

Dietary Habits, Body Composition and Life Satisfaction Among Saudi University Female Students by Physical Activity

Asmaa Alsubhi¹, Arwa M Turkistani^{1*}

¹Department of Food and Nutrition, Faculty of Human Sciences and Design, King Abdulaziz University, Jeddah, Saudi Arabia.

Abstract

The undergraduate stage plays a crucial role in promoting healthy habits. Therefore, this study aimed to determine and compare the body composition, dietary assessment, and life satisfaction level among physically active and inactive female students at King Abdulaziz University (KAU). This cross-sectional study was conducted on 257 university students between March and November 2022. This study used the International Physical Activity Questionnaire (IPAQ), Healthy Eating Assessment, and Life Satisfaction-11 (LISAT-11) to collect data, and the body composition was measured. 45.5% of the participants were in a low level of physical activity (PA), 36.2% had a moderate level, and 18.3% had a high level. Students spent 8.11 ± 3.94 hours/day of sitting time. 78.2% of students were satisfied with their life. 63.4% of students had a good eating pattern while 33.1% were in a “Fair” zone. Significant inverse differences were found between eating patterns and PA levels, body fat percentage, waist circumference, and waist-to-hip ratio ($p \leq 0.05$). This study concluded a high prevalence of sedentary behavior and insufficient PA levels among KAU students. Furthermore, the majority of students fell within the normal weight range, reported high life satisfaction, and demonstrated good dietary patterns. There were no significant differences in life satisfaction and body composition among physically active and inactive students.

Keywords: Physical activity, Body composition, Dietary habits, Life satisfaction, Behavior, University students

INTRODUCTION

Health-promoting lifestyles are shaped by individual choices, with examples encompassing engaging in PA, adhering to dietary habits, and managing overweight [1]. Body composition is a pivotal indicator of overall health and PA levels. High body fat levels and overweight conditions are prevalent across age groups, and metrics like body fat percentage and fat mass index have shown a moderate capacity to identify and predict metabolic syndrome in Colombian collegiate students [2]. It is noteworthy that the risk of metabolic syndrome is inversely associated with higher levels and intensities of PA, while it is positively linked to prolonged sedentary behavior [3].

Physical activity is one of the main concerns all around the world due to its role in preventing various diseases. In fact, a sufficient PA level benefits people of all ages and a modest 10% reduction in physical inactivity could prevent over 533,000 global deaths while eliminating physical inactivity is estimated to increase average life expectancy by 0.68 years [4]. To achieve an optimal quality of life, one must consider the frequency, duration, and intensity of PA. In general, achieving 10,000 steps per day is deemed suitable [5]. Within a weekly regimen, it is recommended for adults to engage in 150–300 mins of moderate-intensity PA or 75–150 mins of vigorous-intensity PA [6]. Additionally, young adults who

are insufficiently active tend to exhibit behaviors like skipping meals, consuming limited fruits and vegetables, and relying on fast [7, 8].

Alongside the challenges that confront college students, life satisfaction is an important factor that affects overall health. intensive academic workload, pressure to succeed, and concerns about the future, act as stressors that can lead to the development of psychological issues and hinder academic performance as well as worsen their dietary behaviors [9, 10]. Common psychological problems experienced by college students include depression, stress, and anxiety with a significant correlation observed between these issues and

Address for correspondence: Arwa M Turkistani, Department of Food and Nutrition, Faculty of Human Sciences and Design, King Abdulaziz University, Jeddah, Saudi Arabia. arwaturkistani@kau.edu.sa

This is an open-access article distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 License, which allows others to remix, tweak, and build upon the work non commercially, as long as the author is credited and the new creations are licensed under the identical terms.

How to cite this article: Alsubhi A, Turkistani AM. Dietary Habits, Body Composition and Life Satisfaction Among Saudi University Female Students by Physical Activity. *Arch Pharm Pract.* 2024;15(3):28-36. <https://doi.org/10.51847/TFhQCTNtzj>

satisfaction of life [11]. The college years represent a crucial period for the establishment of various habits. Therefore, maintaining adequate awareness and preparedness is essential for effectively managing daily stressors, ensuring the preservation of good health, and preventing the onset of numerous diseases.

The global decline in PA levels, accompanied by increased sedentary behavior, is a significant public health concern [12]. This decline, along with the prevalence of overweight and obesity, contributes to a substantial portion of worldwide mortality and elevates the risk of non-communicable diseases [13]. Notably, following high blood pressure, tobacco use, and high blood glucose, insufficient PA is a leading risk factor for noncommunicable diseases, including heart diseases, diabetes, and cancer [14].

The decline in PA is particularly pronounced among women and varies by country, such as in Saudi Arabia [15]. In Saudi Arabia, the prevalence of insufficient PA among females is alarmingly high, with 88.38% of Saudi females being insufficiently active [16]. University students, who face the challenges of academic workloads, are susceptible to instabilities in their PA levels [17].

However, there is a limited body of research investigating the impact of PA on dietary habits, body composition, and life satisfaction in Saudi Arabia, with variations in research samples, objectives, and variables. This study seeks to bridge this research gap by providing insights into the PA levels and overall well-being of university students. This study aimed to determine and compare the dietary assessment, body composition and life satisfaction level among physically active and inactive female students at King Abdulaziz University (KAU).

MATERIALS AND METHODS

Study Design

To accomplish our research objectives, we adopted a cross-sectional design. This study evaluated the life satisfaction, dietary assessment, and PA among healthy young adults at KAU, Jeddah, Saudi Arabia, between March and November 2022. Data collection took place in two stages; initial anthropometric measurements of the participants were taken, followed by the completion of an online questionnaire. The study procedures were ethically approved by the Research Ethics Committee, Faculty of Medicine, KAU (Reference No 480-21). The participants signed an informed consent form that outlined the study's objectives, ensured their right to withdraw at any time, potential data processing, and strict data confidentiality for research purposes. Their information would be treated as strictly confidential and used only for scientific research.

Participants

A voluntary response sampling technique was used to recruit the study sample. The sample size was determined within 0.05 of the total population of ~41,072 [18] with a 90% confidence level [19]. The sample size calculation has revealed several 271 participants were enrolled in this study. The study focused on female students at KAU and set specific eligibility criteria. The study sample comprised healthy, free from acute or chronic diseases, without disabilities, not pregnant, not dieting, and aged 19-30 years. Eligibility was determined through the initial section of the questionnaire, and enrolled participants were willing to undergo body measurements.

Data Collection

An invitation to the study was distributed through the University's email and students' social network groups. The researcher was responsible for gathering anthropometric measurements and study data. The questionnaires were derived from established and validated sources then customized for Saudi participants and translated into Arabic. A pilot study involving 15 students was undertaken to detect any content, language, or layout-related issues and to estimate the completion time of the questionnaire. Notably, the data from the pilot study were excluded from the final analysis.

International Physical Activity Questionnaire (IPAQ)

A validated long-form, self-reported IPAQ was used to assess the participants' PA levels and classify them as physically active and inactive female university students [20, 21]. The IPAQ is commonly used and inquires about the frequency and duration of physical activities in various domains including work, transportation, household chores, gardening, and leisure-time activities. To be considered sufficiently active, individuals need to achieve a total of ≥ 600 metabolic equivalent tasks (MET) minutes/week, while falling below this threshold indicates insufficient activity. Each domain within the questionnaire has a specific MET value for each type of PA, and the total MET-minutes/week is computed as the sum of the Total MET-minutes/week across the 4 Domains [22].

Healthy Eating Assessment

Healthy Eating Assessment adopted by Paxton *et al.* (2011) was used to identify dietary patterns [23]. It consisted of ten questions about their recent food and beverage consumption. Questions contained five possible answers and participants received five points for each correct response. The total score was then used to categorize their dietary habits into four health benefit zones: "Needs improvement," "Fair," "Good," or "Excellent". The maximum score ranged between 40-50 for the Excellent domain; then, a 30-39 score reflected the Good domain and a 20-29 score reflected the Fair domain. The lowest score ranged between 10-19 for the Needs improvement domain.

Life Satisfaction Questionnaire-11 (LISAT-11)

The LISAT-11 was developed by Ryan (2013). was employed as a self-report tool to evaluate the quality of life across various life domains [24]. These domains encompass life in general, vocational, financial and leisure situations, social interactions with friends, sexual life, self-care management, family life, partner relationships, and physical and psychological health. It employs a six-grade satisfaction scale, ranging from 1 (very dissatisfied) to 6 (very satisfied). The overall Life Satisfaction score is calculated as the mean of the individual item scores and categorized into "dissatisfied" (scores 1-4) and "satisfied" (scores 5-6).

Body Composition Measurements

Body weight, fat percentage, visceral fat rate, and muscle mass were measured using the Tanita body composition monitor BC 554 IRONMAN® following the established methodology outlined in the Tanita BC-554 scale guidelines. This scale utilizes single-frequency bioelectrical impedance analysis technology to assess body composition. Height, waist, and hip measurements were obtained using an anthropometer, and the body mass index (BMI) was calculated using the Quetelet equation: weight (kg)/height (m²) [25].

Statistical Analysis

The statistical analysis was carried out using Statistical Package of Social Sciences (SPSS) version 26, developed by IBM Corp in Chicago, USA. The primary data analysis involved generating descriptive statistics in the form of frequency distributions and measures of central tendency means and variability standard deviations (SD).

To examine differences between variables, the Chi-square test was used for categorical variables, while the t-test was employed for quantitative variables. Variables containing overlapping demographic information were assessed using One-way ANOVA for parametric data or the Kruskal Wallis test for non-parametric data.

Furthermore, the correlation between the key variables, including body composition, Physical activity, Life satisfaction, and Dietary assessment, was investigated using Pearson correlations for quantitative variables and Spearman correlations for ordinal variables. The statistical significance level was set at $p \leq 0.05$ or $p \leq 0.01$.

RESULTS AND DISCUSSION

In the current study, 257 of the 271 participants were eligible. Five participants were excluded because of withdrawal from the study, while 6 participants failed to attend the body assessment due to a lack of free time and university requirements. Three participants failed to respond to the follow-up survey and/or phone contact with no indication of the cause.

Demographic Characteristics

The demographic information for the study participants sample (N= 257) is presented in **Table 1**. The data illustrated that Saudi students constituted 96.1% (n=247) of the study sample. Most of the participants were single 88.7% (n=228) and non-smokers 93% (n=239). Concerning education, 91.8% (n=236) of them were bachelor students and 35% were from Scientific majors followed by Humanities and Education majors (33.9%). Regarding family income, the highest percentage found was 32.3% for (5,000 – 10,000 SR) while the lowest was 10.5% for (More than 20,000 SR).

Table 1. Demographic characteristics of the study participants (n=257).

Variable	Category	n(%) or Mean ±SD
Age (yrs.)		22.06±2.27
Nationality	Saudi	247(96.1)
	Non-Saudi	10(3.9)
Marital status	Single	228(88.7)
	Married	25(9.7)
	Divorced	4(1.6)
Education level	Undergraduate	236(91.8)
	Postgraduate	21(8.2)
	Scientific majors	90(35.0)
	Humanities and Education majors	87(33.9)
Academic specialization	Engineering and Computer science majors	17(6.6)
	Administrative and Legal majors	51(19.8)
	Medical and Health majors	1(0.4)
	Preparatory year	11(4.3)
Family income level	below 5000	45(17.5)
	5000-10,000	83(32.3)

	>10,000-15,000	54(21.0)
	>15,000-20,000	48(18.7)
	above 20,000	27(10.5)
Smoking	Smoker	18(7.0)
	Non-smoker	239(93.0)
Height (m)		1.57±0.06
Weight (kg)		58.12±14.98
BMI (kg/ m ²)		23.46±5.80
Body fat) %)		26.29±10.01
Muscle mass (kg)		39.42±4.67
Visceral fat rate		2.50±2.42
Waist circ. (cm)		72.77±11.64
Hip circ. (cm)		99.18±11.76
Waist-to-hip ratio		0.73±0.05

The participant's ages ranged between 19 and 30 years with mean age (22±2.26). The BMI which is calculated as a person's weight in kilograms divided by the square of height in meters, ranged between 14 and 44 (kg/ m²) with a mean of 23.5±5.8. Concerning the other body composition measurements, the body fat percentage that calculated as the following equation (1.20 x BMI) + (0.23 x Age) – 5.4. ranged between 5 and 50% with a mean of 26.3±10. The muscle mass that was calculated as the following equation: body weight - (body weight × body fat %) ranged between 28 and 60 Kg with a mean of 39.42±4.66. The visceral fat ranged between 1 and 13 with a mean of 2.5±2.42. According to the manufacturer's information on the TANITA BC-554 body composition analyzer, a rating between 1 and 12 indicates a healthy level of visceral fat, whereas a rating of 13 and over indicates excess visceral fat. The waist-to-hip ratio mean was (0.73±0.05).

Physical Activity Level

Almost half the participants 45.5% (n=117) were classified as low Physically Active. In total, 36.2% (n=93) of participants reported moderate PA levels while 18.3% (n=47) of participants reported a high level of PA. In addition, the average weekly physical activity for the low PA level group was 307.42 MET/mins while for the high PA level group was 4547.95 MET/mins.

On the other hand, the total sitting time of the study participants was 874,843 minutes per week with an average of (486.29±236.49) minutes per day. The results showed that students spent (8.11±3.94 hours/day) of sitting time that may

be distributed on various activities including transportation, screen activity, writing computer work, and studying.

Life Satisfaction Level

Most of the participants 78.2% (n=201) were satisfied with their life and only 21.8% (n=56) were dissatisfied. Descriptive statistics of participants' responses (n=257) for all life satisfaction questions (11) were applied as frequency and percentage. All questions ranged between kind of Satisfied and Very satisfied. Eight questions had a Very satisfied mode and three questions had a kind of Satisfied mode. The first rank was for the question (the ability to manage your self-care?) with 80.5% of participants being very satisfied.

Dietary Habits

The health benefit zone of the students according to their HEA score showed that 3.1% (n=8) had an excellent eating pattern and 63.4% (n=163) had a good eating pattern. As a result, most of the sample respondents said that their overall habits of eating healthy foods were good. However, 33.1% (n=85) were in a "Fair" zone and 0.4% (n=1) were in a "Needs Improvement" zone.

Variables Differences in Physically Active and Inactive Participants Demographic Characteristics by PA Among Participants

There was no significant relationship between demographic factors and PA (**Table 2**). Body composition variables by PA also showed no statistical difference in body composition measurements of physically active and inactive students (p >0.05) (**Table 3**).

Table 2. Demographic variables by PA among participants (n=257).

Variable	Category	n(%)		P
		Active	Inactive	
Marital status	Single	127 (90.71)	101 (86.32)	0.52
	Married	11 (7.85)	14 (11.96)	
	Divorced	2 (1.42)	2 (1.70)	
Education level	Undergraduate	127 (90.71)	109 (93.16)	0.47
	Postgraduate	13 (9.28)	8 (6.83)	

Academic specialization	Scientific majors	54 (38.57)	36 (30.76)	0.59
	Humanities and Education majors	44 (31.42)	43 (36.75)	
	Engineering and Computer science majors	7 (5)	10 (8.54)	
	Administrative and Legal majors	28 (20)	23 (19.65)	
	Medical and Health majors	1 (0.71)	0 (0)	
	Preparatory year	6 (4.28)	5 (4.27)	
Family income level	below 5000	25 (17.85)	20 (17.09)	0.56
	5000-10,000	49 (35)	34 (29.05)	
	>10,000-15,000	30 (21.42)	24 (20.51)	
	>15,000-20,000	21 (15)	27 (23.07)	
Smoking	above 20,000	15 (10.71)	12 (10.25)	0.11
	Smoker	13 (9.28)	5 (4.27)	
Nationality	Non-smoker	127 (90.71)	112 (95.72)	NA
	Saudi	133 (95)	114 (97.43)	
	Non-Saudi	7 (5)	3 (2.56)	

NA-Not Available

Table 3. Body composition measurements by PA of the study participants (n= 257).

Variables	Active	Inactive	Δ	P
	Mean ±SD			
Age (yrs.)	22.04±2.37	22.08±2.14	0.034	0.90
Height (m)	1.58±0.058	1.57±0.06	0.007	0.30
Weight (kg)	58.83±14.45	57.27±15.6	1.55	0.40
BMI (kg/m2)	23.6±5.5	23.2±6.07	.408	0.57
Body fat (%)	26.6±9.8	25.8±10.2	0872	0.48
Muscle mass (kg)	39.66±4.5	39.1±4.8	0.534	0.36
Visceral fat rate	2.56±2.29	2.43±2.56	0.137	0.56
Waist circ. (cm)	73.3±11.4	72.14±11.9	1.17	0.42
Hip circ. (cm)	99.6±11.6	98.66±11.9	0.949	0.52
Waist-to-hip ratio	0.73±0.054	0.73±0.054	0.005	0.44

BMI-body mass index; circ.- circumference; Δ-difference of mean; P-value of Independent T-test

Life Satisfaction by PA Among Participants

No statistical significance was demonstrated for PA according to life satisfaction P = 0.65. No association was found between PA level and life satisfaction level, the value of chi-squared (χ^2) is (0.206). However, in those who were physically active, 108 of 140 (77.14%) reported that they

were satisfied with their lives, and 32 of 140 (22.85%) reported dissatisfaction levels of life. While in those physically inactive, 93 of 117 participants (79.48%) achieved a satisfied level of life, and 24 of 117 (20.51%) achieved a dissatisfied level of life. In total, 54.47 % of participants were physically active and 45.52% were classified as inactive (**Table 4**).

Table 4. Life satisfaction by PA of the study participants (n=257).

Variable	Life Satisfaction n(%)		Total (%line)	χ^2	P
	Dissatisfy	Satisfy			
PA	Inactive	24 (20.51) (42.85)	93 (79.48) (46.26)	117 (45.52)	0.206
	Active	32 (22.85) (57.14)	108 (77.14) (53.73)		
Total (% column)		56 (21.78)	201 (78.21)	257 (100)	

Dietary Habits by PA Among Participants

In terms of PA according to dietary habits, results are illustrated in **Table 5**. The results showed that 93 active students out of 140 (66.43%) achieved a good health benefit zone according to their eating habits and 7 (5%) achieved an excellent zone. In contrast, 40 participants (28.57%) achieved

a fair zone. Of the inactive students, 70 out of 117 (59.83%) achieved a good zone, followed by 45 (38.46%) who achieved a fair zone and only 1 (0.85%) of them achieved an excellent zone as well as an improvement zone. There were significant differences among the two groups for PA according to dietary habits ($p \leq 0.05$).

Table 5. Dietary habits by PA of the study participants (n=257).

Variable	Dietary habits n(%)				Total (%line)	χ ²	P	
	Excellent	Good	Fair	Need Improvement				
PA	Inactive	1 (0.85) (12.5)	70 (59.83) (42.94)	45 (38.46) (52.94)	1 (0.85) (100)	117 (45.52)	6.49	0.05
	Active	7 (5) (87.5)	93 (66.43) (57.05)	40 (28.57) (47.05)	0 (0) (0)			
Total (% column)		8(3.11)	163 (63.42)	85 (33.07)	1 (0.38)	257 (100)		

Correlation Between the Main Variables

The correlation between the main variables is shown in **Table 6**. There was a positive relationship between; PA with dietary

habits, life satisfaction with dietary habits, and dietary habits with; body fat, waist circumference, and hip circumference.

Table 6. Correlation between the main variables

Variable	Correlation (R)		
	PA	Life Satisfaction	Dietary habits
Height (m)	.098	.037	.109
Weight (kg)	.093	-.008	.104
BMI (kg/ m ²)	.071	-.017	.078
Body fat (%)	.075	.018	.125*
Muscle mass (%)	.101	-.072	.065
Visceral fat rate	.058	-.003	.079
Waist circ. (cm)	.098	.008	.142*
Hip circ. (cm)	.076	.006	.125*
Waist-to-hip ratio	.089	.005	.108
PA ⇄	1	.005	.248**
Life Satisfaction⇄	.005	1	.171**
Dietary habits ⇄	.248**	.171**	1

BMI–body mass index; circ.- circumference.

**Correlation is significant at the 0.01 level (2-tailed)

*Correlation is significant at the 0.05 level (2-tailed)

Variables that are analyzed with Spearman correlation are labeled with “⇄”, otherwise Pearson correlation has been applied.

University students are particularly susceptible to non-communicable diseases risks due to physical inactivity during their college years and adiposity [26]. Academic demands can also contribute to stress, impacting students' daily routines and quality of life [27]. The results concerned the incidence of PA and its role in health aspects; body composition, dietary habits, and life satisfaction of university students and the relationship of these aspects to each other. Demographically, the majority of our participants were single, non-smokers, and bachelor students.

Although no statistically significant relationship was observed between the variables, it's essential to highlight key findings. Notably, 45.5% of students were found to be physically inactive, with an average total MET of 307.42. In contrast, 36.18% were engaged in moderate PA, averaging a total MET of 1589.59, while only 18% maintained a high level of PA, with an average total MET of 4547.95. These findings are promising as almost half of the participants appear to lead an active lifestyle or it reflects an overestimation by participants due to using a long form of IPAQ [28].

Physical Activity Level

On the other hand, it is concerning that nearly half of the participants are insufficiently active, which is consistent with the findings of Jalloun & Surrati (2020) and Al-Hassan and colleges (2020) who targeted university students and reported a similar trend of physical inactivity [29, 30]. Furthermore, Albawardi and colleagues (2016) reported that 52% of women aged 18-58 were inactive in Riyadh [31]. A higher prevalence of inactivity has also been documented in other studies of Saudi adults [32-34].

Moreover, the sedentary behaviors of the students reflected by spending an average amount of 8.11 ± 3.94 hours/day of sitting time in transportation, studying, or relaxation. Similarly, a study of 375 Malaysian university students found that female students spent an average of 9.64 hours per day of sitting time watching TV, doing computer work, transportation and many more activities. In addition, half the students (52.5%) in a study conducted by Yahia and colleges (2016) reported spending 3 to 4 hours/day in computer use, which might be a common practice due to the popularity of laptops, social media, and internet that affects the interest of being physically active [35]. Qahwaji (2023) confirmed the adverse impact of high screen time on PA among 747 first-year university students in Saudi Arabia [36].

The physically active students ($n=140$) had an average height of 1.58 m and a body weight of 58.83 kg. Their BMI was calculated as 23.6 kg/m^2 , with a body fat proportion of 26.6%. In contrast, the inactive students ($n=117$) had an average height of 1.57 m and a body weight of 57.27 kg, resulting in a BMI of 23.2 kg/m^2 and a body fat proportion of 25.8%. Notably, there were no statistically significant differences in body composition between physically active and inactive students. The BMI values of both groups fall within the normal weight range according to WHO standards, consistent with findings in similar Saudi Arabian populations [37, 38]. However, the proportion of body fat in all students may be considered high when compared to the recommended body fat percentage for healthy non-athletic women (20 to 25%) [39]. Students with higher fat percentages may be involved in weight control practices such as exercising, which may explain the slightly higher values of active students compared with inactive counterparts in our study [40, 41].

Life Satisfaction Level

Regarding life satisfaction, the majority of participants (78%) expressed satisfaction with life and no significant differences were observed between physically active and inactive students. In contrast, Sharaf (2015) illustrated that exercising had a noteworthy impact on the overall satisfaction of life for college students in Buraydah [42].

Despite that, 42% of the participants were satisfied and physically active while 36.2% of the participants were unsatisfied and physically inactive. This might be attributed to other factors such as a healthy dietary lifestyle and stressless life. PA may exert an influence on overall life

satisfaction, a notion supported by previous research. For instance, Alaaddin *et al.* (2021) found that a longer duration of exercise was linked to reduced stress levels among pharmacy students at Umm Al-Qura University [43].

Dietary Habits

In the present study, the results revealed that 3.1% of the students exhibited an excellent eating pattern, while the majority, accounting for 63.4%, displayed a good eating pattern. Consequently, most of the respondents in the sample considered their overall dietary habits to be favorable. This aligns with previous research, including studies by Yahia and colleagues (2016) and Javed and colleagues (2021), which indicated that students generally have "satisfactory" eating habits [35, 44]. Furthermore, our findings demonstrated significant differences between eating patterns and PA levels. This was in agreement with the results reported by Wirnitzer and colleagues (2023), who suggested that active students tend to consume more fruits and vegetables compared to their inactive counterparts [45]. Another study involving 378 KAU students found that students who did not engage in regular exercise had significantly lower eating pattern scores [46]. These behaviors are subject to continuous changes influenced by factors such as health behaviors over time, particularly diet and exercise, peer influence and self-efficacy [47, 48].

In addition, we observed significant differences between eating patterns and body fat percentage, as well as waist circumference and waist-to-hip ratio ($P=02$). Surprisingly, these values were higher as the dietary pattern improved. This result is supported by Mumena *et al.* (2020) who demonstrated that a dietary pattern characterized by high consumption of added sugar was inversely associated with BMI and waist circumference [49]. In contrast, other studies explored the effect of various dietary patterns on adiposity and found that the western pattern (poor diet) has a positive association, while the vegetables and fruit pattern and meat pattern have a negative association [50, 51]. The current result could be explained by the study of Bhurtun & Jeewon (2013) which confirmed that the participants with higher body fat tend to engage in weight control practices such as dieting [41]. Reducing fat and sugar intake, exercising and increasing fruit and vegetable intake were the most common practices for losing weight [40].

CONCLUSION

The present study concluded a high prevalence of sedentary behavior and insufficient PA levels among KAU female students in Saudi Arabia. This highlighted that sedentary and inactivity are widespread among Saudi university students. Furthermore, the study identified that the majority of students fell within the normal weight range, reported high life satisfaction, and demonstrated good dietary patterns. This study revealed no significant differences in life satisfaction and body composition among physically active and inactive students. However, significant inverse differences were found between eating patterns and PA levels, body fat

percentage, waist circumference, and waist-to-hip ratio, as well as a significant correlation with PA and life satisfaction. In a noteworthy manner, this study design is cross-sectional and the data collected from the participants were self-reported which makes the results not representative but gives an impression of the student's lifestyle. It recommended using objective assessment methods and a bigger sample size to increase the reliability of the result, and studying other related variables that may influence health-promoted behaviors such as body dissatisfaction and eating disorders.

Limitations and Dimensions for Future Research

To appreciate the results some limitations of this study need to be considered. Firstly, the use of a self-reported IPAQ survey may introduce measurement error in PA level that is acquired to be less accurate and/or overestimated. In addition, the survey's length may confuse the participants. The use of objective assessment methods like accelerometers or pedometers is advisable for greater accuracy. Secondly, the exclusion of subjects due to missing data resulted in a smaller sample size, which could impact the study's findings. It is recommended to include a larger sample size for increased statistical significance and better representation of the university population. Finally, since the study is cross-sectional, it does not provide insights into whether the survey itself influenced students' awareness of their behaviors, possibly encouraging them to become more active or adopt healthier dietary habits.

ACKNOWLEDGMENTS: Gratitude is extended to the university students who participate in the study.

CONFLICT OF INTEREST: None

FINANCIAL SUPPORT: None

ETHICS STATEMENT: The entire study procedures were ethically approved by the Research Ethics Committee, Faculty of Medicine, King Abdulaziz University (Reference No 480-21).

REFERENCES

- Walker SN, Sechrist KR, Pender NJ. The Health-Promoting Lifestyle Profile: development and psychometric characteristics. *Nurs Res*. 1987;36(2):76-81.
- Ramírez-Vélez R, Correa-Bautista JE, Sanders-Tordecilla A, Ojeda-Pardo ML, Cobo-Mejía EA, Castellanos-Vega RDP, et al. Percentage of Body Fat and Fat Mass Index as a Screening Tool for Metabolic Syndrome Prediction in Colombian University Students. *Nutrients*. 2017;9(9):1009.
- Salonen MK, Wasenius N, Kajantie E, Lano A, Lahti J, Heinonen K, et al. Physical activity, body composition and metabolic syndrome in young adults. *PLoS One*. 2015;10(5):e0126737.
- Lee IM, Shiroma EJ, Lobelo F, Puska P, Blair SN, Katzmarzyk PT, et al. Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *Lancet*. 2012;380(9838):219-29.
- Tudor-Locke C, Hatano Y, Pangrazi RP, Kang M. Revisiting "how many steps are enough?". *Med Sci Sports Exerc*. 2008;40(7 Suppl):S537-43.
- Bull FC, Al-Ansari SS, Biddle S, Borodulin K, Buman MP, Cardon G, et al. World Health Organization 2020 guidelines on physical activity and sedentary behaviour. *Br J Sports Med*. 2020;54(24):1451-62.
- Al-Hazzaa HM, Abahussain NA, Al-Sobayel HI, Qahwaji DM, Musaiger AO. Physical activity, sedentary behaviors and dietary habits among Saudi adolescents relative to age, gender and region. *Int J Behav Nutr Phys Act*. 2011;8(1):140.
- Musaiger AO, Awadhalla MS, Al-Mannai M, AlSawad M, Asokan GV. Dietary habits and sedentary behaviors among health science university students in Bahrain. *Int J Adolesc Med Health*. 2017;29(2).
- Sreeramareddy CT, Shankar PR, Binu VS, Mukhopadhyay C, Ray B, Menezes RG. Psychological morbidity, sources of stress and coping strategies among undergraduate medical students of Nepal. *BMC Med Educ*. 2007;7(1):26.
- Almogbel E, Aladhadh AM, Almotyri BH, Alhumaied AF, Rasheed N. Stress Associated Alterations in Dietary Behaviours of Undergraduate Students of Qassim University, Saudi Arabia. *Open Access Maced J Med Sci*. 2019;7(13):2182-8.
- Kumar H, Shaheen A, Rasool I, Shafi M. Psychological Distress and Life Satisfaction among University Students. *J Psychol Clin Psychiatry*. 2016;5(3):00283.
- Aceijas C, Waldhäusl S, Lambert N, Cassar S, Bello-Corassa R. Determinants of health-related lifestyles among university students. *Perspect Public Health*. 2017;137(4):227-36.
- Salem V, AlHusseini N, Abdul Razack HI, Naoum A, Sims OT, Alqahtani SA. Prevalence, risk factors, and interventions for obesity in Saudi Arabia: A systematic review. *Obes Rev*. 2022;23(7):e13448.
- World Health Organization. Global health risks: mortality and burden of disease attributable to selected major risks. 2009. Available from: <https://apps.who.int/iris/handle/10665/44203>
- Guthold R, Stevens GA, Riley LM, Bull FC. Worldwide trends in insufficient physical activity from 2001 to 2016: a pooled analysis of 358 population-based surveys with 1.9 million participants. *Lancet Glob Health*. 2018;6(10):e1077-86.
- General Authority of Statistics. Household Sports Practice Survey 2019. Available from: https://www.stats.gov.sa/sites/default/files/household_sports_practice_survey_2019_ar.pdf
- Mialich MS, Covolo N, Vettori JC, Junior AAJ. Relationship between body composition and level of physical activity among university students. *Rev Chil Nutr*. 2014;41(1):46-53.
- King Abdulaziz University, Deanship of Admission and Registration. 2020. Available from: <https://www.kau.edu.sa/Content-0-EN-2384>.
- Raosoft. Sample Size Calculator. 2004. Available from: <http://www.raosoft.com/samplesize.html>.
- Booth M. Assessment of physical activity: an international perspective. *Res Q Exerc Sport*. 2000;71(2 Suppl):S114-20.
- International Physical Activity Questionnaire IPAQ. Long last 7 days self-administered format. For use with young and middle-aged adults (15–69 years). 2002. Available from: <http://www.ipaq.ki.se/>.
- IPAQ International Physical Activity Questionnaire. Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire (IPAQ). 2005. Available from: <https://sites.google.com/view/ipaq/score>.
- Paxton AE, Strycker LA, Toobert DJ, Ammerman AS, Glasgow RE. Starting the conversation performance of a brief dietary assessment and intervention tool for health professionals. *Am J Prev Med*. 2011;40(1):67-71.
- Ryan S. Life Satisfaction Questionnaire 9. 2013. Available from: <https://www.sralab.org/rehabilitation-measures/life-satisfaction-questionnaire-9>.
- Branca F, Nikogosian H, Lobstein T, editors. The challenge of obesity in the WHO European Region and the strategies for response: summary. World Health Organization; 2007.
- Albaker W, El-Ashker S, Baraka MA, El-Tanahi N, Ahsan M, Al-Hariri M. Adiposity and Cardiometabolic Risk assessment Among University Students in Saudi Arabia. *Sci Prog*. 2021;104(1):36850421998532.
- Rahamathulla MP, M MS. Frequency and Awareness of Risk Factors of Non-Communicable Diseases among University Students in Saudi Arabia. *Pak J Med Sci*. 2020;36(4):740-5.
- Sebastião E, Gobbi S, Chodzko-Zajko W, Schwingel A, Papini CB, Nakamura PM, et al. The International Physical Activity Questionnaire-long form overestimates self-reported physical activity of Brazilian adults. *Public Health*. 2012;126(11):967-75.

29. Jalloun RA, Surrati AM. Physical Activity Pattern Among Female College Students at Taibah University. *Int J Nutr, Pharmacol, Neurol Dis.* 2020;10(3):137-43.
30. Al-Hassan YT, Fabella E, Estrella E, Al-Ramadan HA, Bujbara AH. Utilizing the health belief model in determining the association between perceptions of obesity and exercise behavior of Saudi university students. *Open Public Health J.* 2020;13(1):87-93.
31. Albawardi NM, Jradi H, Al-Hazzaa HM. Levels and correlates of physical activity, inactivity and body mass index among Saudi women working in office jobs in Riyadh city. *BMC Womens Health.* 2016;16:33..
32. El-Sobkey SB. Physical activity level and adult Saudi health related quality of life. *Open J Ther Rehabil.* 2014;2014.
33. Al-Hazzaa HM. Physical inactivity in Saudi Arabia revisited: A systematic review of inactivity prevalence and perceived barriers to active living. *Int J Health Sci (Qassim).* 2018;12(6):50-64.
34. Al Zahib YH, Baarimah H. Physical activity profile among Saudi adults in Abha City, Saudi Arabia. *Middle East J Family Med.* 2020;7(37):10-5742.
35. Yahia N, Wang D, Rapley M, Dey R. Assessment of weight status, dietary habits and beliefs, physical activity, and nutritional knowledge among university students. *Perspect Public Health.* 2016;136(4):231-44.
36. Qahwaji DM. Lifestyle behaviours, dietary habits, physical activity and biochemical measurements in Saudi University students. *Med Sci.* 2023;27:e198ms2940.
37. Majeed F. Association of BMI with diet and physical activity of female medical students at the University of Dammam, Kingdom of Saudi Arabia. *J Taibah Univ Med Sci.* 2015;10(2):188-96.
38. Balgoon MJ, Al-Zahrani MH, Alkhatabi NA, Alzahrani NA. The correlation between obesity and metabolic syndrome in young female university students in the Kingdom of Saudi Arabia. *Diabetes Metab Syndr.* 2019;13(4):2399-402.
39. Hatano Y. Use of the pedometer for promoting daily walking exercise. *Int Coun Health, Phys Educ, Rec, Sport Dance J.* 1993;29:4-8.
40. Thakkar HK, Srivastava K, Misra SK, Gupta SC. Obesity and weight control measures: Findings from female college students of Agra. *Med J DY Patil Univ.* 2013;6(1):66-70.
41. Bhurtun DD, Jeewon R. Body weight perception and weight control practices among teenagers. *Int Sch Res Notices.* 2013;2013.
42. Sharaf F. Life satisfaction with sleep, caffeinated drinks and physical exercise among qassim medical students. *Aljouf Uni Med J.* 2015;2(4):7-16.
43. Alaaddin RN, Ibrahim NK, Kadi M. Prevalence and Predictors of Depression, Anxiety and Stress among Pharmacy Students from Umm Al-Qura University, Saudi Arabia. *J Pharm Res Int.* 2021;33(57B):118-34.
44. Javed A, Ameer S, Talib H, Bashir I, Jamshaid M. Evaluating Concept of Healthy Eating in Relation with Physical Activity and Dietary Habits Among University Students. *Pak Armed Forces Med J.* 2021;71(5):1603-06.
45. Wirtzner KC, Motevalli M, Cocca A, Tanous DR, Wirtzner G, Wagner KH, et al. Health behavior of Austrian tertiary students focusing on diet type linked to sports and exercise-first glimpse of results from the "sustainably healthy-from science 2 high school and university" study. *Front Public Health.* 2023;11:1129004.
46. Alzahrani SH, Saeedi AA, Baamer MK, Shalabi AF, Alzahrani AM. Eating Habits Among Medical Students at King Abdulaziz University, Jeddah, Saudi Arabia. *Int J Gen Med.* 2020;13:77-88.
47. Steptoe A, Sanderman R, Wardle J. Stability and changes in health behaviours in young adults over a one year period. *Psychol Health.* 1995;10(2):155-69.
48. Cao J, Wang K, Shi Y, Pan Y, Lyu M, Ji Y, et al. Effects of personal and interpersonal factors on changes of food choices and physical activity among college students. *PLoS One.* 2023;18(7):e0288489.
49. Mumena WA, Alamri AA, Mahrous AA, Alharbi BM, Almohaimed JS, Hakeem MI, et al. Knowledge, attitudes, and practices toward added sugar consumption among female undergraduate students in Madinah, Saudi Arabia: A cross-sectional study. *Nutrition.* 2020;79-80:110936.
50. Beaudry KM, Ludwa IA, Thomas AM, Ward WE, Falk B, Josse AR. First-year university is associated with greater body weight, body composition and adverse dietary changes in males than females. *PLoS One.* 2019;14(7):e0218554.
51. Haq IU, Mariyam Z, Zeb F, Jiang P, Wu X, Shah J, et al. Identification of Body Composition, Dietary Patterns and Its Associated Factors in Medical University Students in China. *Ecol Food Nutr.* 2020;59(1):65-78.