

Frequency and Risk Factors for the Occurrence of Work Related Musculoskeletal Disorders among Slaughter House Workers in Nairobi County

James Kinuthia Waithaka^{1*}, Peterson N. Warutere², Pius Makhonge¹ and Richard Korir³

Institution affiliations:

1. Jommo Kenyatta University of Agriculture and Technology P.O. Box 62,000 – 00200 Nairobi, Kenya
2. Kenyatta University, P.O Box 43844-00100 Nairobi, Kenya
3. Kenya Medical Research Institute, P.O. Box 54840-00200, Nairobi, Kenya.

***Corresponding author:** James Kinuthia Waithaka and Richard Korir, Jommo Kenyatta University of Agriculture and Technology P.O. Box 62,000 – 00200 Nairobi, Kenya; Email, richkori@yahoo.com; Mobile Number, +254710173815

Abstract

Work-related musculoskeletal disorders describe a wide range of inflammatory and degenerative disorders and diseases such as metacarpal syndrome, tenosynovitis, tendonitis, fasciitis, epicondylitis, shoulder impingement syndrome among others, resulting in pain and functional impairment. The main objective of this study was to determine the frequency and risk factors for the occurrence of work related muscular disorders among slaughter house workers in Nairobi County. The study adopted a cross sectional descriptive design. Cluster sampling was used to select a sample of 155 workers from the selected slaughter houses within Nairobi County. Oral interviews, questionnaires and observational methods were used to collect both qualitative and quantitative which was analysed using SPSS version 20. Data was analysed using chi square test for association. The study results showed that majority of the workers (82.4% n=128) experienced pain in one or more parts of the body. Frequency of neck pain stood at 15% (19), wrist and hand pain at 29.6% (38), shoulder pain at 51% (65), hips and thigh pain at 2% (3). Risk factors were identified as lack of breaks during working hours, working for long hours, working posture and change of duty after sick off. There is a high prevalence of work related musculoskeletal pain associated with development of musculoskeletal disorders among slaughter house workers in Nairobi County. The slaughter houses management should restrict the number of working hours to 8 hours in any working day.

Key words: Risk Factors, Occurrence, prevalence, Nairobi County, pain, slaughter house, MSDs

1. Introduction

Work-related musculoskeletal disorders (MSDs) are impairments of body structures such as muscles, joints, tendons, ligaments, nerves, bones or a localised blood circulation system caused or aggravated primarily by the performance of work and by the effects of the immediate environment where the work is carried out (European Agency for safety and Health at Work, 2008). Most work-related MSDs are cumulative disorders, resulting from repeated exposures 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. The MSDs can interfere with activities at work and can lead to reduced productivity, sickness absence and chronic occupational disability (McCauley, 2011). The World Health Organization (WHO), recognizing the impact of ‘work-related’ musculoskeletal diseases, has characterized WRMSD as multifactorial, indicating that a number of risk factors contribute to and exacerbate these maladies. They are of concern in all occupations but perhaps more so when the occupation requires medium to heavy lifting and holding awkward positions for prolonged periods of time (McCauley, 2011). The strong correlation between the incidence of WRMSD and the working conditions is well known, particularly the physical risk factors associated with jobs e.g., awkward postures, high repetition, excessive force, static work, cold or vibration. Work intensification and stress and other psychosocial factors also seem to be factors that increasingly contribute to the onset of those disorders (EU-OSHA, 2008; EU-OSHA 2011).

The problem of work related musculoskeletal disorders in the meat processing industry was first highlighted in the USA during the 1980s. Two U.S. companies involved in the meat processing industry were fined in 1987 and 1988 for a series of violations related to record keeping and high accident incidence rates. Both reached settlement agreements with the administration which reduced the fine by agreeing to instigate long term ergonomics programmes. The fine for one company was US\$4.33 million (Tappin *et al.*, 2006). In Kenya, the Livestock sub-sector contributes about 10% of the Gross Domestic Product (GDP) and accounts for over 30% of farm gate value of agricultural commodities. Livestock production is a major economic and social activity for the communities that live in arid and semi-arid areas (ASALS) in Kenya (Kiptarus, 2005). With a growing population in the main cities, meat and meat related products continue to serve as food for millions. The United Nation's Food and Agriculture Association (FAO) estimates per capita meat consumption in Kenya at 14.2 kilogrammes a year and this is growing rapidly (Chacha, 2012). The meat processing industry is therefore a source of employment for many and therefore a sector that requires a closer look in terms of the risks associated with working there and the effects on the musculoskeletal system. The current study aimed at assessing the frequency and risk factors for the occurrence of work related muscular disorders among slaughter house workers in Nairobi County.

2. Materials and Methods

2.1 Study Design

This study employed a cross-sectional and descriptive design. According to Saunders *et al.*, (2007), a cross-sectional descriptive study is ideal in situations where the aim is to provide a point in time information that captures the opinions, attitudes, preferences, prevalence and factors of interest in research.

2.2 Study Area

The study was conducted in Nairobi City County in Kenya. Nairobi is situated in Latitude 1.283S, Longitude 36.18E.

2.3 Study Population

The County has six main slaughter houses as shown in Table 1. These are: Kiamaiko in Kariobangi, Kariokor chicken slaughter house, Farmers' choice-Kahawa west, Kayole slaughter house, Quality Meat Packers along Kangundo road and Alpha fine foods in industrial area. A sample of four of the six slaughter houses was selected to represent the study population and they were: Kayole slaughter house, Kiamaiko slaughter, Kariokor slaughter and Alpha fine foods. The study focused on meat processing workers involved in slaughtering, deboning, cutting, packing and carrying meat in slaughter houses within the selected Abattoirs in Nairobi County. Information from the individual slaughter houses studied indicates that there were approximately 2200 workers.

Table 1: Number of slaughter houses in the County

Abattoirs name	No. of workers	Specialization
Kiamaiko	200	Lamb-slaughter
Farmers choice	750	Pork, lamb-slaughter and processing
Kayole	400	Beef –slaughter
Quality meat packers	600	Beef, lamb, chicken slaughter and processing
Alpha fine foods	150	Beef, lamb, chicken-processing
Kariokor slaughter	100	Chicken slaughter

*Total population 2200

2.4 Subject selection

2.4.1 Inclusion Criteria

Eligible respondents were butchers working in the slaughter house who were above the age of 18 years and were directly involved in handling meat and meat products. The eligible respondents should have been working in their respective companies for at least 6 months.

2.4.2 Exclusion Criteria

Those respondents who declined to participate in the study were excluded. Any worker present in the slaughter house but his work does not involve the activities of interest.

2.5 Sample Size Determination

The sample size was determined using Fisher's *et al.*, (1998) formula where:

$$n_0 = \frac{Z^2 \times (p)(q)}{(0.05)^2} \quad n_0 = \frac{(1.96)^2 \times (.88) \times (.12)}{(0.05)^2} = 162$$

Where Z = value of the standard variate = 1.96 at 95% CI

Where (p) = proportionate target population estimated to have a particular characteristic being measured (0.88)

q=1-p (0.12)

Where d = acceptable margin of error for proportion being estimated = .05

Prevalence of work related musculoskeletal disorders among butchers 88.2% (Kaka *et al.*, 2015)

Therefore for a population of 2200 workers, the final sample size was determined as follows:

$$n_1 = \frac{n_0}{1 + \frac{n_0}{\text{population}}} = \frac{162}{1 + (162/2200)} = 150$$

Population size = 2200; n_1 = required return sample size because sample is greater than 5% of population; n_0 = required sample size; to cater for any cases of non-response, 5 respondents were added to the sample size to give a total of 155.

2.6 Sampling Procedure

In each work stations of interest, random sampling of those who met the inclusion criteria was done. In slaughter houses where shifts are in place, sampling was only carried out in day shifts. The sampling frame for the collective respondents were butchers only.

2.7 Data collection tools

2.7.1 Questionnaires

Both self and researcher administered questionnaires were used to collect data with the help of two trained research assistants. The questionnaires had both open-ended and closed ended question.

2.7.2 Data storage

All research materials; hard copy questionnaires and other scripts were securely kept in lockable lockers and confidentiality maintained before and after analysis. The analyzed data were stored in electronic devices, CDs, flash disks and files which were password encrypted to protect from unauthorized access. Protection from loss was done by backing up the data in appropriate devices.

2.7.3 Data analysis

Analysis of data was done using statistical package for social sciences (SPSS) version 20 and it entailed frequencies and cross tabulation tables with chi-square tests of significance at 5% confidence level. The results were then presented in form of charts, graphs, tables and figures.

2.7.4 Questionnaires data management

Data cleaning involved examining and assessing primary data from questionnaires for validation. The systematically coded data was used to create Database in Microsoft Access. The quantitative data was tabulated and descriptive statistics used to generate frequency tables. The qualitative data was analyzed and linked to the study objectives.

2.8 Ethical consideration

Approval to conduct the research was obtained from Jomo Kenyatta University of Agriculture and Technology, institute of energy and environmental technology. An introductory letter was given to the administration of each of the slaughter houses to get permission to conduct the study at the plants. Informed consent was also obtained from all participants and confidentiality of the information collected was assured.

3. Results and Discussions

3.1 Frequency of work related muscular pain among the workers

In this study, workers reported experiencing pain in at least one body part within the last 12 months. Majority of the workers (82.4% n=128) experienced pain in one or more parts of the body (Table 2).

Table 2: Frequency of work related muscular pain

PAIN SITES REPORTED	YES	NO	Total
Neck Pain	19 (14.8%)	109 (85.2%)	128 (100%)
Shoulders	65 (51%)	63 (49%)	128 (100%)
Wrist hands	38 (29.6%)	90 (70.4%)	128 (100%)
Back Pain	34 (26.9%)	94 (73.1%)	128 (100%)
Elbows	5 (3.7%)	123(96.3%)	128 (100%)
Ankles and feet	5 (3.7%)	123(96.3%)	128 (100%)
Knees Hips and thighs	3 (2%)	125 (98%)	128 (100%)

Majority of the workers who had reported a painful episode had experienced shoulder pain (51%, n=65) while the least reported pain episodes were on the lower extremities, that is, knees hips and thighs at 2%, n=3. These results were consistent with a study by Tirloni *et al.*, (2012) where it was shown that the body regions most frequently cited were shoulders at 62.6%. In this study some workers had experienced mild and moderate pains at least once; an episode in the last 12 months. Blangsted *et al.*, (2008), Janwantanakul *et al.*, (2008), Andersen *et al.*, (2011) and Brandt *et al.*, (2014) in their studies reported that approximately a third of working-age adults are bothered by neck pain and every worker experiences neck and shoulder pain on a weekly basis.

3.2 Seeking for medical care after the onset of the symptoms

When a person feels pain in any part of his body, it is advisable for him/her to visit a health care provider for medication. In this study, twenty seven workers (21% n=27) of those who reported pain in at least one part of the body sought medical attention for their symptoms as opposed to (79% n=101) who never sought any medical attention for their symptoms (Figure 1). These findings are similar to a study by Kaka *et al.*, (2015) which found that 23.3% of butchers with pain visited a hospital for medical attention. According to kaka *et al.* (2015), the most common reasons given for not seeking medical attention were fear of losing a job, not wanting to miss work, and not believing the injury was serious enough to report which are consistence with the responses from the participants in the current study.

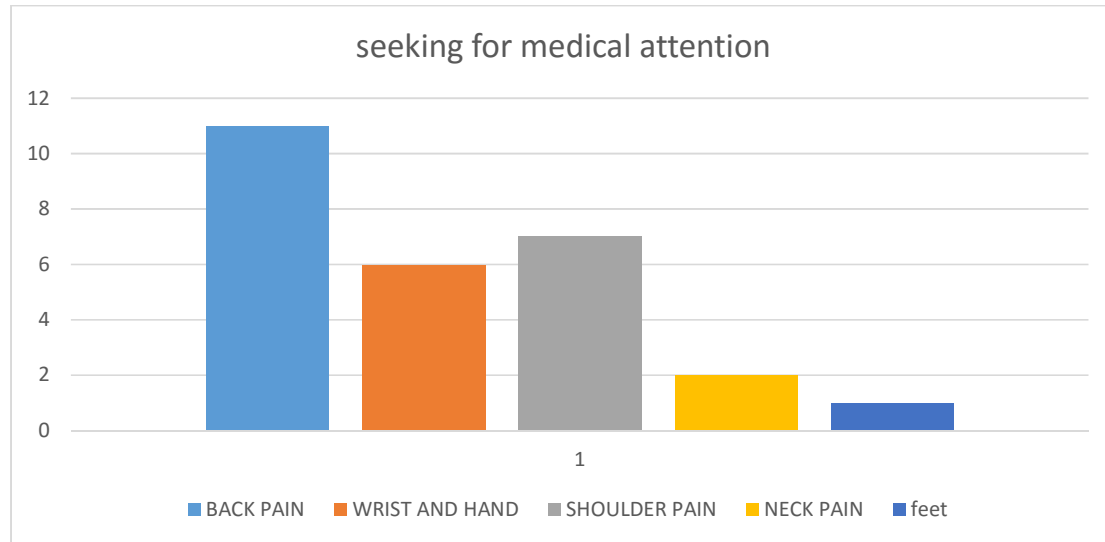


Figure 1: Seeking medical attention for the muscle pain

3.3 Risk factors for the occurrence of WRMSDs, among the workers

3.3.1 Duration of employment and pain frequency

The results shows that majority (85.8% n=115) of those with pain in various part of their bodies had worked for more than one year in their work stations (Table 3). Working in the same organization for more than 12 months and doing the same job repeatedly is a risk factor to WRMSD. There was significant association ($\chi^2=7.2188$, $df=1$, $p=0.007214$) between the length of service and the occurrence of pain in at least one part of the body at 5% significance level.

Regarding pain in different body parts, there was no significant association between length of service and shoulder pain, wrist/hand pain, back pain and lower extremities (hip/thigh, knees, ankles and feet) with the p values at 0.413081, 0.928238, 0.717121 and 0.709892, respectively at 5% significance level. The study results differ with findings in a similar study by Henrietta *et al.* (2015), where significant association between length of service and pains in the elbow and knees was established with p values being 0.01 and 0.001 respectively at 5% significance level. There was however no significant association with other body parts. ($P>0.05$)

Table 3: Duration of employment and body pain

Characteristic percentage of respondents N=155			
Length of service	Yes	No	significance
Below 12 months	13 (61.6%)	8 (38.9%)	$\chi^2=7.2188$, $df=1$, $p=0.007214$
More than 12 months	115 (85.8%)	19 (14.2%)	
Total	128(82.4%)	27(17.6%)	

3.3.2 Daily working hours and pain causation

Majority of the workers (86.4% n=134) in the study reported to be working for 8 hours or less in a day while only a few (13.6% n=21) were working for more than 8 hours in a day (Table 4). The results showed that there was no significant ($\chi^2=4.2765$, $df=1$, $p=0.03864$) association between working hours and episodes of pain. Employees working more than 8 hours at a time have a significantly greater risk of bearing a work-related injury (Lockley *et al.*, 2015).

Table 4: Relationship between working hours and pain

Characteristic percentage of respondents N=155			
Length of service	Yes	No	significance
8 hours and below	114 (85%)	20 (15%)	$\chi^2=4.2765, df=1, p=0.03864$
More than 8 hours	14 (66.7%)	7 (33.3%)	
Total	128 (82.6%)	27 (17.4%)	

3.3.3 Speed of working and pain causation

In this study, all the respondents (100% n=108) who reported having pain in any part of the body also reported to be working at a fast pace to keep up with the work demands. The most prevalent was shoulder pain at (51% n=55) and the least was pain in the lower extremities, that is, knees ankles and feet (5% n=6). Speed is of essence in slaughter house work due to the demand especially in the peak hours of early morning. This leaves little time for breaks and does not even allow for adequate sharpening of knives. The single largest factor contributing to worker injuries is the speed at which the animals are slaughtered and processed. In an industry where profit margins are slim and volume is everything, workers are endlessly pressured to slaughter more animals in less time. Rather than regulate line speeds for the interest of worker safety, line speed in the USA is limited only by federal sanitation laws (WHO, 2010). But in developing countries including Kenya, line speed is not controlled by any law, the companies are after making huge profits in expense of the workers safety. Frost *et al.* (1998) found elevated risk of carpal tunnel syndrome among slaughterhouse workers which they associated with exposure to combined forceful and repetitive manual movements.

4. CONCLUSION AND RECOMMENDATION

4.1 Conclusion

There is a high prevalence of work related musculoskeletal pain associated with development of musculoskeletal disorders among slaughter house workers in Nairobi County. The most affected body parts in the study were shoulders, wrist and hands, and back. Length of service, was significantly associated with incidences of pain among the workers. Other risk factors include working posture, lack of breaks during working hours, working for more than 8 hours a day and the speed at which workers were carrying put their tasks.

4.2 Recommendations

The study recommends the following:-

- a) In a bid to reduce the frequency of muscular pains associated with work, workers should be trained on ergonomics and proper working postures. There should also be regular monitoring of the working tools

for instance the knives. If they are blunt, more force is required to cut and this increases the risk for hand and wrist pains.

- b) The management of any slaughter house should ensure that they restrict the number of hours of continuous working by introducing sufficient breaks and provision of sitting facilities where possible. They should also formulate standard operating procedures to mitigate on the risk factors identified.
- c) Ensure that all workers with various pains and discomfort in their body parts seek for medical attention from the healthcare centers as soon as possible. Those in charge of the slaughter houses should formulate a health and safety policy and communicate it to all the workers and other stakeholders.

4.3 Suggestions for further research

- a) More research should be done to consider the role of psychological risk factors and the role of hobbies in the development of muscular pain.
- b) More research needs to be carried out to establish the awareness levels of workers in slaughter houses on the risk factors for development of musculoskeletal disorders.

5. Conflict of interest

We declare that there is no conflict of interest regarding publication of this manuscript whatsoever.

6. Acknowledgement

We are very grateful to the management of Jommo Kenyatta University of Agriculture and Technology for providing an enabling environment for these work to be done. The management of the four slaughter houses and individual participants are highly acknowledged.

References

- EU-OSHA (2008). What are work-related musculoskeletal disorders (WRMSDs)? In: European Agency for Safety and Health at Work, 2012, Available from: <http://osha.europa.eu/en/faq/frequently-asked-questions/what-are-work-related-musculoskeletal-disorders-msds>.
- EU-OSHA (2011). Musculoskeletal Disorders: General questions. Available at: <http://osha.europa.eu/en/faq/frequently-asked-questions>, European Agency for Safety and Health at Work
- McCauley, Bush, P. (2011) Ergonomics: Foundational Principles, Applications and Technologies, an Ergonomics Textbook; CRC Press, Taylor & Francis, Boca Raton, FL
- Tappin, D., Vitalis, A. & Bentley, T. (2006) Adopting an industry-wide participative approach in facilitating MSD intervention implementation. In: Proceedings of the 16th International Ergonomics Association World Congress on Ergonomics, Maastricht
- Kiptarus, J. K. (2005) focus on livestock sector: supply policy framework strategies status and links with value addition. Presented at a workshop on value asses food & export investment on 3rd march 2005.
- Chacha, G. (2012) *Nyama Choma linked to Prostate Cancer* [online]. Nairobi: standardmedia.co.ke available

from http://www.standardmedia.co.ke/?articleID=2000065389&story_title=Nyama-Choma-linked-to-prostate-cancer. [Accessed 10/11/2012]

Saunders, M., Lewis, P., & Thornhill, A. (2007) *Research methods for business students*, 4th edition, London: prentice hall

Fisher, A., Laing, J.E & Strocker, J.E. (1998). *Handbook for family planning operation research design in sampling*. Population council, 40-45.

Tirloni, A. S., dos Reis, D. C., dos Santos, J. B., Reis, P. F., Barbosa, A., & Moro, A. R. P. (2012). Body discomfort in poultry slaughterhouse workers. *Work*, **41**(Supplement 1), 2420-2425.

Blangsted, A. K., Sjøgaard, K., Hansen, E. A., Hannerz, H., & Sjøgaard, G. (2008). One-year randomized controlled trial with different physical-activity programs to reduce musculoskeletal symptoms in the neck and shoulders among office workers. *Scandinavian journal of work, environment & health*, 55-65.

Janwantanakul, P., Pensri, P., Jiamjarasrangsi, V., & Sinsongsook, T. (2008). Prevalence of self-reported musculoskeletal symptoms among office workers. *Occupational medicine*, **58**(6), 436-438.

Andersen, L. L., Mortensen, O. S., Hansen, J. V., & Burr, H. (2011). A prospective cohort study on severe pain as a risk factor for long-term sickness absence in blue-and white-collar workers. *Occupational and environmental medicine*, **68**(8), 590-592.

Brandt, M., Sundstrup, E., Jakobsen, M. D., Jay, K., Colado, J. C., Wang, Y., ... & Andersen, L. L. (2014). Association between neck/shoulder pain and trapezius muscle tenderness in office workers. *Pain research and treatment*, 2014.

Kaka, B., Idowu, O. A., Fawole, H. O., Adeniyi, A. F., Ogwumike, O. O., & Toryila, M. T. (2016). An Analysis of Work-Related Musculoskeletal Disorders Among Butchers in Kano Metropolis, Nigeria. *Safety and health at work*, **7**(3), 218-224.

Henrietta, O., Fawole, Ade, F., Adeniyi, Omoyemi, O. Ogwumike., Mark T. Toryila (2015) An Analysis of Work-Related Musculoskeletal Disorders Among Butchers in Kano Metropolis, Nigeria. *Journal of Safety and Health at Work* **7** (2016) 218e224, by Occupational Safety and Health Research Institute. Published by Elsevier.

Lockley, S. W., Barger, L. K., Ayas, N. T., Rothschild, J. M., Czeisler, C. A., & Landrigan, C. P. (2007). Effects of health care provider work hours and sleep deprivation on safety and performance. *The Joint Commission Journal on Quality and Patient Safety*, **33**(11), 7-18.

Frost, P., Andersen, J. H., & Nielsen, V. K. (1998). Occurrence of carpal tunnel syndrome among slaughterhouse workers. *Scandinavian journal of work, environment & health*, 285-292.