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Prevalence of musculoskeletal pain in dental students and associated factors

Renata Reis dos Santos[1,*], Cléa Adas Saliba Garbin[1,*], Julia Arruda Batista[1], Tânia Adas Saliba[1], Artênio José Isper Garbin[1]

[1] Department of Infant and Social Dentistry, Araçatuba School of Dentistry, Univ. Estadual Paulista – UNESP, Araçatuba, Brazil.

Corresponding author:
Cléa Adas Saliba Garbin/
Julia Arruda Batista
Department of Infant and Social Dentistry, Araçatuba School of Dentistry, UNESP, José Bonifácio Street, 1193. Neighborhood: Vila Mendonça, Araçatuba, SP –Brazil.
e-mail: cgarbin@foa.unesp.br / jarrudabaptista@gmail.com
https://orcid.org/0000-0001-5069-8812

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Aim: The objective of this research was to evaluate the prevalence of painful symptoms among dental academics, as well as their associated factors. **Methods:** A cross-sectional study was carried out at a public higher education institution, and the study population (n = 303) included undergraduate students who studied at least one subject that included clinical activities. For data collection, two self-administered questionnaires were delivered to the participants, the first of which consisted of sociodemographic variables, academic life, harmful habits, physical activity practice, and general health. The validated Nordic Musculoskeletal Questionnaire was used to identify musculoskeletal symptoms, the need to seek health resources, and to assess whether the disorders interfered with the work activities of academics. **Results:** The presence of pain in the past 12 months was observed in 199 participants (82.6%). Several variables, including gender, number of courses performed, physical activity, and general health status, had an association with painful symptoms in at least one area of the body (GA) over the past 12 months. In addition, variable general health was associated with pain symptoms in any area of the body (DG) over the past seven days. **Conclusion:** There was a high prevalence of musculoskeletal symptoms, especially in the upper limbs, and there were associations between muscular pain and the number of disciplines studied and between muscular pains and the general health of the students.

Keywords: Dentistry. Musculoskeletal disorders. Occupational health. Students. Pain.

Introduction

Musculoskeletal disorders are common morbidities in dental practice and are characterized by persistent pain and/or discomfort in the musculoskeletal system, including joints, ligaments, tendons, nerves, and structures that support the limbs; these disorders may present as inflammatory or degenerative conditions that occur either alone or by cumulative trauma, causing painful symptomatology in different parts of the body[1-5]. In addition to pain, they include complaints such as tingling, numbness, weight, and early fatigue; thus, these diseases contribute to the inability of the professional from his job, and even their withdrawal from the position[6].

Among occupational diseases in health workers, musculoskeletal disorders affect approximately 63% to 93% of dentists, and their early onset is a very common problem for these professionals[1]. A career in dentistry requires clinical care to be carried out in a restricted area (the mouth); thus, the professional remains in the same position for a long time, requiring extreme precision and strength of the movements of the hands and wrists, often repetitively[1,7]. The necessity of this positioning during the work activity can increase the risk of developing Work-Related Osteomuscular Disorders (DORT)[7]. These disorders arise from the interplay of many factors, including a lack of knowledge surrounding the need for correct ergonomic posture, work posture associated with repetitive movements, long working hours, and a lack of physical activity and muscle strengthening[7,8].

Although the prevalence of musculoskeletal problems among dental surgeons is high (63% to 93%), there are few studies focused on this profession[9]. In a study carried out in academics in Brazil, it was found that an incorrect posture was assumed during the execution of work[7]. In another study, there was an increased risk of the development of musculoskeletal disorders and painful or chronic conditions due to the professional attitudes during the execution of the work[8].

Therefore, this study aimed to evaluate the prevalence of pain symptoms among dental students, as well as their association with other factors.

Materials and methods

This was a cross-sectional study involving dentistry students enrolled at the University, who attended at least one course that included clinical activities in its teaching plan. During the collection period (September 2013 to November 2013), 303 students were enrolled who met this criterion. Students who had any congenital physical impairment involving the upper or lower limbs were excluded, as were pregnant women, infants, and those who did not consent to participate in the study.

An explanation of free and informed consent was attached to the questionnaire in order to clarify any questions regarding the voluntary participation in the research. This study was approved by the Araçatuba School of Dentistry Committee for Ethics Research - UNESP, and followed all national and international regulations (CAAE: 18569513.2.0000.5420)

Each participant responded to two self-administered questionnaires, which were delivered at the end of the theoretical lectures so as not to disrupt the teaching activities.

The questionnaires were distributed to the participants by previously trained graduate students, who explained and clarified doubts, thus avoiding errors in the completion and understanding of the questionnaire.

The first questionnaire consisted of a series of questions about socio-demographic variables (gender, age, and marital status); academic life (number of subjects taken); harmful habits (use of tobacco, alcohol, and other drugs); the performance of physical activities (what, how long, frequency, and monitoring by a specialist); and general health. Further information on weight and height were collected in order to calculate the body mass index (BMI). An individual was considered obese when their BMI was ≥ 30 kg/m^2, overweight when the BMI was between 25 and 29.9 kg/m^2, and normal when the BMI was between 20 and 24.9 kg/m^2.

In the second questionnaire, a Portuguese adaptation of the Nordic Musculoskeletal Questionnaire, assessed musculoskeletal disorders[10]. This questionnaire has been validated, and has a reliability ranging from 0.88 to 1, according to the Kappa coefficient[11]. The questionnaire is used internationally and is accepted for the assessment of musculoskeletal disorders. It consists of questions on nine areas of the body divided into three areas of the upper extremities, three of the lower extremities, and three of the spine. The questionnaire assesses symptoms of pain in the neck, shoulder, elbow, forearm, wrist/hand/finger, dorsal, lumbar, hip/thigh, knee, and ankle/foot. The participants report if they have had any experience of pain or discomfort in any of the nine areas of the body during the past 12 months or 7 days, and whether they sought professional help for these pains. Positive pain symptoms were identified when pain or discomfort was reported in at least one of the body areas. The students who reported pain or discomfort were also asked whether they were using drugs to relieve the pain and/or discomfort, and if so, were asked to indicate which drug was used.

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS), version 21.0. Descriptive statistics were used to characterize the sample (gender, age, marital status, BMI, courses taken, harmful habits, physical activity, general health problems, use of medications, and symptoms of pain). In order to verify the association between pain symptoms and the variables studied, a response of "yes" was given when at least one positive was reported in any area of the body for each question of the Nordic Musculoskeletal Questionnaire. Thus new variables were obtained as follows: Symptoms in the last 12 months in any area of the body (GA), impairment of normal activities as a result of this problem in any area of the body in the past 12 months (GB), consultation with a health professional because of this condition in the past 12 months (GC), and symptoms in past 7 days concerning any area of the body (GD). The Fisher's exact chi-square test and the likelihood ratio were used to determine the association between variables.

Results

Following completion of the questionnaire, 241 students were obtained for participation in this study. The average age of the subjects was 22:31 years (SD ± 1.97), and the majority of the respondents (62.7%) were women. Regarding marital status, 97.9% of the respondents were single. Regarding the number of clinical disciplines

studied, the average was 12 (SD ± 4.25). The BMI analysis of the students showed that 62.7% were in the normal range, 14.5% were considered overweight, 5.4% were classified with obesity, and no less than a disorder 17.4% were considered underweight. In terms of unhealthy habits, the majority of students did not use alcohol, tobacco, or other drugs (Table 1).

Physical activity was reported as routine for 59.8% of the undergraduate students, with most of the practiced activities being classified as resistance (weight training or some type of contact sport) (54.2%); these activities were practiced on average 4 times per week or more, and were mostly supervised by professionals. Although only a few students reported having been diagnosed with a general health issue in the past 12 months (n = 24), 33.3% of these were diagnosed with problems related to musculoskeletal disorders. Regarding the use of medication to control pain, 44.4% reported using painkillers, anti-inflammatories, or a combination of these drugs to eliminate symptoms of pain (Table 2).

Table 1. Sociodemographic variables of undergraduate students of Araçatuba Dental School- Unesp. Araçatuba, 2013.

Variables	n	%
Genre		
Female	151	62.7
Male	90	37.3
Age		
19 years	4	1.7
20 a 24 years	209	86.7
25 a 29 years	27	11.1
32 years	1	0.4
Marital status		
Married	4	1.7
Single	236	97.9
No information	1	0.4
BMI		
Underweight	42	17.4
Normal weight	151	62.7
Overweight	35	14.5
Obesity	13	5.4
Subjects		
Less than 12	124	51.5
12 or more	117	48.5
Harmful habits		
Alcohol	81	33.6
Tobacco	2	0.8
No habit	158	65.6

Table 2. Variables related to physical activity, general health and medication use by undergraduate students of Araçatuba Dental School- Unesp. Araçatuba, 2013.

Variables	n	%
Do you do any type of physical activity?		
Yes	144	59.8
No	97	40.2
What activity?		
Resistive	78	54.2
Aerobic	33	22.9
Both	32	22.2
No information	1	0.7
How Long?		
Less than 6 months	38	26.4
From 6 a 12 months	42	29.2
From 12 a 24 months	13	9
More than 24 months	48	33.3
No Information	3	2.1
How many times a week?		
Once	7	4.9
Twice	19	13.2
Three time	47	32.6
Four time or more	70	48.6
No Information	1	0.7
Do you have guidance of a professional to do physical activity?		
Yes	91	63.2
No	53	36.8
Has a problem of general health diagnosed in the last 12 months?		
Yes	24	10
No	217	90
What general health problem?		
WMSD	8	33.3
Other	16	66.7
Medicine use?		
Yes	107	44.4
No	134	55.6
What Medicine?		
Analgesic	36	33.6
Anti Inflammatory	11	10.3
Combination	15	14
Other	43	40.2
No information	2	1.9

The presence of pain in the past 12 months was observed in 199 participants (82.6%). More than half of the respondents reported neck pain (51.5%), while 48.1% had upper back pain, 38.6% had pain in the wrist/hand, and 49.8% reported pain in the lumbar region. Musculoskeletal pain in the lower extremities (hips/thighs, knees, calves/legs, ankles/feet) was reported by less than 30% of the respondents (Table 3).

Table 3. Associations between body regions and musculoskeletal symptoms according to the dimensions of the Nordic Musculoskeletal Questionnaire.

Body Area	Symptoms in the last 12 months				Impediment to the normal activities because of perform this problem over the past 12 months				Consultation with a professional in the area of health because of this condition in the past 12 months				Symptoms in the last 7 days			
	Yes		No		Yes		No		Yes		No		Yes		No	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Neck	124	51.5	117	48.5	18	7.5	223	92.5	15	6.2	226	93.8	51	21.2	190	78.8
Shoulder	102	42.3	139	57.7	14	5.8	227	94.2	14	5.8	227	94.2	42	17.4	199	82.6
Upper Back	116	48.1	125	51.9	11	4.6	230	95.4	23	9.5	218	90.5	48	19.9	193	80.1
Elbow	18	7.5	223	92.5	1	0,4	240	99.6	3	1,2	238	98.8	4	1.7	237	98,3
Wrist/Hand	93	38.6	148	61.4	17	7.1	224	92.1	12	5.0	238	95.0	24	10.0	217	90.0
Lower Back	120	49.8	121	50.3	20	8.3	221	91.7	28	11.6	213	88.4	52	21.6	189	78.4
Hip/haunch	41	17.0	200	83.6	5	2.1	236	97.9	5	2.1	236	97.9	13	5.4	228	94.6
Knee	66	27.4	175	72.6	17	7.1	224	92.9	17	7.1	224	92.9	26	10.8	215	89.2
Ankle/foot	55	22.8	186	77.2	8	3.3	238	96.7	6	2.5	235	97.5	8	3.3	233	96.7

Regarding the impairment of activities, 25% of the students reported that pain interfered with task performance in the past 12 months. In Table 3, the frequency and percentage of students who had some impairment due to pain, and the respective areas, can be observed in detail. Only a small number of students sought medical advice or treatment for pain or symptoms that they reported in the past 12 months (28.2%). Regarding the painful symptoms in the past 7 days, nearly half of the students (48.5%) reported pain in at least one area of the body (Table 3).

The analysis of the association between the socio-demographic variables and the general variables of each of the Nordic questions demonstrated an association between pain symptoms in the past 12 months in at least one area of the body (GA) and sex; GA and the number of courses taken; GA and the practice of physical activity and general health; and GA and between pain symptoms in the last 7 days in any area of the body (GD) and general health (Table 4).

Discussion

Work associated musculoskeletal disorders have a high prevalence among dental surgeons; given the impairment on work and normal activities, research in this field has increased worldwide[9].

Table 4. Associations between sociodemographic variables and the variables of the Nordic Musculoskeletal Questionnaire. Araçatuba, 2013 .

Variable	GA				p	GB				p	GC				p	GD				p
	Yes		No			Yes		No			Yes		No			Yes		No		
	n	%	n	%		n	%	n	%		n	%	n	%		n	%	n	%	
Gender																				
Female	131	66	20	48	0,027	37	63	114	63	0.992	43	63	108	62	0.907	79	68	72	58	0.129
Male	68	34	22	52		22	37	68	37		25	37	65	38		38	33	52	42	
Marital status																				
Married	3	1.5	1	2	0.539*	-	-	4	2.2	0.575*	2	3	2	1	0.318*	2	2	2	2	1.000*
Singles	195	99	41	98		59	100	177	98		66	97	170	99		115	98	121	98	
BMI																				
Normal	126	63	25	60	0.308**	39	66	112	62	0.934**	47	70	104	60	0.292**	73	62	78	63	0.252***
Overweight	29	15	6	14		8	14	27	15		10	15	25	15		19	16	16	13	
Obesity	8	4	5	12		3	5,1	10	5.5		4	5	9	5		3	2,6	10	8,1	
Underweight	36	18	6	14		9	15	33	18		7	10	35	20		22	19	20	16	
Subjects																				
Less than 12	109	55	15	36	0.025	30	51	94	52	0.915	37	54	87	50	0.564	67	57	57	46	0.079
12 or more	90	45	27	64		29	49	88	48		31	46	86	50		50	43	67	54	
Physical Activies																				
Yes	126	63	18	43	0.014	38	64	106	58	0.401	39	57	105	61	0.634	68	58	76	61	0.616
No	73	37	24	57		21	36	76	42		29	43	68	39		49	42	48	39	
Harmful Habits																				
Alcohol	71	36	10	24	0.158	21	36	60	33	0.75	20	29	61	36	0.356	39	34	42	34	0.932
No habit	127	64	31	76		38	64	120	67		48	71	110	64		77	66	81	66	
Health																				
Yes	23	12	1	2	0.089*	9	15	15	8	0.118	16	24	8	4,6	0	19	16	5	4	0.002
No	176	88	41	98		50	85	167	92		52	77	165	95		98	84	119	96	
Medicine																				
Yes	86	43	21	50	0.421	30	51	77	42	0.251	34	50	73	42	0.273	56	48	51	41	0.293
No	113	57	21	50		29	49	105	58		34	50	100	58		61	52	73	59	

x^2 Test
* Fischer's test
** Likelihood ratios

In the United States, since 1995, posture training activities undertaken during working hours are presented in the curricula of the courses of dentistry[10]. Since occupational problems can affect students of dentistry, it is necessary to include these activities in the curriculum.

In this study, a high prevalence of painful symptomatology was observed in the study population; indeed, high pain rates have been previously reported by dentists of both sexes, with early onset[5]. These indexes were also high when only the students who already perform activities clinical practices were analyzed[11,12].

In a study using the RULA methodology, we found a high risk for the development of musculoskeletal disorders and, especially, in the upper limbs, of the students who were performing preclinical activity[11].

In the present study, when the individual body areas were analyzed, the upper body (neck, shoulder, and upper back) was found to be the most affected by pain. These are commonly the most affected areas in both dentistry professionals and students[13]. Among the possible pathologies are the degeneration of the intervertebral discs of the cervical region, such as the scapulohumeral periarteritis or bursitis, and physiological muscular contracture[4]. These lesions on the upper limbs often result in a temporary or permanent incapacity to work[2].

Another region with a high prevalence of pain among students in this study was the lumbar area of the spine, however, the prevalence was lower than other studies. Lower back pain is among one of the main chronic health complaints, leading to the need for medical care and also to absenteeism[14]. In a study of students from the first to the last year of graduation in dentistry (n = 154), 95 (62.5%) of the students complained of lower back pain[15].

However, when analyzed, the lower body was found to be affected to a lesser extent, and the majority of the discomfort or pain in these areas is due to the fact that students do not work with their feet supported on the floor[11]. A good sitting position, with a support base of the expanded body, avoids potential changes in the circulatory system, such as varicose veins, edema, pain, and inflammation, which may occur as a result of muscle compression of the lower extremities which impedes venous return[7].

Despite the high prevalence of pain among students, there were few reports of impairments of normal activities because of pain and/or discomfort. Consequently, the search for a health professional to treat or minimize the problems was also low.

An association was found between pain symptoms (GA) and the number of disciplines studied, with a smaller number of disciplines being associated with a greater complaint of pain. This is likely due to the fact that the discipline of vocational guidance is given clinical disciplines concomitantly; This complicates the application of ergonomic knowledge in the practices of pre-clinical activities, which is reflected in their performance in clinical practice[11,13].

It is important to highlight the fact that students who are starting their clinical and preclinical activities focus on developing the proposed activities and are not aware of their posture during the execution of the work. This reinforces the need for ever-present ergonomic guidance during pre-clinical and clinical training so that the student receives constant information about the mistakes that they make and to ensure that they are promptly corrected[11].

In a study conducted by Botta et al.[16], it was possible to verify that the students understanding was limited in relation to the risk factors that contribute to the musculoskeletal disorders; this can be explained by a lack of knowledge of ergonomics. Thus, the integration of preventive-educational programs and ergonomic training in the university dentistry curriculum is essential not only for the expansion of knowledge, but also to allow for the early diagnosis of musculoskeletal disorders. In addition, monitoring

and/or advising of the ergonomic habits of future professionals, particularly in the initial phase of their clinical activities, is pertinent to the adoption of an adequate postural awareness, considering that these students are developing their manual skills, and are best placed to avoid future musculoskeletal damages[16,17].

Just over half of the students interviewed stated that they performed physical activities, and the habit of exercising, essentially aerobics and stretching, is considered to be an ergonomic preventive means. The high prevalence of musculoskeletal pain is associated with the long working hours and the sedentary lifestyle of these professionals. Studies have shown that because of the ability to increase oxygen flow, improve cardiovascular/musculoskeletal function and help reduce muscle tension due to incorrect posture, these physical activities may be relevant in reducing pain symptoms in work-associated musculoskeletal disorders related to work[18-22]. Thus regular physical activity is suggested and is included in the curricula of undergraduate programs for the prevention of muscular disorders, especially back pain[15].

The present study demonstrated an association between the pain symptoms in the past year (GA) and the past 7 days (GD), and general health. Indeed, in some previous studies, dentists have presented with poor general health[7,23,24]. It is important to emphasize that musculoskeletal pain can affect other areas of life, not just the performance and limitations of work activities. Indeed, in a study conducted in Brazil with teaching professionals who had musculoskeletal symptoms, it was shown that these pains correlated with the quality of life of the professionals[23,25].

The majority of the existing epidemiological studies involving dentistry students are cross-sectional and use different methods of identification and classification of painful symptomatology, which makes it difficult to compare existing studies. In addition, they present with the characteristic limitations of cross-sectional studies including an increase in the possibility of bias and not allowing for causal inference; however, they do provides essential evidence for future research in the field of ergonomics. Another possible limitation of this study is associated with the use of self-administered instruments that only show the students' occupational health at a specific moment in time[7,24,25].

In the current study, the subjects had a high prevalence of musculoskeletal symptoms (82.6%), especially in the upper limbs. We demonstrated an association between muscular pain and the number of disciplines studied, as well as between muscular pains and the general health of the students.

Thus, it is necessary to begin measures to reduce and prevent musculoskeletal disorders early, while students are still in training, since the correction of bad posture habits is easier at this early stage.

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