The Prevalence and Associated Risk Factors of Musculoskeletal Disorders among Carpenters in Kano Metropolis, Nigeria

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Abstract

Introduction: Occupation is as old as humans and is not devoid of health risks. Carpentry is a skilled occupation that could predispose workers to associated health risks such as musculoskeletal disorders (MSDs). The carpentry work is becoming increasingly popular in the northern part of Nigeria but the musculoskeletal disorders associated with the occupation have not been investigated. **Objectives:** To determine the prevalence and associated risk factors of Musculoskeletal Disorders among Carpenters in Kano Metropolis. **Methodology:** Three hundred (300) carpenters selected using a purposive sampling technique participated in this cross-sectional study. Their relevant information was obtained using a modified Nordic Musculoskeletal Questionnaire (NMQ). Descriptive statistics of frequencies were used to summarize the data. Spearman rank order correlation was used to analyze the relationships between the MSDs and socio-demographic characteristics using Statistical Package for Social Science (SPSS) version 20.0, the alpha level was set at 0.05. **Result:** The response rate was 100% with the majority (63.7%) aged between 18-29 years, 62% were single and 62.7% of them obtained a minimum of secondary school education. The annual and point prevalence of MSDs among carpenters were 82.7% and 41.7% respectively. Shoulder (50.4%) and lower back (21%) regions have the highest MSD prevalence during the last 12 months and last 7 days respectively. There is a statistically significant positive correlation between age and shoulder and lower back MSDs ($p < 0.05$). **Conclusion:** The prevalence of MSDs among carpenters in the Kano metropolis is high, shoulder and lower back are the commonest affected regions. The prevalence of MSDs increases with age.

***Keywords**:* Musculoskeletal Disorders, Risk factors, Carpenters, Kano

Introduction

Occupation is the central aspect of human experience and it provides the basic essential needs for human survival (Wilcock, 1993). People earn income through

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occupation, which is necessary to sustain basic living needs. These occupations could be white collar jobs such as the work of doctors, engineers, administrators etc., or blue-collar jobs like tailoring, mechanic work, carpentry etc (Marandi & Moghaddas, 2013). However, each occupation is attributed to certain occupational risks, some of these occupational risks are due to, human nature (individual behaviour and methodologies in performing work), technical nature (working environment, equipment, tools, machines and materials) or other causes outside the workplace (Energy De Portugal [EDP], 2009).

Carpenters construct and repair items and structures made from wood such as furniture, stairways, doorframes, partitions, rafters, kitchen fittings, bridge support and building frameworks etc. They have a higher rate of work-related musculoskeletal injuries and illnesses because of the type of work they do, than the national average (Bureau of Labour Statistics, 2016).

Studies have been carried out to establish a relationship between certain jobs and risk factors that are associated with the development of MSDs (Bernard, 1997; da Costa & Vieira, 2010). Surprisingly, although carpentry is a common job worldwide, there is a lack of studies to assess the MSDs these workers are exposed to. Carpentry-related risk factors for MSDS can be physical, like force application e.g. lifting, carrying, pulling, pushing; use of tools, repetition of movements and awkward and static postures (working with hands above shoulder level, or prolonged standing and sitting); Other include local compression of tools and surfaces, vibration and excessive cold or heat etc (European Agency for Safety and Health at Work, 2007).

Lemasters et al (1998) have previously reported the prevalence of MSDs among carpenters within the range of 20%–24% but the population were carpenters doing drywall or ceiling, finishing or framing, and the building of concrete forms. The study was carried out in the USA where the nature of the work and the working environment can differ from other parts of the world. Work-related MSDs are a common problem in both developed and developing countries, Nigeria inclusive. Several studies have been carried out on MSDs among different types of occupations like secretaries (Akodu *et al.,* 2015), construction workers (Ekpenyoong *et al*. 2015), nurses (Tinubu *et al.,* 2010), truck drivers and official workers (Mozafari, *et al*., 2014), butchers (Kaka, *et al.,* 2016), physiotherapists (Adegoke *et al.,* 2010), welders (Gbiri *et al.,* 2012), healthcare professionals (Sokunbi, *et al*., 2016) etc which show that every worker either skilled or unskilled stands a risk of developing musculoskeletal disorders; carpenters inclusive.

Carpentry jobs are becoming more popular in the Northern part of Nigeria, especially in big cities like Kano and the carpentry industry plays a very big role in reducing the

number of thousands of unemployed youths in the region. These carpenters carry out most of their activities with the assumption of poor posture, coupled with long working hours, repetitive movements of the body and poor workstation design. Others include; a lack of technological advancement in the carpentry industry, absence of effective work injury prevention programs, insufficient/non-functioning vocational and technical schools for effective training and cultural differences among others.

Nowadays, there is a rise in demand for carpentry works due to modernization in wedding accessories and also office stationaries. Therefore this study investigated the prevalence of musculoskeletal disorders among carpenters in the Kano metropolis. To the best of our knowledge, there is no known published work that was conducted to investigate MSDs among carpenters who specialize in furniture making, which is very popular in the Northern Nigeria region.

The study aimed to find out the prevalence and associated risk factors of Musculoskeletal Disorders among Carpenters in Kano Metropolis, Nigeria.

Method

Study Population and Design

In the cross-sectional survey, three hundred (300) carpenters were recruited from Gwale Local Government of Kano State. After signing consent papers, questionnaires were given to them. The carpenters who make mainly furniture and have a working experience of at least 12 months duration were included. Carpenters who have additional occupations like driving furniture and wood to various destinations or are involved in other paid jobs were excluded.

Data Collection

Ethical clearance to conduct the study was obtained from the ethics committee of the Kano State Hospitals Management Board (MOH/OFF/797/T.I/617). An introductory letter was obtained from the Physiotherapy Department of Bayero University Kano which was submitted to the Kano State Carpenters Association and written permission to conduct the study was granted by the leadership of the association. All participants consented to the study after explaining the purpose and importance of the study by the researcher. Nordic musculoskeletal questionnaire, a self-administered questionnaire was used as an assessment tool for MSDs in different body regions for the carpenters. It was self-administered by those who can read and understand English and the Hausa version was administered to participants who cannot read and understand the English language.

The data was collected between May 2017 and November 2017. The questionnaire consists of 27 items that describe different parts of the body and it is used to assess the level of pain, discomfort and aches. The questionnaire was categorized into three

sections; section A comprises socio-demographic variables (age, gender, height, weight, dominant hand, level of education, marital status, and tribe). Section B comprises questions about risk factors (duration of work, years of experience, nature of work and work posture). Section C comprises questions inquiring about trouble encountered around the nine human body areas defined (neck, shoulders, upper back, lower back, elbows, wrists, thighs, knees, ankles) (Kuorinka. *et al.,* 1987). Participants completed the questionnaires immediately and for those who were very busy at the time, the questionnaires were retrieved a day after.

Data Analysis

Descriptive statistics of frequencies were used to summarize the data. Spearman rank order correlation was used to determine the relationship between MSDs and the risk factors (age, duration of work, years of experience, BMI, marital status, level of education, working posture, arm dominance and nature of work). The statistical analysis was performed using IBM SPSS Statistics version 20.0, alpha level was set at 0.05.

Results

Socio-Demographic Characteristics of the Participants

Table 1 shows the socio-demographic characteristics of the participants. A total number of three hundred 300 carpenters are males within the age range of 18-59 and 63.7% of the participants are within the range of 18-29 years. Up to 70% have a normal BMI range, 81% are right-handed, 62% are singles and 75.7% of the participants attain a minimum of secondary school education.

Annual Prevalence of MSDs in Different Body Parts

Table 2 shows the pattern of MSDs in different body parts in the last 12 months. The shoulder is the most frequently affected (50.4%) followed by the wrist/hand and lower back with a frequency of 48.3% and 47% respectively while the upper back had the lowest frequency of 17%. Overall, 82.7% of the participants had MSDs in one or more joints in the last 12 months.

Point Prevalence of MSDs at Different Body Parts

Table 2 shows the pattern of MSDs reported at different body parts in the last 7 days, in which the lower back had the highest frequency (21%), while the knees had the lowest frequency of 3.3%. Overall, 41.7% of the participants had MSDs in one or more joints in the last 12 months.

Table1: Socio-Demographic Characteristics of the Participants

Variables (%)	Frequency (n)	Percentage
AGE (YEARS)		
18-29	191	63.7
30-39	82	27.3
40-49	25	8.3
50-59	2	0.7
GENDER		
Male	300	100
Female	-	-
BODY MASS INDEX (kg/m^2)		
Underweight	46	15.3
Normal	235	78.3
Overweight	18	6.0
Obesity class I	1	0.3
DOMINANT ARM		
Right	243	81.0
Left	57	19.0
TRIBE		
Hausa	295	
Yoruba	5	1.7
MARITAL STATUS		
Single	186	62.0
Married	114	38.0
LEVEL OF EDUCATION		
Qur'anic/Arabic school	39	13.0
Primary	34	11.3
Secondary	188	62.7
Tertiary	39	13.0

Table 2: Frequency of MSDs at Different Body Parts in the last 12 Months and Last 7 Days Among the Participants

Body parts	**n (%) Last 12 months**	**n (%) Last 7 days**
Neck		
No	220 (73.3%)	289(96.3)
Yes	80 (26.7)	11(3.7)
Shoulder		
No	149(49.7)	247(82.3)
Yes in the right shoulder	51(17.0)	41(13.7)
Yes in the left shoulder	11(3.7)	4(1.3)
Yes in both shoulders	89(29.7)	8(2.7)
Elbow		
No	205(68.3)	279(93)
Yes in right elbow	64(21.3)	15(5)
Yes in left elbow	11(3.7)	2(0.7)
Yes in both elbow	20(6.7)	4(1.3)
Wrists/hands		
No		155(51.7)
245(81.7)		
Yes in the right wrist/hand	100(33.3)	43(14.3)
Yes in the Left wrist/hand	17(5.7)	5(1.7)
Yes in both wrist/hand	28(9.3)	7(2.3)
Upper back		
No	24(83.0)	283(94.3)
Yes	51(17.0)	17(5.7)
Lower back		
No	159(53.0)	237(79)
Yes	141(47.0)	63(21)
Hips/thigh/buttocks		
No	201(67.0)	276(93)
Yes	99(33.0)	24(8.0)
Knees		
No	242(80.7)	290(96.7)
Yes	58(19.3)	10(3.3)
Ankles		
No	231(77.0)	286(95.3)
Yes	69(23.0)	14(4.7)
Overall MSDs in the last 12 months		
Yes	248(82.7)	125(41.7)
No	52(17.3)	175(58.3)

Activities of Daily Living (ADL) Restricted due to Musculoskeletal Pain in Different Body Parts over the Last 12 months.

Table 3 shows the results of activity of daily living restricted by pain in the last 12 months. Only 11.3% of participants acknowledged that wrist pain prevented them from ADL which was the highest, while ankle pain recorded the list restriction (0.7%). Overall, only 18.7% of the participants had restriction of ADLs in one or more joints due to pain over the last 12 months.

Risk factors of Musculoskeletal Pain among Participants

Table 4 shows the risk factors for musculoskeletal disorders (MSDs). Most of the participants (61.3%) worked for about 9-12 hours per day, 63% worked daily and 34% had 6-10 years of working experience. The repetitive nature of work is the dominant work pattern (74.7%) and 98% of the participants adopt standing and bending during working.

Relationship between Socio-Demographic/Risk Factors and Overall Annual and Point Prevalence of MSDs

Table 5 shows the relationship between risk factors and overall annual and point prevalence of MSDs among the participants, which reveals that there is no significant relationship between overall MSDs and risk factors during both the last 12 months and 7 days ($p>0.05$) except for age ($r=0.137$, $p=0.018$ and $r=0.181$, $p=0.002$ for the last 12 months and 7 days respectively)

Table 3: Activities of Daily Living Prevented due to MSDs at Different Body Parts over the last 12 months

Body parts/Limitation	Frequency (n)	Percentage (%)
Neck		
No	293	97
Yes	7	2.3
Shoulder		
No	286	95.3
Yes	14	4.7
Elbow		
No	296	98.7
Yes	4	1.3
Wrists/hands		
No	266	88.7
Yes	34	11.3
Upper back		
No	293	97.7
Yes	7	2.3
Lower back		
No	276	92.0
Yes	24	8.0
Hips/thigh/buttocks		
No	296	98.7
Yes	4	1.3
knees		
No	296	98.7
Yes	4	1.3
Ankles		
No	298	99.3
Yes	2	0.7
Overall restriction in one or more joint		
No	244	81.3
Yes	56	18.7

Table 4: Risk Factors of MSDs among the Carpenters

Variables	Frequency (n)	Percentage (%)
Working hours per day		
1-4	2	0 .7
5-8	114	38
9-12	184	61.3
12 & above	0	0
Working days per week		
1-2	3	1.0
3-4	15	5.0
5-6	93	31
Daily	189	63
Years of working experience		
1-5	99	33
6-10	102	34
11-15	60	20
16 and above	39	13
Nature of work		
Repetitive	224	74.7
Vibratory	53	17.7
Forceful	22	7.3
Handling heavy load	1	0.3
Work Posture		
Squatting	3	1.0
Kneeling	2	0.7
Standing and bending	295	98.3

Table 5: Relationship between the Demographics/Risk factors and overall MSDs of the participants in the last 12 months and last 7 days

Variables	r	p-value
During the last 12 months		
Age	0.137	0.018*
BMI	0.082	0.158
Arm dominance	-0.048	0.411
Marital status	0.086	0.136
Level of education	-0.014	0.808
During last 7 days		
Age	0.181	0.002*
BMI	0.104	0.073
Arm dominance	0.004	0.941
Marital status	0.077	0.186
Level of education	-0.024	0.678
During the last 12 months		
Hours worked per day	-0.058	0.316
Days worked per week	-0.065	0.259
Years of working experience	0.047	0.420
Nature of work	-0.057	0.321
The posture assumed while working	0.079	0.173
During the last 7 days		
Hours worked per day	-0.038	0.517
Days worked per week	-0.074	0.201
Years of working experience	0.047	0.420
Nature of work	-0.066	0.251
The posture assumed while working	0.057	0.326

**=Correlation is significant at the 0.05 level (2-tailed), r= Spearman's rho*

Discussion

This study investigated the prevalence of musculoskeletal disorders among 300 carpenters in the Kano metropolis and with a 100% response rate. All the participants are males and this is not surprising because carpentry is a male-dominated occupation. About 81% of the participants were right dominant which is supported by Lutsky, *et al* (2016) on hand dominance and common hand conditions. The percentage of marital status among the participants was found to be 62.0% for single, although getting married is the target of every adult in this part of the world, this may be related to the high percentage of carpenters that are in the age range of 18-29 years. The overall prevalence of MSDs among the carpenters was found to be 82.7% and 41.7% in the

last 12 months and 7 days respectively. During the past 12 months, 82.7% was found to be the overall prevalence. This makes it is similar to a study by Lemasters, *et al.,* (1998) on the prevalence of MSDs in active union carpenters Lemasters et al 1998, which reported a 12-month highest prevalence of 20-24% among carpenters working at construction sites. The high prevalence in our study may be connected with the fact that From it was shown that the majority of the participants (78.3%) had a BMI within the normal range. Also, 81% of the participants were right-handed therefore making it similar to a study by Lutsky, *et al* (2016) on hand dominance and common hand conditions. The percentage of marital status among the participants was found to be 62.0% for single. This may be related to the high percentage of carpenters that are in the age range of 18-29 years. Individuals within this age range are not usually married especially in this part of the country because of socio-economic factors. The study also showed that 62.7% of the participants attended secondary school.

The study has also investigated that standing and bending with a percentage close to 100% (98.3%) is the commonest risk factor, this result was in agreement with to result of the study by Akodu *et al.,* (2015) reporting low back pain among the participants may be as a result of awkward posture.

This study also revealed the joint with the highest prevalence of MSDs to be the shoulder joint with 50.4% followed by wrist/hand (48.3%), then lower back having 47% and upper back has the lowest prevalence of 17% during the last 12 months. During the past 12 months, 82.7% was found to be the overall prevalence. This makes it similar to a study by Lemasters, *et al.,* (1998) on the prevalence of MSDs in active union carpenters and also in agreement with the findings (71%) of a study by Akodu *et al.,* (2015) on the prevalence of work-related musculoskeletal disorders (WMSDs) of the upper extremity and low back among secretaries. The result of this study also revealed that carpenters were restricted from carrying out their daily activities due MSDs in the wrist/hand (11.3%), and lower back (8.0%) during the last 12 months, and this result was in tandem with that of a study by Kaka, et al., (2016) on work-related musculoskeletal disorders among butchers in Kano Metropolis, Nigeria. Probable reasons for wrist/hand problems among carpenters could be due to constant repetitive movement of the wrist/hand while working at an uncontrolled pace e.g. during screwing and unscrewing and manual wood cutting using a saw.

The study also investigated the relationship between age and overall MSDs during the last 12 months and last 7 days. A statistically significant relationship exists between age and shoulder MSDs, age and lower back MSDs, this result was in agreement with that of Mozafari *et al.,*(2015) which shows that a strong significant association exist between age and shoulder, wrist and lower back. Prevalence of the MSDs increased with age and shoulder, wrist and lower back were associated with high prevalence.

This is not surprising because, manual carpentry work, which is obtainable among the study participants, involved wrist and should activities with associated lower back flexion.

Also, the result from Table 5 shows that there was no significant relationship between overall MSDs and risk factors (hours worked per day, days worked per week, years of working experience, nature of work and posture assumed while working). This makes it similar to a study on the analysis of work-related musculoskeletal disorders among butchers in the Kano metropolis, Nigeria by Kaka *et al.,* (2016).

The Relationship between BMI and MSDs was not significant, making these findings contrary to Viester *et al* (2013) study which showed that overall high BMI (overweight and obesity) was associated with an increased 12-month prevalence of musculoskeletal symptoms. This difference in result could be because the majority (78.3%) of the carpenters had BMI within the normal range.

The result of this study also revealed that there was no significant relationship between overall MSDs and marital status, this is also contrary to a study by Kaka *et al.,* (2016) that found an association between marital status and WRMSDs, with more married individuals reporting lower back complaints. This difference in findings could be attributed to the fact that the majority of the respondents in this study were single. With regard to the relationship between level of education and overall MSDs, it showed that there was no significant relationship between them.

Conclusion

It can be concluded that there is a high prevalence of musculoskeletal disorders among carpenters within the Kano metropolis with shoulder, lower back and wrist being the most prevalent. A significant association between age and MSDs exists. With increasing age, MSDs are more prevalent.

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