Original Research Article

Prevalence of temporomandibular disorder among telemarketers and associated occupational factors: a cross-sectional study

ABSTRACT

Purpose: The present study aimed to describe the prevalence of temporomandibular dysfunction among telemarketers and identify factors associated with its occurrence, especially those related to occupation. **Methods:** A cross-sectional study was carried out involving 200 telemarketers from a call center, through interview and physical examination. Clinical, socio-demographic, occupational, and psychosocial aspects of the occupation (JCQ) and psychological stress (SQG12) were considered. Signs and symptoms and the severity of TMD were established using the RDC/TMD scale and TMI respectively. A descriptive analysis was carried out and odds ratios (OR) were estimated using unconditional logistic regression, using the 95% CI as the criterion for accepting the associations. **Results:** The frequency of TMD among telemarketers was 40.50%, with low severity (IMR=0.08±0.02). There was a positive association between length of service (ORadjust= 2.0; 95% CI: 1.1- 4.0), average number of calls per day (ORadjust= 2.1; 95% CI: 1.1- 3.9) and stress level (ORadjust= 2.1; 95% CI: 1.1- 4.4) and TMD. **Conclusions:** In the population studied, an association is suggested between time working for more than 7 months, an average number of calls above 82 per day, a high level of stress, and TMD.

Keywords: Temporomandibular dysfunction; TMD; Telemarketing; Occupational Health; Call center

INTRODUCTION

Disorders involving chronic orofacial pain are pervasive in the general population. Among these is temporomandibular dysfunction (TMD), defined in 1999 by the American Academy of Orofacial Pain[1]as “a collective term covering a wide range of clinical problems involving the masticatory muscles, the temporomandibular joints (TMJ) and their associated structures or all of these elements”. The pain associated with TMD can originate from the joint or the muscle, with masticatory muscle pain (MMP) being the most common type[2].

The use of the temporomandibular joint without rest criteria, through repetitive movements, is considered to generate functional overload and, when associated with periods of stress, can trigger TMD [3]. Such conditions are observed in telecare, which is characterized by repetitive movements of the TMJ for hours, without adequate breaks and under constant stress situations [4-6].

The teleservice consists of providing information to the customer through the constant use of voice, supported by information and communication technologies. This activity is carried out in call centers, organizational structures comprising service workstations using a computer terminal and a telephone [6]. In Brazil, there are more than 2,000 call centers, 250 of which are outsourced[7]. According to the Brazilian Teleservices Association (ABT), more than one million people currently work in this sector throughout the country [7].

Complaints point to unfavorable working conditions, which include rigid time control on tasks and strict productivity requirements. The pathogenic potential of working conditions in call centers translates into a major public health problem. Several studies have shown that call center workers have a high prevalence of complaints of anxiety[6-11], stress and fatigue[12], visual and hearing problems[6], and, above all, musculoskeletal disorders[4,6,13,14]. According to a survey carried out by the National Institute of Social Security (INSS) at the request of the Superintendence of Labor and Employment (SRTE), 45% of absences among teleworkers are due to musculoskeletal disorders[6]. Although it is a work situation that has multiple effects, research into TMD in this population is still a knowledge gap. Therefore, this study identified the prevalence of TMD and the factors associated with its occurrence among teleworkers, especially those related to occupation.

MATERIAL AND METHODS

Study design

This cross-sectional, exploratory study was reported concerning the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines [15] and conducted with telemarketers at a telemarketing company, in Salvador, Bahia, Brazil.

Ethical aspects

This studyfollowed the guidelines of Resolution 466/2012 on research with human beings and was approved by the University's Research Ethics Committee (CAAE:0603090078590). All individuals who agreed to take part in the research signed an Informed Consent Form.

Characterization of Sample

The sample was a convenience sample from a call center. To this end, 400 individuals between the ages of 18 and 49 were recruited, 200 of whom were eligible.

Eligibility Criteria

All call center agents were invited to voluntarily participate in the study, and those with a history of facial trauma, systemic diseases, and/or who had undergone surgery on the temporomandibular joint were excluded.

Evaluations

Primary data was used. Considering the voluntary nature of the workers' participation, the diagnosis of temporomandibular dysfunction and the application of the questionnaires were carried out from August to October of 2007, after being widely publicized using various communication strategies. When they showed up at the previously scheduled time, each worker was invited to answer a structured questionnaire, containing six blocks of questions on socio-demographic, clinical, occupational, psychosocial aspects of the occupation, minor mental disorders (SRQ-20), and stress reaction – General Health Questionnaire (GHQ-12). Subsequently, after proper calibration using the examination protocol and a video detailing all the examination procedures, the researcher made the diagnosis and classified the TMD using a validated scale, RDC/TMD [16], according to AXIS I, since at the time the study was carried out the translated version of the DC/TMD into Portuguese/Brazilian was not yet available. To ensure consistency in the physical examinations carried out

using the DCR/TMD, intra-examiner agreement was checked, where 10% of the total sample was re-examined by the same examiner. The second examination was carried out after a period of 1 to 2 weeks.

The questionnaire was structured into six thematic sections, the content of which involved identification and socio-demographic data - such as age in years, sex, skin color according to the criteria chosen by the IBGE, marital status, level of education categorized as high school, complete and incomplete college and family income in minimum wages; clinical aspects - with emphasis on signs and symptoms related to TMD (presence of pain, clicking, incoordination of jaw movements and decreased range of motion); occupational aspects - related to length of service in months, average number of calls per day and average service time in minutes; psychosocial aspects of the occupation - made up of the categories of an analysis model called demand-control, which classifies individuals according to the demands of the job; minor mental disorders - using the Self-Report Questionnaire (SRQ20), considering seven or more positive answers as the cut-off point for suspecting mental disorders; and mental stress - the SRQ20 was used, which aims to investigate aspects relating to "tension, irritation, tiredness and overload". The averages were found and categorized as 0 - data below the average (low level of stress); and 1 - data above the average (high level of stress). Subsequently, the data was reorganized according to gender and based on the averages (1.92 for men and 2.08), as suggested by Pasquali [17] (1994). The symptomatic profile was established for values above the 90th percentile (2.62 for men and 2.92 for women), considering that there are approximately 10% of psychiatric cases in a population considered normal.

To standardize palpation pressure, an electronic scale was used, as suggested by Dworkin and LeResche, 1992 [16], where pressure was applied with the index finger until it was possible to repeat the necessary pressure automatically. Pachymetry was carried out using a Digimess digital pachymeter, 150 mm.

Statistical analysis

Initially, a descriptive analysis of the variables of interest was carried out, obtaining simple frequencies for categorical variables and measures of central tendency and dispersion for continuous variables. Intra-examiner reliability for TMD diagnosis and severity was analyzed using the Kappa statistic and interpreted as: <0.00 poor, 0.00 - 0.20 mild, 0.21 - 0.40 fair, 0.41 - 0.60 moderate, 0.61 - 0.80 substantial and 0.81 - 1.00 almost perfect reliability.

We also looked at the prevalence of the effect according to the variables of interest, analyzing the differences between categories using the Chi-square test. For each variable of interest, the crude associations with TMD diagnosis were estimated using the Prevalence Ratios (PR) and 95% Confidence Intervals obtained using the Mantel Haenszel Method. It is considered that when the PR is equal to 1, the prevalence of the event of interest is equal in the two groups purchased, so exposure is not associated with the outcome. When the PR is greater than 1, there is a positive association, i.e. a greater probability of disease among those exposed, indicating that exposure is associated with the event of interest. When the PR is less than 1, there is an inverse association, i.e. a lower probability of disease among those exposed, suggesting that exposure is associated with the outcome. Variables with a significance level less than or equal to 5% were selected for multivariate analysis.

For this analysis, the method used was non-conditional logistic regression, as the dependent variable was treated dichotomously and the study was unpaired. The modeling procedures allowed the final model to be built to estimate the measure of association between the potential association factors and the diagnosis of TMD. The "backward" procedure was used to select the variables, starting with a complete model containing all the independent variables, without hierarchization and adapting the level of statistical significance (alpha=0.05) as the criterion for remaining in the model. The magnitude of the association between the potential determinants and TMD was verified by calculating the estimated Odds Ratio (OR), whose measure of precision was the 95% confidence interval estimated by the Wald Test (Hosmer &Lemeshow, 1989)[18]. Exposure is considered to be unrelated to the disease, OR = 1; if exposure is positively related to the disease, OR > 1; if exposure is negatively related to the disease, OR < 1. The statistical programs used were Epi-info version 6.03 (Dean et al., 1994)[18] and SPSS version 25.

RESULTS

Atotal of 200 telemarketers were enrolled in this study (figure 1).According to the baseline 40.50% (81) of whom had TMD, 88.89% of whom had MMP, with a higher proportion of women (44.22%), separated/divorced (50.00%), black (44.23%), aged over 24 years (41.75%) ranging from 18 to 49 years (±4.6), with a university degree

(52.78%) and family income ranging from 1 to 3 minimum wages (14.50%) (table 1).

According to the occupational characteristics (table 2), the telemarketers with TMD had been working in this activity for more than seven months (51.79%), making more than 82 calls/day (54.88%) and with a service average time (SAT)of less than 3 minutes (50.00%). There was also a higher frequency of TMD among those who considered the activity as an stress occupation (44.85%), who characterized it as high demand (47.37%) and high control (47.37%).

As for the severity of TMD, the respective values were found for the functional index (FI)=0.08±0.52, the muscular index (MI)=0.10±0.02 and the articular index (AI)=0.06±0.13, with the TMI being=0.08±0.02 (table 3). The Kappa index for intra-examiner reliability found for TMD diagnosis and severity was 0.93 (0.86-1.00).

The crude association between each variable of interest and TMD was checked. The variables: gender (PR=1.2, 95% CI=1.0 -1.4), length of service (PR =1.6, 95% CI=1.3 - 2.5), average number of calls per day (PR =1.8, 95% CI=1.3 - 2.5) and stress level (PR =2.1, 95% CI=1.2 - 3.6) were selected for modeling considering their statistical significance (table 4).

In the multivariate analysis, when the association between the selected variables and TMD was checked, after simultaneous adjustment it was found that time in the job over 7 months (OR =2.0, 95% CI=1.1 - 4.0, p=0.03), the average number of calls above 81 per day (OR =2.1, 95% CI=1.1 - 3.9, p=0.02), and a high level of stress (OR =2.1, 95% CI=1.1 - 4.4, p=0.05) remained positively associated with TMD and with statistical significance. Although the gender variable was positively associated with the outcome, it was not statistically significant (table 5).

DISCUSSION

This study aimed to identify the prevalence of TMD among telemarketers and the factors associated with its occurrence, especially those related to occupation. It was found that the occurrence of TMD among telemarketers is associated with having worked for more than seven months, an average number of calls above 82 per day, and a high level of stress. The intra-examiner reliability found for the diagnosis and severity of TMD was almost perfect, according to the Kappa test. There was a crude association between each variable of interest and TMD. There was also a positive association between the variables gender, working hours, average number of calls per day, and stress level. In the multivariate analysis, when the association between the selected variables and TMD was checked, after simultaneous adjustment it was found that time on the job over 7 months, average number of calls over 82 per day, and high-stress level remained positively associated with TMD and with statistical significance. Although the gender variable showed a positive association, it was not statistically significant.

The high occurrence of TMD found in this population when compared to other occupations was described as being of low severity (0.08±0.02), according to the TIM, an index that ranges from 0 to 1, where 1 expresses maximum severity. It is suggested that this finding is due to the high turnover characteristic of the occupation, where it can be seen that the majority of telemarketers did not stay with the company for more than a year. On the other hand, when comparing the results of this study with those found among other occupations such as dental surgeons, analysts, TV station employees, military personnel, nurses, information technology (IT) professionals and violinists, the frequency of TMD among telemarketers is different from those described in other occupations [20-22]. When investigating TMD in military personnel, an occurrence of 24.7% was found [23], while 69% was identified in nurses [24]. Among musicians who use wind instruments and professional singers, they found that although the incidence is like that of the general population, the symptoms start and increase during training and performances [22,25]. These differences may be due to the inherent characteristics of each occupation.

Another factor that could lead to divergent results would be the lack of standardization of TMD diagnostic criteria, due to its aetiological variety and the

possibility of multiple diagnoses. This study opted for the RDC/TMD, which provides clear and precise parameters for data collection and diagnosis [26] and expands a taxonomy standardized worldwide[27], which has been translated and validated in numerous languages, including Brazilian Portuguese. Previous studies using this scale have identified occurrences of around 10% [26-29], which is in line with the results presented in this study.

Among teleattendants, the highest occurrence of TMD was observed in the muscle diagnosis group, specifically the group with myofascial pain without amplitude limitation, followed by myofascial pain with amplitude limitation, as well as other investigations [29–33]. This condition is currently classified as masticatory muscle pain (MMP) and is associated with overuse of the muscle or ischemia resulting from muscle hyperactivity[30]. This is also observed in telecare, which is characterized by repetitive movements of the TMJ for hours, without adequate breaks [4,5], which may justify the high frequency in this study compared to others carried out previously involving other occupational activities, such as dental surgeons, analysts, TV station employees, military personnel, nurses, information technology (IT) professionals and violinists [20].

Numerous studies have investigated the relationship between stress and TMD [14, 22, 33-36]. According to Dutra et al[3], emotional stress is a systemic alteration that can influence masticatory function by increasing muscle tone. Aranha et al [20], in 2021, identified absence due to TMD according to occupation, according to professions that involved exacerbated stress conditions, such as nursing technicians. Similarly, Ton et al[37]of temporomandibular disorder and its association with stress and anxiety among university, reporting that the highest frequency was also among those with higher levels of stress. According toEmodi et al [38], occupation can be a triggering factor for TMD when associated with stress. Similarly, among telemarketers, the occurrence of TMD was also higher among those with a higher level of stress according to the General Health Questionnaire 12 (GHQ 12).

The activity of telephone answering involves determining stress factors such as time pressure, insufficient breaks, strong demands on memory and attention, stimuli for competition, and recording and monitoring of calls [5-12]. This is the portrait of Toyotism, which illustrates the adaptation of production to demand, increased outsourcing and working in “islands”, intensifying the pace of work, increasing pressure

in the workplace and the consequent risk of acquiring cardiovascular diseases, diseases of the musculoskeletal system, depression and stress [6,8,9,12].

The greater the demands placed on workers and the less latitude they have to control them, the greater the risk to their health [38]. Although telecare has been described as a high-demand, low-control activity [6, 8, 9,11,12,40], in this study TMD was more frequent among high-demand, high-control workers. This may be because this is an information-providing company where, although the role of the telemarketer is receptive, there isn't as much control over the time of each call per minute, which can be identified by the more frequent TMA among calls lasting more than three minutes, contrary to what has been described in other companies with an average TMA of 28 seconds. However, there was a positive association between the average number of calls above 82, suggesting that those with a TMA of less than three minutes make more calls and are consequently more prone to TMD.

From the same point of view, we can infer the time spent working, because in general, the longer the time spent working, the greater the cumulative effects resulting from it. It is well known that the pathogenic potential of working conditions in call centers is an important public health problem, which has been described since 1956 by the psychiatrist Lê Guillant[7]. The intense cognitive load, the high number of calls, and the average service time are some of the factors that can be associated with TMD. It is worth noting that in this study there was a positive association between having been in the profession for more than seven months (OR=2.0 95%CI=1.1-4.0), an average number of calls of more than 82 per day (OR=2.1 95%CI = 1.1-3.9) and a high level of stress (OR=2.1 95%CI = 1.1-4.4). Although there have been no previous studies on the association between telecare and TMD, the fact that workers have been taking on new responsibilities which generate a great deal of psychological burden characterizes the emergence of new pathologies, most of which are not recognized as occupational in origin.

The investigation of TMD among non-patients and in specific occupations is an advance in knowledge; however, as this is an exploratory cross-sectional study, all the findings should be analyzed with caution. Despite the limitations, the scarcity of research on this subject justifies carrying out exploratory analyses to formulate hypotheses that can be studied more adequately. We therefore recommend the development of confirmatory studies, with a longitudinal design, which focuses on risk factors related to occupation in the occurrence of TMD.

It is essential to create public policies aimed at workers' health, especially about clarifying TMD in the occupational context, as we seek to guide prevention and control measures in the workplace, adopting more appropriate coping strategies. Among these strategies, emphasis should be placed on time issues, reducing the working day and increasing rest breaks at intervals defined according to the working day. The elimination of the average service time and the replacement of assessment methods, currently based on the ability to follow prescribed procedures, known as scripts, with other assessment criteria that involve the ability to solve problems, point to a perspective of progress that emerges as a way of changing such harmful conditions.

CONCLUSION

It can be concluded from the present study that the prevalence of TMD among telemarketers is 40.5% and is associated with working for more than seven months, with an average number of calls per day above 82, and with a high level of stress.

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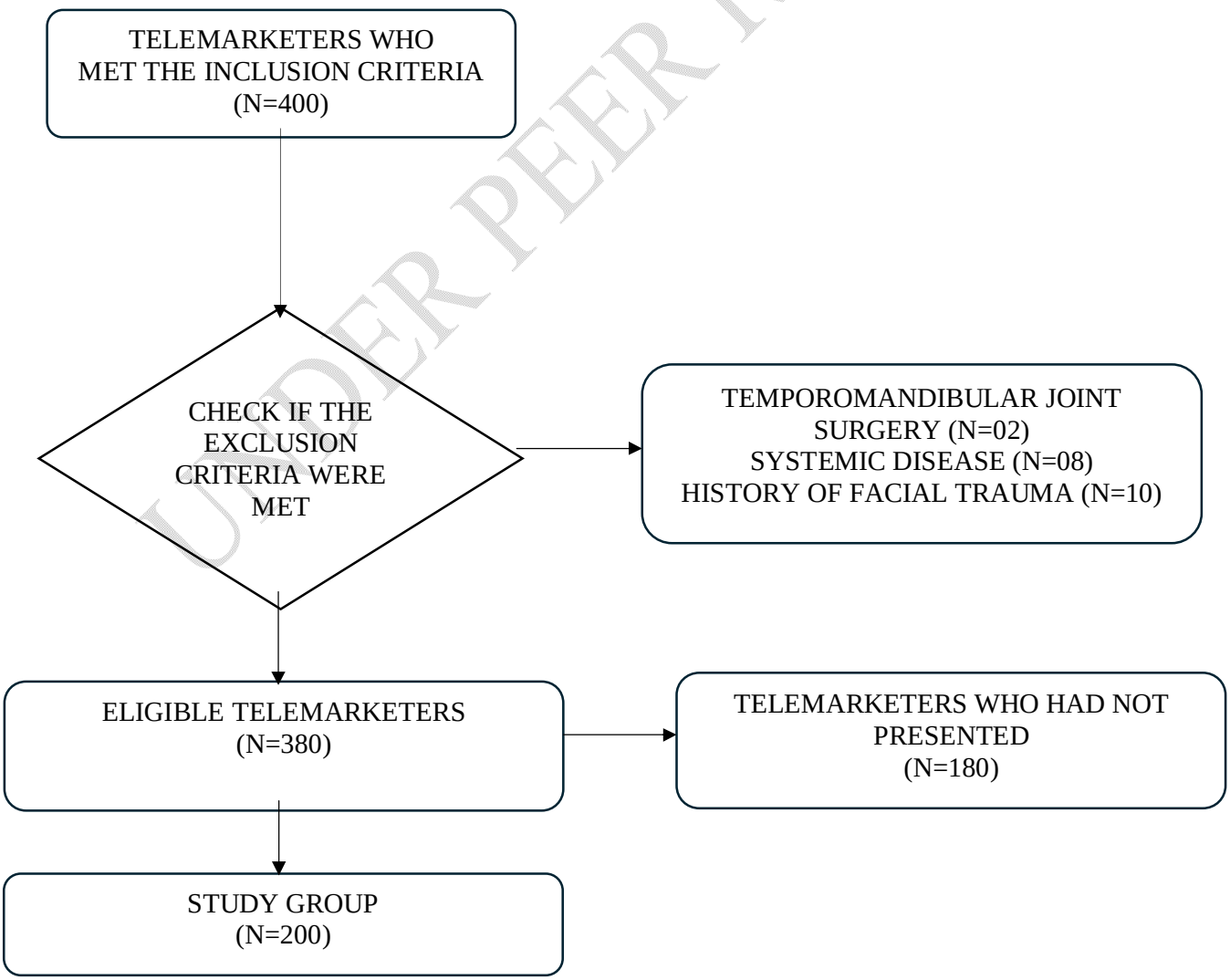

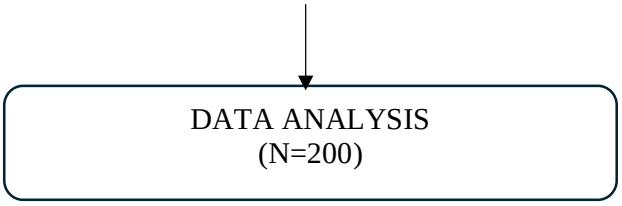

Figure 1. The flowchart of the study

Table 1. Prevalence of Temporomandibular Disorder (TMD) according to social and demographic characteristics of the studied population (n= 200)

Variable	TMD (81) n	%	p - χ^2
Age (Years)			
< 24	38	39,18	0,71
≥24	43	41,75	
Sex			
Female	65	44,22	0,08
Male	16	30,19	
Level of schooling			
High School	25	32,05	0,16
Complete University Education	19	52,78	
Incomplete University Education	37	43,02	
Family income			
From 1 to 3 minimum wages	29	14,50	0,07
>3 e ≤ 5 minimum wages	23	11,50	
>5 e ≤ 7 minimum wages	11	05,50	
>7 e ≤ 9 minimum wages	09	04,50	
>9 minimum wages	09	04,50	
Marital Status			
Single	67	39,88	0,65
Married	13	43,33	
Separated/Divorced	01	50,00	
Skin color			
White	12	38,71	0,51
Mixed-ethnicity	21	35,59	
Black	46	44,23	
Yellow	02	33,33	

Table 2. Prevalence of Temporomandibular Disorder (TMD) according to occupational characteristics of the studied population (n= 200)

Variable	N%	TMD (81)	p - χ^2
Lengh of service			
≥ 7 months	58	51,79	0,0003
< 7 months	23	26,14	
Average call/day			
≥ 81 call/day	45	54,88	0,0006
< 81 call/day	36	30,51	
Service average time (SAT)			
≥ 3 min/ call	78	40,21	0,63
< 3 min/ call	03	50,00	
Relationship between symptoms and work			
Yes	41	51,25	0,01
No	40	33,33	
Stress activity			
Yes	61	44,85	0,06
No	20	31,25	
Demand			
Low	38	35,51	0,12
High	43	46,24	
Control			
Low	36	34,29	0,06
High	45	47,37	

Table 3. The severity of TMD among call center attendants according to the Temporomandibular index (TMI) and their sub-indexes functional index (FI), muscular index (MI) and articular index(AI)(n=81)

Descriptive Measures

Index	Minimum	Maximum	Median	Mean
TMI	0,0	0,62	0,08±0,02	0,12±0,13
FI	0,0	0,83	0,08±0,52	0,17±0,23
MI	0,0	0,90	0,10±0,02	0,14±0,16
AI	0,0	0,63	0,06±0,13	0,00±0,16

Table 4. Prevalence Ratios (PR) and 95% Confidence Intervals (95% CI) for the association between TMD and the independent variables studied, obtained through bivariate analysis

Variable	PR	CI95 %
Sex		
Male	1,0	
Female	1,2	(1,0 – 1,4)
Lengh of service		
< 7 months	1,0	
≥ 7 months	1,6	(1,2 – 2,0)
Average call/day		
< 81 calls/day	1,0	
≥ 81 calls/day	1,8	(1,3 – 2,5)
Stess level		
Low	1,0	
Hjgh	2,1	(1,2 – 3,6)

Table 5. Final Logistic Regression analysis model for the occurrence of TMD among call center attendants.

Model[a]	Odds Ratio	CI 95 %[b]
Lengh of activity		
< 7 meses	1,0	
≥ 7 meses	**2,0**	**(1,1 – 4,0)**
Average calls/day		
< 81 calls/day	1,0	
≥ 81 calls/day	**2,1**	**(1,1 – 3,9)**
Stress level		
Low	1,0	
High	**2,1**	**(1,1 – 4,4)**

[a] Stepwise backward method
[b] Confidence Interval 95%
*Hierarchic multiple logistic regression with level of significance p<0,05; interval with 95% confidence