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Prevalence of musculoskeletal symptoms among Portuguese call center operators: associations with gender, Body Mass Index, hours of work and sitting time

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Abstract

According to previous studies, the prevalence of musculoskeletal symptoms among call center operators is high. In Portugal, although it is an occupation that has been growing over, there is a lack of studies assessing this issue as well as its associations with different risk factors. The aim of this study is to investigate 7-day and 12-month prevalence of musculoskeletal symptoms among Portuguese call center operators and their associations with gender, body mass index, hours of work and sitting time. The study was carried out in a call center company in Portugal. One-hundred and forty-eight workers agreed to participate, and filled out questionnaires to evaluate sociodemographic, anthropometric, and occupational variables, as well as the Nordic Musculoskeletal Questionnaire (NMQ) to assess musculoskeletal symptoms of 9 body regions, in the last 7 days and 12 months. In NMQ, the 12-month prevalence of musculoskeletal symptoms, the 3 most affected body regions were: neck (56.1%), low back (54.7%) and shoulders (43.9%). And the 7-day prevalence, the three most affected body region were the same, but in different percentages: low back (31.8%), neck (23.6%) and shoulders (21.6%). Significant associations were found between gender and reporting symptoms in the wrist/hands (p=0.033) and the knees (p=0.031), with females reporting significantly more symptoms than males; and between body mass index and reporting symptoms in the thighs/hips, with overweight operators reporting more symptoms (p=0.010). No significant associations were found for the hours of work, neither in sitting time. Conclusions: Workplace interventions are needed to decrease the prevalence of musculoskeletal complaints among call center operators.

1. INTRODUCTION

Call centers are a growing sector of the labor market and are responsible for the employment of a large number of workers (Odebiyi, Akanle, Akinbo, & Balogun, 2016). This rapid growth has not always been accompanied by the modernization of processes and organizational planning, which often results in musculoskeletal symptoms and absenteeism (Rocha, Glina, Marinho, & Nakasato, 2005).

In this occupational setting the main activity involves the simultaneous use of the computer and telephone (Bagnara & Marti, 2001; d'Errico et al., 2010; Odebiyi et al., 2016). The work performed by call center operators presents a limited variety of tasks, since they have to follow scripts that limit their autonomy (d'Errico et al., 2010; Norman,

Nilsson, Hagberg, Tornqvist, & Toomingas, 2004). This activity presents characteristics that are both occupational and psychosocial risk factors for the development of musculoskeletal disorders, namely: repetitive movements and prolonged static postures (Lacaze, Sacco Ide, Rocha, Pereira, & Casarotto, 2010), limited/insufficient breaks (Rocha et al., 2005), limited autonomy and the need to solve complex situations, where communication skills and efficiency are expected from them, who are often under time pressure and monitoring of performance. Therefore, these workers are exposed to high levels of stress and anxiety which may induce muscle tension (Bhuyar et al., 2008; d'Errico et al., 2010; Rocha et al., 2005).

Most call center workers spend most of their working hours in a sitting position, generally with uncomfortable seat equipment or inadequate workplaces (Ferreira & Saldiva, 2002; Sauter, Schleifer, & Knutson, 1991), which may expose them to a higher prevalence of musculoskeletal disorders and related symptoms (Al-Eisa, Egan, Deluzio, & Wassersug, 2006; Ferreira & Saldiva, 2002; Reid, Bush, Karwowski, & Durrani, 2010; L. Straker, Healy, Atherton, & Dunstan, 2014). Sitting has been associated with musculoskeletal disorders due to prolonged stress on connective tissues, muscle fatigue and circulation commitment (Tikkanen et al., 2013). It can also trigger low back pain (Al-Eisa et al., 2006), as a result of the increase in spinal load, rotation of the pelvis and spinal shrinkage during sitting (Pope, Goh, & Magnusson, 2002), lower extremity and upper limb pain or discomfort (Reid et al., 2010). These musculoskeletal disorders reduce work productivity, efficiency and are often burdensome and costly (Leon Straker, Dunstan, Gilson, & Healy, 2016).

During sitting time, overweight and/or obesity of workers may contribute to the increase of physiological and mechanical load on tissues, especially in the spine, which represents a higher risk of musculoskeletal disorders (Shiri et al., 2008). Moreover, in individuals with high body mass index (BMI), a decrease in postural stability and flexibility is often verified, which could have a potentially negative impact on efficiency in the control of upper limb movements (Berrigan, Simoneau, Tremblay, Hue, & Teasdale, 2006; Sjolie, 2004).

The number of daily working hours and labor pauses can influence the prevalence of musculoskeletal complaints (Leite & Melo, 2011), however, the number of calls answered can also be an influence factor (Saruhanoğlu, Gökçen-Röhlig, Saruhanoğlu, Öngül, & Koray, 2017).

Gender is also a potential risk factor to be accounted for. In a study carried out in France on call center workers, with 2000 individuals, it was found that the employees were predominantly women (Chevalier et al., 2011). In sedentary activities, as in call center operators, it appears that average daily sedentary time is higher in women than men (Colley et al., 2011), which may contribute to higher prevalences in female workers, as reported in previous studies (Odebiyi et al., 2016; Seghetto & Piccoli, 2012).

According to different authors, the most affected body regions in call center workers are the low back, neck and upper extremities (Hales et al., 1994; Kim & Choo, 2017; Norman et al., 2004). A previous investigation reported that 65.2% of call center operators experienced musculoskeletal symptoms during the previous year, with the four most prevalent body regions in male and female operators being the neck, the lumbar region, the upper back and the shoulders (Odebiyi et al., 2016).

The prevalence of musculoskeletal symptoms in call center operators has been widely studied in different countries, namely in Sweden (Norman et al., 2004), in Brazil (Rocha et al., 2005), Italy (d'Errico et al., 2010), Taiwan (Lin, Chen, & Lu, 2009), Turkey (Saruhanoglu, Gokcen-Rohlig, Saruhanoglu, Ongul, & Koray, 2017), United States of America (Krause, Burgel, & Rempel, 2010) and Nigeria (Odebiyi et al., 2016). However, although this is a developing occupation in Portugal, there is a lack of studies investigating this topic, as well as its association with different sociodemographic, anthropometric and occupational risk factors.

Thus, the aim of this study is to investigate the prevalence of musculoskeletal symptoms among call center operators and their associations with gender, BMI, hours of work and sitting time.

2. MATERIALS AND METHODS

2.1 Study design and sample

The study was approved by the ethical committee of Fernando Pessoa University. The study was conducted in a Portuguese call center company. Both male and female workers were selected to the study, aged between 18 and 65 years old that have been working for at least 6 months in part-time or full-time. Workers with health problems prior to their employment in the company that could cause musculoskeletal symptoms, as well as those who started their activity at the company less than 6 months ago were excluded. One hundred and forty-eight call center operators (68 male and 80 female) gave their written consent to participate.

2.2 Instruments and procedures

To assess sociodemographic (age, gender), anthropometric (weight, height and BMI) and occupational variables (number of hours of work per day, work position, sitting time), a sample characterization questionnaire was used.

The Standardized Nordic Musculoskeletal Questionnaire (NMQ) (Kuorinka et al., 1987), validated to the Portuguese population (Mesquita, Ribeiro, & Moreira, 2010), was also filled out in order to assess musculoskeletal symptoms in the last 7 days and in the last 12 months, of nine body regions (neck, shoulders, elbows, wrists/hands, dorsal region, low back region, hips/thighs, knees and ankles/feet).

2.3 Data analysis

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS v.26.0) software for Windows. Descriptive characteristics of the participants (age and BMI) are presented as mean ± standard deviation. The 7-day and 12-month prevalence of musculoskeletal symptoms in each body region was described in percentage (%). The Chi-Square test was used to assess the association between the prevalence of musculoskeletal symptoms and gender (male or female), BMI (normal or overweight), number of work hours (full-time or part-time), and sitting time (less or more than 8 hours). A p value under 0.05 was considered significant. In tables 1, 2, 3 and 4, the percentage represents the proportion of participants reporting pain in each body region, divided by category (columns).

3. RESULTS

The sample presented a mean ± standard deviation of 34.3 ± 8.6 years and a BMI of 24.9 ± 4.9 kg/m2.

Regarding the 12-month prevalence of musculoskeletal symptoms by body region, the most affected one was neck (56.1%), followed by low back (54.7%), shoulders (43.9%), wrist/hands (32.4%), knees (27.7%), thighs/hip (22.7%), ankles/feet (19.6%), dorsal region (14.2%) and finally, elbows (10.8%). Regarding the 7-day prevalence, the most affected body region was low back (31.8%), followed by neck (23.6%), shoulders (21.6%), wrist/hands (14.9%), knees (12.8%), thighs/hips (9.5%), ankles/feet (8.8%), dorsal region (6.1%) and lastly, elbows (2.7%) (Table 1).

The association analysis between the presence of musculoskeletal symptoms and gender, BMI, work hours and sitting time is presented in Tables 2, 3, 4 and 5, respectively.

Regarding gender, although in all body regions the number of women reporting pain is higher than men, only for the regions of the wrists/hands (p=0.033) and knees (p=0.031) there is a significant association (Table 2).

Table 1. Prevalence (12-month and 7-day) of musculoskeletal symptoms by body region

Body Regions	12-month (%)	7-day (%)
Neck	56.1	23.6
Low back	54.7	31.8
Shoulders	43.9	21.6
Wrists/Hands	32.4	14.9
Knees	27.7	12.8
Thighs/Hips	22.7	9.5
Ankles/Feet	19.6	8.8
Dorsal Region	14.2	6.1
Elbows	10.8	2.7

Table 2. Association between musculoskeletal symptoms and gender

Body Regions	Female (n=80)	Male (n=68)	Chi-Square Test
Neck (n=83)	46 (57.5)	37 (54.4)	$X^2(1)$=0.142; p=0.706
Shoulders (n=65)	40 (50.0)	25 (36.8)	$X^2(1)$=2.614; p=0.106
Elbows (n=16)	9 (11.3)	7 (10.3)	$X^2(1)$=0.035; p=0.852
Wrists/Hands (n=48)	32 (40.0)	16 (23.5)	$X^2(1)$=4.550; ***p*=0.033***
Thighs/Hips (n=33)	22 (27.5)	11 (16.2)	$X^2(1)$=2.720; p=0.099
Knees (n=41)	28 (35.0)	13 (19.1)	$X^2(1)$=4.629; ***p*=0.031***
Ankles/Feet (n=29)	17 (21.3)	12 (17.6)	$X^2(1)$=0.303; p=0.582
Dorsal Region (n=21)	15 (18.8)	6 (8.8)	$X^2(1)$=2.975; p=0.085
Low Back (n=81)	48 (60.0)	33 (48.5)	$X^2(1)$=1.952; p=0.162

Regarding BMI, only the thighs/hips region revealed a significant association (p=0.010), with overweight participants reporting significantly more musculoskeletal symptoms in this body region than those with normal BMI (Table 3).

Table 3. Association between musculoskeletal symptoms and BMI

Body Regions	Normal (n=87)	Overweight (n=61)	Chi-Square Test
Neck (n=83)	50 (57.5)	33 (54.1)	$X^2(1)$=0.166; p=0.684
Shoulders (n=65)	35 (40.2)	30 (49.2)	$X^2(1)$=1.166; p=0.280
Elbows (n=16)	7 (8.0)	9 (14.8)	$X^2(1)$=1.673; p=0.196
Wrists/Hands (n=48)	24 (27.6)	24 (39.3)	$X^2(1)$=2.262; p=0.133
Thighs/Hips (n=33)	13 (14.9)	20 (32.8)	$X^2(1)$=6.590; ***p*=0.010***
Knees (n=41)	19 (21.8)	22 (36.1)	$X^2(1)$=3.624; p=0.057
Ankles/Feet (n=29)	13 (14.9)	16 (26.2)	$X^2(1)$=2.899; p=0.089
Dorsal Region (n=21)	14 (16.1)	7 (11.5)	$X^2(1)$=0.628; p=0.428
Low Back (n=81)	47 (54.0)	34 (55.7)	$X^2(1)$=0.043; p=0.837

Regarding the hours of work, no significant associations were found between the prevalence of musculoskeletal symptoms and working full-time or part-time, even though in general, the number of call center operators working full-time and that report symptoms is higher than those who work in part-time (Table 4).

Table 4. Association between musculoskeletal symptoms and work hours

Body Regions	Full-time (n=81)	Part-time (n=67)	Chi-Square Test
Neck (n=83)	48 (59.3)	35 (52.2)	$X^2(1)$=0.734; p=0.392
Shoulders (n=65)	35 (43.2)	30 (44.8)	$X^2(1)$=0.037; p=0.848
Elbows (n=16)	9 (11.1)	7 (10.4)	$X^2(1)$=0.017; p=0.897
Wrists/Hands (n=48)	29 (35.8)	19 (28.4)	$X^2(1)$=0.927; p=0.336
Thighs/Hips (n=33)	21 (25.9)	12 (17.9)	$X^2(1)$=1.360; p=0.244
Knees (n=41)	23 (28.4)	18 (26.9)	$X^2(1)$=0.043; p=0.836
Ankles/Feet (n=29)	15 (18.5)	14 (20.9)	$X^2(1)$=0.132; p=0.717
Dorsal Region (n=21)	10 (12.3)	11 (16.4)	$X^2(1)$=0.499; p=0.480
Low Back (n=81)	46 (56.8)	35 (52.2)	$X^2(1)$=0.307; p=0.580

Also, no significant associations were found between the workers who spend less and more than 8h per day sitting and the musculoskeletal symptoms in any of the 9 body regions (Table 5).

Table 5. Association between musculoskeletal symptoms and sitting time

Body Regions	Less than 8h (n=74)	More than 8h (n=74)	Chi-Square Test
Neck (n=83)	39 (52.7)	44 (59.5)	$X^2(1)$=0.686; p=0.408
Shoulders (n=65)	29 (39.2)	36 (48.6)	$X^2(1)$=1.344; p=0.246
Elbows (n=16)	7 (9.5)	9 (12.2)	$X^2(1)$=0.280; p=0.597
Wrists/Hands (n=48)	29 (39.2)	19 (25.7)	$X^2(1)$=3.083; p=0.079
Thighs/Hips (n=33)	17 (23.0)	16 (21.6)	$X^2(1)$=0.039; p=0.843
Knees (n=41)	20 (27.0)	21 (28.4)	$X^2(1)$=0.034; p=0.854
Ankles/Feet (n=29)	15 (20.3)	14 (18.9)	$X^2(1)$=0.043; p=0.836
Dorsal Region (n=21)	10 (13.5)	11 (14.9)	$X^2(1)$=0.055; p=0.814
Low Back (n=81)	40 (54.1)	41 (55.4)	$X^2(1)$=0.027; p=0.869

4. DISCUSSION

This study aimed to investigate the 7-day and 12-month prevalence of musculoskeletal symptoms among call center operators and their associations with gender, BMI, hours of work and sitting time.

The nature of a call center work has been shown to increase repetitive strain and sedentary behaviour (Lacaze et al., 2010), predisposing these workers to a higher risk of musculoskeletal disorders (Toomingas, Nilsson, Hagberg, Hagman, & Wigaeus Tornqvist, 2003). Nonetheless, the simultaneous use of a computer and telephone, while under pressure to have an effective communication with their clients, allied to training deficits of the worker, bad quality of the furniture or bad conditions of the workstation (Tittiranonda, Burastero, & Rempel, 1999; Westin, 1992), may also contribute to the higher recurrence of these disorders in this professional group (Subbarayalu, 2013).

Results of the present study revealed that the three most affected body regions were the neck (56.1%), followed by the low back (54.7%) and the shoulders (43.9%). These findings are in line with previous investigations, where it seems to have a consensus regarding at least the 2 most affected body regions (d'Errico et al., 2010; Odebiyi et al., 2016). In the study of Odebiyi et al. (2016) carried out in a call center workers in Nigeria, it was also reported that the most affected body regions in the previous year were the neck, shoulders, upper back and lower back (Odebiyi et al., 2016). Also, in the study of d'Errico et al. (2010) in Italy, it was demonstrated that most complaints came from the neck (39%), shoulders (22%) and wrist/hands (10%). On the other hand, Charbotel et al. (2009) referred that the most frequent complaints were in the neck (59.2%), dorsal (54.2%), low back (43.1%), followed by the shoulder (31.6%). However, it should be

noted that in the present investigation, the percentages of reported complaints are, in general, higher than those reported by the previous authors.

Regarding the association between musculoskeletal symptoms and gender, our findings revealed that in general, women complained more than men, however, significant associations were only denoted in the wrists/hands and knees. These results are also in accordance with previous investigations who also conclude that a higher prevalence of musculoskeletal disorders is reported by women (Charbotel et al., 2009; d'Errico et al., 2010; Odebiyi et al., 2016; Rocha et al., 2005).

The association between musculoskeletal symptoms and BMI revealed that overweight participants reported significantly more musculoskeletal symptoms than those with normal BMI only in the thighs/hips region. To our knowledge, there are no previous investigations studying the influence of BMI in the musculoskeletal symptoms of these particular workers. However, several authors corroborate that a high BMI has a significant effect on increasing the prevalence of musculoskeletal symptoms (Berrigan et al., 2006; Shiri et al., 2008; Viester et al., 2013) and less hip mobility (Sjolie, 2004).

The results of this investigation also suggest that no significant associations between musculoskeletal symptoms and working full-time or part-time, even though in general the number of call center operators working full-time reported higher prevalences than those who worked in part-time, which can be explained by full-time workers (8 hours daily) being exposed during more hours to repetitive nature of tasks, prolonged static postures and also to more hours of stress and anxiety levels naturally involved in the call center occupation, which compromises a perception of the quality of life (Bhuyar et al., 2008; d'Errico et al., 2010; Lacaze et al., 2010; Parise & Soler, 2016; Rocha et al., 2005).

Although in our study there were no significant results in the association between musculoskeletal symptoms and sitting time, other authors reported in a previous investigation – in computer-using office workers – that musculoskeletal disorders increase with daily working hours (Ardahan & Simsek, 2016; Griffiths, Mackey, Adamson, & Pepper, 2012). And it is recommended to reduce the number of hours sitting, even if it is through short periods of interruption, it can bring benefits in terms of health and productivity (Pronk, Katz, Lowry, & Payfer, 2012; Peddie et al., 2013).

Some limitations should be recognized in the present study. First, although sample size is acceptable, a larger number of participants could be more representative of the sector and provide more power to the results. Second, although explicitly stated that we were collecting information about musculoskeletal symptoms related to the occupational task, data related to the assessment of physical load exposure levels was not collected, which makes it harder to establish a direct association between reported symptoms and physical work-related factors.

5. CONCLUSIONS

The prevalence of musculoskeletal symptoms among call center workers is high, with the three most affected body regions being the neck, low back and the shoulders. Significant associations were found between gender and reporting symptoms in the wrist/hands and the knees, with females reporting significantly more symptoms than males; and between BMI and reporting symptoms in the thighs/hips, with overweight operators reporting more symptoms. No significant associations were found regarding the hours of work and sitting time.

Workplace interventions are needed to decrease and prevent the prevalence of musculoskeletal complaints among call center workers.

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CONFLICT OF INTEREST

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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