

The impact of occupation-related musculoskeletal disorders on dental hygienists

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ABSTRACT

When compared to other dental professionals, dental hygienists who work in clinical practice may be at higher risk for musculoskeletal disorders (MSDs) due to procedures that involve precise, repetitive motions, as well as awkward and static postures. MSDs encompass a range of injuries that can affect both the hard and soft tissues of the body, typically resulting from repetitive strain and cumulative trauma. The reported one-year prevalence rate of MSDs in dental hygienists ranges from 60% to 96%, with pain most frequently presenting in the neck, shoulder, wrist, hand, and back. To manage their pain, many dental hygienists seek conventional solutions, such as medication and splints, while others turn to complementary and alternative methods, such as massage therapy and yoga. MSDs can become a significant concern for dental hygienists working in clinical practice. Without in-depth knowledge of musculoskeletal health and injuries, as well as preventive and/or coping methods, dental hygienists may be forced to endure daily pain while continuing to work. If the injury is allowed to progress beyond a certain stage, some dental hygienists may have no option but to leave clinical practice. The objective of this literature review is to determine the impact of occupation-related MSDs on dental hygienists who work in clinical practice.

RÉSUMÉ

En comparaison avec d'autres professionnels dentaires, les hygiénistes dentaires qui travaillent en pratique clinique peuvent présenter un risque plus élevé de développer un trouble musculosquelettique (TMS) en raison des procédures, qui demandent des mouvements précis et répétitifs, et des postures maladroites et stationnaires. Les TMS englobent diverses lésions qui peuvent avoir un effet à la fois sur les tissus durs et les tissus mous du corps, et qui sont surtout attribuables aux gestes répétitifs et aux microtraumatismes répétés. Le taux de prévalence à un an des TMS chez les hygiénistes dentaires varie de 60 % à 96 %, la douleur se présentant le plus fréquemment au cou, aux épaules, au poignet, à la main et au dos. Pour gérer leur douleur, plusieurs hygiénistes dentaires ont recours aux solutions classiques, telles que les médicaments et les attelles, tandis que d'autres se tournent vers des méthodes complémentaires et non traditionnelles, comme la massothérapie et le yoga. Les TMS peuvent devenir une grande source d'inquiétude pour les hygiénistes dentaires qui travaillent en pratique clinique. En l'absence de connaissances approfondies sur les blessures et la santé musculosquelettique, ainsi que sur les méthodes de prévention et de maîtrise de la douleur, les hygiénistes dentaires peuvent être contraintes à endurer la douleur quotidienne tout en devant continuer à travailler. Si la blessure progresse au-delà d'un certain seuil, quelques hygiénistes dentaires peuvent ne pas avoir d'autres options que de quitter la pratique clinique. L'objectif de cette analyse documentaire est de déterminer les répercussions des TMS liées à la profession sur les hygiénistes dentaires qui travaillent en pratique clinique.

Key words: cumulative trauma injury, dental, dental hygiene, impact, musculoskeletal, prevalence, prevention, repetitive strain injury, risk factor, therapy, treatment

INTRODUCTION

Dental professionals encounter musculoskeletal pain more often than any other occupational health hazard.¹ Compared to dentists and dental assistants, dental hygienists may be at higher risk,¹⁻⁵ due to procedures that involve precise, repetitive motions, as well as awkward and static postures.^{2,4,6-16} Musculoskeletal disorders (MSDs) encompass a range of injuries that can affect both hard and soft tissues of the body, typically resulting from repetitive strain and cumulative trauma.^{2,7,9} Examples of MSDs include carpal tunnel syndrome, tension neck syndrome, tendonitis, trapezius myalgia, and vibration-induced neuropathy.^{2,3,6,12,17,18}

For dental hygienists with MSDs who do not experience positive treatment outcomes, the impact on their health and careers can be significant. Many may be faced with costly and time-consuming options, such as reducing clinical work hours or pursuing further education in order to change practice settings or careers. Performing required clinical responsibilities without adopting appropriate prevention strategies increases the risk of developing an MSD. A study from 2000 revealed that 67% of dentists and 86% of dental hygienists in British Columbia claimed they had experienced musculoskeletal pain within the previous year.⁸ More current overall prevalence rates of MSDs in

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dental hygienists range from 60% to 96%, with pain most frequently presenting in the neck, shoulder, wrist/hand, and back.^{2,3,5,7-9,11,19,20}

The purpose of literature reviews is to summarize findings or themes prevalent in the literature while offering a critique of the studies reviewed. Literature reviews are useful educational articles since they pull many pieces of information together and present a comprehensive and broad overview of a specific topic aimed at informing the readership and offering further insight.²¹

The purpose of this literature review is to explore the relationship between occupation-related MSDs and dental hygienists working in clinical practice. It examines studies that focus on MSDs in dental professionals, particularly those that highlight the experience of dental hygienists. This review analyses the signs, symptoms, and impact of these disorders, associated contributing factors, as well as therapeutic methods for preventing and/or alleviating discomfort (Table 1).

METHODS

A search of CINAHL, Google Scholar, and PubMed for full-text, peer-reviewed articles published since 1995 was undertaken using the following key words: musculoskeletal disorder, musculoskeletal, injury, dental hygiene, dental hygienist, risk factor, treatment, prevalence, qualitative. Forty-one articles were selected for this review, including systematic reviews, randomized controlled trials, cross-sectional, longitudinal cohort studies, and case studies, using both quantitative and qualitative designs that addressed MSDs and dental professionals. Literature reviews were examined for background information. Excluded were articles not published in English.

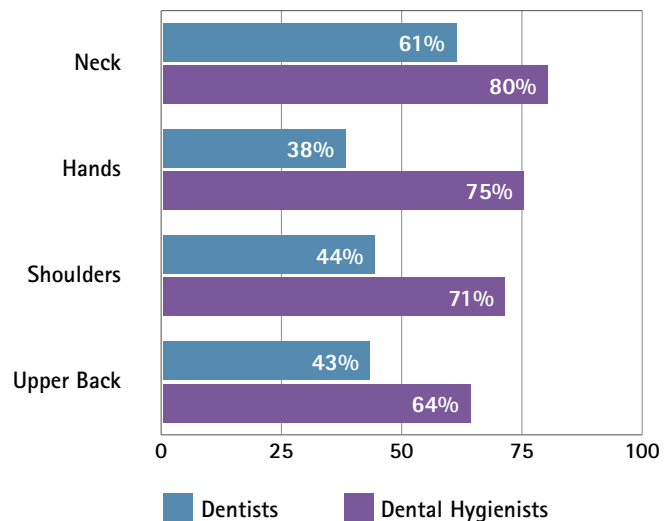
DISCUSSION

Signs and symptoms

MSDs may result from repetitive strain or cumulative trauma to muscles, ligaments, tendons, nerves, bones, and joints, resulting in pain, spasms, tingling, numbness, and weakness of the affected regions.^{2,8,11} In a study comparing dentists and dental hygienists in British Columbia, it was

determined that, within the previous year, 80% of dental hygienists had experienced discomfort in their neck, 75% in the hands, 71% in the shoulders, 64% in the upper back, 59% in the lower back, 45% in the mid-back, and 40% in their arms.⁸ Proportions were greater for dental hygienists in all categories when compared to the participating dentists (Figure 1).⁸ In another study comparing dental hygienists and dental assistants in Ontario, the dental hygienists had approximately 2 to 3 times greater likelihood of reporting hand, wrist, neck, and shoulder problems in the past year.²²

Figure 1. Prevalence of MSDs by anatomical region⁸



Risk factors

Despite differences in design, the studies analysed in this review present similar findings. Approximately 92% of dental professionals reported symptoms in at least one anatomical region within one year, with dental hygienists being the group most affected.^{1-5,23} Work-related MSDs in dental hygienists are often blamed on repetitive movements, awkward and static postures, pinch-grasp, forceful exertions, vibration, poor ergonomics, and insufficient breaks. Dental hygienists with MSDs tend to work longer hours and treat more clients per day, as

Table 1. Common MSD risk factors, treatment options, and prevention strategies for dental hygienists

Risk factors	Treatment options	Prevention strategies
<ul style="list-style-type: none"> • Repetitive movements • Awkward/static postures • Lack of task variety • Lack of breaks throughout workday • Cumulative practice hours (10+ years in clinical practice; >34 hours worked per week) • Incorrect position of overhead light • Poorly fitting/ambidextrous gloves • Inadequate support of operator's chair 	<p>Conventional</p> <ul style="list-style-type: none"> • Physician • Medications • Splints <p>Contemporary and alternative</p> <ul style="list-style-type: none"> • Acupuncture • Herbal products • Chiropractic/massage therapy • Yoga 	<ul style="list-style-type: none"> • Self-awareness of posture and positioning • Proper position of overhead light and operator/client chairs • Continuing education on MSDs and ergonomics • Regular physical exercise • Preventive massage therapy • Yoga • Surgical magnification telescopes • Use sharpened instruments with handles that are round, lightweight, with large diameter and cross-cut or knurled surface

demonstrated in a Swedish study; researchers reported significant findings for MSDs in dental hygienists who work an average of 34 (\pm 3.8) clinical hours per week and treat an average of 11 (\pm 2.7) clients per day.²⁴ Participants in a qualitative study of American dental hygienists described significant contributing factors for MSDs as lack of control over scheduling clients and selection and procurement of equipment and instruments.²⁵

Repetitive movements

Job analysis studies determined not only that instrumentation requires excellent hand-eye coordination and is highly repetitive, but also that dental hygienists often conduct more than 30 strokes per minute, thus increasing their risk for muscle strain.^{12,26} Rucker and Sunell reported that dental hygienists in British Columbia spend an average of 21 to 30 units of time (5.25 to 7.5 hours) per day working solely on scaling and root planing procedures, while treating approximately 2 clients per day who are “difficult from an instrumentation perspective.”^{8, p.45} When instrumenting on clients with heavy calculus deposits, dental hygienists must use additional strength and lateral pressure for controlled function during hand scaling.^{1,27} The non-dominant hand often requires great force and static positioning to retract the tongue and cheek during intraoral procedures.²⁸ Sanders and Michalak-Turcotte claimed that most dental hygienists use small-diameter instrument handles (1/4 inch to 5/16 inch), which along with heavier weight and dull blades contribute to increased pinch-force.^{1,12,27,29}

There are contrary findings regarding the use of ultrasonic scalers: 12 out of 41 studies reviewed for this article claim that vibrations contribute to nerve damage and MSDs,^{1,6,10,12,13,15,18,23,27-30} while only two suggest ultrasonic scalers as a prevention method to minimize the load from hand-scaling.^{1,28} The vibration frequency of

ultrasonic scalers, 25,000 Hz to 30,000 Hz, is thought to exceed the threshold for damage to soft tissues, including nerve receptors in the finger tips.^{10,12}

Awkward and static postures

Constant repetitive motions combined with awkward and static postures allow muscles, ligaments, and joint capsules to adapt to compromised positions, causing greater pain and significantly increasing dental hygienists' likelihood of developing a debilitating injury.²⁷ Forty-four percent of British Columbia dental hygienists sit with their legs split on either side of the client's chair, limiting free mobility in the “clock” positions, creating torso twist/tilt, neck flexion, wrist flexion/extension, and shoulder abduction (Figure 2).^{8,12} During an hour-long appointment, dental hygienists typically maintain fixed and awkward positions for 30 to 50 minutes, contributing to muscular fatigue and pain created by poor circulation, inefficient removal of lactic acid, and increased muscular pressure.¹² Studies claim that exceeding 15 degrees of neck flexion 75% of the time is harmful; this is especially concerning due to reports of dental hygienists maintaining static postures with approximately 45 degrees of neck flexion.^{1,26,31} Additionally, multiple studies of the working postures of dentists found neck flexion greater than 30 degrees 82% of the time and greater than 39 degrees 50% of the time.³¹

Operatory ergonomics and environment

Operatory design and equipment play large roles in either preventing or contributing to work-related MSDs. The following have been named as likely environmental and ergonomic contributors to their development: poor lighting or incorrect position of the overhead light; ability to move freely around the client chair; operator's chair; and gloves.^{1,2,8,12,13,27,30}

Figure 2. Demonstrating the dental hygienist's legs split on either side of client's chair



Figure 3. Incorrect overhead light position, creating shadow in oral cavity



Figure 4. Correct overhead light position, light line within 15 degrees of operator's sightline



If the light line is greater than 15 degrees from the operator's sightline, shadows in the oral cavity may result in the dental hygienist sacrificing proper posture to gain a better view (Figures 3 and 4).²⁰

The operator's chair should allow the dental hygienist to work in a neutral body position, with elbows and hips bent at approximately 90 degrees. Chairs should provide lumbar support with the seat tapered slightly forward and should be no greater than 25% wider than the buttocks, with a rigid base and 5 casters to prevent tipping.³²

Ill-fitting intraoral gloves, whether too small, too large or ambidextrous, place increased force and produce a backwards pull on the muscles and ligaments of the operator's hand, creating pain at the base of the thumb and restricting blood flow to the hand.³²

Lack of job variety

Dental hygienists who work in general clinical practice settings have a defined scope of practice lending itself to an entire workday spent sitting while providing preventive and therapeutic care with little opportunity to stand and stretch.^{2,26} Typical appointments often consist of scaling and root planing for 50% to 57% of the time.^{12,26,33} Other services, including oral health education, examinations, polishing, desensitizing, fluoride delivery, local anaesthesia, and promoting self-care, are also typically provided by the clinician in a sitting position. Lack of job variety and subsequent opportunity to work using various body positions in the clinical arena create a situation in which the dental hygienist has little alternative but to perform repetitive movements using static postures, exacerbating the risk for MSDs.

Cumulative practice hours

Both age and length of time in clinical practice increase a dental hygienist's risk of experiencing musculoskeletal pain.^{8,13,19} In a qualitative study that assessed perceptions of dental hygienists regarding occupation-related health, most participants reported that discomfort frequently occurred, especially after 10 years in practice, and 41% attributed their MSD entirely to clinical tasks.^{8,17,25} Risk of injury increases with longer durations spent performing potentially traumatic movements, and throughout the average work day, dental hygienists typically see fewer clients but for longer periods than do dentists.^{8,27} In their study, Rucker and Sunell found that 72% of dental hygienists work at least 4 days per week, 95% practise more than 7 hours per day, with the majority treating 8 to 9 clients per day.⁸ These results are similar to findings by Sanders and Michalak-Turcotte, and Branson, Black, and Simmer-Beck.^{12,26} Sanders and Michalak-Turcotte noted typical 8-hour workdays with a one-hour lunch break and no other scheduled breaks. In addition, dental hygienists who treat more than 11 clients per day report higher rates

of pain than those who treat fewer clients, and those who work more than 34 hours per week are at higher risk.¹² Branson et al. reported that a typical work week comprises 31.6 hours, with 29.7 hours spent in client contact.²⁶

A study of Swedish dental hygienists revealed a strong correlation between physical workload and hand numbness, likely caused by scaling and root planing instrumentation on several clients per day.²⁴

Scheduling, insufficient work breaks, and psychosocial factors

Other commonly noted contributing factors include having little control over client scheduling, lack of breaks throughout the day, and psychosocial issues.^{1,12,17,27} Dental hygienists should schedule and determine the length of appointments according to individual client needs, and alternate more periodontally complex clients requiring more aggressive instrumentation with those who have simpler treatment needs.¹

If, in addition to their lunch hour, dental hygienists have scheduled break periods every morning and afternoon, they may have adequate time to stretch and complete documentation of charts, allowing recovery and therefore counteracting repetitive movements and static postures held throughout the day.^{1,34}

Psychosocial contributors, including job demands, time management, and the common drive for perfection, lead to greater stress, which is associated with occupation-related MSDs.^{12,25,35,36} Feuerstein, Shaw, Nicholas, and Huang discuss theories surrounding the relationship between perceived stress and upper extremity MSDs, whereby psychosocial stressors lead to physiological responses such as muscle tension and increased release of the stress hormones cortisol and catecholamine.³⁶

For some, job demands and time management can cause stress due to production and turnover requirements or to pressure from their employer to fill down-time if the client is late or does not show up.^{12,37} Dental hygienists may maximize their allotted time with clients, thus applying greater force, eliminating the potential for breaks, and rushing into the next appointment to continue the cycle.¹² One case study revealed that psychosocial stressors caused the dental hygienist to feel increased tension by the end of each work day.¹² Dental professions tend to attract compulsive individuals who set extremely high performance standards and expectations, which likely contribute to greater mental and physiological stress.^{12,35} Finally, psychosocial factors for dental hygienists may be exacerbated by workplace competition and role ambiguity, which stem from the inherent conflict between operating as a self-regulated health care professional while still being predominantly bound to the professional direction of dentists in the clinical private practice setting and driven by an employer-employee relationship.^{12,24}

Pain management

To manage pain, many dental hygienists seek conventional solutions (physicians, medications, splints) while others turn to complementary and alternative medicine (CAM) therapies (acupuncture, herbal products, chiropractic/massage therapy, yoga).^{8,17,25} Studies reveal that yoga, acupuncture, and massage therapy significantly reduce chronic lower back pain, while massage has short-term, positive effects on chronic neck pain.^{8,17}

Chismark, Asher, Curran, Stein, and Tavoc analysed pain management and, when comparing conventional methods to CAM therapies, discovered that dental hygienists who use CAM reported greater overall health (79.3% vs. 54%) along with greater career satisfaction (59.2% vs. 39%). How participants were asked to define overall health was not clear; however, several dental hygienists commented that they would be more inclined to use CAM therapies if such services were covered by health insurance.²³

Impact of MSDs

Akesson, Johnsson, Rylander, Moritz, and Skerfving cautioned that dental professionals had a significant likelihood of developing symptoms within 5 years, and a greater number left their profession due to MSDs, when compared to clinical nurses.¹⁷ Compared to the one-year prevalence rate of 60% to 96% for dental hygienists, 85.5% of nurses experience work-related MSDs¹¹ and approximately 60% of clerical workers live with upper-extremity discomfort.³⁸

Despite experiencing pain, many dental hygienists continue to work because of financial constraints or because they fear job termination for missed work or filing a worker's compensation claim.^{17,25} In order to keep symptoms manageable, numerous dental hygienists choose to work less, decreasing the number of days worked per week, rather than decreasing the hours worked per day.²⁵ While 27% to 31% reduced their workload, approximately 13% left their jobs for further education, a new profession or retirement.^{17,23,25,26} Focus groups revealed that many dental hygienists left the profession early in their careers because they felt ill-prepared for the physical demands of full-time clinical practice.^{17,25}

Of the dental hygienists who responded to Rucker and Sunell's survey for the Workers' Compensation Board of BC, 6% lost a total of 30 work days during the previous year due to work-related MSDs, while 2% used vacation time, 5% took unpaid leave, and 2% collected long-term disability benefits.⁸

Unfortunately, the impact of musculoskeletal discomfort and pain does not end with the work day. Research indicates that quality of life is also affected as the dental hygienist's ability to perform routine personal tasks and recreational activities, such as gardening, dressing, and household chores, may be compromised.^{8,12}

By the time MSDs are painful enough to affect their work, many dental hygienists feel that their options are

limited for changing careers. Participants in a qualitative study of dental hygienists named the following as obstacles to improving work-related MSDs: part-time employment in multiple offices, which makes it difficult to customize equipment and instruments to their individual needs; and the relatively high wage, which tends to outweigh their desire to alleviate symptoms by changing careers.²⁵

Not only do MSDs impact the individual, but they have a snowball effect on the entire practice: employers face increased workers' compensation premiums if a claim is submitted, and dental hygiene appointments must be rescheduled, resulting in loss of revenue and dissatisfied clients.²⁷

Prevention strategies

Based on the literature reviewed, suggestions for dental hygienists to prevent the development of MSDs include focusing on proper posture and the use of ergonomic instruments and equipment; taking frequent stretch breaks; adjusting operator and client chairs; using magnification telescopes; participating in regular physical exercise; and educating themselves about MSDs. Chismark et al. suggested that dental hygienists who suffer from MSDs find relief when using CAM therapies,²³ so methods such as yoga and massage therapy may also be successful prevention methods.

The least expensive prevention strategies involve awareness and self-evaluation of posture and positioning in relation to the client as well as frequent stretch breaks. Dental hygienists must remain vigilant to minimize the degree of neck and wrist flexion, shoulder abduction, and torso contortion. Dental hygienists must utilize indirect vision via the handheld mirror and proper positioning of the overhead light.¹ For optimal illumination of the oral cavity, the overhead light should be slightly behind the operator's head, thus creating a light line within 15 degrees of the operator's sightline.²⁰

The operator chair should allow the dental hygienist to remain in a neutral position, which involves proper lumbar support and keeping the elbows at 90 degrees – ideally supported by bilateral, adjustable arm rests or a trunk support bar set at a height where the knees are even with, or slightly lower than, the dental hygienist's hips.¹²

Another simple and inexpensive solution involves changing one's intraoral gloves.^{1,12,27} Ambidextrous gloves ignore the natural arch of the hand and the bulbous "thumb-ball," creating excess pressure and 330% more force on the thumb and fingers.^{12,27,39,40} One test analysed the difference between ambidextrous and anatomical (handed) gloves, reporting that the ambidextrous glove immediately pulled the thumb back from its natural position, creating a load of approximately 1.8 pounds on the hand.³⁸ Intended for short-term use, ambidextrous gloves may lead to muscle fatigue resulting in cumulative trauma if worn for extended periods of time, especially during tasks requiring fine movements.^{39,40} Poorly fitting gloves will likely create

a backwards pull on the fingers and thumb, which during grasping motions will increase force on the hand from 0.59 pounds for properly fitting gloves to 2.19 pounds.³⁹ However, despite these suggestions, one cross-sectional questionnaire found no significant nerve or tissue damage caused by the type, fit or material of ambidextrous gloves.¹³

The work day schedule remains a critical contributor to MSDs, though it is one that, with the employer's understanding and approval, can be rectified. Several studies discuss dental hygienists' lack of control over their daily work schedule as a main issue; however, it appears that control itself would not be a factor if slight adjustments were made. These adjustments include breaks in the morning and afternoon, variable appointment lengths based on individual client need and the dental hygienist's request, and alternating clients who require greater operator force and time for removal of tenacious deposits with those who require less.^{1,12,27}

One research team advised a minimum of 6 minutes of rest per hour of work that involves repetitive movements.³⁴ The same study discussed the most effective type of breaks for dentists, which, given the nature of the work, would also apply to dental hygienists. These breaks involve: 1) relaxing, dropping, and shaking one's arms for approximately 15 seconds; 2) performing movements opposite to those involved in the static and repetitive tasks; and 3) periods of rest for 10 to 15 minutes every 2 to 3 hours.³⁴

The weight and diameter of instrument handles should be chosen by and appropriately suited to each dental hygienist. Light-weight handles with a large diameter (wider than 11 mm) and a surface that is either cross-cut or knurled will decrease the need for pinch-grip and forceful exertions.^{12,29,32} Although multiple studies stressed the need for sharp blades to prevent discomfort,^{1,12,29,32} one study claimed that 74% of dental hygienists sharpen their instruments only when they become obviously dull.¹² Curettes should be sharpened before each client to ensure efficient and safe removal of deposits.¹²

Surgical magnification telescopes (SMTs) or scopes/loupes have been suggested by many researchers as an effective preventive and corrective tool.^{8,12,15,20,26,41} The use of correctly aligned SMTs reduces pinch-force, torso contortion, and neck flexion, therefore reducing strain which significantly decreases lower back, upper back, and neck pain.^{7,8,12,15,41} According to a qualitative study of American dental hygienists, only 59.7% of 868 respondents use SMTs while working in a clinical setting.⁴¹

Several studies noted that dental hygiene entry-to-practice programs should include a lengthy course devoted to ergonomic training, long-term benefits of regular physical exercise, and use of CAM therapies in order to prevent the development of MSDs.^{1,12,16,23}

Critique of research

The studies discussed in this review contribute to a better understanding of occupation-related MSDs in dental hygienists through cross-sectional and longitudinal designs, using qualitative, quantitative, and mixed method approaches. Specific data collection methods involved pilot tests, questionnaires, interviews, focus groups, case studies, participant journals, and physical exams.

Strengths

Pilot studies, used to test interview guides, and triangulation of data collection methods within the qualitative studies helped to increase the trustworthiness of the findings.^{37,44} In 2 of the qualitative studies, an iterative approach was used during focus groups and semi-structured interviews during which participants answered open-ended questions.^{25,35} This method allowed researchers to gain new insight that may not have been discovered had they used closed-format questions.⁴² Although not transcribed verbatim, data were captured during each session via audio recordings which, along with written notes taken by multiple moderators, were independently reviewed by at least 2 investigators.

Within the quantitative studies, longitudinal designs and the statistical analyses of large samples from various geographic regions improved generalizability.^{42,43} The majority of dental hygiene participants were sampled from national or regional associations which is likely a representative sample of the dental hygienist population in general.²³

Limitations

Despite these strengths, some limitations exist. First, self-reporting questionnaires may have resulted in respondent bias due to the potential challenge of recalling past events. Second, researchers must remain sensitive to the potential for groupthink in focus groups where participants may refrain from voicing an opinion if it does not align with the vocalized consensus of their peers.⁴² Third, there was an apparent lack of member-checking which, if used, involves the participants in verification of the findings, and reduces the potential for researcher bias.^{44,45}

The greatest limitation of the quantitative studies is that, while cross-sectional studies provide useful information on prevalence rates, they do not allow for causal relationships to be determined.^{2,46,47} Nonetheless, many studies concluded that the risk factors outlined are strongly associated with MSDs. Therefore, it is likely that future longitudinal studies would strengthen causality.

Research gaps and future recommendations

Several studies have been conducted to determine the etiological and contributing factors for MSDs in dental professionals; however, further research is required to determine whether occupation-related damage can be prevented entirely. Future qualitative studies could explore the opinions of dental hygienists and policy makers regarding insurance coverage through their professional associations, which might help to manage the costs of preventive CAM therapies. In addition, qualitative studies could provide a deeper understanding of perceptions of practice owners about making necessary ergonomic and scheduling improvements to prevent MSDs.

Missing from the current literature are studies analysing the prolonged use and subsequent impact of SMTs and ultrasonic scalers on the development of MSDs. While ultrasonic scalers are designed to reduce operator strain, current studies present contradictory and inconclusive evidence regarding their relationship to musculoskeletal fatigue and pain. More studies are needed to determine the prevalence of MSDs among those using SMTs regularly in clinical practice, as well as the prevalence of dental professionals using correctly aligned SMTs. Future randomized controlled trials should assess the long-term consequences of repeated use of SMTs and ultrasonic scalers, as well as the ideal weight and diameter of scaling instruments.

It may also be valuable to investigate 1) the effects of recreational activities, in addition to work-related factors, on the development of MSDs; 2) to what extent productivity in the workplace is affected by employing a clinician who has MSDs; and 3) models that involve extended or alternative health insurance combined with disability insurance for all members of a dental hygiene association.

CONCLUSION

MSDs, such as carpal tunnel syndrome, trapezius myalgia, tension neck syndrome, and median neuropathy, can have a significant impact on dental hygienists who work in clinical practice. Pain and discomfort tend to develop in the wrist, hand, neck, shoulders, and back with risk factors ranging from cumulative and repetitive strain to ill-fitting gloves. Once pain is noticed, dental hygienists often turn to conventional and/or alternative treatments and therapies. Without in-depth knowledge of musculoskeletal health and injuries, as well as preventive and coping methods, dental hygienists may be forced to endure daily pain while continuing to work. If the injury is allowed to progress, some dental hygienists may have no option but to leave clinical practice.

Preventive strategies are critical for dental hygienists to maintain their musculoskeletal health and enjoy longevity in clinical practice. Dental hygienists must continuously assess their posture, instruments, and equipment, including gloves and SMTs, as well as the design of their operatory.

They must listen to their body and take action if they begin to feel discomfort while fulfilling their clinical responsibilities. Taking frequent stretch breaks throughout the work day, making time for regular physical exercise, and using preventive CAM therapies early in one's career may help to minimize the potential for injury, which is so common to those in the dental hygiene profession.

Dental hygiene students expend significant finances and resources on their education to prepare for a healthy and lengthy career as a dental hygienist. Yet, many practising dental hygienists do not seem to adopt preventive and maintenance strategies outlined in this review. Dental professionals need to place a higher value on their long-term health and recognize the potential financial losses and dissatisfaction that they are likely to experience if they do not invest in preventive care.

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