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Musculoskeletal disorders and associated factors among dockers and handlers in the cotonou port companies in 2020

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Musculoskeletal disorders (MSD) are one of the main causes of occupational diseases. The sea port and maritime sectors seem to be among the most affected. The objective of this study is to determine the prevalence of MSDs among workers in this sector and the risk factors. A cross-sectional study was conducted among the 576 dockers and 38 boaters selected by non-probability sampling for convenience. A questionnaire was used to collect the sociodemographic, assessment of musculoskeletal pain and occupational stress data. The study population was exclusively male with an average age of 44.97±9.7 years and job tenure of 15.94±6.95 years. The prevalence of musculoskeletal pain over the last 12 months was 88.6% for the lower back; 39.4% for the upper back; 37.9% for the neck; 40.4 and 39.1 respectively for the right and left shoulders. 89.4% of the subjects were subjected to job strain. The main risk factors for MSDs were: age, seniority, perceived stress, high psychological demand and job strain. This study confirms that the sea port sector is a high-risk work environment for MSDs, especially low back pain. It also confirms the multifactorial risks of MSDs. In this high-risk environment, prevention strategies must be considered in order to act on all of these factors.

Key words: Musculoskeletal disorders, stress, job strain, dockers, handlers.

INTRODUCTION

Health risks in the workplace remain a real public health problem and often lead to functional disability in developing countries (De Carvalho et al., 2016). As far as material handlers are concerned, they are constantly

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exposed to Musculoskeletal Disorders (MSD), making MSDs a priority for prevention at international level (Caroly et al., 2012). Several factors such as physical strain, heavy loads, and postures favour the occurrence of MSDs in these workers. In 2015, a study carried out in Brazil showed that the prevalence of MSDs was 37.4% among dockworkers, with lumbar spine diseases predominating in 22.5% of cases (De Carvalho et al., 2016). Another study conducted in 2018 in Brazil shows that the prevalence of low back pain among casual dockworkers is 69.8%, and that of back pain is 50.9% (Cezar-Vaz et al., 2018). In Africa, several studies demonstrate the relevance of the topic. In Cameroon, the prevalence of MSDs was 87.9% among dockers working in the port of Douala (Dieuboue et al., 2020). In Ghana, at the port of Tema, a study showed that 38% of dockers suffer from musculoskeletal diseases (Ivan, 2015). In Benin, to our knowledge, no specific and limited data are available on MSDs among dockworkers. This study aimed to assess the prevalence and factors associated with MSDs in these workers.

Study area

The study took place at Société Béninoise de la Manutention Portuaire (SOBEMAP) directorates and at the captaincy department of the autonomous port of Cotonou (PAC). The two companies are located in Cotonou, the economic capital of Benin country.

MATERIALS AND METHODS

A cross-sectional survey was conducted from May to November 2020. The study population was dockers and handlers from the two selected port companies. Included participants are SOBEMAP dockers with at least two years of experience and PAC dockworkers with at least 1 year of experience. A total of 576 dockers and 38 dockworkers or handlers were included in the study. The selection of dockworkers and dockers was done by non-probability sampling for convenience. Two types of survey tools were used: the MSD questionnaire from INRS (Cail et al., 2010) and the Karasek questionnaire, SUMMER 2003 survey version (Conners, 2006).

The variables studied were socio-demographic (age, sex, marital status, level of education), socio-professional (length of service at work, type of position, stress at work felt or not), clinical, and psychosocial. The data were analysed using R 3.6.1 software with the RStudio environment. The weight of the association between the MSD and exposure factors was measured by the Odds ratio. Logistic regression is performed to remove some confounding factors. All the tests used were interpreted with a significance level of 5%.

RESULTS

Description of the population

A total of 614 subjects were surveyed. Of the respondents, there were 576 (93.8%) dockworkers and 38 (6.2%) dockworkers. The average age of the subjects was 44.97±9.24 years. The most represented age group was 35-44 years (36.5%). All the subjects were male. The majority of the workers had a secondary level of education (40.7%). The average seniority of the subjects was 15.94±6.95 years (Table 1).

Prevalence of musculoskeletal disorders

The spine (neck, upper back, lower back) and the shoulders were the most affected, with 37.9% for the neck; 39.4% for the upper back; 88.6% for the lower back; 40.4% for the right shoulder and 39.1% for the left shoulder. Lower back pain is the most frequent complaint; almost all (88.6%) of the workers suffer from it (Table 2). Of the 614 subjects, 549 (89.4%) were exposed to job strain.

Factors associated to musculoskeletal disorders

According to univariate analysis, the occurrence of MSDs in the neck was influenced by: age, seniority, stress, psychological demand, job strain and iso strain. We note that the longer the seniority was, the higher was the occurrence of neck MSDs; intense stress influenced also the occurrence of MSDs ($p<0.001$) as did high psychological demand ($p<0.001$), (Table 3). The occurrence of upper back MSDs was influenced by age, seniority, stress, psychological demand and job strain, iso strain (Table 4). The occurrence of low back MSDs is influenced by age, seniority, level of education, job type and stress (Table 5). The occurrence of shoulder MSDs was influenced by age, seniority, level of education, stress, psychological demand, job and iso strain (Tables 6 and 7). After multivariate analysis, the occurrence of MSDs was influenced by seniority, stress, and psychological demand for the neck; by age, seniority, stress and job strain for the upper back; by seniority, level of education, type of job and stress for the lower back; and by seniority, stress, and psychological demand for the shoulders (Tables 3 to 7).

DISCUSSION

Prevalence of MSDs

We found 37.9% of neck pain in our study. This prevalence is lower than that of Mikponhoue (2013) which was 43.3% in a port company in Cotonou (Mikponhoue et al., 2017). Our prevalence of low back pain is similar to that of the general population in Canada in 2019 (L'Estrie Centre De Santé Communautaire, 2019). But it is higher than that found in France in a study of low back pain in the general population which found 13.7%

Table 1. Distribution of respondents according to socio demographic criteria, port companies, Cotonou, 2020.

Variable	n	Percentage
Age group (years)		
<35	76	12.4
35-44	224	36.5
45-54	213	34.7
≥55	101	16.4
Level of education		
Primary school	207	33.7
Secondary school	250	40.7
University	60	9.8
None	97	15.8
Experience (years)		
<15	302	49.2
15-24	229	37.3
≥25	83	13.5

Source: Musculoskeletal disorders and associated factors among dockers and handlers in the Cotonou port companies study, 2020.

Table 2. Distribution of the respondents according the location of musculoskeletal disorders (MSD), port companies, Cotonou, 2020.

Location	Musculoskeletal disorders (MSD)	
	Yes n (%)	No n (%)
Neck	233 (37.9)	381 (62.1)
Back		
Upper	544 (88.6)	70 (11.4)
Lower	242 (39.4)	372 (60.6)
Shoulder		
Right	248 (40.4)	366 (59.6)
Left	240 (39.1)	374 (60.9)

Source: Musculoskeletal disorders and associated factors among dockers and handlers in the Cotonou port companies study, 2020.

for men and 17.2% for women (Plouvier et al., 2010). It is also higher than that found by De Carvalho et al. (2016) in Mexican dockworkers in 2016 which was 4.7%. These low prevalences observed in some developed countries may be explained by the fact that they have better means of prevention. "In the current study, the TMS located on the lower back prevalence is lower (39.4%) than that observed by Boton (Boton, 2010) among a port handling company in Cotonou in Benin (48.5%)."

In our study, the spine is the most affected part, especially the lumbar spine. The French data available

are in agreement with what is found in almost all studies, namely that low back pain is more frequent (Buchbinder et al., 2018). This finding was also made in China by Ye et al. (2017) in office workers

Factors associated with the occurrence of MSDs

Age

In our study, we found that MSDs of the upper back and

Table 3. Factors associated to musculoskeletal disorders located in the neck, univariate and mulivariate analysis, Cotonou, 2020.

Variable	Musculoskeletal disorders on the neck		Univariate		Multivariate		
	Yes	No	Brut OR (CI95%)	p	Adjusted (CI95%)	OR	p
Age group (years)				<0.001			
< 35	16 (21.1)	60 (78.9)	1				
35-44	73 (32.6)	151 (67.4)	1.81 (0.99 - 3.45)				
45-54	86 (40.4)	127 (59.6)	**2.53 (1.39 - 4.82)**				
≥55	58 (57.4)	43 (42.6)	**5.05 (2.61 - 10.20)**				
Education level				0.082			
Primary school	42 (43.3)	55 (56.7)	1				
Secondary school	87 (42.0)	120 (58.0)	0.94 (0.58 - 1.54)				
University	88 (35.2)	162 (64.8)	0.71 (0.44 - 1.15)				
None	16 (26.7)	44 (73.3)	0.47 (0.23 - 0.94)				
Work experience (years)				<0.001			<0.001
<15	86 (28.5)	216 (71.5)	1		1		
15-24	97 (42.4)	132 (57.6)	1.84 (1.28 - 2.65)		1.68 (1.13-2.51)		
≥25	50 (60.2)	33 (39.8)	3.80 (2.30 - 6.35)		2.92 (1.71-5.05)		
Type of job				0.089			
Doking pilot	9 (23.7)	29 (76.3)	1				
Docker	224 (38.9)	352 (61.1)	2.05 (0.98 - 4.66)				
Stress				<0.001			<0.001
Light	126 (31.1)	279 (68.9)	1		1		
Intense	107 (51.2)	102 (48.8)	2.32 (1.64 - 3.27)		2.08 (1.44-3.01)		
Decision-making				0.560			
<70	231 (37.8)	380 (62.2)	1				
≥70	2 (66.7)	1 (33.3)	3.29 (0.31 - 71.02)				
Psychological demand				0.005			0.005
≤21	13 (21.0)	49 (79.0)	1		1		
>21	220 (39.9)	332 (60.1)	2.49 (1.36 - 4.89)		2.46 (1.28-5.05)		
Social support				0.823			
<24	226 (37.8)	372 (62.2)	1				
≥24	7 (43.8)	9 (56.2)	1.28 (0.45 - 3.48)				
Job strain of Karasek				0.013			
No	15	50	1				
Yes	218	331	2.19 (1.23 - 4.13)				
Iso strain				0.052			
No	22 (27.5)	58 (72.5)	1				
Yes	211 (39.5)	323 (60.5)	1.72 (1.03 - 2.95)				

Source: Musculoskeletal disorders and associated factors among dockers and handlers in the Cotonou port companies study, 2020.

Table 4. Factors associated to musculoskeletal disorders located in the upper back, univariate and multivariate analysis, Cotonou, 2020.

	Musculoskeletal disorders on the upper back		Univariate		Multivariate	
	Yes	No	Brut OR (CI95%)	p	Adjusted OR (CI95%)	p
Age group (years)				<0.001		0.047
< 35	13 (17.1)	63 (82.9)	1		1	
35-44	83 (37.1)	141 (62.9)	2.85 (1.52 - 5.70)		2.33 (1.52 - 5.70)	
45-54	87 (40.8)	126 (59.2)	3.34 (1.78 - 6.69)		2.45 (1.78 - 6.69)	
≥55	59 (58.4)	42 (41.6)	6.80 (3.41- 14.39)		3.12 (3.41- 14.39)	
Education level				0.999		
Primary school	38 (39.2)	59 (60.8)	1			
Secondary school	82 (39.6)	125 (60.4)	1.01 (0.62 - 1.67)			
University	98 (39.2)	152 (60.8)	1.00 (0.62 - 1.62)			
None	24 (40.0)	36 (60.0)	1.03 (0.53 - 1.99)			
Work experience (years)				<0.001		0.006
<15	85 (28.1)	217 (71.9)	1		1	
15-24	106 (46.3)	123 (53.7)	2.20 (1.53 - 3.16)		1.86 (1.20 - 2.91)	
≥25	51 (61.4)	32 (38.6)	4.06 (2.46 - 6.81)		2.53 (1.30 - 4.97)	
Type of job				0.857		
Doking pilot	16 (42.1)	22 (57.9)	1			
Docker	226 (39.2)	350 (60.8)	0.88 (0.45 - 1.75)			
Stress				<0.001		<0.001
Light	132 (32.6)	273 (67.4)	1		1	
Intense	110 (52.6)	99 (47.4)	2.29 (1.63-3.23)		2.06 (1.40-3.02)	
Decision-making				0.999		
<70	241 (39.4)	370 (60.6)	1			
≥70	1 (33.3)	2 (66.7)	0.76 (0.03-8.05)			
Psychological demand				<0.001		
≤21	8 (12.9)	54 (87.1)	1			
>21	234 (42.4)	318 (57.6)	4.96 (2.45-11.47)			
Social support				0.379		
<24	234 (39.1)	364 (60.9)	1			
≥24	8 (50.0)	8 (50.0)	1.55 (0.56-4.28)			
Job strain of Karasek				<0.001		<0.001
No	9 (13.8)	56 (86.2)	1		1	
Yes	233 (42.4)	316 (57.6)	4.58 (2.33-10.10)		4.17 (2.02-9.57)	
Iso strain				0.003		
No	17 (21.2)	63 (78.8)				
Yes	225 (42.1)	309 (57.9)				

Source: Musculoskeletal disorders and associated factors among dockers and handlers in the Cotonou port companies study, 2020.

Table 5. Factors associated to musculoskeletal disorders located in the lower back, univariate and multivariate analysis, Cotonou, 2020.

Variables	Musculoskeletal disorders on the upper back		Univariate		Multivariate	
	Yes	No	Brut OR (CI95%)	p	Adjusted OR (CI95%)	p
Age group (years)				0.003		
< 35	57 (75.0)	19 (25.0)	1			
35-44	197 (87.9)	27 (12.1)	2.43 (1.24 – 4.67)			
45-54	196 (92.0)	17 (8.0)	3.84 (1.87 – 7.95)			
≥55	94 (93.1)	7 (6.9)	4.47 (1.84 -12.07)			
Education level				0.001		0.005
Primary school	95 (97.9)	2 (2.1)	1		1	
Secondary school	190 (91.8)	17 (8.2)	0.23 (0.03-0.84)		0.29 (0.04-1.10)	
University	212 (84.8)	38 (15.2)	0.11 (0.01-0.39)		0.16 (0.02-0.56)	
None	47 (78.3)	13 (21.7)	0.07 (0.01-0.29		0.13 (0.01-0.53	
Work experience (years)				<0.001		0.003
<15	248 (82.1)	54 (17.9)	1		1	
15-24	215 (93.3)	14 (6.1)	3.34 (1.85-6.41)		2.09 (1.08-4.24)	
≥25	81 (97.6)	2 (2.4)	8.81 (2.66-54.60)		6.44 (1.76-42.38)	
Type of job				0.013		
Doking pilot	29 (76.3)	9 (23.7)	1			
Docker	515 (89.4)	61 (10.6)	2.62 (1.12-5.59)			
Stress				0.001		0.037
Light	347 (85.7)	58 (14.3)	1		1	
Intense	197 (94.3)	12 (5.7)	2.74 (1.48-5.47)		2.01 (1.04-4.17)	
Decision-making				0.304		
<70	542 (88.7)	69 (11.3)	1			
≥70	2 (66.7)	1 (33.3)	0.25 (0.02-5.52)			
Psychological demand				0.694		
≤21	54 (87.1)	8 (12.9)	1			
>21	490 (88.8)	62 (11.2)	1.17 (0.49-2.44)			
Social support				0.888		
<24	530 (88.6)	68 (11.4)	1			
≥24	14 (87.5)	2 (12.5)	0.89 (0.24-5.79)			
Job strain of Karasek				0.511		
No	56 (86.2)	9 (13.8)	1			
Yes	488 (88.9)	61 (11.1)	1.28 (0.57-2.61)			
Iso strain				0.478		
No	69 (86.2)	11 (13.8)	1			
Yes	475 (89.0)	59 (11.0)	1.28 (0.61-2.47)			

Source: Musculoskeletal disorders and associated factors among dockers and handlers in the Cotonou port companies study, 2020.

Table 6. Factors associated to musculoskeletal disorders located in the right shoulder, univariate and multivariate analysis, Cotonou, 2020.

Variable	Musculoskeletal disorders on the right shoulder		Univariate		Multivariate	
	Yes	No	Brut OR (CI à 95%)	p	Adjusted OR (CI95%)p	p
Age group (years)				<0.001		
< 35	15 (19.7)	61 (80.3)	1			
35-44	91 (40.6)	133 (59.4)	2.78 (1.52-5.35)			
45-54	84 (39.4)	129 (60.6)	2.64 (1.44-5.11)			
≥55	58 (57.4)	43 (42.6)	5.48 (2.81-11.21)			
Education level				0.001		
Primary school	44 (45.4)	53 (54.6)	1			
Secondary school	102 (49.3)	105 (50.7)	1.17 (0.72-1.90)			
University	85 (34.0)	165 (66.0)	0.62 (0.38-1.00)			
None	17 (28.3)	43 (71.7)	0.47 (0.23-0.93)			
Type of job				>0.999		
Doking pilot	15 (39.5)	23 (60.5)	1			
Docker	233 (40.5)	343 (59.5)	1.04 (0.53-2.07)			
Work experience (years)				<0.001		0.002
<15	96 (31.8)	206 (68.2)	1		1	
15-24	98 (42.8)	131 (57.2)	1.60 (1.12-2.29)		1.31 (0.86-1.99)	
≥25	54 (65.1)	29 (34.9)	3.99 (2.41-6.73)		2.81 (1.57-5.12)	
Stress				<0.001		<0.001
Light	127 (31.4)	278 (68.6)	1		1	
Intense	121 (57.9)	88 (42.1)	3.00 (2.13-4.26)		2.97 (2.00-4.43)	
Decision-making				>0.999		
<70	247 (40.4)	364 (59.6)	1			
≥70	1 (33.3)	2 (66.7)	0.73 (0.03-7.73)			
Psychological demand				<0.001		<0.001
≤21	6 (9.7)	56 (90.3)	1		1	
>21	242 (43.8)	310 (56.2)	7.28 (3.33-19.16)		5.35 (2.33-14.59)	
Social support				0.450		
<24	243 (40.6)	355 (59.4)	1			
≥24	5 (31.2)	11 (68.8)	0.66 (0.20-1.85)			
Job strain of Karasek				<0.001		
No	7 (10.8)	58 (89.2)	1			
Yes	241 (43.9)	308 (56.1)	6.48 (3.10-15.82)			
Iso strain				<0.001		
No	12 (15.0)	68 (85.0)	1			
Yes	236 (44.2)	298 (55.8)	4.48 (2.45-8.89)			

Source: Musculoskeletal disorders and associated factors among dockers and handlers in the Cotonou port companies study, 2020.

Table 7. Factors associated to musculoskeletal disorders located in the left shoulder, univariate and multivariate analysis, Cotonou, 2020.

Variable	Musculoskeletal disorders on the left shoulder		Univariate		Multivariate	
	Yes	No	Brut OR (CI à 95%)	p	Adjusted OR (CI95%)p	p
Education level				**0.005**		0.080
Primary school	43 (44.3)	54 (55.7)	1			
Secondary school	100 (48.3)	107 (51.7)	1.17 (0.72-1.90)			
University	82 (32.8)	168 (67.2)	0.62 (0.38-1.00)			
None	15 (25.0)	45 (75.0)	0.47 (0.23-0.93)			
Type of job				0.642		
Doking pilot	13 (34.2)	25 (65.8)	1			
Docker	227 (39.4)	349 (60.6)	1.25 (0.63-2.56)			
Work experience (years)				**<0.001**		**0.016**
<15	91 (30.1)	211 (69.9)	1		1	
15-24	97 (42.4)	132 (57.6)	1.70 (1.19-2.44)		1.37 (0.86-2.19)	
≥25	52 (62.7)	31 (37.3)	3.89 (2.35-6.52)		2.82 (1.38-5.87)	
Stress				**<0.001**		**<0.001**
Light	123 (31.4)	282 (69.6)	1		1	
Intense	117 (57.9)	92 (44.0)	2.91 (2.06-4.12)		2.73 (1.82-4.11)	
Decision-making				0.999		
<70	239 (39.1)	372 (60.9)	1			
≥70	1 (33.3)	2 (66.7)	0.77 (0.03-8.16)			
Psychological demand				**<0.001**		**<0.001**
≤21	4 (9.7)	58 (90.3)	1		1	
>21	236 (43.8)	316 (56.2)	10.82 (4.37-36.07)		8.17 (3.14-28.04)	
Social support				0.450		
<24	236 (39.5)	362 (60.5)	1			
≥24	4 (25.0)	12 (75.0)	0.51 (0.14-1.48)			
Job strain of Karasek				**<0.001**		
No	5 (7.7)	60 (92.3)	1			
Yes	235 (42.8)	314 (57.2)	8.98 (3.90-26.01)			
Iso strain				**<0.001**		
No	9 (11.2)	71 (85.0)	1			
Yes	231 (43.3)	303 (56.7)	6.01 (3.09-13.14)			

Source: Musculoskeletal disorders and associated factors among dockers and handlers in the Cotonou port companies study, 2020.

left shoulder are related to age. Yuan et al. (2015) noted a greater frequency of low back pain in relation to the average age of the population (45-50 years). Our data are in contradiction with the literature. This could be explained by the fact that our population is young.

Length of service

Seniority in the department is a factor that influences the occurrence of all MSDs regardless of location in our study. The same observation was made by Zomalheto

(2015) who found that the length of time at work is a very important factor influencing the occurrence of MSDs [16]; in Tunisia in 2016, Kacem et al., also found that seniority of less than 15 years influenced the occurrence of MSDs in employees (Kacem et al., 2016). This could be explained by the pathophysiology of MSDs, as MSDs are the consequence of prolonged exposure over time to different risk factors.

Occupational stress

In our study, 89.4% (549 workers) have occupational stress. Ghailan et al. (2020) found similar results when studying occupational stress and MSDs among women in artisanal fisheries in 2020. Ben Aissa has shown that stress at work has direct consequences on the individual including MSDs (Ben and Galindo, 2016). Stress would therefore play a key role in the occurrence of MSDs since it increases basal muscle tension, which leads to a more rapid onset of pain.

High psychological demand

We found an association between high attentional demand from work and MSDs of the neck, upper back and shoulders. A Quebec survey of 5000 workers on working conditions studied the relationship between MSDs and high psychological demand (Stock, 2011). Multivariate analyses of the data from this survey concerning spinal MSDs confirm the contribution of risks associated with high psychological demand. Mechergui et al. (2018) also identified high psychological demand as a risk factor for MSDs, estimated at 37.1% in 2018.

Limitation of the study

This study explored the factors associated with musculoskeletal disorders of several parts of the human body. However, the tasks or jobs that most often induce these MSDs were not investigated. The identification of these tasks could facilitate advocacy with the managers of these structures in order to improve the working conditions and thus the well-being of dockers and handlers.

Conclusion

The study aimed to evaluate the prevalence and associated factors to MSDs among dockers and handlers in the Cotonou port companies. The spine (neck, upper back, lower back) and the shoulders were the most affected, with 37.9% for the neck; 39.4% for the upper back; 88.6% for the lower back; 40.4% for the right shoulder and 39.1% for the left shoulder. The prevalence of low back pain (MSD of the lower back) in this population is the highest. The main risk factors for MSDs were: age, seniority, perceived stress, high psychological demand and job strain. The multifactorial risks associated to MSDs must guide the prevention measures to be implemented in these companies.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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