

Original Research Article

WORK- RELATED MUSCULOSKELETAL DISORDERS AMONG RADIOLOGISTS IN NIGERIA

Running title: work related disorders

ABSTRACT:

Background: Work- related musculoskeletal disorders (WRMSDs) are defined as conditions that are caused or aggravated by work place activities, and they account for up to 60% of all work place illnesses. Regular operation of the ultrasound machine in addition to long sitting position during reporting of images had subjected the radiologist to development of work-related musculoskeletal disorders. The study aimed at investigating the prevalence of musculoskeletal complaints among radiologists practicing diagnostic and interventional ultrasonography in Nigeria.

Methods: The subjects were radiologists who had completed their fellowship and residents in radiology with more than three years experience in the practice of radiology. Structured self administered questionnaires were distributed to the subjects at two International Conferences with radiological meetings session.

Results: 124 questionnaires were analyzed, consisting of 50(40.3%) females and 74(59.7%) males, giving female/male ratio of 1: 1.48. The mean age was 42 ± 0.97 years. The neck was the part of the body commonly affected by WRMSD, with 68 (54.84%) respondents. This was followed by low back seen in 66(53.23%) respondents and shoulder/upper back seen in

52(41.94%) respondents. 94(75.8%) of the respondents have had visual acuity test for eye strains and poor vision.

Conclusion: There was high prevalence of work – related musculoskeletal disorders among radiologists in Nigeria. These ranged from pains at the neck, shoulder, spine, upper and lower limbs as well as eye strain.

KEY WORDS: musculoskeletal disorders, imaging modalities, radiologists, Nigeria, posture.

INTRODUCTION:

Work- related musculoskeletal disorders (WRMSDs) are defined as conditions that are caused or aggravated by work place activities, and they account for up to 60% of all workplace illnesses.¹ Injury among sonographers was first reported in 1985 when Craig identified “sonographers shoulder”.² Unlike in Western countries where there are trained sonographers and technicians who man the ultrasound machines, acquire images for interpretation by the radiologist; in Nigeria the radiologists acquire the images and do the reports on the images. This practice was put in place to ensure that proper assessment of the patients is done and also to checkmate inappropriate medical reports from inexperienced sonographers and technicians. Regular operation of the ultrasound machine in addition to long sitting position during reporting of images from other imaging modalities such as computed tomography, magnetic resonance imaging, and conventional radiography as well as fluoroscopy screening and interventional radiological practices had subjected the radiologist to development of work- related musculoskeletal disorders. Several epidemiological studies have shown that physical factors, such as postures, are important determinants of musculoskeletal disorders.^{3,4,5} Most WRMSDs are cumulative disorders, resulting from repeated exposure to high or low intensity loads over a long period of time. The symptoms may vary from discomfort and pain to decreased body function and invalidity.⁴ While there are reported WRMSDs among sonographers in different parts of the world,^{6,7,8} WRMSDs emanating from operation of ultrasound machines in radiologists in Nigeria have not been given adequate reporting.

The study aimed at investigating the prevalence of work-related musculoskeletal disorders among radiologists practicing diagnostic and interventional ultrasonography in Nigeria.

MATERIALS AND METHODS:

The subjects were radiologist who had completed their fellowship and residents doctors in radiology with more than three years experience in the practice of radiology. Structured self administered questionnaires were distributed to the subjects at two international conferences with radiological sessions. This was to give the study a wide national coverage as radiologists from different part of the country attended theses conferences. The first was in Burkina-faso (February 2017) and the second was in Nigeria (July 2017). The respondents in the first conference were excluded from responding in the second conference.

The questionnaire was designed to elicit information on the age and gender of the respondents, number of years of practicing radiology and ultrasonography as well as number of patients scanned per week. Details on imaging modalities used in the practice and region of the body affected by WRMSD as well as visual defect related to the practice were also elicited.

All respondent not practicing in Nigeria were excluded from the study.

The study was approved by the medical ethics committee of University of Port Harcourt Teaching Hospital.

Data were analyzed using the descriptive statistics of mean, standard deviation and percentages. Pearson's Chi square analysis was used to determine the association of prevalence of work related musculoskeletal symptoms with number of years of ultrasound practice and number of patients scanned per week. The data analyses were carried out using SPSS software version 16.0 (SPSS Inc., Chicago, Illinois, USA). The level $p = 0.05$ was considered as the cut-off value for significant.

RESULTS:

There were 129 respondents, five were not Nigerians, hence were excluded from analysis. A total of 124 questionnaires were analyzed (Table 1), consisting of 50(40.3%) females and 74(59.7%) males, giving female/male ratio of 1: 1.48. The mean age was 42 ± 0.97 years. Sixty-eight (54.8%) of the respondents practice minimal interventions while 56(45.2%) do not. Forty-six (37.10%) of the respondents use computed tomography, magnetic resonance imaging, ultrasound, conventional radiography and fluoroscopy in their practice; while 28(22.58%) of the respondents use only ultrasound and conventional x-rays (table 2). All the 124 respondents use ultrasonography in their daily practice. Only 20 (16.13%) of the respondents scan more than 100 patients per week (table 4). Of the 124 respondents, only 3(4.8%) had no WRMSDs. The rate of experiencing WRMSDs was at its peak 49.52 (39.52%) among those who had practiced radiology for 11-20 years and decreased with increasing years of practice (tables 3 & 5). The neck was the part of the body commonly affected by WRMSD, with 68 (54.84%) respondents (table 6). This was followed by low back seen in 66(53.23%) respondents and shoulder/upper back seen in 52(41.94%) respondents. Tingling sensation in the fingers was found in 52 (41.9%) of the respondents and 36(29%) of the respondents, complained of either radiculopathy or sciatica. Ninety-four (75.8%) of the respondents have had visual acuity test for eye strains and

poor vision. There was no statistical significant relation between number of years of radiological practice , number of years of ultrasonography practice , age and work- related musculoskeletal disorders (p = 0.96, 0.73 and 0.3 respectively).

Table1: Frequency of age distribution and work related musculoskeletal disorder in the respondents

Age range	Number of respondents (percentage)	WRMSD (%)
<30	4(3.2%)	4(3.2%)
31-40	18(14.5%)	18(14.5%)
41-50	62(50.0%)	60(48.39%)
51-60	24(19.4%)	23(18.55%)
>60	16(12.9%)	16(12.9%)
TOTAL	124(100%)	121(97.54%)

Table 2: Imaging modalities for radiological practice.

Modalities	Number of respondents	Percentage
CT,MRI,US,CX,PET,FL,ANG	2	1.61
CT, MRI,US,CX,FL	46	37.10
CT,MRI,US,PET,CX	4	3.23
CT,MRI,US,CX	12	9.68
CT,US,CX	12	9.68
CT,US,CX,ANG	2	1.61
CT,US,CX,FL	6	4.84
CT,US,CX,FL,ANG	6	4.84
US,CX	28	22.58
US,CX,ANG	2	1.61
US,CX,FL	2	1.61
US,CX,FL	2	1.61
TOTAL	124	100

112 CT-computed tomography, US- ultrasound scan, MRI- magnetic resonance imaging, CX,
113 conventional x-ray, FL-fluoroscopy, ANG- angiography, PET- positron emission tomography.

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117 Table 3: number of years of ultrasound practice verses WRMSD among respondents

Number of years	Number of respondents (%)	Frequency of WRMSD (%)
1-10	42(33.87%)	40(32.26%)
11-20	50(40.32%)	49(39.52%)
21-30	22(17.74%)	22(17.74%)
31-40	8(6.45%)	8(6.67%)
41-50	2(1.61%)	2(1.61%)
TOTAL	124(100%)	121(97.58%)

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128 Table 4: Number of patients scanned with sonography per week

Number	Number of respondents	Percentage
<50	52	41.94
50-100	52	41.94
>100	20	16.13
TOTAL	124	100

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130 Table 5: Number of years of radiological practice

Years of practice	Number of respondent	Percentage
1-10	32	25.81
11-20	58	46.77
21-30	24	19.35

31-40	8	6.45
41-50	2	1.61
TOTAL	124	100

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132 Table 6: part of the body affected by WRMSD.

Part of the body affected	Number of respondents	Percentage of the respondents
Arms	44	35.48
Elbows	40	32.26
Lower back	66	53.23
Shoulder /upper back	52	41.94
Fingers	16	12.90
Wrists	34	27.42
Thighs	14	11.29
Neck	68	54.84
Knees	14	11.29
No WRMSD	3	4.8

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134 DISCUSSION.

135 The World Health Organization (WHO) characterized work related musculoskeletal disorders
136 (WRMSDs) as multifactorial to indicate the inclusion of physical, organizational, psychosocial,
137 and sociological risk factors.⁹ Long working hour had been reported to increase the risk of some
138 physical disorders especially musculoskeletal disorders in general. The radiologists in this study
139 were found to use multiple imaging modalities in their daily practice. This will lead to a yield of
140 large number of films for reporting. Film reporting requires the radiologist sitting or standing for
141 long hours staring at films on the highly illuminated screen. All the respondents in this study use
142 ultrasound machine in their practice. Sonography had been reported to be associated with high
143 prevalence of WRMSDs as reported in previous literatures.^{6,7} These disorders affect parts of the
144 body in frequent usage during scanning. The long period of sitting or standing, awkward posture,
145 excess abduction and twisting of the neck, waist and wrist which occur during sonography may
146 contribute to the large number of the radiologists having WRMSDs as recorded in the index
147 study with a prevalence of 95.2% among the respondents. This was similar to the report from a
148 study in United states of America, where the prevalence was 90% among clinical sonographers.⁶
149 Another study in Nigeria on WRMSDs among health workers showed that the prevalence among
150 radiologist was 66.5%.⁴

151 The neck, shoulders, wrists, hands\ fingers and back were sites most affected with WRMSDs.⁷ In
152 the index study, the neck was the most affected part of the body with a frequency of 68%,
153 followed by the lower back 66%, shoulder\upper back 52%. Other commonly affected areas

were the arms, elbows and wrists with frequency of 44%, 40% and 34% respectively. A study on WRMSDs in radiology department showed that pain in the neck \shoulder was the most frequent complaint among staff with a prevalence of 61.9%. The highest incidence, 75% was found among ultrasound technologists.¹⁰ These injuries result from awkward postures of the trunk, neck and upper extremities, as well as excessive gripping and downward force applied with the transducer. Awkward or sustained postures occur when body parts are positioned away from their neutral position. These postures can put stress on the joint and its associated muscles. These include flexion\extension of the wrist, excess abduction of the shoulders (reaching), bending\ twisting at the waist and bending or rotating the neck.⁸ It is a common thing in sonography to adopt awkward position during scanning in effort to access the region of interest or as a result of insufficient adjustability of the equipment.

There was also a high frequency of lower back pain in respondents of the index study. Low – back pain is associated with lifting heavy loads, twisting, and bending of the trunk.¹¹ Sitting is also a known risk factor for lower back pain.¹⁰ Jin et al in a review of two studies, reported a higher incidence of back pain among sedentary workers than for workers with free posture.¹¹

John et al also found low back to be the commonest site of injury which constituted 65%.⁹ Reports from Poland concerning specialists performing echocardiography showed that 70% of the sonographers had back pain, 32% had wrist pain and 20% had shoulder pain.¹²

Static posture during ultrasonography results in abduction and twisting of the shoulder and the upper limb in reaching the patients and operating the machine knobs. Pains in the arms, elbow, wrist and fingers which in some cases were associated with tingling sensations and numbness

were seen among the respondents. Chiang et al¹³ found that shoulder girdle (neck, shoulder, upper arms) pains were significantly higher among workers performing task with repetitive movements. Repetitive movement is a common phenomenon in sonography and could be the cause of muscle weakness and pain experienced by the radiologist both in interventional and diagnostic sonography.

The daily routine of radiology reporting requires a prolonged focus on objects close to the eye, necessitating a persistent combination of ocular convergence and accommodation.¹⁴ Eye strain is a symptom complex that involves sensation of irritation to the eye itself, changes in vision (such as blurred or double vision and associated symptoms such as headache).¹⁵ Our study showed that 75.8% of respondents have had visual acuity test for eye strain. This is actually high compared to the prevalence of 36% reported among American radiologists.¹⁵

STUDY LIMITATIONS: we were unable to carry out objective ergonomic measurements. Detailed quantitative observations on posture and movements were not done as the study was questionnaire based. Further studies with highlight on the above factors are encouraged.

CONCLUSION: There was high prevalence of work – related musculoskeletal disorders among radiologists in Nigeria. This ranges from pains at the neck, shoulder, spine, upper and lower limbs as well as eyes strain. These were as a result of large volume of work in awkward and static posture for long hours.

RECOMMENDATION: The radiologist need to be well informed on the risk factors for work-related musculoskeletal disorders as they join the institution for training as resident radiologists. They should also be encouraged to take short breaks during working hours to rest the affected

muscles. They may also need to exercise regularly to strengthening the muscles around the neck, trunks and upper limbs to withstand the strain of the job.

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