HEALTH PSYCHOLOGY | RESEARCH ARTICLE

Quality of work life among surgeons and its association with musculoskeletal complaints

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Abstract: Quality of Work Life (QWL) can affect health and safety of individuals. The aim of the present study was to evaluate QWL among surgeons and investigate its association with musculoskeletal complaints. This cross-sectional study was conducted among surgeons working in hospitals located in Zahedan, Iran. QWL was assessed using the Walton’s 35-item questionnaire and the Nordic Musculoskeletal Questionnaire (NMQ) was used for assessing musculoskeletal complaints. The effects of age, gender, BMI, working hours, and working posture were adjusted. Univariate and multivariate binary logistic regressions and independent T-test were employed for analyzing data. Seventy-four surgeons participated in this study. They were mostly male (60.8%) and married (73.00%) with the mean age of 37.9 years (±5.3) and the mean experience of 7 years (±4.23). Most of them (87.8%) had a moderate level of QWL and 90.6% of them had musculoskeletal complaints in at least one part of their body. “Development of human capacities” and “the total life space” had the highest and lowest scores, respectively. QWL was a significant predictor of pain and discomfort complaints in the neck, shoulders, upper back, elbows and legs. Alongside improving workstations and tools used by surgeons, interventions aimed at promoting QWL may be necessary to reduce musculoskeletal complaints among them.

Subjects: Ergonomics; Ergonomics & Human Factors; Work Design - Ergonomics; Musculoskeletal Disorders - Ergonomics; Public Health - Medical Sociology; Health Psychology; Health & Safety at Work; Occupational Health and Safety; Occupational Health & Safety; Surgery

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PUBLIC INTEREST STATEMENT

Surgeons are an important working group which may be exposed to various stressors in their workplace (i.e. hospitals). These stressors can degrade the mental and physical health of patients, which can further endanger the health and safety of patients underwent surgical operations. Quality of work life (QWL) is a rather new concept which means how interesting the work and working environment are to the employees. It can affect the performance, productivity, and burnout intentions of employees. This study aimed at investigating the effect of QWL on musculoskeletal complaints. The study showed that QWL was significantly related to musculoskeletal complaints particularly in the neck, shoulders, and upper back regions. Therefore, musculoskeletal complaints can be reduced by improving QWL.
Keywords: Quality of work life; musculoskeletal complaints; surgeons

1. Introduction

Traditional management approaches, such as “scientific management” introduced by Fredrick Taylor, have always been criticized for ignoring human values and its inability to fulfill higher-order human needs. Nowadays, such approaches are rarely effective in accomplishing organization goals because values, beliefs, needs, and desires of the workforce have experienced drastic changes. Many employees now prefer to take jobs which are more meaningful and enjoyable to them and characteristics like job promotion, job content, task identity, skill variety, job control and autonomy, praise and recognition, social interactions, and feedback have attracted many attentions in designing jobs and tasks (Hosie et al., 2013; Lunenburg, 2011; Ruiz-Palomo et al., 2020). In other words, employees are increasingly becoming more concerned about the identity of their jobs and environment within which they performed their work-related activities (Karwowski & Marras, 1998). As a response to these changes, the term Quality of Work Life (QWL) was emerged during 1970th.

First conceived and introduced by social scientists and physiologists, QWL has been defined as “the favorableness or unfavorableness of a job environment for people” (Davis, 1983). QWL is a broad concept which can be affected by many factors. Hackman and Oldham’s job characteristics theory introduced skill variety, task identity, task significance, autonomy, and feedback as the most important factors affecting QWL (Hackman & Oldham, 1974). QWL influential factors can be categorized into two groups of extrinsic and intrinsic job factors (Cooper & Mumford, 1979; Herzberg, 2017). Monetary payments, working hours and working conditions are some extrinsic job factors and nature of work, skill variety, and social environment are some important intrinsic factors determining QWL. At the same time, Warr et al. (1979) emphasized on participation, motivation, higher order need strength, perceived intrinsic job characteristics, job and life satisfaction, happiness, and self-rated anxiety as the main factors shaping QWL. Ellis and Pompili (2002) believed that components of QWL may vary across different working groups. They conducted a study on nurses and listed factors such as poor working environments, resident aggression, workload, inability to deliver quality of care preferred, balance of work and family, shiftwork, lack of involvement in decision making, professional isolation, lack of recognition, poor relationships with supervisor/peers, role conflict, lack of opportunity to learn new skills as the main components of QWL. In line with this, other studies reported different components for QWL (Nanjundeswaraswamy & Swamy, 2013b): Lau and May (1998) stated that job security, reward systems, training, carrier advancements opportunities, and participation in decision in decision-making are the main components of QWL in manufacturing industries, Mirvis and LawlerIII (1984) investigated a corporation service company and introduced safe work environment, fair wages, equal employment opportunities, and opportunities for progress as the most important components of QWL, and Rethinam and Ismail (2008) conducted a study among information technology professionals and found health and well-being, competence development, and being able to balance life and work as the components of QWL. Nanjundeswaraswamy and Swamy (2013a) developed a scale for measuring QWL based on nine components extracted from previous studies, including work environment, organizational culture and climate, relation and co—operation, training and development, compensation and rewards, facilities, job satisfaction and Job security, autonomy of the work, and adequacy of resources.

Improving QWL will result in many desirable outcomes. It can enhance work efficiency and effectiveness, job satisfaction, organizational productivity, and lower occupational accident rate (Nayak & Sahoo, 2015; Nazari & Dashi, 2019). The findings of some studies have also indicated that having a good level of QWL would reduce employee complaints and work-related absences (Uysal et al., 2018). In contrast, undesirable QWL can make employees prone to mental disorders (Biglari et al., 2014) and increase turnover rate and burnout symptoms (Ashrafi et al., 2018; Jafari et al., 2017). In addition,
undesirable QWL could influence depersonalization (Permarupan et al., 2020). Cognitive failures, as an important precedent of human error, also can be affected by QWL (Abbasi et al., 2017). Alongside these studies, there has been a high volumes researches conducted to identify mechanisms through which QWL can affect the mentioned outputs. Ashrafi et al. (2018) demonstrated that the effect of QWL on outputs such as personal accomplishment, emotional exhaustion, and depersonalization might be mediated by burnout. Likewise, Salehi et al. (2020) demonstrated that the effect QWL on psychological well-being is mediated by burnout. Nayak and Sahoo (2015) introduced job commitment as the mediator on the relationship between QWL and organizational performance. Moreover, there has been reported a significant relationship between QWL and job satisfaction (Efraty & Sirgy, 1990; Ramawickrama et al., 2017) and between job satisfaction and job performance (Inuwa, 2016; Judge et al., 2001), hence, it can be postulated that QWL is indirectly associated with job performance.

Work-related musculoskeletal disorders (WMSDs) are a common problem in almost all occupational settings, affecting employees’ health and organizational productivity (Dianat et al., 2018). Many occupational factors can contribute to the development of WMSDs which can be categorized into two main groups: physical (biomechanical) and psychosocial risk factors (Feijó et al., 2019). Physical risk factors include force, repetitive movements, and awkward postures and risk factors such as job control, job demands, social interaction, and so on constitute the psychosocial risk factors group. Previous studies have shown a considerable rate of WMSDs among surgeons (Epstein et al., 2018). Surgeons are members of the healthcare group that are exposed to various occupational stressors, such as inappropriate working conditions, long working hours, high workload, and so on. Further, surgical tasks require excellent skills with high speed and accuracy (Dianat et al., 2018). All these factors alongside patient safety responsibilities make the surgical profession a mentally and physically intensive job. Adverse effects of WMSDs on surgeons include decreased surgical performance and increased absenteeism.

According to these explanations, low levels of QWL would lead to job dissatisfaction, burnout, and complaints among employees. Moreover, QWL has been strongly linked to occupational stress (Eisopareh et al., 2020; Kalanlar et al., 2020) and stress has been known to affect musculoskeletal disorders through the physiological, psychological, and behavioral pathways (Carayon et al., 1999). Therefore, it can be hypothesized that low levels of QWL can also increase Musculoskeletal Pain and Discomfort Complaints (MPDCs) among surgeons. Consequently, this study was conducted to investigate QWL and its association with MPDCs among a sample of Iranian surgeons.

2. Materials & methods

2.1. Participants
This cross-sectional study was conducted among surgeons working in hospitals located in Zahedan, Iran. Based on the census sampling approach, all surgeons, 81 ones, working in these hospitals were contacted to participate in the study. Surgeons who had at least one year work experience, no underlying disease, and without any history of bone fracture were included. Participation in the study was voluntary and all participants filled in and signed an informed consent form. Moreover, the study protocol was reviewed and approved by the ethics committee of Zahedan University of Medical Sciences with the code of IR.ZAUMS.REC.1397.164. It is worth to mention that during data collection, some participants refused to give required information and excluded from the study. Finally, the study was performed with the participation of 74 surgeons (response rate:91%).

2.2. Demographic and occupational information of participants
Demographic and occupational information including age, work experience, height and weight (to calculate body mass index (BMI)), daily and weekly working hours, gender, and marital status were gathered using a self-administered questionnaire.
2.3. Quality of work life
Walton’s 35-item tool was used for measuring QWL. This tool has been used by many researchers for measuring QWL in various occupational settings (Ahmad & Mohammad Hasan, 2002; Ahvazian & Kavosi, 2016; Eatebarian & Khalili, 2008; Mehdad et al., 2011). Moreover, the tool has been translated into Persian and successfully validated for Iranian working population by Masoumzadeh (2012). The questionnaire has been designed to measure eight subscales.

1. Adequate and fair compensation (AFC): Refers to equal pay for equal work and proportionality of pay with social and staff criteria as well as with other types of work. Employees prefer to be paid in a fair manner based on the quantity and quality of work that they perform. This subscale is measured by four items.

2. Safe and healthy work environment (SHE): Refers to physically and mentally safe working conditions alongside reasonable working hours. Employees prefer to work in a pleasant, comfortable and safe environment which is free of any hazardous agent. This subscale is measured by six items.

3. Development of human capacities (DHC): Refers to opportunities created by the job for learning, acquiring, and applying new skills and knowledge. Jobs with higher levels of autonomy and participation have been shown to be more preferable for employees. Such jobs can also improve job satisfaction and attenuate job stress. This subscale is measured by five items.

4. Growth and security (GrS): Opportunities for growth and promotion within the organization, type of contract (short-term or long-term), and future ambiguity are factors assessed by this subscale. This subscale is measured by four items.

5. Social integration (ScI): Refers to the creation of a pleasant atmosphere and work environment to reinforce the employees’ sense of belonging to the organization and that they are of vital importance to the organization. This subscale is measured by four items.

6. Constitutionalism (Con): Refers to the freedom of expression without fear of higher official reaction and the rule of law over human domination. This subscale is measured by four items.

7. The total life space (TLS): Refers to the balance between work life and other aspects of the employee’s life, including leisure and family. This subscale is measured by three items.

8. Social relevance (ScR): Refers to how employees perceive social responsibility in the organization, the sense of responsibility of the organization towards the environment, and the organization’s managers respecting the rules governing society. This subscale is measured by five items.

Respondents were asked to answer items on the basis of a five-Likert scale ranging from totally dissatisfied (score 1) to totally satisfied (score 5). The final score of QWL has a range between 35 and 140 and higher scores are indicative of better QWL. Scores lower than 58 can be regarded as low QWL, scores between 59 and 118 can be regarded as moderate QWL, and scores higher than 118 can be regarded as high QWL.

2.4. Prevalence of musculoskeletal pain and discomfort complaints
The Nordic Musculoskeletal Questionnaire (NMQ), as a well-accepted and comprehensive tool, was used for measuring prevalence of MPDCs among surgeons. NMQ was developed and introduced by Kuurinkka et al. (1987), and since that time it has been extensively utilized by many researchers all around the world. NMQ evaluates pain and discomfort in nine areas of the body, including neck,
shoulders, upper back, hands/wrists, pelvis/thighs, knees, and feet/ankles. The validity and reliability of the Persian version of this questionnaire have already been confirmed (Asghari et al., 2019).

2.5. Posture assessment
There have been developed a variety of techniques for analyzing worker postures. The first point to be considered in posture assessment is the selection of appropriate method in respect to the type of hazards posed by the task to be performed. As all body segments of surgeons are exposed to ergonomic risk factors, Rapid Entire Body Assessment (REBA), developed by Hignett and McAtamney (2004), was used for posture assessment of surgeons. REBA, as a whole-body assessment technique, allows simultaneous analyses of the upper limb, forearm, trunk, neck, and legs. It also includes other risk factors such as force or displacement, type of load, grip, and muscle activity. Both static and dynamic postures can be investigated with this method. In this step, the research team observed surgeons directly during operations in the operating room. In accordance with the standard protocol of REBA, the most frequent or worst postures were selected and recorded by taking photos (Asghari et al., 2019). Each posture was then evaluated separately by two ergonomists and for each part of the body a code was assigned. The final REBA score was extracted using Microsoft Excel software and REBA spreadsheet.

2.6. Data analysis
Descriptive statistical indices (average, median, and variance) were used for explaining the data. Univariate and multivariate binary logistic regressions were employed to assess the effects of predictor variables (age, work experience, BMI, REBA score, daily and weekly working hours, and QWL) on pain and discomfort complaints. Moreover, independent t-test was employed for comparing QWL between surgeons suffering from pain and discomfort in their musculoskeletal system and those not suffering such pain and discomfort. All analyses were conducted using R software version 3.6.2. The p values lower than 0.05 were considered to be statistically significant.

3. Results
The present study was conducted on 74 surgeons working in public hospitals of Zahedan, Iran. As demonstrated in Table 1, the mean age and work experience of the subjects were 37.92 and 7 years, respectively. Over half of participants were male and married.

3.1. Quality of work life
The findings related to QWL and its dimensions are also summarized in Table 1. Overall, the mean value of QWL was 88.7 (±19.19) which is a moderate QWL. The highest rated dimension was DHC with a mean value of 16.19 (±3.51), and the lowest rated one was TLS with a mean value of 6.16 (±2.53). In other words, surgeons believed that their work provides sufficient opportunities for gaining new skills and knowledge and employing them in work related activities, whereas, they believed that it was difficult for them to make a balance between their work life and personal life.

3.2. Musculoskeletal pain and discomfort complaints
Surveys of MPDCs showed that 70 cases (94.6%) of surgeons experienced pain and discomfort in at least one segment of their bodies. The neck (61 cases, 82.4%) and knees (10 cases, 13.5%) were the most and least prevalent regions of pain and discomfort complaints, respectively. To determine the severity of MPDCs in each part of the body, a set of 10 questions of NMQ was collected. The score could range from zero to 10 in each area. Results showed that the highest and lowest mean scores for pain and discomfort were related to neck (3.81) and knees (0.14), respectively. It was also found that 57 persons (77.0%) experienced pain and discomfort in 3 or more parts of their bodies. These results are shown in Table 3.
### Table 1. Demographic and occupational characteristics of study population

| Variable                        | Value |
|---------------------------------|-------|
| Age (mean ± SD), years          | 37.92 ± 5.30 |
| Work experience (mean ± SD), years | 7.00 ± 4.23 |
| BMI (mean ± SD), kg/m²          | 25.55 ± 4.24 |
| Daily working hours (mean ± SD) | 11.14 ± 3.21 |
| Weekly working hours (mean ± SD)| 85.50 ± 28.73 |
| Marital status (n (%))          |       |
| Single                          | 20 (27.0) |
| Married                         | 54 (73.0) |
| Educational grade (n (%))       |       |
| Assistant of surgery            | 41 (55.4) |
| Surgeon                         | 33 (44.6) |
| Gender (n (%))                  |       |
| Male                            | 45 (60.8) |
| Female                          | 29 (39.2) |
| QWL level (n (%))                |       |
| Low                             | 5 (6.8) |
| Moderate                        | 65 (87.8) |
| High                            | 4 (5.4) |
| QWL (mean ± SD)                 |       |
| AFC                             | 7.65 ± 2.81 |
| SHE                             | 13.65 ± 4.24 |
| DHC                             | 16.19 ± 3.51 |
| GrS                             | 10.87 ± 3.01 |
| ScI                             | 10.84 ± 3.45 |
| Con                             | 10.00 ± 3.48 |
| TLS                             | 6.01 ± 2.53 |
| ScR                             | 13.57 ± 4.06 |
| Total QWL                       | 88.77 ± 19.01 |
| MPDCs (n (%))                   |       |
| Neck                            | 61 (82.4) |
| Shoulders                       | 30 (40.5) |
| Upper back                      | 51 (68.9) |
| Elbows                          | 30 (40.5) |
| Hands/wrists                    | 38 (51.4) |
| Low back                        | 54 (73.0) |
| Knees                           | 10 (13.5) |
| Hips/thighs/buttocks            | 27 (36.5) |
| Feet/ankles                     | 24 (32.4) |
| Any regions                     | 70 (94.6) |
| Number of regions with MPDCs (n (%)) |       |
| 0                               | 4 (5.4) |
| 1                               | 4 (5.4) |

(Continued)
| Action level | REBA final score (n, %) |
|--------------|-------------------------|
| 2            | 9 (12.2)                |
| 3            | 57 (77.0)               |

3.3. Posture assessment

The score of each body segment based on REBA is demonstrated in Table 2. As evident, the neck, trunk, and wrists were in the most undesirable conditions. As shown in Table 1, REBA scores showed that the risk was very high in 14 cases (18.9%) and high in 31 cases (41.9%).

3.4. Logistic regression analyses

First, the effects of predictor variables on pain and discomfort complaints in various body segments were assessed using univariate logistic regression and results are presented in Table 3. Predictors with a significant level lower than 0.2 (i.e., $p < 0.2$) in the univariate regression analyses were included in the multivariate logistic regression model. The results of multivariate regression analyses are presented in Table 4. Accordingly, QWL was the only significant predictor of pain and discomfort in the neck and upper back ($p < 0.05$), the REBA final score was the only significant predictor of pain and discomfort in the lower back and knees ($p < 0.05$), and gender was the only significant predictor of wrists pain and discomfort ($p < 0.05$). Moreover, QWL and REBA were significant predictors of pain and discomfort in the shoulders ($p < 0.05$), QWL and BMI were significant predictors of pain and discomfort in elbows ($p < 0.05$), and QWL, REBA, and experience were significant predictors of pain and discomfort in the legs ($p < 0.05$).

3.5. Independent T-test comparisons

Figure 1 demonstrates the results of pairwise comparisons of QWL dimensions between subjects with and without musculoskeletal complaints. Two columns located in the rightmost of each graph are related to the average score of QWL over all its dimensions. As evident, the average score of QWL was significantly different between subjects with and without pain and discomfort in any segment of the body ($p < 0.05$). Moreover, in the case of pain and discomfort in the neck and upper back, all QWL dimensions differed significantly between subjects with and without pain and discomfort ($p < 0.05$). The nearly same pattern was observed for the shoulders pain and discomfort. However, in other segments of the body, some QWL dimensions were not significantly different between subjects with and without pain and discomfort ($p > 0.05$). In the case of lower back pain and discomfort, AFC, SHE, ScI, Con, and TLS were not significantly different between two groups ($p > 0.05$). In the case of elbows pain and discomfort, there was no significant difference between the two groups in terms of DHC, GrS, TLS, and ScR ($p > 0.05$). In the case of wrists and hands, the two groups did not differ significantly in terms of GrS, ScI, Con, and ScR ($p > 0.05$). In the case of knees, two groups were similar with respect to AFC, SHE, ScI, Con, and TLS ($p > 0.05$).

4. Discussion

Previous studies have introduced QWL as an influential factor on many employees’ work-related outcomes such as satisfaction and productivity (Horst et al., 2014; Koushki & Arab, 2013; Zakerian
et al., 2014). It can also be associated with many undesired consequences, including anxiety, depression, stress, and disability (Sudhir et al., 2012). Although a high volume of studies has been conducted on job satisfaction, occupational stress, and musculoskeletal disorders among surgeons, less attention has been paid to their QWL. The main aim of the present study was to investigate QWL among surgeons. The results showed that most surgeons (65 cases, 87.8%) had a moderate level of QWL. Moreover, DHC had the highest score among eight dimensions of QWL, suggesting that surgeons believed that their work provides sufficient opportunities for gaining new skills and knowledge and employing them in work-related activities. In contrast, TLS was the lowest rated dimension. This dimension is related to the ability of making a balance between work life and personal life. Therefore, it can be inferred that it was difficult for surgeons to balance these two aspects of their lives. The issue of work-family conflict among surgeons and its related consequences has been addressed by many studies such as Dianat et al. (2018). However, more studies are needed in this regard. Safe and healthy work environment was another low-scored dimension of QWL among surgeons. Surgeons may be exposed to a variety of hazards such as harmful chemical, ergonomics and biological agents which can endanger their health and safety. Moreover, a recent study has shown that healthcare workers, including physicians and surgeons, are subject to workplace violence (Marte et al., 2019). All these issues should be properly addressed in hospitals in order to improve this aspect of QWL.

Table 2. Distribution of REBA scores in each part of body

| Body part     | REBA score | n (% ) |
|---------------|------------|--------|
| Neck          | 1          | 26 (35.1) |
|               | 2          | 46 (62.2) |
|               | 3          | 2 (2.7) |
| Trunk         | 1          | 0 (0.0) |
|               | 2          | 14 (18.9) |
|               | 3          | 32 (43.2) |
|               | 4          | 28 (37.8) |
|               | 5          | 0 (0.0) |
| Legs          | 1          | 37 (50.0) |
|               | 2          | 32 (43.2) |
|               | 3          | 5 (6.8) |
|               | 4          | 0 (0.0) |
| Upper arm     | 1          | 0 (0.0) |
|               | 2          | 54 (73.0) |
|               | 3          | 16 (21.6) |
|               | 4          | 4 (5.4) |
|               | 5          | 0 (0.0) |
|               | 6          | 0 (0.0) |
| Lower arm     | 1          | 48 (64.9) |
|               | 2          | 26 (35.1) |
| Wrist         | 1          | 8 (10.8) |
|               | 2          | 42 (56.8) |
|               | 3          | 24 (32.4) |
| Predictor | Neck OR (95% CI) | Shoulders OR (95% CI) | Upper back OR (95% CI) | Lower back OR (95% CI) | Elbows OR (95% CI) | Wrist OR (95% CI) | Knees OR (95% CI) | Legs OR (95% CI) |
|-----------|------------------|----------------------|------------------------|------------------------|-------------------|------------------|------------------|------------------|
| REBA      | 1.09** (1.04–1.13) | 1.17** (1.11–1.23) | 1.09** (1.04–1.15) | 0.99** (0.98–1.10)   | 1.04 (0.99–1.14)  | 1.07* (1.04–1.13)| 1.09** (1.04–1.19)| 1.13**           |
| QWL       | 0.99** (0.99–0.99)| 0.99** (0.98–0.99) | 0.99** (1.10–1.20)   | 0.99** (0.99–1.00)   | 0.99* (0.99–1.00)| 0.99** (0.99–1.00)| 0.99** (0.99–1.00)| 0.99**           |
| Age       | 1.02* (1.00–1.03)| 1.02 (1.00–1.04)    | 1.02 (1.00–1.04)     | 1.02 (1.00–1.04)     | 1.01 (0.98–1.02)| 1.00 (1.01–1.03)| 1.02* (1.01–1.05)| 1.03**           |
| Experience| 1.02 (1.00–1.04)| 1.03* (1.00–1.06)| 1.02* (1.00–1.05)   | 1.02* (1.00–1.05)   | 1.01 (0.98–1.03)| 1.00 (1.00–1.03)| 1.03** (1.02–1.07)| 1.05**           |
| Gender    | 1.06 (0.99–1.12)| 0.99 (0.79–1.25)| 1.12 (0.92–1.37)    | 1.05 (0.85–1.29)     | 0.91 (0.72–1.14)| 1.17 (0.92–1.47)| 0.95 (0.81–1.12)| 0.86 (0.69–1.08) |
| BMI       | 1.00 (0.98–1.02)| 0.99 (0.97–1.02)| 0.99 (0.96–1.01)    | 1.01 (0.98–1.03)     | 0.98 (0.95–1.00)| 1.02 (0.99–1.05)| 1.00 (0.99–1.02)| 1.01 (0.98–1.04) |
| Week      | 1.00 (1.00–1.00)| 1.00 (1.00–1.00)| 1.00 (1.00–1.00)    | 1.00 (1.00–1.00)     | 1.00 (1.00–1.00)| 1.00 (1.00–1.00)| 1.00 (1.00–1.00)| 1.00 (0.99–1.00) |
| Day hours | 1.02 (0.99–1.05)| 0.99 (0.96–1.03)| 0.97 (0.94–1.00)    | 0.97 (0.94–1.00)     | 1.02 (0.98–1.05)| 1.01 (0.98–1.05)| 1.01 (0.98–1.03)| 0.99 (0.947–1.02) |

*Significance at the 0.05 level.
**Significance at the 0.01 level.
Table 4. Multivariate regression analysis of predictors

| Predictor | Neck       | Shoulders  | Upper back | Lower back | Elbows   | Wrists   | Knees   | Legs     |
|-----------|------------|------------|------------|------------|----------|----------|---------|----------|
|           | OR (95% CI)| OR (95% CI)| OR (95% CI)| OR (95% CI)| OR (95% CI)| OR (95% CI)| OR (95% CI)| OR (95% CI)|
| REBA      | 1.02       | 1.11**     | 1.03       | 1.13**     |          | 1.06      | 1.05*   | 1.07*    |
|           | (0.97–1.07)| (1.04–1.17)| (0.97–1.09)| (1.07–1.19)|          | (0.99–1.13)| (1.00–1.10)| (1.01–1.14)|
| QWL       | 0.99**     | 0.99**     | 0.99**     | 1.00       | 0.99**   | 1.00      |        | 0.99*    |
|           | (0.98–0.99)| (0.99–1.00)| (0.98–0.99)| (0.99–1.00)| (0.99–1.00)| (0.99–1.00)|        | (0.99–1.00)|
| Age       | 1.04       | 0.99       | 1.01       | 0.99       |          |          |        | 0.99     |
|           | (0.99–1.08)| (0.94–1.04)| (0.96–1.06)| (0.94–1.04)|          |          |        | (0.95–1.03)| (0.91–1.02)|
| Experience| 0.97       | 1.03       | 1.00       | 1.02       |          |          |        | 1.03     |
|           | (0.93–1.03)| (0.96–1.10)| (0.94–1.06)| (0.96–1.09)|          |          |        | (0.98–1.08)| (1.01–1.15)|
| Gender    | -          | -          | -          | -          | -        | 1.03*    |        | -        |
|           |            |            |            |            |          | (1.00–1.60)|        |          |
| BMI       | -          | -          | -          | -          |          | 0.97*    |        | 1.27     |
|           |            |            |            |            |          | (0.95–1.00)|        | (1.00–1.60)|
| Week      | -          | -          | -          | -          | 1.00     |          |        | -        |
| hours     |            |            |            |            | (1.00–1.00)|          |        | -        |
| Day hours | -          | -          | 0.97*      | -          | -        | 0.96      |        | -        |
|           |            |            | (0.95–1.00)|            |          | (0.93–1.00)|        |          |

*Significance at the 0.05 level.
**Significance at the 0.01 level.
Figure 1. QWL in people with and without pain and discomfort in each port of their body (**significant level of 0.01, *significant level of 0.05, and dash denotes none-significant differences).
Another aim of the present study was to investigate musculoskeletal pain and discomforts among surgeons. The results of our study showed that 70 subjects (94.6%) experienced pain and discomfort in at least one part of their body. This finding is in line with Soueid et al. (2010) reporting that 81.8% of surgeons experienced pain and discomfort in at least one part of their body. However, Dianat et al. (2018) found that 77.2% of surgeons experienced such a pain and discomfort which is slightly lower than what we found. This difference can have many causes, such as demographic characteristics of surgeons, working conditions, work hours, lifestyle of surgeons and so on.

Furthermore, the results of present study showed that neck (61 cases, 82.4%) and knees (10 cases, 13.5%) had the highest and lowest prevalence of pain and discomfort, respectively. Soueid et al. (2010) reported that most surgeons had pain in the back (57%) and neck (48%). Also, 13% of people had pain in their knees, which is in line with the results of the present study. The findings are also comparable with those of Adams et al. (2013) reporting lower back, neck and shoulders as parts of the body with the highest levels of pain and discomfort complaints among surgeons. The results of logistic regression analyses demonstrated that QWL is a significant predictor of pain and discomfort complaints in the neck, shoulders, upper back, elbows and legs. The results are in line with Schmidt and Dantas (2012) reporting QWL as a determinant of musculoskeletal complaints in the lumbar region and shoulders among nurses. The results are also in agreement with the study carried out by Mahmoudifar and Seyedamini (2017), in which a significant correlation between QWL and musculoskeletal complaints in all body regions was reported among nursing staff. These results are also in line with the study of Ghasemzade et al. (2017) conducted on office workers and showed that lower QWLs lead to increased complaints and dissatisfaction. It also confirms the findings of a study conducted by Khachian et al. (2018) among critical care nurses, which highlighted a significant negative relationship between presence of musculoskeletal problems and QWL scores. However, results are slightly different from those reported by Asghari et al. (2019), as they did not find a significant relationship between QWL and neck pain, they found a significant relationship between QWL and knees and ankles/feet pain. These disparities in findings can be attributed to the different occupations investigated by two studies, as Asghari et al. (2019) study was conducted among operating room nurses. Therefore, in line with most of previous studies, QWL can raise musculoskeletal complaints particularly in the neck, shoulders, and back. However, the mechanism of such an effect needs to be delineated. Job stress can mediate this relationship. Previous studies on hospital staff have demonstrated a significant association between QWL and job stress (Khaghanizadeh et al., 2008; Mosadeghrad et al., 2011). On the other hand, job stress can cause musculoskeletal pain and discomfort in a variety of ways including emotional (e.g. adverse mood states), behavioral (e.g. smoking, excessive use of force in work-related activities, unsafe load lifting), and physiological (e.g. increased muscle tension, increased blood pressure, elevated cortisol and catecholamine levels) pathways (Council, 2001). Furthermore, the results of multivariate regression analyses indicated that gender was significantly associated with pain and discomfort in the wrists/hands, such that female surgeons reported more pain and discomfort in this body region than did their male counterparts. Pain and discomfort in the wrists is mainly due to the involvement of median nerve passing through the carpal tunnel. The risk of carpal tunnel syndrome (CTS) is higher among females because of several reasons (Farioli et al., 2018). Fluid retention in females as a result of hormonal changes, particularly during pregnancy, can lead to wrist swelling, thereby reducing the available space for the median nerve, increasing pressure on it, and finally causing pain in this region (Padua et al., 2010). Further, males and females are different in anthropometric characteristics in several ways which can contribute in CTS incidence. These differences include a smaller carpal tunnel area and a smaller free space in the carpal tunnel among females when compared with males (Bower et al., 2006). Moreover, traditionally, Iranian women are more likely to expose to off-the-job risk factors (such repetitive and forceful movements of wrists during washing dishes and clothes) which can contribute in CTS development.
After all, it should be noted that the present study had some limitations which should be addressed in future studies. One of the major limits of our study was the small population size. Therefore, it is highly recommended to repeat this study among a larger population of surgeons. In this study, factors such as regular exercises, field of surgery, smoking status, job satisfaction, and work stress were not included; hence, it is recommended for future studies to investigate the effect of these variables alongside QWL. Moreover, since the present study was cross-sectional in nature, the generalization of findings should be with caution. As mentioned in the paper, work stress can play a mediating role on the relationship between QWL and musculoskeletal disorders, therefore, it is highly recommended for future studies to investigate such a relationship.

5. Conclusion

Generally, a high prevalence of musculoskeletal complaints was observed among surgeons. Surgeons believed that they had a moderate QWL. QWL can influence musculoskeletal complaints, particularly in the neck, shoulders, and upper back regions. It can be postulated that by improving QWL such complaints can be reduced. There have been recommended several strategies for improving QWL among employees such employees’ empowerment, mutual commitment, and providing good work environment. However, these strategies have not been tested among surgeons and should be used with caution.

Ethical considerations

This study was registered in Zahedan University of Medical Sciences Ethics Committee with the number of IRZAUMS.REC.1397.164, and informed consent to participate in the study was signed by all population before beginning the study.

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