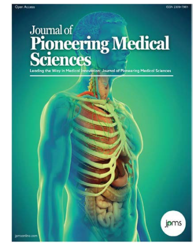

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Prevalence of Physical Inactivity and Sedentary Behaviour Among Applied Medical Sciences Students at Majmaah University, Saudi Arabia: A Cross-Sectional Study

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Abstract **Background:** Physical inactivity and sedentary behaviour are major modifiable risk factors for non-communicable diseases, yet evidence from universities in Saudi Arabia indicates persistently high inactivity levels among health sciences students. This study assessed the prevalence of physical inactivity and sedentary behaviour among applied medical sciences students using the International Physical Activity Questionnaire-Short Form (IPAQ-SF). **Methods:** A cross-sectional survey was conducted among 343 students at the College of Applied Medical Sciences, Majmaah University, Saudi Arabia (February-May 2024). Physical activity and sedentary behaviour were assessed using the International Physical Activity Questionnaire-Short Form (IPAQ-SF). Activity was categorized as Inactive, Minimally Active or Health-Enhancing Physical Activity (HEPA Active) according to IPAQ guidelines and high sedentary behaviour was defined as sitting ≥7 hours/day. Descriptive statistics and multivariable logistic regression were used to examine prevalence and predictors of inactivity. **Results:** Among 343 participants, 57% were inactive, 30% minimally active, and 13% HEPA active. Mean MET-min/week increased across activity levels (285, 812, and 1650, respectively), with males reporting higher activity than females ($p<0.05$). Daily sitting time decreased with higher activity levels (7.4, 6.9, and 6.5 h/day; $p = 0.001$), and prolonged sitting (≥7 h/day) was most common among inactive participants (64%) compared to minimally active (52%) and HEPA active groups (45%; $p = 0.003$). **Conclusions:** Over half (57%) of applied medical sciences students are Inactive, with high sedentary time (58%) and significant gender disparities, highlighting a knowledge-practice gap. We recommend implementing mandatory curriculum-integrated physical activity modules and establishing fitness facilities to address these disparities, align with Vision 2030 and reduce NCD risks in future healthcare professionals.

Key Words Physical Inactivity, Sedentary Behavior, University Students, IPAQ-SF, Saudi Arabia

INTRODUCTION

Physical inactivity constitutes a significant global public health concern, acknowledged by the World Health Organization (WHO) as the fourth most significant risk factor for mortality, accounting for approximately 5 million deaths each year [1]. It serves as a major contributor to Non-Communicable Diseases (NCDs), encompassing cardiovascular disease, type 2 diabetes mellitus, obesity, specific cancers and mental health conditions [2-4]. The WHO guidelines recommend that adults engage in a minimum of 150-300 minutes of moderate-intensity aerobic physical activity or 75-150 minutes of vigorous-intensity activity weekly, which equates to at least 600 metabolic equivalent task-minutes per week (MET-min/week) [4]. Nevertheless, global surveillance data indicate that 31% of adults do not meet these criteria, with forecasts suggesting an increase to 35% by 2030 in the absence of focused interventions [5,6]. This pattern is especially concerning in high income Middle Eastern nations such as Saudi Arabia, where inactivity rates among young adults frequently surpass 50-85% [7-10].

Sedentary behaviour, defined as any waking activity with an energy expenditure ≤1.5 METs in a sitting, reclining or lying posture [11], poses independent risks beyond physical inactivity [12]. Prolonged periods of sedentary behavior correlate with heightened all-cause mortality (hazard ratio 1.22 for >8 hours/day), alongside insulin resistance, dyslipidaemia, systemic inflammation and endothelial dysfunction [13-15]. Epidemiological data indicate that adults who engage in more than 7-8 hours of daily sedentary activity exhibit a 20-30% greater likelihood of developing metabolic syndrome, with positive outcomes associated with interrupting sitting every 30 minutes [16]. Within university environments, sedentary behavior is intensified by lecture-based instruction, digital assignments and recreational screen time, typically averaging 7-9 hours/day [17,18]. Several elements contribute to physical inactivity among university students, encompassing academic demands, time constraints, restricted access to facilities and competing obligations. Specifically, among Saudi students, extreme heat, cultural limitations on mixed-gender exercise and dependence on motorized transportation further exacerbate these obstacles.

University students, especially those in medical sciences, are a critical demographic for intervention. The transition to higher education frequently leads to declining physical activity. Contributing factors include academic demands, greater autonomy over lifestyle choices and reduced participation in organised sports [19]. Global meta-analyses suggest that physical inactivity affects 40-50% of university students, with higher rates in developing regions, possibly reaching 60% [20]. It's expected that health sciences students, who study exercise physiology and non-communicable disease prevention, would be more physically active [21]. However, research shows mixed results, with inactivity rates similar to or higher than those of the general student population (45-65%), which is often linked to time constraints and stress [22].

In Saudi Arabia, socioeconomic transformations have intensified physical inactivity, driven by urbanization, extreme heat, motorized transport and sociocultural factors [23]. National surveys report 65-85% inactivity among young adults, with females disproportionately affected (75-91% vs. 41-72% in males) due to limited access to facilities, cultural norms and safety concerns [24-26]. Sedentary behaviour is also prevalent, with 58-70% of university students reporting ≥7 hours/day [27,28]. Vision 2030 aims to increase physical activity through infrastructure and campaigns [29] but implementation in educational settings lags. These students receive education in preventive medicine and lifestyle counselling, yet preliminary observations suggest that knowledge of healthy behaviours may not consistently translate into personal practice. This potential practice gap underscores the importance of assessing actual physical activity and sedentary behaviour within this population, providing institution-specific data to guide targeted interventions. College-specific data in applied medical sciences are scarce, despite these students' future role in health promotion [30]. Despite growing evidence on physical inactivity among Saudi university students, no study has specifically investigated applied medical sciences students at Majmaah University-a population uniquely positioned to act as future health promoters yet potentially demonstrating a gap between knowledge and practice.

The primary objective of this study was to determine the prevalence of physical inactivity and high sedentary behaviour (≥7 hours/day sitting) among students at the College of Applied Medical Sciences, Majmaah University, using the IPAQ-SF. Secondary objectives were to examine gender, BMI and department as predictors of inactivity. We hypothesised that despite their health-related education, a substantial proportion of applied medical sciences students would be physically inactive and that female students would demonstrate higher inactivity rates than males, consistent with regional patterns.

METHODS

Study Design

This cross-sectional observational study was conducted from February 2024 to May 2024 at the College of Applied Medical Sciences, Majmaah University, Saudi Arabia. The design enabled a detailed examination of physical activity and sedentary behaviour in a targeted applied medical sciences population. The study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines [31].

Participants and Sampling

Eligibility and exclusion criteria were assessed using self-report screening questions embedded in the questionnaire and students reporting any exclusion condition were omitted from the analysis. No independent verification was conducted, which may have led to misclassification in some cases.

Stratified random sampling was used, with strata based on departments and proportional to enrollment. A sampling frame was derived from college records and students were randomly selected using computer-generated numbers. Invitations were sent via university email, in-class announcements and follow-up reminders to achieve a high response rate.

Sample size was calculated using G*Power 3.1.9.7, assuming 50% inactivity prevalence [8], 5% precision, 95% CI, design effect 1.5 for clustering, yielding n = 320. Targeting 400 to account for 20% non-response, 343 completed surveys were obtained (response rate 85.8%).

Ethical Considerations

Ethical approval was obtained from the Majmaah University Institutional Review Board. Participants received detailed information on study objectives, voluntary participation, confidentiality and withdrawal rights. Informed consent was documented electronically and in writing. Data were de-identified and stored on encrypted servers compliant with General Data Protection Regulation principles.

Data Collection Procedures

A self-administered IPAQ-SF questionnaire was distributed electronically (Google Forms) and in-person during non-academic periods to minimize bias from exam stress. Data quality was ensured through built-in validation checks. Because the IPAQ-SF relies on recall of the previous week, measurement error due to recall and social desirability bias is possible.

Measurements

Physical Activity: The IPAQ-SF, validated in 12 countries including Arabic versions (test-retest reliability Spearman's rho ≈0.8; criterion validity median rho = 0.30 vs. accelerometry) [21,32], assessed last 7 days' walking, moderate and vigorous activities.

Total MET-min/week was computed using standard multipliers [33]:

- Walking: 3.3 METs×minutes×days
- Moderate: 4.0 METs×minutes×days
- Vigorous: 8.0 METs×minutes×days

Categorical scoring per IPAQ protocol [33]:

- Inactive: No activity or insufficient for Categories 2/3
- Minimally Active: ≥3 days vigorous ≥20 min/day OR ≥5 days moderate/walking ≥30 min/day OR ≥5 days combination ≥600 MET-min/week
- HEPA Active: Vigorous ≥3 days and ≥1500 MET-min/week OR ≥7 days combination ≥3000 MET-min/week
- Data cleaning followed IPAQ rules

Sedentary Behaviour

IPAQ-SF sitting domain: average daily sitting time (hours/day) from weekdays/weekends. High sedentary defined as ≥7 hours/day based on risk thresholds [11,34].

Covariates

Self-reported: Age, gender, department, height, weight (BMI = weight [kg]/height [m²], categorized per WHO [4]: underweight <18.5, normal 18.5-24.9, overweight 25-29.9, obese ≥30).

Statistical Analysis

IBM SPSS Statistics v26.0 was used. Normality assessed via Shapiro-Wilk (MET-min/week non-normal, p<0.001). Continuous variables: Means±SD or medians (IQR). Categorical: frequencies/percentages with 95% CIs (Clopper-Pearson method). Associations: chi-square/Fisher's exact (categorical); Kruskal-Wallis. Sub-analyses explored MET-min/week by category, gender, department, BMI. Multivariable logistic regression examined predictors of Inactive category (adjusted for gender, BMI, department; odds ratios [ORs] with 95% CIs). Significance: p<0.05 (two-tailed). Missing data (<5%) imputed via multiple imputation for sensitivity; primary analysis used listwise deletion. Power analysis (post-hoc): With n = 343, 57% prevalence, achieved 80% power for detecting 10% gender differences (α = 0.05).

RESULTS

Participant Characteristics

The sample (n = 343) was representative, 58% males (n = 199) and 42% of females and with overall mean age 21.4±2.3 years (95% CI: 21.2-21.6) and. Mean BMI was 24.8±4.1 kg/m^2 (95% CI: 24.4-25.2), with 8% underweight, 52% normal, 28% overweight and 12% obese. Department distribution: Physical therapy 38% (n = 130), Medical Laboratories 32% (n = 110), Radiological and Medical Imaging 30% (n = 103). No significant differences in age (p = 0.42) or BMI (p = 0.11) by gender; department differences non-significant (p = 0.15) (Table 1, Figure 1).

Among the 343 participants, 196 (57%, 95% CI: 52–62%) were classified as inactive, 103 (30%, 95% CI: 25–35%) as minimally active, and 44 (13%, 95% CI: 10–16%) as HEPA active (Table 2). Consequently, more than half of the study population failed to meet the minimum recommended levels of physical activity.

The overall mean MET-min/week (±SD) was 285±148 (95% CI: 267–303) in the inactive group, 812±245 (95% CI: 764–860) in the minimally active group, and 1650±420 (95% CI: 1530–1770) in the HEPA active group, with corresponding median (IQR) values of 240 (120–420), 780 (620–980), and 1580 (1350–1950) MET-min/week, respectively.

Significant gender differences were noted across all categories (p<0.05). Males consistently reported higher mean MET-min/week than females: 310±162 (95% CI: 285–335) versus 255±128 (95% CI: 232–278) in the inactive group (p = 0.02); 890±270 (95% CI: 828–952) versus 720±210 (95% CI: 665–775) in the minimally active group (p = 0.005); and 1780±450 (95% CI: 1620–1940) versus 1480±380 (95% CI: 1330–1630) in the HEPA active group (p = 0.01) (Figure 2, Table 2).

Sedentary Behaviour

Sedentary behaviour was assessed by daily sitting time (hours/day). Mean sitting time differed significantly across

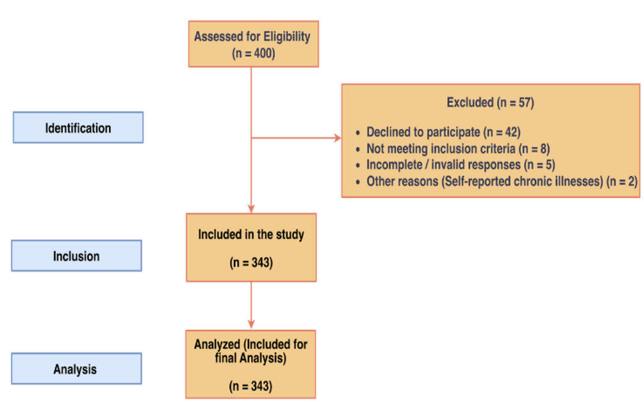

Figure 1: STROBE Flow Chart

Table 1: Demographic Characteristics (n = 343)

Characteristic	Overall (95% CI)	Males (n = 199)	Females (n = 144)	p-value (Gender)
Age (years, Mean±SD)	21.4±2.3 (21.2-21.6)	21.5±2.4	21.3±2.2	0.42
BMI (kg/m², Mean±SD)	24.8±4.1 (24.4-25.2)	25.1±4.3	24.4±3.8	0.11
BMI Categories (%) (95% CI)				
Underweight (<18.5)	8% (5-11)	7%	9%	0.18
Normal (18.5-24.9)	52% (47-57)	50%	55%	
Overweight (25-29.9)	28% (23-33)	30%	25%	
Obese (≥30)	12% (9-15)	13%	11%	
Department (%) (95% CI)				
Physiotherapy	38% (33-43)	40%	35%	0.15
Medical Laboratories	32% (27-37)	31%	34%	
Radiology & Medical Imaging	30% (25-35)	29%	31%	

Table 2: MET-Min/Week by Category and Gender

Category	n (%) (95% CI)	Mean MET-min/week± SD (95% CI)	Median (IQR)	Males Mean±SD (95% CI)	Females Mean±SD (95% CI)	p-value (Gender)
Inactive	196 (57%) (52-62%)	285±148 (267-303)	240 (120-420)	310±162 (285-335)	255±128 (232-278)	0.02
Minimally Active	103 (30%) (25-35%)	812±245 (764-860)	780 (620-980)	890±270 (828-952)	720±210 (665-775)	0.005
HEPA Active	44 (13%) (10-16%)	1650±420 (1530-1770)	1580 (1350-1950)	1780±450 (1620-1940)	1480±380 (1330-1630)	0.01

Table 3: Associations Between Physical Activity Categories and Sedentary Behaviour

Variable	Inactive (n = 196) (95% CI)	Minimally Active (n = 103) (95% CI)	HEPA Active (n = 44) (95% CI)	p-value
Sitting time (h/day, Mean±SD)	7.4±2.1 (7.1-7.7)	6.9±1.9 (6.5-7.3)	6.5±1.7 (6.0-7.0)	0.001
≥7 h/day sitting (%)	64% (57-71)	52% (42-62)	45% (30-60)	0.003

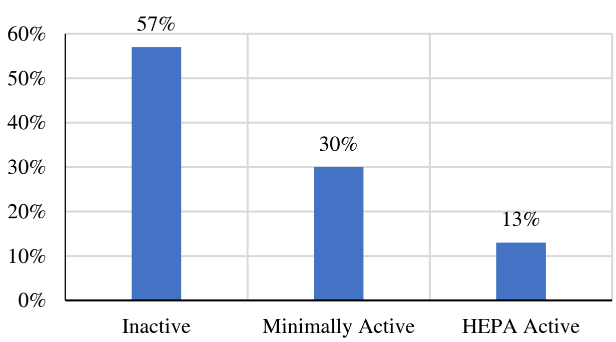

Figure 2: Distribution of IPAQ-SF Categorical Levels (n = 343)

physical activity categories (p = 0.001). Participants in the inactive group reported the highest mean sitting time of 7.4±2.1 h/day (95% CI: 7.1–7.7), followed by the minimally active group at 6.9±1.9 h/day (95% CI: 6.5–7.3), and the HEPA active group at 6.5±1.7 h/day (95% CI: 6.0–7.0) (Table 3).

The proportion of participants spending ≥7 h/day sitting also varied significantly across categories (p = 0.003), with 64% (95% CI: 57–71%) in the inactive group, 52% (95% CI: 42–62%) in the minimally active group, and 45% (95% CI: 30–60%) in the HEPA active group. The IPAQ-SF sitting domain captures total sitting time without differentiating between contexts (academic lectures, study time, leisure screen use, commuting). This limits our ability to identify which sedentary behaviours are most amenable to intervention (Table 3).

DISCUSSION

This study demonstrates a high prevalence of physical inactivity among applied medical sciences students, overall with 57% classified as Inactive, aligning with national Saudi estimates (>50-85%) [7-10,24] and exceeding global university averages (40-50%) [18,20]. The mean MET-min/week (602) indicates marginal achievement of minimal guidelines [4], primarily through walking and moderate activities, with limited vigorous intensity-essential for optimal cardiorespiratory and metabolic health [35]. For applied medical sciences students, this represents a notable knowledge-practice discrepancy, as curricula typically include modules on physical activity's role in NCD prevention [19,36]. Possible explanations include academic workload, exam stress and lack of practical application opportunities [17,30].

Gender disparities were evident, with females exhibiting higher Inactive rates (65% vs. 52%) and lower MET-min/week, consistent with Saudi literature (female inactivity 75-91%) [24-26]. Sociocultural factors, such as restricted access to co-ed facilities, cultural modesty norms and greater domestic responsibilities, likely contribute [10,23]. In applied medical sciences, where females often outnumber males in some departments, this gap could impair their ability to serve as role models for patients.

Sedentary behaviour prevalence was substantial (mean 7.1 hours/day; 58% ≥7 hours), comparable to Saudi university reports (58-70%) [27,28] and associated with increased NCD risks [11,13,15]. The strong correlation with Inactivity (64% high sedentary overlap) suggests a synergistic effect, potentially amplified by digital learning and prolonged study sessions post-COVID-19 [30]. Non-significant gender trends (males slightly higher) may reflect differences in leisure activities. BMI associations, i.e., obese higher sitting/lower MET, align with bidirectional relationships between sedentarism, inactivity and adiposity [10]. These gender differences may reflect sociocultural factors such as restricted access to co-ed facilities and cultural modesty norms; however, as we did not directly measure these barriers, this interpretation remains speculative and requires confirmation in future research incorporating barrier-specific assessments.

Strengths include the validated IPAQ-SF with categorical and MET analyses [21,33], powered sample with stratified design for representativeness and sub-analyses enhancing robustness. Implications are multifaceted. Curriculum enhancements could include mandatory physical activity modules, experiential learning (e.g., student-led fitness programs) and infrastructure improvements (e.g., women-only gyms). Gender-sensitive approaches, such as culturally adapted apps or peer mentoring, may address disparities [8]. Aligning with Vision 2030 [29], these could reduce NCD burdens [27] and prepare students to promote activity in clinical practice. Also, this study includes a high response rate and the use of multivariable regression to identify predictors of inactivity.

Some of the limitations warrant consideration. First, the cross-sectional design captures a single time point and cannot establish causal relationships. Second, the reliance on self-reported physical activity, while using a validated instrument, likely overestimates actual activity levels [9]; objective accelerometery would provide more accurate data. Third, this study was conducted at a single university in central Saudi Arabia, limiting generalisability to other institutions or regions. Fourth, the IPAQ-SF does not differentiate between activity or sitting domains, preventing identification of specific behaviours most amenable to intervention. Fifth, we did not assess barriers to physical activity, limiting our ability to explain the observed patterns or design targeted interventions. These limitations are acknowledged and future studies should address them through objective measurement, multi-centre designs and mixed methods approaches incorporating barrier assessments.

CONCLUSIONS

This study revealed a high prevalence of physical inactivity (57%) and prolonged sedentary behaviour (58% reporting ≥7 hours/day sitting) among applied medical sciences students at Majmaah University, with female gender emerging as a key predictor of inactivity. Mean physical activity levels were only marginally sufficient to meet minimal recommendations and were characterised by low vigorous-intensity engagement. These findings highlight a substantial knowledge-practice gap in a group expected to champion active lifestyles as future healthcare professionals. Curriculum-integrated, gender-sensitive interventions and environmental changes that facilitate regular movement and reduce prolonged sitting are urgently needed to support healthier behaviours and align with Saudi Vision 2030 goals for NCD prevention.

Based on these findings, we recommend three specific actions for Majmaah University: (1) Integration of mandatory practical physical activity sessions into the applied medical sciences curriculum, (2) Establishment of women-only fitness facilities with culturally appropriate programming and (3) Implementation of 'active break' protocols during extended lecture periods to interrupt prolonged sitting.

Future Recommendations

Future research should address the limitations of this study through several approaches: (1) Objective activity measurement using accelerometers or similar devices to validate self-reported findings; (2) Multi-institutional studies with objective measures are warranted to improve generalisability; (3) Qualitative research exploring perceived barriers to physical activity among health sciences students; (4) Longitudinal designs tracking activity patterns across the university years to identify critical transition points and (5) Intervention studies testing specific strategies such as curriculum-integrated activity modules, active breaks during lectures or peer-led fitness programmes.

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