WORK RELATED MUSCULOSKELETAL DISORDERS AMONG NIGERIAN MEDICAL LABORATORY SCIENTISTS

AFECȚIUNI MUSCULOSCHELETALE SPECIFICE LOCULUI DE MUNCĂ LA CERCETĂTORII MEDICALI LABORANȚI NIGERIENI

Bosede A. Tella8, Oluseun A. Fapojuwo2, Ogechi O. Willliams3

Key words: prevalence, work, musculoskeletal disorders, medical laboratory scientists

Cuvinte cheie: prevalență, muncă, afecțiuni musculoscheletale, cercetători medicali laboranți

Abstract

Introduction: Work-related musculoskeletal disorders (WRMDs) have been widely identified as a major problem affecting the work force. However, data on WRMDs in medical laboratory scientists in Nigeria are sparse.

Aims: This study aimed to investigate the prevalence of WRMDs, its associated job risk factors, impact and the coping strategies among medical laboratory scientists in Lagos state, Nigeria.

Method: Cross-sectional survey involving 282 respondents who completed a 32-item self-administered questionnaire modified from the Standardized Nordic Questionnaire. Descriptive statistics of mean, standard deviation and percentage and inferential statistics of Chi-square was utilized for data analysis. The level of significance was set at $p<0.05$.

Result: The 12-month and point prevalence rate of WRMDs in the respondents were 67.4% and 29.8% respectively. The low back (35.8%), neck (29.1%), and knees (19.1%) were the most affected body regions. Repetitive job performance was the most perceived job risk factor. Avoidance of lifting heavy objects the most reported coping strategy. Work performance was affected in 15.2% of respondents while 11% had absented from work due to WRMDs. There was significant association in the ages of respondents and 12-month prevalence (X^2=62.828; p= 0.007), years of experience and number of body parts affected (X^2=216.209; p< 0.001)

Conclusion: There is a high prevalence of WRMDs among medical laboratory scientists in Lagos state with the low back and neck being the most commonly affected. There should be increased awareness of preventive measures and proper ergonomic postures in work places of medical laboratory scientists.

Rezumat

Introducere: Afecțiunule musculoscheletale specifice locului de muncă (WRMDs) sunt considerate o problemă majoră care afectează forța de muncă. Date conctere privind WRMDs la cercetătorii medicali laboranți din Nigeria sunt puține.

Scop: Acest studiu își propune să analizeze prevalența WRMDs și riscurile asociate, impactul și strategiile de gestionare a acestora, în rândul cercetătorilor medicali laboranți din statul Lagos, Nigeria.

Method: Un chestionar încrucișat s-a aplicat la 282 respondenți, care au complectat un chestionar modificat autoadministrat de 32 de itemi, din Standardized Nordic Questionnaire. S-a realizat analiza statistică descriptivă precum media, abaterea standard și procentajul. Pentru statistica inferențială s-a folosit Chi-square. Nivelul de semnificație s-a stabilit la $p<0.05$.

Rezultate: S-a constatat o prevalență a WRMDs la respondenți de 67.4% și respectiv 29.8%. Regiunea lombară, (35.8%), zona cervicală (29.1%), și genunchii (19.1%) au fost cele mia afectate segmente ale corpului. Acțiunile repetitive au fost percepute ca fiind cel mai mare factor de risc. Evitarea ridicării obiectelor grele a fost cea mai raportată trategie de gestionare. Performanța la locul de muncă a fost afectată la 15.2% dintre respondenți iar 11% au absentat de la muncă datorită WRMDs. Există o asociere semnificativă între vârsta respondenților și prevalența la 12 luni (X^2=62.828; p= 0.007), anii de experiență și numărul părților corpului afectate (X^2=216.209; p< 0.001)

Concluzii: Există o mare prevalență a WRMDs la cercetătorii medicali laboranți din statul Lagos, coloana lombară, cevicală și genunchii fiind cele mai afectate zone. Este necesară accentuarea importanței măsurilor preventive și a posturilor ergonomice la locul de muncă, la cercetătorii medicali laboranți.

[8] Department of Physiotherapy, Faculty of Clinical Sciences, College of Medicine, University of Lagos. Lagos, Nigeria. atella@unilag.edu.ng

[2] Department of Physiotherapy, Faculty of Clinical Sciences, College of Medicine, University of Lagos. Lagos, PMB 12003, Surulere, Lagos, Nigeria.

Corresponding author: ofapojuwo@unilag.edu.ng,

[3] Department of Physiotherapy, Faculty of Clinical Sciences, College of Medicine, University of Lagos. Lagos, Nigeria. labakewilliams@yahoo.com

Introduction

Work-related musculoskeletal disorders (WRMDs) are conditions of the musculoskeletal system which have been proven or assumed to have at least a work-related background [1]. They have been described as one of the most common cause of long-term pain and physical disability that affects hundreds of millions of the working-class people across the world [2], resulting in high costs of worker's compensation [3]. The United States department of labour in 1994 stated that Work-related upper extremity musculoskeletal disorders accounted for more than 60% of all newly reported occupation related illnesses [4].

In recent years, investigations of WRMDs has attracted considerable attention because of its importance in the assessment of ergonomic risk factors involved in industrial work places [4]. Increasing evidence also suggests that musculoskeletal disorders are common in workers in the health care industry [5]. Physiotherapists, who commonly treat patients with these disorders, have been found to be at risk of WRMDs in the upper limb and low back [2,6,7,8]. Tinubu et al, [9] established that WRMDs are common among Nurses in Ibadan, South west, Nigeria. Tella et al [10] in a similar study on bank workers showed that neck and upper extremity repetitive stress injury is prevalent among bank workers, which may be associated with the type of job, work station design and job demand. High prevalence of low back pain has also been observed among those in the farming occupation because of awkward postures assumed while performing their farm tasks [11]. In a related study, Aweto et al [12], reported that low back pain was the most common area of discomfort, followed by the shoulder and then the neck among hairdressers.

Medical laboratory scientists, in addition to the risk involved with the use of hazardous substances, are constantly exposed to many ergonomic risk factors due to the nature of their work [13,14]. These ergonomic risk factors include their sitting posture, fixed or constrained body position, continual repetition of movement, excessive force concentrated on small parts of the body, such as the hand or wrist, a pace of work that does not allow sufficient recovery or rest between movements or tasks, standing for long periods of time, contact stress i.e. resting the forearms or wrists on the hard edge surface, pinch grip [15].

Agwaral et al [14] in a review of WRMDs among medical laboratory professionals showed overall prevalence's ranges of 40-60%, with neck being more prevalent at 18-78%. Several studies have reported high prevalence of musculoskeletal disorders among different occupational groups in Nigeria. [2,5,6,8,9,10,11,17], there is however dearth of information on the prevalence of musculoskeletal disorders among medical laboratory scientists, especially in developing countries, which includes Nigeria. This is pertinent due to lack of appropriate facilities and adequate information which are predominant in such environment.

Purpose

This study was therefore designed to evaluate the prevalence of work-related musculoskeletal disorders among medical laboratory scientists, the most commonly affected body parts, the risk factors of the WRMDs and the coping strategies adopted by the medical laboratory scientists in Lagos state, Nigeria.

Material and Methods

Subject

Respondents in the study were registered medical laboratory scientists who had at least one-year post qualification experience and were practicing in hospital based or private medical laboratories in Lagos state. The respondents were neither interns nor on industrial attachment at the time of the study.

Assessment

The questionnaire for this study was modified from questionnaires of previously published surveys. Its content validity was evaluated by a group of seasoned physiotherapists during a focus group session. It consisted of 32 items and seven sections. Section A sought information on the bio-data of the respondents. Section B included information on their work experience. Section C was on postures assumed at work. Section D was on information about symptoms of musculoskeletal injury. This section was a modification of the standardized Nordic questionnaire and it included a picture showing ten areas of the body that are vulnerable to work related injuries. The respondents were asked to tick the area of their injury. The respondents were also requested to indicate the most significant WRMD injury experienced and time of the first experience of the WRMD. Section E collected information on the effect of musculoskeletal disorder on job performance. Sections F and G sought information on the probable causes or risk factors of musculoskeletal disorder and coping strategies adopted in reducing the effect of the musculoskeletal strain on the body.

Three hundred and fifty-four copies of the questionnaire and informed consent forms were distributed individually to the medical laboratory scientists at their places of work. Copies of the questionnaire were completed and returned immediately.

Data Analysis/Means

Data was summarized using descriptive statistics of mean, standard deviation and percentage. Chi-square analysis was used to determine the association of prevalence of WRMDs with specialty area, years of experience, age, gender, duration of working hours and posture. The data was analysed using SPSS version 13 with the alpha level set at $p \leq 0.05$.

Result

Three hundred and fifty-four copies of the questionnaire were distributed but only 287 copies were returned giving a response rate of 81.1%. Five of the copies were invalid for analysis due to non-response or incomplete response in most parts of the questionnaire. Therefore, 282 copies of the questionnaire were analysed in this study. No reasons were given for non-response by those who did not return their copies of the questionnaire.

Socio-demographic characteristics of the respondents

One hundred and forty-nine (52.8%) male and 153 (47.2%) female laboratory technologists participated in the study. The age of the respondents ranged from 21 years to 64 years with a mean of 37.94 ± 8.50 years. Two hundred and seventy-seven respondents (98.2%) reported having a qualification in Medical Laboratory Science. Bachelor degree, Masters, fellowship and postgraduate diploma, were the highest educational attainment in 135(47.9%), 53(18.8%), 46(16.3%) and 29 (10.3%) of the respondents respectively.

Work experience and activity of respondents

The mean year of work experience of the respondents was 11.4 ±8.22years. Majority of the respondents 150 (53.2%) had between 1-10 years of work experience. Ninety-one (32.3%) respondents worked in a teaching hospital, 78 (22.7%) worked in private laboratories, 55 (19.5%) worked in general hospitals while 52 (18.7%) worked in private hospitals, public laboratories and research institutes. Majority (103, 36.5%) of the respondents specialized in microbiology/parasitology while 25 (8.9%) respondents specialized in histology. Most of the respondents (183, 64.9%) worked on an average of 0-40 specimens per day. Thirty-nine (13.8%) and 23 (8.2%) respondents worked on an average of 41-80 specimens and 81-120 specimens respectively. Two hundred and forty-six (87.2%) of the respondents work for 6-10 hours per day and most of the respondents (250, 88.7%) reported working for an average of 5-6 days per week.

Work postures and sitting platforms

At work, 211 (74.8%) of the respondents adopted a sitting and bending at the neck posture 186 (66%) adopted a standing and bending neck posture, 109 (38.7%) adopted the sitting and bending at the waist posture while 83 (29.4%) adopted the standing and bending at the waist position. Fifty-nine (20.9%) of the respondents stood and bent at the neck for less than 1 hour during work, 39 (13.8%) of the respondents stood and bent at the waist for less than 1 hour, 42 (14.9) of the respondents sat and bent at the neck for 4 hours while 27 (9.6%) of the respondents sat and bent at the waist for less than 1 hour (table 1). At work, 112 (39.7%) of the respondents sat on high backless stools. One hundred and thirty-one of the respondents were comfortable with their sitting platforms at work while 134 were dissatisfied with their sitting platforms at work especially the high backless stool (figure 1).

Table 1: Type and duration of work postures

	Posture Assumed			
	Standing and bending at the neck n(%)	**Standing and bending at the waist n(%)**	**Sitting and bending at the neck n(%)**	**Sitting and bending at the waist n(%)**
Not applicable	96(34)	199(70.6)	71(25.2)	173(61.3)
<1 hour	59(20.9)	39(13.8)	28(9.9)	27(9.6)
1 hour	26(9.2)	14(5)	25(8.9)	26(9.2)
2 hours	36(12.8)	7(2.5)	42(14.9)	10(3.5)
3 hours	26(9.2)	13(4.6)	31(11)	22(7.8)
4 hours	20(7.1)	4(1.4)	42(14.9)	11(7.8)
5 hours	13(4.6)	3(1.1)	27(9.6)	10(3.5)
>5 hours	6(2.1)	3(1.1)	16(5.7)	3(1.1)
Total	282(100)	282(100)	282(100)	282(100)

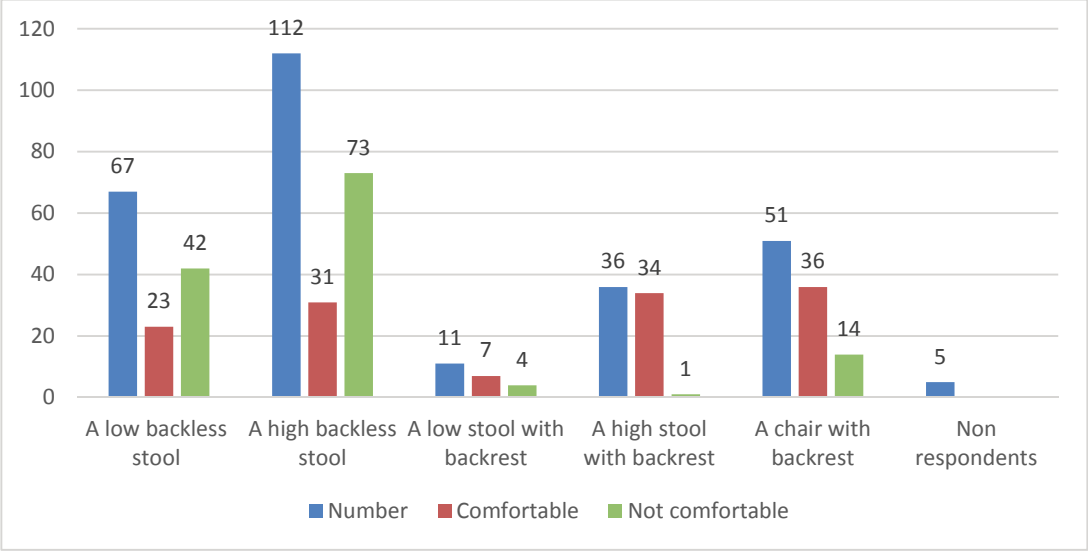

Figure 1: Sitting platform and comfort

Prevalence of WRMD

The prevalence of WRMD in respondents is shown in table 2. The 12-month prevalence of WRMD in the respondents was 67.4% while the point prevalence of WRMD in the respondents was 29.8%. Females had higher 12-month prevalence (34.8%). Respondents between the ages of 31 and 40 years had higher 12-month prevalence (25.2%). The low back was the affected body part with the highest 12-month prevalence (35.8%).

Table 2: Prevalence and Body Part affected

	12-month prevalence		Point prevalence	
Body part	**frequency**	**%**	**Frequency**	**%**
Neck	82	29.1	39	13.8
Shoulders	54	19.1	18	6.4
Upper back	29	10.3	10	3.5
Elbow	2	0.7	2	0.7
Low back	101	35.8	42	14.9
Wrist/hands	18	6.4	5	1.8
Hips/thigh	6	2.1	2	0.7
Knees	26	9.2	8	2.8
Ankles/feet	21	7.4	7	2.5

Treatment of WRMD

One hundred and one (35.8%) of the respondents reported that they sought treatment of which 26 (9.2%) and 35 (12.4%) were treated by physiotherapists and general practitioners respectively while 39 (13.8%) resorted to self-medication. Reasons cited by most of the participants who did not seek treatment include disappearance of symptoms, 20 (7.1%), ability to bear the pain, 14 (5%), taking rest to ease symptoms, 11 (3.9%), no time to seek treatment due to busy schedules, 10 (3.5%), felt unbothered since it occurred occasionally, 7 (2.5%), or work related, 6 (2.1%), procrastination, 2 (0.7%), and performance of exercises or yoga, 2 (0.7%). No reason was given by 11 (3.9%) of respondents

First experience of pain was observed during internship, 38 (13.5%), at the first 5 years after graduating, 69 (24.5%), 5 to 15 years after graduating, 50 (18.1%) and more than 15 years after graduating in 31 (11%) of participants.

Impact, risk factors and coping strategies of WRMD

Forty-three (15.2%) of the respondents reported that the WRMD affected their performance at work and 31 (11%) stated that the WRMD caused them to be absent. Repetitive performance of the same task was the major risk factor, reported by 240 (85.1%) of the respondents. Static positions, high number of procedures, inadequate rests and work schedules were reported in 213 (75.5%), 205 (72.7%), 165 (58.5%) and 142 (50.3%) of respondents respectively. The least reported risk factors are continuous reaching for objects away from the body 74 (26.2%), continuous work despite injury, 42 (14.9%) and heavy lifting, 27 (9.6%). To cope with their disorders or pain, majority 115 (40.8%) of the respondents avoided lifting heavy objects. One hundred and ninety (67.3%) respondents modified their positions continuously, 166 (58.9%), had to pause between procedures, 163 (57.8%) usually selected non-aggravating techniques and procedures while 89 (31.6%) and 66 (23.4%) usually alter their schedules and use analgesic drugs respectively. Sixty three respondents (22.4%) always sought medical advice, 18 (6.4%) respondents sought physiotherapy advice while 14 (5%) used alternative medicine.

Association of variables

The association of Specialty area, years of experience, age, gender, duration of working hours, work postures with prevalence of WRMDS among medical laboratory scientists are

presented in table 6. There was an association (p= 0.01) between the ages of the respondents and the 12-month prevalence of WRMDs. An association (p< 0.001) was also observed between the years of experience and the number of body parts affected.

Table 3: Chi-square association between Specialty, Years of Experience, Age, Gender, Working Hours, Working Postures and Prevalence of WRMDS

	Frequency (%)	Prevalence (%)	X^2	P-value
Specialty				
Haematology	81 (28.7)	53 (27.9)		
Microbiology/parasitology	103 (36.5)	66 (34.7)	7.03	0.07
Histology	25 (8.9)	23 (12.1)		
Chemical Pathology	73 (25.9)	48 (25.3)		
Years of Experience				
1-10	150 (53.2)	88 (46.8)		
11-20	85 (30.1)	72 (38.3)	38.28	0.14
21-30	36 (12.8)	22 (11.7)		
31-40	8 (2.8)	6 (3.2)		
No response	3 (1.1)			
Ages				
21-30	69 (24.5)	41(14.5)		
31-40	112 (39.7)	71(5.2)	62.83	0.01*
41-50	79 (28)	63(22.3)		
51-60	21(7.4)	14(5.0)		
>60	1(0.4)	1(0.4)		
Gender				
Male	149(52.8)	92(32.6)	3.74	0.05*
Female	153 (47.2)	98(34.8)		
Length of work hours				
1-5	7 (2.5)	12 (6.3)		
6-10	246 (87.2)	159 (84.1)	10.94	0.62
11-15	25 (8.9)	16 (8.5)		
16-20	2 (0.7)	2 (1.1)		
No Response	2 (0.7)			
Work Posture				
Standing and bending at the neck	79 (28)	77 (29.1)	2.01	0.16
Standing and bending at the waist	37 (13)	29 (10.9)	3.27	0.07
Sitting and bending at the neck	127 (45)	120 (45.3)	1.34	0.25
Sitting and bending at the waist	39 (14)	39 (14.7)	2.54	0.28

Discussion

This study was carried out to evaluate the prevalence of WRMDs among medical laboratory scientists in Lagos state. To the best of the knowledge of the authors no study has investigated the work related musculoskeletal disorders among medical laboratory scientists in Nigeria. Studies have investigated the WRMDS among health professionals (2,5,7,8) and awareness of ergonomics among medical laboratory scientists [18] but research has not focused on the peculiar work related disorders among medical laboratory scientists in this environment.

In this cross-sectional survey, a 12-month prevalence rate of 67.4% was observed. This suggests that WRMDs are a substantial problem among medical laboratory scientists in Lagos state. However, this prevalence is slightly higher than the previously reported in literature. Agwari et al [13] observed a prevalence rate of 21.2%, Agwari et al [14] in a review also observed a prevalence rate of 40%-60%. This may be due to the low knowledge and application of ergonomic principles by medical laboratory scientists [18] and the work settings obtainable

in the Nigerian environment. Majority of the respondents reported a gradual onset which is typical of WRMDs.

The highest incidence of pain occurred in respondents that work in teaching hospitals. This may be due to the high work demand associated with these hospitals. There was also a high incidence of WRMDs among those respondents who specialized in microbiology and parasitology. This may be due to their frequent static posture (i.e. sitting and bending at the neck) when they use the microscope. It was also noticed that they used more of the high backless stool which could also be a contributing factor to the occurrence of WRMDs.

This study revealed a significant association between age and prevalence of WRMDs among medical laboratory scientists. The highest incidence of WRMDs occurred in respondents within the age group of 31-40 years. This may suggest that medical laboratory scientists in this age group are more prone and are commonly affected by WRMSDs. This might be due to the relatively higher level of work activity performed by medical laboratory scientists in this age group. This agrees with the study of Guo et al [22], who reported that the prevalence of musculoskeletal disorders increases as people enter their working years and by age 35, most people have had their first episode of WRMDs.

A high incidence of WRMDs occurred in respondents with working experience of between 1-10 years and decreasing as the years of experience increases though inferential statistics showed no significant association between years of experience and prevalence of WRMDs. This suggests that most medical laboratory scientists usually have WRMDs in their first 10 years of practice. This agrees with the study by Friedrich et al, [23], which showed that there is no significant effect of years working experience on WRMDs. But as the years of experience increase, the respondents tend to be affected in multiple areas.

The low back and the neck were the most frequent area of pain and discomfort because of work irrespective of their specialty, thereby corroborating previous findings by Friedrich et al, [23] and Maul et al, [24] who reported that the lower back and neck were the most frequently affected body part by WRMDs. This could be due to their ergonomically unsuitable sitting positions, work platforms, frequent use of the microscope and computers.

There was a very high incidence of WRMDs among those who use high backless stools with the lowest incidence occurring among those using the low stools with backrests. Also, there was a high incidence of WRMDs occurring in those respondents who reported being uncomfortable with their sitting platform at work with majority of them using high backless stools. This may imply that their sitting platforms could be a cause for their low back pain as majority of those respondents using high backless stools reported pain in the low back.

Repetitive tasks, performing lots of procedures, insufficient breaks, over exertion and static positions were the most cited risk factors for WRMDs by the respondents. This suggests that tasks performed by the medical laboratory scientists have a significant effect on the occurrence of WRMDs.

The respondents in this study adopted varying coping techniques ranging from rest to drugs. But scantily few sought medical advice concerning their condition giving reasons like “no need”, “the pain disappeared after rest”, “no time” etc. Even fewer sought physiotherapy advice concerning their condition possibly because of the lack of knowledge of the role of physiotherapy in the management of various WRMDs. This showed the level of awareness of medical laboratory scientists on the proper steps to take in the alleviation of pain and discomfort arising from WRMDs. This also indicates the need for enlightenment about proper management of WRMDs among Medical Laboratory Scientists.

Conclusion

There is a high prevalence of WRMDs among medical laboratory scientists in Lagos state with the low back and neck most commonly affected irrespective of specialty of medical laboratory scientists. There is little or no awareness about physiotherapy and their role in management of WRMDs. Age of the medical laboratory scientist is a predisposing factor to WRMDs. The number of body parts affected is associated with the number of years of experience. There should be increased public awareness on the prevalence of musculoskeletal disorders among Medical Laboratory Scientists and an increased awareness of preventive measures and proper ergonomic postures in their work places.

Key points to note from this study are that medical laboratory scientists in Lagos state, Nigeria are at risk of WRMDs due to the work environment and peculiar tasks, the low back is the most frequently injured part of the body in respect of WRMDs and advocacy on preventive measures is required to reduce occurrence of WRMDs among medical laboratory scientists.

Limitations

Self- reported responses were utilized in this study for data. This might be a limitation as recall inaccuracies may occur.

Acknowledgement

The authors wish to acknowledge the assistance of the Chairman, Association of Medical Laboratory Scientists of Nigeria, Lagos state and all the medical laboratory scientists who participated in this study.

References

[1] Luttmann, A., Jäger, M., Griefahn, B. (2003) Protecting Workers' Health Series No. 5. Preventing musculoskeletal disorders in the workplace. World Health Organization

[2] Adegoke, O.A., Akodu, A.K., Adewale, L. (2008). Work-related musculoskeletal disorders among Nigerian physiotherapists. *BMC Musculoskeletal Disorders* 18(9), 112. doi: 10.1186/1471-2474-9-112.

[3] Dunning, K.K., Davis K.G., Cook, C., Kotowski, S.E., Hamrick, C., Jewel, G., Lockey, J. (2010). Costs by industry and diagnosis among musculoskeletal claims in a state worker's compensation system: 1999 – 2004. *American Journal of Industrial Medicine* 53, 276 – 286.

[4] Silverstein, B.A, Stetson, D.S., Keyserling, W.M., Fine, L.J. (1997). Work-related musculoskeletal disorders: Comparison of data sources for surveillance. *American Journal of Industrial Medicine* 31(5), 600-608.

[5] Ayanniyi, O., Nudamajo, O.S., Mbada, C.E. (2016). Pattern of work-related musculoskeletal disorders among Nigerian hospital workers. *Journal of Environmental and Occupational Science* 5(1), 18-24

[6] Bork, B.E., Cook, T.M., Rosecrance, J.C., Engelhardt, K.A., Thomason, M.E., Wauford, I.J., Worley, R.K. (1996). Work-related musculoskeletal disorders among physical therapists. *Physical Therapy* 76(8), 827-835.

[7] Obembe, A., Onigbinde, A., Johnson, O., Emechete, A., Oyinlola, M. (2008). Occupational Injuries among Physical Therapists in South-West, Nigeria. *Nigerian Journal of Medical Rehabilitation* 13, 1- 2

[8] Tella, B.A., Aiyejusunle, C.B., Adekunle, K.M, Odebiyi, D.O, Okafor, U.A.C. (2009). Work Related Musculoskeletal Disorders among Physiotherapists in Nigeria. *Ghana Journal of Physiotherapy* 1(1), 6-9

[9] Tinubu, M.S., Mbada, E., Oyeyemi, L., Fabunmi, A. (2010). Work-related Musculoskeletal Disorders among Nurses in Ibadan, South-west Nigeria: a cross-sectional survey. *BMC Musculoskeletal Disorders*. 20(11),12. doi: 10.1186/1471-2474-11-12.

[10] Tella, B.A., Akodu, A.K., Fasuba, O.O. (2011). The Prevalence of Neck and Upper Extremity Repetitive Stress Injury among bank workers in Lagos, Nigeria. *The Internet Journal of Rheumatology* 6(2), 1-6

[11] Tella, B.A., Akinbo, S.R.A., Asafa, S.A., Gbiri, C.A., (2013). Prevalence and Impact of Low Back Pain among Peasant Farmers in South-West Nigeria. *International Journal of Occupational Medicine and Environmental Health* 26 (4), 621-627

[12] Aweto, H.A., Tella, B.A., Johnson, O.Y. (2015). Prevalence of Work-Related Musculoskeletal Disorders among Hairdressers. *International Journal of Occupational Medicine and Environmental Health.* 28(3)**,** 545-55. doi 10.13075/ijomeh.1896.00291.

[13] Agrawal, P.R, Maiya, A.G., Kamath, V., Kamath, A. (2014). Musculoskeletal Disorders among Medical Laboratory Professionals-A Prevalence Study. *Journal of Exercise Science and Physiotherapy* 10(2), 77-81

[14] Agrawal, P.R., Maiya, A.G., Kamath, V., Kamath, A. (2014). Work related musculoskeletal disorders among medical laboratory professionals: a narrative review. *International Journal of Research in Medical Sciences* 2(4),1262-1266

[15] Eshetu, L.H., Bineyam, T., Fatuma, H. (2012). Ergonomic workstations and work-related musculoskeletal disorders in the clinical laboratory. Laboratory Medicine 43, e11-19.

[16] Sillanpaa, J., Huikko, S., Nyberg, M., Kivi, P., Liappala, P., Uiti, J. (2003). Effect of work in visual display unit on musculoskeletal disorders in the office environment, Occupational Medicine (Lond) 53 (7): 443-451

[17] Adedoyin, R.A., Idowu, B.O., Adagunodo, R.E., Idowu, P.A. (2004). Musculoskeletal pain associated with the use of computer systems in Nigeria. *The Internet Journal of Pain, Symptom Control and Palliative Care* 3(2), 1-6

[18] Oladeinde, B.H., Ekejindu, I.M., Omoregie, R., Aguh, O.D. (2015). Awareness and Knowledge of Ergonomics Among Medical Laboratory Scientists in Nigeria. Annals of Medical and Health Sciences Research 5(6), 423-427

[19] Alireza, C., Sayed, I.T., Marzieh, T., Fatemeh, G. (2007) Musculoskeletal problems among workers of an Iranian communication company. *Indian Journal of Occupational and environmental Medicine* 11(1), 32- 36

[20] d'Errico, A., Caputo, P., Falcone, U., Fubini, L., Gilardi, L., Mamo, C., Migliardi, A., Quarta, D., Coffano, E. (2010). Risk factors for upper extremity musculoskeletal symptoms among call centre employees. *Journal of Occupational Health.*52(2),115-124.

[21] Akodu, A.K., Tella, B.A., Adebisi, O.A. (2013). Prevalence, Pattern and Impact of Musculoskeletal Disorders among Sewing Machine Operators in Surulere Local Government of Lagos State, *Nigeria. Indian Journal of Physiotherapy and Occupational Therapy* 8(2),15-20.

[22] Guo HR, Tanaka S, Cameron LL, Seligman PJ, Behrens VJ, Ger J, Wild DK, Putz-Anderson V (1995). Back pain among workers in the United States: national estimates and workers at risk. *American Journal of Industrial Medicine*. 28(5), 591-602.

[23] Friedrch, M., Cermark, T., Heiller, I. (2000). Spinal troubles in sewage workers: Epidemilogical data and work disability due to low back pain. *International Archives of Occupational and Environmental Health.* 73(4), 245-254.

[24] Maul, I., Laubli, T., Klipstien, A., Krueger, H. (2003). Course of low back pain among nurses: a longitudinal study across eight years. *Occupational and Environmental Medicine.* 60(7):497-503.