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RESEARCH ARTICLE

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Prevalence of Musculoskeletal Disorders and Associated Factors among View Screen Workers in Benin In 2020

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ABSTRACT

Introduction: Musculoskeletal disorders (MSDs) are a real health problem at work. They drastically affect workers on the display screen.

Objective: Studying the prevalence and associated factors of MSDs among workers on display screens in Benin.

Methodology: This was a cross sectional, analytical, descriptive study carried out from October 1 to December 31, 2020, among workers on display screens in Benin. The sampling was non-probability. The data collected were analysed using R software version 3.6.1. The comparison of frequencies was made using the Chi2 test.

In multivariate analysis, a multiple logistic regression was carried out to find the associated factors. An odds ratio (OR) with a 95% confidence interval (95% CI) was calculated. A $p \leq 0.05$ was considered statistically significant.

Results: The overall prevalence of MSDs was 93.1%. For the neck, upper back, lower back, shoulders, elbows and left right wrists, the prevalence was 69.9%, 70.3%, 77.3%, 46.1%, 34%, 8%, 20.7%, 16.8%, 45.7%, 26.2% respectively.

Factors associated with MSDs were the use of a bad keyboard (p=0.028), use of corrective lenses (p=0.048), female gender (p=0.039), symptoms of stress type: cardiovascular disorders (p=0.001), gastrointestinal disorders (p=0.008), anxiety (p=0.031) and anxiety (p=0.035).

Conclusion: This study shows a high prevalence of MSDs among workers on display screens in Benin. The implementation of appropriate preventive measures could help reduce this prevalence.

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KEYWORDS
Musculoskeletal disorders; Workers on a display screen; Prevalence; Associated factors; Benin.

Background

Musculoskeletal Disorders (MSDs) are among the top concerns in occupational health [1]. According to the National Institute for Occupational Safety and Health (INRS), "MSDs are damages that affect the musculoskeletal system of the human body, in particular in the bones, vertebral discs, tendons, joints, ligaments, cartilage, nerves and blood vessels" [2].

With rapid technological development, the use of electronic data has affected both workers and workplaces. Work data is mainly displayed on visualization screens making work more sedentary, requiring more attention, and involving more cognitive processes.

Bad body postures, static work and long working hours in front of those terminals are not without risks [3]. They facilitate the occurrence of MSDs which are a real public health problem [4]. In the United States, half of adults (125 million) over 18 reported having been diagnosed with MSD in 2012 [5]. Likewise, in Quebec MSDs are the main cause of disability and represent one of the greatest economic burdens caused by illness [6]. MSDs are of interest to all industries,

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although they are affected to varying degrees. In the United States, in the state of New York in 2007 the prevalence of MSDs was 87% in the communications department of the police force [7]. Likewise, in Brazil, a study carried out in banks in Sao Paulo demonstrated a prevalence of MSDs of 43% respectively for the neck and shoulder, and of 39% for the wrist and hand among female employees [8].

In Nigeria, a prevalence of 65.2% was found in 2016, among employees of telecommunication structures in the city of Lagos [9]. In Benin, a study carried out within a company found a prevalence of 77.9% among workers using a computer [10]. Far from being just an occupational and public health problem, MSDs have a significant impact, not only on the quality of life of individuals, but also on the development of companies and at the same time on the economy of countries. They generate an economic cost that is not negligible, as in the United States where this cost was estimated between 45 and 54 billion dollars in 2015 [11]. Also, because of their consequences, both in terms of health and economics, MSDs constitute a real centre of interest, the in depth knowledge of which is important. The present study was then initiated by associating workers from several sectors of activity having in common the use of display screen (insurance company, mobile telephone structure, and banking institutions) in order to determine the prevalence of MSDs. and the risk factors associated with the use of those display screens which are of great importance in today's working world.

Material and Methods

Study type and population

This was a cross sectional descriptive study with an analytical aim covering the months of October to December 2020. The study population consisted of employees using computers and coming from banks and insurance companies.

Inclusion Criteria

The workers included in our study had to be computer users, have at least one year of seniority. They must also have given their consent and completed the survey questionnaire correctly. Workers who provided non-usable data and those with proven joint pathologies were excluded.

Sampling

The minimum sample size was determined by Schwartz's formula, based on a 2012 study in Ghana by Abledu et al. which found a prevalence of 83.5% among bank workers.

$n=(Z\alpha)^2.p.q / i^2$

With Zα=reduced deviation from risk α (1,96), p=prevalence of workers with MSDs (83,5%), q=1-p=(16,5%), i=5% (precision); n=211

In order to avoid non-response, this sample size has been weighted by 10%.

n total=211+21=232. The minimum size is therefore 232 people.

Voluntary non-probability sampling was then performed by exhaustive recruitment of all those who met the inclusion criteria, up to the sample size. A total of 256 workers were surveyed.

Variables

- Dependent variables

The dependent variable was whether or not there was subjective pain or discomfort in one of the body regions (neck, cervical spine, shoulders, elbows, wrists/hands, lumbar spine).

- Independent variables
- Variables relating to socio demographic factors: gender and age
- Occupational variables
  - Seniority in using the display screen,
  - Mode of use of the display screen,
  - Number of hours of daily work on the display screen,
  - Positioning of the display screen used,
  - The posture adopted during the use of the display screen,
  - Status of the keyboard associated with the display screen used,
  - The main task performed and repetitiveness of the task,
  - Presence of breaks during work, sedentary lifestyle at work.
- Variables relating to psychosocial characteristics according to the Karasek model

These were the psychological demands of work, decision latitude, and social support at work.

- Clinical data variables

They included laterality, obesity, frequency and location of pain, and the existence of symptoms of stress (cardiovascular and gastrointestinal disorders, anxiety and anguish).

Collection of data

The survey questionnaire used for data collection was composed of the MSD questionnaire of INRS version 2000 [12], and the one by Karasek [13].

As for the administration of the questionnaire, it was done in various ways.

In some companies, it was an online questionnaire

(Google form) used to reach as many employees as possible. In others, a document version completed by the workers was included in our study.

Data processing and analysis

All the data collected had been configured and entered in the EPI Data 3.1 software. The data were analysed using software R 3.6.1. The first part of the data analysis consisted of using the parameters of central tendency, dispersion and confidence intervals at the 95% level to describe the study population. The second part of the analysis consisted of performing a univariate analysis to study the association between the dependent variable and the independent variables. The proportion comparison tests were performed using Pearson's Chi2 test, and if this test was not valid, by Fisher's two tailed exact test. Multivariate multiple logistic regression analysis was performed to look for associated factors. From the univariate analysis, all variables whose p<0.20 were retained for the analysis of multiple logistic regression. A study of the independence between the factors studied was carried out, as well as the terms of interactions. The descending stepwise regression procedure was the one used to select the variables of the final model and based on the Akaike Information Criterion (AIC). The contribution of each variable to the model was estimated by the likelihood ratio test. The contribution of an independent variable to the dependent was significant at the 0.05 level. The ORs adjusted with their 95% CI were calculated.

Results

A total of 256 workers were surveyed.

Sociodemographic features

The mean age of the participants was 37 ± 7.1 years with extremes ranging from 22 to 59 years. Most of them were between 30 and 39 years old (61.3%) and were male (60.5%).

Occupational features

More than half of the workers (75%) used the keyboard as well as the mouse while using the display screen. Few workers (21.1%) took breaks during work and more than half (66.8%) were sedentary. The majority of workers had poor posture while using a display screen (68.8%).

Psychosocial features

More than half (51.1%) of the workers were in a "Job Strain" situation and 56.9% in an "Iso Strain" situation. (Tables 1 and 2).

Table 1. Prevalence of Job Strain among View Screen Workers according to the Karasek model

Decision latitude			
Psychological Demand	**High n (%)**	**Low n (%)**	**Total**
High	110 (48.9)	**115 (51.1)**	225
Low	13 (41.9)	18 (58.1)	31
Total	123 (48.0)	133 (52.0)	256

Table 2. Prevalence of Iso Strain among View Screen Workers according to the Karasek model

Job strain of Karasek			
Social support	**Yes**	**No**	**Total**
Low	**33 (56.9%)**	25 (43.1%)	58
High	82 (41.4%)	116 (58.6%)	198
Total	115 (44.9%)	141 (55.1%)	256

Prevalence of MSDs

The overall prevalence of MSDs was 93.1% among the workers in our study. For the cervical spine, upper back, lower back, shoulders, elbows and right left wrists the prevalence was respectively 69.9%, 77.3%, 70.3%, 46.1%, 34, 8%, 20.7%, 16.8%, 45.7%, 26.2% (Table 3).

Table 3. Distribution of View Screen Workers according to the location of MSDs

MSDs			
		Yes n(%)	No n(%)
Neck		179 (69.9)	77 (30.1)
Back	Down	198 (77.3)	58 (22.7)
	Top	180 (70.3)	76 (29.7)
Shoulder	Right	118 (46.1)	138 (53.9)
	Left	89 (34.8)	167 (65.2)
Elbow	Right	53 (20.7)	203 (79.3)
	Left	43 (16.8)	213 (83.2)
Wrist	Right	117 (45.7)	139 (54.3)
	Left	67 (26.2)	189 (73.8)

Factors associated with the occurrence of MSDs

The main risk factors associated with MSDs among the workers surveyed during the study were: The use of a keyboard in poor condition (p=0.028), the use of corrective glasses (p=0.048) the female sex (p=0.039), and the subjective symptoms of stress: anxiety (p=0.031), cardiovascular disorders (p=0.001), gastrointestinal ulcer type disorders (p=0.008), anxiety (p=0.018), "Job strain" assessed based on decisional latitude and psychological demand (Tables 4 and 5).

Discussion

Though this is first study which estimated interleukin

Table 4. Distribution of MSD risk factors among View Screen Workers

MSDs						
		Total N	**Yes n (%)**	**No n (%)**	**OR (IC à 95%)**	**p**
View Screen Keyboard Status						0.028
Good		216	147 (68.1)	69 (31.9)	1	
Bad		40	32 (80.0)	8 (20.0)	2.03 (1.08-3.83)	
Use of corrective lenses						0.048
No		110	67 (60.9)	43 (39.1)	1	
Yes		146	112 (76.7)	34 (23.3)	1.92 (1.00-3.69)	
Sex						0.039
Male		155	103 (66.5)	52 (33.5)	1	
Female		101	77 (76.2)	24(23.8)	1.02 (1.02-3.57)	
Stress Symptom's						0.018
Anxiety	No	84	42 (50.0)	42 (50.0)	1	
	Yes	172	137 (79.7)	35 (20.3)	2.25 (1.15-4.41)	
Anguish						
No		134	82 (61.2)	52 (38.8)	1	0.031
Yes		122	98 (80.3)	24 (19.7)	1.97 (1.06-3.66)	
Cardiovascular disorders						Yes
No		143	97 (67.8)	46 (32.2)	1	<0.001
Yes		113	101 (89.4)	12 (10.6)	3.20 (1.56-6.55)	
Gastrointestinal disorders (ulcer)						Yes
No		105	69 (65.7)	36 (34.3)	1	0.008
Yes		151	129 (85.4)	22 (14.6)	2.32 (1.24-4.38)	

Table 5. Link between Job Strain and occurrence of MSDs in View Screen Workers

		Job Strain			
	Total N	**Yes n (%)**	**No n (%)**	**OR (IC à 95%)**	**p**
MSD of Neck					
No	141	88 (62.4)	53 (37.6)	1	0.003
Yes	115	91 (79.1)	24 (20.9)	2.28 (1.30-4.01)	
MSD of upper back					
No	141	90 (63.8)	51 (36.2)	1	0.011
Yes	115	90 (78.3)	25 (21.7)	2.04 (1.16-3)	
MSD of lower back					
No	141	103 (73.0)	38 (27.0)	1	0.069
Yes	115	95 (82.6)	20 (17.4)	1.75 (0.95-3.22)	

levels among those handling toxic gas like phosgene, there are some limitations in the study. The study involves a smaller sample size which was further reduced on categorization. This might have resulted in non-significant difference in mean levels according to study variables. Though the area monitoring of the workplace revealed that the phosgene exposure was within the international permissible level still the personal monitoring of toxic gas level would have given more appropriate dose response relationship. The most represented age group was that of participants aged 30-39 (61.3%). The mean age of the participants was 37 ± 7.1 years. This is a relatively young population. This is justified by the fact that the Beninese population is characterized by its youth. Indeed, according to the age pyramid of Benin, people aged 14-64 years represent 54.3% [14]. Several studies have also found similar results. This is the case with that carried out by Odebiyi et al. among telephone workers in Nigeria [9], by Nawal et al. among computer users in the workplace in Morocco [15], and that carried out by Basu et al. with display screen users in India [16]. The majority of our study population is male (60.5%). This observation is the same in the work carried out by M Maduagwu et al. in Nigeria, Nawal et al. in Morocco and those of Basu et al. in India on bank workers, where males made up 76.55%, 55.08%, and 54.4% of the study population, respectively [15-17]. On the other hand, studies carried out in Ethiopia and Brazil respectively by Dagne et al. Rocha et al. still in the banking sector find a predominance of women in their study population [8,18]. The prevalence of MSDs in our study is very high and was 93.1%. This prevalence was similar to that found by Seknadji et al. in Morocco and Basu et al. in India in their study on MSDs among computer users where the prevalence of MSDs was also high, respectively 93% and 90.78% [15,16]. But it was higher than that found by Odebiyi et al. in Nigeria (65.2%) and by Abledu et al. in Ghana (83.5%) [9,19]. This difference could be explained by the fact that those two studies were carried out only with bank workers, unlike ours which covered in addition to bank workers, workers from other sectors such as insurance, banking and telecommunication. MSDs involving the spine (neck, upper back, lower back) were the most frequent and the lumbar spine was the region most affected. The prevalence of MSDs of the neck, upper and lower back was 69.9%, 70.3% and 77.3%, respectively. These results were similar to those found by Abledu et al. in Ghana where the spine was also the most affected region with an MSD prevalence of the neck, upper and lower back of 47.4%, 61.7%, and 64.8% [19]. They were also similar to the results of Dagne et al. in Ethiopia, among bank workers where the lumbar spine was the most affected region with a prevalence of 54.3% [18]. The same observation was made in Kuwait in the work of Alkrouf et al. in the banking sector (51.1%) [20]. As for the upper limbs, they were disproportionately affected with a predominance of damage to the right side. In the right shoulder, elbow, and wrist, the prevalence of MSDs was 46.1%, 20.7% and 45.7%, respectively. In contrast to the left side where the prevalence of MSDs was lower, was respectively 34.8%, 16.8% and 26.2%.

This predominance of damage on the right side is explained by the fact that almost all of the study population was of right laterality (94.5%). Also, the shoulder was the most affected area regardless of the side. Some studies were in the same direction, such as those by Dagne et al. in Ethiopia, Abledu et al. in Ghana, Maduagwu et al. in Nigeria and Rocha et al. in Brazil among bank workers, where the shoulder was also the most affected upper limb region with a respective prevalence of 40.9%, 37.4%, 46% and 43%[8,17,19]. In our study, female workers were at greater risk of developing upper back MSDs. The same observation has been made by several other authors. This is the case with Lompo et al. in Ouagadougou, Abledu et al. in Ghana [19,21]. This association between the female sex and MSDs could be justified by the fact that women are most often assigned to perform repetitive tasks at high speed [22]. In addition, it cannot be overlooked that in addition to their professional responsibilities, women generally take care of household chores, thus straining their musculoskeletal structures more frequently. Also, using a keyboard in poor condition was a risk factor for neck MSD. Gerr et al. in the United States found similar results in their study on the association between keyboard use and MSDs [23]. Indeed, the use of a keyboard in bad condition (keys too hard or too sensitive) causes typing errors during the text entry, which leads the worker to make a pronounced tilt of the head and the trunk to better visualize his keyboard. This inclination is associated with a significant flexion of the neck and therefore a shortening of the eye screen distance. The use of corrective lenses was also identified as a risk factor for neck MSD ($p=0.048$). Similar results were found by Pawalia et al. in India [24]. This association between the use of corrective lenses and the occurrence of MSDs could be explained by the incorrect adjustment of the viewing screen depending on the type of corrective lenses used. This forces the user to maintain prolonged extension or flexion of the neck (depending on the type of corrective lenses) while using their screen. The muscle fatigue that follows favours the occurrence of MSDs of the neck [24]. Finally, stress at work was a

risk factor for MSDs. Stress is commonly described in the literature as a risk factor for MSDs, and the results of our study support this [25]. Symptoms of stress such as cardiovascular disorders (p<0.001), gastrointestinal disorders (p=0.008), anxiety (p=0.031) and anxiety (p=0.035) were all identified as risk factors of TMS in our study. The same is true in other studies carried out on MSDs such as that of Griffiths et al. in Australia and Dagne et al. in Ethiopia [18,26]. This association between stress and MSDs is explained by the fact that certain stressful working conditions are associated with increased muscle tension, thus facilitating the onset of MSDs [27].

Conclusion

The prevalence of MSDs among workers on display screens in Benin in 2020 was high (93%), with a predominance for low back pain.

For the female, the use of corrective glasses, the use of a bad keyboard condition and stress were all risk factors for MSDs.

The implementation of adequate measures taking into account compliance with ergonomic standards, and stress management in the workplace could help reduce the occurrence of those MSDs.

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Competiting Interests

The authors declare no competing interests.

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Refernces

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