

Musculoskeletal Disorders in a 3 Year Longitudinal Cohort of Dental Hygiene Students

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Introduction

Musculoskeletal disorders (MSDs) are usually defined as injuries to the soft and hard tissues of the body, and may occur after a single event or due to cumulative trauma.¹ Work related MSDs are considered a global health and financial burden, costing millions of dollars annually.^{2,3} For example, in Australia, work related MSDs were reported in over 76,000 workers' compensation claims.⁴ Reduced work hours and increased sick leave are a significant burden not only for the individual, but also on the economy.

Research has demonstrated that MSDs are a significant occupational health issue for the dental profession, especially for dentists and dental hygienists.⁵⁻⁷ A number of unique risk factors have been documented among these professionals, including a limited working field, static postures, fine movements and repetitive tasks. A recent review, for example, identified that over half of dental hygienists report MSDs in any body region.⁷ More specifically, MSDs in the neck, shoulder, wrist/hand and lower back regions is frequently reported across a number of studies.⁸⁻¹¹ Despite this fact, there is a distinct lack of evidence regarding the efficacy of preventive measures for MSDs in the dental hygiene profession.

In recent years, there is mounting evidence that undergraduate students are burdened by MSDs.¹² In particular, health sciences students have been identified as suffering MSDs at considerable rates.¹³⁻¹⁵ Computer usage and desk based study have been shown to increase the report of MSDs among cohorts of university students, while psychosocial stress has been suggested as another possible risk factor.^{14,16-19} Despite this fact, a surprising lack of

Abstract

Purpose: Musculoskeletal disorders (MSDs) are a significant occupational health issue for the dental hygiene profession. There is increasing evidence that these problems commence during undergraduate training; however, there is a surprising lack of studies investigating how MSD develops in student groups over the course of their study. The aim of this study was to determine the longitudinal MSD trends among a cohort of undergraduate dental hygiene students at an Australian university.

Methods: A previously validated self-reporting questionnaire was distributed to dental hygiene students in 3 consecutive years from 2008 to 2010.

Results: MSDs were most commonly reported in the neck (ranging from 66 to 68%) and lower back (ranging from 61 to 68%), with a marked increase in reported lower back pain by the final year of study.

Conclusion: This study not only supports mounting evidence that MSDs are a common problem for dental hygiene students, but further demonstrates the magnitude of this occupational health issue across the training program. These findings are concerning for a group yet to embark on their professional careers, given that it raises some serious questions about career longevity and the efficacy of preventive measures.

Keywords: musculoskeletal disorders, dental hygiene, students, occupational health

This study supports the NDHRA priority area, **Occupational Health and Safety:** Investigate the impact of exposure to environmental stressors on the health of the dental hygienist (aerosols, chemicals, latex, nitrous oxide, handpiece/instrument noise).

research has investigated MSDs among dental hygiene student populations.

Dental hygiene is a rapidly growing profession in Australia, as elsewhere, with a number of new baccalaureate programs established within the last decade. Dental hygiene education and training in Australia involves the completion of a 2 year advanced diploma or a 3 year bachelor's degree program. Given that dental hygiene students are undergraduate students working towards a career that has a high incidence of MSDs, it is of great concern that

this particular group may be at an increased risk of developing MSDs.

The focus of the current study was to collect epidemiological data, such as the prevalence, and determine predictors of MSDs over a period of time to allow insight into patterns and trends of risky behaviors or disease. Ascertaining patterns of MSDs among dental hygiene students is essential for employing sound ergonomic principles in the dental hygiene curriculum, as well as influencing how and when preventive strategies should be employed to best effect. As such, the aim of the present study was to determine the longitudinal MSD trends in a cohort of dental hygiene students at an Australian University, across the 3 years of their education and training.

Methods and Materials

This study was carried out as descriptive and exploratory research, using a longitudinal approach. It is an extension of a cross-sectional study that was completed in 2008. As such, the methodology has been published in detail elsewhere.¹⁴ An institutional review board approval to collect data over a 3 year period was sought and obtained from the University of Newcastle Human Research and Ethics Committee. All dental hygiene students commencing the Bachelor of Oral Health at the University of Newcastle in 2008 (n=75) were invited to participate in this study. For 3 consecutive years, in the first week of semester 2, students were approached during a scheduled lecture or clinical session and invited to participate in the study. They were invited by a staff member not involved with the research project, and were clearly advised that there were no penalties or rewards for participation. An anonymous, 2 page modified version of the Standardized Nordic Questionnaire was completed by students agreeing to participate.²⁰ This questionnaire is a valid tool that has demonstrated a high level of reliability (k=0.73 to 0.82) and sensitivity (0.9 to 1.0).²¹ Completing the survey involved answering 17 tickbox questions, covering items such as age, gender, weekly clinical hours, regular exercise and study habits. Participants were asked to indicate whether they had experienced any ache, pain or discomfort in specific body regions in the previous 12 months, whether it lasted longer than 2 days, affected their daily life or required medical attention. An anatomical diagram was included to aid participants in identifying various regions of the body. The survey has been used among a variety of health science student groups in various countries.^{15,16,22-24}

All data collected was entered into a spreadsheet and analyzed using the STATA statistical software

Table I: Demographic Data

	2008		2009		2010	
	n	%	n	%	n	%
Gender						
Female	45	90	50	98	38	93
Male	5	10	1	2	3	7
Have children						
Yes	4	8	6	12	11	27
No	46	92	43	88	27	65
Experience as a dental assistant						
Yes	41	82	42	82	28	68
No	9	18	9	18	13	32
Age						
Mean	25.8	-	26.8	-	28.1	-

*Percentages may not total 100% where some values are missing

package. Descriptive statistics were calculated, with direct logistic regression performed to elucidate potential risk factors for MSD.

Results

Across the 3 years, response rates ranged from 54 to 68%. From a cohort of 75 students commencing in 2008, 50 students participated in the first year (2008), 51 students in the second year (2009) and 41 students in their final year of study (2010). Demographic data is presented in Table I. The cohort was predominately female non-smokers, who had prior experience working as a dental assistant.

The 12 month prevalence of MSDs by body region for the 3 year period between 2008 to 2010 is presented in Table II. Neck pain was the most commonly reported MSD, and its prevalence rate increased steadily over the 3 year period (the prevalence rates ranging from 66% in 2008, to 68.3% in 2010). Lower back pain was also commonly reported by students, with the results showing a noticeable increase in the final year of study (rising from 60.8% in 2009, to 68.3% in 2010). Wrist/hand pain was reported by over one-third of respondents in the first year of study; however, this increased noticeably in the second year, and even further in the final year (34%, 41.2% and 43.9%, respectively). The prevalence of upper back pain lasting longer than 2 days (22%, 27.5%, 34.1%) increased steadily across the 3 years of training, while pain lasting longer than 2 days in the neck, shoulders and wrist/hand regions peaked in the second year of study.

All students who reported feelings of extreme stress associated with the clinical requirements of the dental hygiene course indicated that they had experienced pain in the neck, shoulder, upper back and lower back, a finding that was consistent for all 3 years of the study. Logistic regression analysis did not elucidate any statistically significant correlations between year of study, number of clinic hours or prior experience as a dental assistant with MSD.

A comparison of 12 month prevalence of MSDs in the neck, shoulder, wrist/hand and lower back regions among student cohorts is displayed in Table III. All studies utilized the Standardised Nordic questionnaire anatomical diagram for investigating the 12 month prevalence of MSD.

Discussion

This study investigated the prevalence of MSDs among a group of dental hygiene students, over the 3 year duration of their education and training program. The results suggest that MSD is a common problem, in particular at the neck, shoulder, wrist/hand and lower back regions, which were reported frequently across the 3 years from 2008 to 2010. The cohort of students in this study closely resembles those in other studies of dental hygiene students, which were also predominantly female with an average age in the mid-twenties.^{25,26} A study from the U.S. found that second year dental hygiene students were more likely to report any MSD (70%) than their first year counterparts (62%).²⁶

Compared with students undertaking other health science studies, dental hygiene students appear to suffer from MSDs at considerably higher rates.^{14,16,22,27,28} A comparison of 12 month prevalence of MSD in the neck, shoulder, wrist/hand and lower back regions among student cohorts suggests that dental hygiene students are more likely to suffer from wrist/hand pain and lower back pain than other health science students. Clinical tasks carried out by hygiene students are very repetitive and require static postures - these risk factors may not be as common for other health sciences students, which may explain the differences in reported MSD rates. Perhaps the most comparable group to dental hygiene students are occupational therapy students, whose reports of neck and shoulder pain appear to be related more to computer usage and increasing age rather than occupational risks.¹⁶ Higher prevalence rates documented in the current study may also be influenced by the relatively high proportion of females in dental hygiene cohorts, given that previous research has indicated that females are more likely to report MSDs than their male counterparts.²⁹

Table II: Prevalence of MSD by Body Region

	Reported MSD (% students)		
	2008	2009	2010
Neck			
Any symptoms	66.0	66.7	68.3
Persisted >2 Days	44.0	54.9	46.3
Affected daily life	28.0	39.2	24.4
Needed treatment	18.0	25.5	14.6
Shoulders			
Any symptoms	44.0	52.9	46.3
Persisted >2 Days	32.0	39.2	29.3
Affected daily life	22.0	23.5	12.2
Needed treatment	16.0	15.7	1.0
Upper Back			
Any symptoms	42.0	35.3	43.9
Persisted >2 Days	22.0	27.5	34.1
Affected daily life	8.0	13.7	14.6
Needed treatment	12.0	15.7	12.2
Wrists/Hands			
Any symptoms	34.0	41.2	43.9
Persisted >2 Days	26.0	25.5	26.8
Affected daily life	14.0	19.6	14.6
Needed treatment	4.0	7.8	4.9
Lower Back			
Any symptoms	62.0	60.8	68.3
Persisted >2 Days	46.0	43.1	39.0
Affected daily life	26.0	25.5	31.7
Needed treatment	26.0	13.7	22.0

It is interesting that the current study did not find any statistically significant correlations between MSDs and previous experience as a dental assistant, number of clinical hours or year of study. Previous research among dental hygiene students suggests that those with a dental assisting background self-reported neck and shoulder pain more than their inexperienced student counterparts.³⁰ Furthermore, studies of nursing students in both Australia and Japan have found an association between reported MSD and previous experience working in a hospital.^{22,31} It may be that as the clinical requirements of the course increase, students spent less hours working in paid employment - this may have minimized the effect of dental assisting on reported MSD. Practicing dental professionals may be at an increased risk of developing MSD over time, with a study of Swedish dentists, hygienists and assistants reporting increased pain levels after 5 years when compared to baseline measures.⁸

Table III: Comparison of 12 Month Prevalence (%) of MSD Among Student Cohorts, by Body Region

Student group		Body region (%)				Reference
Country	Field	Neck	Shoulder	Wrist/hand	Lower back	-
Australia	Dental Hygiene	66	44	34	62	14
Australia	Nursing	35	24	13	59	22
Italy	Radiography	16	11	5	27	28
Australia	Occupational Therapy	67	46	-	-	13
Korea	Nursing	36	46	22	39	27

A number of studies have also reported increasing age to be correlated with increased MSD symptoms, in both student groups¹⁴ and practicing hygienists.^{10,32,33} It may be that a combination of factors, such as increased time practicing in clinical settings and one's natural increase in age, contributes to MSD, however, neither correlated individually with reported MSD in the current study.

Based on the findings of the current and previous studies, it is important that dental hygiene students undertake comprehensive occupational health and ergonomics modules during their education and training. Contemporary research has found that among practicing hygienists, education on patient and operator positioning can help reduce the risk of MSD.³⁴ Despite this fact, there is limited research published on this topic.³⁵ Future studies should investigate the educational component of ergonomics in the curriculum, along with the expertise of faculty in this area.

The results of this study are concerning for a group yet to embark on their professional careers, and this raises some serious questions about career longevity and the efficacy of preventive measures. Further investigations into the epidemiological patterns of MSD among larger cohorts of dental hygiene students are necessary. Also, longitudinal studies following students into their employment would also be extremely valuable. It has also been established elsewhere that there is very limited research investigating the effectiveness of preventions or interventions for MSD.⁷

The present study required careful design to ensure that the students invited to participate did not feel as though they were coerced, or that there was

any perceived benefit or disadvantage to their education if they chose to participate. As such, the privacy and anonymity of the students was vital, and for this reason the follow-up of individual students was not possible. Another perceived limitation of the study may be the use of a self-reporting survey, as possible response bias may limit the generalizability of the results. However, while there is a plethora of research involving MSD, little research has investigated this occupational health issues among dental hygiene students. Given that this study appears to be the first to follow a cohort of dental hygiene students across their 3 years of training, the findings are nevertheless valuable, adding to the small body of research and facilitating an increasing understanding of MSD in our profession.

Conclusion

The results of this study provide valuable insight into the epidemiological patterns of this occupational health issue. Dental hygiene students are reporting MSDs at considerably higher rates than students in other health science disciplines. What continues to remain unclear is the risk factors involved and, therefore, how to instigate appropriate preventive strategies.

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