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Work-Related Muscluskeletal Disorders and Work Ability Among Hospital Employees in Southeast of Iran

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Abstract

Background: The Work Ability Index (WAI) evaluates how well workers cope with the physical and mental demands of their jobs.

Objectives: This study aims to explore how demographic factors and work-related musculoskeletal disorders (WMSDs) influence work ability among employees at the largest specialized hospital in southeast Iran.

Methods: This cross-sectional study was conducted at the largest specialized hospital in Zahedan. A sample of 194 clinical staff and support personnel, including nurses, nursing assistants, patient transporters, and cleaning staff, were randomly selected through a stratified random sampling method. Work ability and musculoskeletal discomfort were assessed using the Persian versions of the WAI and Cornell Questionnaires. Quantitative data were presented as mean ± SD, while qualitative data were expressed as numbers and percentages. Pearson correlation, Kruskal-Wallis, Mann-Whitney U, and one- and multi-factor General Linear Models were used for data analysis in SPSS version 19.

Results: Work ability decreased with age ($P < 0.001$). Significant associations were found between work ability and age, job category, education, and Body Mass Index (BMI) ($P < 0.05$). After adjusting for age, job, education, and BMI, lower back pain ($P = 0.002$), thigh pain ($P = 0.004$), and knee pain ($P = 0.026$) were significantly linked to work ability. There was a notable negative correlation between work ability and discomfort score ($r = -0.337$, $P < 0.001$), with nursing assistants reporting higher discomfort scores compared to nurses, cleaning staff, and patient transporters ($P < 0.05$).

Conclusions: Our findings suggest a potential link between musculoskeletal disorders (MSDs) and work ability. Therefore, it is recommended to implement a program focused on identifying and addressing the risk factors associated with MSDs.

Keywords: Work Ability, Musculoskeletal Disorders, Hospital Personnel

1. Background

The concept of "work ability" refers to an individual's mental and physical condition, as well as their capacity to perform assigned tasks. Key factors influencing work ability include job demands, lifestyle, health, and personal attributes, all of which are essential in enhancing workforce participation and effectiveness (1).

Several quantitative and qualitative models have been proposed to assess employees' work ability. Common indicators used in these assessments include heart rate variations, maximum oxygen consumption, and the Work Ability Index (WAI) (2, 3).

The WAI assesses and estimates an individual's capacity to perform their job. Developed in Finland, it reflects the balance between employees' perception of job demands and their ability and resources to meet those demands (4).

Research indicates that an increase in musculoskeletal disorders (MSDs) leads to a reduction in work capacity (5, 6). Additionally, experiencing musculoskeletal pain in multiple areas can significantly impair job performance (7). Thus, improving work capacity requires addressing both psychological factors and MSDs (8).

Work-related musculoskeletal disorders (WMSDs) are a major contributor to workplace injuries, resulting in

higher costs, lost workdays, and increased absenteeism (9). Various body parts, including the neck, shoulders, arms, wrists, and back, can be affected by these disorders, with back pain being the most common (10).

Work-related musculoskeletal disorders account for one-third of work-related illnesses and injuries, and half of all absenteeism cases are attributed to these conditions (11, 12). For 60% of workers in the European Union facing occupational challenges, MSDs are the most significant work-related issue (12).

In healthcare environments, physical injuries, particularly MSDs, are common due to occupational hazards such as extended periods of standing, poor posture, patient handling, and psychological stress (13, 14). Nurses, in particular, face a heightened risk of back problems due to frequent patient handling tasks (15). Factors contributing to the high prevalence of MSDs in nursing include insufficient training, outdated patient handling techniques, and a lack of awareness about proper transfer assistance among nursing staff (16).

Several personal factors, including age, education level, work experience, BMI, physical activity, workplace conditions, and financial status, play significant roles in determining an individual's work ability and influencing their WAI (17-20).

Hospitals play a crucial role in community health, making the well-being of all staff essential for providing effective care and supporting societal welfare.

2. Objectives

Given that MSDs can reduce work ability, leading to increased absenteeism, disability, and early retirement, this study aimed to investigate the relationship between work ability and MSDs among employees at the largest specialized hospital in southeastern Iran.

3. Methods

This study was conducted in 2017 at Ali-ibn Abi Talib Hospital, the largest specialized hospital in southeastern Iran. This hospital is affiliated with Zahedan University of Medical Sciences and is recognized as a leading provincial tertiary teaching hospital, serving as a referral center for other tertiary hospitals in Sistan and Balochestan. A sample of 194 clinical and support staff, including nurses, nursing assistants, patient transporters, and cleaning staff, was randomly selected through a stratified random sampling method.

Participants with pre-existing musculoskeletal diseases, those on sick leave, and individuals who missed any data collection periods were excluded from the study. The WAI Questionnaire, administered according to the standard methodology recommended by the Finnish Institute of Occupational Health (17-20), was used to evaluate participants' perceived job capacity. A study conducted in Iran demonstrated that the Persian version of the WAI questionnaire has strong psychometric properties, including good internal consistency and reliability in test-retest evaluations, with a Cronbach's alpha coefficient of 0.78 (21).

The WAI questionnaire comprises two sections: (1) demographics and (2) seven items. Scores range from 7 to 49, categorized as follows: 7 - 27 (poor), 28 - 36 (moderate), 37 - 43 (good), and 44 - 49 (outstanding). A score of 36 or lower indicates "low work ability," while a score of 37 or higher indicates "satisfactory work ability" (21). The WAI is a self-administered tool that assesses health status, resources, and work demands. It was noted that the distribution of participants across WAI categories and the average WAI score remained consistent over a four-week period (22).

Like many tools, the WAI has several limitations:

(1) The full WAI can be too lengthy for practical use in many settings, especially in large studies that require efficient data collection.

(2) Privacy concerns arise because many employees may be hesitant to disclose their medical information when completing the WAI.

(3) The WAI lacks specificity in providing guidance on where and how to intervene when low scores are observed, whether at the individual or group level (23, 24).

The Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) was used to evaluate MSDs. Derived from the Nordic Musculoskeletal Questionnaire and the Cornell Hand Discomfort Questionnaire, the CMDQ assesses pain and discomfort across 11 body areas (25). It is widely used among ergonomics professionals and has been translated into Persian for various workplace applications in Iran (26).

The validity of the CMDQ in Iran has been confirmed, with its reliability established using Cronbach's alpha coefficient (0.986) (25). This method is generally simple to implement, requiring only a small team of trained personnel and a brief period for completion. Additionally, it is cost-effective. However, it has limitations, such as the potential for biased or one-sided responses influenced by workers' perspectives (27).

Participants provided informed consent before completing the questionnaires. The study received ethical approval from the Ethical Committee of Zahedan University of Medical Sciences.

Quantitative variables were expressed as mean ± SD, while qualitative variables were presented as number (%). Pearson correlation was used to assess the relationship between work ability and discomfort scores. Additionally, the Kruskal-Wallis and Mann-Whitney U tests were applied to compare discomfort scores across different occupational groups. A univariate General Linear Model was employed for both one-factor and multi-factor analyses to explore the relationship between work ability, demographic factors, and musculoskeletal disorders. Data analysis was conducted using SPSS version 19.

4. Results

A total of 194 hospital personnel, including nurses (49%), nursing assistants (9.3%), patient transfer staff (10.3%), and hospital cleaners (31.4%), were studied. The mean job experience was 8.75 ± 7.37 years, and the mean age was 34.37 ± 8.78 years. The majority of participants were female (67.5%), with 54.1% holding a university degree and 51% having a normal weight (Table 1).

The work ability score ranged from 22 to 49, with a mean of 40.86 ± 6.07. Most participants were at an excellent (40.2%) or good (34.5%) level of work ability.

In a one-factor model, there was a downward trend in work ability with age, with work ability significantly lower in individuals over 40 years old ($P < 0.001$). Similarly, individuals with more than 20 years of job experience reported lower work ability than those with 6 - 20 years of experience ($P = 0.001$) or less than 6 years ($P < 0.001$). The mean work ability was significantly higher among male individuals ($P = 0.029$) and those who exercised weekly ($P = 0.038$). Work ability was also significantly greater among people with a university degree compared to those with only school education ($P = 0.038$). Individuals with normal weight had higher work ability than obese individuals ($P = 0.001$), and work ability was significantly lower in nursing assistants compared to nurses ($P = 0.021$) and patient transfer staff ($P = 0.002$) (Table 2). In a multi-factor model, the most important factors associated with work ability were age, education, BMI, and job category (Table 2).

Pain was most prevalent in the lower back (53.1%), hand (51.0%), knee (45.4%), lower leg (45.4%), upper back (33.5%), and neck (35.1%) (Table 3).

In a one-factor model, work ability significantly decreased with pain in all body parts ($P < 0.05$) except for the upper back area ($P = 0.095$) (Table 3). In the multi-factor model, pain in the upper back ($P = 0.009$), lower back ($P < 0.001$), thigh ($P = 0.003$), knee ($P = 0.002$), and hand ($P = 0.023$) significantly decreased work ability. After adjusting for age, job, education, and BMI, work ability was still significantly affected by pain in the lower back ($P = 0.002$), thigh ($P = 0.004$), and knee ($P = 0.026$) (Table 3).

There was a significant negative correlation between work ability and discomfort score ($r = -0.337$, $P < 0.001$). The mean discomfort score was 184.97 ± 225.12 in nursing assistants, 68.26 ± 114.62 in nurses, 53.62 ± 60.14 in cleaning staff, and 48.85 ± 85.94 in patient transfer staff. The mean discomfort score was significantly higher for nursing assistants compared to other groups ($P < 0.05$).

5. Discussion

The research revealed that over 40% of participants had a good WAI score. Factors such as age, gender, education level, BMI, job type, work experience, and physical activity had a significant impact on WAI, with the strongest effects observed for age, education, BMI, and occupation. Pain was most prevalent in the lower back, thigh, and knee, areas that were strongly associated with diminished work ability. An inverse relationship was found between pain and work ability, indicating that higher levels of pain were linked to lower work ability. Nursing assistants and cleaning staff reported the lowest average WAI scores, while patient transporters recorded the highest.

This study observed a decline in individuals' WAI scores with increasing age, with the lowest scores found in those over 40 years old. This trend aligns with previous research on workers in Poland, which has identified a similar pattern. Some studies suggest that this decline in work ability is a natural consequence of aging, particularly after the age of 45. However, it is also important to consider that body weight, as indicated by BMI, tends to increase with age, and being overweight may contribute to lower work ability among older adults (28).

The study revealed that participants had an average of 8.75 years of work experience. It also identified a significant relationship between the WAI and work experience, with individuals who had 20 or more years of experience often exhibiting the lowest WAI scores. This finding suggests that those with longer careers may be at a higher risk of physical and mental health issues due to the demanding nature of their work and extended working hours (29, 30).

In this study, individuals classified as obese had significantly lower WAI scores compared to their non-obese counterparts. Previous studies have also demonstrated a correlation between obesity and reduced work ability (18, 31, 32).

Table 1. Frequency Distribution of Demographic Characteristics Among Hospital Employees in Southeast of Iran

Variables	No. (%)
Age, (y)	
Equal/less than 30	78 (40.2)
31 - 40	68 (35.1)
More than 40	48 (24.7)
Gender	
Male	63 (32.5)
Female	131 (67.5)
Education	
Primary/secondary/high school degree	33 (17.0)
High school diploma	56 (28.9)
University graduate	105 (54.1)
BMI	
Thin	10 (5.2)
Normal	99 (51.0)
Overweight	61 (31.4)
Obese	24 (12.4)
Job	
Nurse	95 (49.0)
Patient transfer	20 (10.3)
Nursing assistant	18 (9.3)
Cleaning	61 (31.4)
Job experience (y)	
Equal/less than 5	83 (42.8)
6 - 10	49 (25.3)
11 - 20	41 (21.1)
More than 20	21 (10.8)
Exercise (per week)	
Yes	59 (30.4)
No	135 (69.6)
Second job	
Yes	Yes
No	187 (96.4)

Furthermore, a significant association was found between education level and work ability. Prior research suggests that higher education levels positively impact WAI and support the application of ergonomic principles in the workplace (33).

Consistent with earlier research (34, 35), individuals who participated in sports activities demonstrated significantly higher work ability levels than those who did not engage in such activities. Additionally, it is estimated that approximately 1 kilogram of weight loss can be expected for every 50 minutes of exercise performed per week over a six-month period (36). Health education has also been shown to effectively support weight reduction among employees. In a study by Peter et al., examining the impact of Japanese health education on adult workers, a significant decrease in participants' average weight was reported following the completion of the health education program (37).

In contrast to Akodu and Ashalejo's study (38), we observed a significant correlation between gender and WAI, with men exhibiting higher WAI scores than women. Previous studies suggest that this difference in WAI may be linked to women's generally lower average physical strength and muscle mass compared to men, as well as their greater susceptibility to musculoskeletal injuries (39). Furthermore, our findings reveal a significant inverse relationship between WAI and discomfort scores, indicating that MSDs are key factors contributing to reduced WAI. Studies on oil company workers have suggested that men's denser fibrous and muscular tissues, which contain less water than

Table 2. Association of Demographic Factors with Work Ability Among Hospital Employees in Southeast of Iran

Variables	Work Ability, Mean ± SD	One-factor Model (P-Value)	Multi-factor Model (P-Value)
Age, (y)			
Equal/less than 30	42.74 ± 6.11	< 0.001	0.007
31 - 40	41.18 ± 5.20	< 0.001	0.019
More than 40	37.33 ± 5.72	Reference	Reference
Gender			NS
Male	42.22 ± 5.40	0.029	
Female	40.20 ± 6.28	Reference	
Education			
Primary/secondary/high school degree	38.33 ± 6.71	0.038	0.286
High school diploma	42.43 ± 5.32	0.102	0.005
University graduate	40.81 ± 6.01	Reference	Reference
BMI			
Thin	40.40 ± 6.40	0.260	0.943
Normal	42.54 ± 5.22	0.001	0.026
Overweight	39.36 ± 6.28	0.306	0.404
Obese	37.92 ± 6.84	Reference	Reference
Job			
Nurse	41.13 ± 5.72	0.021	0.001
Patient transfer	43.60 ± 4.96	0.002	0.023
Cleaning	40.51 ± 6.94	0.066	0.018
Nursing assistant	37.56 ± 4.26	Reference	Reference
Job experience, (y)			NS
Equal/less than 5	42.69 ± 5.27	< 0.001	
6 - 10	41.28 ± 6.23	0.001	
11 - 20	39.07 ± 5.78	0.054	
More than 20	36.10 ± 6.07	Reference	
Exercise			NS
Yes	42.22 ± 6.06	0.038	
No	40.26 ± 5.99	Reference	
Second job			NS
Yes	39.14 ± 6.59	0.448	
No	40.92 ± 6.06	Reference	

Abbreviation: NS, not significant.

women's, may contribute to women's heightened vulnerability to musculoskeletal issues (17).

We identified a significant disparity in work ability across various occupational categories, with nursing assistants showing the lowest Work Ability Index (mean WAI = 37.56) and patient transporters demonstrating the highest (mean WAI = 43.6). This variation could be linked to demographic factors such as age and work experience. Additionally, MSDs have a substantial impact on work ability, as evidenced by the higher average discomfort scores reported by nursing assistants compared to other groups.

The results from the Cornell Musculoskeletal Discomfort Questionnaire revealed a strong association between WAI and discomfort in the back, thigh, and knee regions, regardless of factors like age, education, employment history, occupational group, BMI, and other pain factors. Upon examining pain areas across different groups (specific results not provided), it was noted that nursing assistants reported more discomfort in regions such as the neck, knees, and lower back (lumbar) than their counterparts.

Consistent with our findings, there is a significant association between the frequency of MSDs, reduced musculoskeletal capacity, high psychological work demands, and diminished work ability (40). Research has shown that the prevalence of MSDs among employees increases as work ability declines over a period of four years (7). Various factors contribute to

Table 3. Association Between Pain and Work Ability Among Hospital Employees in Southeast of Iran

Pain area	No. (%)	Work Ability	P-Value		
			One-factor Model	Multi-factor Model 1 [a]	Multi-factor Model 2 [b]
Neck			0.001	NS	NS
No	126 (64.9)	41.95 ± 5.58			
Yes	68 (35.1)	38.82 ± 6.43			
Shoulder			0.005	NS	NS
No	138 (71.1)	41.62 ± 5.83			
Yes	56 (28.9)	38.96 ± 6.27			
Upper Back			0.095	0.009	NS
No	129 (66.5)	41.37 ± 5.61			
Yes	65 (33.5)	39.83 ± 6.82			
Arm			0.019	NS	NS
No	156 (80.4)	41.36 ± 5.82			
Yes	38 (19.6)	38.79 ± 6.69			
Lower Back			< 0.001	< 0.001	0.002
No	91 (46.9)	43.25 ± 4.82			
Yes	103 (53.1)	38.74 ± 6.28			
Lower arm			0.015	NS	NS
No	170 (87.6)	41.25 ± 5.81			
Yes	24 (12.4)	38.04 ± 7.19			
Wrist			< 0.001	NS	NS
No	141 (72.7)	41.93 ± 5.61			
Yes	53 (27.3)	38.00 ± 6.35			
Hip			0.029	NS	NS
No	177 (91.2)	41.15 ± 6.00			
Yes	17 (8.8)	37.76 ± 6.13			
Thigh			< 0.001	0.003	0.004
No	174 (89.7)	41.48 ± 5.74			
Yes	20 (10.3)	35.40 ± 6.22			
Knee			< 0.001	0.002	0.026
No	106 (54.6)	42.84 ± 5.64			
Yes	88 (45.4)	38.46 ± 5.72			
Lower leg			< 0.001	NS	NS
No	106 (54.6)	41.68 ± 5.77			
Yes	88 (45.4)	37.88 ± 6.25			
Hand			< 0.001	0.023	NS
No	95 (49.0)	42.65 ± 5.45			
Yes	99 (51.0)	39.13 ± 6.15			
Foot			0.004	NS	NS
No	170 (87.6)	41.32 ± 5.86			
Yes	24 (12.4)	37.86 ± 6.61			

Abbreviation: NS, not significant.

[a] Multi-factor model 1: Using forward method.

[b] Multi-factor model 2: Adjusted model 1 for age, job, education, and BMI.

these disorders, including increased physical workload, lifting heavy items, patient transportation, obesity, age, and gender. Additionally, improper body mechanics strongly correlate with MSDs. Key contributors to these issues include bending, neck turning, prolonged sitting or standing, and performing manual tasks (41).

The higher average MSD scores among nursing assistants likely contribute to their lower work ability compared to other groups. The role of nursing

assistants requires significant physical activity in patient care, as they spend much of their time standing and are often required to lift or move patients and equipment, with primary duties focused on bedside care (40).

In line with our findings, Naoum et al. demonstrated that work ability tends to remain stable in professions that demand high mental engagement and independence but involve minimal physical strain. Nurse supervisors often benefit from these conditions due to their experience and career progression. Conversely, non-supervisory nurses face heavier workloads and additional clinical responsibilities, which may lead to fatigue and irritability (42). Similarly, Choi and Brings found that nurses and assistant nurses who manually lift and transport overweight and obese patients are more susceptible to developing MSDs (43). Transferring such patients is a significant risk factor for MSDs, particularly back pain. According to the National Institute for Occupational Safety and Health (NIOSH) guidelines, the maximum recommended weight for patient lifting is 15 kilograms. It has been documented that using transfer aids, such as basket-slings, ceiling lifts, and sliding boards, as well as providing proper training on patient lifting and movement techniques, can prevent numerous injuries and health problems among hospital staff (43). In agreement with our study, a cross-sectional investigation into WMSDs among healthcare workers revealed a notable association between back and neck pain and specific job roles. Evaluations conducted with the Quick Exposure Check (QEC) tool indicated a high-risk level (L = 4) for WMSDs among healthcare personnel involved in patient carrying or transferring, and a medium action level (L = 3) for nurses who stand for extended periods (44).

Our results align with the findings of Pompeii et al., who reported that patient handling tasks account for a significant proportion (one-third) of musculoskeletal injuries. Their study also found that nurse aides were twice as likely to experience a patient handling injury compared to inpatient nurses. After nurse aides, the highest rates of MSDs were observed in emergency medical technicians, patient transporters, operating room technicians, and morgue staff (40).

Karahan et al. conducted a study on the prevalence and contributing factors of low back pain among various Turkish hospital staff, including nurses, doctors, physical therapists, technicians, secretaries, and hospital aides. In their study, nurses reported the highest prevalence of low back pain (45).

Similarly, research has highlighted that nurses working in intensive care units face increased risks of injuries related to physical material handling. Additionally, moderate to high workloads are associated with a greater likelihood of developing MSDs, which can impair nurses' ability to perform their duties effectively (46).

In the current study, cleaners had lower WAI scores compared to nurses, likely due to their workload and the factors contributing to musculoskeletal disorders. A previous study reported a high prevalence of MSDs among hospital cleaners, with the lower back (57.7%) and shoulder (52.6%) being the most commonly affected areas. Poor ergonomic design in workspaces and cleaning equipment exacerbates the challenges cleaners face in performing their tasks effectively. Research on MSDs among subcontracted hospital cleaners in Thailand indicated that the cleaning industry has the fourth-highest absenteeism rate. Cleaning responsibilities in medical facilities differ significantly from those in office buildings, as they are subject to strict hygiene standards requiring frequent cleaning to minimize the risk of infectious microorganisms that could endanger both patients and staff (47). Additionally, hospital cleaners often work in preparation for 24-hour shifts, and the dynamic hospital environment, with constantly moving patients and shifting requirements, contributes to a hectic and congested workspace.

In comparison, workers in India's Class 4 categories undertake departmental tasks such as cleaning, assisting nurses with patient transportation, changing patients, and preparing them for surgery. This group commonly reports feeling underpaid, experiencing high levels of work-related stress, struggling to balance personal and professional life, and lacking emotional or social support from colleagues (48).

In the current study, the subjects' mean WAI was 40.86. According to the Finnish Institute of Occupational Health, this value falls within the "good" range, indicating that the healthcare professionals studied should receive support to further enhance their work competence. Most research on WAI among nursing staff has found an average score between 37 and 43, which is categorized as good. However, other studies have reported that employees' work ability is mediocre, with scores ranging between 28 and 36 (49).

Consistent with the findings of earlier studies, ergonomic interventions, physical exercise, and behavioral changes have a positive impact on reducing the frequency of WMSDs and enhancing the work ability of affected individuals (50, 51).

Furthermore, there is increasing recognition within the healthcare sector of the need to enhance personal

skills and capabilities among its workforce. Consequently, there is a global demand for in-service training, which not only improves staff proficiency but also reduces errors and enhances the quality of patient care (52, 53).

5.1. Limitations

This study has several limitations. Firstly, its cross-sectional design precludes establishing causal relationships among the variables. Secondly, the study was conducted in a single hospital, so differences in management systems and physical conditions in other hospitals may yield different results. Additionally, due to the demanding workload of clinical staff and challenges in securing participation, questionnaires were not uniformly completed across all hospital departments and occupational groups, such as the medical team.

5.2. Conclusions

Our findings suggest a potential link between MSDs and work ability. Therefore, we recommend implementing a program focused on identifying and addressing the risk factors associated with MSDs. Such an approach would help alleviate these conditions, improve the work capacity of hospital staff, and prevent early disability and retirement. Additionally, given the inadequate working conditions for healthcare providers in the hospital under study and the need for patient transfer aids, it is essential to emphasize the importance of conducting training sessions to raise employees' awareness of the causes of MSDs and effective preventive strategies.

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Footnotes

Authors' Contribution: The research was designed and conducted by H. O. A.. R. H. H. and H. O. A. provided the tables. R. H. H. reported the results. The article was written by R. H. H. and revised by H. O. A.

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