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Prevalence and correlates of musculoskeletal disorders among Australian dental hygiene students

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Hayes MJ, Smith DR, Cockrell D. Prevalence and correlates of musculoskeletal disorders among Australian dental hygiene students.

Abstract: *Introduction:* Although musculoskeletal disorders (MSD) have been identified as a significant occupational health issue for dental hygienists, few studies have explored this problem among the dental hygiene student population. *Aim:* The aim of this study was to investigate the prevalence and correlates of MSD among a selection of undergraduate dental hygiene students in Australia. *Methodology:* A self-reporting questionnaire was distributed to dental hygiene students at an Australian university during 2008, from which a response rate of approximately 72% was achieved. *Results:* Musculoskeletal disorders were most commonly reported by students at the neck (64.29%), lower back (57.94%) and shoulder (48.41%) regions. Logistic regression indicated various correlations with MSD. Students who did not undertake regular exercise every week experienced an increased risk of lower back pain [Odds Ratio (OR): 4.88, 95% Confidence Interval (CI): 1.75–14.9]. Students undertaking 16–20 h of desk-based study per week were much more likely to report neck pain (OR: 19.7, 95% CI: 1.34–378.94). Working 6–10 h on a computer each week was a risk factor for shoulder (OR: 7.03, 95% CI: 1.42–39.49) and upper back pain (OR: 5.29, 95% CI: 1.21–25.56). *Conclusions:* Overall, this study suggests that MSD are a reasonably common problem for dental hygiene students in Australia. As such, further studies are required to establish epidemiological patterns of MSD, and our profession will need to carefully consider preventive strategies to help minimize the impact of this important occupational health issue on the next generation of dental hygienists.

Key words: dental hygiene; lower back pain; musculoskeletal disorders; risk factor; students

Introduction

Musculoskeletal disorders (MSD) have long been identified as a significant occupational health problem for dental personnel. In recent literature, for example, MSD have been shown to affect between 64% and 93% of all dental personnel (1–9). Research suggests that MSD are a major contributor to sick leave, reduced productivity and early retirement in dentistry (1, 10). Investigations of musculoskeletal pain experienced by dental hygienists have found it to be a common complaint (10, 11), and a number of studies have also reported that dental hygienists are more likely to experience neck, shoulder and hand/wrist pain than other dental clinicians (5, 12, 13). Research also suggests that dental hygienists often feel unprepared for the physical workload of dental practice experienced during their education (10). In recent years, an increasing body of evidence has begun to suggest that health science students may suffer MSD at reasonably high rates (14–16). Despite this fact, however, data on the prevalence, distribution and correlates of MSD among dental hygiene students are lacking.

This is quite a surprising oversight, as various studies have revealed a wide variety of causative factors associated with musculoskeletal pain among dental hygienists (1, 5, 6, 8, 13, 17–22). The physical burden of clinical work has been established as having a strong association with MSD in dental health workers (8, 10). However, evidence is mounting which suggests that psychosocial factors may also be strongly associated with the development of MSD (8, 23–27). Furthermore, the current generation of university students is known to be increasingly burdened by back pain (28). Given the pressures of tertiary education, and the physical burden of clinical training, it is essential that we understand the prevalence and causes of MSD among dental hygiene students. Despite this fact, however, very few studies have examined the prevalence of musculoskeletal pain among them, particularly considering that symptoms may begin to appear during undergraduate training.

This situation may prove critical in the future as dental hygiene represents a growing field in Australia. As dental hygiene numbers increase in the coming years, it is important to understand and elucidate potential occupational hazards for this group. The aim of our study therefore, was to investigate the prevalence and correlates of MSD among a previously understudied group of undergraduate dental hygiene students in Australia.

Study population

In Australia, registration as a Dental Hygienist with the Dental Board requires the completion of either a 2-year Advanced Diploma or Associate Degree; or, a 3-year Bachelors degree. For our study, we recruited all students currently enrolled in the 3-year Bachelor of Oral Health programme at the University of Newcastle in New South Wales, Australia.

Methodology

Survey instrument

Each of the participants completed an anonymous, two-page modified version of the Standardized Nordic Questionnaire (29). Our dental hygiene questionnaire was an adapted version of an original tool that has been previously used among medical, nursing and occupational therapy students in Australia (14–16). The questionnaire itself was a simple, tick-box format consisting of seventeen questions covering demographic items such as gender, age, parenthood status, smoking, alcohol consumption and work experience as a dental assistant. A number of questions included a five-point Likert scale to establish the number of clinical hours worked per week, self-perceived level of stress related to study, and hours per week spent exercising, on the computer and undertaking desk-based study. An anatomical diagram used in the original tool was included to aid participants in answering questions focusing on musculoskeletal symptoms in various regions of their body. Questions regarding the presence of musculoskeletal pain focused on whether the participant had experienced any trouble in the region in the previous 12-month period, whether this pain had lasted longer than 2 days, whether it had affected their daily life and whether medical attention had been required.

Procedures

Ethics approval was sought and obtained from the University of Newcastle Human Research Ethics Committee in 2008 (Approval No. H-2008-0208). Students who were enrolled in the Bachelor of Oral Health Programme were approached by the researcher during scheduled lecture and tutorial times. Students were invited by the researcher, who described the project briefly, after which time each student was given a participant information statement and questionnaire. Students who wished to participate were given time to complete and return their questionnaires during the lecture. Informed consent was implied by the voluntary completion and return of the questionnaire.

Data analysis

Data were entered into a spreadsheet program and analysed using the JMP (version 6) (SAS Institute Inc., Cary, NC, USA)

statistical software package. Statistical analysis was performed to help elucidate statistical correlates with MSD, by means of logistic regression. All calculations were adjusted for age, year of study, sex, parenthood, previous work experience as a dental assistant, alcohol consumption and tobacco consumption. All results were expressed as odds ratios (OR) with 95% confidence intervals (95% CI).

Results

Demographic items

A total of 126 students completed the questionnaire, yielding a response rate of approximately 71.6%. By year of study, 50 of 75 first-year students (66.7%), 41 of 56 second-year students (73.2%) and 35 of 45 third-year students (77.8%) responded. Demographic characteristics of the participants are shown in Table 1.

Prevalence of musculoskeletal pain

The 12-month period prevalence of MSD in various body regions is shown in Table 2. Neck pain had the highest prevalence rate, with 64.3% of respondents reporting trouble in this region during the past year. Of those who had experienced neck pain, almost two-thirds (65.4%) reported that their pain lasted more than 2 days, over 50% (53.1%) experienced neck pain that affected their daily life, while 30.9% indicated that they required medical treatment. The 12-month prevalence for lower back pain (LBP) was also high. Pain in this region was reported by over half (57.9%) of the dental hygiene students who responded. Over two-thirds of those experiencing LBP (67.1%) had pain lasting longer than 2 days, while 48% had experienced pain of a level sufficient to affect their daily life. Over one-third (37%) of those who reported pain indicated that they had sought medical attention for this problem. Shoulder pain had the third highest prevalence of all the body regions investigated, with 48.4% of students indicating they had experienced pain in this region in the past year. Almost two-thirds (65.6%) of those reporting pain revealed that the pain had lasted longer that 2 days, over half (54.1%) had pain that affected their daily life and over a third (37.7%) required medical treatment for pain in this region. While only a small percentage of students reported pain in the ankles or feet (12.7%) in the previous 12 months, it is interesting to note that of these students that reported pain, 81.3% reported that the pain lasted more than 2 days, and 87.5% reported that the pain had affected their daily life.

Table 1. **Demographic characteristics of dental hygiene students**

Age	*n*	%
Mean age (SD)	26.4 (6.2)	
Gender		
Female	119	94.4
Male	7	5.6
Year of study		
1st year	50	39.7
2nd year	41	32.5
3rd year	35	27.8
Have children		
Yes	19	15.4
No	104	84.5
Regular tobacco smoker		
Yes	13	10.3
No	113	89.7
Regular alcohol consumption		
Yes	60	47.6
No	66	52.3

Statistical correlations

Logistic regression analysis indicated that weekly exercise and computer hours per week were statistically significant risk factors for LBP (see Table 3). Students who did not undertake regular exercise every week experienced an increase in LBP (OR: 4.88, 95% CI: 1.75–14.90). Those students undertaking 16–20 h of desk-based study per week were much more likely to report neck pain (OR: 19.7, 95% CI: 1.34–378.94). Interestingly, 6–10 h spent working on a computer per week was revealed as a risk factor for shoulder (OR: 7.03, 95% CI: 1.42–39.49) and upper back pain (OR: 5.29, 95% CI: 1.21–25.56).

Discussion

This study examined the prevalence of MSD in numerous body regions among Australian dental hygiene students, for what appears to be one of the first times. Neck pain was revealed as a particularly important problem, with nearly two-thirds of respondents (64.3%) reporting trouble in this region. This result is higher than a recent study of MSD of the neck and shoulder among Swedish dental hygiene students, in which 37% of students without prior experience and 43.2% of students with prior experience as dental assistants experienced neck pain (30). However, it is similar to the results reported in a study of practicing dental hygienists, whereby 62% of Swedish hygienists (31) and 68.5% of United States hygienists (6) reported experiencing symptoms in the neck region. The presence of LBP reported in our study (57.9%) is also quite high compared with the previous research conducted among

Table 2. **Prevalence of muscoloskeletal disorders and their sequelae among Australian dental hygiene students**

	Any MSD	MSD lasting >2 days		MSD affect daily life		Required medical treatment	
	% Students	% Students	% Cases	% Students	% Cases	% Students	% Cases
Neck	64.29	42.06	65.43	34.13	53.09	19.84	30.86
Shoulders	48.41	31.75	65.57	26.19	54.10	18.25	37.70
Upper back	41.27	19.84	48.08	12.70	30.77	13.49	32.69
Elbows	5.56	3.17	57.14	3.17	57.14	0.00	0.00
Forearms	7.14	3.97	55.56	3.17	44.44	0.79	11.11
Wrists/hands	42.06	23.81	56.60	12.70	30.19	3.97	9.43
Lower back	57.94	38.89	67.12	27.78	47.95	21.43	36.99
Hips/thighs	11.90	8.73	73.33	6.35	53.33	3.17	26.67
Knees	26.19	14.29	54.55	9.52	36.36	6.35	24.24
Calf/lower leg	3.17	2.38	75.00	1.59	50.00	0.00	0.00
Ankles/feet	12.70	10.32	81.25	11.11	87.50	4.76	37.50

Table 3. **Statistical correlations with musculoskeletal disorders among Australian dental hygiene students**

	Correlate	Category	OR	95% CI	*P*-value
Lower back pain	Weekly exercise	No	4.88	1.75–14.90	0.0034
	Computer hours	<5 h	16.83	2.44–138.13	0.0056
	Computer hours	16–20 h	0.06	0.002–0.75	0.0489
Neck pain	Computer hours	<5 h	12.89	1.92–102.69	0.0108
	Desk hours	16–20 h	19.70	1.34–378.94	0.0346
Shoulder pain	Age	Increasing	16.34	1.16–321.13	0.0485
	Computer hours	6–10 h	7.03	1.42–39.49	0.0204
	Desk hours	11–15 h	0.03	0.002–0.36	0.0103
Upper back pain	Age	Increasing	12.59	1.02–210.96	0.0598
	Computer hours	6–10 h	5.29	1.21–25.56	0.0314

practicing hygienists, who have reported back pain at rates between 20.7% and 56.8% (12, 13, 31). However, back pain has been investigated in many student populations, and the results from our study are very similar to those reported by Australian nursing and physiotherapy students (14, 32, 33). It may be that computer and desk-based work related to university study may explain the differences in LBP rates between student and practicing hygienists.

The previous research has established that dental hygienists conduct their work using prolonged and awkward postures, which may contribute to muscle pain (20). On the other hand, it has been suggested that the use of ergonomically designed furniture and dental tools can help promote good posture, thus limiting the potential for MSD (20). A study looking at the use of magnification lenses on student posture found that these devices may have an overall positive effect, with head and neck positions being noticeably improved (34). Further research has indicated that the use of loupes must complement optimal positioning to truly support the musculoskeletal health of dental hygienists (35). In this study, only 5% of all students who completed the questionnaire indicated that they routinely wear loupes when treating patients. Without the assistance of surgical magnification, these students may be putting themselves at risk of developing MSD, by manoeuvring into unstable positions to enable direct vision (12). It is important that students undertaking dental hygiene studies are educated on correct posture and back care as part of their clinical training; this should include the promotion of apparatus that support optimal posture and body care. This view could be extended to include correct footwear and foot care, given the interesting findings documented in relation to the foot and ankle region. Most previous investigations of dental or dental hygiene students have focused on the prevalence of upper body musculoskeletal pain, and as such, it was not possible to directly compare with our current results. Nevertheless, this would appear to be an area that will require attention to help prevent further injury.

Unlike similar research, this study did not find any statistically significant differences in MSD prevalence rates among students who had previous experience as a dental assistant, when compared with those who had not. A large percentage of respondents (76%) indicated experience as a dental assistant, which may have limited the elucidation of statistically significant findings. However, the large number of students with dental assistant experience may also explain the high prevalence of MSD reported in our study, as the previous research

has indicated that students working as dental assistants may have a higher prevalence of neck and shoulder symptoms than those who do not (30).

While the results of this study have certainly offered some interesting findings, further research in this area is still required. Longitudinal studies of dental hygiene students and practicing dental hygienists would assist in determining epidemiological patterns of musculoskeletal symptoms. Considering that research on the occupational health situation of Australian dental hygienists is currently limited, this is an area that would be well worth exploring. Research into ergonomic interventions and physical well-being may also have an impact on musculoskeletal problems among this group. Further exploration into the dental hygiene curricula will clarify what students are learning about balanced positioning and musculoskeletal care. As the dental hygiene profession is rapidly growing in Australia, it is also important to elucidate strategies for reducing MSD before it becomes an even larger problem. This study suggests that MSD problems begin during dental hygiene education and training, which in turn, suggests that preventive measures should now be investigated and further developed in this unique group.

It is worth noting that results from our study may be difficult to generalize as students were recruited from a single dental hygiene school. In addition, given the very small proportion of male students, it was difficult to elucidate statistically significant differences in MSD prevalence rates by gender. Gender has been identified as a risk factor for the severity of musculoskeletal pain in the previous studies of dentists (7, 9); however, a detailed review of back pain among students has suggests that gender may actually be a confounding variable, rather than a true risk factor (28). The sample size in this study reflects the difficulties in recruiting university students for this kind of voluntary research, particularly as absenteeism from scheduled lectures could not be avoided and thus becomes a potential limitation, as it always will be in student-based investigations. Nevertheless, it is always important to investigate student groups to explore potential occupational health issues before people begin employment. Interestingly, in this study there were no correlations between clinical hours worked per week and the development of MSD. Given these findings, future research may benefit from including more specific questions related to clinical practice. These may help elucidate more elusive statistical associations between MSD and variables such as manual tasks or the use of vibrating instruments. On the other hand, it is important to recognize that in this study the questionnaire was designed to be brief, concise and easily interpreted.

Conclusion

Overall, our study suggests that MSD represent an emerging issue for Australian dental hygiene students, with some results higher that those previously reported among practicing hygienists. The high prevalence of neck, lower back and shoulder pain clearly indicate a concern for the future occupational health of this group. Further studies will now be required to investigate more detailed epidemiological patterns of MSD, particularly among the practicing hygienists in our study population. The dental hygiene profession will also need to carefully consider the adoption of appropriate strategies to help minimize the impact of this important occupational health issue on the next generation of dental hygienists, in Australia as elsewhere.

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