



Work-related musculoskeletal symptoms among healthcare professionals at a provincial hospital in Morocco: prevalence and associated factors

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Abstract

Musculoskeletal disorders (MSDs) are one of the main health problems affecting healthcare professionals. This study aimed to estimate the prevalence of MSDs and identify associated factors at the Ibn Baja Provincial Hospital Centre in Taza, Morocco. A cross-sectional study with analytical components was conducted among 200 healthcare professionals. Data were collected using a questionnaire covering socio-demographic and occupational characteristics, ergonomic and organizational factors, and the consequences of MSDs. Associations were analyzed using bivariate and multivariate analysis ($p < 0.05$). The prevalence of musculoskeletal disorders was 67%. It varied according to occupational category: 66.4% among nurses, 81.3% among midwives, 57.9% among doctors, 60% among nursing assistants and 70% among healthcare technicians. The most common sites of pain were the lower back (67 %), the back (61 %), the shoulders (45 %) and the knees (41 %). Multivariate analysis identified the following factors as being associated with MSDs: poor workplace ergonomics, a lack of training in MSD prevention, high work pressure, poor work organization, a BMI $> 25 \text{ kg/m}^2$ and more than 10 years of work experience. MSDs were associated with pain, reduced work capacity, limitations in daily activities and absenteeism. This is the first study conducted at the Ibn Baja Provincial Hospital Centre in Taza to investigate MSDs among healthcare professionals and it highlights their high prevalence as well as the important role of ergonomic, organizational, and individual factors associated with their presence.

Keywords: ergonomics; healthcare professionals; musculoskeletal disorders; occupational health; risk factors

Abbreviations: BMI, body mass index; CI, confidence interval; MSDs, musculoskeletal disorders; ORa, adjusted odds ratio; WHO, World Health Organization.

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1. Introduction

Musculoskeletal disorders (MSDs) represent one of the leading causes of work-related morbidity today (1). They include a wide range of disorders affecting muscles, tendons, ligaments, nerves and joints, and can lead to disability and reduced quality of life (2, 3). According to the World Health Organization (WHO), nearly 1.71 billion people suffer from MSDs, making it one of the leading causes of disability worldwide (1, 2). Work-related MSDs are mainly linked to biomechanical stresses such as repetitive movements, uncomfortable postures, carrying loads, and prolonged physical exertion (1, 4, 5).

Healthcare professionals form one of the groups most exposed to these disorders due to the physical demands inherent in their work, such as caring for patients, main-

taining a static posture for long periods, and performing repetitive movements (6, 7). This risk is exacerbated by organizational pressures, including excessive workloads, long on-call periods, irregular working patterns, staff shortages and the urgent nature of care (8–10).

Several studies have reported high rates of musculoskeletal disorders among healthcare professionals. A meta-analysis carried out in 2023 by Sun et al., covering 42 studies and 36,934 nurses, estimated the annual prevalence of work-related MSDs at 77.2%, with the most commonly affected areas being the lower back (59.5%), the neck (53.0%) and the shoulders (46.8%) (11). A systematic review by Gorce et al., covering 71 studies and 33,809 nurses, reported an overall prevalence of 82.0%, with higher rates in Europe (89.5%) than in Asia (84.3%) (12).

Similarly, Yan et al. confirmed that lower back pain (56 %), neck pain (42 %), and shoulder pain (36 %) are the most common sites of pain, primarily linked to handling patients, uncomfortable postures, repetitive movements, and long working hours (13). In line with these findings, Davis and Kotoski report, in a comprehensive review, prevalence rates ranging from 40% to 90% depending on the healthcare setting, and highlight the impact of musculoskeletal disorders on absenteeism, reduced work capacity, staff turnover, and costs to healthcare organizations (14).

In Morocco, data on musculoskeletal disorders among healthcare professionals remain limited. The available studies show high prevalence rates, ranging from 88 to 100%, with lower back, neck and shoulder pain being the most common (15, 16). These studies identify repetitive movements, patient handling, postural strain and physical workload as the main risk factors, alongside organizational and psychosocial factors, notably work-related fatigue and dissatisfaction with working conditions (15, 16). Furthermore, a multicenter survey conducted in Moroccan public hospitals highlighted excessive workloads, a sustained pace of work and an unsuitable working environment among a significant proportion of healthcare professionals (17). Similarly, at Hassan II University Hospital in Fez, paramedical staff in the emergency department reported staff shortages, high levels of physical exertion and an unfavorable working environment, all of which are factors likely to contribute to the onset of MSDs (18).

To our knowledge, no study has been carried out at the Ibn Baja Provincial Hospital Centre in Taza, Morocco. This evidence gap justified the present study, which aims to investigate MSDs among healthcare staff at the Ibn Baja PHC in Taza, focusing on their prevalence, anatomical locations, functional and occupational impacts, and the main associated risk factors.

2. Materials and Methods

A cross-sectional study with an analytical focus was conducted between 25 April and 22 May 2026 at the Ibn Baja Provincial Hospital Centre in Taza, Morocco.

The target population comprised all healthcare professionals working at the Ibn Baja Provincial Hospital in Taza, Morocco ($n = 305$). Before recruitment, we verified the list of healthcare professionals with the hospital administration. Twenty healthcare professionals were absent for the entire duration of data collection as they were on vacation and were therefore unavailable for recruitment. The remaining 285 healthcare professionals were eligible and were invited to take part in the study.

To maximise coverage of the target population, recruitment took place over multiple visits during the study period, covering morning, afternoon and night shifts, as well as weekends. Eligible healthcare professionals were informed

about the study and invited to complete the anonymous self-administered questionnaire. Several attempts were made to contact professionals during the data collection period if they were unavailable during an initial visit.

Of the 285 eligible professionals contacted, 200 agreed to take part, whilst 85 declined, representing a response rate of 70.2%. No individual information was collected from those who declined to take part; consequently, the characteristics of the respondents could not be compared with those of the non-respondents.

Data were collected using an anonymous, self-administered questionnaire, investigator-developed specifically for this study. The questionnaire was designed and administered in French, and no translation or back-translation was required. Items were informed by scientific literature and based on questionnaires used in our previous work (19–21), which were then adapted to the specific objectives of this study. The questionnaire was pretested to assess its clarity, comprehensibility, and relevance before administration. The survey covered the participants' socio-demographic and occupational characteristics, biomechanical and organizational risk factors, the presence of musculoskeletal disorders, their anatomical location, their impact, and the prevention and management measures adopted.

MSDs were assessed through self-reporting ('Yes/No'), without clinical confirmation or a medical diagnosis. The questionnaire defined MSDs as disorders of the muscles, joints, tendons, ligaments and nerves, which may cause pain or restricted movement.

Affected participants specified the affected areas and their side. As a single person could report several areas, the anatomical percentages are not mutually exclusive.

No standardised follow-up period was specified, and the question did not require an explicit link to work.

Data were entered and analyzed using IBM SPSS Statistics software version 21 (IBM Corp., Armonk, NY, USA). Qualitative variables were described in terms of frequencies and percentages. Associations between MSDs and qualitative variables were examined using Pearson's χ^2 test. Variables with a p-value of less than 0.20 in the bivariate analysis were included in a binary logistic regression model to identify factors independently associated with MSDs. The results were presented as adjusted odds ratios (ORa) and their 95% confidence intervals (95% CI). Statistical significance was set at $p < 0.05$. For the binary logistic regression, the dependent variable was coded as 1 for participants reporting MSD symptoms and 0 for those reporting no MSD symptoms. For each binary predictor, the category coded 0 was used as the reference category.

This study was approved by the Head of the Ibn Baja Provincial Hospital Centre (approval no. 1740 of 29 April 2026). Participation was voluntary, informed consent was obtained from each participant, and the anonymity and confidentiality of the data were guaranteed.

3. Results

3.1 Socio-demographic and occupational characteristics of the participants

Among the 285 healthcare professionals invited to participate, 200 agreed to take part in the study, corresponding to a response rate of 70.2%. The socio-demographic and occupational characteristics of the participants are presented in Table 1.

The majority of the surveyed population was women (67.5%). Participants aged under 30 represented 72.0% of the sample, while 62.0% had a body mass index (BMI) of less than 25 kg/m². Nearly half of the healthcare professionals (48.5%) reported engaging in regular physical activity. The majority of participants had been working for less than ten years (76.0%). Nurses constituted the most represented professional group (70.0%), followed by doctors (9.5%), midwives (8.0%), nursing assistants (7.5%) and healthcare technicians (5.0%).

3.2 Work conditions and ergonomic factors

The working conditions and the main ergonomic factors reported by the participants are presented in Table 2.

Most healthcare professionals reported being exposed to a physically demanding work pace (96.5%) and high work pressure (90.0%). Poor working postures were reported by 80.0% of participants, while 75.5% performed repetitive movements and 73.0% regularly handled heavy loads. Lack of time was reported by 73.5% of respondents, and 70.5% considered that they had not received adequate training on the prevention of MSDs. More than half of the participants (52.0%) considered their work organization to be inadequate, whereas only 18.0% reported benefiting from ergonomic workplace adjustments. Finally, 41.5% indicated a lack of appropriate equipment.

3.3 Prevalence and anatomical distribution of MSDs

Among the 200 healthcare professionals who participated in the survey, 67% (IC95%: 60.2–73.1) reported MSD symptoms, while 33% reported no MSD symptoms (Figure 1). Among participants with MSDs, women accounted for the majority (70.7%). MSDs were more frequent among participants aged over 30 years (34.6%), those with a BMI greater than 25 kg/m² (45.9%), and those with more than 10 years of occupational experience (28.6%) (Table 3). MSD prevalence estimates varied across occupational categories, ranging from 57.9% among doctors to 81.3% among midwives. However, the number of participants in several occupational groups was small (doctors, *n* = 19; midwives, *n* = 16; nursing assistants, *n* = 15; health technicians, *n* = 10). Therefore, these profession-specific estimates have limited precision and should be interpreted as exploratory rather than as evidence of differences between occupational categories.

The anatomical distribution of MSDs is presented in Figure 2.

The most frequently affected body regions were the lower back (67%), followed by the upper back (61%), shoulders (45%), and knees (41%). Neck pain was reported by 35% of participants. Upper-limb disorders mainly affected the right upper limb (36%), the wrist (27%), the left upper limb (23%), and the hand (13%), whereas elbow pain was reported by 13% of participants. Regarding the lower limbs, pain was reported in the ankles (28%), the left lower limb (24%), the right lower limb (22%), and the hips (17%).

3.4 Consequences of MSDs

The functional and occupational consequences reported by the study participants (*N* = 200) are presented in Table 4. Overall, 80.0% (*n* = 160) reported pain or physical fatigue, 75.5% (*n* = 151) reported reduced work capacity, 64.0% (*n* = 128) reported limitations in daily activities, and 48.0% (*n* = 96) reported psychological effects. Absenteeism was reported by 46.5% (*n* = 93) of participants.

3.5 Preventive and management measures for MSDs

The main preventive and management strategies adopted by healthcare professionals are presented in Figure 3. The most frequently reported measures included seeking medical consultation, taking analgesics, reducing physical exertion, improving workstation organization, task redistribution, improving the work environment, reducing repetitive movements, adjusting working time, reducing manual handling activities, stress management, and participating in training programs on MSD prevention.

3.6 Factors associated with MSDs

Bivariate analysis using Pearson's chi-square test identified several factors significantly associated with the presence of MSDs among the surveyed population (Table 5).

Age was significantly associated with MSDs ($\chi^2 = 8.543$; *df* = 1; *p* = 0.003; Cramer's *V* = 0.207), indicating that healthcare professionals aged over 30 years experienced a higher percentage of MSDs than younger participants. Similarly, BMI was significantly associated with MSDs ($\chi^2 = 6.730$; *df* = 1; *p* = 0.009; Cramer's *V* = 0.183), suggesting a higher percentage among participants with a BMI greater than 25 kg/m².

Occupational experience was also significantly associated with MSDs ($\chi^2 = 4.549$; *df* = 1; *p* = 0.033; Cramer's *V* = 0.151). Healthcare professionals with more than 10 years of work experience were more likely to report MSDs.

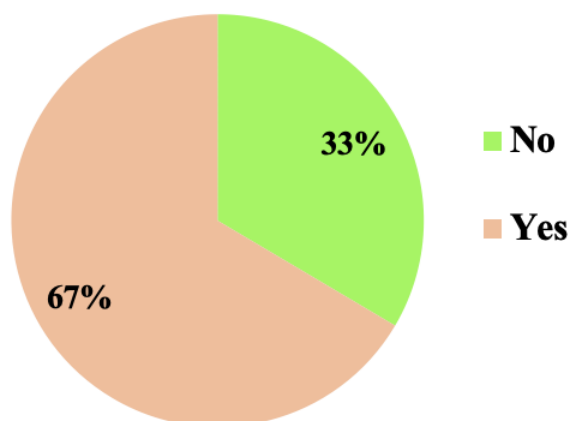
Regarding organizational factors, poor work organization was significantly associated with MSDs ($\chi^2 = 5.527$; *df* = 1; *p* = 0.019; Cramer's *V* = 0.166). High work pressure was strongly associated with MSDs and showed the strongest bivariate association among all variables examined ($\chi^2 = 13.94$; *df* = 1; *p* < 0.001; Cramer's *V* = 0.265). In addition, the absence of ergonomic workplace arrangements showed the strongest association among the variables examined ($\chi^2 = 10.014$; *df* = 1; *p* = 0.002; Cramer's *V* = 0.224), highlighting the strength of

Table 1: Socio-demographic and Occupational Characteristics of the Participants

Characteristic	Category	n	%
Sex	Female	135	67.5
Sex	Male	65	32.5
Age	< 30 years	144	72.0
Age	> 30 years	56	28.0
BMI	< 25 kg/m ²	124	62.0
BMI	> 25 kg/m ²	76	38.0
Physical activity	Yes	97	48.5
Physical activity	No	103	51.5
Years of professional experience	< 10 years	152	76.0
Years of professional experience	> 10 years	48	24.0
Professional category	Physician	19	9.5
Professional category	Nurse	140	70.0
Professional category	Midwife	16	8.0
Professional category	Health technician	10	5.0
Professional category	Nursing assistant	15	7.5

Table 2: Participants' Exposure to Occupational and Ergonomic Risk Factors

Factor	Yes n	Yes %	No n	No %
Repetitive movements	151	75.5	49	24.5
Awkward working postures	160	80.0	40	20.0
Manual handling of loads	146	73.0	54	27.0
Poor work organization	104	52.0	96	48.0
Work pressure	180	90.0	20	10.0
Availability of workplace ergonomics	36	18.0	164	82.0
Physically demanding work pace	193	96.5	7	3.5
Lack of time	148	73.5	52	26.0
Lack of equipment	83	41.5	117	58.5
Lack of training	141	70.5	59	29.5

**Figure 1:** Prevalence of musculoskeletal disorders among healthcare professionals

the association between ergonomic conditions and MSDs.

Furthermore, healthcare professionals who perceived their job as stressful were more likely to report MSDs ($\chi^2 = 8.294$; $df = 1$; $p = 0.004$; Cramer's $V = 0.204$). Work pace was also significantly associated with MSDs ($\chi^2 = 4.684$; $df = 1$; $p = 0.030$; Cramer's $V = 0.153$), as was the lack of training on MSD prevention ($\chi^2 = 4.939$; $df = 1$; $p = 0.026$; Cramer's $V = 0.157$).

Overall, Cramer's V values ranged from 0.151 to 0.265, indicating weak to moderate associations between these factors and the presence of MSDs. Among the variables exam-

ined, work pressure showed the largest Cramer's V (0.265), followed by workplace ergonomics (0.224), perceived occupational stress (0.204), and age (0.207). These findings suggest that MSDs are influenced by both individual characteristics (age, BMI, and occupational experience) and organizational and psychosocial factors (ergonomics, work organization, occupational stress, work pace, and training). These associations were subjected to a multivariate analysis in order to identify the factors independently associated with MSDs.

Multivariable binary logistic regression analysis was per-

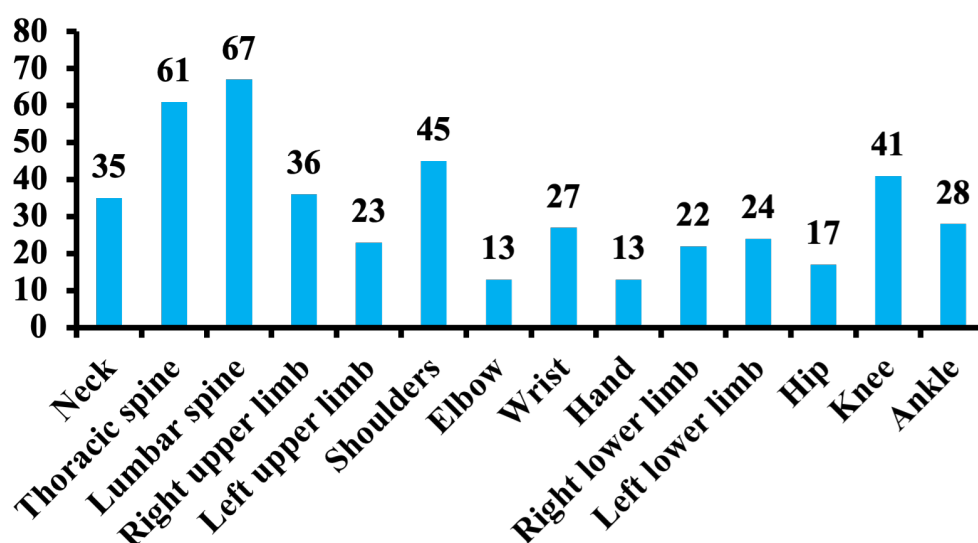


Figure 2: Anatomical distribution of musculoskeletal disorders by affected body region

Table 3: Distribution of healthcare professionals according to the presence of MSDs and sociodemographic and occupational characteristics.

Characteristic	Category	No n	No %	Yes n	Yes %
Sex	Female	41	61,2	94	70,7
Sex	Male	26	38,8	39	29,3
Age	<30 years	57	85,1	87	65,4
Age	>30 years	10	14,9	46	34,6
BMI	< 25	49	73,1	72	54,1
BMI	> 25	18	26,9	61	45,9
Physical activity	Yes	36	53,7	61	45,9
Physical activity	No	31	46,3	72	54,1
Years of work	< 10 years	57	85,1	95	71,4
Years of work	> 10 years	10	14,9	38	28,6
Occupational category	Doctor	8	42,1	11	57,9
Occupational category	Nurse	47	33,6	93	66,4
Occupational category	Midwife	3	18,7	13	81,3
Occupational category	Health technician	3	30	7	70
Occupational category	Nursing assistant	6	40	9	60

Table 4: Self-reported functional and occupational consequences among all study participants (N = 200)

Consequence	Yes n	Yes %	No n	No %
Pain / physical fatigue	160	80,0	40	20,0
Reduced work capacity	151	75,5	49	24,5
Absenteeism	93	46,5	107	53,5
Psychological impact	96	48,0	104	52,0
Limitation of daily activities	128	64,0	72	36,0

formed to identify factors independently associated with the presence of MSDs (Table 6). The overall model was statistically significant ($\chi^2 = 61.36$; $df = 9$; $p < 0.001$), indicating that the variables included in the model significantly contributed to distinguishing participants with and without MSDs. The model explained 26.8% (Cox and Snell R^2) and 37.2% (Nagelkerke R^2) of the variance in MSDs. The Hosmer–Lemeshow goodness-of-fit test was not statistically significant ($\chi^2 = 12,072$; $df = 8$; $p = 0,148$), indicating an

adequate fit of the model to the observed data. The overall classification accuracy of the model was 78.7%.

After adjustment for all variables included in the model, five factors were significantly associated with the presence of MSDs. Participants with a BMI greater than 25 kg/m² had higher odds of reporting MSDs compared with those with a BMI below 25 kg/m² ($\beta = 0.74$; adjusted OR = 2.1; 95% CI: 1.03–4.37; $p = 0.049$). Similarly, participants with more than 10 years of occupational experience had higher odds

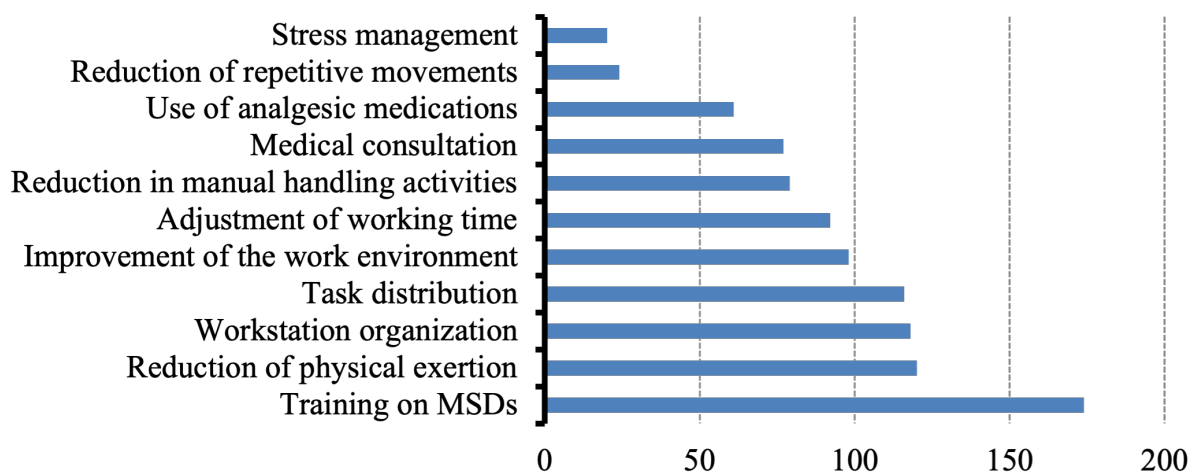


Figure 3: Prevention and management measures adopted by healthcare professionals with musculoskeletal disorders

of reporting MSDs than those with less than 10 years of experience ($\beta = 1.14$; adjusted OR = 3.12; 95% CI: 1.18–8.27; $p = 0.02$). Poor work organization was also independently associated with MSDs, with participants reporting poor work organization having approximately twice the odds of MSDs compared with those reporting no such problem ($\beta = 0.77$; adjusted OR = 2.16; 95% CI: 1.04–4.43; $p = 0.04$). High work pressure was strongly associated with MSDs. Participants reporting work pressure had substantially higher odds of MSDs compared with those who did not report such pressure ($\beta = 1.90$; adjusted OR = 6.70; 95% CI: 1.673–26.89; $p = 0.007$). Perceived occupational stress was also independently associated with a higher odds of MSDs ($\beta = 2.21$; adjusted OR = 9.1; 95% CI: 1.23–67.55; $p = 0.03$).

Two variables showed adjusted ORs below 1.0. Participants reporting a lack of workplace ergonomics had lower odds of MSDs than those with available ergonomic arrangements (adjusted OR = 0.14, 95% CI: 0.04–0.5, $p = 0.002$). Likewise, lack of training was associated with lower odds of MSDs (adjusted OR = 0.26, 95% CI: 0.1–0.63, $p = 0.003$). These inverse associations should be interpreted with caution, as they may reflect the distribution of ergonomic conditions in the study population, the fact that most participants had already received training, or the influence of other variables included in the multivariable model.

In contrast, age over 30 years ($p = 0.07$), and work pace ($p = 0.29$) were no longer significantly associated with MSDs after adjustment for the other variables included in the model.

4. Discussion

This study highlights a 67% prevalence of musculoskeletal disorders among healthcare professionals at the Ibn Baja Provincial Hospital in Taza. Although this prevalence is lower than that reported in several meta-analyses, it confirms that MSDs remain a major occupational health con-

cern among healthcare workers. Sun et al. estimated an annual MSD prevalence of 77.2% among nurses (11), while Jacquier-Bret and Gorce reported a global prevalence of 82% in their systematic review of healthcare professionals (7, 12). More recently, Gregg et al. confirmed through a meta-analysis that MSDs remain among the most common occupational diseases in the healthcare sector, regardless of geographical region (22). The differences observed between our findings and those of previous studies may be explained by variations in the populations investigated, data collection methods, and the organizational and ergonomic characteristics of each healthcare system.

The anatomical distribution of MSDs in our study was dominated by low back pain (67%), upper back pain (61%), shoulder pain (45%), and knee pain (41%). These findings are consistent with the systematic reviews by Yan et al. (13) and Gorce and Jacquier-Bret (12), as well as with their recent meta-analysis conducted among Asian nurses, which identified the lumbar, cervical, and shoulder regions as the most frequently affected anatomical sites (23). This high prevalence is likely attributable to the biomechanical demands inherent to healthcare work, including patient handling, prolonged static postures, repetitive trunk movements, and repetitive manual tasks (5, 6, 13, 14, 22).

Our findings also highlight the high level of exposure of healthcare professionals to ergonomic and organizational risk factors. More than nine out of ten participants reported working under high pressure, and nearly 97% described their work pace as physically demanding. In addition, poor working postures, repetitive movements, and manual handling of heavy loads were reported by more than 70% of respondents. These findings are consistent with reports from the WHO, the European Agency for Safety and Health at Work (EU-OSHA), and the International Labour Organization (ILO), which identify biomechanical constraints combined with adverse work organization as the main factors associated with MSDs in hospital settings (1, 4, 10).

Table 5: Bivariate analysis of factors associated with MSDs

Factor	Chi-square	df	p-value	Cramer's V
Age	8.54	1	0.003	0.207
BMI	6.73	1	0.009	0.183
Years of work	4.55	1	0.033	0.151
Poor work organization	5.53	1	0.019	0.166
Work pressure	13.94	1	<0.001	0.265
Presence of workplace ergonomics	10.01	1	0.002	0.224
Profession perceived as stressful	8.29	1	0.004	0.204
Work pace	4.68	1	0.03	0.153
Lack of training	4.94	1	0.02	0.157

Legend: χ^2 = Pearson's chi-square test; df = degrees of freedom; $p < 0.05$ = statistically significant association; Cramer's V = effect size.

Table 6: Multivariable logistic regression of factors associated with MSDs

Factor	Beta	SE	Wald	ORa	95% CI	p-value
IMC (>25 kg/m ²)	0.74	0.38	3.68	2.1	1.03-4.37	0,05
Length of service (>10 years)	1.14	0.5	5.24	3.12	1.18-8.27	0,02
Poor work organization	0.77	0.37	4.36	2.16	1.04-4.43	0,04
Work pressure	1.90	0.71	7.22	6.70	1.67-26.89	0,007
Profession perceived as stressful	2.21	1.02	4.66	9.1	1.23-67.55	0.03
Lack of workplace ergonomics	-1.95	0.64	9.32	0.14	0.04-0.5	0,002
Lack of training	-1.36	0.46	8.71	0.26	0.1-0.63	0,003
Age	0.87	0.48	3.27	2.39	0.93-6.13	0.07
Work pace	-0.52	0.49	1.13	0.59	0.23-1.55	0.29

Abbreviations: ES: Standard Error; ORa (Exp(B)) = adjusted Odds Ratio; CI 95% = 95% Confidence Interval.

Model fit: $\chi^2 = 61.36$; $p < 0.001$; -2 Log Likelihood = 188.52; Cox & Snell $R^2 = 0.268$; Nagelkerke $R^2 = 0.372$; Hosmer-Lemeshow test: $\chi^2 = 12.072$; $p = 0.148$; overall correct classification = 78.7%.

The multivariable analysis showed that the presence of MSDs is primarily associated with a combination of ergonomic, organizational, and individual factors. The absence of ergonomic workplace conditions emerged as the factor most strongly associated with MSDs, followed by inadequate training, work pressure, poor work organization, a body BMI greater than 25 kg/m², and more than ten years of occupational experience. These findings are consistent with previous studies demonstrating that ergonomic and organizational constraints are among the main modifiable factors associated with MSDs among healthcare professionals (23–25). Regarding individual factors, several systematic reviews have also reported that overweight increases the mechanical load on the spine and joints, while longer occupational experience reflects the cumulative effect of occupational exposures throughout the working career (22, 25). In our study, bivariate analysis identified age as being associated with MSDs; however, this association was no longer significant after multivariable adjustment, suggesting that its effect is largely explained by other variables, particularly working conditions and years of occupational experience.

The high prevalence of poor postures, repetitive movements, and manual handling observed in this study underscores the importance of implementing preventive interventions in hospital settings. Albanesi et al. demonstrated that programs combining ergonomic training, physical exercise, patient-handling assistive devices, and organizational modifications significantly reduce musculoskeletal pain among healthcare professionals (24). Similarly, Gao et al. recom-

mended the use of standardized ergonomic assessment tools to identify high-risk work situations at an early stage and implement appropriate corrective measures (25). Furthermore, Valentim et al. highlighted that biomechanical exposure assessment methods have become essential tools for guiding evidence-based prevention strategies (26).

MSDs had a substantial impact on both the health and occupational lives of the participants. Most respondents reported pain or physical fatigue, reduced work capacity, and limitations in daily activities, while nearly half reported sickness absence related to MSDs. These findings are consistent with those of Davis and Kotowski, as well as Gregg et al., who identified MSDs as a major cause of reduced productivity, absenteeism, and impaired quality of care in healthcare settings (14, 22). Likewise, the findings reported by Chenna et al. among oral healthcare professionals confirm that prolonged awkward postures and repetitive movements contribute to the high prevalence of MSDs across healthcare professions (27).

This study has several limitations. First, its cross-sectional design does not allow causal relationships, temporal sequence, or incidence to be established between the investigated factors and MSDs; the design only permits the identification of statistical associations, and it is not possible to determine whether reported musculoskeletal symptoms preceded or followed exposure to the reported ergonomic and organizational conditions. Second, the collected information was based on self-reported data, which may be subject to recall bias and social desirability bias. Because exposure and outcome data were collected

simultaneously, from the same respondents and through the same self-administered questionnaire, the observed associations may also be inflated by common-method bias. In addition, healthcare professionals most severely affected by musculoskeletal disorders may already have left their position or the institution before the survey was conducted (a healthy-worker effect), which could have led to an underestimation of the true strength of the associations examined. Finally, although the multivariable model was adjusted for the variables measured, residual confounding by unmeasured or imperfectly measured factors cannot be excluded. Thirdly, although several recruitment sessions were organized during morning, afternoon and night shifts, as well as at weekends, in order to maximize participation, 85 of the 285 eligible professionals declined to take part, resulting in a response rate of 70.2%. As no individual information was collected from non-respondents, we were unable to compare respondents and non-respondents and therefore cannot rule out the possibility of non-response bias. Furthermore, the sample consisted disproportionately of nurses (70%) and professionals aged under 30 (72%). Consequently, the overall prevalence estimate should be interpreted primarily as an estimate amongst the participating healthcare professionals rather than as a fully representative estimate of the entire hospital workforce. The small number of respondents in several occupational categories also limits the precision of the estimates specific to each profession, which should therefore be regarded as exploratory.

An additional limitation concerns the measurement of MSDs. The outcome was based on self-reported symptoms rather than clinically confirmed diagnoses and was assessed using a study-specific questionnaire rather than a standardized validated instrument. Moreover, the questionnaire did not specify a standardized recall period and did not explicitly establish whether reported symptoms were work-related.

Despite these limitations, to the best of our knowledge, this is the first study investigating MSDs among healthcare professionals at Ibn Baja Provincial Hospital in Taza, Morocco. Our findings highlight the important role of ergonomic and organizational factors associated with the presence of MSDs and emphasize the need to strengthen evidence-based prevention programs. The implementation of multimodal ergonomic interventions, improvements in work organization, the provision of patient-handling assistive devices, continuous staff training, and regular occupational risk assessments should be considered priority measures that may help address MSDs and improve occupational health, pending confirmation of their effectiveness in longitudinal or interventional studies, in line with the recommendations of the WHO, EU-OSHA, and the ILO (1, 4, 10).

5. Conclusion

This study is the first to be conducted at Ibn Baja Provincial Hospital in Taza, Morocco, to assess the prevalence of musculoskeletal disorders and their associated factors among healthcare professionals. The findings revealed a high prevalence of MSDs (67%), confirming that they represent a major occupational health concern. Low back pain, upper back pain, and shoulder pain were the most frequently reported complaints and were associated with substantial impacts on work capacity, daily activities, and sickness absenteeism. Multivariable analysis identified poor workplace ergonomics, inadequate training in MSD prevention, high work pressure, poor work organization, a body mass index (BMI) greater than 25 kg/m², and more than ten years of occupational experience as the main factors associated with MSDs.

These findings highlight the need to implement a comprehensive prevention strategy based on improving workplace ergonomics, strengthening healthcare professionals' training, optimizing work organization, and conducting regular occupational risk assessments. Such measures may potentially be associated with a lower burden of MSDs, improved health and well-being of healthcare professionals, decreased sickness absenteeism, and better quality of patient care, although their effectiveness remains to be confirmed by longitudinal and interventional studies.

Further studies are needed to confirm these findings, clarify the causal relationships between risk factors and MSDs, and evaluate the effectiveness of preventive interventions in Moroccan healthcare settings.

Declarations

Data availability

The datasets generated and analyzed during the present study are available from the corresponding author upon reasonable request.

Competing interests

The authors declare that they have no competing interests.

Ethics approval and consent to participate

Institutional administrative authorization to conduct the study was obtained from the Director of Ibn Baja Provincial Hospital Centre, Taza (No. 1740, dated 29 April 2026). No independent ethics committee review was required. All respondents were well informed of the objectives of the study, the confidentiality of their participation and the data provided, and the right to refuse to participate and to withdraw at any time. In addition, the survey data were collected using an anonymous survey.

Authors' contributions

TA: Conceptualization, methodology, data collection, statistical analysis, interpretation of data, and drafting of the manuscript. NL: Data collection, data validation, interpretation of results, and critical revision of the manuscript. BK: Data collection, literature review, and manuscript revision. SS: Interpretation of data and critical revision of the manuscript. HT: Methodological supervision, statistical validation, and critical review of the manuscript. FL: Study conception and design, supervision of the research, interpretation of findings, critical revision of the manuscript, and final approval of the version to be published. All authors have read and approved the final version of the manuscript.

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