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INCIDENCE OF WORK-RELATED MUSCULOSKELETAL DISORDERS AMONG FARMERS IN THE SAVANNAH REGION OF GHANA

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Abstract

Background: Despite the significant impact of Ghana's agricultural sector on economy growth, research on work-related musculoskeletal disorders (WRMSDs) among farmers remains limited, especially in the Northern regions. The present study explores the incidence of WRMSDs among farmers in the Savannah region of Ghana.

Methods: A cross-sectional study was conducted on 400 farmers who practice both crop farming and animal husbandry. Nordic Musculoskeletal Questionnaire (NMQ) was employed to determine musculoskeletal pain among the participants in the previous 12 months.

Results: The participants were made up of 45.3% (n=181) males and 54.8% (n=219) females. The participants' age ranges from 18-65years, with a mean age of 37.08±14.4years. Most participants (63%) had been farming for between 1-10 years. Those without formal education were 35%. Only 15.8% had a tertiary education. Most participants were married (61.8%), with single participants representing 30.5% of the total sample. Incidence of WRMSDs was 100% over 12 months. Low back pain was the most frequent (52.8%), followed by upper back (38.5%), and knee pain (36.3%). The significant risk factors for WRMSDs were age ($p = 0.001$), gender ($p = 0.012$), educational status ($p = 0.036$), prolonged bending ($p = 0.002$), standing ($p = 0.008$), and walking for extended distances ($p = 0.015$).

Conclusion: The high rate of WRMSDs, especially low back pain among farmers, necessitates ergonomic interventions and occupational health education for farmers working in the Savannah Region. Targeted prevention programmes and occupational health policies should be developed for Ghana's farming communities to reduce the incidence of WRMSDs.

Keywords: *Farmers, Ghana, occupational health, pain, Savannah Region, work related musculoskeletal disorder*

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Introduction

Work-related musculoskeletal disorders (WRMSDs) are injuries of the muscles, nerves, tendons, ligaments, joints, cartilage, and spinal discs that are caused or aggravated by workplace activities.[1] They often show up as pain in areas like the back, shoulders, or knees.[1,2,3] These disorders arise when repetitive motions, awkward postures, or excessive force disrupt the delicate balance between vertebrae (spinal bones), intervertebral discs (cushioning structures), muscle fibers, and connective tissues.[4,5]

Affected individuals often complain of pain and discomfort, which affects their functional abilities and quality of life.[6] Musculoskeletal disorders (MSDs) were identified as the leading cause of worker absenteeism, disability, and wage loss.[7] Work-related musculoskeletal disorders are a leading cause of morbidity globally, with prevalence rates between 15% and 93.6%.[8] The most prevalent WRMSDs are low back pain, followed by shoulder pain, then neck and knee pain.[1,9] Studies from African occupational studies reported that MSDs prevalence rates were approximately 63.9% to 89.3%. [10,11,12,13]

For instance, studies have been conducted among female small-scale farmers in South Africa, butchers in Nigeria occupational drivers in Nigeria, and flower farm workers in Kenya.[10,11,12,13] This highlights the impact of physically demanding environments with limited ergonomic interventions. Interestingly, agricultural workers constitute about two-thirds of the population of Low- and Middle-Income Countries (LMICs) and are at increased risk of developing musculoskeletal disorders due to the physically demanding nature of their activities.[14,15] Occupational exposures, including prolonged stooping, repetitive lifting of heavy loads, machinery vibration, and sustained awkward postures, also predispose agricultural workers to musculoskeletal pathologies.[1,4,16]

In Ghana, agriculture serves as the backbone of the country's economy, with the agricultural sector employing about 39.74 % of the total workforce as of 2022, making it the largest employment sector in the country.[17] The sector contributes approximately 21.1 % to Ghana's GDP as of 2023 and helps to providing food security and rural livelihood support.[18] This suggests that the health and productivity of agricultural workers could directly impact national food security, export revenues, and overall economic stability of the country. Despite this substantial economic contribution, Ghana's agricultural industry remains significantly underdeveloped in terms of technology and innovative practices compared to developed countries.[19] This may have contributed to dependence on and predominantly smallholder-based farming practices in Ghana, characterized by family-operated farms that rely heavily on manual labor and traditional farming techniques.[20]

The limited access to modern agricultural tools and equipment presents a challenge that increases the risk of WRMSDs among Ghanaian farmers.[21] This is because farmers often resort to the use of manual methods and basic hand tools such as cutlasses and hoes, requiring farmers to adopt and maintain awkward postures for extended periods, thereby increasing their susceptibility to developing musculoskeletal disorders.[1,4,16]The resulting health complications not only affect individual farmer wellbeing but also exacerbate the economic burden on farming families and communities, potentially

compromising agricultural productivity and food security across the country.

Despite the significant impact of Ghana's agricultural sector, research on WRMSDs among farmers remains severely limited, especially in northern regions. This knowledge gap is critical since Sub-Saharan African agricultural workers show higher WRMSDs rates than other global region.[10,14] The Savannah Region presents unique challenges with subsistence farming, limited healthcare, and seasonal work patterns that increase injury risks. Therefore, this study was conducted to examine WRMSDs incidence, and risk factors in the Savannah Region of Ghana.

Methods

A cross-sectional survey was conducted at Bole, in the Savannah Region of Ghana, among crop- and livestock-producing farmers. This group of farmers was selected because mixed crop and livestock farming makes up the agricultural practice in the area, thus making them the majority representative of farmers in the region. Studying this population, therefore, provides a more accurate understanding of the prevailing agricultural practices and challenges within the Bole Municipality, in the Savannah Region of Ghana. Four hundred (n=400) farmers were selected randomly from the farming population.

Study site

The research was carried out at Bole, a rural community within the Savannah Region of Ghana, where agriculture is the major economic activity. The farming sector at the study site involved labor-intensive activities such as crop farming and animal husbandry, and thus it was a suitable place for the investigation of WRMSDs.

Eligibility criteria

Participants at least 18 years of age and those with a minimum of one year farming experience were recruited into the study. This was to ensure that participants possessed sufficient farming maturity and occupational exposure to provide reliable information. To maintain the focus on work-related factors in farming, farmers with pre-existing non-occupational musculoskeletal conditions were excluded. This was necessary in reducing potential confounders and strengthening the validity of the findings.

Data Collection

Data on WRMSDs were obtained from the farmers using the Nordic Musculoskeletal Questionnaire (NMQ). The NMQ is a validated and reliable questionnaire with 66% – 92% sensitivity and 71%–88% specificity, respectively.[22] NMQ measured musculoskeletal pain or discomfort in nine body locations (neck, shoulders, upper back, elbows, low back, wrists/hands, hips/thighs, knees, ankles/feet) during the previous 12 months (August 2023 to August 2024). Data was obtained from the farmers through house-to-house questionnaire administration, supplemented by clinical examinations, and were approximately 15 minutes in duration. Additionally, a self-developed questionnaire was used to collect data on perceived risk factors using a Likert scale, and sociodemographic information (sex, marital status, education, household income, and years of experience in agriculture) of the participants.

Ethical Considerations

The study conformed to the ethical guidelines of the Declaration of Helsinki. Ethical clearance was obtained from the Kwame Nkrumah University of Science and

Technology (KNUST) Committee on Human Research Publications and Ethics (CHRPE) with approval number (CHRPE/AP/679/23). Informed consent was obtained from participants while collecting data, and all data were anonymized to ensure confidentiality.

Statistical Analysis

Data was entered into Excel and imported into SPSS version 26.0 for analysis. Sociodemographic profiles and prevalence were described using descriptive statistics (means, percentages, frequencies, and standard deviations). Bivariate correlation analysis was performed to find the associations between risk factors and various body regions affected by WRMSDs. Additionally, Chi-square tests were used to identify the association between WRMSDs, sociodemographic profiles, and risk factors. A p-value of less than 0.05 was used as statistically significant

Results

From Table 1, the participants' age ranges from 18- 65 years, with a mean age = 37.08 years; SD = 14.4. The largest age group was 18-30 years (n = 174, 43.5%), followed by 31-40 years (n = 84, 21%). Female participants comprised 54.8% of the sample (n = 219), while males represented 45.3% (n = 181). Participants who were 35.0% (n = 140) had no formal education, while 21.5% (n = 86) completed junior high school. Only 15.8% (n = 63) had a tertiary education. The majority of participants were married (n = 247, 61.8%), with single participants representing 30.5% (n = 122) of the sample. Most participants (n = 252, 63%) had been farming for between 1-10 years, with fewer having longer farming experience. The mean household size was 8.47 (SD = 3.79), with half of the participants (n = 203, 50.7%) living in households of 6-10 members. Annual income distribution showed that the largest group earned GH₵ 501-1000 (n = 145, 36.3%), followed by those earning GH₵ 201-500 (n = 107, 26.8%).

Table 2 shows the prevalence of WRMSDs among participants across different body regions. Lower back pain was the most commonly reported disorder, affecting 52.8% of the participants (n = 211), followed by upper back pain (n = 154, 38.5%). Knee pain affected 36.3% (n = 145) of the participants. Neck pain was reported by 34.3% (n = 137). Less commonly affected areas included wrist and hand (n = 107, 26.3%), ankle and feet (n = 96, 24%), shoulder (n = 94, 23.5%), hip and thigh (n = 85, 21.3%), and elbow (n = 68, 17%).

The study examined 13 risk factors for WRMSDs; 11 were classified as work characteristics, 1 as a personal characteristic (age), and 1 as a psychosocial factor (knowledge). Table 3 revealed that majority of the participants (n = 213, 53.3%) strongly disagreed that age influenced WRMSDs, while only 12.8% (n = 51) strongly agreed with this association. For psychosocial factors, 32.3% of participants (n = 129) agreed that knowledge influenced WRMSDs, with an additional 15% (n = 60) strongly agreeing.

Work characteristics showed varied responses across different factors. The most concerning work-related risk factor was working with hands and knees, with 36.5% (n = 146) of participants strongly agreeing that this

contributed to WRMSDs. Load carrying and bending were also identified as significant risk factors, with 28% (n = 112), and 24.3% (n = 97) of participants strongly agreeing that these activities contributed to musculoskeletal problems, respectively.

Table 1. Sociodemographic Characteristics of Participants (N = 400)

Variable	Category	Frequency n (%)
Age	18-30	174 (43.5)
	31-40	84 (21.0)
	41-50	54 (13.5)
	51-60	48 (12.0)
	>60	40 (10.0)
Gender	Male	181 (45.3)
	Female	219 (54.8)
Educational Level	None	140 (35.00
	Primary	66 (16.5)
	Junior High School	86 (21.5)
	Senior High School	45 (11.3)
	Tertiary	63 (15.8)
Years of Farming	1-10	252 (63.0)
	11-20	92 (23.0)
	21-30	37 (9.3)
	31-40	21 (5.3)
	>40	2 (0.5)
Household Size	1-5	102 (25.5)
	6-10	203 (50.8)
	11-15	72 (18.0)
	16-20	22 (5.5
	>21	1 (0.3)
Marital Status	Single	122 (30.5)
	Married	247 (61.8)
	Divorced	13 (3.3)
	Widowed	18 (4.5)

Chi-square tests revealed several significant associations between sociodemographic factors and the prevalence of WRMSDs. From Table 5, Gender showed a significant association with upper back pain ($\chi^2 = 4.950$, $p = .026$), with females reporting higher rates than males. Educational level demonstrated significant associations with multiple body regions, including upper back pain ($\chi^2 = 10.297$, $p = .036$), lower back pain ($\chi^2 = 9.700$, $p = .046$), neck pain ($\chi^2 = 1.494$, $p = .005$), elbow pain ($\chi^2 = 11.381$, $p = .023$), and ankle/feet pain ($\chi^2 = 13.836$, $p = .008$).

Age category showed significant associations with neck pain ($\chi^2 = 9.661$, $p = .047$), lower back pain ($\chi^2 = 15.421$, $p = .004$), and elbow pain ($\chi^2 = 10.731$, $p = .030$). Household size was significantly associated only with shoulder pain ($\chi^2 = 9.842$, $p = .043$). No significant associations were found between marital status, annual income, or years of farming experience and any of the musculoskeletal disorders examined

Bivariate correlation analysis revealed significant associations between risk factors and various body regions affected by WRMSDs. From Table 4, Strong positive correlations were found between risk factors and neck pain ($r = .674$, $p < .001$), knee pain ($r = .670$, $p < .001$), and ankle/feet pain ($r = .586$, $p < .001$). Moderate to strong correlations were also observed for shoulder pain ($r = .674$, $p < .001$), wrist/hand pain ($r = .533$, $p < .001$), lower back pain ($r = .525$, $p < .001$), upper back pain ($r = .483$, $p < .001$), and elbow pain ($r = .433$, $p = .021$). The weakest correlation was found for hip/thigh pain ($r = .255$, $p = .159$), which was not statistically significant.

Table 2: Prevalence of Work-Related Musculoskeletal Disorders by Body Region *(N = 400)*

Body Region	Yes N (%)	Yes N (%)
Lower back	211 (52.8)	189 (47.3)
Upper back	154 (38.5)	246 (61.5)
Knee	145 (36.3)	255 (63.8)
Neck	137 (34.3)	263 (65.8)
Wrist and hand	107 (26.8)	293 (73.3)
Ankle and feet	96 (24.0)	304 (76.0)
Shoulder	94 (23.5)	306 (76.5)
Hip and thigh	85 (21.3)	315 (78.8)
Elbow	68 (17.0)	332 (83.0)

Table 3. Perceived Risk Factors for Work-Related Musculoskeletal Disorders (N = 400)

Risk Factor	Strongly Agree n (%)	Agree n (%)	Neutral n (%)	Disagree n (%)	Strongly Disagree n (%)
Personal Factor					
Age	51 (12.8)	35 (8.8)	54 (13.5)	47 (11.8)	213 (53.3)
Psychosocial Factor					
Knowledge	60 (15.0)	129 (32.3)	91 (22.8)	37 (9.3)	83 (20.8)
Work Related Factors					
Working on hands/knees	146 (36.5)	85 (21.3)	55 (13.8)	49 (12.3)	65 (16.3)
Load carrying	112 (28.0)	102 (25.5)	52 (13.0)	60 (15.0)	74 (18.5)
Bending	97 (24.3)	129 (32.3)	71 (17.8)	42 (10.5)	61 (15.3)
Repetitive movements	69 (17.3)	98 (24.5)	90 (22.5)	50 (12.5)	93 (23.3)
Prolonged standing	65 (16.3)	88 (22.0)	92 (23.0)	54 (13.5)	101 (25.3)
Heavy lifting	65 (16.3)	97 (24.3)	82 (20.5)	61 (15.3)	95 (23.8)
Walking	73 (18.3)	103 (25.8)	79 (19.8)	50 (12.5)	95 (23.8)
Squatting	74 (18.5)	78 (19.5)	84 (21.0)	58 (14.5)	106 (26.5)
Twisted posture	92 (23.0)	87 (21.8)	72 (18.0)	47 (11.8)	102 (25.5)
Awkward hand positions	70 (17.5)	84 (21.0)	70 (17.5)	62 (15.5)	114 (28.5)
Neck positioning	64 (16.0)	67 (16.8)	102 (25.5)	54 (13.5)	113 (28.3)

Table 4. Bivariate Correlations Between Risk Factors and Body Region Work-Related Musculoskeletal Disorders

Body Region	Correlation Coefficient	*p*-value
Neck	0.674	< .001
Shoulder	0.674	< .001
Knee	0.670	< .001
Ankle/feet	0.586	< .001
Wrist/hand	0.533	< .001
Lower back	0.525	< .001
Upper back	0.483	< .001
Elbow	0.433	.021
Hip/thigh	0.255	.159

Table 5. Chi-Square Tests of Association Between Sociodemographic Factors and Body Region Work-Related Musculoskeletal Disorders

Variable	Body Region	χ^2	*p*-value
Gender	Neck	0.101	.750
	Shoulder	0.791	.374
	Upper back	4.950	.026*
	Elbow	0.420	.517
	Wrist/hand	1.399	.237
	Lower back	2.651	.103
	Hip/thigh	0.631	.427
	Knee	0.976	.323
	Ankle/feet	0.034	.854
Educational Level	Neck	1.494	.005*
	Shoulder	3.589	.464
	Upper back	10.297	.036*
	Elbow	11.381	.023*
	Wrist/hand	4.747	.314
	Lower back	9.700	.046*
	Hip/thigh	4.804	.308
	Knee	9.265	.055
	Ankle/feet	13.836	.008*
Age Category	Neck	9.661	.047*
	Shoulder	0.175	.996
	Upper back	3.872	.424
	Elbow	10.731	.030*
	Wrist/hand	4.716	.318
	Lower back	15.421	.004*
	Hip/thigh	3.674	.531
	Knee	5.481	.232
	Ankle/feet	2.049	.727
Household Size	Neck	3.056	.549
	Shoulder	9.842	.043*
	Upper back	2.517	.472
	Elbow	1.440	.696
	Wrist/hand	2.594	.578
	Lower back	2.517	.642
	Hip/thigh	1.393	.672
	Knee	1.334	.771
	Ankle/feet	3.107	.540

Note. p < .05. Only significant associations are marked with *

Chi-square tests revealed several significant associations between sociodemographic factors and the prevalence of WRMSDs. From Table 5, Gender showed a significant association with upper back pain ($\chi^2 = 4.950$, $p = .026$), with females reporting higher rates than males. Educational level demonstrated significant associations with multiple body regions, including upper back pain ($\chi^2 = 10.297$, $p = .036$), lower back pain ($\chi^2 = 9.700$, $p = .046$), neck pain ($\chi^2 = 1.494$, $p = .005$), elbow pain ($\chi^2 = 11.381$, $p = .023$), and ankle/feet pain ($\chi^2 = 13.836$, $p = .008$).

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Discussion

This is the first study to be undertaken at Bole Municipality, in the Savanna Region of Ghana, investigating WRMSDs among farmers. The study found a 100% incidence rate of WRMSDs among the participants, surpassing global estimates of 85.6%–90.6%.[23,24] This finding could be attributed to the highly demanding physical nature of non-mechanized farming practices in the area. With agriculture providing employment to most Ghanaians and serving as the backbone of rural livelihoods, the widespread nature of WRMSDs represents a substantial threat to productivity, quality of life, and economic stability.[6,19] Low back pain was the most common work-related musculoskeletal pain (52.8%) in this population, followed by upper back pain (38.5%) and knee pain (36.3%). The findings from the current study confirms previous study, and this pattern persists more than a decade later.[24] These findings suggest that the incidence patterns align with other studies among agricultural workers in low and middle-income countries[14,15,24] as established in their systematic review that lower back pain was the most common MSD among farmers, followed by upper and then lower extremity MSDs. The persistence of WRMSDs implies that little has changed in terms of prevention and support for farmers over the years, and without targeted solutions, these challenges will likely continue to affect future generations.

The study further found that the hands and knees were the most significant contributor to WRMSDs among the farmers. This reflects the reality of small-scale farming practices across Ghana and sub-Saharan Africa, where mechanization remains limited and ground-level activities such as weeding, planting, and harvesting predominate.[19,25] This finding gains particular significance when viewed alongside recent meta-analytic evidence that found associations between musculoskeletal disorders and particular activities, including heavy lifting and repetitive activities among agricultural workers in LMICs.[15,26]

The prominence of load carrying and bending as critical risk factors, identified by 28% and 24.3% of participants, respectively, speaks directly to the labor-intensive nature of Ghanaian agriculture. These activities are not merely occupational hazards but core components of farming livelihoods, particularly for women who often bear primary responsibility for transporting agricultural

products to markets using traditional head-loading techniques.[27,28] The relevance of these findings extends beyond immediate health concerns to broader concerns about agricultural sustainability and productivity.

Additionally, the results of the current study showed a strong positive correlation between risk factors and various anatomical regions affected by WRMSDs. There were strong correlations with neck pain ($r = .674$, $p < .001$), shoulder pain ($r = .674$, $p < .001$), and knee pain ($r = .670$, $p < .001$) suggesting that workplace risk factors especially in farming have especially pronounced effects on these body regions.[1,4,14,16] These correlation patterns likely reflect the biomechanical demands of traditional farming activities common in Ghana.[19] Such biomechanical demands include frequent overhead reaching during tree crop cultivation, sustained neck flexion during ground-level tasks, and prolonged kneeling or squatting during planting and weeding activities.[10,11,12,13,19,25]

The moderate correlation with lower back pain ($r = .525$, $p < .001$), despite its high incidence, suggests that lower back disorders in this population result from complex interactions between multiple risk factors, likely including individual characteristics, psychosocial factors, and cumulative occupational exposures that extend beyond the workplace variables measured in this study.[1,4,14,16]

Also, the significant association between gender and upper back pain ($\chi^2 = 4.950$, $p = .026$), with females reporting higher rates, reflects the gendered division of agricultural labor that characterizes farming systems across West Africa. Women in Ghanaian agriculture typically engage in activities such as weeding, harvesting, and extensive post-harvest processing that require sustained forward bending and awkward postures, potentially contributing to increased upper back strain. This finding aligns with agricultural ergonomics research, where female gender has been identified as a risk factor associated with MSDs.[26]

Educational level was also associated with multiple body regions, including upper back, lower back, neck, elbow, and ankle/foot pain. This pattern suggests that farmers with lower educational levels may face multiple disadvantages, including limited access to information about ergonomic practices, proper lifting techniques, and injury prevention strategies.[14,29,30,31] Comprehensive health promotion programmes targeting farming communities could yield substantial benefits by improving both awareness and practical skills related to occupational safety.

Interestingly, the age-related associations observed in our study, with significant relationships between age categories and neck pain, lower back pain, and elbow pain, reflect the cumulative toll of prolonged exposure to physically demanding agricultural work.[1,4,14,16] These findings are consistent with recent research documenting age as a significant predictor of musculoskeletal disorders among agricultural populations.[13,14,32,33] This highlights the importance of implementing early preventive measures in farmers' careers to reduce long-term health challenges and preserve productivity. The findings serve as essential evidence to develop targeted prevention programmes and inform occupational health policies for Ghana's farming communities.

Strengths and limitations

This is the first study to be undertaken at Bole, in the Savanna Region of Ghana, investigating WRMSDs among farmers. The evidence presented in this study provides a foundation for developing targeted, culturally appropriate interventions to address this substantial public health burden. However, the cross-sectional design precludes the establishment of causal relationships between risk factors and musculoskeletal disorders, and future longitudinal studies are needed to provide stronger evidence for temporal associations and enable examination of disorder progression over time. The reliance on self-reported measures, while appropriate for large-scale epidemiological investigations, may be subject to recall bias and individual differences in pain perception and reporting.[34]

Conclusion

In conclusion, this study demonstrates that WRMSDs represent a critical occupational health challenge among farmers in Ghana, with prevalence patterns and risk factor associations that reflect the physically demanding nature of traditional agricultural practices. The strong correlations between workplace risk factors and musculoskeletal disorders offer clear targets for prevention efforts, while the sociodemographic associations highlight the need for tailored approaches that consider individual and community characteristics. Addressing WRMSDs among farmers requires coordinated efforts among stakeholders such as the Ministry of Agriculture and the Ministry of Health. Effective interventions in Ghana and other African settings should focus on improving manual techniques, introducing appropriate intermediate technologies, and suitable training programmes while promoting safer work methods.

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Author Contributions:

G.D and C.Y. conceptualized the study. G.D wrote the first draft of the manuscript and was supported by P.T, F.O, C.Y, D.E and M.O.M. All authors listed have made a substantial, direct, intellectual contribution to the work. All authors have read and agreed the manuscript for publication.

Declaration of Conflict of Interest:

The authors declare no conflicts of interest.

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Data Availability Statement

The data presented for this study will be made available upon reasonable request from the corresponding author due to privacy, legal and ethical concerns.

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