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# Work-related Stress, Musculoskeletal Disorder Complaints, and Stress Symptoms among Radiographers in the Northern Part of Jordan

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## ABSTRACT

**Objective:** The aims of this study were to report the variation in work-related stressor (WRS) and musculoskeletal disorder (MSD) complaints across three major hospitals in the northern part of Jordan and to examine the correlations between stressors, MSD complaints, and stress symptoms using a questionnaire.

**Methods:** A qualified radiographer distributed a questionnaire in the radiology department at three hospitals, including a governmental public hospital (GH), a university educational hospital (UH), and a private hospital (PH). The questionnaire included demographic, WRS, management and responsibility stressors, stress symptoms, stress relievers, and MSD complaints sections. A total of 74 radiographers (GH = 28, UH = 29, PH = 17) agreed to participate after signing a consent form.

**Results:** The average age ranged from  $30.8 \pm 3.3$  to  $33.6 \pm 1.4$  ( $P = .6$ ), and the average experience ranged from  $6.2 \pm 2.5$  to  $8 \pm 1.2$  years ( $P = .7$ ) in the hospitals. The number of men was higher than women only in the UH (ratio = 2.6). The number of diploma degree holders was higher than the number of bachelor's degree holders only in the GH (ratio = 3). Stress symptoms such as depression and MSD complaints such as low back pain in the GH were significantly higher than the other hospitals. There was a significant correlation (Spearman correlation coefficient = 0.61,  $P = .04$ ) between WRS and MSD complaints.

**Conclusion:** The GH had more MSD complaints and stress symptoms than the other hospitals. WRSs were correlated significantly with MSD complaints. Encouraging the radiographers to attend work stress management sessions may help in reducing the level of stress.

*Keywords:* stress; radiographer; computed tomography

## RÉSUMÉ

**Objectif:** Cette étude visait à présenter les variations dans les facteurs de stress liés au travail (WRS) et les plaintes de troubles musculo-squelettiques (MSD) dans trois grands hôpitaux du nord de la Jordanie et à examiner les corrélations entre les facteurs de stress, les plaintes de MSD et les symptômes de stress, à l'aide d'un questionnaire.

**Matériel et méthodes:** Un radiographe qualifié a distribué un questionnaire dans le service de radiologie de trois hôpitaux, dont un hôpital public gouvernemental (GH), un hôpital universitaire (UH) et un hôpital privé (HP). Le questionnaire comprenait des sections sur les renseignements démographiques, les facteurs de stress liés au travail, les facteurs de stress liés à la gestion et aux responsabilités, les symptômes de stress, les réducteurs de stress et les plaintes de MSD. Au total, 74 radiographes (GH: 28, UH: 29, PH: 17) ont accepté de participer, après avoir signé un formulaire de consentement.

**Résultats:** L'âge moyen allait de  $30,8 \pm 3,3$  à  $33,6 \pm 1,4$  ( $p = 0,6$ ) et l'expérience moyenne de  $6,2 \pm 2,5$  à  $8 \pm 1,2$  ans ( $p = 0,7$ ) dans les hôpitaux. Le nombre d'hommes était plus élevé que le nombre de femmes à UH seulement (ratio : 2,6). Le nombre de titulaires de diplômes était plus élevé que le nombre de titulaires de baccalauréat à GH seulement (ratio : 3). Les symptômes de stress comme la dépression et les plaintes de MSD comme les douleurs lombaires à GH étaient notablement plus élevés que dans les autres hôpitaux. Il y avait une corrélation significative (coefficient de corrélation de Spearman = 0,61,  $p = 0,04$ ) entre les facteurs de stress liés au travail et les plaintes de troubles musculo-squelettiques. Encourager les radiographes à suivre des séances de gestion du stress lié au travail pourrait aider à réduire le niveau de stress.

## Introduction

Stress is known as a disturbance of the physical and mental status of individuals [1]. It is characterized by the response of body systems to external physical and emotional factors

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Table 1  
Questionnaire Sections

Section	Factor	Choices
1. Demographic information	1. Age	NA
	2. Sex	Male/female
	3. Experience	NA
	4. Degree	Bachelor/diploma
	5. Job category	General X-ray/fluoroscopy/computed tomography/magnetic resonance imaging/angiography/portable/mammography/nuclear medicine/dental X-ray/ultrasound
6. Work-related stressors	1. Working hours	35 hours or less/more
	2. Working over weekend	Yes/no
	3. Using digital radiography	
	4. Staff shortage	
	5. On call work	Never/rarely/usually/always
	6. Using daylight processor	
	7. Using darkroom facility	
	8. Carrying large cassette	
	9. Using lead apron	
	10. X- ray tube adjustment	
	11. Radiographic table adjustment	
	12. Dealing with patients	
	13. Radiation exposure during work	
9. Management and responsibility stressors	1. Awareness of duties	Never/rarely/usually/always
	2. Troubles with superiors	
	3. Working apart from duties	
10. Stress symptoms	1. Anger	Never/rarely/usually/always
	2. Anxiety	
	3. Violence	
	4. Depression	
	5. Insomnia	
	6. Fatigue	
	7. Headache	
	8. High blood pressure	
11. Musculoskeletal disorders complaints	1. Low back pain	Never/rarely/usually/always
	2. Shoulder pain	
	3. Neck pain	
	4. Legs pain	
	5. Hand pain	
12. Stress relievers	1. Exercise	Never/rarely/usually/always
	2. Eating	
	3. Medication	
	4. Smoking	
13. Staff support and stress awareness lectures	1. Stress-management lectures	Never/rarely/usually/always
	2. Staff support	

in order to adapt to a situation. Stress can be divided into two components: social and mechanical stress [1]. In the literature, two models were reported to explain the stress mechanism: a systemic reaction model studies the effects of prolonged stimuli, whereas a psychological model focuses on the response of individuals to manage their demands [2]. As a consequence of untreated stress, burnout can take place [1, 3].

Musculoskeletal disorders (MSDs) have been reported to be the most common illness related to work in Britain [4]. Staff shortage, increased workload, and pressure are significant stressors associated with MSDs [4]. Moreover, physical factors such as manual handling, bending, and twisting can lead to MSDs [5].

Many studies have investigated work-related stressors (WRSs) and MSD complaints among radiographers. A study

Table 2  
Age Variation in Hospitals

Hospital	GH	UH	PH
Mean	33.57	31.66	30.76
SE	1.410	1.329	3.266

GH, governmental public hospital (n = 28); PH, private hospital (n = 17); SE, standard error; UH, university educational hospital (n = 29).

Table 3  
Sex Distribution in Hospitals

Hospital	Male	Female
GH	11	17
UH	21	8
PH	8	9

GH, governmental public hospital; PH, private hospital; UH, university educational hospital.

Table 4  
Experience Variation in Hospitals

Hospital	GH	UH	PH
Mean	8.036	7.984	6.231
SE	1.189	1.264	2.514

GH, governmental public hospital (n = 28); PH, private hospital (n = 17); SE, standard error; UH, university educational hospital (n = 29).

conducted in Southeast Nigeria showed that the upper back musculoskeletal symptoms of pain were the most prevalent in radiographers among other examined anatomic regions [1]. Another cross-sectional study among Italian x-ray technologists reported a high prevalence of musculoskeletal complaints, and different factors such as aging and high job demands were associated with the complaints [5]. In addition, a study at government hospitals in Zimbabwe revealed that the most common reasons of occupational stress were overwork, inadequate pay, and lack of recognition [6]. Moreover, a comparative study in Australia found a difference in the type of stressors in private and public hospitals and the way of relieving the stress; radiographers in private hospitals were three times more likely to drink alcohol in comparison with radiographers in public hospitals in order to relieve the stress [7].

In Jordan, the radiography profession is organized through the Jordanian Ministry of Health and the Jordan Nuclear Regulatory Commission [8]. In 2012, the number of workers in allied health professions, including radiography, in the Jordanian public hospitals was estimated to be 2,320 [9]. A shortage of radiography staff and imaging equipment is predominant in public hospitals, mainly in regions away from Amman (capital city), such as the northern part of Jordan. Most of the hospitals are using conventional film and darkroom systems, whereas digital imaging systems are scarce because of economic difficulties [10].

The relationship between WRSs and stress symptoms is not well understood. Furthermore, many studies have addressed the causes of stress in different health professions, but little is reported about radiography [4, 7]. In addition, studying the impact of workload, management, and responsibility stressors in the radiology departments and the incidence of MSDs among radiographers has not been conducted in Jordan. There is a dearth of literature investigating the correlation between WRS and MSD complaints as two dependent variables among radiographers. Therefore, our null hypothesis was that there is no association between WRS and MSD complaints. Accordingly, the aims of this study were to report the variation in WRS and MSD complaints across three major hospitals in

Table 5  
Degree Variation in Hospitals

Hospital	Bachelor's	Diploma
GH	7	21
UH	21	8
PH	13	4

GH, governmental public hospital; PH, private hospital; UH, university educational hospital.

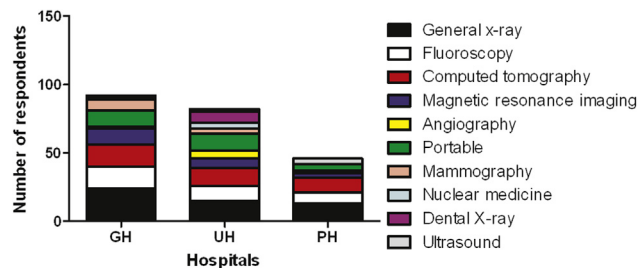


Figure 1. Job categories variation in hospitals. The numbers on the y-axis represent the absolute number of the respondents. Each color represents a job category as shown. The black color corresponds to the general X-ray area and has the highest number of respondents in each hospital.

the northern part of Jordan and to examine the correlations between stressors, MSD complaints, and stress symptoms.

## Materials and Methods

### Subjects and Study Design

The study was approved by the university committee board and the institutional review board. A qualified radiographer with 2 years' experience conducted a quantitative cross-sectional study for a period of 3 months in three hospitals: a governmental public hospital (GH), university educational hospital (UH), and private hospital (PH). The largest GH, UH, and PH in northern Jordan were selected for the study. All radiographers in the three hospitals were invited to participate in a survey by filling out a questionnaire. Before filling out the questionnaire, a consent form that contains the study objectives and procedures was obtained from participants. Seventy-four (GH = 28, UH = 29, and PH = 17) of the 90 (82%) radiographers filled out and returned the questionnaire. Subjects with a history of pre-employment MSDs (before working as a radiographer) were excluded.

The questionnaire was available in both English and Arabic languages. The content of the questionnaire was based on WRSs and MSDs published in the literature [1, 2, 7], and other factors from the authors' experience. Accordingly, the questionnaire was divided into the following sections: (1) demographic information such as age (5 questions), (2) WRSs such as working hours (13 questions), (3) management and responsibility stressors such as trouble with superiors (3 questions), (4) stress symptoms such as anger (8 questions), (5) MSD complaints such as low back pain (5 questions), (6) stress relievers such as exercise (4 questions), and (7) staff support and stress awareness lectures (2 questions).

Closed-ended questions were used with two different formats. The questions related to frequency, such as incidence of low back pain, were given four choices (never, rarely, usually, and always) and were ranked from one to four. The other questions such as staff shortage were given two choices (yes or no). The questionnaire sections are summarized in Table 1.

Before conducting the study, the questionnaire was piloted on a sample of 15 radiographers to be checked for validity and

Table 6  
Work-related Stressors Variation in Hospitals

Question	Hospital									P Value	Significant Difference
	GH			UH			PH				
	Mean	Median	Mode	Mean	Median	Mode	Mean	Median	Mode		
Using darkroom facility	2.75	3	4	1.448	1	1	1.059	1	1	.0001	Yes
X- ray tube adjustment	3.214	4	4	2.793	3	4	3.235	4	4	.161	No
Radiographic table adjustment	3.179	4	4	2.517	3	3	3.294	4	4	.0202	Yes
Dealing with patients	3.286	3	3	2.862	3	3	2.765	3	3	.0621	No
Radiation exposure during work	3.321	4	4	2.586	3	3	2.235	2	2	.001	Yes
Using daylight processor	2.25	2	2	2.31	2	1	2.471	3	1	.9181	No
Using lead apron	1.607	1.5	1	2.103	2	2	2.529	3	3	.0061	Yes
Carrying large cassette	1.964	1.5	1	2.517	3	1	3.412	4	4	.0017	Yes
On call work	1.857	2	2	1.931	2	2	2.294	2	3	.3131	No

GH, governmental public hospital (n = 28); PH, private hospital (n = 17); UH, university educational hospital (n = 29).

reliability in terms of understanding the questions and the consistency of the answers. The reliability rate was 89%.

### Statistical Analysis

Categorical variables, including sex, educational degree, and job type, were analyzed using the chi-square test to examine whether the variation in each factor was significantly associated with the type of hospital. One-way analysis of variance was used to test the numerical variables, including age and experience. Nonparametric ordinal variables such as WRSs and MSDs were examined using the Kruskal-Wallis test to examine the significant differences between hospitals. Then, correlations between the responses of WRSs and MSDs, WRSs and stress symptoms, management and responsibility stressors and MSDs, and management and responsibility stressors and stress symptoms were tested using the nonparametric Spearman correlation coefficient. The difference was considered significant if the *P* value was  $\leq 0.05$  (two-tailed test) at a 95% confidence interval. The nonparametric variables were presented as descriptive statistics including mean, median, and mode, whereas the numerical data were expressed as the mean with a standard error (SE). Statistical analysis was performed using Prism 5 (GraphPad, La Jolla, CA).

## Results

### Demographic Information (Age, Sex, Experience, Degree, and Job Category)

The age of participants in the three hospitals is expressed as the mean  $\pm$  SE (Table 2). The oldest group

corresponded to the GH ( $33.6 \pm 1.4$ ), whereas the youngest group corresponded to the PH ( $30.8 \pm 3.3$ ). There was no significant difference in age variation between the hospitals (*P* = .6).

The sex distribution in the three hospitals is shown as the number of respondents (Table 3). The number of women was higher than men in the GH and PH (ratio = 1.5 and 1.1, respectively), whereas the number of men was higher than women in the UH (ratio = 2.6). There was a significant difference in sex variation between the hospitals (*P* = .03).

The experience in the three hospitals is shown as the mean  $\pm$  SE (Table 4). The longest experience was found in the GH ( $8 \pm 1.2$ ), whereas the shortest was found in the PH ( $6.2 \pm 2.5$ ). There was no significant difference in experience variation between the hospitals (*P* = 0.7).

The degree distribution in the three hospitals is shown as the number of respondents (Table 5). The number of bachelor's degree holders was higher than the diploma degree holders in the UH and PH (ratio = 2.6 and 3.3, respectively), whereas the number of the diploma degree holders was higher than the number of the bachelor's degree holders in the GH (ratio = 3). There was a significant difference in degree variation between the hospitals (*P* = .0002).

Job categories distribution in the three hospitals is shown as the number of respondents (Figure 1). General imaging (extremities and chest X-ray) was found more than the other categories in all hospitals. There was a significant difference in the job categories between the hospitals (*P* = .008).

Table 7  
Management and Responsibility Stressors Variation in Hospitals

Question	Hospital									P Value	Significant Difference
	GH			UH			PH				
	Mean	Median	Mode	Mean	Median	Mode	Mean	Median	Mode		
Awareness of duties	1.679	1	1	2.069	2	2	1.941	2	1	.1944	No
Troubles with superiors	2.679	2	2	2.034	2	2	2	2	2	.0307	Yes
Working apart from duties	1.464	1	1	1.931	2	2	1.882	2	2	.0116	Yes

GH, governmental public hospital (n = 28); PH, private hospital (n = 17); UH, university educational hospital (n = 29).

Table 8  
Staff Support and Stress Awareness Lectures Variation in Hospitals

Question	Hospital									P Value	Significant Difference
	GH			UH			PH				
	Mean	Median	Mode	Mean	Median	Mode	Mean	Median	Mode		
Stress-management sessions	1.679	1	1	2.069	2	2	1.941	2	1	0.1944	No
Staff support	2.464	3	3	2.379	2	2	3.118	3	4	0.0575	No

GH, governmental public hospital (n = 28); PH, private hospital (n = 17); UH, university educational hospital (n = 29).

WRSs

Nine questions about WRSs (out of 13) scaled with four choices are summarized in Table 6. Five stressors were found to be significantly different between hospitals, including the darkroom facility, radiographic table adjustment, radiation exposure during work, using a lead apron, and carrying a large cassette. The highest means of using the darkroom facility and radiation exposure during work were found in the GH (2.75 and 3.32, respectively), whereas the highest means of radiographic table adjustment, using a lead apron, and carrying a large cassette were found in the PH (3.29, 2.52, and 3.41, respectively).

Most of the UH and PH respondents reported working more than 35 hours a week (86.2% and 76.5%, respectively), whereas more than half of the GH employees reported working 35 hours or less a week (57.1%). There was a significant difference in the working hours between the hospitals (P = .0015). Most GH and UH participants indicated they do not work weekend shifts (78.6% and 72.4%, respectively), whereas more than half of the PH participants worked on the weekend (52.9%), providing a significant difference between the hospitals (P = .07). The number of respondents using computed radiography (digital radiography) in the GH was higher than in the UH and PH (92.9%, 62.1%, and 64.1%, respectively). There was a significant difference in using digital radiography between the hospitals (P = 0.02). Most of the GH, UH, and PH respondents agreed to having a staff shortage in the radiology departments (71.4%, 79.3%, and 58.8%, respectively). There was no significant difference between the hospitals (P = .3).

Management and Responsibility Stressors

Three questions scaled with four choices are summarized in Table 7. Two stressors were found to be significantly different between hospitals: trouble with superiors and working apart from duties. The highest mean of trouble with superiors was found in the GH (2.67), whereas the highest mean of working apart from duties (1.9) was found in the UH.

Staff Support and Attending Stress Awareness Sessions

Two questions scaled with four choices are summarized in Table 8. The highest mean of staff support was found in the PH (3.12), whereas the highest mean of attending stress awareness and management sessions was found in the UH (2.06). There was no significant difference between the hospitals (P = .19 and P = .057, respectively).

Stress Symptoms

Eight questions scaled with four choices are summarized in Table 9. Five symptoms were found to be significantly different between hospitals, including anxiety, depression, high blood pressure, fatigue, and headache. The highest means were found in the GH.

MSD Complaints

Five questions scaled with four choices are summarized in Table 10. All MSDs were found to be significantly different between hospitals, including low back pain, shoulder pain, neck pain, leg pain, and hand pain. The highest means were found in the GH.

Table 9  
Stress Symptoms Variation in Hospitals

Question	Hospital									P Value	Significant Difference
	GH			UH			PH				
	Mean	Median	Mode	Mean	Median	Mode	Mean	Median	Mode		
Anger	2.75	3	3	2.31	2	2	2.412	2	2	.1303	No
Anxiety	2.821	3	2	2.345	2	2	1.941	2	1	.009	Yes
Violence	1.893	2	2	1.759	2	1	1.353	1	1	.0609	No
Depression	2.929	3	4	2.207	2	2	1.941	2	1	.0033	Yes
Insomnia	2.25	2	1	2.207	2	2	2.059	2	1	.8976	No
High Blood Pressure	3.214	3	4	2.69	3	3	1.706	2	2	.0001	Yes
Fatigue	3.464	4	4	2.897	3	4	2.588	3	2	.0084	Yes
Headache	3.214	3	4	2.69	3	3	2.118	2	1	.0017	Yes

GH, governmental public hospital (n = 28); PH, private hospital (n = 17); UH, university educational hospital (n = 29).

Table 10  
Musculoskeletal Disorder Complaints Variation in Hospitals

Question	Hospital									P Value	Significant Difference
	GH			UH			PH				
	Mean	Median	Mode	Mean	Median	Mode	Mean	Median	Mode		
Low back pain	3.464	4	4	2.966	3	3	2.529	3	3	.0009	Yes
Shoulder pain	3.107	4	4	2.207	2	2	1.588	1	1	.0001	Yes
Neck pain	3.464	4	4	2.483	2	2	1.941	2	1	.0001	Yes
Legs pain	3.536	4	4	3.103	3	3	2.471	3	3	.0018	Yes
Hand pain	3.036	4	4	2.241	2	2	1.471	1	1	.0001	Yes

GH, governmental public hospital (n = 28); PH, private hospital (n = 17); UH, university educational hospital (n = 29).

### Stress Relievers

Four questions scaled with four choices are summarized in Table 11. The highest means of exercise and eating were found in the PH (1.7 and 2.58, respectively), and the highest means of medication and smoking were found in the UH (1.89 and 1.82, respectively). There was no significant difference in stress relievers between the hospitals.

### Correlations

The only significant correlation was found between WRSs and MSDs (Spearman correlation coefficient = 0.61,  $P = .04$ ; Figure 2). Management and responsibility stressors did not show a significant correlation with MSDs (Spearman correlation coefficient = 0.34,  $P = .28$ ; Figure 3). Stress symptoms did not significantly correlate with WRSs (Spearman correlation coefficient = 0.55,  $P = .066$ ; Figure 4) or management and responsibility stressors (Spearman correlation coefficient = 0.55,  $P = .062$ ; Figure 5).

### Discussion

This study found a significant correlation between WRS and MSD complaints. In addition, it was the first study to report stress levels and their effects on stress symptoms and MSD complaints among radiographers in Northern Jordan. Therefore, it provides a baseline for future investigations and studies regarding WRSs in radiography.

We determined that the GH has the significantly highest means of stress symptoms and MSD complaints. This is in agreement with a previous report regarding the radiology services in Jordan, which found that the shortage of radiography staff and imaging equipment is predominant in the public

hospitals; most of them are still using conventional film and a darkroom and are not well equipped with digital imaging systems [10]. Also, the average age and number of females in the GH were reported to be higher than the other hospitals. Therefore, it is possible that age and sex factors contributed to the increased stress symptoms and MSD complaints in the GH in comparison with the other hospitals. Previous studies that investigated the effect of age, sex, and prevalence of stress symptoms at work found that MSD complaints increased with age and pain symptoms were more prevalent in women than men [11–13]. The educational degree varied between hospitals; the majority of the GH employees have a diploma degree, whereas a bachelor's degree was predominant in the other hospitals. Lower degree holders may have increased stress about keeping their positions or getting promoted to a higher position in the presence of bachelor's degree holders. A study was conducted on two nursing cohorts with two different degrees (associate's degree and bachelor's degree) to compare job satisfaction [14]. The study found that the bachelor's degree holders scored significantly higher than the associate's degree holders in terms of job satisfaction and that the older age group tended to remain in their positions longer. The most occurring type of work in the three hospitals was found to be in the general x-ray area, which is more physically demanding than other imaging areas such as magnetic resonance imaging in terms of moving the x-ray tube, carrying cassettes to the examination rooms, adjusting the x-ray couch, and processing the radiographic films with different chemical agents. The work nature of x-ray technologists was found to be biomechanically demanding. A study reported that routine tasks such as patient repositioning and lifting patients from a wheelchair can place a large

Table 11  
Stress Relievers Variation in Hospitals

Question	Hospital									P Value	Significant Difference
	GH			UH			PH				
	Mean	Median	Mode	Mean	Median	Mode	Mean	Median	Mode		
Exercise	1.571	1	1	1.655	2	2	1.706	1	1	.5757	No
Eating	2.107	2	1	2.31	2	1	2.588	3	3	.3303	No
Medication	1.75	1	1	1.897	2	1	1.882	2	1	.6553	No
Smoking	1.536	1	1	1.828	1	1	1.353	1	1	.1895	No

GH, governmental public hospital (n = 28); PH, private hospital (n = 17); UH, university educational hospital (n = 29).

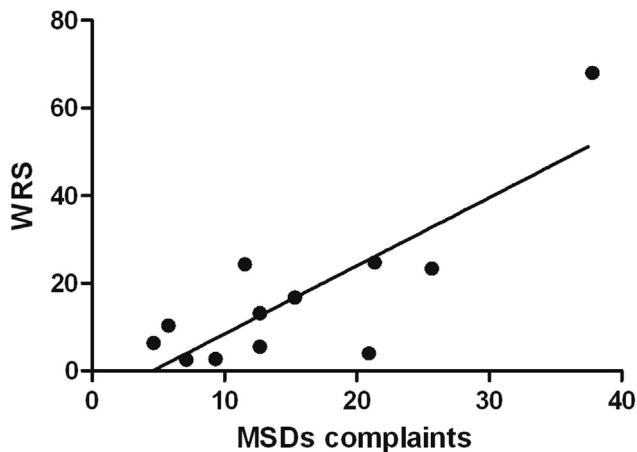


Figure 2. The correlation between WRS and MSD complaints for the three hospitals. The numbers on the y-axis represent the mean score of responses of WRS questions ( $n = 9$ ). The numbers on the x-axis represent the mean score of responses of MSD complaint questions ( $n = 5$ ).

amount of weight on joints and extremities [15]. In addition, spending 2 hours per day in an awkward posture, frequent use of heavy imaging equipment and lead aprons, and moving patients were associated with repetitive stress among radiology technologists [16]. Another study compared two professions (radiographers and physiotherapists) and found excess symptoms in radiographers because of darkroom disease [17]. A correlation between management stressors and stress symptoms was found. Notably, the level of stress was reported among UK radiographers, and the results suggested that the role ambiguity and role conflict correlated with work-related stress [18]. High blood pressure was found to be significantly higher in the GH, which could be caused by weekend and on-call work. However, there was a conflict about the relationship between hypertension and WRSs [7, 19, 20]. Shortage of staff has been linked to WRSs [21, 22] because

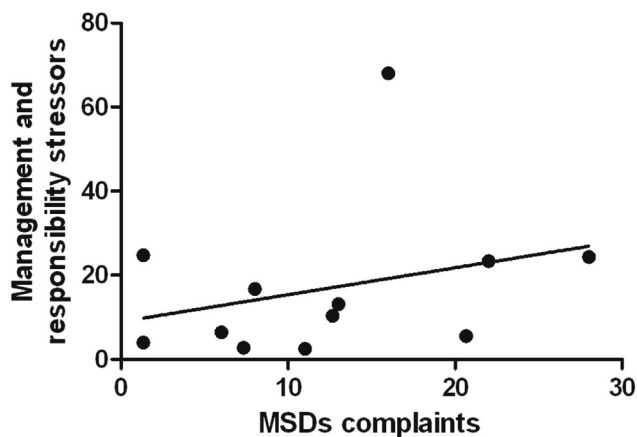


Figure 3. The correlation between management and responsibility stressors and MSD complaints for the three hospitals. The numbers on the y-axis represent the mean score of responses of management and responsibility stressor questions ( $n = 3$ ). The numbers on the x-axis represent the mean score of responses of MSD complaint questions ( $n = 5$ ).

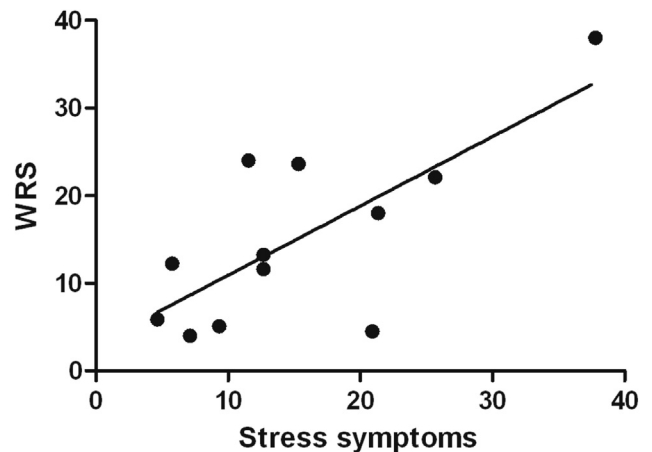


Figure 4. The correlation between WRS and stress symptoms for the three hospitals. The numbers on the y-axis represent the mean score of responses of WRS questions ( $n = 9$ ). The numbers on the x-axis represent the mean score of responses of stress symptom questions ( $n = 8$ ).

of the increased work demand to manage the large growing number of patients, and most of the respondents in all hospitals reported having inadequate staff to overcome the workload. In addition, the PH participants reported having more staff assistance and support than the UH and GH, which may explain the low incidence of stress symptoms and MSDs in the PH compared with the other hospitals. Inadequate staff support and assistance have been listed among other factors to cause stress at work [2]. Lectures and workshops regarding awareness and management of stress at work have been shown to be useful in reducing stress level [7, 23]. However, most of the respondents in the GH indicated that they did not attend work stress awareness sessions, which might have contributed to the increased stress at work.

Although all radiographers in the three hospitals were invited to participate in the study, the sample size was

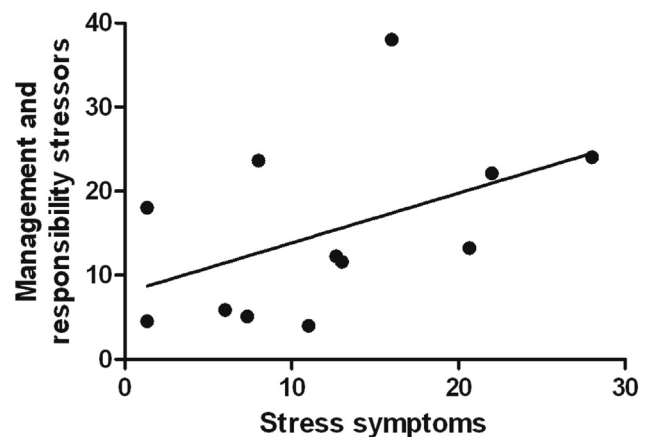


Figure 5. The correlation between management and responsibility stressors and stress symptoms for the three hospitals. The numbers on the y-axis represent the mean score of responses of management and responsibility stressor questions ( $n = 3$ ). The numbers on the x-axis represent the mean score of responses of stress symptom questions ( $n = 8$ ).

relatively small. This is in correspondence with the shortage of radiographers in the region of Northern Jordan. In addition, the effect of dealing with patients as a WRS among radiographers and ergonomic strategies was not fully covered in the design of the questionnaire. However, the main focus of this study was to study the effect of physical stressors on MSDs.

For future work, the correlation between WRSs and MSDs can be investigated in other sectors such as private imaging centers and clinics. Also, in addition to our study, the effect of psychological stressors on MSDs among radiographers and ergonomic strategies would provide a comprehensive picture of the working environment.

## Conclusion

In this study, the GH hospital had more MSD complaints and stress symptoms than the other hospitals. WRSs were correlated significantly with MSD complaints. Encouraging radiographers to attend work stress management sessions may help to reduce the level of stress.

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