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Pattern and predictors of musculoskeletal pain among bakery workers in Abeokuta, Nigeria

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Abstract

Introduction. The magnitude of musculoskeletal pain (MSP) and its risk factors among bakery workers are not well known in Nigeria. Therefore, this study investigated the pattern and predictors of musculoskeletal pain (MSP) seen in Nigerian bakery workers.
Methods. The analytical cross-sectional survey used a proforma and the standard Nordic questionnaire in assessing demographic characteristics, relevant work-related/ergonomic hazards and MSP information. Participants were selected using a multistage sampling technique with simple random sampling at stage one (25 bakeries) and a consecutive sampling technique at stage two (7 employees from each bakery). Statistics like chi-square and logistic regression were used in analysing the data.
Results. One hundred and seventy-seven participants (77.4% males) with a mean age of 29.7 ± 6.7 years, and the average length of working in the bakery was 9.3 ± 5.2 years. Bending for prolonged periods (93.2%) and repetitive hand movements (92.1%) were the most prevalent ergonomic work hazards. In the past year, 72.3% reported MSP with the lower back region most prevalent (80.2%) followed by pain in the neck region (63.8%). Age, gender and educational attainments were significantly associated with the presence of MSP while ergonomic factors such as repetitive bending, overstretching and use of vibration-generating movement were also significantly associated with the presence of MSP among the bakery workers. Inadequate staffing, using vibration movement handling and education are the main predictors of the presence of MSP ($\chi^2 = 29.09$, $p < 0.001$; $R^2 = 0.219$).
Conclusions. High prevalence of musculoskeletal pain in the past one year among Nigerian bakery workers predicted by education level, inadequate staffing, and vibration movement handling.
Key words: bakery workers, ergonomic hazard, musculoskeletal pain, Nigeria, risk

Introduction

Bread consumption and bakeries are ubiquitous to mankind. Bakery workers are frequently exposed to strenuous manual activities including heavy lifting, forceful exertions, and awkward postures, which lead to serious injuries and pains in various parts of the body [1]. Musculoskeletal painful disorders are one of the most common and costly occupational injuries which constitute the most prevalent causes of labour disability globally [2]. These injuries can be described as discomfort when not examined or diagnosed by qualified personnel [3] and are a major factor in the loss of working time, increased costs and human damage [2].

The prevalence of musculoskeletal discomfort in any part of the body among Taiwanese bakery workers in the past one year was 93.0% [4] compared to 55.1% and 72% which is the six-month and one-year prevalence of musculoskeletal discomfort in Egypt [5] and Nigerian bakery workers [6] respectively. Forcier et al. [7] further compared musculoskeletal pain among workers in seven departments in supermarkets in Canada and concluded that bakers were the second most likely to experience pain among all groups. Musculoskeletal discomfort in the upper extremities was reportedly prevalent in 23% of bakery workers in Lebanon [8] and a high prevalence of 66.3% and 51.8% in the hands/wrists (right and left) among Taiwanese bakery workers [4] gives a picture that the regions of the body mostly reported to be affected by musculoskeletal pain in bakery worker are the upper extremities. This information may necessitate bakery task rearrangement and redesign.

Most of the operations of bread making in Nigeria are performed manually; therefore, the presence of ergonomic risk factors, such as repetitive motions, cumulative trauma disorders (CTD), inappropriate posture, and prolonged standing, are high in this job [9]. Psychological factors and poor environmental conditions are equally predominant in bakeries considering that workers are forced to hold certain postures during work, favourable or unfavourable postures, duration of holding time, and static or dynamic work, alone or in combination [9].

Local fabricators of food processing equipment have designed and manufactured various improvised versions of imported bread-baking machines without due ergonomic consideration [10]. Despite these few locally fabricated machines, most of the processes in bread making largely involve Manual Materials Handling (MMH), which continues to present major time loss in the workplace as well as musculoskeletal disorders. The manual operations, besides being uncomfortable, are characterized by low output and unhygienic products; it frequently leads to musculoskeletal pain among workers [11]. Consequent on the inadequacy of appropriate bread-baking equipment and the over-dependence on manual

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material handling in Nigerian bakeries, it is necessary to document the pattern of musculoskeletal pain seen in Nigerian bakery workers. We further investigated the predictors of musculoskeletal pain (MSP) among Nigerian bakery workers.

Subjects and methods

This study is reported using the relevant domains of Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines [12]. The study used an analytical cross-sectional design in assessing bakery workers for musculoskeletal dysfunction. The sample size was calculated using the Cochran formula and Cochran correction [13] for assessing a descriptive study having set the anticipated proportion of bakery workers presenting musculoskeletal pain as 0.5 at a 95% confidence interval, a 5% margin of error, with estimated 242 bakery workers in Abeokuta and a 20% none response rate, it was necessary to involve 177 participants in this research. They were selected using a multistage sampling technique with simple random sampling at stage one and a consecutive sampling technique at stage two. There are 74 registered bakeries distributed over the 25 wards of the Abeokuta township. In stage one, a bakery was randomly selected in each ward, with 25 bakeries and 7 employees from each bakery being selected consecutively (as they became available and gave informed consent) and invited to complete the study questionnaire (Figure 1). Inclusion criteria were that the participants should consent to the study and be on duty during the survey. Exclusion criteria were that the participants should not have apparent physical deformities, histories of major trauma outside the job, degenerative disc diseases, spondylitis, benign and or malignant tumours.

The instruments used included a proforma that contained questions on gender, age, ethnic group, educational status, length of employment. The proforma also contained questions on the individual perspective on the perceived workplace ergonomic hazards, such as prolonged sitting, lifting of heavy objects etc. The standardized Nordic questionnaire [14] was used to measure the presence and absence of musculoskeletal pain in various parts of the body. The standardized Nordic questionnaire have been shown to have acceptable validity and reliability [14].

Data analysis

Frequency distribution and percentage was used in summarizing socio-demographic and individual characteristics of the participants. The risk of a perceived ergonomic hazard manifesting as MSP was evaluated using Odds ratio. Chi-square and *t*-test were used in making inferences on the association between the prevalence of MSP and selected demographic and work-related characteristics. Logistic regression analysis was used in determining the variables that predicts the presence of MSP amongst bakery workers. SPSS version 20.0 software (IBM Corp, 2012) was utilized for data analysis.

Ethical approval

The research related to human use has complied with all the relevant national regulations and institutional policies, has followed the tenets of the Declaration of Helsinki, and has been approved by the Health Research Committee of the Federal Medical Centre Abeokuta Ogun State, Nigeria (approval No.: FMCA/470/HREC/021/07/2020).

Informed consent

Informed consent has been obtained from all individuals included in this study.

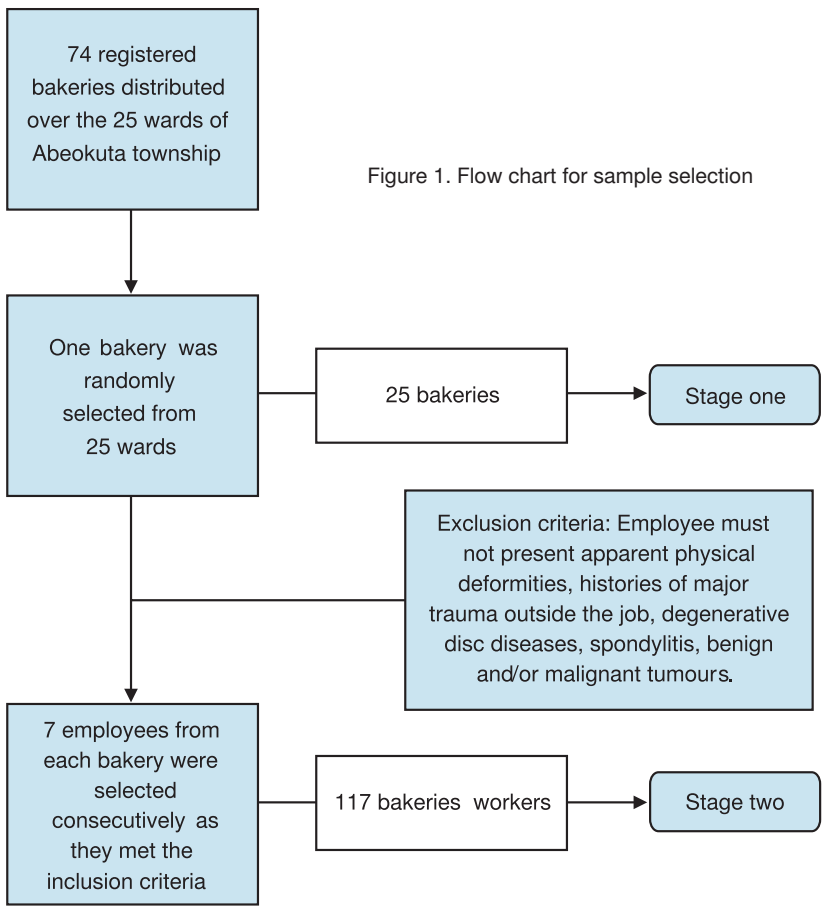

Figure 1. Flow chart for sample selection

Results

One hundred and seventy-seven employees from 25 bakeries (total staff of 242) in Abeokuta North and South local Government area of Ogun State, Nigeria, participated in this study, meaning 73.1% of the employees in the selected 25 bakeries participated in this study. The mean age of the participants was 29.7 ± 6.7 years. 137 (77.4%) of these bakery workers were male and 71(40.1%) of them had secondary education. The average time of working in the bakery was 9.3 ± 5.2 years. The detailed demographic and work-related characteristics of these participants are presented in table 1.

Table 1. Demographic and work-related characteristics of bakery workers

Variables	Frequency *n* = 177	%
Age as at last birthday (mean ± *SD* = 29.7 ± 6.7 years)		
Below 20 years	13	7.4
21–30 years	102	57.8
31–40 years	48	27.1
41 years and above	14	8.0
Gender		
Male	137	77.4
Female	40	22.6
Educational attainment		
No formal education	22	12.4
Primary	66	37.3
Secondary	71	40.1
Tertiary	18	10.2
Years of working (mean = ± *SD* 9.3 ± 5.2 years)		
1–5 years	44	24.9
6–10 years	61	34.4
11–15 years	51	28.8
16–30 years	21	11.8
Hours working/day (mean = ± *SD* 8.9 ± 3.3 hours)		
Less than 6 hours	39	22.1
7–12 hours	127	71.8
Over 12 hours	11	6.3
Days worked per week (mean = ± *SD* 5.6 ± 1.1 days)		
2–4 days	15	8.5
5 days	32	18.1
6 days	106	59.9
7 days	24	13.6
Number of bakery staff (mean = ± *SD* 7.8 ± 2.4)		
4–7	70	39.8
8–10	66	37.3
Over 10	41	23.2

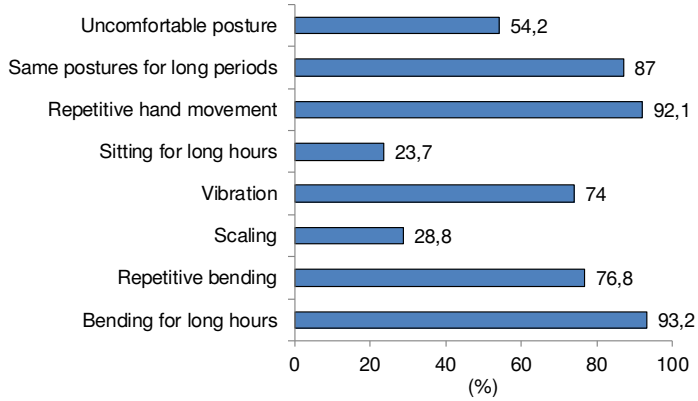

Figure 2. Prevalence of ergonomic risk factors for musculoskeletal pain

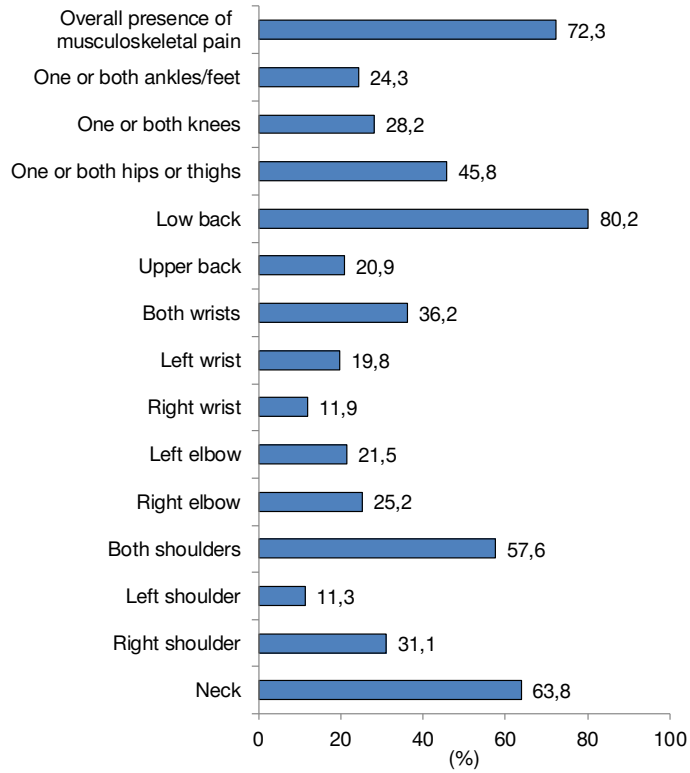

Figure 3. Pattern of musculoskeletal pain in the last 12 month

The most prevalent ergonomic work hazards were bending for prolonged periods (93.2%) and repetitive hand movements (92.1%) (Figure 2). The 12-month prevalence of musculoskeletal pain among bakery workers was 72.3% (Figure 3). The pattern of musculoskeletal pain revealed that pain in the lower back region was most prevalent in 80.2% of the bakery workers followed by pain in the neck region in 63.8% (Figure 3). Age, gender and educational attainments were significantly associated with the presence of musculoskeletal disorder (MSK) among the bakery workers. Repetitive bending, overstretching and use of vibration-generating movement are ergonomic factors that were significantly associated with the presence of MSK in this study population; as bakery workers between 21–30 years old ($p = 0.01$), who are male ($p = 0.02$) and with secondary education ($p < 0.001$) significantly have the presence of MSP (Table 2).

Logistic regression was performed using a forward stepwise mode to ascertain the impact of predictor variables (demographic, work-related and presence of ergonomic work hazard) on the likelihood that respondents would present musculoskeletal pain. The model was statistically significant

Table 2. Association between perceived ergonomic hazard / demographic / work-related variables and the prevalence of musculoskeletal pains

Variable	Test statistics	*p*-value
Age	2.60[a]	0.01*
Gender	12.3[b]	0.02*
Educational attainment	13.0[b]	0.00*
Years of working	1.3[a]	0.20
Hours of working/day	1.2[a]	0.80
Days worked per week	1.3[a]	0.38
Number of bakery staff	1.6[a]	0.10
Bending for long hours	0.2[b]	0.70
Repetitive bending	4.1[b]	0.04*
Overstretching	7.0[b]	0.01*
Scaling	3.5[b]	0.06
Vibration	13.4[b]	0.00*
Standing for long hours	0.2[b]	0.60
Sitting for long hours	0.06[b]	0.80
Repetitive hand movement	0.3[b]	0.60
Same postures for long periods	0.4[b]	0.81
Uncomfortable posture	0.02[b]	0.90

[a] *t*-test, [b] χ^2, * significant at $p < 0.05$

with $\chi^2 = 29.09$, $p < 0.001$. The model explained 21.9% (Nagelkerke R^2) of the variance in prevalence of musculoskeletal pain and correctly classified 78% of cases. Inadequate staffing, using vibration movement handling and education are the main predictors of the presence of MSP. Employees not using vibration generated movement/equipment are 76% less likely not to present musculoskeletal pain compared with those who did use. With one increase in staff, there is a 16% likelihood of a decrease in the presence of MSP (odds ratio = 0.84, 95% CI = 0.715–0.979). Those with secondary and tertiary education are four and seven times less likely to present MSP respectively compared with those with no formal education (Table 3).

Discussion

This study evaluated pattern and risks of musculoskeletal pain (MSP) among Nigerian bakery workers. In the past one year, 72.3% of the participants experienced MSP. This suggests that bakery workers in Nigeria are at high risk of developing MSP. In Nigeria like many low and middle-income countries, bakery workers are subjected to inadequate equipment and material handling compared with industrialised nations. This may explain the high prevalence noticed in our sample. Exposure to force, vibration and repetitive movement have been suggested to elicit physiological, morphological and behavioural responses which lead to musculoskeletal disorders [15]. An attempt to compare the past year's prevalence of MSP revealed that Nigerian bakery workers are comparable in the report on MSP with Taiwanese bakery workers, although Taiwanese bakery workers reported more musculoskeletal symptoms (93%) [4].

The lower back is the body region where bakery workers reported MSP most (80.2%). We expected that upper limbs or neck would be most reported site of MSP given that the upper limbs were frequently utilised in carrying out their daily routine duties. It has been suggested that those workers at high risk of material handling, presented greater odds of developing musculoskeletal disorders, especially in the upper limbs [16]. However, workers in similar work settings, like food processing companies, have also reported a high prevalence of MSP in the lower back [17, 18]. A casual observation of working condition of Nigerian bakery workers utilising locally fabricated equipment show some ergonomic risks, such as repetitive motions, cumulative trauma disorders, inappropriate posture, and prolonged standing [9, 10]. These ergonomic risks may account for the high observation of reports on lower back pain in our sample. Although the lower back was highly reported, neck and shoulder pain were also prevalent in our sample. This was consistent with observations from previous studies among bakery workers [4, 8].

Most of the participants in this study reported high proportions of the ergonomic risk factors examined. Seven of the risk factors were highly reported among bakery workers in Nigeria (74%–93.2%). This is not unexpected as most bakery factory operations in Nigeria are manually operated with ill-equipped locally fabricated equipment [10]. Some of these ergonomic risk factors were reported among Egyptian bakery workers, which were responsible for the musculoskeletal disorders among them [5]. This may call for govern-

Table 3. Predictors of the presence of musculoskeletal pain

Variable	Beta	Standard error	Wald	*p*-value	Exp(B)	95%CI
Constant	1.536	0.775	3.934	0.047	4.648	
Number of bakery staff	–0.178	0.08	4.936	0.026	0.837	0.715–0.979
Use of vibration						
Yes (ref)						
No	–1.412	0.392	13.004	0.001	0.244	0.113–0.525
Education						
No formal education (ref)						
Primary	0.836	0.714	1.368	0.242	2.306	0.569–9.355
Secondary	1.356	0.611	4.933	0.026	3.881	1.173–12.845
Tertiary	1.971	0.630	9.794	0.002	7.179	2.089–24.669

$\chi^2 = 29.092$, $p < 0.001$, overall percentage predicted = 78.0%, Nagelkerke $R^2 = 0.219$, ref – reference option for the logistic regression

ment intervention in formulating occupational safety and health (OSH) legislation. Most bakery factories in Nigeria are small or middle-scale businesses and are interested in profit rather than the welfare of their workers. A recent review has indicated that legislative and regulatory policies may reduce injuries and fatalities and improve compliance with the OSH regulations [19]. On the part of the employer, continuous educational intervention should be initiated for all bakery workers to raise their knowledge and practices about first aid and ergonomics related to occupational hazards. Educational interventions related to first aid and ergonomics on improving bakery workers' performance related to occupational hazards have been shown to be effective in increasing the level of bakery workers' knowledge as well as their practices about first aid and ergonomic manoeuvres in bakers [5, 20].

Our data suggest that the sociodemographics of age, gender and educational level were associated with reported MSP. Most (65%) of the participants were ≤ 30 years of age. Bakery workers older than 30 years have been reported to show an increased likelihood of reporting MSP [4]. About half of the participants have no formal education or primary education. This may pose a challenge in ergonomic risk prevention at work as low education has been associated with the high prevalence of MSP [21, 22]. However, the regression analysis shows that as the level of education increases, the higher the chances of reporting MSP in our sample [23, 24]. It has been suggested that highly educated people usually play important roles in the team and take on more work, and as such may be noticed by their employer for more assignments [23]. Also, anecdotal information suggests that employees with higher educational status are usually older than those with lesser educational status. Increased age is strongly associated with the presence of MSK in our study and other research [3, 4]. Therefore, increased age may manifest in higher educational status to predict the presence of MSK. Our data suggest that female bakery workers are more likely to present MSP compared to males, indicating that gender may be one of the predictors of MSP.

Gender differences in the report of MSP have been reported in the literature with females implicated [25, 26]. However, gender influence in the report of MSP has been inconsistent in the literature. Some studies suggested more females reported MSP [25–27] while others show no significant difference between gender [28]. Ergonomic risk factors, such as repetitive bending, overstretching and vibration movement handling were also associated with the reports on MSP among the participants. These risk factors have been repeatedly implicated in the report on MSP in previous studies [15, 20, 28, 29]. In the present study, the logistic analysis further confirmed the ergonomic risks of vibration movement handling as a predictor of MSP. Vibratory movement handling has a 24% likelihood of reporting more MSP. The number of staff, i.e. bakery workers, also predicted the report of MSP. An increase in the number of employees determined the reduction in MSK reported. This is not surprising as anecdotal reporting suggests that most bakery factories in Nigeria are understaffed; hence, the report of more MSPs among Nigerian bakery workers. Lower back pain is a public health problem mostly reported in the bakery industry, as seen in this study. There is a high prevalence of ergonomic work hazards and resultant musculoskeletal pain. from repetitive bending, overstretching and use of vibration-generating movement machines. Thus, community health nurses should focus on the health education of bakery workers related to body ergonomics to reduce the burden of musculoskeletal disorders and associated morbidity among bakery workers. Also, they should advocate that bakery owners need to employ more workers as inadequate staffing and education were implicated as the main predictors of MSP.

Limitations

This study has some limitations which must be considered while interpreting the results. First, we did not assess psychosocial factors which may influence the report or prevalence of MSP. Psychosocial demands of work have been reported as an independent risk factor of musculoskeletal disorders [30]. Secondly, we did not undertake ergonomic audits of workstations to verify the reported ergonomic risk factors. The lack of physical examination to verify or strengthen the reported symptoms were not undertaken. Lastly, causal-effect relationship cannot be assumed like in cross-sectional studies. Despite these limitations, the study provides an accurate report of musculoskeletal pain and associated risk factors. Thus, it is a valuable addition to the scarce research on musculoskeletal pain among Nigerian bakery workers.

Conclusions

There has been a high prevalence of musculoskeletal pain in the past year among Nigerian bakery workers. Education level, inadequate staffing and vibration movement predicted the report of musculoskeletal pain. It is recommended that Nigerian bakery workers should be educated on postural and work hygiene that can ensure the reduction of the prevalence of MSK. Also, employers of labour in this sector must adopt adequate staffing to minimize over exertion of the employees.

Disclosure statement

No author has any financial interest or received any financial benefit from this research.

Conflict of interest

The authors state no conflict of interest.

References

1. Dempsey PG. A survey of lifting and lowering tasks. Int J Industr Ergon. 2003;31(1):11–16; doi: 10.1016/S0169-8141(02)00104-X.
2. Arrandale V, Meijster T, Pronk A, Doekes G, Redlich CA, Holness DL, et al. Skin symptoms in bakery and auto body shop workers: associations with exposure and respiratory symptoms. Int Arch Occup Environ Health. 2013;86:167–175; doi: 10.1007/s00420-012-0760-x.
3. Ogunlana MO, Awobayo AO, Oyewole OO, Ayodeji AF. Work and musculoskeletal discomfort of Nigerian health workers: pattern and predictors. Phys Ther Rev. 2019; 24(6):389–393; https://doi.org/10.1080/10833196.2019.1662208.
4. Chen Y-L, Zhong Y-T, Liou B-N, Yang C-C. Musculoskeletal Disorders Symptoms among Taiwanese bakery workers. Int J Environ Res Public Health. 2020;17(8); doi: 10.3390/ijerph17082960.
5. El-Ghany GMA, Mahmoud SF. Effect of educational intervention about first aid and ergonomics on improving bakery workers' performance related to occupational hazards at Zagazig City. Egypt Nurs. J 2019;16(1):10–24; doi: 10.4103/ENJ.ENJ_19_18.
6. Joshua IA, Abubakar I, Gobir AA, Nmadu AG, Igboanusi CJC, Onoja-Alexander MO, et al. Knowledge of occupational hazards and use of preventive measures

among bakery workers in Kaduna North Local Government Area, Kaduna State, Nigeria. Arch Med Surg. 2017; 2(2):78–83; doi: 10.4103/archms.archms_39_17.
7. Forcier L, Lapointe C, Lortie M, Buckle P, Kuorinka I, Lemaire J, et al. Supermarket workers: their work and their health, particularly their self-reported musculoskeletal problems and compensable injuries. Work. 2008;30(4): 493–510.
8. Habib RR, El-Harakeh A, Hojeij S. Musculoskeletal pain among bakery workers in Lebanon: a national survey. Cogent Eng. 2019;6:1608669; doi: 10.1080/23311916.2019.1608669.
9. Ige OM, Awoyemi OB. Respiratory symptoms and ventilatory function of the bakery workers in Ibadan, Nigeria. West Afr J Med. 2002;21(4):316–318; doi: 10.4314/wajm.v21i4.28009.
10. Kalejaiye PO. Occupational health and safety: issues, challenges and compensation in Nigeria. Peak J Pub Health Manag. 2013;1:16–23.
11. Bolaji AO. Analytical Study of Carpenters Attitude Towards Safety and Occupational Health Practice in Oyo State of Nigeria. J Hum Ecol. 2005;18(2):99–103; doi: 10.1080/09709274.2005.11905815.
12. Cuschieri S. The STROBE guidelines. Saudi J Anaesth. 2019;13(Suppl 1):31–34; doi: 10.4103/sja.SJA_543_18.
13. Cochran WG. Sampling Techniques. 3rd ed. New York: John Wiley & Sons; 1977.
14. Kuorinka I, Jonsson B, Kilbom A, Vinterberg H, Biering-Sørensen F, Andersson G, et al. Standardised Nordic questionnaires for the analysis of musculoskeletal symptoms. Appl Ergon. 1987;18(3):233–7; doi: 10.1016/0003-6870(87)90010-x.
15. Barbe MF, Gallagher S, Massicotte VS, Tytell M, Popoff SN, Barr-Gillespie AE. The interaction of force and repetition on musculoskeletal and neural tissue responses and sensorimotor behavior in a rat model of work-related musculoskeletal disorders. BMC Musculoskelet Disord. 2013;14:303; https://doi.org/10.1186/1471-2474-14-303.
16. Klussmann A, Liebers F, Gebhardt H, Rieger MA, Latza U, Steinberg U. Risk assessment of manual handling operations at work with the key indicator method (KIM-MHO) – determination of criterion validity regarding the prevalence of musculoskeletal symptoms and clinical conditions within a cross-sectional study. BMC Musculoskelet Disord. 2017;18:184; doi: 10.1186/s12891-017-1542-0.
17. Chaiklieng S. Health risk assessment on musculoskeletal disorders among potato-chip processing workers. PLoS One. 2019;14(12); doi: 10.1371/journal.pone.0224980.
18. Caieiro TTM, de Assis DB, Mininel VA, Rocha FLR, Hortense P. Musculoskeletal pain: comparison between administrative and production employees of a poultry farming company. Rev Bras Med Trab. 2020;17(1):30–8; doi: 10.5327/Z1679443520190277.
19. Andersen JH, Malmros P, Ebbehoej NE, Flachs EM, Bengtsen E, Bonde JP. Systematic literature review on the effects of occupational safety and health (OSH) interventions at the workplace. Scand J Work Environ Health. 2019;45(2):103–113; doi: 10.5271/sjweh.3775.
20. Wami SD, Abere G, Dessie A, Getachew D. Work-related risk factors and the prevalence of low back pain among low wage workers: results from a cross-sectional study. BMC Public Health. 2019;19:1072; doi: 10.1186/s12889-019-7430-9.
21. Farioli A, Mattioli S, Quaglieri A, Curti S, Violante FS, Coggon D. Musculoskeletal pain in Europe: role of personal, occupational and social risk factors. Scand J Work Environ Health. 2014;40(1):36–46; doi: 10.5271/sjweh.3381.
22. Markotić V, Zubac D, Miljko M, Šimić G, Zalihić A, Bogdan G, et al. Level of education as a risk factor for extensive prevalence of cervical intervertebral disc degenerative changes and chronic neck pain. Cent Eur J Public Health. 2017;25(3):245–250; doi: 10.21101/cejph.a4897.
23. Wang T, Zhao Y-L, Hao L-X, Jia J-G. Prevalence of musculoskeletal symptoms among industrial employees in a modern industrial region in Beijing, China. Chin Med J. 2019;132(7):789–797; doi: 10.1097/CM9.0000000000000165.
24. Yu W, Yu ITS, Li Z, Wang X, Sun T, Lin H, et al. Work-related injuries and musculoskeletal disorders among factory workers in a major city of China. Accid Anal Prev. 2012;48:457–463; doi: 10.1016/j.aap.2012.03.001.
25. Lee JW, Lee JJ, Mun HJ, Lee K-J, Kim JJ. The relationship between musculoskeletal symptoms and work-related risk factors in hotel workers. Ann Occup Environ Med. 2013;25(1):20; doi: 10.1186/2052-4374-25-20.
26. Cavallari JM, Ahuja M, Dugan AG, Meyer JD, Simcox N, Wakai S, et al. Differences in the prevalence of musculoskeletal symptoms among female and male custodians. Am J Ind Med. 2016;59(10):841–852; doi: 10.1002/ajim.22626.
27. Das B. Gender differences in prevalence of musculoskeletal disorders and physiological stress among the brick field workers of West Bengal, India. Work. 2019; 63(3):389–403; doi: 10.3233/WOR-192945.
28. Wami SD, Dessie A, Chercos DH. The impact of work-related risk factors on the development of neck and upper limb pain among low wage hotel housekeepers in Gondar town, Northwest Ethiopia: institution-based cross-sectional study. Environ Health Prev Med. 2019;24; doi: 10.1186/s12199-019-0779-7.
29. Balogh I, Arvidsson I, Björk J, Hansson G-Å, Ohlsson K, Skerfving S, et al. Work-related neck and upper limb disorders – quantitative exposure-response relationships adjusted for personal characteristics and psychosocial conditions. BMC Musculoskelet Disord. 2019;20:139; doi: 10.1186/s12891-019-2491-6.
30. Kerr MS, Frank JW, Shannon HS, Norman RW, Wells RP, Neumann WP, et al. Biomechanical and psychosocial risk factors for low back pain at work. Am J Public Health. 2001;91:1069–75; doi: 10.2105/ajph.91.7.1069.