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Original Article

An Analysis of Work-Related Musculoskeletal Disorders Among Butchers in Kano Metropolis, Nigeria

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ABSTRACT

Background: Butchering is often associated with high rates of work-related musculoskeletal disorders (WRMSDs). However, published work on the prevalence of WRMSDs among butchers in Nigeria is scarce. This is important because meat processing practices differ across geographical and cultural locations. This study was therefore aimed at analyzing WRMSDs among butchers in Kano metropolis.

Methods: Sociodemographic and work-settings information was obtained from 102 male cattle butchers (age, 37.49 ± 11.68 years) through survey. Information on the prevalence and pattern of musculoskeletal disorders was obtained from the respondents using the Standardized Nordic Questionnaire. Additional information on health seeking practices was also obtained using a pro forma. Associations between the prevalence of WRMSDs and each of the sociodemographic data and work settings were explored using Chi-square analysis. The level of significance was set at $p < 0.05$.

Results: The 12-month and point prevalence rates of WRMSDs among butchers in this study were 88.2% and 74.5%, respectively. Whereas lower back complaints (66.7%) were the overall and lower body quadrant's most commonly reported WRMSDs among the butchers surveyed, wrist/hand complaints were the leading upper quadrant's (45.1%) most commonly reported WRMSDs among the respondents. There were significant associations between age and majority of WRMSDs in the body regions. Only 23.3% of the 90 individuals who had WRMSD visited the hospital to seek redress for their WRMSD.

Conclusion: The prevalence of WRMSDs is high among butchers in Kano Metropolis. Few individuals with WRMSD utilize healthcare facilities. Age is a major risk factor in this setting.

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1. Introduction

Work-related musculoskeletal disorders (WRMSDs) refer to a gamut of inflammatory and degenerative disorders initiated or aggravated largely by the performance of work or associated work settings [1,2]. It is the major cause of pain, disability, absenteeism, reduced productivity, and heavy financial costs among workers worldwide [2–4]. Although not fatal, WRMSDs have the potential of developing into serious injuries in the musculoskeletal system if

ignored [5]. Most WRMSDs are accumulative disorders resulting from protracted exposure to loads of varied intensity at work [5]. Risk factors often cited for musculoskeletal disorders in the workplace include rapid work pace and repetitive motion, forceful exertions, nonneutral body postures, and vibration [6,7]. Although it is unclear as to what extent musculoskeletal disorders are caused by work, their impact on work is huge. Compelling evidence shows that physiological and individual factors play a role in the development of WRMSDs [7–11].

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WRMSDs affect various occupations ranging from blue collar to white collar workers [3,12–15]. Blue collar workers, often faced with higher physical work demands, are reported to experience more WRMSDs than white collar workers [10,16,17]. Although WRMSDs have been widely reported in most blue collar occupations, meat butchers have not been extensively studied.

The schedule of a typical meat processing industry worker often involves a series of events such as slaughtering, boning, cutting, and packing. These activities involve the frequent use of forceful exertions, rapid work pace, repetitive motions, and nonneutral body postures sustained over a long period [18,19]. As physical work demand is a risk factor for WRMSDs, workers with high physical work demands are expected to have increased prevalence of musculoskeletal disorders [20]. Studies suggest that butchers are likely to experience one occupational hazard or another. Such hazards include infections, lung cancer, and knife injuries [21–23]. Omokhodion and Adebayo [21] highlighted musculoskeletal disorders as one of the major occupational hazards faced by butchers in the workplace. However, information on the prevalence, pattern, and risk factors of WRMSDs among butchers in these settings is not readily available. This may become more relevant in developing countries (e.g., Nigeria), where the meat processing industry is not so well organized. In the developed world, there is a chain of organized, skilled labor in the meat processing industry including job specifications such as butchers, meat processor, and packagers [18]. Conversely, in Nigeria, there is no such organized labor; the man who butchers the animal is usually the one who processes, packages, and sells the meat. This further predisposes butchers in this environment to higher degrees of WRMSDs. This study was therefore aimed at determining the prevalence and risk factors of WRMSDs among butchers working in selected abattoirs in Kano metropolis, Nigeria.

2. Materials and methods

2.1. Participants

Our study, which was designed as a descriptive cross-sectional study, explored WRMSDs among butchers in Kano Metropolis, Nigeria. The ancient city of Kano, a densely populated cosmopolitan city, is home to > 3 million residents. The major occupations among Kano residents are trading, farming, and cattle rearing. Meat sold in the markets of Kano is obtained from one major abattoir, and a few other slaughterhouses within the metropolis, all of which are duly registered and regulated by the Kano state ministry of agriculture. All eligible and consenting butchers ($N = 167$) who attended a 1-day WRMSD prevention program, organized for and well attended by members of the Association of butchers in Kano Metropolis, were invited to participate in the study. The workshop was facilitated by two of the researchers (K.B. and T.T.M.).

2.2. Instrument

Information on the prevalence and pattern of musculoskeletal disorders was obtained from participants using the Standardized Nordic Questionnaire (SNQ) [24]. The SNQ included a drawing with nine anatomical regions clearly marked. Respondents were asked if they “ever had trouble in the past 12 months (ache, pain, or discomfort)” around five different upper quadrant body regions (neck, shoulder, elbow, wrist/hand, and upper back) and four different lower quadrant body regions (lower back, hip/thigh, knee, and ankle/feet). Furthermore, respondents who had such troubles in the past 12 months were asked if such troubles prevented them

from doing their normal work (at home or away from home). Other information such as sociodemographic characteristics (such as age, sex, highest educational attainment, years of working experience, and marital status), work settings (nature of work, working hours per day, working days per week, posture often adopted at work), WRMSDs on any body part/region in the past 12 months and 7 days, respectively, health seeking behavior of individuals who presented with WRMSDs in the past 12 months, and mode of seeking redress for their work-related musculoskeletal symptoms were obtained from respondents using a pro forma. The English version of the SNQ and the other information garnered questions are presented in [Appendix 1](#).

2.3. Procedure

A letter of introduction, giving details of the study and asking for permission to conduct the study, was obtained from the Department of Physiotherapy, Bayero University, Kano, Nigeria and presented to the chairman of the Association of butchers in Kano Metropolis prior to the commencement of the study. Full-time butchers, with no less than 1 year working experience, aged ≥ 18 years, were eligible, and those who gave their informed consent participated in the study. Individuals who were no longer actively involved in butchering or slaughtering cows, who were involved in other occupations that could also predispose to WRMSDs (e.g., farmers, commercial drivers, automobile mechanics, or bricklayers), with a history of musculoskeletal disorder (such as kyphosis, scoliosis), rheumatoid arthritis, previous musculoskeletal surgeries (such as joint replacement), and inflammatory disease were excluded from the study. At this stage, 11 participants were excluded from the study as a result of not meeting the inclusion criteria. The purpose of the study was explained to the recruited butchers in simple terms. Thereafter, informed consent of willing participants were sought and obtained from participants prior to the commencement of the study. The questionnaire was self-administered to participants who were literate in the English language. All the questionnaires were administered by one of the authors (B.K.). Individuals who could not write in English, but understood Hausa, were interviewed using the instrument. At the time this study was being conducted, the Hausa version of the SNQ was not available. In order to overcome this limitation, the individuals who understood Hausa language alone were interviewed by B.K. Standardization of interpretation was maintained by asking respondents the Hausa equivalent of the English SNQ and additional questions. It was ensured that questions were asked in a nonleading manner. This study was reviewed and approved by the Faculty of Allied Health Sciences, Bayero University, Kano Institutional Review Board.

2.4. Data analysis

Data was analyzed using IBM SPSS Statistics 20.0 (IBM Corp., Armonk, NY, USA). Data were summarized using descriptive statistics (mean, standard deviation, and frequency of distribution). Associations between the prevalence of WRMSDs and each of sociodemographic factors and work settings of butchers were analyzed using Chi-square test. The alpha level was set at 0.05.

3. Results

3.1. Sociodemographic data

A total of 156 questionnaires were distributed among the butchers surveyed, of which 125 were returned (80.1% response

Table 1
Sociodemographic characteristics of butchers surveyed

Variable	Frequency	%
Marital status		
Single	23	22.6
Married	79	77.4
Age group (y)		
18–40	67	65.7
≥ 40	35	34.3
Highest educational level		
Quranic school	40	39.2
Primary school	22	21.6
Secondary school	40	39.2
Experience as a butcher (y)		
1–10	38	37.2
11–20	43	42.2
> 20	21	20.6
Nature of work		
Repetitive & forceful	79	77.5
Handling heavy loads	223	22.5

rate). However, only 102 were correctly completed and used for analysis. Respondents surveyed in this study were all male participants and of the Hausa tribe. The Hausa tribe is one of the three major tribes in Nigeria, with the two others being Yoruba and Igbo. The majority of the butchers were married (77.4%). The ages of participants (mean, 37.49 ± 11.68 years) ranged between 18 years and 63 years. The mean year of experience of the butchers surveyed in this study was 15.32 ± 8.45 years. The sociodemographic characteristics of the respondents are presented in [Table 1](#).

3.2. Prevalence rate of WRMSDs

The 12-month and point prevalence rates of WRMSDs among butchers in this study were 88.2% and 74.5%, respectively.

According to the 12-month prevalence data, lower back complaint (66.7%) was the overall and lower body quadrant's most commonly reported WRMSD among the butchers surveyed. Other commonly affected regions in the lower body quadrant included the hips/thighs (44.1%), knee (52.0%), and ankle/feet (27.5%). The 12-month prevalence of lower back complaints was significantly associated with the participants' marital status ($p = 0.05$), with more married individuals reporting lower back complaints ([Table 2](#)). Similarly, work-related lower back complaints were associated with highest educational attainment of participants ($p = 0.02$), with a higher occurrence among individuals with Quranic education. More butchers aged ≥ 40 years reported low back pain complaints than those who were younger than 40 years ([Table 2](#)). Furthermore, the prevalence of work-related lower back complaints was not significantly associated with years of working experience, number of working days per week, number of work hours per day, and nature of job ([Table 2](#)). Majority of the lower body quadrant WRMSDs were significantly ($p < 0.05$) associated with age and marital status (except ankles/feet; [Table 2](#)). However, there were no statistically significant associations between lower body quadrant WRMSDs and each of educational level (except lower back), years of working experience (except knee), workdays per week, number of work hours per day, nature of job, and posture often adopted while working ([Table 2](#)).

Wrist/hand complaints were the leading upper quadrant (45.1%) and third most commonly reported WRMSDs among respondents. Other upper quadrant body regions affected included the neck (39.2%), shoulder (43.1%), elbow (28.4%), and upper back (24.5%). The prevalence rates of all upper body quadrant WRMSDs were significantly associated ($p < 0.05$) with age ([Table 3](#)). Additionally, neck, shoulder, elbow, wrist/hand, and upper back complaints were not associated with marital status (except shoulder, $p = 0.03$), educational level (except upper back, $p = 0.04$), years of work

Table 2
Prevalence and association of lower quadrant located WRMSDs among butchers with sociodemographic data and work setting

	Lower back			Hip/thigh			Knee			Ankle/feet		
	n	%	p	n	%	p	n	%	p	n	%	p
Age (y)												
< 40	36	53.7		23	34.3		24	35.8		14	20.9	
≥ 40	32	91.4	< 0.001*	22	62.9	0.01*	29	82.9	< 0.001*	14	40	0.07
Marital status												
Single	11	47.8		5	21.7		5	21.7		4	17.4	
Married	57	72.2	0.05*	40	50.6	0.03*	48	60.8	< 0.001*	24	30.4	0.34
Education												
Quranic	31	77.5		20	50.0		24	60		15	37.5	
Primary	17	77.3		10	45.5		9	40.9		4	18.2	
Secondary	20	50.0	0.02*	15	37.5	0.52	20	50.0	0.34	9	22.5	0.18
Experience (y)												
1–10	20	52.6		14	36.8		13	34.2		9	23.7	
11–20	33	76.7		18	41.9		25	58.1		11	25.6	
Above 20	15	71.4	0.06	13	61.9	0.16	15	71.4	0.01*	8	38.1	0.46
Work (d/wk)												
1–4	18	78.3		8	34.8		11	47.8		6	26.1	
> 4	50	63.3	0.28	37	46.8	0.43	42	53.2	0.83	22	27.8	> 0.99
Work (h/d)												
1–4	25	67.6		16	42.3		21	56.8		12	32.4	
5–8	26	65.0		15	37.5		22	55.0		9	22.5	
9–12	17	68.0	0.96	14	56.0	0.34	10	40.0	0.38	7	28.0	0.62
Nature of job												
Repetitive & forceful	50	63.3		32	40.5		41	51.9		18	22.8	
Handling heavy load	18	78.3	0.28	13	56.5	0.26	12	52.2	> 0.99	10	43.5	0.09
Posture												
Squatting	23	60.5		15	39.5		20	52.6		11	28.9	
Standing	45	70.3	0.43	30	46.9	0.60	33	51.6	> 0.99	17	26.6	0.97

*Significant at $p < 0.05$ level.

Quranic, Quranic education; WRMSDs, work-related musculoskeletal disorders.

Table 3

Prevalence and association of upper quadrant located WRMSDs among butchers with sociodemographic data and work setting

	Neck			Shoulder			Elbow			Wrist/hand			Upper back		
	n	%	p	n	%	p	n	%	p	n	%	p	n	%	p
Age (y)															
≤ 40	18	26.9		22	32.8		12	17.9		21	31.3		11	16.4	
> 40	22	62.9	< 0.001*	22	62.9	< 0.001*	17	48.6	< 0.001*	25	71.4	< 0.001*	14	40.0	0.02*
Marital status															
Single	7	30.4		5	21.7		6	26.1		8	34.8		6	26.1	
Married	33	41.8	0.46	39	49.4	0.03*	23	29.1	0.98	38	48.1	0.37	19	24.1	< 0.99
Education															
Quranic	16	40.0		19	47.5		15	37.5		21	52.5		13	32.5	
Primary	9	40.9		11	50.0		3	13.6		9	40.9		1	4.5	
Secondary	15	37.5	0.96	14	35.0	0.40	11	27.5	0.13	16	40.0	0.48	11	27.5	0.04*
Experience (y)															
1–10	13	34.2		12	31.6		8	21.1		12	31.6		7	18.4	
11–20	15	34.9		19	44.2		9	20.9		21	48.8		10	23.3	
Above 20	12	57.1	0.17	13	61.9	0.08	12	57.1	< 0.001*	13	61.9	0.07	8	38.1	0.23
Work (d/wk)															
1–4	10	43.5		6	26.1		4	17.4		9	39.1		5	21.7	
> 4	30	38.0	0.82	38	48.1	0.10	25	31.6	0.28	37	46.8	0.68	20	25.3	0.94
Work (h/d)															
1–4	12	32.4		12	32.4		10	27.0		15	40.5		9	24.3	
5–8	17	42.5		20	50.0		13	32.5		19	47.5		9	22.5	
9–12	11	44.0	0.57	12	48.0	0.25	6	24.0	0.74	12	48.0	0.78	7	28.0	0.88
Nature of job															
Repetitive	29	36.7		28	35.4		20	25.9		32	40.5		18	22.8	
Heavy load	11	47.8	0.47	16	69.6	< 0.001*	9	39.1	0.30	14	60.9	0.14	7	30.4	0.63
Posture															
Squatting	15	39.5		10	26.3		8	21.1		19	50.0		7	18.4	
Standing	25	39.1	0.97	34	53.1	0.01*	21	32.8	0.30	27	42.2	0.57	18	28.1	0.39

*Significant at $p < 0.05$ level.

Quranic, Quranic education; WRMSDs, work-related musculoskeletal disorders.

experience (except elbow, $p = 0.00$), workdays per week, work hours per day, nature of job (except shoulder, $p = 0.01$), or posture often assumed while working (except the shoulder, $p = 0.01$; Table 3).

3.3. Activity limitation and health seeking practices of individuals with WRMSDs

Out of the 90 butchers who reported at least an episode of WRMSDs in the past 12 months, 24 (26.7%) were prevented from carrying out their normal duties (e.g., job, house chores, and leisure activities) as a result of WRMSDs. WRMSD of the neck (10.0%), shoulder (6.7%), elbow (4.4%), wrist/hand (4.4%), upper back (2.2%), lower back (14.4%), hip/thighs (7.8%), knees (13.3%), and ankle/feet (5.6%) prevented butchers from carrying out their normal duties. Twenty-one butchers (23.3%) who had WRMSDs visited the hospital for treatment, 32 (35.6%) took over-the-counter analgesics from patent medicine stores, whereas 37 (41.1%) individuals did not seek treatment for their work-related musculoskeletal symptoms. Out of the 21 individuals who visited hospitals, 28.6%, 52.4%, and 19.0% claimed that they received physiotherapy treatment, drug prescription from a doctor, and both physiotherapy and drugs, respectively.

4. Discussion

The respondents in this study were all males. In Northern Nigeria, most women do not engage in so much work as compared with men for religious and cultural reasons [25]. Butchering is mostly considered not to be a woman's job in this setting.

Butchers are undoubtedly engaged in strenuous and highly repetitive tasks. This is reflected in the WRMSD prevalence rates reported in our study. This 12-month and point prevalence rates of 88.2% and 74.5%, respectively, were obtained from butchers in this study. A study by Magnusson et al [26], reported a WRMSD prevalence of 92% among butchers in Sweden. However, direct comparison with the present study should be viewed with caution, as the comparison study was conducted about 30 years ago and only sought 3 months WRMSDs prevalence. Generally, there is a dearth of published studies focusing on the whole-body (the 9 anatomical regions as specified by the Nordic Musculoskeletal Questionnaire) prevalence of WRMSDs among butchers involved in slaughtering and processing of cows. As slaughtering of bigger animals are likely to be more physically demanding, direct comparisons with other studies reporting prevalence of WRMSDs among butchers involved with smaller animals cannot be made. However, studies on butchers of other types of animals such as pigs and poultry reported varying prevalence rates of WRMSDs [27–30]. Butchers carry out monotonous and physically demanding tasks. This makes them highly vulnerable to WRMSDs. The low-technology and poorly organized settings found in slaughterhouses and butchers in the developing world (such as those prevailing in Nigeria) may be a possible explanation for the high prevalence of WRMSDs reported in our study.

The lower back was the most vulnerable body region to WRMSDs among butchers in our study. In another study [26], complaints of WRMSDs on the low back ranked second following the wrist joint. According to the United States Bureau of Labor Statistics, slaughterers and meat packers adopt standing positions

during most of their workday [27]. Adopting awkward standing positions while working increases the likelihood of developing back pain. A study with settings similar to ours reported musculoskeletal pain resulting from WRMSDs as major complaints reported by butchers [21]. However, studies from elsewhere highlight a higher vulnerability of the upper extremities to WRMSDs among butchers and meat processing workers [28–31]. Most slaughterhouses in the developed world maintain low temperature for hygiene purposes. This temperature regulation has, however, been linked to preponderance of upper limb WRMSDs [32–34]. Direct comparison cannot be made with these studies for two reasons. First, meat processing practices are more organized in those other settings compared to ours; moreover, butchering practices differ across different geographical and cultural contexts. Second, most of the butchers in those studies slaughter pigs and poultry.

Next to lower back complaints, the four leading WRMSDs reported by butchers in our study were those involving the knees, wrist/hand, hip/thighs, and shoulder. More than half of respondents (52%) reported work-related musculoskeletal knee complaints. This differs from other findings in the literature [28–31]. This result is not surprising as butchering practices in this setting often involve a lot of standing and squatting because slaughterhouses are not ergonomically set up when compared to those in developed countries. According to da Costa and Vieira [7], specific biomechanical risk factors are associated with the occurrence of WRMSDs in each body region. Some of the body regions outlined includes the shoulder (highly demanding physical work and monotonous work), wrist (highly demanding physical work, awkward static and dynamic working postures, and repetitive work), hips (regular lifting and carrying of heavy loads), and knee (highly demanding physical work, sustained kneeling or squatting, prolonged standing, everyday climbing, and repeated lifting loads and carrying of heavy loads).

The prevalence of work-related musculoskeletal wrist/hand complaints in this study (45.1%) was higher than those reported by dos Reis et al [28] (20%) and Tirloni et al [29] (25.6%), but lower than that reported by Magnusson et al [26]. The differences in prevalence could be attributed to the nonhomogenous study design methods and varied work settings. Falck and Aarnio [35] and Kivi [36] attributed WRMSDs of the upper limbs among butchers to the physical demands of the job, lifting of heavy bulky meats, and compromised posture. Furthermore, animal slaughtering requires repetitive and forceful upper limb movements; this, in turn, predisposes the shoulder, wrist, and hand to WRMSDs [2]. The body region locations of the WRMSDs are concomitant to the usual postures/or risk factors associated with butchering. Generally, upper limbs WRMSDs in the present study were not as dominant as those reported by previous studies [32–34]. This could be attributed to differences in work settings between our study and those of the comparison studies. Slaughterhouses in Nigeria are generally located outside, and temperature is often not regulated in comparison to other climates. Furthermore, the environment in Nigeria is hotter than most climates of the comparison studies.

Lower temperatures have been cited as a reason for the increased susceptibility to WRMSDs of the shoulder, wrist, and hand as lower temperatures increase the resistance of the meat being butchered or processed, thus increasing the force required for cutting [37].

Age (> 40 years) was consistently associated with the prevalence of WRMSDs in our study. Contrariwise, associations between age and WRMSDs have been reported to be weak elsewhere [38,39]. Although age is not known as an independent risk factor for WRMSDs, decline in the functional capacity of older workers is mostly responsible for the susceptibility of this population to WRMSDs [40]. More specifically, the imbalance between the work demands and the functional capacity of the aging workforce puts them at more risk than their younger counterparts [40]. The reason for this is unknown; however, it is possible that the symptoms were mild to moderate during the course of the WRMSD. WRMSDs are accumulated microtrauma that could be highly disabling over time if not treated properly [5]. There is therefore a need to enlighten butchers on the long-term impact of WRMSDs and also to encourage them to seek proper care even when the symptoms are not overwhelmingly disabling.

The number of participants who sought redress for their work-related musculoskeletal symptoms in this study was low. By contrast, Magnusson et al [26] reported that as high as 50% out of 67 butchers ($N = 73$) who had WRMSDs sought medical attention. This low utilization of healthcare facilities in managing WRMSDs found in this study is similar to that noted by Ogwumike et al [25], who reported a low utilization of healthcare facilities by individuals with chronic neck pain in a rural community in North-West, Nigeria, the same region from where this current study was conducted. Butchers, who are mostly self-employed in this environment, have been reported to seldom take sick leave because of musculoskeletal disorders [21]. The perceived nonfatal nature of WRMSDs among butchers and the anticipated loss of income resulting from work absence have been suggested as reasons for the phenomenon.

It is important to note the following limitations of the study. First, the study relied on self-reported data; most participants may either not have recalled all incidents or overestimated their reports of WRMSDs. Moreover, a Hausa version of the SNQ was not used for this study. Finally, the severity of the symptoms was not considered in this work.

WRMSDs are prevalent among butchers in Kano metropolis, with low back pain being the most common in this blue collar population. Age was consistently associated with the prevalence of WRMSDs. Only a few butchers have sought redress for their work-related musculoskeletal symptoms. Concerted efforts should be made to reduce the high prevalence of WRMSDs among butchers in this environment. This may include ergonomic interventions, physical activity interventions, enlightenment campaigns, and mass media sensitization directed toward the menace and appendages of WRMSDs.

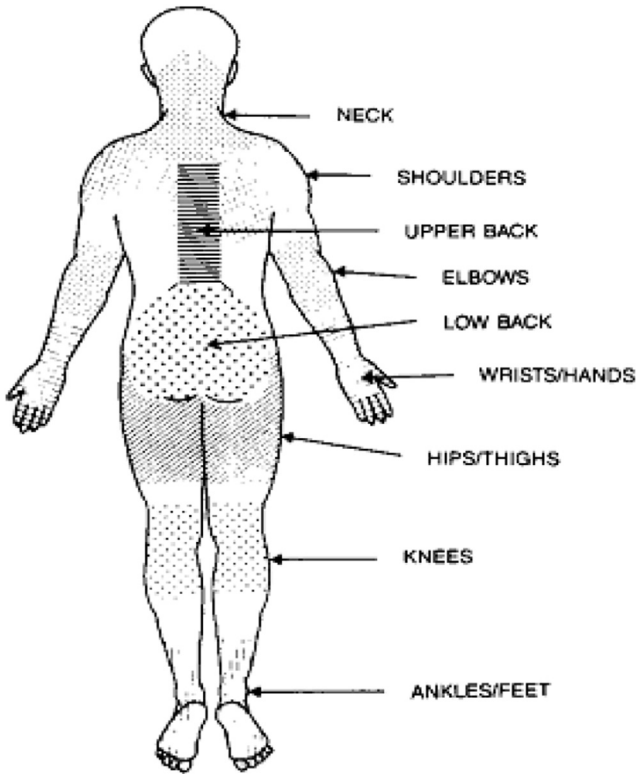
Conflicts of interest

The authors declare no conflict of interest.

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Appendix I



Nordic musculoskeletal questionnaire

Please answer by putting a cross in the appropriate box—one cross for each question. You may be in doubt as to how to answer, but please do your best anyway. Please answer every question, even if you have never had trouble in any part of your body. In this picture, you can see the approximate position of the parts of the body referred to in the questionnaire. Limits are not sharply defined, and certain parts overlap. You should decide for yourself if you have ever had or never had any trouble in the regions.

1. Have you ever had any trouble (ache, pain, or discomfort) on any body part (listed above) in the past 12 months? No [] Yes [].
If you answered no to question 1, do not answer any question further.
2. Have you ever had any trouble (ache, pain, or discomfort) on any body part (listed above) in the past 7 days? No [] Yes [].
3. Have you ever had neck trouble (ache, pain, or discomfort) in the past 12 months? No [] Yes [].
If you answered no to question 3, do not answer question 3B.
3B. Have you at any point during the past 12 months been prevented from doing your normal work (at home or away from home) because of the trouble? No [] Yes [].
4. Have you ever had shoulder trouble (ache, pain, or discomfort) in the past 12 months? No [] Yes [].

- If you answered no to question 4, do not answer question 4B.
- 4B. Have you at any point during the past 12 months been prevented from doing your normal work (at home or away from home) because of the trouble? No [] Yes [].
 5. Have you ever had elbow trouble (ache, pain, or discomfort) in the past 12 months? No [] Yes [].
If you answered no to question 5, do not answer question 5B.
5B. Have you at any point during the past 12 months been prevented from doing your normal work (at home or away from home) because of the trouble? No [] Yes [].
 6. Have you ever had wrist/hand trouble (ache, pain, or discomfort) in the past 12 months? No [] Yes [].
If you answered no to question 6, do not answer question 6B.
6B. Have you at any point during the past 12 months been prevented from doing your normal work (at home or away from home) because of the trouble? No [] Yes [].
 7. Have you ever had upper back trouble (ache, pain, or discomfort) in the past 12 months? No [] Yes [].
If you answered no to question 7, do not answer question 7B.
7B. Have you at any point during the past 12 months been prevented from doing your normal work (at home or away from home) because of the trouble? No [] Yes [].
 8. Have you ever had lower back trouble (ache, pain, or discomfort) in the past 12 months? No [] Yes [].
If you answered no to question 8, do not answer question 8B.
8B. Have you at any point during the past 12 months been prevented from doing your normal work (at home or away from home) because of the trouble? No [] Yes [].
 9. Have you ever had trouble (ache, pain, or discomfort) on one or both hips/thighs in the past 12 months? No [] Yes [].
If you answered no to question 9, do not answer question 9B.
9bB. Have you at any point during the past 12 months been prevented from doing your normal work (at home or away from home) because of the trouble? No [] Yes [].
 10. Have you ever had trouble (ache, pain, or discomfort) on one or both knees in the past 12 months? No [] Yes [].
If you answered no to question 10, do not answer question 10B.
10B. Have you at any point during the past 12 months been prevented from doing your normal work (at home or away from home) because of the trouble? No [] Yes [].
 11. Have you ever had trouble (ache, pain, or discomfort) on one or both ankles/feet in the past 12 months? No [] Yes [].
If you answered no to question 11, do not answer question 11B.
11B. Have you at any point during the past 12 months been prevented from doing your normal work (at home or away from home) because of the trouble? No [] Yes [].

Pro forma

Sociodemographic data

1. How old are you? _____ years.
2. Sex Male [] Female [].
3. Marital Status Single [] Married [].
4. Tribe Hausa [] Igbo [] Yoruba []
Others (specify) _____
5. Level of education Qur'anic [] Primary School []
Secondary School [] Tertiary Institution [].
6. How many years have you been working as a butcher?

Work settings

1. What is the nature of your work?
 - A. Repetitive and forceful []
 - B. vibratory []
 - C. handling heavy loads []
2. How many hours do you work per day?
 - A. 1–4 []
 - B. 5–8 []
 - C. 9–12 []
 - D. 12 & above []
3. How many days do you work per week
 - A. 1–2 []
 - B. 3–4 []
 - C. 5–6 []
 - D. Daily []
4. Which posture do you adapt more at work?
 - A. Lying []
 - B. sitting []
 - C. squatting []
 - D. kneeling []
 - E. standing []

Health seeking practices

(Answer these questions only if you answered yes to any of questions

1-11-11-11—of the Nordic Musculoskeletal Questionnaire)

1. What did you do to alleviate the symptoms you had?
 - A. Nothing []
 - B. Visited the hospital for expert care []
 - C. Over-the-counter drugs []
 - D. Local herbs []

(Answer this question if your response to 1 above was B)

2. What mode of treatment did you receive?
 - A. Prescription drugs []
 - B. Physiotherapy []
 - C. Prescription drugs and Physiotherapy []
 - D. Nothing []

References

- [1] Collins RM, Janse van Rensburg DC, Patricios JS. Common work-related musculoskeletal strains and injuries. *S Afr Fam Pract* 2011;53:240–6.
- [2] Punnett L, Wegman DH. Work-related musculoskeletal disorders: the epidemiologic evidence and the debate. *J Electromyogr Kinesiol* 2004;14:13–23.
- [3] Tinubu BMS, Mbada CE, Oyeyemi AL, Fabunmi AA. Work-related musculoskeletal disorders among nurses in Ibadan, South-west Nigeria: a cross-sectional. *BMC Musculoskelet Disord* 2010;11:12.
- [4] Smith DR, Leggat PA. Musculoskeletal disorders in nursing. *Aust Nurs J* 2003;11:1–4.
- [5] Kumar VK, Kumar SP, Baliga MR. Prevalence of work-related musculoskeletal complaints among dentists in India: a national cross-sectional survey. *Indian J Dent Res* 2013;24:428–38.
- [6] National Institute of Occupational Safety and Health (NIOSH). Quality of work life questionnaire. Washington DC (WA): NIOSH; 2002.
- [7] da Costa BR, Vieira ER. Risk factors for work-related musculoskeletal disorders: A systematic review of recent longitudinal Studies. *Am J Ind Med* 2010;53:285–323.
- [8] David GC. Ergonomic methods for assessing exposure to risk factors for work-related musculoskeletal disorders. *Occup Med (Lond)* 2005;55:190–9.
- [9] Fabunmi AA, Oworu JO, Odunniyi NE. Prevalence of musculoskeletal disorders among nurses in University College Hospital, Ibadan. *West Afr J Nurs* 2008;19:21–5.
- [10] Schreuder KJ, Roelen CAM, Koopmans AC, Groothoff JW. Job demands and health complaints in white and blue collar workers. *Work* 2008;31:425–32.
- [11] Karahan A, Kar S, Abbasogbu A, Dodan N. Low back pain: prevalence and associated factors among hospital staff. *J Adv Nurs* 2009;65:516–24.
- [12] Ekpenyong C, Inyang UC. Associations between worker characteristics, workplace factors, and work-related musculoskeletal disorders: a cross-sectional study of male construction workers in Nigeria. *Int J Occup Saf Ergon* 2014;20:447–62.
- [13] Widanarko B, Legg S, Stevenson M, Devereux J, Eng A, Mannetje A, Cheng S, Douwes J, Ellison-Loschmann L, McLean D, Pearce N. Prevalence of musculoskeletal symptoms in relation to gender, age, and occupational/industrial group. *Int J Ind Ergon* 2011;41:561–72.
- [14] Ghaffari M, Alipour A, Jensen I, Farshad A, Vingard E. Low back pain among Iranian industrial workers. *Occup Med J* 2006;56:455–60.
- [15] Sanya AO, Ogwumike OO. Low back pain prevalence amongst industrial workers in the private sector in Oyo State, Nigeria. *Afr J Med Med Sci* 2005;34:245–9.
- [16] Silverstein BE, Viikari-Juntura J, Kalat. Use of a prevention index to identify industries at high risk for work-related musculoskeletal disorders of the neck, back, and upper extremity in Washington State, 1990–1998. *Am J Ind Med* 2002;41:149–69.
- [17] Work-related musculoskeletal disorders (MSDs): an introduction. European Agency for Safety and Health at Work [Internet]. 2015 [cited 2015 Jul 23]. Available from: <http://www.osha.europa.eu>.
- [18] Mansi S, Milosavljevic S, Tumilty S, Hendrick P, Baxter GD. Use of pedometer-driven walking to promote physical activity and improve health-related quality of life among meat processing workers: a feasibility trial. *Health Qual Life Out* 2013;11:185.
- [19] Arvidsson I, Balogh I, Hansson GT, Ohlsson K, Åkesson I, Nordander C. Rationalization in meat cutting — consequences on physical workload. *Appl Ergon* 2012;43:1026–32.
- [20] Idowu PA, Adedoyin RA, Adagunodo RE. Computer-related repetitive strain injuries. *J Nig Soc Physiother* 2005;15:13–5.
- [21] Omokhodion FO, Adebayo AM. Occupational hazards and self-reported health problems of butchers in Ibadan, southwest Nigeria. *J Public Health (Germany)* 2013;21:131–4.
- [22] Ola SO, Otegbayo JA, Yakubu A, Odaibo GN, Olaleye DO. Nigerian butchers and hepatitis B virus. *Trop Gastroenterol* 2008;29:32–4.
- [23] Corbin M, McLean D, Mannetje A, Dryson E, Walls C, McKenzie F, Maule M, Cheng S, Cunningham C, Kromhout H, Blair A, Pearce N. Lung cancer and occupation: a New Zealand cancer registry-based case—control study. *Am J Ind Med* 2011;54:89–101.
- [24] Kuorinka I, Jonsson B, Kilborn A, Vinterberg H, Biering-Sorensen F, Andersson G, Jorgesen K. Standardized Nordic Questionnaire for the analysis of musculoskeletal symptoms. *Appl Ergon* 1987;18:233–7.
- [25] Ogwumike OO, Kaka B, Adeniyi AF, Fawole HO, Idowu OA. Prevalence of neck pain in a rural community in Northwest Nigeria. *J Med Biomed Res* 2015;14:104–16.
- [26] Magnusson M, Ortengren R, Andersson GB, Petersen I, Sabel B. An ergonomic study of work methods and physical disorders among professional butchers. *Appl Ergon* 1987;18:43–50.
- [27] United States Department of Labor. OSHA recordable case rates — latest incidence rates, by industry, for nonfatal work-related injuries and illnesses—NAICS code 311611: animal (except poultry) slaughtering. U.S. Bureau of Labor Statistics, U.S. Department of Labor; 2012.
- [28] dos Reis PF, Peres LS, Tirloni AS, dos Reis DC, Estrázulas JA, Rossato M, Moro ARP. Influence of anthropometry on meat-packing plant workers: an approach to the shoulder joint. *Work* 2012;41:4612–7.
- [29] Tirloni AS, dos Reis DC, dos Santos JB, dos Reis PF, Barbosa A, Moro ARP. Body discomfort in poultry slaughterhouse workers. *Work* 2012;41:2420–5.
- [30] Quandt SA, Grzywacz JG, Marín A, Carrillo L, Coates ML, Burke B, Arcury TA. Illnesses and injuries reported by Latino poultry workers in western North Carolina. *Am J Ind Med* 2006;49:343–51.
- [31] Van der Windt DA, Thomas E, Pope DP, De Winter AF, Macfarlane GJ, Bouter LM, Silman AJ. Occupational risk factors for shoulder pain: a systematic review. *Occup Environ Med* 2000;57:433–42.
- [32] Hildebrandt VH, Bongers PM, Van dijk FJH, Kemper HCG, Dul J. The influence of climatic factors on non-specific back and neck—shoulder disease. *Ergonomics* 2002;45:32–45.
- [33] Aasmoe L, Bang B, Egegens C, Lochen ML. Musculoskeletal symptoms among seafood production workers in North Norway. *Occup Med (Lond)* 2008;58:64–70.
- [34] Magnavita N, Elovainio M, De Nardis I, Heponiemi T, Bergamaschi A. Environmental discomfort and musculoskeletal disorders. *Occup Med* 2011;61:196–201.
- [35] Falck B, Aarnio P. Left-sided carpal tunnel syndrome in butchers. *Scand J Work Environ Health* 1983;9:291–7.
- [36] Kivi P. Rheumatic disorders of the upper limbs associated with repetitive occupational tasks in Finland 1875–1979. *Scand J Rheumatol* 1984;13:101–7.
- [37] Sundstrup E, Jakobsen MD, Andersen CH, Jay K, Persson R, Aagaard P, Andersen LL. Participatory ergonomic intervention versus strength training on chronic pain and work disability in slaughterhouses workers: study protocol for a single-blind, randomized controlled trial. *BMC Musculoskelet Disord* 2013;14:67.
- [38] Arndt V, Rothenbacher U, Daniel U, Zschenderlein B, Schubert S, Brenner H. Construction work and risk of occupational disability: a ten-year follow-up of 14,474 male workers. *Occup Environ Med* 2005;62:559–66.
- [39] Cassou B, Derriennic F, Monfort C, Norton J, Touranchet A. Chronic neck and shoulder pain, age, and working conditions: longitudinal results from a large random sample in France. *Occup Environ Med* 2002;59:537–44.
- [40] Okunribido O, Wynn T. Ageing and work-related musculoskeletal disorders: a review of the recent literature. Sudbury (UK): UK Health and Safety Executive Books; 2010. p. 50.