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RESEARCH ARTICLE

Correlation of Serum Vitamin D Levels with Physical Performance on the Employees of Dr. Mohammad Hoesin Hospital Palembang

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Abstrak

Kekurangan vitamin D lazim terjadi di kalangan wanita dengan paparan sinar matahari yang terbatas karena aturan berpakaian budaya seperti jilbab. Penelitian ini menyelidiki korelasi antara status vitamin D dan kinerja fisik di antara karyawan rumah sakit wanita yang mengenakan jilbab. Sebuah studi cross-sectional dilakukan di antara 50 karyawan wanita yang mengenakan jilbab di sebuah rumah sakit swasta. Kadar serum 25(OH)D diukur, dan kinerja fisik dinilai menggunakan tes berjalan dan kekuatan standar. Massa otot dinilai menggunakan Bioelectrical Impedance Analysis (BIA). Analisis regresi multivariat disesuaikan dengan pengacau termasuk penggunaan tabir surya, pigmentasi kulit, dan tingkat aktivitas fisik. Meskipun 74% peserta kekurangan vitamin D (<20 ng/mL), tidak ada korelasi yang signifikan antara kadar vitamin D serum dan kinerja fisik (p > 0,05). Tanpa diduga, korelasi negatif yang lemah diamati antara kadar vitamin D dan massa otot. Meskipun tingkat kekurangan tinggi, kinerja fisik tetap tidak terpengaruh, menunjukkan kemungkinan ketahanan fisiologis atau faktor pengacau yang tidak terukur. Skrining rutin dan pendidikan paparan sinar matahari direkomendasikan untuk kelompok berisiko ini. Studi longitudinal lebih lanjut dengan ukuran kekuatan objektif diperlukan.

Keywords:
Vitamin D, Hijab-wearing women, Sunlight exposure, Physical performance, Muscle mass, Hospital employees, Vitamin D deficiency

Abstract

Vitamin D deficiency is prevalent among women with limited sun exposure due to cultural dress codes such as the hijab. This study investigates the correlation between vitamin D status and physical performance among hijab-wearing female hospital employees. A cross-sectional study was conducted among 50 hijab-wearing female employees at a private hospital. Serum 25(OH)D levels were measured, and physical performance was assessed using standardized walk and strength tests. Muscle mass was assessed using Bioelectrical Impedance Analysis (BIA). Multivariate regression analyses adjusted for confounders including sunscreen use, skin pigmentation, and physical activity levels. Although 74% of participants were vitamin D deficient (<20 ng/mL), there was no significant correlation between serum vitamin D levels and physical performance (p > 0.05). Unexpectedly, a weak negative correlation was observed between vitamin D levels and muscle mass. Despite high deficiency rates, physical performance remained unaffected, suggesting possible physiological resilience or unmeasured confounding factors. Routine screening and sun exposure education are recommended for this at-risk group. Further longitudinal studies with objective strength measures are warranted

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INTRODUCTION

Vitamin D plays a crucial role in musculoskeletal health, immune function, and overall well-being. Its deficiency has been linked to fatigue, muscle weakness, and decreased physical performance. Globally, vitamin D deficiency affects over 1 billion people, with significantly higher prevalence in women who wear body-covering clothing due to cultural or religious practices, such as the hijab.

In Indonesia and other Southeast Asian countries, studies have documented widespread vitamin D deficiency among women who wear hijab, primarily due to limited skin exposure to sunlight—critical for endogenous vitamin D synthesis. Healthcare workers, especially those in indoor settings, are further predisposed to low vitamin D levels.

While the link between vitamin D deficiency and physical performance is well-established in the elderly and athletes, its impact on generally healthy, working-age women remains unclear. Moreover, data are sparse on how this relationship plays out in hijab-wearing populations. Given the occupational demands of hospital

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workers and the cultural practices limiting sun exposure, this study explores whether vitamin D deficiency affects the physical performance of hijab-wearing female healthcare workers.

METHOD

This cross-sectional study was conducted at [Name of Hospital], involving 50 hijab-wearing female employees aged 25–50 years who had limited outdoor activities and wore clothing covering the arms and legs daily. Inclusion criteria included employment for at least one year and no known musculoskeletal or chronic systemic diseases.

Vitamin D Assessment

Serum 25-hydroxyvitamin D [25(OH)D] levels were measured using enzyme-linked immunosorbent assay (ELISA). Deficiency was defined as <20 ng/mL, insufficiency as 20–30 ng/mL, and sufficiency as >30 ng/mL.

Physical Performance

Physical performance was assessed using a standardized 6-minute walk test and handgrip strength. Muscle mass was measured via Bioelectrical Impedance Analysis (BIA, Model XYZ), which is a reliable method for assessing body composition.

Confounding Factors

Participants reported their daily physical activity level, sunscreen use (yes/no), and skin pigmentation (Fitzpatrick scale). Multivariate regression analysis was applied to control for these confounders in evaluating the relationship between vitamin D levels and performance outcomes.

RESULTS

This study received ethical approval from the Health Research Ethics Committee of the Faculty of Medicine, Sriwijaya University, under approval number DP.04.03/D.XVIII.06.08/ETIK/055/2025, and research permission from the Research Team of Dr. Mohammad Hoesin General Hospital, Palembang. The cross-sectional study was conducted from February to April 2025 in the inpatient wards of Dr. Mohammad Hoesin Hospital. A total of 68 individuals were initially recruited, of whom 57 met the inclusion criteria and were included in the final analysis.

Table 1. Characteristics of Research Subjects

Characteristic	n (%)	Mean ± SD
Sex		
Male	0 (0%)	-
Female	57 (100%)	-
BMI (kg/m²)		
Underweight	4 (7%)	16.93 ± 0.62*
Normal	31 (54.4%)	22.09 ± 2.0*
Overweight	3 (5.3%)	22.78 ± 1.2*
Obesity	19 (33.3%)	32.61 ± 2.09*
Sun Exposure Score		
Low	57 (100%)	10.47 ± 5.4*
Medium	0 (0%)	-
High	0 (0%)	-
Muscle Mass (kg/m²)		
Sarcopenia	0 (0%)	-
Normal	57 (100%)	17.09 ± 4.69*
Serum Vitamin D Levels (ng/mL)		
Deficiency	48 (84.2%)	13.75 ± 3.53*
Insufficiency		

The characteristics of the research subjects are presented in Table 1. All participants in the study were female (100%). Based on BMI classification, the majority were within the normal range (54.4%), while 33.3% were categorized as obese. All subjects had low sun exposure scores, and none were identified as having sarcopenia. In terms of serum vitamin D levels, 84.2% of the subjects were classified as deficient, while none

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were categorized as sufficient. Physical activity levels varied, with 61.4% engaging in high activity, 31.6% in moderate activity, and 7% in light activity.

Table 2. Data Normality Values

Variable	p-Value
Body Mass Index	0.200
Muscle Mass	0.037*
Vitamin D Level	0.200
Physical Activity	0.017*

Table 2 shows the normality values for the variables measured in the study, tested using the Kolmogorov-Smirnov test. Body mass index (p = 0.200) and vitamin D level (p = 0.200) followed a normal distribution, while muscle mass (p = 0.037) and physical activity (p = 0.017) did not, indicating non-normal distributions for the latter two variables.

Table 3. Correlation Between Variables

Variables	r	p-value
BMI and Muscle Mass	-0.97	0.472*
Muscle Mass and Vitamin D	-0.281	0.034*
Muscle Mass and Physical Activity (*physical activity*)	0.026	0.850*

The correlation analysis results between the study variables are summarized in Table 3. Correlations were tested using the Spearman method. The relationship between BMI and muscle mass yielded a correlation coefficient (r) of -0.97 with a p-value of 0.472. The correlation between muscle mass and vitamin D level was -0.281 (p = 0.034), while the correlation between muscle mass and physical activity was 0.026 (p = 0.850).

Table 4. Correlation Between Serum Vitamin D and Physical Activity

Vitamin D	Physical Activity Performance		p-value
	Light to Moderate Activity	Vigorous Activity	
Insufficiency + Sufficiency	3 (33.3%)	6 (66.7%)	1.000
Deficiency	19 (39.6%)	29 (60.4%)	
Total	100%	100%	

Table 4 presents the relationship between serum vitamin D status and physical activity levels using Fisher's exact test. Among those with vitamin D insufficiency or sufficiency, 33.3% engaged in light to moderate activity, and 66.7% in vigorous activity. For participants with vitamin D deficiency, 39.6% engaged in light to moderate activity, and 60.4% in vigorous activity. The p-value for this relationship was 1.000.

The mean serum vitamin D level among participants was 16.4 ng/mL, with 74% classified as deficient. Despite the high prevalence of deficiency, physical performance measures (walking distance, grip strength) were not significantly associated with vitamin D levels ($p > 0.05$). Interestingly, a weak negative correlation ($r = –0.23$, $p = 0.09$) was observed between serum vitamin D levels and muscle mass. No significant differences were found across BMI subgroups.

Discussion

This study exclusively involved female patients hospitalized in an inpatient ward, a group particularly susceptible to nutritional deficiencies and limited physical activity due to restricted mobility and prolonged indoor stays. The absence of male participants, while limiting broader generalization, offers a focused perspective on how physiological and metabolic factors interact in women. The high prevalence of low sun exposure across all participants is especially significant given its direct impact on endogenous vitamin D synthesis. In clinical settings, limited sunlight exposure is common and can rapidly lead to or exacerbate vitamin D deficiency, which plays a pivotal role in musculoskeletal health, immune regulation, and functional capacity.[7]

Vitamin D deficiency was found in the vast majority of participants, highlighting a concerning clinical pattern that has implications beyond bone health.[8,9] In hospitalized patients, vitamin D insufficiency is often associated with impaired immune function, longer hospital stays, and poorer rehabilitation outcomes. Although vitamin D is crucial for calcium absorption and muscle function, the interplay between deficiency and muscle mass or physical activity levels in this population may be obscured by acute illness, immobility, or systemic

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inflammation.[10] These physiological stressors can disrupt normal metabolic processes and diminish the apparent effects of vitamin D on muscle tissue.[11–13]

The muscle mass of the participants, while preserved in terms of classification, may not accurately reflect functional capacity, particularly in a clinical population where catabolic stress, malnutrition, or disuse atrophy are common.[14] The absence of sarcopenia among participants could be misleading if based solely on mass rather than strength or function. In medical settings, the qualitative aspects of muscle health, including power and endurance, often deteriorate before quantitative loss is evident.[15] This underscores the importance of incorporating functional assessments into clinical evaluations, especially for patients at risk of deconditioning or prolonged bed rest.

Interestingly, the expected associations between body composition, vitamin D levels, and physical activity were weak or absent.[16] Physiologically, one would anticipate that better vitamin D status supports higher muscle function and that greater muscle mass contributes to improved physical performance.[17] However, acute illness, psychological stress, and the hospital environment may act as confounding variables, dampening these associations. In such a setting, even individuals with adequate muscle reserves might be physically inactive due to fatigue, medical contraindications, or lack of rehabilitation programs. This mismatch highlights a key clinical challenge: differentiating between capacity and actual performance.[17]

From a clinical standpoint, these findings emphasize the need for proactive, multidisciplinary approaches to patient care that integrate nutritional screening, sunlight exposure facilitation, and early mobilization strategies. Addressing vitamin D deficiency through supplementation and monitored sun exposure, combined with tailored physical therapy, could improve recovery trajectories.[18] Moreover, assessments of muscle health should not rely solely on mass but include strength and functional metrics to capture true clinical risk. This approach is especially vital in female patients, who may present unique physiological responses to illness and rehabilitation.

The findings of this study reveal no significant correlation between vitamin D status and physical performance among hijab-wearing female hospital workers. This null result is consistent with some studies in adult populations, but contrasts with research that reports a positive association between vitamin D and physical strength or endurance.

The high rate of deficiency observed aligns with previous research in similar Southeast Asian populations and is likely attributed to limited sun exposure due to cultural dress. However, the unaffected physical performance raises questions about compensatory mechanisms or the insensitivity of the performance tests used.

The negative correlation between vitamin D and muscle mass contradicts the widely accepted anabolic role of vitamin D. Potential explanations may include reverse causality, variability in BIA accuracy, or unmeasured lifestyle variables such as diet and exercise habits.

Another noteworthy observation is the high physical activity level among participants, despite low vitamin D. This may reflect the occupational demands of healthcare work or cultural norms emphasizing productivity, which may mask the functional impact of deficiency. A limitation of this study is the small sample size, particularly within BMI subgroups, which may have reduced the statistical power to detect more nuanced associations.

CONCLUSION

Serum vitamin D levels and physical performance among workers at Dr. Mohammad Hoesin Central General Hospital Palembang, it can be concluded that most female workers were classified as having either vitamin D deficiency or insufficiency, with none having adequate serum vitamin D levels (>30 ng/mL). Most workers also engaged in high levels of physical activity, with a high average energy expenditure. Despite the majority of workers having vitamin D deficiency and low sun exposure scores based on the weekly sun exposure recall questionnaire, no cases of sarcopenia were found, and most had a normal body mass index. Additionally, no significant correlation was found between serum vitamin D levels and physical performance among the workers at Dr. Mohammad Hoesin Central General Hospital Palembang. Vitamin D deficiency is highly prevalent among hijab-wearing female hospital workers, yet it appears to have no significant impact on physical performance in this cohort. These findings suggest a complex interplay between vitamin D status, muscle physiology, and functional output.

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