Research Journal of Biological Sciences 6 (4): 170-174, 2011
ISSN: 1815-8846

Work-Related Musculoskeletal Disorders among Cardiologists

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Abstract: Work-related Musculoskeletal Disorders (WMSDs) are common health problems and an important cause of disability among working groups including physicians. The aim of this study was to investigate the 12 months period prevalence of WMSDs in cardiologists. The study was conducted on Isfahan cardiologists' population from whom 30 cardiologists entered the study. Researchers took a photograph using digital camera when they were performing echocardiography. Data analyzed using Quick Exposure Check (QEC) for assessing exposure to WMSDs related risk factors. The 12 months prevalence rates of WMSDs in cardiologists were highest in the lower back and neck (20%). Individual anatomical prevalence rate was high in the cases who were >40 years old compared with <40 ($p = 0.6$). There were no significant relation between anatomical regions pain and sex ($p = 0.5$), total working hours ($p = 0.3$) and echocardiography practice hours ($p = 0.08$). There was significant relation between types of shoulder exposure risks and age groups ($p = 0.05$). WMSDs among cardiologists were not related to advanced age and echocardiography practice hours. However, researchers recommend conducting further studies with more cases in future in order to determine relation between WMSDs and other risk factors in cardiologists, particularly in whom performing angiography as well as echocardiography.

Key words: Musculoskeletal disorders, echocardiography, cardiologists, Quick Exposure Check (QEC), prevalence rate, angiography

INTRODUCTION

Occupational diseases include those caused by individual exposure to physical, chemical, biological and psychological factors in work field (Helmseresht, 2001). Work-related Musculoskeletal Disorders (WMSDs) are common health problems and an important cause of disability (Aaras, 1994). Workload imposition is an important factor in the occurrence of musculoskeletal symptoms among the working groups (Hildebrandt, 1995; Ryden *et al*., 1989). Three groups of risk factors associated with the development of WMSDs include workplace, individual and psychosocial risk factors. Workplace risk factors include the physical demands imposed by performing the task such as posture adopted, force applied, frequency and repetition of movement, task duration and vibration experienced. Individual risk factors include age, gender, anthropometry, muscle strength and physical fitness. Psychosocial factors include work or pressures, lack of social support and poor job satisfaction (Geoffrey *et al*., 2008). One of the working groups suffer from WMSDs are physicians. Musculoskeletal symptoms among physicians have been considered a consequence of the workload of their practice depending on their specialty (Ratzon *et al*., 2000; Holder *et al*., 1999; Lipscomb *et al*., 2004). Cardiologists are one of the medical practitioners suffer from musculoskeletal symptoms secondary to performing echocardiography and/or angiography.

The purpose of this study was to determine the 12 months prevalence of musculoskeletal symptoms among cardiologists performing echocardiography and explore the relationship between echocardiography practice posture and workload factors with occurrence of symptoms.

MATERIALS AND METHODS

In a cross-sectional study, cardiologists population in Isfahan determined by using Medical Council Information Center. From 80 cardiologists, only 33 cardiologists registered to the study. Among them, 3 cases excluded from the study because they were performing angiography as well as echocardiography.

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Researchers went to their research place (hospital, clinic or office) and took a photograph using digital camera during performing echocardiography. Then, photographs data analyzed using Quick Exposure Check (QEC) for assessing exposure to risk factors for work-related musculoskeletal disorders. A questionnaire was used for socio-demographic information such as age, sex, duration of total work per week, duration of echocardiography practice per week and musculoskeletal complaints depending on anatomical regions (back, neck, shoulder, arm, elbow, forearm, leg and wrist). Cases were asked whether they had experienced WMSDs that researchers defined as discomfort or pain secondary to their work and lasting >2 days in the last 12 months in any part of body. Then, subjects who indicated experience of WMSDs symptoms in any of body regions were asked to choose the regions of disorder that they considered as the most significant and asked further questions about their disorder. All of subjects categorized in three groups depending on working hours per week, low working hours (≤35 h), moderate working hours (between 36 and 54 h) and high working hours (≥55 h). Also, depending on exposure percentage, all subjects categorized in low risk, moderate and high risk which their risk levels calculated by QEC software. Collected data were subjected to statistical analysis using SPSS software. The results were given as mean (SD) values. Paired t-test and Pearson Chi-square (χ^2) test were used to compare the differences between mean values of two paired variables for normally and none normally distributed data. The level $p \leq 0.05$ was considered as the cut-off value for significance.

RESULTS

Among 30 cardiologists entered to the study, women and men accounted for 8 (26.7%) and 22 (73.3%) of the sample population, respectively. The mean age, total work hours per week and echocardiography practice hours per week were 43.2±9, 35.6±5.9, 13.2±4.9, respectively. Table 1 shows the association between 12 months prevalence of WMSDs and age, sex and working hours (total and echocardiography) among all affected cases. The 12 months prevalence rates of WMSDs was highest in the back and neck (20%) followed by the elbow (16.7%) and then arm (13.3%) but least in the leg, wrist and shoulder (6.7%). Among all of affected cases, no one reported that they had sought treatment from other health practitioners for WMSDs. Individual anatomical prevalence rate was high in the cases who were >40 years old compared with <40 that it was not significant statistically (p = 0.6). Also, there were no significant

Table 1: Association between 12 months prevalence of WMSDs and age, sex and working hours (total and echocardiography)

		Sex		Echocardiography practice hours			Total working hours			Age groups	
Parameters	Total frequency	Man	Female	<15	15-30	>30	Low	Moderate	High	≤40	>40
Neck											
N	6.0	3.0	3.00	3.0	0.0	3.0	4.0	1.0	1.0	2.0	4.0
Percent	20.0	10.0	10.00	10.0	0.0	10.0	13.3	3.3	3.3	6.7	13.3
Back											
N	6.0	4.0	2.00	4.0	1.0	1.0	4.0	1.0	1.0	2.0	4.0
Percent	20.0	13.3	6.70	13.3	3.3	3.3	13.3	3.3	3.3	6.7	13.3
Arm											
N	4.0	3.0	1.00	3.0	1.0	0.0	3.0	1.0	0.0	0.0	4.0
Percent	13.3	10.0	3.30	10.0	3.3	0.0	10.0	3.3	0.0	0.0	13.3
Elbow											
N	5.0	3.0	2.00	5.0	0.0	0.0	2.0	2.0	1.0	2.0	3.0
Percent	16.7	10.0	6.70	16.7	0.0	0.0	6.7	6.7	3.3	6.7	10.0
Forearm											
N	3.0	3.0	0.00	1.0	1.0	1.0	2.0	0.0	1.0	0.0	3.0
Percent	10.0	10.0	0.00	3.3	3.3	3.3	6.7	0.0	3.3	0.0	10.0
Leg											
N	2.0	2.0	0.00	0.0	0.0	2.0	1.0	0.0	1.0	0.0	2.0
Percent	6.7	6.7	0.00	0.0	0.0	6.7	3.3	0.0	3.3	0.0	6.7
Wrist											
N	2.0	2.0	0.00	2.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0
Percent	6.7	6.7	0.00	6.7	0.0	0.0	3.3	3.3	0.0	3.3	3.3
Shoulder											
N	2.0	2.0	0.00	2.0	0.0	0.0	0.0	1.0	1.0	1.0	1.0
Percent	6.7	6.7	0.00	6.7	0.0	0.0	0.0	3.3	3.3	3.3	3.3
Total											
N	30.0	22.0	8.00	20.0	3.0	7.0	17.0	7.0	6.0	8.0	22.0
Percent	100.0	73.3	26.70	66.7	10.0	23.3	56.7	23.3	20.0	26.7	73.3
p-value	-	0.5	0.08	0.3	0.6	-	-	-	-	-	-

Table 2: Relation between exposure risk and age, sex and working hours (total and echocardiography)

Pain regions	Risk exposure	Parameters	Total freq.	Sex			Total working hours				Age groups (years)			Working hours with echocardiography			
				Man	Female	p-values	Low	Moderate	High	p-values	31-40	41-50	p-values	>14	15-30	>30	p-value
Back	With low risk	N	24.0	16.0	8.0	0.2	15.0	4.0	5.0	0.6	5.0	19.0	0.5	16.0	3.0	5.0	0.5
		Percent	80.0	53.3	26.7		50.0	13.3	16.7		16.7	63.3		53.3	10.0	16.7	
	With moderate	N	4.0	4.0	0.0		0.0	3.0	1.0		1.0	3.0		2.0	0.0	2.0	
	risk	Percent	13.3	13.3	0.0		0.0	10.0	3.3		3.3	10.0		6.7	0.0	6.7	
	With high risk	N	2.0	2.0	0.0		2.0	0.0	0.0		2.0	0.0		2.0	0.0	0.0	
		Percent	6.7	6.7	0.0		6.7	0.0	0.0		6.7	0.0		6.7	0.0	0.0	
Shoulder	With low risk	N	17.0	11.0	6.0	0.4	10.0	3.0	4.0	0.5	4.0	13.0	0.05	10.0	2.0	5.0	0.7
		Percent	56.7	36.7	20.0		33.3	10.0	13.3		13.3	43.3		33.3	6.7	16.7	
	With moderate	N	11.0	9.0	2.0		5.0	4.0	2.0		2.0	9.0		8.0	1.0	2.0	
	risk	Percent	36.7	30.0	6.7		16.7	13.3	6.7		6.7	30.0		26.7	3.3	6.7	
	With high risk	N	2.0	2.0	0.0		2.0	0.0	0.0		2.0	0.0		2.0	0.0	0.0	
		Percent	6.7	6.7	0.0		6.7	0.0	0.0		6.7	0.0		6.7	0.0	0.0	
Wrist	With low risk	N	4.0	2.0	2.0	0.3	2.0	0.0	2.0	0.4	2.0	2.0	0.1	3.0	1.0	0.0	0.6
		Percent	15.4	6.7	6.7		6.7	0.0	6.7		6.7	6.7		10.0	3.3	0.0	
	With moderate	N	20.0	17.0	6.0		13.0	6.0	4.0		4.0	19.0		15.0	2.0	6.0	
	risk	Percent	76.9	56.7	20.0		43.3	20.0	13.3		13.3	63.3		50.0	6.7	20.0	
	With high risk	N	2.0	3.0	0.0		2.0	1.0	0.0		2.0	1.0		2.0	0.0	1.0	
		Percent	7.7	10.0	0.0		6.7	3.3	0.0		6.7	3.3		6.7	0.0	3.3	
Neck	No risk	N	1.0	0.0	1.0	0.8	1.0	0.0	0.0		0.0	1.0	0.5	1.0	0.0	0.0	0.5
		Percent	3.3	0.0	3.3		3.3	0.0	0.0	0.5	0.0	3.3		3.3	0.0	0.0	
	With low d risk	N	20.0	13.0	7.0		12.0	3.0	5.0		5.0	15.0		13.0	2.0	5.0	
		Percent	66.7	43.3	23.3		40.0	10.0	16.7		16.7	50.0		43.3	6.7	16.7	
	With moderate	N	2.0	2.0	0.0		1.0	1.0	0.0		0.0	2.0		1.0	1.0	0.0	
	risk	Percent	6.7	6.7	0.0		3.3	3.3	0.0		0.0	6.7		3.3	3.3	0.0	
	With high risk	N	7.0	7.0	0.0		3.0	3.0	1.0		3.0	4.0		5.0	0.0	2.0	
		Percent	23.3	23.3	0.0		10.0	10.0	3.3		10.0	13.3		16.7	0.0	6.7	
Total pain	With low risk	N	17.0	11.0	6.0	0.1	10.0	3.0	4.0	0.8	4.0	13.0	0.7	10.0	2.0	5.0	0.5
		Percent	56.7	36.7	20.0		33.3	10.0	13.3		13.3	43.3		33.3	6.7	16.7	
	With moderate	N	5.0	3.0	2.0		3.0	1.0	1.0		1.0	4.0		4.0	1.0	0.0	
	risk	Percent	16.7	10.0	6.7		10.0	3.3	3.3		3.3	13.3		13.3	3.3	0.0	
	With high risk	N	8.0	8.0	0.0		4.0	3.0	1.0		3.0	5.0		6.0	0.0	2.0	
		Percent	26.7	26.7	0.0		13.3	10.0	3.3		10.0	16.7		20.0	0.0	6.7	

relation between anatomical regions pain and sex (p = 0.5), total working hours (p = 0.3) and echocardiography practice hours (p = 0.08). Table 2 shows relation between anatomical regions of pain exposure risk and sex, total working hours, age groups and working hours with echocardiography. The only statistically significant relation is relation between types of shoulder exposure risks and age groups (p = 0.05). WMSDs onset reported as a gradually, suddenly and known accident in 65, 31.5 and 3.5%, respectively.

DISCUSSION

Studies have shown that WMSDs are particularly common in health care workers who are in direct contact with patients (Ratzon *et al*., 2000; Holder *et al*., 1999; Lipscomb *et al*., 2004). In this study, we used direct technical measurement (Digital Camera and QEC Software) due to low validity of the questionnaire-assessed exposure data (Hansson *et al*., 2001). Researchers found a high prevalence of body pain among 30 participants. We believe this is the 1st study to evaluation of WMSDs among cardiologists using QEC tool.

In this cross-sectional study, the most frequent percentage of reported regions pain and discomfort among man and women were back (20%) and neck (20%), respectively. Elbow pain was another common region that cases reported (16.7%). In comparison with the study by Hoozemans on back and shoulder complaints, the report rate is comparable to their result of 21% for back pain. However, there was a higher prevalence of neck pain (41%) in their studied group (Hoozemans *et al*., 1998). In a study, performed on hospital nurses, neck pain was higher than the study (34%) (Smedley *et al*., 2003). Also, in a study performed on medical staff in a radiology department, neck pain was significantly higher than the group (61%) (Kao *et al*., 2009). In Ratzon *et al*. (2000)'s study on dentists, reported WMSDs symptoms in the last 12 months were predominately localized in the back and neck (55 and 38.3%, respectively) that both of them was higher than the study.

In the study, photographs analysis revealed that cardiologists during echocardiography occasionally bent or twisted their neck and sit with their neck and shoulders bent laterally (Fig. 1), on the other hand, they moderately flexed or twisted or side bent their back (Fig. 2) and their wrist and hand were in a deviated or bent position (Fig. 3). The low prevalence rate of pain reports in neck and back compared with these regions in other studies suggests that cardiologist's neck and back are exposed to a low or moderate levels of stress during performing echocardiography compared with radiology staff, dentists and nurses however in all of groups mentioned before, the most common affected anatomical regions were back

Fig. 1: Neck in a bent or twisted position

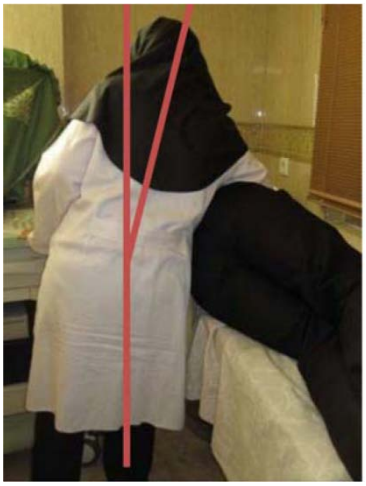

Fig. 2: Back in a moderately flexed or twisted or side bent position

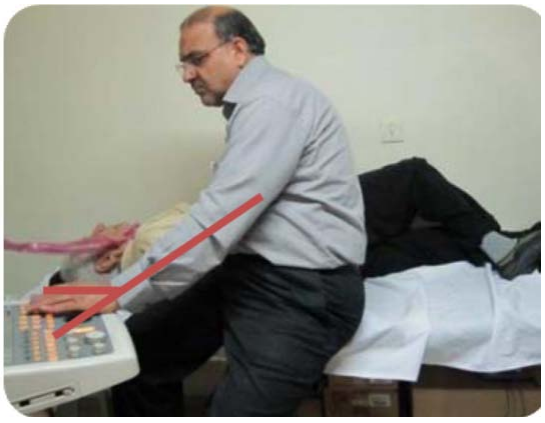

Fig. 3: Wrist and hand in a deviated or bent position

and neck suggesting that common affected regions are identical despite of different levels of stress on neck and back among them.

Eventually, it is difficult to make comparisons due to the different measurement methods used and widely varying study population. The relationship between neck/shoulder pain and sitting posture has been examined for workers from seven manufacturing industries in South Africa (Schierhout *et al*., 1995). During echocardiography, operator spends 5-10 min scanning for a single patient. The repetitive nature of the task may increase the exposure risk. Chiang *et al.* (1993) found that shoulder-girdle (neck, shoulder and upper arm) pain was significantly higher among workers performing tasks with repetitive movements. In the study, relationship between shoulder exposure risk and age groups was significant ($p = 0.05$).

Researchers found no significant association between wrist exposure risk and other risk factors. In Kao *et al.* (2009) as well as Jin *et al.* (2000)'s studies also the results for wrist were similar to the study. The cardiologists in the study complained most frequently of back pain but there was no significant association between back exposure risk and other risk factors ($p>0.05$). During echocardiography, they spent prolonged periods of sitting and it is appear back pain is associated with twisting and bending the trunk. In Jin *et al.* (2000)'s review of two studies, the incidence of back pain among sedentary workers was higher than for workers with free posture. Moeini *et al.* (2008) study on ophthalmologists' sitting position showed significant association between lower back pain and total working hours.

In the study, researchers found no association between anatomical regions pain including lower back pain and total or echocardiography practice hours ($p>0.05$). Also, no significant association was found between time workload and back pain in Ratzon *et al.* (2000)'s study on dentists. In the study, relationship between shoulder pain and age groups was significant ($p = 0.05$). Studies noted an association between WMSDs and age (Rundcrantz *et al*., 1990; Adegoke *et al*., 2008). In Ratzon *et al.* (2000)'s study on dentists no significant association was found between age and workload. Researchers observed higher prevalence of WMSDs among male cardiologists (73.3%) in comparison to females (26.7%) but there was no significant relationship between them ($p = 0.5$). In Adegoke *et al.* (2008)'s study on physiotherapists, they observed a significantly higher prevalence of WMSDs among female physiotherapists compared with males.

CONCLUSION

These findings suggest that the 12 months prevalence of WMSDs among cardiologists is similar to prevalence reported in other studies but values are lower than their values. Also, there was no significant relation between anatomical regions pain and most of risk factors.

RECOMMENDATION

Researchers recommend performing further studies with more cases on cardiologists particularly in whom performing angiography as well as echocardiography.

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