Work-Related Musculoskeletal Disorders Among Brazilian Dental Students

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Abstract: The aim of this analytical cross-sectional study was to evaluate the presence of work-related musculoskeletal disorders (WMSD) among dental students in two Brazilian dental schools. The sample included 227 randomized subjects from fifth to ninth semesters who were developing clinical activities. Each student signed an informed consent form. A self-reporting questionnaire was used to obtain data on the practice of physical exercise, the presence of pain during or soon after treating patients, and the adoption of preventive measures related to clinical activities. Results were analyzed using the Statistical Package for Social Sciences 13.0. The χ² test was used to identify associations between variables. The presence of pain during or after clinical work was reported by 173 participants (76.2 percent). Statistically significant differences were found between gender and the occurrence of pain. Pain was present during clinical activities (p=0.006) and imposed limitations on the work routine (p=0.011). Among those who practiced physical exercise, eighty-eight (74.6 percent) reported pain. The high percentage of pain reported by dental students suggests the value of reviewing work conditions in dental practices in order to minimize the exposure of all workers to WMSD.

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The term “cumulative trauma disorders” (CTD) was used for the first time in Brazil in 1986. The first Regulation nº 4062/1987 of the Ministério da Previdência Social (Ministry of Social Security) recognized tenosynovitis as an occupational disease. This term also refers to other occupational disease of other workers who perform repetitive movements of the wrist.

In 1998, the Ministry of Social Security edited Order nº 606, which was revised by Normative Instruction nº 98, adopting the term “work-related musculoskeletal disorders” (WMSD). This term has since replaced CTD because it was acknowledged that stress, fatigue, and some types of psychological depression could also trigger pain even if no lesion was present.

There are many pathologies included in the WMSD group, such as synovitis, bursitis, tendinitis and tenosynovitis, carpal tunnel syndrome, retundus pronator syndrome, Guyon’s canal syndrome, and cubital tunnel syndrome. An interaction of several factors is necessary to unleash these pathologies, mainly the ones related to the absence of ergonomic orientation or lack of attention in its use, such as anatomical and physiological fatigue due to physical/muscular strain, wrong working posture, repetitive movements, improperly designed work stations, and long work hours. Once risks are identified, control measures should be taken to decrease the probability of this disease being made manifest.

Dental students are often exposed to risks inherent to clinical practice. Therefore, the assessment of dental students’ knowledge about WMSD pathologies may highlight characteristics of the pain observed in this group and how the lack of attention to prophylactic actions can increase ergonomic risks hidden in their occupational activity.
Methods

This analytical cross-sectional study was carried out in the cities of Recife and Camaragibe, Brazil, at the Dentistry School of Recife (FOR) and the Dentistry School of the University of Pernambuco (FOP-UP), a private and a public school, respectively, chosen for this study by a convenience criterion. The sample comprised all students from fifth to ninth semesters who were developing clinical activities. Each student signed an informed consent form. The age of the interviewed sample was stratified for statistical purposes according to the United Nations Development Program.

A self-reporting questionnaire with twenty closed questions was developed based on the pattern of work-related injuries in dentists and dental hygienists identified in British Columbia, Canada in the Rucker study, as well as on studies conducted by Browne et al. and Oliveira (Figure 1). In these studies, the key concepts were related to the presence or absence of pain; its intensity; reasons for pain to get worse; its persistence while resting or at night; the practice of physical exercise; the adoption of preventive measures related to clinical activities; the presence of pain during or soon after the treatment of patients; the characterization, anatomical localization, and consequences of the pain; and whether students had already experienced some pathology related to WMSD. Furthermore, there were questions about the use of drugs to control pain and other therapies like acupuncture and physiotherapy. Most of the questions had multiple alternatives, but only one could be answered.

All interviews were conducted by an experienced researcher (coauthor EPS) and were held in a classroom when all students were present at both dental schools.

The validity of the questionnaire was tested in a pilot study that found no need to modify any issue since all students understood the meaning of each question. Thirty dental students who participated in the study were randomly selected and interviewed a second time, to assess the test-retest reliability of

<table>
<thead>
<tr>
<th>Stages, according to Oliveira¹</th>
<th>Stages, according to Browne et al.²</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Fatigue, discomfort, localized pain without irradiation, which gets worse with work and better with rest.</td>
<td>I. Pain at work, ceasing at night, without sleep disturbance.</td>
</tr>
<tr>
<td>II. Persistent and more intense pain, associated with paresthesia and burning feeling. It gets worse with work and home activities and causes reduction in productivity.</td>
<td>II. Pain during work that persists at night and causes sleep disturbance.</td>
</tr>
<tr>
<td>III. Persistent, strong, and irradiated pain, which gets some relief at rest, associated to a decrease in muscular strength and movement control, edema, and paresthesia. There is reduction of productivity or incapacity for work.</td>
<td>III. Pain even at rest, with sleep disturbance.</td>
</tr>
<tr>
<td>IV. Strong and continual pain, with intense suffering and irradiation to all members. It causes incapacity for any work.</td>
<td></td>
</tr>
</tbody>
</table>

Sources:

Figure 1. Characterization of WMSD stages
the survey. This second interview was conducted at
least one month after the first one and presented the
dental student with the same questions used in the
first interview. The analysis of data obtained in this
way showed a high consistency in the dental students’
responses, with Kappa values of 1 for categorical
variables and the intraclass correlation coefficient
ranging from 0.97 to 1.00 for numerical variables.
The Statistical Package for Social Sciences (SPSS)
version 13.0 was used for determining frequency
distributions, means, and medians and the chi-square
test for calculating the level of significance. The
significance level was set at 5 percent.

This study was approved by the Ethics and Re-
search Committee of the University of Pernambuco
in accordance with Resolution nº 196/96
of the
National Health Council.

Results

Of the 274 students attending both dental
schools, 227 (90 percent) participated in this study.
Of these, forty-nine (21.6 percent) were from FOR
and 178 (78.4 percent) from FOP-UPE. Ninety-five
(41.9 percent) of the students were female, and 132
(58.1 percent) were male. The age of the participants
ranged from nineteen to forty-four years, and the
median age was twenty-two years.

When questioned about WMSD, 176 students
(77.5 percent) reported that they were unaware of
its meaning. Among the forty-two subjects (18.5
percent) who indicated that they knew what WMSD
meant, only eleven (4.8 percent) defined it correctly.
One hundred and twenty-three students (54.2 per-
cent) indicated that they had not taken a course on
WMSD or ergonomics in their dental education.
Nevertheless, 193 participants (85 percent) reported
they had received some guidance in relation to
ergonomics measures applied to the dental work
environment.

Forty-two students (18.5 percent) including
sixteen males (38.1 percent) and twenty-six females
(61.9 percent) reported that they had already been
diagnosed with WMSD disorders, such as spondylal-
gia, bursitis, and tendinitis.

The presence of pain or fatigue during or soon
after treating a patient was mentioned by 173 students
(76.2 percent). Fisher’s exact test showed statistically
significant differences between gender and the oc-
currence of pain (p=0.05). The comparison between
age and the occurrence of pain, the diagnosis of
WMSD, and the type of lesions diagnosed is shown
in Table 1.

When asked about the anatomical localization
of the pain, 119 participants (52 percent) answered
that they had felt pain in more than one body region;
4 percent, 5 percent, and 7 percent reported pain in
the cervical, dorsal, and lumbar regions, respectively.
Shoulders (2 percent), wrists (2 percent), hands (2
percent), legs (1 percent), and other body regions
were also named as locations of pain. Of the particip-
ants who reported pain, 132 (76.3 percent) did not
seek medical assistance.

Pain occurred more often during students’ clin-
ical activities (χ²=14.62; p=0.006), causing limitations
in their work routine (χ²=19.71; p=0.011). In addition
to differences between genders, Tables 2 and 3 charac-
terize pain according to intensity, frequency, percep-
tion, and the occurrence of physical limitations.

One hundred and forty-six students (64.3 per-
cent) reported taking preventive actions against the
occurrence of WMSD. The more frequent preventive
actions were correct working posture (14.1 percent),
utilization of adequate furniture and ergonomic
equipment (3.1 percent), pauses during the work day
(2.2 percent), muscular relaxation techniques (1.8
percent), and a combination of two or more of these
preventive measures (41 percent).

The regular practice of physical exercise (walk-
ing, jogging, using exercise equipment for cardiovas-
ular conditioning, weight lifting, etc.) was reported
by 118 participants (52 percent). Body-building and
walking/running were the most frequently mentioned
forms of exercise at 20.3 percent and 16.7 percent,
respectively. When the occurrence of pain was
evaluated among those who reported regular physi-
cal exercise, it was observed that eighty-eight (74.6
percent) reported pain during or soon after their work
with patients. However, there were no statistically
significant differences between the practice of physi-
cal exercise and the presence of pain in this study
(χ²=2.494; p=0.287).

Discussion

Scientific research using self-reports for past
events is increasingly frequent in areas that need to
quantify certain aspects of health behavior whose
nature is essentially self-reported and therefore some-
times is not directly observable as well as amenable
to memory error. Several studies of the cognitive
processes relevant in the survey context pointed to
Table 1. Characterization of pain and WMSD diagnosis, according to age

<table>
<thead>
<tr>
<th>Variable</th>
<th>Young Adult (19 to 23 years)</th>
<th>Adult (24 to 44 years)</th>
<th>Total Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td><strong>Characteristics of pain</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slight</td>
<td>56</td>
<td>35.4%</td>
<td>23</td>
</tr>
<tr>
<td>Moderate</td>
<td>58</td>
<td>36.7%</td>
<td>16</td>
</tr>
<tr>
<td>Strong</td>
<td>4</td>
<td>2.5%</td>
<td>4</td>
</tr>
<tr>
<td>Did not answer</td>
<td>7</td>
<td>4.4%</td>
<td>5</td>
</tr>
<tr>
<td>Do not feel pain</td>
<td>33</td>
<td>20.9%</td>
<td>21</td>
</tr>
<tr>
<td><strong>Diagnosis of WMSD</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>31</td>
<td>19.6%</td>
<td>11</td>
</tr>
<tr>
<td>No</td>
<td>122</td>
<td>77.2%</td>
<td>57</td>
</tr>
<tr>
<td>Did not answer</td>
<td>5</td>
<td>3.2%</td>
<td>1</td>
</tr>
<tr>
<td><strong>Diagnosis of lesions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tendinitis</td>
<td>9</td>
<td>5.7%</td>
<td>1</td>
</tr>
<tr>
<td>Bursitis</td>
<td>2</td>
<td>1.3%</td>
<td>—</td>
</tr>
<tr>
<td>Synovitis</td>
<td>1</td>
<td>0.6%</td>
<td>1</td>
</tr>
<tr>
<td>Back pain</td>
<td>19</td>
<td>12.0%</td>
<td>11</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>1.3%</td>
<td>—</td>
</tr>
<tr>
<td>Did not have lesions</td>
<td>125</td>
<td>79.1%</td>
<td>56</td>
</tr>
</tbody>
</table>

Note: P-value for χ² test: p>0.05. Percentages may not total 100% because of rounding.

Table 2. Intensity, frequency, and perception of pain, according to gender

<table>
<thead>
<tr>
<th>Variable</th>
<th>Male</th>
<th>Female</th>
<th>Total Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td><strong>Intensity of pain</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slight</td>
<td>33</td>
<td>34.7%</td>
<td>46</td>
</tr>
<tr>
<td>Moderate</td>
<td>25</td>
<td>26.3%</td>
<td>49</td>
</tr>
<tr>
<td>Strong</td>
<td>2</td>
<td>2.1%</td>
<td>6</td>
</tr>
<tr>
<td>Did not answer</td>
<td>7</td>
<td>7.4%</td>
<td>5</td>
</tr>
<tr>
<td>Do not feel pain</td>
<td>28</td>
<td>29.5%</td>
<td>26</td>
</tr>
<tr>
<td><strong>Frequency of pain</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rarely feel pain</td>
<td>30</td>
<td>31.6%</td>
<td>31</td>
</tr>
<tr>
<td>Monthly</td>
<td>9</td>
<td>9.5%</td>
<td>19</td>
</tr>
<tr>
<td>Weekly</td>
<td>13</td>
<td>13.7%</td>
<td>39</td>
</tr>
<tr>
<td>Daily</td>
<td>5</td>
<td>5.3%</td>
<td>8</td>
</tr>
<tr>
<td>Did not answer</td>
<td>10</td>
<td>10.5%</td>
<td>9</td>
</tr>
<tr>
<td>Do not feel pain</td>
<td>28</td>
<td>29.5%</td>
<td>26</td>
</tr>
<tr>
<td><strong>Perception of pain</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fatigue or slight pain, without irradiation</td>
<td>51</td>
<td>53.7%</td>
<td>81</td>
</tr>
<tr>
<td>Persistent and more intense pain, presenting paraesthesia</td>
<td>7</td>
<td>7.4%</td>
<td>17</td>
</tr>
<tr>
<td>Persistent and strong pain, with irradiation and productivity reduction</td>
<td>1</td>
<td>1.1%</td>
<td>1</td>
</tr>
<tr>
<td>Strong and continuous pain, with intense and incapacitating suffering</td>
<td>—</td>
<td>—</td>
<td>2</td>
</tr>
<tr>
<td>Did not answer</td>
<td>8</td>
<td>8.4%</td>
<td>5</td>
</tr>
<tr>
<td>Do not feel pain</td>
<td>28</td>
<td>29.5%</td>
<td>26</td>
</tr>
</tbody>
</table>

Note: P-value for χ² test: p>0.05.
the difficulty of converting episodic memory to an incident. A review of the literature on recall accuracy suggests that the extent of inaccurate recall is related to characteristics of the exposure of interest and of the respondents, though a distinction must be drawn between recall that is biased and that which is simply inaccurate. Interviewing technique and the study protocol, including the design of questionnaires and the motivation of respondents, play a central role and are under the control of the investigator. For this reason, the results of this research should be examined with caution. However, as the respondents were students who were developing clinical activities, the majority of the information collected occurred at the actual moment of their daily activities.

Musculoskeletal disorders are some of the most important work-related problems currently reported. Occupational diseases have not only physical, psychological, and social consequences but also economic and security impacts when they reach a level of severity that directly affects work capacity, causing absences and early retirement.

In Brazil, 393,071 work-related accidents were reported in 2002, of which 22,311 were work-related diseases; among these, 13,302 (59.6 percent) were considered to be WMSD. These incidents generally evolved into prosecutions to obtain welfare or accident benefits. Data from the Ministry of Social Security on the economic impact of these benefits show that the expenses ranged from about US$2,168,620,394 in 1995 to US$4,910,642,500 in 2000, reaching the considerable amount of US$10,015,453,799 in 2003. These data seem to be very low for a nation as large as Brazil. However, it is important to highlight that reports of WMSD and the analysis of health care utilization and cost details are underestimated worldwide.

It is important to emphasize that a connection between cause and time must be established before disorders are classified as WMSD. The presence of risk factors such as working without pauses, the absence of ergonomic guidance and properly designed work stations, and the use of repetitive movements at work should be simultaneous with the worker’s performance of the same physical activity for long periods of time.

Dentists are among the workers who are more often susceptible to musculoskeletal disorders; their work includes risk factors that may lead to many pathologies, such as tendinitis, synovitis, tenosynovitis, and bursitis. One study found a prevalence of widespread pain in the general population ranging from 4.2 to 11.4 percent. Compared to the general population, the sample studied in this survey showed a higher prevalence of pain.

A study conducted in Brazil found that 58

| Table 3. Time and place pain was felt and caused limitations, according to gender |
|-------------------------------------|--------|--------|--------|
| Variable                           | Male   | Female | Total Group |
|                                    | N  | %     | N  | %     | N | %     |
| Feel pain (p=0.037)                |     |       |     |       |     |       |
| At work, ceasing at night, without sleep disturbance | 44  | 46.3% | 83  | 62.9% | 127 | 55.9% |
| During work, persisting at night, causing sleep disturbance | 5   | 5.3%  | 9   | 6.8%  | 14  | 6.2%  |
| Pain even at rest, with sleep disturbance | 1   | 1.1%  | 6   | 4.5%  | 7   | 3.1%  |
| Did not answer                     | 17  | 17.9% | 8   | 6.1%  | 25  | 11.0% |
| Do not feel pain                   | 28  | 29.5% | 26  | 19.7% | 54  | 23.8% |
| The pain causes limitations (p=0.041) |     |       |     |       |     |       |
| At work                            | 20  | 21.1% | 38  | 28.8% | 58  | 25.6% |
| At leisure time                    | 2   | 2.1%  | 4   | 3.0%  | 6   | 2.6%  |
| At daily routine                   | 2   | 2.1%  | 19  | 14.4% | 21  | 9.3%  |
| Even at rest                       | 2   | 2.1%  | 2   | 1.5%  | 4   | 1.8%  |
| In all of the above options        | 2   | 2.1%  | 3   | 2.3%  | 5   | 2.2%  |
| In more than one of the above options | 4   | 4.2%  | 3   | 2.3%  | 7   | 3.1%  |
| Did not answer                     | 33  | 34.7% | 30  | 22.7% | 63  | 27.8% |
| Doesn’t cause                      | 28  | 29.5% | 26  | 19.7% | 54  | 23.8% |

Note: P-value for $\chi^2$ test: $p<0.05$. Percentages may not total 100% because of rounding.
percent of dentists reported complaints of musculoskeletal pain in one or more body regions. Actually, dentists face several inherent ergonomically related risks because of the nature of the clinical activities necessary for patient care, which, if not prevented or treated in time, may trigger severe health problems and suffering. In our study, a high percentage of students at two dental schools in Brazil reported pain or fatigue during or soon after treating patients. This weekly slight/moderate pain was mostly related to fatigue, stopped at night, did not disturb sleep, and did not radiate to other areas of the body. However, this pain contributed to limitations at work and the students’ daily routine. The inability of students to practice in an ergonomic manner can also be attributed to practicing without an assistant in some parts of the country. However, at the two schools of dentistry interviewed, all students work in pairs in their clinical activities.

Considering the clinical stages of WMSD shown in Figure 1, the sample studied would be designated at Stage I of both criteria used in this analysis. This result reveals the importance of preventive intervention to stop such disorders from progressing to more severe stages. Pain is the most common symptom in WMSD and may have serious repercussions in an individual’s life. Initially characterized by a diffuse feeling of fatigue and tiredness arising only at the end of the work day, the pain tends to increase if causal factors persist.

It was also observed that the students’ knowledge of WMSD was precarious because most of them could not recall courses on this topic in their dental education although many acknowledged they had received some guidance in relation to ergonomics, which aims to adapt the individual to his or her work environment.

Regarding anatomical distribution of pain, it was observed that spondylalgia predominated over apendicular pain. Overall, the presence of pain was detected in more than one body region at a time. The occurrence of this kind of associated pain reached 90 percent in a previous study. In our study, in spite of the pain complaints, most of participants reported that they did not seek medical care to have either the pain evaluated or its causes diagnosed.

The occurrence of WMSD was higher among female than male dental students, and there were statistically significant differences as shown in Table 3. A relationship between the occurrence of WMSD and gender has been found by other authors.

who have proposed several reasons to explain this fact, including high and continuous physical demand of the arms on women’s work; working posture not according to ergonomic principles; monotonous movements; the exacerbation of the work capacity of arms, hands, and fingers; the organic fragility of women; and long work hours.

The regular practice of physical exercise is one strategy for prevention of WMSD because people who take part in any kind of athletic endeavor or physical conditioning show lower levels of severe symptoms than those who do not. This is also important to employer systems since employee participation in sports may increase productivity and decrease costs and absenteeism.

Conclusions

Dental students at two Brazilian dental schools were found to have an increased risk of developing musculoskeletal disorders and more painful or persistent conditions. The findings of this survey highlight the need for educational programs to be implemented in dental school and during the continuing professional development of practicing dentists to reduce the incidence of this problem within the profession.

REFERENCES


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