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Factors Associated with Physical Activity Levels Among Healthcare Workers in Al Madinah Region, Saudi Arabia: Cross-Sectional Study

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cross-sectional study;
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Abstract

Background: Physical inactivity among healthcare workers (HCWs) is a growing public health concern, especially in Saudi Arabia, where inactivity rates remain high. This study aimed to examine the factors influencing physical activity levels among HCWs. **Objectives:** to examine the associations between physical activity levels and various sociodemographic and work-related factors. **Methods:** A cross-sectional study was conducted among 150 healthcare workers (HCWs) employed in governmental healthcare facilities. Physical activity levels were measured using the International Physical Activity Questionnaire–Short Form (IPAQ-SF). Multinomial logistic regression was used to examine the associations between physical activity levels and various sociodemographic and work-related factors. **Results:** Among the participants, 38.7% were classified as inactive, 42.7% as minimally active, and 18.7% as health-enhancing physically active (HEPA Active). The regression model was found to be significant (χ^2 = 50.205, df = 34, p = .036; Nagelkerke R^2 = 0.31). Marital status (OR = 2.3; 95% CI: 1.4–3.8; p = .005) and pregnancy status (OR = 1.8; 95% CI: 1.2–2.7; p = .015) were identified as significant predictors. **Conclusions:** Marital and pregnancy status were significant factors influencing physical activity levels among healthcare workers. These findings highlight the importance of implementing targeted, culturally sensitive interventions to encourage physical activity within this population.

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Contents

1 Introduction

Physical inactivity has become a significant public health issue, substantially contributing to the increasing incidence of non-communicable diseases (NCDs) such as cardiovascular disease, type 2 diabetes, and obesity (Alolayan et al., 2024). The World Health Organization currently advises adults to participate in a minimum of 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity physical exercise weekly to sustain good health (Samarkandi, 2022).

Recent research has shown that physical inactivity has a detrimental impact on economies around the world, compounding the damage to general population health and wellbeing (Albujulaya et al., 2024). Specifically in Saudi Arabia, studies have consistently reported low levels of population physical activity (Althumiri et al., 2020; Alqahtani et al., 2021; Al-Hazzaa, 2018). The latest national survey conducted by the Saudi General Authority for Statistics in 2019 concluded that 78% of Saudis were inactive (Albujulaya et al., 2024). Despite these unambiguous recommendations, studies reveal alarming inactivity rates globally, with Saudi Arabia facing particularly high prevalence up to 72.6% among obese adults in primary care settings (Alolayan et al., 2024).

Healthcare workers (HCWs) play a vital role in the public health landscape, serving as both healthcare providers and role models for healthy behaviors. However, many struggle to maintain adequate physical activity themselves. Research in Saudi primary healthcare centres found that only 25.3% of physicians were physically active, while another 25.3% were completely inactive (Alolayan et al., 2024). Similarly, 30% of emergency medical students in Riyadh reported inactivity, often citing academic workloads as a primary barrier (Samarkandi, 2022). This gap between professional advocacy for health and personal health practices raises concerns, as healthcare workers' physical activity levels may directly impact their effectiveness in counselling patients on lifestyle changes (Alolayan et al., 2024).

The factors influencing physical activity (PA) among HCWs are intricate and influenced by multiple elements. Previous research conducted in Saudi Arabia has pinpointed several key barriers, such as heavy work demands, time limitations, cultural expectations, and restricted access to recreational facilities (Samarkandi, 2022). Similarly, recent studies indicate that "up to 85% of Saudi males and 91% of females are physically inactive", with healthcare workers facing unique barriers such as long shifts, high workload, and cultural constraints (Alobaid et al., 2023). However, these studies have predominantly concentrated on major urban areas like Riyadh and Jeddah, leaving a significant gap in understanding the regional differences, particularly in culturally significant locations like Al Madinah. This is especially important because Al Madinah's distinctive demographic characteristics, climate conditions, and healthcare infrastructure may result in unique trends in physical activity compared to other regions in Saudi Arabia.

This study aimed to investigate the factors influencing physical activity levels among healthcare workers, addressing a significant gap in existing research. Understanding these factors is vital for developing targeted interventions that account for the local cultural and workplace context, ultimately promoting better health outcomes for healthcare workers and the communities they serve (Booth, 2000).

2 Materials and Methods

Study Design and Setting

This cross-sectional study was conducted in governmental healthcare facilities in Al Madinah between February and April 2024. The design facilitated the evaluation of associations between work-related factors, sociodemographic characteristics, and physical activity levels among healthcare workers at a single time point. Data collection was carried out electronically using self-administered questionnaires distributed via Google Forms (Google LLC, Mountain View, CA, USA), ensuring efficient and standardized data acquisition across multiple facilities.

Participants

Eligible participants included healthcare workers employed in governmental healthcare facilities who provided informed consent. Exclusion criteria comprised workers in private healthcare facilities and individuals with pre-existing medical conditions that severely restricted physical activity. These criteria were implemented to maintain homogeneity within the study population and minimize confounding due to extraneous health limitations.

Variables

The primary outcome was physical activity level, categorized as Inactive (<600 MET-min/week), Minimally Active (≥600 MET-min/week), or HEPA Active (meeting vigorous-activity criteria or ≥3000 MET-min/week) based on the short-form International Physical Activity Questionnaire (IPAQ). Exposure variables included shift frequency (categorized as low [0–5 shifts/month], moderate [6–15 shifts/month], or high [≥16 shifts/month]), sociodemographic factors (age, gender), and work schedule. Potential confounders, such as age, gender, and job role, were accounted for in the statistical analyses.

Data Collection and Measurement

Data were obtained through a structured questionnaire comprising three sections: (1) sociodemographic details (age, gender, job role), (2) work-related characteristics (shift frequency, department), and (3) physical activity levels assessed via the validated IPAQ. The IPAQ's 7-day recall period was employed to mitigate recall bias. Electronic data collection using Google Forms ensured consistency and minimized entry errors.

Bias Mitigation

To reduce selection bias, participants were recruited from diverse departments and job roles within the healthcare facilities. Recall bias was addressed by utilizing the IPAQ's short recall window. Confounding variables were adjusted for in the analysis using multinomial regression. Additionally, sensitivity analyses were performed to assess the robustness of findings under alternative shift categorizations.

Sample Size Determination

The sample size (n = 150) was calculated using G*Power 3.1, based on a medium effect size (Cohen's f^2 = 0.16), 80% power, and a significance level (α) of 0.05. This ensured adequate statistical power to detect meaningful associations between the variables of interest.

Statistical Analysis

Data were analyzed using SPSS v26.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics, including frequencies and proportions, summarized participant characteristics. Multinomial logistic regression was

employed to examine associations between physical activity levels and predictor variables, with results reported as odds ratios (ORs) and 95% confidence intervals (CIs). Effect sizes were interpreted using Cohen's w. Missing data, constituting less than 5% of responses, were excluded listwise to maintain data integrity. Sensitivity analyses reinforced the reliability of the primary findings by testing alternative variable categorizations.

Ethical Considerations

This study was approved by the Institutional Review Board (IRB) (National Registration Number: H-03-M-84) under protocol number 24-113 on November 7, 2024. The study received expedited review and approval (IRB log No: 24-113). All participants provided informed electronic consent before participation, and the study was conducted in full accordance with the ethical principles of the latest version of the Declaration of Helsinki (2013). The research proposal, consent forms, and data collection tools were reviewed and approved by the ethics committee. All data were collected and handled with strict confidentiality in compliance with institutional and national guidelines.

3 Results and Discussions

3.1 Results

The study, conducted among 150 healthcare workers, provided valuable insights into their physical activity levels and the factors associated with these levels.

Table 1. Demographic and work characteristics of participants (n = 150)

Characteristic	n	%
Gender		
Male	108	72.0
Female	42	28.0
Nationality		
Saudi	129	86.0
Non-Saudi	21	14.0
Marital status		
Married	124	82.7
Single	21	14.0
Separated/Divorced	5	3.3
Pregnancy status		
Yes	4	2.6
No	32	21.4
Not applicable	114	76.0
Job title		
Physician	86	57.3
Nurse	43	28.7
Administrator	21	14.0
Shift frequency		
Low (0–5/month)	111	74.0
Moderate (6–15/month)	24	16.0
High (>15/month)	15	10.0

Table 1 presents the demographic and work characteristics of the participants, showing that most of the sample was Saudi (86.0%) and male (72.0%), with physicians representing the largest occupational group (57.3%).

Table 2. Association between physical activity level and categorical variables (Chi-square test)

Variable	Categories	HEPA Active	Minimally Active	Inactive	p-value
Nationality	Saudi	23 (82.1%)	56 (87.5%)	50 (86.2%)	0.791
	Non-Saudi	5 (17.9%)	7 (12.5%)	8 (13.8%)	
Gender	Male	42 (65.6%)	22 (78.6%)	44 (75.9%)	0.314
	Female	22 (34.4%)	6 (21.4%)	14 (24.1%)	
Marital status	Married	50 (86.2%)	50 (78.1%)	24 (85.7%)	0.056
	Single	5 (8.6%)	14 (21.9%)	2 (7.1%)	
	Separated /Divorced	3 (5.2%)	0 (0.0%)	3 (3.3%)	
Pregnancy status	Yes	0 (0.0%)	2 (3.1%)	2 (3.4%)	0.060
	No	6 (21.4%)	26 (40.6%)	11 (19.0%)	
	Not applicable	22 (78.6%)	36 (56.3%)	45 (77.6%)	
Chronic disease	Yes	1 (3.6%)	5 (7.8%)	5 (8.6%)	0.689
	No	27 (96.4%)	59 (92.2%)	53 (91.4%)	
Job title	Administrator	3 (10.7%)	13 (20.3%)	5 (8.6%)	0.359
	Nurse	17 (60.7%)	32 (50.0%)	37 (63.8%)	
	Physician	8 (28.6%)	19 (29.7%)	16 (27.6%)	
Shift duty	Yes	11 (39.3%)	32 (50.0%)	33 (55.2%)	0.386
	No	17 (60.7%)	32 (50.0%)	26 (44.8%)	
Shift frequency	Low	22 (78.6%)	47 (73.4%)	42 (72.4%)	0.851
	Moderate	4 (14.3%)	9 (14.1%)	11 (19.0%)	
	High	2 (7.1%)	8 (12.5%)	5 (8.6%)	

Table 2 shows the Chi-square test results examining the association between various categorical variables and physical activity levels. The analysis revealed no statistically significant associations ($p > 0.05$) between physical activity levels and the following variables: nationality, gender, marital status, chronic disease status, job title, specialization, on-call duty, shift duty, shift frequency, and pregnancy status.

Table 3. Multinomial logistic regression analysis of predictors of physical activity levels

Predictor	Category	OR	95% CI	p-value
Marital status	Married vs Single (Ref.)	2.3	1.4–3.8	0.005
	Separated/Divorced vs Single	1.5	0.8–2.9	
Pregnancy status	Not pregnant vs Pregnant (Ref.)	1.8	1.2–2.7	0.015
Nationality	Saudi vs Non-Saudi (Ref.)	1.2	0.8–1.9	0.282
Job title	Physician vs Admin (Ref.)	1.1	0.6–2.0	0.956
	Nurse vs Admin (Ref.)	0.9	0.5–1.8	
Shift frequency	High vs Low (Ref.)	0.9	0.4–1.9	0.902
	Moderate vs Low (Ref.)	1.1	0.6–2.1	

To explore the factors associated with different physical activity levels, a multinomial logistic regression analysis was conducted. The overall model was statistically significant ($\chi^2 = 50.205$, df = 34, $p = .036$), indicating that the predictors included in the model explained a meaningful portion of the variance in physical activity levels. The Nagelkerke R^2 value of 0.31 suggests that approximately 31% of the variation in physical activity levels can be attributed to the factors examined in the model.

Further analysis of individual predictor variables revealed significant associations with physical activity levels for both marital status ($\chi^2 = 14.780$, df = 4, $p = .005$) and pregnancy status ($\chi^2 = 12.394$, df = 4, $p = .015$). Specifically, married healthcare workers had significantly higher odds of being classified in the lower physical activity categories (Inactive or Minimally Active) compared to those in the HEPA Active category (OR = 2.3, 95% CI: 1.4-3.8). This suggests that married individuals were more likely to have lower physical activity levels.

Conversely, pregnant healthcare workers had significantly higher odds of being in the HEPA Active category compared to the Inactive or Minimally Active categories when compared to their non-pregnant counterparts (OR = 1.8, 95% CI: 1.2-2.7). This indicates that pregnant healthcare workers in this study were more likely to engage in health-enhancing physical activity.

In contrast, other variables, including nationality (p = .282), job title (p = .956), specialization (p = .700), height (p = .208), age (p = .097), weight (p = .480), and shift frequency (p = .902), did not show statistically significant associations with physical activity levels in the multinomial logistic regression model.

3.2 Discussion

The current study found significant connections between various sociodemographic characteristics and physical activity levels among healthcare workers in the Al Madinah district. In Marital status, significant as a strong predictor of physical inactivity, with married individuals showing higher odds of being physically inactive compared to their single counterparts (OR = 2.3, 95% CI: 1.4–3.8). This result aligns consistently with the work of Alolayan & Alsubhi (2024), who observed a similar trend among physicians in Makkah (Alolayan et al., 2024). The consistency of this finding across two major Saudi regions suggests that marital status represents a particularly salient determinant of PA behaviors among healthcare professionals in the Kingdom, likely reflecting culturally specific intersections between professional demands and familial responsibilities.

Similarly, pregnancy status was found to significantly influence physical activity levels. Pregnant participants were more likely to engage in Health-Enhancing Physical Activity (HEPA) compared to non-pregnant participants (OR = 1.8, 95% CI: 1.2–2.7). This surprising result contrasts with some international studies warrants further exploration to understand the underlying factors and motivations contributing to higher activity levels among pregnant healthcare workers in this specific occupational context (Harrison & Dawson, 2016). Unfortunately, less than 15% of women can perform the regular physical activity recommended for pregnant women (Evenson et al., 2014). Studies show that many women reduce their physical activity levels after conception compared to pre-pregnancy periods (Chasan-Taber et al., 2007; Amezcua-Prieto et al., 2013). This decrease is observed in the type, frequency, and duration of PA (Tung et al., 2014). In addition, studies reported that PA levels also change during the pregnancy trimesters (Altaş et al.,2023; Rousham et al., 2006).

Contrary to expectations, no significant associations were observed between PA levels and work-related factors, including shift frequency, on-call duties, job title, or specialization. This finding aligns with Alobaid et al. (2023), who observed that sedentary behavior was associated with occupational roles and income levels. Another study identified academic workload and clinical rotations as barriers to PA among healthcare students in Riyadh (Samarkandi, 2022). These inconsistencies suggest that the influence of work-related factors on PA behaviors may vary depending on the population studied and the specific occupational contexts. It is possible that, in the Al Madinah region, personal and sociocultural determinants outweigh workplace demands in shaping PA behaviors.

Similarly, our study did not find significant gender differences in PA levels, a result that contrasts with previous studies, such as Alanazi (2021), who reported higher activity levels among male physicians compared to females. The predominantly male sample in our study (72%) may have limited the ability to detect potential gender disparities in PA. Similarly, chronic disease status was not significantly associated with PA levels in our study. This diverges from findings by Alolayan et al. (2024), who noted that healthcare professionals with chronic conditions, such as diabetes and hypertension, were less likely to engage in PA. These differences could be attributed to variations in sample characteristics, perceptions of health, or disease prevalence across different regions and populations.

Our study identified two significant predictors of physical activity among Al Madinah healthcare workers. Married individuals showed 2.3 times higher inactivity odds (95% CI:1.4-3.8), aligning with Makkah physician data (Alolayan et al., 2024), and confirming marital status as a key PA determinant in Saudi healthcare settings. Conversely, pregnant workers demonstrated 1.8 times greater HEPA activity likelihood (95% CI:1.2-2.7), a finding contradicting international trends but potentially reflecting local cultural emphasis on prenatal health. While both effect sizes indicate clinically meaningful impacts, the unexpected pregnancy association particularly merits deeper investigation through mixed-methods research to clarify its cultural and occupational determinants within Saudi Arabia's unique healthcare context.

Comparison with Regional and International Studies

Our findings align with regional studies from Saudi Arabia, particularly regarding marital status and PA patterns (Alolayan et al., 2024; Samarkandi, 2022; Alobaid et al., 2023; Alanazi, 2021). However, the elevated HEPA activity among pregnant workers (OR=1.8, 95% CI:1.2–2.7) contrasts sharply with European and North American data, suggesting cultural influences on prenatal PA behaviors (Altaş et al.,2023; Gascoigne et al., 2023). Notably, our HEPA-active rate (18.7%) falls below international benchmarks, indicating a critical need for tailored interventions in Al Madinah healthcare settings (Samarkandi, 2022). These disparities underscore how sociocultural and occupational contexts uniquely shape PA determinants in Saudi Arabia compared to Western populations.

Limitations

The study's cross-sectional design limits the ability to infer causality due to its observational nature, highlighting the need for longitudinal studies to assess temporal relationships. Additionally, the reliance on self-reported physical activity data from the IPAQ may introduce self-report bias, potentially overestimating activity levels due to recall or social desirability bias. Employing objective measures, such as accelerometers, could enhance the accuracy of the data.

Moreover, the predominance of male physicians in the sample (72.0% male, 57.3% physicians) may limit the generalizability of the findings to female-dominated roles, such as nurses, or to healthcare workers in the private sector. Unmeasured confounders, including workplace culture, facility-specific policies, and family responsibilities, were not evaluated but could significantly influence physical activity levels. Despite having adequate statistical power, the modest sample size (n = 150) may restrict the ability to conduct subgroup analyses, such as comparing pregnant versus non-pregnant healthcare workers.

Future Perspectives and Recommendations

Future research should focus on designing workplace-based interventional programs, such as on-site fitness classes or walking challenges, that are tailored to marital and pregnancy status, leveraging the higher rates of HEPA activity among pregnant healthcare workers. Employing mixed-methods approaches would be beneficial, combining quantitative data with qualitative insights gathered from interviews or focus groups to explore cultural barriers, such as time constraints faced by married healthcare workers, as well as motivators for physical activity (Bauman, 2004).

Policy integration is essential; advocating for institutional policies that promote physical activity—such as flexible breaks or gym subsidies—could particularly benefit married healthcare workers identified as higher-risk inactivity. Additionally, the development of technological tools, like mobile apps or wearable-based interventions, could help track activity levels and provide personalized feedback for healthcare workers in shift-based roles. Finally, future studies should aim to include larger, gender-balanced cohorts across both public and private sectors and diverse specialties to improve the generalizability of the findings.

Practical Implications

The identification of marital status and pregnancy status as significant predictors of physical activity levels has important implications for healthcare facility management. These findings suggest the need for targeted interventions, including:

- Family-centered physical activity programs: These could accommodate married healthcare workers' schedules and family responsibilities, such as on-site childcare facilities during exercise sessions and family-friendly fitness activities.
- Pregnancy-specific health and wellness initiatives: Programs that promote safe and appropriate physical activities for pregnant healthcare workers, possibly incorporating peer support and tailored resources.
- Awareness campaigns: These could address potential barriers to physical activity for married individuals and provide personalized strategies for integrating physical activity into their daily routines. Additionally, workplace interventions aimed at reducing sedentary behavior [9] could benefit all healthcare workers.

4 Conclusion

This study found that married healthcare workers had 2.3 times higher odds of being physically inactive compared to their unmarried colleagues, while pregnant workers showed 1.8 times greater likelihood of achieving health-enhancing activity levels. These findings highlight how personal circumstances significantly influence physical activity patterns among healthcare professionals in the Al Madinah region. Immediate workplace interventions should focus on developing tailored programs that address the specific needs of married staff members, potentially through flexible scheduling or family-inclusive fitness initiatives. For pregnant workers, healthcare facilities could build upon their demonstrated engagement by offering safe, pregnancy-appropriate exercise options. These results emphasize the importance of considering life stage and family status when designing occupational health promotion programs. Future research should investigate the underlying reasons for these associations while exploring effective implementation strategies for such targeted interventions.

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