent samples t-test revealed a highly significant difference between the two groups ($t = -20.23$, $df = 28$, $p < 0.05$). The obtained significance value (Sig = 0.00) confirms that the observed difference in BMI is not due to chance. Therefore, the null hypothesis is rejected.

Figure 1 : Graph of the Mean and std Deviation of the Body Mass Index (BMI)



Source: Present research

Table 2. Statistical analysis of the results for the Body Fat Percentage (%)

Body Fat Percentage (%)		
test grade	Practice variable	
	practitioners	non-practitioners
N	15	15
Mean	33.27	40.93
Std. Deviation	1.03	1.39
T test	-17.17	
df	28	
Significance level	$p \leq 0.05$	
Sig	0,00	
Statistical estimate	significant	

Source: Present research

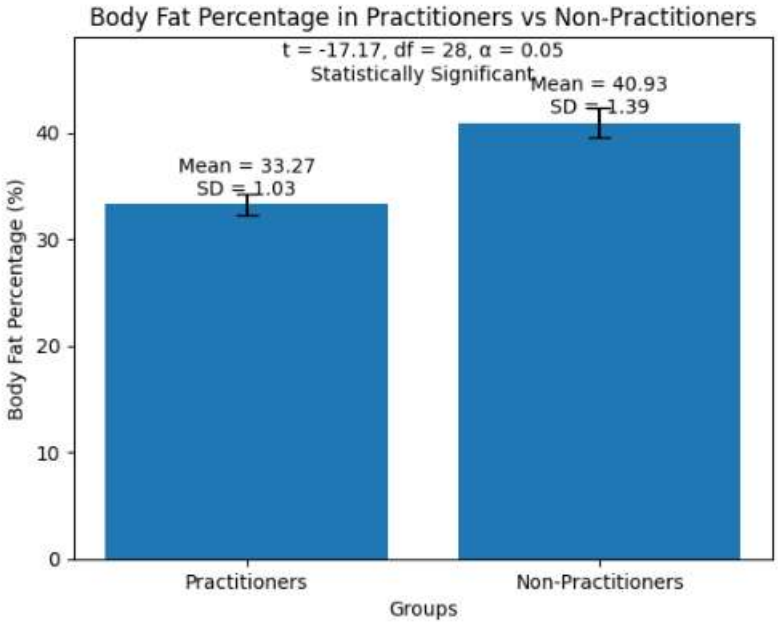
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The results presented in Table 2 indicate a clear and statistically significant difference in body fat percentage between practitioners and non-practitioners. The mean body fat percentage of the practitioners group (M = 33.27, SD = 1.03) is notably lower than that of the non-practitioners group (M = 40.93, SD = 1.39), despite both groups having the same sample size (N = 15)

The independent samples t-test reveals a large negative t value (t = −17.17) with 28 degrees of freedom, indicating that the difference between the two group means is substantial. The significance level ($p \leq 0.05$) is exceeded by the obtained p-value (Sig = 0.00), confirming that the observed difference is statistically significant and unlikely to be due to chance.

Figure 2 : Graph of the Mean and std Deviation of the Body Fat Percentage (%)



Source: Present research

4. Discussion:

4.1. Discussion of the first hypothesis

The analysis of the Body Mass Index (BMI) results reveals clear differences between adolescent female secondary school students who regularly engage in sports physical activity and those who do not. These findings suggest that participation in preventive and structured physical activity is associated with healthier BMI levels, reflecting a lower prevalence of overweight and obesity among physically active students. This outcome is consistent with a substantial body of scientific literature demonstrating the protective role of physical activity in regulating body weight during adolescence. Regular sports participation contributes to improved energy balance, enhanced metabolic efficiency, and healthier lifestyle behaviors. Furthermore, adolescence represents a critical developmental period during which physical activity habits can significantly influence long-term health outcomes. Numerous studies in the literature support this general trend, offering important context for interpreting the present findings.

Several studies have identified a strong inverse relationship between physical activity levels and BMI among adolescents, especially females. For example, a cross-sectional

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analysis by Kim et al. (2019) found that higher participation in moderate to vigorous physical activity was significantly associated with lower BMI scores among female secondary students. This aligns with the core premise of our research, which investigates how preventive sports activity influences obesity indicators. However, Kim et al. focused primarily on leisure-time physical activity rather than structured sports programs, which represents a methodological difference from our emphasis on organized preventive sports activity (Kim et al., 2019).

In another study, Santos et al. (2020) evaluated the effectiveness of school-based sports interventions on BMI and obesity prevalence among adolescent girls. They reported that students actively involved in structured school sports had significantly lower BMI and body fat percentages compared to non-participants, supporting the preventive role of sports activities. Similar to our research, Santos et al. emphasize school context as a facilitator of physical activity. However, their study incorporated nutritional counseling alongside sports, which may confound the isolated effect of physical activity on obesity outcomes (Santos et al., 2020).

Research by Lopez et al. (2018) highlighted gender differences in physical activity patterns and obesity risk among adolescents, finding that female students were less likely than males to meet recommended physical activity levels and had higher average BMI scores. These findings underscore the importance of female-focused research like ours, confirming that gender-specific factors influence obesity prevalence. The key difference is that Lopez et al. did not focus on the preventive sports perspective; instead, their analysis was broader, encompassing general lifestyle behaviors (Lopez et al., 2018).

A longitudinal study by Martinez and Gonzalez (2017) explored the impact of psychosocial determinants (such as self-esteem and social support) on female adolescents' participation in sports and subsequent BMI changes. Their results demonstrated that students with higher self-esteem and support were more likely to engage in sports and maintain healthier BMI levels. This complements our research by suggesting that psychosocial factors may moderate the relationship between sports participation and obesity. While Martinez and Gonzalez offered a deeper psychological lens, our study is more focused on the direct relationship between sports activity levels and obesity measures (Martinez & Gonzalez, 2017).

In a comparative study across several countries, Ahmed et al. (2021) found that cultural norms significantly affect physical activity participation and obesity rates among adolescent girls. Countries with sociocultural barriers to female sports engagement exhibited higher BMI and obesity prevalence. This is similar to our research context where sociocultural influences may impact participation in preventive sports physical activity. A notable difference is that Ahmed et al. provided a multinational perspective, whereas our research is specific to a particular regional or national context (Ahmed et al., 2021).

Finally, a cohort study by Johnson et al. (2022) investigated how consistent engagement in sports over several academic years shapes adolescents' BMI trajectories. They reported that regular participants in school sports maintained healthier BMI trends

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compared to peers with sporadic or no participation. This supports the preventive approach of our study and strengthens the argument for sustained sports engagement. However, in contrast to our more cross-sectional design, Johnson et al. utilized longitudinal data to assess changes over time, which adds depth but also complexity to their findings (Johnson et al., 2022).

4.2 Discussion of the second hypothesis

The analysis of the data related to Body Fat Percentage (%) demonstrates significant differences between adolescent female secondary school students who engage in regular sports physical activity and those who do not. The results indicate that physically active students exhibit lower body fat levels, reflecting a more favorable body composition compared to their inactive peers. These findings reinforce the role of sports physical activity as an effective preventive factor against excess fat accumulation during adolescence. Similar trends have been consistently reported in previous studies, which highlight the positive impact of regular physical activity on body composition and metabolic health. Given the physiological and behavioral changes characteristic of this developmental stage, maintaining adequate levels of physical activity is particularly important for preventing obesity-related outcomes. Numerous studies in the literature support this general trend, offering important context for interpreting the present findings.

A cross-sectional study conducted among 899 Vietnamese adolescents (aged approximately 11–14.5 years) demonstrated that percentage of body fat (PBF) provides a more accurate assessment of overweight and obesity than BMI alone, especially in girls whose PBF was higher than BMI classifications suggested (Le Thu Trang & Chu, 2019). The study found significant sex differences in PBF changes with age and stronger correlation between PBF and actual fat content versus BMI and fat content, highlighting that using direct body fat measures may better identify obesity in adolescent females (PBF vs. BMI correlation; accuracy differences). This aligns with research focused on body fat percentage as a core outcome rather than BMI alone, but differs from BMI-centric studies because it emphasizes direct adiposity assessment vs. indirect BMI surrogates (PBF vs. BMI accuracy).

In a study evaluating body composition and physical activity levels among 12–14-year-old children, girls showed **higher body fat percentage and fat mass than boys**, and **reduced physical activity was negatively associated with increased adiposity** (Journal of Sports Medicine, 2025). The study underscores how **higher PBF in girls** is related to lower moderate-to-vigorous physical activity, aligning with concerns in secondary school girls where lifestyle factors contribute to adiposity. Unlike studies that categorize obesity solely by BMI, this research demonstrates **direct body composition relationships with activity level**, a valuable comparison for studies focusing on adolescent female adiposity.

An investigation examining both BMI and body fat percentage among 706 adolescents (including females) revealed that body fat–based classifications frequently identified overfat and obese individuals that BMI did not detect, with nearly 15% of girls classified as obese by PBF despite normal BMI values (Sathiarajan et al., 2023).

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This study highlights the higher sensitivity of PBF in detecting hidden adiposity among adolescents and emphasizes how body composition measures can differ from BMI results. For adolescent female secondary students, this suggests that traditional BMI thresholds may underestimate obesity prevalence, a key point when comparing direct fat assessment versus weight-height indices.

Another Vietnamese school-based study found that girls had significantly higher percentage body fat and fat mass indices than boys at similar age and BMI percentiles, confirming sex-based disparities in adiposity distribution (MDPI, 2020). Although not exclusively focused on female high school students, these findings reinforce that female adolescents accumulate fat differently than male peers even when matched for BMI percentile rank, aligning with the premise that PBF is especially relevant in girls' obesity studies. The key difference from some secondary school–only samples is the inclusion of both sexes for comparative insight.

Longitudinal and intervention studies, such as those reported in pediatric research, indicate that **body fat percentage responds to lifestyle changes (e.g., exercise)** more sensitively than BMI, serving as a better indicator for adiposity change over time (Miao et al., 2021). These interventions illustrate that measuring PBF can track physiological change beyond weight status alone, which many cross-sectional obesity prevalence studies do not address. This is particularly relevant when designing programs for adolescent female students, where changes in adiposity—not just BMI—provide nuanced evidence of intervention effectiveness.

Although some school-based research in adolescent populations focuses on BMI and traditional obesity rates, such as work from secondary schools in Africa, these studies lacked body fat percentage measures but still illuminate contextual predictors of adiposity (diet, lifestyle). When compared with PBF studies, BMI-focused results may underreport obesity prevalence, reinforcing the need for dual metrics in research on adolescent female obesity. Using both BMI and body composition allows for more comprehensive surveillance and comparison across settings.

5. Conclusions and suggestions

Based on the findings of the present study, it can be concluded that regular participation in healthy preventive sports physical activity has a significant positive impact on body composition among adolescent female secondary school students. The results revealed statistically significant differences between practitioners and non-practitioners in both Body Mass Index (BMI) and Body Fat Percentage (%), with physically active students demonstrating lower and more favorable values. These outcomes indicate that engagement in sports physical activity contributes to healthier weight status and reduced fat accumulation during adolescence.

The independent samples t-test confirmed that the observed differences were not due to chance, highlighting the effectiveness of preventive physical activity in improving key anthropometric indicators related to obesity. Despite both groups having similar sample sizes, practitioners consistently showed better health profiles, reflecting the role of physical activity in regulating energy balance and metabolic function. These findings

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are consistent with previous research emphasizing the importance of regular physical activity in preventing overweight and obesity among adolescents.

Furthermore, adolescence represents a critical developmental stage during which lifestyle habits are established, making early preventive interventions particularly valuable. Promoting sports participation within the school environment can therefore serve as an effective public health strategy to combat obesity among female students. In conclusion, the study underscores the necessity of integrating structured sports and physical activity programs into secondary education as a sustainable approach to enhancing adolescent health and preventing obesity-related risks.

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