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Original Article

Suboptimal Health Status and Associated Factors Among Administrative Staff in Educational Hospitals in Shahrekord, Iran: A Cross-Sectional Study

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Abstract

Introduction: Suboptimal health status (SHS) is characterized by decreased vitality and functional capacity in the absence of a definitive clinical diagnosis. This study aimed to evaluate SHS and its determinants among administrative staff in two educational hospitals in Shahrekord, Iran.

Methods: This cross-sectional study was conducted between 2024 and 2025 on 200 administrative and employees in Shahrekord, Iran, selected via convenience sampling. Data were collected using a demographic and occupational characteristic checklist and the validated Persian version of the SHS Questionnaire-25 (SHSQ-25). Descriptive statistics summarized participant characteristics and SHS scores. Independent t-tests and chi-square tests were employed to compare variables between hospitals. Finally, Pearson correlation and multivariable linear regression analyses were performed to identify SHS-associated factors.

Results: The mean total SHSQ-25 score was 52.1 ± 14.1, with no significant difference between the hospitals (P = 0.83). Female gender was independently associated with higher total SHS scores (β = 5.97, P = 0.006), as were longer average daily working hours (β = 0.46, P < 0.001). Moreover, fatigue scores were significantly related to female gender, years of service, and daily working hours. Cardiovascular and digestive complaints were also linked to lower educational attainments and longer working hours. Ultimately, higher immune system scores were observed among older participants, those with lower education, and individuals working evening or night shifts.

Conclusion: SHS was prevalent among hospital administrative staff. It was associated with gender, workload, educational level, age, and shift work, indicating a need for targeted occupational health measures to improve working conditions while reducing suboptimal health.

Keywords: Suboptimal health status, Hospital administrative staff, Occupational health, Working hours

Introduction

Suboptimal Health Status (SHS) represents an intermediate condition between optimal health and overt disease. It is characterized by reduced vitality, impaired physiological function, and diminished adaptive capacity in the absence of a clinically diagnosed disorder.[1-2] As a core concept in preventive medicine, SHS has been increasingly recognized as a measurable public health construct associated with the future risk of chronic diseases.[1-3] Moreover, SHS is linked to multiple chronic diseases, including diabetes and cardiovascular disease.[4-6] These documented associations between SHS and chronic diseases highlight the importance of identifying the upstream and potentially modifiable determinants of SHS, among which occupational and work-related factors have been consistently emphasized.[7-9]

Work environments are considered a key determinant of SHS. More precisely, physical, psychological, and social stressors disrupt the dynamic balance of the neurological, endocrine, and immune systems, leading to functional declines that may manifest as SHS.[8-10] Work constitutes a major source of psychosocial stress, and extensive research over recent decades has demonstrated its significant influence on workers' health.[7] Recent evidence underscores the substantial prevalence of stress and burnouts among medical staff.[11]

Administrative hospital employees represent a vital workforce, frequently working long hours, facing bureaucratic pressures, and having limited control over resources. University staff with poor physical health reported seriously lower well-being, and psychological resources partly mitigated this effect.[12] Thus, the occupational context of hospital administrative staff is marked by high responsibility, organizational complexity, and stress exposure,[13-14] making them especially vulnerable to SHS.

Some studies demonstrated that SHS is prevalent in occupational groups exposed to sustained psychosocial and work-related stress. According to evidence from healthcare and university settings, adverse working conditions, high workload, and psychosocial strains are associated with poorer physical and psychological health outcomes among staff.[7-15-17] In university environments, academic and administrative personnel have been shown to experience elevated levels of occupational stress, with female staff reporting a higher burden of stress-related health complaints.[16-17] In addition, studies from low-income and middle-income countries have revealed a high prevalence of cardiometabolic risk factors among university staff, highlighting early vulnerability to health deterioration in this population.[18]

Although SHS has been increasingly investigated in various occupational groups [7-19], empirical evidence from Iran remains scarce, particularly among hospital administrative and non-clinical staff. To the best of our knowledge, most previous studies have focused on clinically manifest conditions or isolated health indicators, while evidence addressing the intermediate, reversible stage between health and disease remains limited. In the Iranian health system, administrative employees constitute a substantial proportion of the hospital workforce and play a critical role in organizational coordination, resource management, and continuity of healthcare services.[20-21] Despite their central role and sustained exposure to occupational stressors (e.g., long working hours and high administrative demands), this population has been largely overlooked in occupational health research, resulting in a critical gap in evidence.[12-13] Therefore, this study aims to assess self-reported health status and explore its associations with demographic and occupational characteristics among hospital administrative and non-clinical staff.

Materials and Methods

Study Design and Participants

This cross-sectional study was performed at Hajar and Kashani Educational Hospitals affiliated with Shahrekord University of Medical Sciences, Shahrekord, Iran, between 2024 and 2025. Kashani Hospital primarily provides trauma-related services, whereas Hajar Hospital mainly delivers internal medicine services. Given that these service profiles differ in patient flow, urgency, and coordination requirements, the comparison between hospitals was designed as an exploratory analysis in order to assess whether SHS among administrative staff varies across contrasting institutional contexts within the same regional healthcare system. The study population consisted of administrative and non-clinical employees. The inclusion criteria were employment as an administrative or non-clinical staff member and willingness to provide informed consent. However, the exclusion criteria included a self-reported history of chronic diseases (e.g., cardiovascular disease, hypertension, diabetes mellitus, respiratory disorders, hematologic conditions, or immunodeficiency), current treatment for chronic diseases, and incomplete or invalid questionnaire responses.

Sampling Method

A convenience sampling strategy was employed due to practical constraints inherent to the hospital setting, including rotating work shifts, variable workloads, and limited accessibility of administrative staff during working hours. Although convenience sampling may limit representativeness and introduce selection bias, it is commonly used in occupational health studies conducted in complex workplace environments where probability-based sampling is frequently infeasible.[22-23] To partially mitigate selection bias, participants were recruited from two distinct educational hospitals with comparable organizational structures. Recruitment was continued until the predetermined sample size was reached.

The sample size was determined using the standard formula for estimating a population proportion in cross-sectional studies [24]:

$$n = (Z^2 \times p\ (1 - p)) / d^2$$

In addition, a 95% confidence level was assumed ($Z = 1.96$). In the absence of a precise prior estimate for the target population, the expected proportion was conservatively set at $P = 0.50$, which yields the maximum required sample size. Further, the margin of error was set at $d = 0.07$. Based on these parameters, the minimum required sample size was calculated as 196 participants. To account for potential non-response and incomplete questionnaires, the final target sample size was increased to 200.

Data Collection

Data were obtained from participants using several instruments. A demographic and occupational checklist was used to collect data on age, gender, marital status, education level, place of residence, type of employment (permanent, fixed-term, or contractual), years of service, average daily working hours, predominant shifts during the past three months (morning, evening, or night), and perceived income adequacy.

Furthermore, SHS Questionnaire-25 (SHSQ-25) [25] was employed, which is a validated self-report instrument that measures SHS across five domains: fatigue (9 items), cardiovascular system (3 items), digestive system (3 items), immune system (3 items), and mental status (7 items). Items were rated on a five-point Likert-type scale (1 = "never or rarely" to 5 = "always"). Raw domain scores were obtained by summing the item scores within each domain, and the total raw score was calculated by summing all 25 items. To facilitate interpretation and comparability, the total score was linearly transformed to a 0–100 scale using the standard SHSQ-25 scoring procedure, with higher scores indicating poorer health status.[19-25] It should be noted that the Persian version of the SHSQ-25 has been validated in an Iranian population of university academic and supporting staff, with Cronbach's alpha coefficients above 0.70 for all domains.[19]

The questionnaires were administered in printed form and completed by participants during morning work shifts, in a self-administered manner, in order to minimize recall bias and ensure a consistent setting. Prior to completion, a trained member of the research team provided a brief standardized explanation regarding the study objectives, instructions for completing the questionnaires, and assurance of confidentiality. After providing informed consent, each participant independently completed the demographic checklist and the SHSQ-25, with no researcher assistance provided unless the clarification of procedural questions was requested. Moreover, participation was voluntary, and anonymity was preserved throughout the study. Questionnaires with substantial missing data were excluded from the analysis, and only fully completed questionnaires were included in the final dataset.

Statistical Analysis

All analyses were performed using IBM SPSS Statistics, version 27. Continuous and categorical variables were expressed as means ± standard deviations (SD), as well as frequencies and percentages, respectively. Independent t-tests were used to compare continuous variables between the two hospitals, while chi-square tests were employed for categorical variables. Additionally, Pearson correlation coefficients were computed to examine associations between SHSQ-25 domain scores and demographic and occupational factors. Likewise, multivariable linear regression analyses were conducted to identify independent predictors of SHSQ-25 total and domain scores. First, demographic variables were entered into the model and reduced using the "Backward" elimination method to identify a parsimonious set of demographic predictors. Then, occupational variables were added to the retained demographic model and selected using a "Stepwise" procedure based on statistical significance criteria. Prior to model estimation, multicollinearity among independent variables was assessed using variance inflation factors (VIF) and tolerance statistics. No evidence of problematic multicollinearity was observed, as all VIF values were below five, and tolerance values exceeded 0.2. A two-tailed P-value of < 0.05 was considered statistically significant for all analyses.

Results

Participant Characteristics

A total of 200 administrative staff members were enrolled, with equal representation from Hajar ($n = 100$) and Kashani ($n = 100$) Hospitals. The mean age of the participants was 38.6 years ($SD = 8.2$), and 60.5% were female. In addition, the average duration of employment was 12.9 years ($SD = 8.3$), with a mean of 8.8 working hours per day. More details of participants' demographic and occupational characteristics are summarized in Table 1.

Suboptimal Health Status

The mean total SHSQ-25 score was 52.1 ($SD = 14.1$), with mean (SD) scores of 20.9 (6.1), 4.6 (2), 5.3 (2), 5.9 (2), and 15.3 (5.3) for fatigue, cardiovascular system, digestive system, immune system, and mental status domains, respectively. Additionally, no significant difference across total SHSQ-25 and its domains scores was identified between the two hospitals ($P > 0.05$ for all; Supplementary Materials, Table S1).

Correlations Between Demographic and Occupational Characteristics and Domains of Suboptimal Health Status Questionnaire-25

Among SHSQ-25 domains, fatigue was positively and significantly correlated with age ($r = 0.161$), daily working hours ($r = 0.145$), and years of service ($r = 0.168$). Other SHSQ-25 domains, including cardiovascular, digestive, and immune system, and mental status, were significantly associated with daily working hours ($r = 0.171$, $r = 0.242$, $r = 0.204$, $r = 206$, respectively). More results of correlation coefficients are presented in Supplementary Materials (Table S2).

Multivariable Linear Regression Analysis

The results of multivariable linear regression analyses are provided in Table 2. The total SHSQ-25 score was significantly associated with female gender ($\beta = 5.97$; $P = 0.006$) and longer average daily working hours ($\beta = 0.46$; $P < 0.001$). Moreover, lower income adequacy showed a marginal effect ($P = 0.072$).

Furthermore, fatigue was independently predicted by female gender ($\beta = 3.33$; $P < 0.001$), longer years of service ($\beta = 0.12$; $P = 0.016$), and extended daily working hours ($\beta = 0.65$; $P = 0.002$) (Table 2).

The results (Table 2) also revealed that cardiovascular system scores were significantly influenced by lower educational attainment ($\beta = -0.50$; $P = 0.026$) and daily working hours ($\beta = 0.18$; $P = 0.011$).

Based on the obtained data (Table 2), digestive system complaints were also associated with female gender ($\beta = 0.61$; $P = 0.045$), lower education ($\beta = -0.45$; $P = 0.036$), and daily working hours ($\beta = 0.24$; $P < 0.001$).

Further, immune system scores were linked to higher age ($\beta = 0.08$; $P = 0.030$), lower educational level ($\beta = -0.47$; $P = 0.036$), and night and evening shifts compared with morning shifts ($\beta = 0.46$; $P = 0.046$) (Table 2).

Finally, mental status was marginally associated with longer daily working hours ($P = 0.085$) and non-morning shifts ($P = 0.07$) (Table 2).

Discussion

The present study investigated SHS among administrative staff at two educational hospitals in Shahrekord, Iran, using the validated SHSQ-25 instrument. Based on the findings, several demographic and occupational factors, including female gender, longer daily working hours, lower educational attainment, and shift work, could significantly predict poorer health outcomes across specific domains. These results highlight the substantial burden of occupational and lifestyle factors on the well-

Table 1. Demographic and Occupational Characteristics of Hospital Staff

Characteristics	Subcategory	Total n = 200	Hajar n = 100	Kashani n = 100	Effect Size	*P*-Value
Age (year); mean (SD)	-	38.6 (8.2)	38.9 (8.7)	38.3 (7.7)	Cohen's d = 0.08	0.56
Gender: Female; n (%)	-	121 (60.5%)	58 (58%)	63 (63%)	$Chi^2 = 0.52$	0.47
Education; n (%)	Associate's degree or lower	31 (15.5%)	14 (14%)	17 (17%)	$Chi^2 = 4.24$	0.12
	Bachelor's	114 (57%)	52 (52%)	62 (62%)		
	Higher than a Bachelor's	55 (27.5%)	21 (21%)	21 (21%)		
Marital status; n (%)	Single	49 (24.5%)	26 (26%)	23 (23%)	$Chi^2 = 0.54$	0.76
	Married	148 (74%)	73 (73%)	75 (75%)		
	Widowed	3 (1.5%)	1 (1%)	2 (2%)		
Place of residence; n (%)	In the city of work	151 (75.5)	72 (72%)	79 (79%)	$Chi^2 = 1.32$	0.25
	Outside the city of work	49 (24.5%)	28 (28%)	21 (21%)		
Employment type; n (%)	Permanent	108 (54%)	54 (54%)	54 (54%)	$Chi^2 = 0.52$	0.77
	Fixed-term	23 (11.5%)	13 (13%)	10 (10%)		
	Contractual	69 (34.5%)	33 (33%)	36 (36%)		
Years of service; mean (SD)	-	12.9 (8.3)	13.3 (8.7)	12.6 (7.8)	Cohen's d = 0.09	0.54
Average daily working Hours; mean (SD)	-	8.8 (2.3)	8.7 (2.1)	8.9 (2.4)	Cohen's d = -0.11	0.44
Most frequent shift (last 3 months); n (%)	Morning	153 (76.5%)	76 (76%)	77 (77%)	$Chi^2 = 0.47$	0.98
	Evening	22 (11%)	11 (11%)	11 (11%)		
	Night	25 (12.5%)	13 (13%)	12 (12%)		
Income level; n (%)	Below adequacy	195 (97.5%)	97 (97%)	98 (98%)	$Chi^2 = 0.21$	0.65
	Above adequacy	5 (2.5%)	3 (3%)	2 (2%)		

Note. SD: Standard deviation.

Table 2. Results of Multiple Linear Regression Analyses for Dependent Variables

Dependent Variable	Independent Variable	B	SE	*P*-Value
Total SHSQ-25	Gender (Reference: Male)	5.970	2.136	0.006*
	Average daily working hours	0.463	0.463	< 0.001*
	Income level (Reference: Below adequacy)	-11.113	6.136	0.072
Fatigue	Gender (Reference: Male)	3.332	0.923	< 0.001*
	Years of service	0.122	0.050	0.016*
	Average daily working hours	0.646	0.201	0.002*
Cardiovascular system	Gender (Reference: male)	0.576	0.313	0.068
	Education (Reference: Associate's degree or lower)	-0.499	0.222	0.026*
	Average daily working hours	0.175	0.068	0.011*
Digestive system	Gender (reference: Male)	0.606	0.300	0.045*
	Education (Reference: Associate's degree or lower)	-0.450	0.213	0.036*
	Average daily working hours	0.238	0.065	< 0.001*
Immune system	Age	0.078	0.036	0.030*
	Gender (Reference: Male)	0.548	0.309	0.077
	Education (Reference: Associate's degree or lower)	-0.471	0.223	0.036*
	Years of service	-0.064	0.036	0.076
	Average daily working hours	0.140	0.073	0.056
	Most frequent shift (Reference: Morning)	0.462	0.230	0.046*
	Income level (Reference: Below adequacy)	-1.527	0.890	0.088
Mental status	Average daily working hours	0.324	0.187	0.085
	Most frequent shift	1.107	0.607	0.070

Note. SHSQ-25: Suboptimal Health Status Questionnaire-25; SE: Standard error; *Significant *P*-values.

being of non-clinical hospital staff, a group frequently overlooked in occupational health research despite their critical role in sustaining hospital operations.

Moreover, extended working hours emerged as the most consistent occupational correlate of suboptimal health in this study, showing associations across multiple SHSQ-25 domains. This pattern suggests that prolonged work duration functions as a systemic stressor rather than affecting a single physiological pathway. Similarly, existing evidence indicates that long working hours contribute to cumulative cardiovascular, psychological, and metabolic strains through sustained stress exposure and insufficient recovery.[26-28]

In our study, female gender was independently associated with higher total SHSQ-25 and fatigue scores, which is consistent with population-level evidence representing greater prevalence and severity of fatigue among women.[29] The occupational mental health literature further identifies women as experiencing higher levels of emotional exhaustion, the core symptom dimension that overlaps with perceived fatigue.[30] Evidence from prior studies corroborates the magnitude and direction of gender-related associations with total and fatigue scores.

Our findings revealed that higher educational attainment was inversely related to the cardiovascular, digestive, and immune function domains of the SHSQ. Education functions as a key determinant of health literacy, coping capacity, and preventive behavior. Major reviews demonstrated that higher educational attainment enhances health literacy, thereby promoting improved health outcomes.[31] Consistent with this evidence, workplace studies showed that employees with higher education or income exhibit superior overall and cardiometabolic health.[18]

Additionally, longer years of service were associated with higher fatigue scores, suggesting that cumulative occupational exposure may contribute to exhaustion over time. This observation is consistent with evidence, implying that prolonged tenure in healthcare settings can increase vulnerability to fatigue and burnout, particularly during later career stages. For instance, a hospital-based study reported that years of service remained a significant predictor of nurses' fatigue.[32] In addition, studies on burnout confirmed that there is a non-linear relationship between length of work experience and exhaustion, with elevated symptoms at certain career stages (early and later years), which helps explain why tenure can track with higher fatigue in some cohorts.[33-34]

Likewise, non-morning (rotating, evening, or night) most-frequent shifts were related to higher immune and mental status scores. A comprehensive systematic review and meta-analysis showed that shift work is associated with poorer mental health, with the strongest signal for irregular and unpredictable schedules.[35] Mechanistically, circadian misalignment and sleep loss alter inflammatory and endocrine profiles in controlled human studies.[36-37] Further, consensus summaries describe circadian-immune crosstalk, whereby misalignment compromises both innate and adaptive responses.[38-39] These data provide a coherent mechanistic substrate for the higher immune and mental status scores observed among non-morning-shift workers in our findings.

Age was positively linked to the immune domain of the SHSQ-25, with older participants reporting greater symptom burden. This pattern is biologically plausible, as aging drives thymic involution, naïve T-cell decline, impaired signaling, and other features of immunosenescence that increase vulnerability to minor infections and immune symptoms. Some authoritative reviews characterize the decline of naïve T cells due to thymic involution, repertoire restriction, and diminished responsiveness to stimulation as the defining features of T-cell aging.[40-41]

Taken together, the observed associations between extended working hours and multiple SHSQ-25 domains suggest that work duration represents a systemic occupational exposure rather than an isolated risk factor. Prolonged working schedules may exert cumulative physiological and psychological strains through chronic stress, disrupted recovery, and adverse health-related behaviors, thereby contributing to suboptimal health across several bodily systems.[26-42] This integrative interpretation is consistent with the findings of prior occupational health research, linking long working hours to cardiovascular risk, psychological distress, fatigue, and stress-related somatic symptoms.[43-44]

Several associations in the present study did not reach statistical significance but demonstrated borderline trends that warrant cautious interpretation rather than dismissal. Specifically, income adequacy showed an inverse (protective) trend with overall SHSQ-25 scores, suggesting that perceived economic stressors may influence subjective health complaints even when statistical thresholds are narrowly missed.[45] Similarly, non-morning shift schedules demonstrated a marginal association with the mental-status domain, a pattern that is in line with previous evidence, linking shift work and non-standard working hours to poorer mental health outcomes.[35-46] Future studies with larger and more heterogeneous samples and more refined exposure assessment are, therefore, warranted to clarify these associations and improve statistical power.

Strengths and Limitations

This study had some limitations that should be acknowledged. The cross-sectional design of the current study prevented causal inference; the associations, but not their direction, could be described. Further, the use of convenience sampling may have limited the generalizability of the findings, and future studies employing probability-based sampling are warranted accordingly. In addition, the sample was drawn from two teaching hospitals. It was limited to administrative and non-clinical personnel; thus, selection and setting effects may have limited the generalizability of our findings to other hospital staff or regions. Moreover, all exposures and outcomes were self-reported using a demographic and occupational checklist and the SHSQ-25 over a three-month recall window. While the Persian version of the SHSQ-25 has acceptable reliability and validity, self-report introduces common-method bias and may not accurately reflect the objective clinical status. Additionally, several potentially important confounders, such as sleep quality, physical activity, and detailed comorbidities beyond our exclusion criteria, were not measured, leaving room for residual confounding. Furthermore, some predictors had restricted variability (e.g., income adequacy), which reduces power for subgroup contrasts. Considering that average daily working hours were not verified against administrative records, non-differential misclassification is possible. Finally, although multivariable modeling helps isolate independent associations, data-driven model selection can still introduce specification bias; replication in prospectively designed cohorts is warranted accordingly.

Conclusion

The findings of this study indicated that hospital administrative staff exhibit increased SHS scores across multiple domains, and these scores are strongly associated with demographic and occupational characteristics. In addition, female gender, extended daily working hours, lower education, and shift work emerged as the key determinants of poorer health outcomes across several domains. These findings underscore the vulnerability of administrative staff, whose health and well-being are often overlooked compared to those of clinical personnel, regardless of their vital role in sustaining hospital operations.

Routine screening for suboptimal health using validated tools, such as the SHSQ-25, may help hospital managers and occupational health units identify at-risk staff early. Likewise, integrating such screening into workplace health programs can support targeted interventions, including workload optimization, review of working hours, and stress management strategies, thereby improving staff well-being and organizational efficiency. Thus, it is recommended that future studies employ longitudinal designs to clarify causal relationships between occupational exposures and SHS. Moreover, expanding research to include diverse hospital settings and other occupational groups would improve generalizability. Finally, such approaches would strengthen the evidence base for preventive strategies in occupational health research.

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Competing Interests

The authors declare that there is no conflict of interests.

Ethical Approval

Ethical considerations in this study included obtaining permission from the Ethics Committee of Shahrekord University of Medical Sciences (IR.SKUMS.MED.REC.1403.109) and obtaining written consent from the participants.

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Supplementary Files

Supplementary file 1 contains Tables S1 and S2.

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