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MUSCULOSKELETAL DISORDERS ASSOCIATED WITH COCOA WAREHOUSE TASKS IN GHANA: PRELIMINARY RESULTS FROM A PILOT STUDY

A. Addo* & A. Bart-Plange
Department of Agricultural Engineering
Kwame Nkrumah University of Science and Technology
Kumasi, Ghana

Abstract

This study was conducted with the objective of assessing musculoskeletal disorders (MSDs) in workers who manually handle bagged cocoa beans in warehouses. Questionnaires were administered to 48 workers of 5 major cocoa purchasing companies within the Kumasi metropolis and its environs in Ghana. The results showed that MSDs were prevalent among workers in the warehouses. The percentage of workers who reported MSDs in the hip, upper back, shoulder and neck were 71%, 69%, 67% 49%, respectively. Furthermore, 44%, 42%, 22% and 17% reported MSDs in the lower back, knee, wrist/hand and foot/ankle, respectively. Multi-location MSDs in the upper back, shoulder and hip were experienced by 31% of the workers. Injury cases that required medical attention and work interruption, and fatigue after work were reported. Further studies and rationalisation of work methods such as the introduction of semi-mechanised material handling systems would help improve the health and safety of the workers.

Keywords: Warehouse, manual handling, cocoa, musculoskeletal disorders.

1. Introduction

Ghana is the second largest producer of cocoa (*Theobroma cacao* L.) beans in the world with an average annual production varying from 662,000 to 1010,000 tonnes in 2008/2009 and 2010/2011 cocoa seasons respectively (International Cocoa Organization (ICCO), 2011). Manual handling of 64 kg bagged cocoa beans is extensively carried out during loading and unloading of trucks in warehouses. These activities typically involve extensive high levels of physical effort and high demands on the musculoskeletal system (Van Dieen *et al*., 1997; Cavaletto *et al*., 1994).

Warehouse workers are very commonly exposed to repetitive lifting, carrying, pushing and pulling tasks requiring excessive body bending and twisting. These exposures put these workers at increased risk of injuries due to excessive fatigue and cumulative trauma. Manual handling tasks involve a risk of strains and sprains notably to the back, but also to other parts of the body. This may increase the chance of a back disorder developing when it is prolonged, frequent or combined with awkward postures (Colwyn Bay County Borough Council, 2002).

A number of studies have linked the development of back pain, hip and knee arthritis with physically strenuous work (Felson *et al*., 1991; Maetzel *et al*., 1997; Walker-Bone and Palmer, 2002). Work-related musculoskeletal disorders result from excessive physical work demands involving both forceful activities and repetition without an adequate recovery time and generally involve pain and discomfort in the lower back, neck, hands, arms, shoulders, or legs (Waters & Wilkins, 2004; Stäl & Englund, 2005). There is evidence that MSDs result from repeated biomechanical stress caused by ergonomic hazards (United States Department of Labor (USDOL), 1990). Silverstein *et al*. (1987) demonstrated a relationship between occupational exposures (specifically those with high force-high repetitious tasks) and pathology. Reviews of the literature (Garg & Moore, 1992; Pope, 1989) indicate that heavy physical work, repeated lifting and body twisting are consistently associated with greater risk. The adverse effects resulting from these exposures can interfere with activities of daily living and may have negative long-term economic consequences for the individual and community.

Studies on ergonomics in the cocoa industry in Ghana have been limited to on-farm activities among children (Mull & Kirkhorn, 2005), and no attention has been paid to the MSDs of workers in the handling of bagged cocoa beans in warehouses. Database searches on MSDs associated with manual handling of bagged cocoa beans yielded no results. The objective of this paper therefore was to conduct an exploratory study of MSDs experienced by workers in cocoa warehouses in Ghana.

2. Methodology

2.1 *Demography and Ergonomics*

The general data on demography and ergonomics were collected during personal interviews. Data on duration of work per day, experience in a warehouse, nature of work, fatigue, injury and work interruption were collected. Work-related MSDs are mostly cumulative, resulting from repeated exposure to loads at work over a period of time. Therefore, to assess the effect on health due to working for prolong periods in warehouses, workers who had worked in a warehouse for more than one year were interviewed. Questionnaires were administered to workers in four warehouses located in Asokwa, Adum, Abuakwa and Kaase in the Kumasi metropolis, and one in Ejisu in the Ejisu-Juaben District, all located

in Ghana. The number of workers per warehouse ranged from 7 to 12, and a total of 48 workers in the 5 major cocoa buying companies were interviewed.

2.2 Data Analysis

The individual worker was the unit of analysis. One–way analysis of variance (ANOVA) was used to compare numerical values and Pearson's chi–square test was used to compare percentages across age groups (Chapman *et al*., 2003) using SPSS (2001) statistical software.

3. Results and Discussion

All the workers in the warehouses were males and aged between 20 to 55 years showing a significant difference ($p \leq 0.001$) (Table 1). Forty-seven (98%) of the workers worked in the warehouse without any other jobs except 1 (2%) who was also engaged in farming. The duration of working in a warehouse varied from 1 to 23 years showing a significant difference ($p \leq 0.001$). Fatigue after work was experienced by 98% of the workers, of which 63% depended on pain relievers after work. Although injury was not reported by majority of the workers, 34% had injuries that required medical attention and led to work interruption.

Table 1: Demographics, work hours, and injuries of workers engaged in cocoa warehouse tasks

	Age						All	p-value[a]
	20-25	26-31	32-37	38-43	44-49	50-55	Ages	
Sample group size	4	10	14	16	2	2	48	
Male gender (%)	100	100	100	100	100	100		
Age (years)[b]	22.75[a] ±2.22	29.40[a] ±1.43	34.50[a] ±1.87	39.81[a] ±1.38	44.50[a] ±0.71	52.50[a] ±3.34	35.40 ±6.83	0.001
Body weight (kg)	62 [a] ± 0.98	68 [a] ± 1.21	65 [a] ± 1.01	59 [a] ± 1.55	63 [a] ± 2.11	65 [a] ± 1.84	64 ±1.45	0.821
All work in this warehouse (hours/day)[b]	7.5 ±1.73	6.4 ±1.84	6.0 ±1.66	6.89 ±1.99	6.5 ±2.12	8.5 ±0.71	6.56 ±1.82	0.453
Duration of working in warehouse (years)[b]	3[a] ±2.00	6.3 [b] ±2.50	8.14[a,c] ±2.60	10.40[a,b,d] ±3.66	13.00[a,b] ±5.66	17.50[a,b,c,d] ±7.78	8.67 ± 4.32	0.001
Loading/unloading (%)	100 (n=4)	100 (n=10)	100 (n=14)	100 (n=16)	100 (n=2)	100 (n=2)		
Fatigue after work (%)	100 (n=4)	100 (n=10)	100 (n=14)	100 (n=16)	100 (n=2)	50 (n=1)		
Injury requiring medical attention (%)	25 (n=1)	33 (n=3)	36 (n=5)	31 (n=5)	50 (n=1)	0		
Injury requiring work interruption (%)	50 (n=2)	33 (n=3)	31 (n=5)	38 (n=6)	0	0		

Values followed by same lowercase letters in a row are significantly different from each other using least significant difference post hoc tests.

[a] 1–way ANOVA.

[b] Values for variables in hours/day and years are all mean ± standard deviation.

Table 2: Any musculoskeletal disorders in the last year reported by workers in cocoa warehouses

	Age						All-Age	
	25-30 (n=4)	26-31 (n=10)	32-37 (n=14)	38-43 (n=16)	44-49 (n=2)	50-55 (n=2)	Average (n=48)	p-value[a]
Neck	1 (25%)	4 (40%)	7 (50%)	7 (44%)	1 (50%)	2 (100%)	22 (49%)	0.955
Upper back	3 (75%)	7 (70%)	9 (64%)	11 (69%)	1 (50%)	1 (50%)	33 (69%)	0.955
Shoulder	4 (100%)	5 (50%)	10 (71%)	11 (69%)	1 (50%)	1 (50%)	32 (67%)	0.233
Elbow	1 (25%)	0 0	2 (15%)	1 (6%)	0 0	1 (50%)	5 (10%)	0.955
Wrist/Hand	1 (25%)	5 (50%)	3 (21%)	1 (6%)	1 (50%)	0 0	11 (22%)	0.896
Lower back	2 (50%)	5 (50%)	5 (36%)	8 (50%)	1 (50%)	0 0	21 (44%)	0.180
Hip	4 (100%)	6 (60%)	11 (69%)	11 (69%)	1 (50%)	2 (100%)	34 (71%)	0.955
Knee	1 (25%)	6 (60%)	4 (29%)	7 (44%)	0 0	2 (100%)	20 (42%)	1.000
Foot/ankle	2 (50%)	0 0	3 (21%)	2 (13%)	1 (50%)	0 0	8 (17%)	0.799

[a] Chi-square analyses.

Manual labour characterised the lifting and carrying of 64 kg bagged cocoa beans during loading and unloading of trucks. From the localised MSDs reported, 49% of the workers reported that their neck problems were due to head carrying of bagged cocoa beans (Table 2). The percentages of workers who experienced upper back and shoulder pains were 69% and 67%, respectively, and only 22% reported wrist/hand pains. Furthermore, 71% of the workers reported hip pains and 44% lower back pains. Disorders in the knee and foot/ankle were 42% and 17%, respectively. Similar findings on MSDs experienced by workers in a bagged grain warehouse in India have been reported (Prandhand *et al*., 2007). In our study, there was no significant difference ($p>0.05$) between age groups for the various musculoskeletal disorders. Furthermore, two-way ANOVA results (not reported) showed that there was no effect or interaction ($p\geq0.5$) of age, years of experience or weight with any of the MSDs.

MSDs were reported in more than one location of the body by some workers and the most affected parts were the upper back, hip and shoulder. From the study, 15 (31%) of the workers reported multi-local MSDs in the upper back, shoulder and hip, while 6 (12%) reported MSDs in the upper back and shoulder (Fig. 1). Furthermore, 8 (17%) had multi-local MSDs in the upper back and hip, and 7 (15%) in the shoulder and hip.

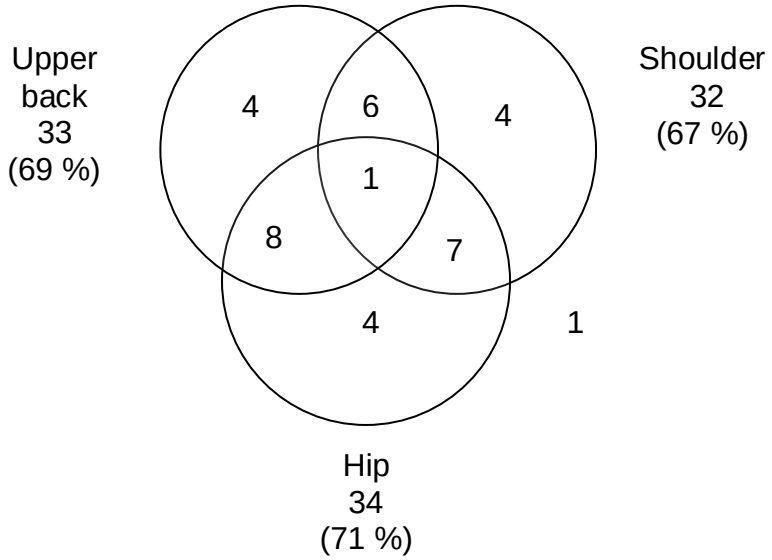

Fig. 1: Multi-local MSDs reported in the upper back, shoulder and hip.

From this study, it was evident that most of the workers were lifting and carrying a full baggged cocoa beans each weighing 64 kg, which was equal to the average weight of a worker but more than those with body weights of 59, 62 and 63 kg (Table 1). The International Labour Organization (ILO) (2010) recommends that employers should elimante exposure to ergonomic hazards such as carrying of heavy loads greater than 23 kg.. Although this recommended practice would drastically reduce loads to be carried, it would lead to longer periods of operation in warehouses. Therefore, the introduction of mechanised or semi-mechanised conveyors would be more appropriate in terms of turn around periods of trucks, but also in alleviating MSDs in warehouse workers.

Carrying load on shoulder or head was the major job component of the bagged cocoa beans handling by workers. Adoption of awkward posture during lifting and carrying loaded sacks repetitively results in musculoskeletal complain. The overall stress of a worker is the integrated form of physical workload and postural stress (Prandhad *et al.*, 2007).

Application of force is required for handling loads (lifting, lowering, holding, carrying loads, pushing and pulling weights, etc.) (Pradhand *et al*., 2007). The force requirements vary with the posture adopted during work (Ayoub & Mital, 1992). Awkward body posture causes the work to become strenuous and the physiological costs are higher in non-erect postures than in erect postures (Mital *et al*., 1997). The occupational work of handling loads requires high muscular effort in awkward posture giving rise to musculoskeletal strains and low back signs and symptoms (Gosh & Nag, 1986). Turning, twisting and bending are also associated with increased incidence of low back disorders like pain, ache and discomfort (Christensen *et al*., 1995).

Although further work needs to be done to clearly understand MSDs among workers in cocoa warehouses in Ghana, our findings indicate that the workers experience pains in different parts of the body leading to the dependence on pain relievers. In addition, some injuries were reported that required medical attention or interruption of work. To minimise ergonomic hazards, ILO (2010) recommends that employers should provide information and training to workers in safe work techniques. Furthermore, workers should be informed of the risks associated with handling loads greater than 23 kg; and be encouraged to report any pain and discomfort to the employer. An intervention such as the installation of mechanised or semi-mechanised bag handling equipment in the warehouses would minimise MSDs in workers.

4. Conclusions

MSDs have been identified in this study as a serious health concern among workers in cocoa warehouses, who handle bagged cocoa beans manually. Generally, the upper back, shoulder and hip were identified as the major parts of

the body that most experienced MSDs. Furthermore, fatigue and injury were prevalent among the workers and pain relievers were routinely used after work. An intervention such as the installation of mechanised or semi-mechanised bag handling equipment in major warehouses would minimise MSDs in workers. Further study is being extended to other warehouses in the Ashanti Region, which is one of the largest cocoa growing regions in Ghana, to elucidate the extent of the problem among workers in cocoa warehouses.

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