Perceptions and coping strategies of dental hygienists practicing during the COVID-19 pandemic

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DEDICATION

I would like to dedicate this thesis to my husband Jon, who always supports my endeavors and is an invaluable sounding board. To my daughter Helena, who was born during this process, and to my sister, Grace, for her support. I would not have gone, or stayed, on this journey if it wasn't for God's guidance and timing.

ABSTRACT

Purpose: This study investigates perceptions and coping strategies used by dental hygienists during the SARS-CoV-2 (COVID-19) pandemic, March 1, 2020 until present. The Transactional Theory of Stress and Coping was used as the framework for this study.

Methods: An electronic questionnaire (Qualtrics™) with questions in three domains: demographics, perceptions, and coping strategies, was emailed to dental hygienists in five Midwest states, summer of 2021. Participants were asked to indicate perceptions of and coping strategies used, while practicing during the COVID-19 pandemic since March 1, 2020. Bivariate comparisons between respondent demographics and survey responses regarding coping, risks, and strategies were computed using Fisher's Exact Test. Survey responses were both analyzed as the original 5-point Likert scale and a collapsed 3-point Likert scale assessing overall agreement, disagreement, and neither agreement nor disagreement.

Results: Completed questionnaires totaled 167, with a 4.4% response rate. Majority of respondents were white females aged 56 or over, were employed full time, and had been in practice for ≥ 21 years in private general practices. Reduction in working hours was reported by 8.4% of respondents, and 7.2% reported leaving the profession. Perceptions of practicing during the pandemic were reported as experiencing increased risk of infection, a threat to the health of self, family/loved ones, and more physically demanding. The vaccine aided in reducing risk perceptions. Adaptive and maladaptive coping strategies were used while practicing during the COVID-19 pandemic.

Conclusion: Dental hygienists perceive practicing dental hygiene during the COVID-19 pandemic as putting themselves and family/loved ones at risk of contracting the virus. Respondents reported dental hygiene practice is more physically demanding than before

the COVID-19 pandemic and dental hygienists are more agitated and worried. Dental hygienists are finding ways of coping with these stresses by engaging in practice to improve mental health, using personal relationships for support, exercising, turning to spirituality, and using social media more than before the pandemic. Dental hygienists in this study reported reduced hours of work or leaving the profession, contributing to workforce attrition.

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SECTION 1

INTRODUCTION

On December 30, 2019, in Wuhan City, Hubei province, China, a bronchoalveolar lavage sample was taken from a patient with an unknown form of pneumonia.[1] This sample was tested and identified as the novel coronavirus SARS-CoV-2--commonly referred to as COVID-19, the seventh member of the coronavirus family that infects humans.[2,3] On January 20, 2020, the first confirmed case of COVID-19 was reported in the United States (US).[4] The introduction of the virus into the US prompted the Centers for Disease Control and Prevention (CDC) and the Surgeon General to issue a recommendation to cease elective surgeries and procedures in order to reduce the spread of the virus, preserve personal protective equipment (PPE) supplies, and increase patient capacity in hospitals.[5,6] On March 16, 2020 the American Dental Association (ADA) issued similar recommendations for elective dental procedure and preventative care, recommending only emergency dental services be provided.[7] Ultimately, the decision to reduce or cease elective procedures was left up to each state.

A majority of states allowed dental hygienists to return to work during spring 2020, despite the threat of illness associated with COVID-19 infection, which persisted throughout the population at the time. The CDC developed COVID-19 dental guidelines to support the safety of providers and patients.[5] These new guidelines altered the way dental hygiene is practiced. Suggested changes included: increasing the amount of protective equipment (PPE) worn; increasing duration of PPE wear-time; changes to the type of PPE used; limiting doffing of PPE throughout the day; patient screening questions and temperature taking; administering pre-procedural rinse; enacting ways to reduce aerosols; and reducing or discontinuing the use of the ultrasonic scaler.[5,8,9] These changes resulted in longer workdays with fewer breaks.[5,10]

In addition to the persistent threat of contracting the virus, these changes have increased stress levels in the dental hygiene occupation.[11–14] The Transactional Theory of Stress and Coping postulates that stress is experienced when an individual perceives that demands exceed their personal resources to handle the demands.[15,16] Personal or social resources may include time, health, and safety of self or loved ones.[15,16] This theory also explains coping as a dynamic process with stages of appraisal of the perceived demands.[15,16] Once an individual appraises demands as exceeding resources, the individual will implement coping strategies; if these strategies are not successful in mitigating stress the appraisal process will continue.[16] The continuation of this process means the individual is still experiencing stress, or still perceives demands as exceeding resources.[15,16] During the COVID-19 pandemic, dental hygienists' demands on personal or social resources may have been exceeded. Coping strategies used to mitigate stress can be successful or unsuccessful.[17–19] Successful coping strategies will aid in stress reduction, unsuccessful coping strategies will not reduce stress, may increase risk of burnout, increase occupational dissatisfaction, and negatively affect wellbeing.[17–28]

Purpose of the Study

The purpose of this study was to investigate current perceptions of occupational risk and to identify how dental hygienists are coping with the stress of practicing during the COVID-19 pandemic.

Statement of the Problem

Dental health professionals (DHP) should feel protected and safe at work. However, they may be at an increased risk of contracting COVID-19 due to the nature of their work, including being in close proximity with patients during procedures.[8,9,29–33] The

COVID-19 virus can be transmitted through aerosols by coughing, sneezing, and through contact transmission by touching one's eyes or mucous membranes.[8,9,34,35] The COVID-19 virus utilizes aerosol spread from an infected individual as the transmission route.[8,9,34] Transmission via aerosols is concerning for dental hygienists seeing as certain routine procedures provided by the dental hygienists can create aerosols in the dental operatory.[8,9,34] Dental hygienists are exposed to aerosols while preforming these routine procedures increasing their risk of contracting the virus.

During the COVID-19 pandemic, dental hygienists have found themselves practicing in an ever-changing work environment. These quick, sometimes unexpected changes may increase demands on dental hygienists, resulting in occupational stress. Also, practicing in an occupation considered high-risk for contracting a disease during a pandemic may lead to increased occupational stress. This stress can have negative effects on mental health and wellbeing. An increase in occupation stress and reduced wellbeing may lead dental hygienists to leave the profession contributing to a workforce shortage. However, if dental hygienists can be offered appropriate support to reduce occupational stress and increase wellbeing this may curb the loss of dental hygienists from the workforce.

Currently little is known about how dental hygienists are coping with the stresses of practicing during the COVID-19 pandemic. Identifying perceptions of dental hygienists practicing during the COVID-19 pandemic will contribute to a better understanding of the origins of occupational stress during a public health crisis and aid in understanding how dental hygienists are coping with that stress. This information can be

used to identify how to support dental hygienists during these stressful times and help protect the profession from attrition.

Significance of the Study

Identifying perceptions and coping strategies will aid in understanding if dental hygienists are able to mitigate stress, or if increased stress is a recurrent issue in the profession, leading to workforce attrition. This information could be used by the profession to identify whether practice changes are needed to reduce risks during a major public health event and improve dental hygiene workforce availability. Furthermore, understanding how dental hygienists are coping with the stresses of practicing during the COVID-19 pandemic will help identify successful or unsuccessful coping strategies. Successful coping strategies may be shared with the profession to promote wellbeing. Negative, unsuccessful coping strategies will signify stress is not being mitigated and the profession can use this information to assess what practice support may be needed for dental hygienists during a major public health event in the future. Additionally, the information from this study may help to identify ways to mitigate stress and burnout leading to workforce attrition.

Research Questions

1. What are Midwest U.S. dental hygienists' perceptions of practicing during the COVID-19 pandemic?
2. How are Midwest U.S. dental hygienists coping with the stresses of practicing during the COVID-19 pandemic?

SECTION 2

REVIEW OF THE LITERATURE

A search of the literature regarding dentistry during the COVID-19 pandemic was completed in the databases Pubmed, Google Scholar, and CINAHL. The search terms used included, “dental,” “dental hygiene,” “COVID-19,” “attitudes, knowledge, perceptions,” “mental health,” “risk perception,” “health care workers,” “coping,” and “burnout”. These results were screened and excluded articles which were: not in the English language, editorials, duplicates, and not available online. Results which were included were: original research, literature reviews, and explanatory information about the virus. The last search of the literature was completed July 20, 2021 and yielded 134 resources. The article search regarding COVID-19 was limited to 2019 and 2020, as to not mistakenly include results from the severe acute respiratory syndrome (SARS) outbreak in 2003.

Mental Health Effects of COVID-19 on Dental Health Professionals

Practicing dentistry during a major public health event may increase stress and demands on personal or social resources.[11,13–16,29,36–38] Demands may be emotional, mental, or physical.[15,16] According to the Transactional Theory of Stress and Coping developed by Lazarus et al., when demands exceed personal or social resources, an individual will experience stress.[16] The Transactional Theory of Stress and Coping developed by Lazarus et al. defines stress and coping as a dynamic process based on the interaction of an individual with their perceptions of an environment.[15,16] This environment may be physical or psychological.[15,16] The theory explains that no one situation or interaction itself is inherently stressful; it is the perception, and appraisal of the perception, that leads an individual to experience stress.[15,16] Stress, in this theory, is explained as demands on resources, and these resources may be physical or

psychological.[15,16] Cognitive appraisal is initiated when an individual perceives demands on resources, and the individual must decide if these demands exceed personal resources.[16]

Cognitive appraisal has three stages: cognitive appraisal, secondary appraisal, and re-appraisal.[16] This process is a dynamic, continuous process that may take place in a matter of seconds and multiple times a day.[16] When an individual perceives a demand on resources, cognitive appraisal is initiated.[16] If the individual perceives the demands as not exceeding resources, the appraisal process is complete and the individual does not experience stress.[16] If the individual perceives demands as exceeding resources, the individual experiences stress, and secondary appraisal is necessary to identify a coping strategy.[16] In the secondary appraisal phase a coping strategy is implemented to mitigate stress.[16] The third appraisal stage is reappraisal. In this stage the individual evaluates the coping strategy implemented in the secondary appraisal stage to identify if it was successful at mitigating stress.[16] If the re-appraisal phase identifies that the coping strategy as not successful in mitigating stress, the appraisal process will continue.[16] The continuation of this process means an individual is still experiencing stress and has not identified successful ways of coping with that stress.[15,16]

Stress, experienced as demands on resources, is impacting the psychological health of dental health professionals (DHP) practicing during the COVID-19 pandemic.[12–14,29,39–42] It has been identified in the literature that DHP are just as susceptible to the psychological impact of COVID-19 as health care workers (HCW), or even frontline HCW, including psychological distress, depression, and anxiety.[11–14,29,40–58]

Psychological distress. Psychological distress is a state of emotional suffering associated with stressors and demands that are difficult to cope with.[59] Psychological distress has been positively associated with subjective overload which refers to how an individual perceives a given circumstance.[14,29] An individual may or may not perceive the circumstance as a demand on personal resources. If the individual possesses adequate resources to pacify the demands, no change to the individual's circumstance is made.[14,16,29] Conversely, when an individual perceives demands as exceeding personal resources, stress is a byproduct of this interaction.[15,16] Mijiritsky et al., and Shacham et al., conducted studies in China, India, Israel, Italy, and the United Kingdom and found subjective overload was positively correlated with psychological distress in DHP practicing during the COVID-19 pandemic.[14,29] Increased demands, in the form of perceived risk, and perceived fear of contracting COVID-19, were positively associated with psychological distress.[14,29] This is concerning for DHP as psychological distress may lead to long-term mental illness and reduce wellbeing.[14,29,59]

Depression. Depression manifests as loss of engagement or interest and role impairment (i.e.-- not being able to perform daily activities such as chores, maintain a career, maintain relationships or social activities.)[60–63] Depression among a sample of 4,776 dental hygienists in the United States during COVID-19 was assessed in a study using the Patient Health Questionnaire (PHQ).[43] Researchers found 16% reported elevated depressive symptoms since the beginning of the COVID-19 pandemic in March 2020.[43] Dental hygienists aged 18-29 years reported highest levels of depressive symptoms with the lowest levels reported among those 64 years of age and older.[43]

Anxiety. Anxiety is a feeling of intense, persistent, and excessive worrying about a situation; fear can be associated with anxiety.[64] Anxiety is an indicator for underlying mental illness when feelings interfere with everyday activities.[64] The General Anxiety Disorder Assessment (GAD-7) assesses the severity of generalized anxiety symptoms.[65,66] These symptoms include: feeling nervous or on edge, not being able to stop or control worrying, worrying excessively about a variety of things, trouble relaxing, restlessness to the point of having difficulty being still, being easily annoyed or irritable, and feelings of dread or anticipating awful or tragic events.[66] This tool has been utilized to assess anxiety in DHP practicing during the COVID-19 pandemic showing an increased level of generalized anxiety symptoms in over half of the populations sampled.[11,13] The GAD-2 was used in a population of 4,776 dental hygienists in the United States and found 25.7% reported generalized anxiety symptoms.[43] These studies identified positive correlations between generalized anxiety symptoms and concerns about self, family, or friends contracting the virus; correlations were also identified between generalized anxiety symptoms and concerns for the future of the dental profession.[11,13,40] Higher levels of anxiety were identified in DHP who discontinued clinical practice due to the virus, as compared to those who did not discontinue practice.[13,40] These results show that even though non-practicing DHP no longer experienced occupational exposure to the virus they were still suffering from increased levels of anxiety.[13] The main concerns of DHP who discontinued practicing and DHP who continued to practice were similar, including, fear for the future of the profession and concern of contracting the virus; however, the non-practicing DHP additionally

reported financial stress as a concern.[11,13,40,45] Research on the effects of COVID-19 on DHP has shown that anxiety, was also correlated with psychosocial concerns.[11,13,40,45]

Psychosocial Effects of COVID-19 on Dental Health Professionals

Psychosocial refers to the interconnection between an individual's thoughts and behaviors with social factors.[45] Psychosocial concerns of DHP practicing during the COVID-19 pandemic can be both negative and positive.[11–13,29,40–42,45,47,49] Negative psychosocial concerns include fear of infection for self or loved ones, financial stress, increased occupational stress, and fear for the future of the profession.[11–13,40,41,45] Positive psychosocial effects include increased exercise, increased self-care practice, and a sense of closeness with family and loved ones.[11–13,40,41,45] Isiekwe et al. surveyed a small sample of DHP about their perceived psychosocial wellbeing in relation to the COVID-19 pandemic by asking participants if they believed there would be an effect on psychosocial wellbeing, such as, feelings of depression, happiness, unhappiness, or whether it was too early to tell what the effects would be.[58] Out of the 73 DHP surveyed, 38% of the sample agreed that there would be a lasting effect on psychosocial wellbeing, but it was too early to know what that effect would be.[58] Similarly, Consolo et al., Tysiąc-Miśta et al., found that the psychosocial impact of the COVID-19 pandemic is unclear and may be negative or positive.[13,67]

Concerns for the future of the profession, financial stress due to shutdowns, fear of contracting the virus, and fear of spreading the virus to loved ones are examples of negative psychosocial effects.[13,40,58] Positive effects were identified as enriching relationships with family or loved ones, feeling closer to individuals one cares for and increased self-care practices.[12,58] A study conducted by Fontana et al., examined a

sample of DHP, HCW, and non-HCW and found positive psychosocial effects in the lives of DHP when analyzing questions pertaining to perceived threats of COVID-19, life experiences, quality of life, and wellbeing.[12] It was found that DHP were less likely than non-HCW to feel threatened by COVID-19.[12] DHP ranked exercise level, caring about one another, and self-care higher since the COVID-19 pandemic than HCW, and non-HCW.[37]

Perceived risk. Research has shown conflicting perspectives regarding the perception of occupational risk among DHPs.[30–32,34,35,41,42,68–76] Dentistry is considered a high-risk profession for transmission of airborne diseases due to the nature of procedures, producing bio-aerosols, and proximity of the DHP to the patient.[30–32,34,35,77–82] If a DHP is concerned about becoming infected with the virus while practicing dentistry and does not feel adequately protected, then demands have exceeded resources, this phenomenon is explained in the Transactional Theory of Stress and Coping.[15,16] In the event demands exceed perceived resources, perceptions of risk will lead to stress.[15,16,83] Research conducted with DHP practicing dentistry in Italy, India, and the Middle East during the COVID-19 pandemic identified themes of perceived dangers and high risk situations in the dental setting for DHP and patients.[34,41,42,68–76] COVID-19 was perceived as very dangerous, meaning that DHP have low confidence in staying healthy while practicing dentistry.[34,41,70] This heightened perception of danger could be due to DHP viewing the dental setting as higher risk for contracting the virus than any other social setting, and the profession as higher risk than other professions.[34,73,70,42] In a study by Cagetti et al. the risk of practicing dentistry during the pandemic was reported to be not acceptable by 99% of 583 DHP surveyed.[70] Viewing the risk as unacceptable may be due to the perception of

the virus being highly contagious and fatal.[72,68,42] Kamate et al. found that 95.9% of 860 DHP reported that they perceive the COVID-19 virus as fatal in nature.[72]

This heightened risk is seen as a barrier to providing safe care in the dental setting because DHP see the virus as difficult to avoid while providing treatment to the patient.[41,42,68,70,74] Further, some DHP have reported perceptions of the patient being at a higher risk than the DHP of contracting the virus during dental treatment.[69,72,83] Alternatively, one study reported DHP perceived the patient and the DHP to have the same risk for transmission during the dental appointment, while others perceived the patient at a low risk of contracting the virus.[34,42,70,74] A study in the United States with 4,667 dental hygienists found the perceived risk to self and patient safety was correlated with the amount of PPE available in the dental setting.[83] Less risk was perceived when the dental setting had more than 14 days of PPE on hand, specifically N95/KN95 masks.[83]

Treating patients with suspected COVID-19 symptoms was also examined in the research and showed varying levels of comfort among DHP proving care.[40–42,71,73,75,76,84] Some DHP have reported they would decline treating patients with COVID-19 symptoms.[40,41,71,73,76,84] However Arora et al. found that 41.8% of the 646 DHP surveyed would be willing to provide care for COVID-19 positive patients.[42] Similarly, a study by Khader et al. found that 36.7% of the 368 dentists sampled did not view COVID-19 as a serious public health issue.[75] Further, this study showed that while 32.2% of the participant dentists would allow their staff to provide treatment to patients with COVID-19 symptoms, 82.6% would personally avoid treating patients with symptoms.[75] Current research displays the spectrum of risk perceptions among DHP.

Practicing in an environment with other DHP who have differing perceptions of risk may lead to increased occupational stress due to increased demands on an individual.[14,68,76] Demands may be mental, physical, or emotional events an individual experiences as stressful.[15,16] The feeling of having little or no support, and not being able to change a situation can increase demands on an individual, and potentially lead to stress or contribute to the perception that a situation is more stressful.[15,16,85] Plessas et al., found DHP felt frustrated, undervalued, and vulnerable, facing emotional and physical challenges with inconsistent and changing guidelines from leadership.[85] Shirahmadi et al. and Shacham et al. found that higher levels of self-efficacy are associated with lower levels of perceived risk of COVID-19.[14,68] These results suggest the more control an individual feels they have over a situation, the less they perceive the situation as a threat or as stressful.[14,68] For example, higher levels of anxiety were found in DHP who discontinued their clinical practice as compared to those who did not; suggesting DHP with potentially less control of their situation perceived more demands.[14,40,68]

Fear of practicing during COVID-19. The perception of fear is a theme identified in the literature on practicing dentistry during the COVID-19 pandemic.[11–14,29,71,84,86–89] Fear of being in close contact with others due to the perceived risk of transmission, becoming infected with COVID-19, transmitting the virus to loved ones, and financial ramifications have been identified in the literature.[11–13,34,40,41,69,71,84,87,89–93] In a study of 686 DHP in India, 92.3% stated they were scared to offer treatment to a suspected COVID-19 positive patient and 77.6% were scared of cross infection from a coworker.[93]

Fear of transmitting the virus to family members or loved ones was reported as more concerning for DHP than contracting the virus themselves.[11,40,71,76,84,89,94,95] This

fear was reported by DHP as the main reason for declining to treat patients with COVID-19 symptoms.[76,96] A study of 203 dental interns in Saudi Arabia found 80.8% were worried about contracting the virus themselves, and 85.7% reported being worried about spreading the virus to family or loved ones.[97]

Fear of negative financial consequences has been reported by DHP for several reasons. First, DHP are concerned about the personal financial ramifications, if they or a family member or loved one becomes ill.[12,93,94] Fontana et al., found that over 70% of the 984 participants surveyed reported concern about financial problems or impacts if a person close to them contracted COVID-19.[12] If DHP become ill, they would be required to quarantine and therefore not be able to practice. With no income, DHP fear they will not be able to pay for medical care.[12,89,94]

Beyond personal financial impact, DHP are also concerned with the financial impact of COVID-19 on the profession.[12,13,42,71,93–95] Aravind et al., found that 99% of 686 DHP surveyed indicated they were scared of the financial ramification of the COVID-19 pandemic.[93] In agreement with these findings Humagain et al. found 70% of 406 dentist sampled in Nepal were severely affected by the COVID-19 pandemic financially, and were not receiving an income in May of 2020.[98] The monetary impact of the COVID-19 pandemic may include consequences from reduced clinic income and increased costs associated with infection control measures.[12,13,41,42,71,94] Governmental orders to halt elective procedures, voluntary dental office closures to limit the spread or due to infections, limited patient interactions due to low PPE supplies, increased time between appointment, and reducing bioaerosol producing procedures have all contributed to monetary ramifications. [12,13,41,42,59,70,71] Adding to this financial stress is the concern

patients may not feel safe in the dental setting due to the fear of contracting the virus.[88,91,92,99] A study by Aquilant et al., in a population of 1003 members of the public in Italy, found 22.6% would attend a dental apportionment but be fearful for their health, and 18.3% would either postpone or cancel their appointment.[91] Another concern is patients may not be able to afford dental care due to increased job loss and the financial slump caused by the COVID-19 pandemic, keeping patients away from the dental office leading to lost revenue.[71,98,100] This increased perception of risk from the patients may lead to more financial concerns for DHP, causing more stress.[71] The COVID-19 pandemic has had a negative impact on DHP psychological state, calling for a greater understanding of coping strategies that may be used to increase wellbeing.[11,13,14,29,36,44,46–57,101,102]

Coping Strategies Among Health Care Workers

Coping strategy research involves identifying how individuals are currently dealing with stressors and identifying those strategies as adaptive or maladaptive.[17,19,25,27,44,103–106] The goal is to ultimately offer support or education to change maladaptive strategies, thereby reducing negative effects of occupational stress and promoting or increasing wellbeing.[17,19,25–27,44,103–106] Literature has pointed to the importance of HCW wellbeing and improved work-life balance as a major need.[21,107,108] This research highlights the Quadruple Aim of Healthcare: to enhance patient experience, improve population health, reduce costs, and improve the work life of health care providers.[21,101,107,108] When a HCW is suffering from stress due to maladaptive coping strategies, it may reduce the quality of care the HCW is providing resulting in reduced patient satisfaction, increased costs, and poor health outcomes.[21,101] Therefore,

identifying negative or maladaptive coping strategies may promote satisfactory patient care, increase HCW wellbeing, and reduce occupational stress and potential for burnout.[18–24,28] Concerns for wellbeing and changing the aim of healthcare to include considerations for providers is also relevant to dentistry and DHPs.

Coping strategies include cognitive, emotional, or behavioral strategies utilized to deal with a problem or perceived stress.[102] Coping strategies may be adaptive useful strategies, or maladaptive not useful strategies.[17,18,102,109,110] Positive coping strategies may include cognitive strategies, such as positive refocusing or putting things into a different more positive perspective; emotional strategies, such as talking or therapy sessions; or behavioral coping, including any activity that may aid in relaxation (i.e., reading a book or going for a walk).[17,102] Other positive coping strategies include behaviors to improve and support mental health, such as sleep hygiene, physical activity, and social support.[36,110,111] Negative coping strategies may include unhealthy relationships with food or substances, or misuse of social media, both causing increased psychological distress.[111–117] Negative or maladaptive coping strategies that do not aid in mitigating occupational stress will lead the individual to continually experience stress, which may eventually lead to burnout.[20,24,118–120]

Problem-focused vs. emotion-focused coping strategies. Individual coping strategies may be problem-focused or emotion-focused.[106,110] Both problem-focused and emotion-focused coping strategies can be used in positive or negative ways. These mechanisms are combined with cognitive, behavioral, or emotional strategies.[106,110] Problem-focused coping is a mechanism that focuses on changing or resolving a stressful situation or modifying the source of the stressful stimuli.[106,110] Emotion-focused coping is a form of

coping that involves managing emotions of the individual, not altering the situation causing the stressful stimuli.[106,110] A meta-analysis of 36 studies involving 9,729 HCW, teachers, social workers, counselors, clergy, parents of children with autism, tradesman, and civil servants identified a negative correlation between problem-focused coping and occupational burnout, and a positive correlation between emotion-focused coping and occupational burnout.[18]

Problem-focused coping strategies have been identified as beneficial to HCW coping.[25,103,105,121] These coping strategies included positive refocusing, planful problem solving, positive self-attitude, and positive outlooks on the situation.[25,103,105,121] Another form of problem-focused coping was identified in the form of information gathering.[25,122] It was identified that the more information HCW had about the COVID-19 virus the more confident they felt in avoiding transmission and the more prepared they felt in avoiding contraction.[25,122] Education found to be helpful included information about the transmission, containment, and personal protective measures to avoid transmission.[25,122] A study by Wang et al., showed a correlation between formal informational lessons about the virus and confidence in coping with its effects.[122]

Emotion-focused coping strategies include denial, avoidance, or distraction.[106] These mechanisms are seen to be used in situations that are perceived as uncontrollable.[27] They have not been identified as beneficial to HCW coping and are not found to be frequently utilized by HCW.[25,47,103,121–123] However one study did find HCW under the age of 40 used avoidance coping strategies more than the population over 40 years of age.[121]

Social support. Research has identified common coping strategies utilized by HCW during the COVID-19 pandemic.[47,53,103,105,121–123] The most common trend identified was seeking emotional and social support from friends and family members.[25,47,103,105,121,123] This type of support came in the form of talking with friends or family members or reaching out to social platforms for emotional and social support.[25,47,103,105,121,123] However, HCW surveyed during the COVID-19 pandemic, did not seek coworker support or support during team meetings as a coping strategy.[25,103,105,121,123–125] A study by Windarwati et al. found 98.7% of 236 HCW surveyed reported seeking support from friends and family.[123] Salopek-Žiha et al. found that age plays a role in the use of social support as a coping strategy in a sample of HCW.[121] In this study, the population over 40 years of age used more social support, while the population under 40 years of age was more likely to avoid social support.[121] The author pointed out this was due to the younger population wishing the pandemic never happened and fantasizing it would simply go away, while the older population accepted the circumstance and reached out to others discuss their feelings.[121]

Coping Strategies Among Dental Health Professionals

Coping with the stress of practicing during the COVID-19 pandemic has been examined in HCW however very a few studies are available for DHP.[25,47,103,121–123] Occupational coping strategies utilized by DHP, outside of a major public health event, have been identified as physical activity or exercise, support from loved ones, self-care, quiet time, and time with family and loved ones.[22,28,44,124,125] Prior to the COVID-19 pandemic, problem-focused and emotion-focused coping strategies have been identified in DHP outside of a major health event, with emotion-focused coping strategies shown to

be maladaptive and not successful in mitigating stress.[22,23,28,41] Maladaptive coping strategies and risk perceptions contribute to clinician burnout and reduced wellbeing, which may lead to a workforce shortage in the dental hygiene profession.[19–21,24–27,44,103,104,107,108,119,124,126–131]

Deep acting and surface acting coping. Research on coping identifies emotional demands as the most common occupational stressor and more taxing on DHP than the overarching stress of clinical practice.[22,23,28,124] Sander et al. used the terms deep-acting and surface-acting to explain how DHP adapted personal emotions to deal with the emotional demands of their occupation.[124] These terms share similar definitions to problem-focused coping and emotion-focused coping.[18,106,124]

Deep-acting, similar to problem-focused coping, is how an individual changes their perspective on a situation to mitigate stress.[18,106,124] This is referred to as deep-acting because the individual actually changes how they perceive or understand a situation and their outlook on the given situation is revised.[124,132] Deep-acting has been shown to aid in mitigating occupational stress and is not correlated with the feeling of emotional exhaustion.[124] Individuals utilizing deep-acting may be at less risk for occupational burnout since emotional exhaustion is a precursor to burnout. [20,24,119,120,124] Surface-acting, similar to emotion-focused coping, is how an individual modifies outward expressions but does not change inner thoughts or views of the situation.[132,124] Surface-acting is positively associated with the feeling of emotional exhaustion.[124] Therefore, individual utilizing surface-acting may be at an increased risk for occupational burnout.[20,24,119,120,124] Chapman et al. pointed out that emotional arousal has adverse

effects on DHP clinical practice and decision-making, leading to a negative impact on patient care.[22,23,28]

Research on coping strategies used while practicing during the COVID-19 pandemic is limited. Pleassas et al. looked at a sample of 38 dentists and dental nurses in the United Kingdom and identified team meetings, co-worker support, monitoring mental health and wellbeing, taking breaks, not working overtime, spending time outdoors, meditation and coloring were found to be successful coping strategies.[85] A literature review by Bastani et al. found common infection control coping strategies in dental offices included implementing patient screening tools, increased infection control and utilizing virtual or tele-dentistry.[133]

Exploring how DHP are currently dealing with stressors, identifying adaptive and maladaptive coping strategies, may lead to the identification of strategies that support adaptive coping or education to change maladaptive coping strategies with the goal of reducing negative effects of occupational stress and promote wellbeing during pandemics or other disruptive events.[17,19,25–27,44,103–106] DHP who are able to identify emotions and implement coping strategies could increase psychological resilience, wellbeing, and decision-making skills to sustain dental care practices during a major public health crisis and contribute to achieving the Quadruple Aim in dentistry.[22,23,28]

Therefore, the purpose of this study was to identify current perceptions and coping strategies utilized by dental hygienists in five US Midwest states including, Iowa, Minnesota, North Dakota, South Dakota, and Wisconsin, during a major public health crisis, such as a pandemic. This will aid in a better understanding of how these events effect dental hygienists personally, and how dental hygienists are dealing with the effects.

This information can be used by the profession to identify what support may be needed to reduced workforce attrition and betterment of the profession.

SECTION 3

MANUSCRIPT

This manuscript will be submitted to the Journal of Dental Hygiene.

Introduction and Literature Review

On December 30, 2019, in Wuhan City, Hubei province, China, the novel coronavirus—commonly referred to as COVID-19, was detected.[1–3] The introduction of the virus into the United States (US) prompted the Centers for Disease Control and Prevention (CDC) and the Surgeon General to issue a recommendation to cease elective surgeries and procedures in order to reduce the spread of the virus, preserve personal protective equipment (PPE) supplies, and increase patient capacity in hospitals.[5,6] On March 16, 2020 the American Dental Association (ADA) issued similar recommendations for elective dental procedure and preventative care, recommending only emergency dental services be provided.[7]

The CDC developed COVID-19 dental guidelines to support the safety of providers and patients.[5] Suggested changes included: increasing the amount of protective equipment (PPE) worn; increased duration of PPE wear-time; changes to the type of PPE used; limiting doffing of PPE throughout the day; patient screening questions and temperature; administering pre-procedural rinse; enacting ways to reduce aerosols; and reducing or discontinuing the use of the ultrasonic scaler.[5,8,9] These changes result in longer workdays with fewer break, warmer working conditions, decreased visibility, compromised ergonomics and musculoskeletal stress.[5,10]

Dental health professionals (DHP) are at an increased risk of contracting COVID-19 due to the nature of work, including being in close proximity with patients during procedures.[8,9,29–33] Research has shown that COVID-19 can be transmitted by coughing, sneezing, and through contact transmission by touching one's eyes or mucous

membranes.[8,9,34,35] DHP are in high contact with these areas, increasing the risk of transmission. Practicing in an occupation considered high-risk for contracting a disease during a pandemic may lead to increased risk/risk perceptions and stress.

Occupational burnout and reduced wellbeing have also been linked to increased costs, reduced health outcomes, reduced patient satisfaction, and increased employee turnover.[20,21,108,119,120,128–130] It has been identified in a study with 4,776 dental hygienists in the US that the dental hygiene workforce has seen an 8% reduction since the start of the COVID-19 pandemic, March 1,2020, with participants in this study citing concerns about COVID-19 as the reason for employment reduction.[83]

Research has identified increased stress on DHP practicing during the COVID-19 pandemic due to recommended practice changes and the persistent threat of contracting the virus while practicing.[11–14,29,36,40,41,68,84,94] Stress of contracting the virus while practicing is heightened due to the nature of the virus as it is transmitted via aerosols, which are commonly created during many routine dental procedure.[8,9,34] This stress has shown to have a negative effect on mental health in the forms of anxiety, depression, and psychological distress.[11,13,14,29,43] The literature shows that DHP are just as susceptible to the psychological impact of COVID-19 as health care workers (HCW) including frontline HCW.[11–14,29,40–42,44–57] Studies from China, India, Israel, Italy,United Kingdom, and the US have identified that more research is needed to establish proper mental health support systems for DHP practicing during major public health events to decrease perceived demands and the subsequent effects on mental health.[14,29,43]

Further, how DHP perceive the risks of practicing during a pandemic can also affect the amount of stress experienced.[14,29,68,83] Increased risk perceptions may signal

increased demands on DHP resources once again leading to stress, reduced wellbeing and potential for burnout.[15,16,19–23,26–28,44,103,104,107,108,119,120,124,126–131,134,135] Practicing in an environment with other DHP who have differing perceptions of risk may lead to increased occupational stress due to an increase in perceived demands.[14,68,76]

The Transactional Theory of Stress and Coping postulates that stress is experienced when an individual perceives demands exceed personal resources available to handle the demands.[15,16] Demands may include anything requiring more attention or effort from an individual; demands may be physical, emotional, social, or mental.[15,16] Personal resources may include thing such as time, finances, health, safety of self or loved ones.[15,16] Once an individual perceives demands as exceeding resources, the individual will implement coping strategies; if these strategies are not successful in mitigating stress the stress response continus.[16] The continuation of this process means the individual is still experiencing stress, or still perceives demands as exceeding resources.[15,16]

Coping strategies utilized to mitigate stress can be adaptive (successful) or maladaptive (unsuccessful).[17–19] Adaptive coping strategies will aid in stress reduction, maladaptive coping strategies will not reduce stress, may increase risk of burnout, increase occupational dissatisfaction, and negatively affect wellbeing.[17–28] Currently there is no research identifying how DHP are personally coping with the stresses of practicing during the COVID-19 pandemic.

The aim of this descriptive cross-sectional study is to identify perceptions and coping strategies of dental hygienists' in five US Midwest states including Minnesota

(MN) and the surrounding states, Iowa (IA), North Dakota (ND), South Dakota (SD), and Wisconsin (WI), since the start of the COVID-19 pandemic, March 1, 2020.

Methods and Materials

A descriptive cross-sectional survey design was used for this research. This study was conducted by a student investigator and overseen by a primary investigator at the University of Minnesota (UMN) School of Dentistry (SOD). The UMN Institutional Review Board (IRB) deemed this study (STUDY00012814) exempt from oversight due to the nature of the research involving a survey and posing minimal risk to participants.

Informed consent was achieved with an electronic consent form in Qualtrics^{XM}, a secure web-based tool.[136] The voluntary nature of the research was explained in an email which contained a link to the consent form and survey. The survey was not accessible without completing the consent form. The initial email was sent July 2021, and bi-weekly remaindered were sent to non-responders for a total of six weeks. The survey closed to all participants August 2021. Responses were confidential, de-identified and only aggregate data was reported. Only investigators and the statistician had access to the aggregate data. Data integrity was maintained using the UMN Box secure storage.[137] Examiner calibration was not required due to electronic administration.

Participants

Participants included dental hygienists in MN and the surrounding states – IA, ND, SD, and WI. A convenience sample of the dental hygienists was collected by purchasing email addresses of licensed dental hygienists from Complete Medical Lists, a company that provides this information for marketing and research purposes.[138] There was a total of 3,868 email addresses to purchase from Complete Medical Lists for the five

states listed. A power analysis determined sample size was deemed unnecessary due to descriptive research with no hypothesis testing. Inclusion criteria includes licensed dental hygienists practicing dental hygiene on March 1, 2020, or any amount of time during the COVID-19 pandemic. Exclusion criteria includes individuals who are under the age, of 18 and who do not hold a dental hygiene license. Participants self-identified as dental hygienists practicing on March 1,2020 or during any time thenceforth.

Instrument

This instrument was developed by the investigator and was based on the theoretical framework used for this study. The three sections of this instrument were initially piloted tested among fifteen practicing dental hygienists and then modified for comprehension, accuracy, and readability. A second round of pilot testing with eight practicing dental hygienists was completed. Pilot testing of the instrument provided face validity.

The instrument included three sections: demographics, employment, and perceptions/coping strategies. Demographic data included: age, gender, marital status, ethnicity, state, years practicing, practice type, number of coworkers, COVID-19 diagnosis for family/coworkers/patient, and vaccination status. Employment questions included yes/no and open response questions aimed at past and current employment statutes, contributions to changes in employment status. Perception and coping strategies were measured with 38 statements on a 5-point Likert-type scale, 1 = strongly disagree and 5 = strongly agree. Qualitative data was collected with four open questions: “What factors contributed to your decision to leave the profession?”; “What factors will influence your decision to return to the profession?”; “What other factors contributed to

your decision to reduce your working hours?" These questions were only asked of participants who answered yes to either leaving the profession or reducing hours. The last open question, "If you have engaged in practices to improve your mental health during the COVID-19 pandemic please explain these practices", was posed to all participants.

A deductive approach to thematic analysis was used, based on the transactional theory of stress and coping.[15,16] Themes for the first three qualitative questions were developed to encapsulate all forms of demands participants may experience on personal resources.

Statistical Analysis

Survey respondent demographics were summarized as means and standard deviations or frequencies and percentages for continuous and categorical characteristics respectively. For quantitative analysis, bivariate comparisons between respondent demographics and survey responses regarding perceptions and coping strategies were computed using a Fisher's Exact test. Survey responses were both analyzed as the original 5-point Likert scale and a collapsed 3-point Likert scale assessing overall agreement, disagreement, and neither agreement nor disagreement. Qualitative analysis was conducted using inductive analysis to code responses to four open response questions and codes were used to develop themes. All statistical analyses were conducted at the 0.05 significance level using the R statistical software (version 4.1.0).[139]

Results

Of the 3,868 surveys emailed 45 were incomplete, 51 undeliverable, and 167 completed to comprise the final sample with a 4.4% response rate.

The majority of respondents were female, white, age 56 or over, employed full time, and had been in practice for ≥ 21 years (Table 1). Since March 1, 2020, 7.2% of

respondents reported leaving the profession, with the majority citing COVID-19 associated reasons (58.3%, n = 7) with no plans to return (83.3%, n = 10). Reduction in working hours was reported by 8.4% (n = 13) of participants with the majority (61.5%, n = 8) citing risk associated with practicing during the COVID-19 pandemic as the reason for the reduction (Table 2).

Table 3 summarizes participants' perceptions of practicing during the COVID-19 pandemic. The majority of dental hygienists perceived their risk of contracting the COVID-19 virus was increased while practicing (62.3%, n = 104), that practicing during the COVID-19 pandemic was seen as a threat to the health of family and/or loved ones (49.1%, n = 82), and practicing now was more physically demanding than before the pandemic (70.6%, n =118). The COVID-19 vaccine was perceived as reducing the risk while practicing (58.7%, n = 98).

Coping strategies used during the COVID-19 pandemic are summarized in Table 4. Dental hygienists are coping with the stresses of practicing during the COVID-19 pandemic by engaging in practices to improve mental health (42.5%, n = 71), turning to personal relationships (79.1%, n = 132), exercising (43.1%, n = 72), focusing on spirituality (34.2%, n = 57), and increased social media use (44.3%, n = 74). Participants also found themselves becoming more agitated (40.1%, n = 67), and worrying more (46.7%, n = 78), since the start of the pandemic. Other coping strategies used infrequently can be found in Table 4.

Correlations

Correlations were identified between the age of participants and two coping strategies, and years of practice with two coping strategies (Table 5). Table 6 displays the

correlations between stress, risk perceptions, and coping strategies for individuals who considered leaving or left the profession due to stress. Stress and risk of practicing during the COVID-19 pandemic were positively correlated with participants who either left ($p = 0.001$) or considered leaving ($p = <0.001$) the profession (Table 6). In the population who left the profession due to stress (41.6%, $n = 7$), a correlation between stress and worrying was identified ($p = 0.034$). The population who considered leaving the profession due to stress (36.1%, $n = 56$) was correlated with greater perceptions of risk. Coping strategies used by this group included engaging in practices to improve mental health ($p = 0.05$), finding comfort in alcohol ($p = 0.004$), spending more money on non-essential goods and services ($p = 0.004$), becoming more easily agitated ($p = <0.001$), experiencing changes in sleep patterns ($p = <0.001$), and worrying ($p = <0.001$).

Qualitative

Eight themes emerged including Physical and Personal Health Concerns, Retirement, Employer Reduced Hours, Vaccination, Education, PPE, Physical Demand, and Family. The last question pertained to coping strategies, these themes were identified based on likeness. Themes included Physical Activity, Wellness Activity, Religion, Personal Relationships, Education, and Mental Health Management. Themes were identified by reviewing all responses and then grouping common responses within each category. Qualitative data from the open questions is summarized in Tables 7-9.

Discussion

The purpose of this study was to identify dental hygienists' perceptions of practicing during the COVID-19 pandemic, March 1, 2020 to August 14, 2021, and identify coping strategies utilized during this time. This research identified dental

hygienists perceived practicing dental hygiene during the COVID-19 pandemic put them, their families and/or loved ones at more risk of contracting the virus. Further, participants reported practicing dental hygiene was more physically demanding now than before the start of the COVID-19 pandemic. However, the majority of participants felt adequately supported with PPE, education, and employer support. The COVID-19 helped dental hygienists feel they were at less risk while practicing dental hygiene.

Employment

Regarding employment finding in this study, few of the respondents, 7.2% (n=12), reported leaving the profession. However, 8.4% (n=13) reported reduced hours of employment. Reasons for reduced employment were cited as COVID-19 risk, stress, physical demands, concerns about PPE/safety, and employer-reduced hours. These findings are similar to a recent study examining 4,776 dental hygienists' employment status and found 7.9% reported leaving the profession since March 1, 2020 and 6.7% shifted from full to part time.[83] In that study, childcare was a reason cited for leaving the profession.[83] In the current study, that trend was not specifically identified, however family obligations were cited as a reason for reduced hours by 30.8% (n=4) of the dental hygienists who reported reduced hours. The trend of shrinking employment numbers is not exclusive to dental hygiene. A study by Bhandari et al., found a 19% increase in unemployment in dentists from March to April 2020 in the US.[140] This trend is similar in physician and nursing staff but at lower rates, 1.4% and 4% respectively.[140] In agreement with these findings, this study identified one quarter of respondents reported they were considering a different profession than dental hygiene. It is worth noting that current research on the profession of dental hygiene found job satisfaction and burnout to be

correlated with the intention to leave the profession.[141] The perception of increased risk may contribute to a reduction in job satisfaction and increase risk for burnout. Personal burnout and work-related burnout have been correlated, showing that occupational or even non-occupational perceptions may contribute to reduced job satisfaction and have effects on the workforce.[142] These results signify a potential for increased workforce attrition due to the strain of the COVID-19 pandemic. This could become a roadblock for patients seeking care, and dental offices seeking employees. The US Bureau of Labor Statistics (BLS) reported the profession of dental hygiene is projected to grow by 11% between 2020 and 2030.[143] This growth rate is higher than the average occupational growth rate of 8%.[143] BLS also noted dental hygiene job openings in the US are projected to rise from 15,600 to 23,100 by 2030.[143]

Perceptions

Dental hygienists' perceptions while practicing during the COVID-19 pandemic were identified as a heightened level of perceived risk and a perceived threat to the health of self and family/loved ones while practicing dental hygiene. Similarly, other studies have found DHPs perceived the dental setting as high-risk for contracting the SARS CoV-2 virus and a risk to their personal health.[42,72,144,145] In a study by De Stefani et al., dentists perceived the virus as very dangerous and were not confident in being able to work safely.[41] Shenoy et al., found DHPs were scared of becoming infected with the COVID-19 virus from a patient or co-worker and anxious about a possible infection, even with appropriate PPE.[144] Similarly, the participants in this study perceived practicing as a risk and threat to health, even with the majority reporting they have sufficient PPE.[144] This is contrast to Estrich et al., who found appropriate/adequate PPE to be correlated

with less concern about contracting the virus.[43] Other studies found DHPs reported stress about returning to work due to the risk of infection; perceived COVID-19 in the dental setting as very threatening; and perceived practicing dentistry as high risk for infection more than any other activity. [34,145,146] Conversely, the majority of participants in the current study did not agree practicing dental hygiene was riskier than any other activity.

The current study identified 83.8% (n=140) of respondents felt safe with the type of PPE provided and 83.2% (n=139) felt they had an adequate PPE supplied to them. However, feeling adequately protected from the virus while practicing may not be linked to PPE exclusively. In this study the COVID-19 vaccine did help dental hygienists feel they were at less risk while practicing 58.7% (= 98). Likewise, a recent study found the vaccine aided in the reduction of fear and anxiety in dental professionals and led to a reduction in PPE usage.[147] This suggests a combination of vaccination and appropriate PPE may be needed to reduce the feeling of risk.

A survey of 368 dentists by Khade et al., during the COVID-19 pandemic found 43.8% would not treat patients with flu-like symptoms, but 32.3% would allow their staff to treat these patients.[75] Allowing staff to work with potentially infectious patient during a pandemic may increase stress. In contrast to these findings the majority of dental hygienists in our study indicated they felt supported by their employers in the form of good communication from the employer during shutdowns or closures, feeling the employer valued safety and provided appropriate/adequate PPE.

Coping

Addressing the second aim of this study involves understanding dental hygienists coping strategies. Dental hygienists reported a variety of adaptive (positive) and

maladaptive (negative) coping strategies used to mitigate stress during the COVID-19 pandemic. Adaptive coping strategies, mitigate stress, and included engaging in practices that improved mental health, finding support in personal relationships, focusing on personal health in the form of diet, exercise, and spiritual practices. Maladaptive coping strategies do not mitigate stress, and included avoiding social interactions, finding comfort in food, alcohol, or tobacco to deal with stress, spending more money on non-essential goods and services, becoming more easily agitated, changes in sleep patterns, and increased worry.

The Transactional Theory of Stress and Coping identifies stress and coping as an imbalance between an individual's perceived demands and resources.[15,16] Demands can be anything an individual values such as health, safety, or time. This research found dental hygienists perceived themselves and their families and/or loved ones as at risk while practicing during the COVID-19 pandemic. The perception of risk may be a demand that exceeds an individual's resources, leading to stress in this population. Further, they reported dental hygiene practice as more physically demanding now than before the pandemic. Work that is perceived as more physically demanding may also lead to stress.[20,119,120] Dental hygienists may not have the proper support to deal with this stress, which may have contributed to the increased agitation and worry reported by most participants. These maladaptive coping strategies do not mitigate stress.[25,148,149] Utilizing coping strategies that do not mitigate stress will lead an individual to continually experience stress.[15,16] Prolonged stress may lead to reduced wellbeing or even burnout.[19,20,119,120] Unmitigated, prolonged stress, in combination with increased physical

demands while practicing dental hygiene, as reported by the majority of participants, could contribute to dental hygiene workforce attrition.

The majority of participants reported increased social media use since the start of the COVID-19 pandemic. Increased social media use can be considered either an adaptive or maladaptive coping strategy, depending on the context and content of the use.[150] Increased social media used to connect with friends and/or loved ones may offer social support. Additionally, social media can be used to disseminate important formation to professional groups, quickly enhancing understanding and adoption of protective measures.[151] Conversely, higher prevalence of mental health problems have been associated with frequent social media exposures during the COVID-19 pandemic.[152] Frequently viewing disturbing images or reading sensationalized articles may lead an individual to feel they are more at risk of contracting the virus, leading to more stress.[16,152] However, the current study did not specify what content the participants were accessing using social media. [21] Understanding how social media is used by dental hygienists during a public health crisis is important to promoting mental health and wellbeing for workforce retention.

Participants in this study noted using personal relationships to provide support, engaging in practices to improve mental health, and focusing on health in the form of exercise and spirituality as useful coping strategies to mitigate stress. Supporting adaptive coping strategies may help increase wellbeing, reduce stress, and reduce workforce attrition during a public health crisis. The profession could aid in supporting and facilitating these strategies through education and resources geared toward dental hygienists or employers.

A focus on practitioner wellbeing is critical to sustain the dental hygiene workforce during a major public health crisis. The Quadruple Aim of Health Care focuses on practitioner wellbeing as well as improving the experience of care, improving the health of populations, and reducing per capita costs of health care. [21] Striving for the Quadruple Aim in the dental hygiene profession will increase practitioner wellbeing and protect the profession from a potential workforce shortage due to the emotional, mental, and physical demands of practicing during the COVID-19 pandemic. Consideration for the patient when discussing the Quadruple Aim is also a key component. A reduction in the dental hygiene workforce will leave patients without care. It is important to note that practitioner wellbeing has been linked to improved patient outcomes and reduced clinical errors.[153] Ultimately the practitioner and patient will benefit from striving for this aim. However, more research on coping strategies and improved wellbeing is necessary to achieve the Quadruple Aim in dental hygiene.[21]

Limitations

Limitations include a low response rate, recall bias, and self- reporting bias leading to a social desirability bias. A low response rate may be due to the timing of the survey, sent in the middle to late summer of 2021. Participant may have used the summer to recover from children's ever changing learning environment, online to hybrid models. Some potential participants could have used the summer to reduce their connectivity and missed the email. Despite the low response rate, no study has explored perceptions and personal coping strategies of dental hygienists during a pandemic. This study will serve as preliminary evidence for future research.

Future Research

Future research should explore ways to reduce risk perceptions and support coping strategies to reduce stress for dental hygienists practicing during major public health events to improve provider wellbeing and avoid a dental hygiene workforce shortage. Current research on practicing amid the COVID-19 pandemic is largely focused on dentists' knowledge, perceptions, and experiences.[13,29,34,41,42,67–71,74,75,89,94,144,154–156] The role dentists and dental hygienists play in the practice setting are different and more research on the experiences of dental hygienists during this time will offer more insight into the support needed by the profession.

Conclusion

Dental hygienists perceive practicing dental hygiene during the COVID-19 pandemic as putting themselves at risk of contracting the COVID-19 virus and a hazard to their health and the health of their families and/or loved ones. The practice of dental hygiene is more physically demanding than before the COVID-19 pandemic and dental hygienists are more agitated and worried. Dental hygienists are finding ways of coping with these stresses by engaging in practice to improve mental health, using personal relationships for support, exercising, turning to spirituality, and using social media more than before the pandemic. Dental hygienists in this study reported reduced hours of work or leaving the profession, contributing to workforce attrition. The results from this study can be used to understand perceptions of dental hygienists and support successful coping strategies to mitigate stress while practicing during a public health crisis.

SECTION 4

FIGURES AND TABLES:

Table I: Demographics

	n (%)
Age:	
18-25	4 (2.4)
26-35	26 (15.6)
36-45	39 (23.4)
46-55	47 (28.1)
56 or over 51	51 (30.5)
Gender Identity:	
Female	164 (98.2)
Male	2 (1.2)
Transgender	1 (0.6)
Marital status:	
Married / Life Partner	134 (80.2)
Single	18 (10.8)
Divorced / Widowed	14 (8.4)
Prefer not to disclose	1 (0.6)
Race/Ethnicity:	
White	156 (93.4)
Black or African American	1 (0.6)
Asian	1 (0.6)
More Than One Race	5 (3)
Prefer not to disclose	4 (2.4)
State practiced in during the COVID-19 pandemic (March 1, 2020 to present):	
Minnesota	102 (61.1)
California	1 (0.6)
Illinois	2 (1.2)
Iowa	11 (6.6)
Nebraska	1 (0.6)
North Dakota	3 (1.8)
Oregon	1 (0.6)
South Dakota	9 (5.4)
Wisconsin	37 (22.2)
Total years practicing:	
1-5	18 (10.8)
6-10	15 (9)
11-20	36 (21.6)
21-30	51 (30.5)
31 or more	47 (28.1)
Practice setting (may select more than one):	
Academic setting	1 (0.6)
Community/Public/Federally funded practice	6 (3.6)
Corporate practice	13 (7.8)
More than one setting	16 (9.6)
Other	3 (1.8)
Private group general practice	60 (35.9)
Private solo general practice	61 (36.5)
Specialty practice	7 (4.2)
Employment status March 1, 2020:	

Full time	99 (59.3)
Not employed	2 (1.2)
Part time	63 (37.7)
Temporary	3 (1.8)
Current employment status:	
Full time	93 (55.7)
Not employed	4 (2.4)
Part time	59 (35.3)
Retired	8 (4.8)
Temporary	3 (1.8)
Number of friends and/or family diagnosed with COVID-19:	
0	29 (17.4)
1-5	94 (56.3)
6-10	32 (19.2)
11-15	7 (4.2)
16-20	1 (0.6)
More than 20	4 (2.4)
Coworkers diagnosed with COVID-19:	
0	39 (23.4)
1-5	115 (68.9)
6-10	11 (6.6)
11-15	2 (1.2)
Care for patient who have reported a history of COVID-19:	
Yes	154 (92.2)
No	9 (5.4)
Not sure	4 (2.4)
Personally diagnosed with COVID-19:	
Yes	30 (18)
No	137 (82)
Received the COVID-19 vaccine:	
No; do not plan to vaccinate	34(20.4)
No; plan to vaccinate	6 (3.6)
Prefer not to respond	5 (3)
Yes; fully vaccinated	120 (71.9)
Yes; partially vaccinated	2 (1.2)
	Mean (SD)
Number of coworkers worked with in one week:	28.1 (136)
Number of patients cared for in a week:	85.7 (262.2)

Table II: Demographics – Employment

	Response: n (%)
Have you left the profession of dental hygiene since March 1,2020?	Yes: 12 (7.2) No: 155 (92.8)
Was your reason for leaving the profession associated with the COVID-19 pandemic?	Yes: 7 (58.3) No: 5 (41.7)
Do you plan to return to the profession of dental hygiene in the future?	Yes: 2 (16.7) No: 10 (83.3)
Have you reduced your working hours as a dental hygienist due to the COVID-19 pandemic?	Yes: 13 (8.4) No: 142 (91.6)
Have you reduced your work hours due to the risk associated with practicing dental hygiene during the COVID-19 pandemic?	Yes: 8 (61.5) No: 5 (38.5)
Have you reduced your work hours due to family obligations during the COVID-19 pandemic?	Yes: 4 (30.8) No: 9 (69.2)

Table III: Perceptions

	Agree n (%)	Neither n (%)	Disagree n (%)
Q1: Practicing dental hygiene during the COVID-19 pandemic put/puts me at increased risk of contracting the virus.	104 (62.3)	23 (13.8)	40 (24)
Q2: Practicing dental hygiene during the COVID-19 pandemic put/puts me at a greater risk of contracting the virus than any other activity.	65 (38.9)	28 (16.8)	74 (44.3)
Q3: The amount of risk experienced practicing dental hygiene during the COVID-19 pandemic is not acceptable.	22 (13.2)	38 (22.8)	107 (64.1)
Q4: The amount of risk would have been considered acceptable if I had more PPE (Personal Protective Equipment).	30 (18)	47 (28.1)	90 (53.9)
Q5: The amount of risk would be/ have been considered acceptable if I had more training and/or education on infection control measures for personal safety.	18 (10.8)	33 (19.8)	116 (69.4)
Q6: The COVID-19 vaccine will/did help me feel I was at less risk while practicing dental hygiene.	98 (58.7)	21 (12.6)	48 (28.8)
Q7: I see/saw the risk of practicing dental hygiene during the COVID-19 pandemic as a threat to the health of my family and/or loved ones.	82 (49.1)	20 (12)	65 (39)
Q8: I was required to expend personal benefits (paid time off/vacation time) to maintain income during periods of shutdowns or closures.	40 (24)	9 (5.4)	118 (70.6)
Q9: I feel/felt my employer values/valued my safety as an employee.	137 (82)	9 (5.4)	21 (17.4)
Q10: I feel/felt I have/had enough time to allow for increased infection control measures.	98 (58.7)	16 (9.6)	53 (31.8)
Q11: I feel/felt my employer offered adequate support in the form of personal protective equipment (PPE).	139 (83.2)	9 (5.4)	19 (11.4)
Q12: I felt/feel safe with the amount and type of personal protective equipment (PPE) I was provided.	140 (83.8)	11 (6.6)	16 (9.6)
Q13: My employer did a good job maintaining communication with employees during shutdowns or closures.	122 (73)	11 (6.6)	34 (20.4)
Q14: My employer made an effort to communicate with employees who were absent from work due to COVID-19 diagnosis/illness.	92 (55.1)	47 (28.1)	28 (16.8)

Q15: I have considered a different profession other than dental hygiene due to the experience of practicing dental hygiene during the COVID-19 pandemic.	43 (25.8)	15 (9)	109 (65.2)
Q16: I feel/felt practicing dental hygiene is more physically demanding than before the COVID-19 pandemic.	118 (70.6)	14 (8.4)	35 (21)
Q17: I have considered leaving the profession due to increased physical demands of practicing during COVID-19.	55 (35.5)	13 (8.4)	87 (56.1)
Q19: I have considered leaving the profession due to risk associated with practicing during COVID-19.	25 (16.1)	15 (9.7)	115 (74.2)
Q20: I have considered leaving the profession due to increased stress of practicing during COVID-19.	56 (36.1)	18 (11.6)	81 (52.3)
Q18: I left the profession due to increased physical demands of practicing during COVID-19.*	6 (50)	1 (8.3)	5 (41.7)
Q21: I left the profession due to the risk associated with practicing during COVID-19.*	5 (41.6)	4 (33.3)	3 (25)
Q22: I left the profession due to increased stress of practicing during COVID-19.*	7 (58.3)	2 (16.7)	3 (25)

*These questions were only provided to participants who indicated leaving the profession since March 1, 2020.

Table IV: Coping Strategies

	Agree n (%)	Neither n (%)	Disagree n (%)
Q23: I have engaged in practices to improve my mental health since the start of the COVID-19 pandemic.	71 (42.5)	44 (26.3)	52 (31.1)
Q25: I have found my personal relationships have provided support for me during the COVID-19 pandemic.	132 (79.1)	24 (14.4)	11 (6.6)
Q26: I have focused more on personal health in the form of diet since the COVID-19 pandemic.	51 (30.6)	49 (29.3)	67 (40.1)
Q27: I have focused more on personal health in the form of exercise since the COVID-19 pandemic.	72 (43.1)	44 (26.3)	51 (30.6)
Q28: I have focused more on personal health in the form of spirituality since the COVID-19 pandemic.	57 (34.2)	55 (32.9)	55 (32.9)
Q29: I have used social media more since the start of the COVID-19 pandemic.	74 (44.3)	37 (22.2)	56 (33.6)
Q30: I have avoided social media more since the start of the COVID-19 pandemic.	40 (24)	35 (21)	90 (55.1)
Q31: I have avoided social interactions as a coping strategy during the COVID-19 pandemic.	61 (36.5)	22 (13.2)	84 (50.3)
Q32: I have found comfort in food to deal with the stresses of COVID-19.	55 (32.9)	30 (18)	82 (49.1)
Q33: I have found comfort in alcohol to deal with the stresses of COVID-19.	45 (27)	22 (13.2)	100 (59.8)
Q34: I have found comfort in tobacco use to deal with the stresses of COVID-19.	3 (1.8)	3 (1.8)	158 (96.4)
Q35: I have spent more money on non-essential goods and services since the start of the COVID-19 pandemic.	55 (32.9)	27 (16.2)	85 (50.9)
Q36: I have found myself becoming more easily agitated during the COVID-19 pandemic.	67 (40.1)	39 (23.4)	61 (36.5)
Q37: My sleep patterns have changed since the COVID-19 pandemic.	57 (34.2)	26 (15.6)	84 (50.3)
Q38: I have found myself worrying more because of the COVID-19 pandemic.	78 (46.7)	23 (13.8)	66 (39.5)

Table V: Years of Practice Correlations and Age Correlations

	Years of Practice	1-5 (n=18)	6-10 (n=15)	11-20 (n=36)	21-30 (n=51)	30 or more (n=47)	p-value
	n (%)						
Q28: I have focused more on personal health in the form of spirituality since the COVID-19 pandemic.	Agree	4 (22.2%)	6 (40%)	16 (44.4%)	17 (33.3%)	14 (29.8%)	0.038
	Neither	4 (22.2%)	2 (13.3%)	10 (27.8%)	15 (29.4%)	24 (51.1%)	
	Disagree	10 (55.6%)	7 (46.7%)	10 (27.8%)	19 (37.3%)	9 (19.1%)	
Q35: I have spent more money on non-essential goods and services since the start of the COVID-19 pandemic.	Agree	8 (44.4%)	9 (60%)	12 (33.3%)	13 (25.5%)	13 (27.7%)	0.003
	Neither	6 (33.3%)	3 (20%)	8 (22.2%)	3 (5.9%)	7 (14.9%)	
	Disagree	4 (22.2%)	3 (20%)	16 (44.4%)	35(68.6%)	27 (57.4%)	

	Age	18-35 (n=30)	36-45 (n=39)	46-55 (n=47)	56 or over (n=51)	p-value
	n (%)					
Q19: I have considered leaving the profession due to risk associated with practicing during COVID-19.	Agree	9 (30%)	8 (21.6%)	2 (4.4%)	6 (14%)	0.039
	Neither	2 (6.7%)	5 (13.5%)	6 (13.3)	2 (4.7%)	
	Disagree	19 (63.3%)	24 (64.9%)	37 (82.2%)	35 (81.4%)	
Q35: I have spent more money on non-essential goods and services since the start of the COVID-19 pandemic.	Agree	15 (50%)	13 (33.3%)	14 (29.8)	13 (25.5%)	0.011
	Neither	6 (20%)	11 (28.2%)	3 (6.4%)	7 (13.7%)	
	Disagree	9 (30%)	15 (38.5%)	30 (63.8%)	31 (60.8%)	

Table VI: Stress Correlations

Left the profession due to increased stress		Strongly Agree (n=3)	Agree (n=4)	Neither (n=2)	Disagrees (n=1)	Strongly Disagree (n=2)	p-value
Q21: I left the profession due to the risk associated with practicing during COVID-19.	Agree	3 (100%)	2 (50%)	0 (0%)	0 (0%)	0 (0%)	0.011
	Neither	0 (0%)	2 (50%)	2 (100%)	0 (0%)	0 (0%)	
	Disagree	0 (0%)	0 (0%)	0 (0%)	1 (100%)	2 (100%)	
Q38: I have found myself worrying more because of the COVID-19 pandemic.	Agree	3 (100%)	4 (100%)	1 (50%)	1 (100%)	0 (0%)	0.034
	Neither	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	
	Disagree	0 (0%)	0 (0%)	1 (50%)	0 (0%)	2 (100%)	
Considered leaving the profession due to increased stress		Strongly Agree (n=22)	Agree (n=35)	Neither (n=18)	Disagrees (n=55)	Strongly Disagree (n=26)	p-value
Q2: Practicing dental hygiene during the COVID-19 pandemic put/puts me at a greater risk of contracting the virus than any other activity.	Agree	16 (72.7%)	10 (29.4%)	10 (55.6%)	16 (29.1%)	9 (34.6%)	0.027
	Neither	2 (9.1%)	5 (14.7%)	1 (5.6%)	11 (20%)	4 (15.4%)	
	Disagree	4 (18.2%)	19(55.9%)	7 (38.9%)	28 (50.9%)	13 (50%)	
Q3: The amount of risk experienced practicing dental	Agree	7 (31.8%)	4 (11.8%)	3 (16.7%)	3 (5.5%)	1 (3.8%)	<0.001

hygiene during the COVID-19 pandemic is not acceptable.	Neither	10 (45.5%)	9 (26.5%)	5 (27.8%)	6 (10.9%)	5 (19.2%)	
	Disagree	5 (22.7%)	21 (61.8%)	10 (55.6%)	46 (83.6%)	20 (76.9%)	
Q4: The amount of risk would have been considered acceptable if I had more PPE (Personal Protective Equipment).	Agree	8 (36.4%)	10 (29.4%)	4 (22.2%)	3 (5.5%)	2 (7.7%)	0.001
	Neither	6 (27.3%)	8 (23.5%)	9 (50%)	15 (27.3%)	5 (19.2%)	
	Disagree	8 (36.4%)	16 (47.1%)	5 (27.8%)	37 (67.3%)	19 (73.1%)	
Q5: The amount of risk would be/have been considered acceptable if I had more training and/or education on infection control measures for personal safety.	Agree	4 (18.2%)	7 (20.6%)	4 (22.2%)	1 (1.8%)	1 (3.8%)	0.003
	Neither	7 (31.8%)	6 (17.6%)	6 (33.3%)	8 (14.5%)	4 (15.4%)	
	Disagree	11 (50%)	21 (61.8%)	8 (44.4%)	46 (83.6%)	21 (80.8%)	
Q6: The COVID-19 vaccine will/did help me feel I was at less risk while practicing dental hygiene.	Agree	12 (54.5%)	25 (73.5%)	15 (83.3%)	29 (52.7%)	11 (42.3%)	0.011
	Neither	2 (9.1%)	6 (17.6%)	0 (0%)	8 (14.5%)	2 (7.7%)	
	Disagree	8 (36.4%)	3 (8.8%)	3 (16.7%)	18 (32.7%)	13 (50%)	
Q7: I see/saw the risk of practicing dental hygiene	Agree	15 (68.2%)	22 (64.7%)	10 (55.6%)	22 (40%)	7 (26.9%)	0.018

during the COVID-19 pandemic as a threat to the health of my family and/or loved ones.	Neither	3 (13.6%)	4 (11.8%)	0 (0%)	7 (12.7%)	5 (19.2%)	
	Disagree	4 (18.2%)	8 (23.5%)	8 (44.4%)	26 (47.3%)	14 (58.8%)	
Q19: I have considered leaving the profession due to risk associated with practicing during COVID-19.	Agree	13 (59.1%)	11 (32.4%)	1 (5.6%)	0 (0%)	0 (0%)	<0.011
	Neither	4 (18.2%)	2 (5.9%)	7 (38.9%)	2 (3.6%)	0 (0%)	
	Disagree	5 (22.7%)	21 (61.8%)	10 (55.6%)	53 (96.4%)	26 (100%)	
Q23: I have engaged in practices to improve my mental health since the start of the COVID-19 pandemic.	Agree	15 (68.2%)	18 (52.9%)	8 (44.4%)	19 (34.5%)	7 (26.9%)	0.05
	Neither	5 (22.7%)	5 (14.7%)	3 (16.7%)	17 (30.9%)	10 (38.5%)	
	Disagree	2 (9.1%)	11 (32.4%)	7 (38.9%)	19 (34.5%)	9 (34.6%)	
Q33: I have found comfort in alcohol to deal with the stresses of COVID-19.	Agree	13 (59.1%)	7 (20.6%)	7 (38.9%)	13 (23.6%)	3 (11.5%)	0.004
	Neither	3 (13.6%)	5 (14.7%)	4 (22.2%)	5 (9.1%)	2 (7.7%)	
	Disagree	6 (27.3%)	22 (64.7%)	7 (38.9%)	37 (67.3%)	21 (80.8%)	
Q35: have spent more money on non-essential goods and	Agree	8 (36.4%)	20 (58.8%)	4 (22.2%)	16 (29.1%)	4 (15.4%)	0.004

services since the start of the COVID-19 pandemic.	Neither	5 (22.7%)	1 (2.9%)	6 (33.3%)	10 (18.2%)	3 (11.5%)	
	Disagree	9 (40.9%)	13 (38.2%)	8 (44.4%)	29 (25.7%)	19 (73.1%)	
Q36: I have found myself becoming more easily agitated during the COVID-19 pandemic.	Agree	17 (77.3%)	16 (47.1%)	9 (50%)	14 (25.5%)	6 (23.1%)	<0.001
	Neither	2 (9.1%)	8 (23.5%)	7 (38.9%)	15 (27.3%)	5 (19.2%)	
	Disagree	3 (13.6%)	10 (29.4%)	1 (11.1%)	26 (47.3%)	15 (57.7%)	
Q37: My sleep patterns have changed since the COVID-19 pandemic.	Agree	14 (63.6%)	13 (38.2%)	5 (27.8%)	14 (25.5%)	3 (11.5%)	<0.001
	Neither	2 (9.1%)	5 (14.7%)	9 (50%)	5 (9.1%)	3 (11.5%)	
	Disagree	6 (27.3%)	16 (47.1%)	4 (22.2%)	36 (65.5%)	20 (76.9%)	
Q38: I have found myself worrying more because of the COVID-19 pandemic.	Agree	15 (68.2%)	22 (64.7%)	9 (50%)	18 (32.7%)	5 (19.2%)	<0.001
	Neither	4 (18.2%)	6 (17.6%)	5 (27.8%)	7 (12.7%)	1 (3.8%)	
	Disagree	3 (13.6%)	6 (17.6%)	4 (22.2%)	30 (54.5%)	20 (76.9%)	

Table VII: Qualitative Responses and Associated Themes by Questions

Question	Theme	Responses
Q4 What factors contributed to your decision to leave the profession?	Physical and Personal Health Concerns	Work was much harder
		Was too exhausting
		I have heart problems and decided to retire
	Retirement	To have to wear all the PPE layers was what made me decide to retire earlier than planned
	Employer Reduced Hours	Laid off for seven weeks
Q5 What factors will influence your decision to return to the profession?	Vaccine	More of the population is vaccinated
	Education	More safety knowledge
Q9 What other factors contributed to your decision to reduce your working hours?	PPE	Uncomfortable with PPE
		The specialty practice did not support me with proper PPE
	Employer Reduced Hours	DDS cut hours
		Lower patient demand
	Physical Demands	Physically exhausting
		Burnout
		No cavitron
	Family	Elderly parents
Q24 If you have engaged in practices to improve your mental health during the COVID-19 pandemic please explain these practices.	Physical Activity	Exercising more
		Bike rides
		Yoga
	Wellness Activity	Meditate or nap after work to clear my stress of the day
		Get out of the office on lunch breaks
	Religion	Getting closer to God
		Devotions
		More spiritual direction
		Read the Bible more
	Personal Relationships	Zoom and FaceTime with friends and family
		Talking through struggles with friends and family
		Discussing my anxiety with close friends
	Mental Health Management	Essential oils for anxiety
		Counseling
		Prescription anti-depressants/anti-anxiety
		Increased does of Prozac
	Education	Educating myself on pandemic, knowledge is power
		Educating myself on COVID, infection control, and prevention
		COVID education

Table VIII: Themed Responses to Qualitative Questions 4, 5, and 9

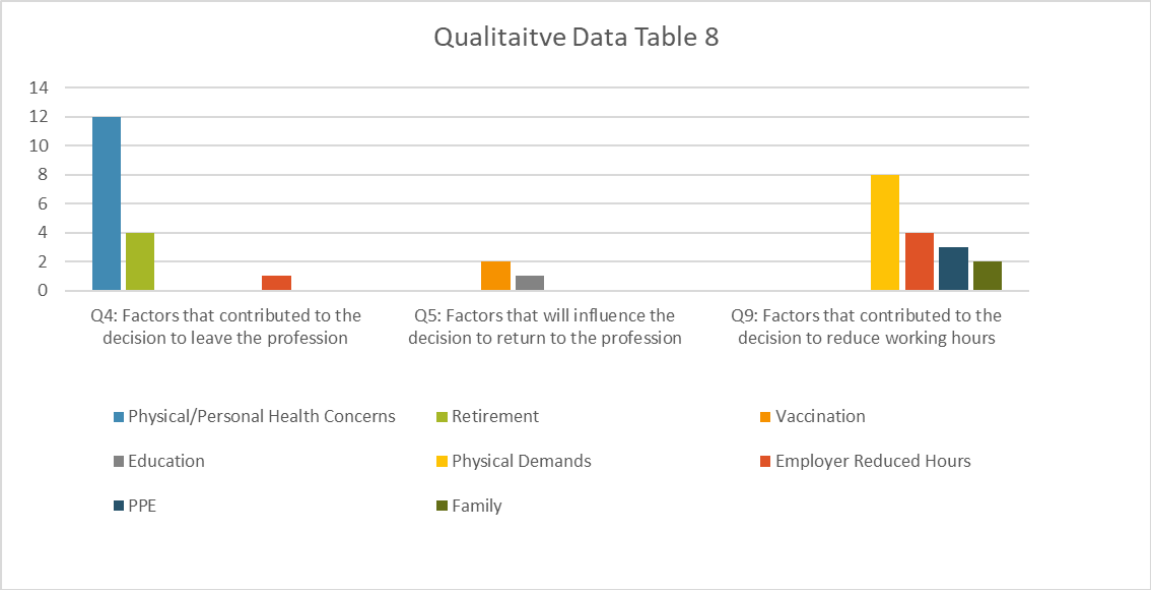
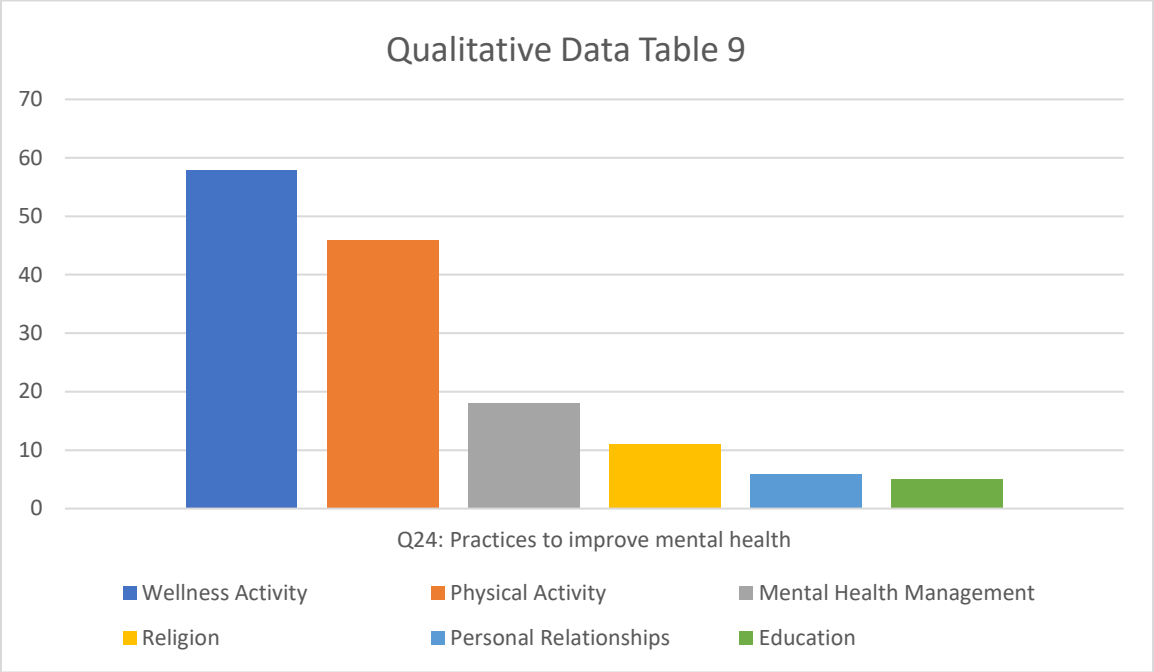


Table IX: Themed Responses to Qualitative Question 24



SECTION 5

BIBLIOGRAPHY
Comprehensive list of references:

References

1. WHO, Aylward, Bruce (WHO); Liang W (PRC). Report of the WHO-China joint mission on coronavirus disease 2019 (COVID-19). WHO-China Jt mission Coronavirus Dis 2019. 2020;2019(February):16–24.

2. Peng X, Xu X, Li Y, Cheng L, Zhou X, Ren B. Transmission routes of 2019-nCoV and controls in dental practice. Int J Oral Sci. 2020;12(1):1–6.

3. Zhou P, Yang X Lou, Wang XG, Hu B, Zhang L, Zhang W, et al. A pneumonia outbreak associated with a new coronavirus of probable bat origin. Nature. 2020;579(7798):270–3.

4. Holshue ML, DeBolt C, Lindquist S, Lofy KH, Wiesman J, Bruce H, et al. First case of 2019 novel coronavirus in the United States. N Engl J Med. 2020;382(10):929–36.

5. Centers for Disease Control and Prevention: Guidance for the dental setting [Internet]. Atlanta (GA) [cited 8 Oct 2020]. Available from: https://www.cdc.gov/coronavirus/2019-ncov/hcp/dental-settings.html.

6. Health and Human Services: Surgeon General News Release [Internet]. Washington (DC) [cited 8 Oct 2020]. Available from: https://www.hhs.gov/about/leadership/secretary/news-releases/2020-news-releases/index.html.

7. American Dental Association: New release 2020 archive [Internet]. Chicago (IL) [cited 4 Nov 2020]. Available from: https://www.ada.org/en/press-room/news-releases/2020-archives?pn=3.

8. Checchi V, Bellini P, Bencivenni D, Consolo U. COVID-19 dentistry-related aspects: A literature overview. Int Dent J. 2020;1–7.

9. Shi AH, Guo W, Chng CK, Chan BH. Precautions when providing dental care during coronavirus disease 2019 (COVID-19) pandemic. Ann Acad Med Singap. 2020 May;49(5):312–9.

10. Dental Post. The state of the RDH career in 2021. RDHmag [Internet]. 2021 Feb 1 [cited 2021 Feb 22];41(2):16-19. Available from: https://www.rdhmag.com/career-profession/article/14190024/the-state-of-the-rdh-career-in-202.

11. Mahendran K, Patel S, Sproat C. Psychosocial effects of the COVID-19 pandemic on staff in a dental teaching hospital. Br Dent J. 2020;229(2):127–32.

12. Fontana M, McCauley L, Fitzgerald M, Eckert GJ, Yanca E, Eber R. Impact of COVID-19 on life experiences of essential workers attending a dental testing facility. JDR ClinTrans Res. 2021 Jan;(6):24-39.

13. Consolo U, Bellini P, Bencivenni D, Iani C, Checchi V. Epidemiological aspects and psychological reactions to COVID-19 of dental practitioners in the northern Italy districts of Modena and Reggio Emilia. Int J Environ Res Public Health. 2020 May;17(10):3459.

14. Shacham M, Hamama-Raz Y, Kolerman R, Mijiritsky O, Ben-Ezra M, Mijiritsky E. COVID-19 factors and psychological factors associated with elevated psychological distress among dentists and dental hygienists in Israel. Int J Environ Res Public Health. 2020 Apr22;17(8):2900.

15. Lazarus R, Folkman S. Stress appraisal and coping. New York: Springer; 1984.

16. Folkman S, Lazarus RS. The relationship between coping and emotion: Implications for theory and research. Soc Sci Med. 1988;26(3):309-17.

17. Sanchez-Craig BM. Cognitive and behavioral coping strategies in the reappraisal of stressful social situations. J Couns Psychol. 1976;23(1):7–12.

18. Shin H, Park YM, Ying JY, Kim B, Noh H, Lee SM. Relationships between coping strategies and burnout symptoms: A meta-analytic approach. Prof Psychol: Res Prac. 2014;45(1):44–56.

19. Ceslowitz SB. Burnout and coping strategies among hospital staff nurses. J Adv Nurs. 1989 Jul;14(7):553–8.

20. Maslach C, Schaufeli WB, Leiter MP. Job burnout. Annu Rev Psychol. 2001;52:397–422.

21. Bodenheimer T, Sinsky C. From triple to quadruple aim: care of the patient requires care of the provider. Ann Fam Med. 2014 Nov-Dec 12(6):573–6.

22. Chapman HR, Chipchase SY, Bretherton R. Understanding emotionally relevant situations in primary dental practice. 2. Reported effects of emotionally charged situations. Br Dent J. 2015 Nov 13;219(9):8.

23. Chapman HR, Chipchase SY, Bretherton R. Understanding emotionally relevant situations in primary dental practice. 3. Emerging narratives. Br Dent J. 2015 Nov 27;219(10):491–6.

24. Quick JC, Henderson DF. Occupational stress: Preventing suffering, enhancing wellbeing. Int J Environ Res Public Health. 2016 Apr 29;13(5):459-70.

25. Cai H, Tu B, Ma J, Chen L, Fu L, Jiang Y, et al. Psychological impact and coping strategies of frontline medical staff in Hunan between January and March 2020

during the outbreak of coronavirus disease 2019 (COVID) in Hubei, China. Med Sci Monit. 2020 Apr 15;26:1–16.

26. Payne N. Occupational stressors and coping as determinants of burnout in female hospice nurses. J Adv Nurs. 2001 Feb;33(3):396–405.

27. Chew QH, Wei KC, Vasoo S, Sim K. Psychological and coping responses of health care workers toward emerging infectious disease outbreaks: A rapid review and practical implications for the COVID-19 pandemic. J Clin Psychiatry. 2020 Oct 20;81(6):350–6.

28. Chapman HR, Chipchase SY, Bretherton R. Understanding emotionally relevant situations in primary care dental practice: 1. Clinical situations and emotional responses. Br Dent J. 2015 Oct 23;219(8):401–9.

29. Mijiritsky E, Hamama-Raz Y, Liu F, Datarkar AN, Mangani L, Caplan J, et al. Subjective overload and psychological distress among dentists during COVID-19. Int J Environ Res Public Health. 2020 Jul 14;17(14):5074-84.

30. To KK-W, Tsang OT-Y, Yip CC-Y, Chan K-H, Wu T-C, Chan JM-C, et al. Consistent detection of 2019 novel coronavirus in saliva. Clin Infect Dis. 2020 Jul 28;71(15):841–3.

31. Wei J, Li Y. Airborne spread of infectious agents in the indoor environment. Am J Infect Control. 2016 Sep 2;44(9):102–8.

32. Cleveland JL, Gray SK, Harte JA, Robison VA, Moorman AC, Gooch BF. Transmission of blood-borne pathogens in US dental health care settings: 2016 update. J Am Dent Assoc. 2016 Sep;147(9):729–38.

33. Rothe C, Schunk M, Sothmann P, Bretzel G, Froeschl G, Wallrauch C, et al. Transmission of 2019-nCoV infection from an asymptomatic contact in Germany. N Engl J Med. 2020 Mar 5;382(10):970–1.

34. Gambarini G, Galli M, Gambarini E, di Nardo D, Seracchiani M, Obino FV, et al. Fine aerosols and perceived risk of COVID-19 among Italian dental practitioners: an experimental survey. J Contemp Dent Pract. 2020 Jun 1;21(6):599–603.

35. Belser JA, Rota PA, Tumpey TM. Ocular tropism of respiratory viruses. Microbiol Mol Biol Rev. 2013 Mar;77(1):144–56.

36. Giacalone A, Rocco G, Ruberti E. Physical health and psychosocial considerations during the coronavirus disease 2019 outbreak. Psychosomatics. 2020 Nov-Dec;61(6):851-52.

37. Fontana M, McCauley L, Fitzgerald M, Eckert GJ, Yanca E, Eber R. Impact of COVID-19 on life experiences of essential workers attending a dental testing facility. JDR Clin Trans Res. 2020 Jan;6(1):24-39.

38. Alkhalifah FN, Tobbal AY, Fried JL. COVID-19 impact, knowledge and preparedness among dental hygienists in Saudi Arabia: A cross-sectional study. Int J Dent Hyg. 2021 Nov;19(4):464-73.

39. Mahendran K, Patel S, Sproat C. Psychosocial effects of the COVID-19 pandemic on staff in a dental teaching hospital. Br Dent J. 2020 Jul;229(2):127–32.

40. Tysiąc-Miśta M, Dziedzic A. The attitudes and professional approaches of dental practitioners during the COVID-19 outbreak in Poland: A cross-sectional survey. Int J Environ Res Public Health. 2020 Jun 30;17(13):4703–20.

41. De Stefani A, Bruno G, Mutinelli S, Gracco A. COVID-19 outbreak perception in Italian dentists. Int J Environ Res Public Health. 2020 May 29;17(11):3867-76.

42. Arora S, Saquib SA, Attar N, Pimpale S, Zafar KS, Saluja P, et al. Evaluation of knowledge and preparedness among Indian dentists during the current covid-19 pandemic: A cross-sectional study. J Multidiscip Healthc. 2020 Aug 24;13:841–54.

43. Estrich CG, Gurenlian JR, Battrell A, Bessner SK, Lynch A, Mikkelsen M, et al. COVID-19 prevalence and related practices among dental hygienists in the United States. J Dent Hyg. 2021 Feb;95(1):6–16.

44. Balasubramanian A, Paleri V, Bennett R, Paleri V. Impact of COVID-19 on the mental health of surgeons and coping strategies. Head Neck. 2020 Jul;42(7):1638–44.

45. Dubey S, Biswas P, Ghosh R, Chatterjee S, Dubey MJ, Chatterjee S, et al. Psychosocial impact of COVID-19. Diabetes Metab Syndr. 2020 Sep-Oct;14(5):779–88.

46. Lai J, Ma S, Wang Y, Cai Z, Hu J, Wei N, et al. Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019. JAMA Netw Open. 2020 Mar 2;3(3):203976.

47. Shechter A, Diaz F, Moise N, Anstey DE, Ye S, Agarwal S, et al. Psychological distress, coping behaviors, and preferences for support among New York healthcare workers during the COVID-19 pandemic. Gen Hosp Psychiatry. 2020 Sep-Oct;66:1–8.

48. Yin Q, Sun Z, Liu T, Ni X, Deng X, Jia Y, et al. Posttraumatic stress symptoms of health care workers during the corona virus disease 2019. Clin Psychol Psychother. 2020 May;27(3):384–95.

49. Mrklas K, Shalaby R, Hrabok M, Gusnowski A, Vuong W, Surood S, et al. Prevalence of perceived stress, anxiety, depression, and obsessive-compulsive symptoms in health care workers and other workers in Alberta during the

COVID-19 Pandemic: A cross-sectional survey. JMIR Mental Health. 2020 Sep 25;7(9):22408.

50. Shrestha SL. Prevalence of psychological effect of COVID-19 on medical professionals in a tertiary care center. JNMA J Nepal Med Ass. 2020 Aug 31;58(228):550–53.

51. Xiao X, Zhu X, Fu S, Hu Y, Li X, Xiao J. Psychological impact of healthcare workers in China during COVID-19 pneumonia epidemic: a multi-center cross-sectional survey investigation. J Affect Disord. 2020 Sep 1;274:405–10.

52. Amin F, Sharif S, Saeed R, Durrani N, Jilani D. COVID-19 pandemic-knowledge, perception, anxiety and depression among frontline doctors of Pakistan. BMC Psychiatry. 2020 Sep 23;20(1):459-68.

53. Cai Z, Cui Q, Liu Z, Li J, Gong X, Liu J, et al. Nurses endured high risks of psychological problems under the epidemic of COVID-19 in a longitudinal study in Wuhan China. J Psychiatr Res. 2020 Dec;131:132–7.

54. Aksoy YE, Koçak V. Psychological effects of nurses and midwives due to COVID-19 outbreak: The case of Turkey. Arch of Psychiatr Nurs. 2020 Oct;34(5):427–33.

55. Kang L, Li Y, Hu S, Chen M, Yang C, Yang BX, et al. The mental health of medical workers in Wuhan, China dealing with the 2019 novel coronavirus. Lancet Psychiatry. 2020 Mar;7(3):14.

56. Chen Q, Liang M, Li Y, Guo J, Fei D, Wang L, et al. Mental health care for medical staff in China during the COVID-19 outbreak. Lancet Psychiatry. 2020 Apr;7(4):15–6.

57. Talevi D, Socci V, Carai M, Carnaghi G, Faleri S, Trebbi E, et al. Mental health outcomes of the CoViD-19 pandemic. Riv Psichiatr. 2020 May-Jun;55(3):137–44.

58. Isiekwe IG, Adeyemi TE, Aikins EA, Umeh OD. Perceived impact of the COVID-19 pandemic on orthodontic practice by orthodontists and orthodontic residents in Nigeria. J World Fed Orthod. 2020 Sep;9(3):123–8.

59. Arvidsdotter T, Marklund B, Kylén S, Taft C, Ekman I. Understanding persons with psychological distress in primary health care. Scand J Caring Sci. 2016 Dec;30(4):687–94.

60. Alonso J, Mortier P, Auerbach RP, Bruffaerts R, Vilagut G, Cuijpers P, et al. Severe role impairment associated with mental disorders: results of the WHO world mental health surveys international college student project. Depress Anxiety. 2018 Sep;35(9):802–14.

61. Kessler RC, Berglund P, Demler O, Jin R, Koretz D, Merikangas KR, et al. The epidemiology of major depressive disorder. JAMA. 2003 Jun 18;289(23):3095-105.

62. Kroenke K, Spitzer R, Williams J. The patient health questionnaire-2: Validity of a two-item depression screener. Med Care. 2003 Nov;41(11):1284-92.

63. Spitzer RL, Kroenke K, Williams JBW. Validation and utility of a self-report version of prime-med. JAMA. 1999 Nov 10;282(18):1737-44.

64. Brown TA, O'Leary TA, Barlow DH. Clinical handbook of psychological disorders .3rd ed. New York: Guilford Publications; 2001. Chapter 4, Generalized anxiety disorder; p. 154-208.

65. Löwe B, Wahl I, Rose M, Spitzer C, Glaesmer H, Wingenfeld K, et al. A 4-item measure of depression and anxiety: validation and standardization of the patient health questionnaire-4 (PHQ-4) in the general population. J Affect Disord. 2010 Apr;122(1–2):86–95.

66. Spitzer RL, Kroenke K, Williams JBW, Löwe B. A brief measure for assessing generalized anxiety disorder: The GAD-7. Arch Intern Med. 2006 May 22;166(10):1092–7.

67. Tysiąc-Miśta M, Dziedzic A. The attitudes and professional approaches of dental practitioners during the COVID-19 outbreak in Poland: A cross-sectional survey. Int J Environ Res Public Health. 2020 Jun 30;17(13):4703-20.

68. Shirahmadi S, Seyedzadeh-Sabounchi S, Khazaei S, Bashirian S, Miresmæili AF, Bayat Z, et al. Fear control and danger control amid COVID- 19 dental crisis: Application of the extended parallel process model. PLoS One. 2020 Aug 13;15(8):0237490.

69. Putrino A, Raso M, Magazzino C, Galluccio G. Coronavirus (COVID-19) in Italy: knowledge, management of patients and clinical experience of Italian dentists during the spread of contagion. BMC Oral Health. 2020 Jul 10;20(1):200-15.

70. Cagetti MG, Cairoli JL, Senna A, Campus G. COVID-19 outbreak in North Italy: An overview on dentistry. A questionnaire survey. Int J Environ Res Public Health. 2020 May 28;17(11):3835.

71. Singh KT, Mishra G, Shukla AK, Behera S, Tiwari AK, Panigrahi S, et al. Preparedness among dental professionals towards COVID-19 in India. Pan Afr Med J. 2020 Jun 19;36:108-17.

72. Kamate SK, Sharma S, Thakar S, Srivastava D, Sengupta K, Hadi AJ, et al. Assessing knowledge, attitudes and practices of dental practitioners regarding the

Covid-19 pandemic: A multinational study. Dent Med Probl. 2020 Jan-Mar;57(1):11–7.

73. Quadri MFA, Jafer MA, Alqahtani AS, al mutahar SAB, Odabi NI, Daghriri AA, et al. Novel corona virus disease (COVID-19) awareness among the dental interns, dental auxiliaries and dental specialists in Saudi Arabia: A nationwide study. J Infect Public Health. 2020 Jun;13(6):856–64.

74. Duruk G, Gümüşboğa ZŞ, Çolak C. Investigation of Turkish dentists' clinical attitudes and behaviors towards the COVID-19 pandemic: A survey study. Braz Oral Res. 2020;34:054.

75. Khader Y, al Nsour M, Al-Batayneh OB, Saadeh R, Bashier H, Alfaqih M, et al. Dentists' awareness, perception, and attitude regarding COVID-19 and infection control: cross-sectional study among Jordanian dentists. JMIR Public Health Surveill. 2020 Apr 9;6(2):18798.

76. Chaudhary FA, Ahmad B, Ahmad P, Khalid MD, Butt DQ, Khan SQ. Concerns, perceived impact, and preparedness of oral healthcare workers in their working environment during COVID-19 pandemic. J Occup Health. 2020 Jan;62(1):12168.

77. Ge Z yu, Yang L ming, Xia J jia, Fu X hui, Zhang Y zhen. Possible aerosol transmission of COVID-19 and special precautions in dentistry. J Zhejiang Univ Sci B. 2020 May;21(5):361–8.

78. Meng L, Hua F, Bian Z. Coronavirus disease 2019 (COVID-19): Emerging and future challenges for dental and oral medicine. J Dent Res. 2020 May;99(5):481–7.

79. Odeh ND, Babkair H, Abu-Hammad S, Borzangy S, Abu-Hammad A, Abu-Hammad O. COVID-19: present and future challenges for dental practice. Int J Environ Res Public Health. 2020 Apr 30;17(9)3151-61.

80. Spagnuolo G, de Vito D, Rengo S, Tatullo M. COVID-19 Outbreak: an overview on dentistry. Int J Environ Res Public Health. 2020 Mar 22;17(6):2094.

81. Umer F, Haji Z, Zafar K. Role of respirators in controlling the spread of novel coronavirus (COVID-19) amongst dental healthcare providers: A review. Int Endod J. 2020 Aug;53(8):1062–7.

82. Lu C-W, Liu X-F, Jia Z-F. 2019-nCoV transmission through the ocular surface must not be ignored. Lancet. 2020 Feb 22;395(10224):e39.

83. Gurenlian JR, Morrissey R, Estrich CG, Battrell A, Bessner SK, Lynch A, et al. Critical issues facing the dental hygiene profession employment patterns of dental hygienists in the United States during the COVID-19 pandemic. J Dent Hyg. 2021 Feb;95(1):17-24.

84. Hua F, Qin D, Yan J, Zhao T, He H. COVID-19 related experience, knowledge, attitude, and behaviors among 2,669 orthodontists, orthodontic residents, and nurses in China: A cross-sectional survey. Front Med. 2020 Aug 7;7:481-8.

85. Plessas A, Paisi M, Baines R, Wheat H, Delgado MB, Mills I, et al. Frontline experiences and perceptions of urgent dental care centre staff in England during the COVID-19 pandemic: A qualitative study. Br Dent J. 2021 Sep 6;1-10.

86. Gambarini G, Galli M, Gambarini E, di Nardo D, Seracchiani M, Obino FV, et al. Fine aerosols and perceived risk of COVID-19 among Italian dental practitioners: An experimental survey. J Contemp Dent Pract. 2020 Jun 1;21(6):599–603.

87. Chaudhary FA, Ahmad B, Ahmad P, Khalid MD, Butt DQ, Khan SQ. Concerns, perceived impact, and preparedness of oral healthcare workers in their working environment during COVID-19 pandemic. J Occup Health. 2020 Jan;62(1):e12168.

88. Guo H, Zhou Y, Liu X, Tan J. The impact of the COVID-19 epidemic on the utilization of emergency dental services. J Dent Sci. 2020 Dec;15(4):564-7.

89. Martinho FC, Griffin IL. A cross-sectional survey on the impact of coronavirus disease 19 (Covid-19) on the clinical practice of endodontists across the United States. J Endod. 2020 Jan;47(1):28-38.

90. Ahmed MA, Jouhar R, Adnan S, Ahmed N, Ghazal T, Adanir N. Evaluation of patient's knowledge, attitude, and practice of cross-infection control in dentistry during COVID-19 pandemic. Eur J Dent. 2020 Dec;14(1):S1–6.

91. Aquilanti L, Gallegati S, Temperini V, Ferrante L, Skrami E, Procaccini M, et al. Italian response to coronavirus pandemic in dental care access: The DeCADE study. Int J Environ Res Public Health. 2020 Sep 24;17(19):6977-89.

92. González-Olmo MJ, Ortega-Martínez AR, Delgado-Ramos B, Romero-Maroto M, Carrillo-Diaz M. Perceived vulnerability to coronavirus infection: Impact on dental practice. Braz Oral Res. 2020 May 8;34:1–9.

93. Aravind A, Nair S, Aparna T, Thomas A, Oommen S, Vijayan A. Attention to COVID-19 pandemic among dental experts of Kerala State, India: A knowledge, attitude, and practice study. J Pharm Bioallied Sci. 2021 Jun 5;13(1):836-40.

94. Ahmed MA, Jouhar R, Ahmed N, Adnan S, Aftab M, Zafar MS, et al. Fear and practice modifications among dentists to combat novel coronavirus disease (COVID-19) outbreak. Int J Environ Res Public Health. 2020 Apr 19;17(8)2821.

95. Dreher A, Pietrowsky R, Loerbroks A. Attitudes, stressors and work outcomes related to the COVID-19 pandemic among dental assistants in Germany: A cross-sectional study. BMJ Open. 2021 Sep 15;11(9):045881.

96. Hua F, Qin D, Yan J, Zhao T, He H. COVID-19 related experience, knowledge, attitude, and behaviors among 2,669 orthodontists, orthodontic residents, and nurses in China: A cross-sectional survey. Front Med. 2020 Aug 7;7:481-94.

97. Shariff S, Benten M, Ahmed Al-Zabidi M, Alshehri G, Almehmadi A, F Alhazmi S, et al. Knowledge and attitude towards dental clinical practice related to COVID-19 pandemic among dental interns in Saudi Arabia. J Pharm Bioallied Sci. 2021 Jun;13(1):831-35.

98. Humagain M, Humagain R, Rokaya D. Dental practice during COVID-19 in Nepal: A descriptive cross-sectional study. JNMA J Nepal Med Assoc. 2020 Oct 15;58(230):764–9.

99. Moffat RC, Yentes CT, Crookston BT, West JH. Patient perceptions about professional dental services during the COVID-19 pandemic. JDR Clin Trans Res. 2021 Jan;6(1):15–23.

100. Abdulkareem AA, Abdulbaqi HR, Alshami ML, Al-Rawi NH. Oral health awareness, attitude towards dental treatment, fear of infection, and economic impact during COVID-19 pandemic in the Middle East. Int J Dent Hyg. 2021 Aug;19(3):295-304.

101. Berwick DM, Nolan TW, Whittington J. The triple aim: care, health, and cost. Health Aff. 2008 May-Jun;27(3):759-69.

102. Akinkugbe AA, Garcia DT, Smith CS, Brickhouse TH, Mosavel M. A descriptive pilot study of the immediate impacts of COVID-19 on dental and dental hygiene students' readiness and wellness. J Dent Educ. 2021 Mar;85(3):401-410.

103. Man MA, Toma C, Motoc NS, Necrelescu OL, Bondor CI, Chis AF, et al. Disease perception and coping with emotional distress during Covid-19 pandemic: A survey among medical staff. Int J Environ Res Public Health. 2020 Jul 7;17(13):4899-912.

104. Savitsky B, Findling Y, Ereli A, Hendel T. Anxiety and coping strategies among nursing students during the Covid-19 pandemic. Nurse Educ Pract. 2020 Jul;46(1):102809.

105. Park CL, Russell BS, Fendrich M, Finkelstein-Fox L, Hutchison M, Becker J. Americans' COVID-19 stress, coping, and adherence to CDC guidelines. J Gen Intern Med. 2020 Aug;35(8):2296–303.

106. Baker JP, Berenbaum H. Emotional approach and problem-focused coping: A comparison of potentially adaptive strategies. Cogn Emot. 2007;21(1):95–118.

107. Fletcher B, Jones F. A refutation of Karasek's demand-discretion model of occupational stress with a range of dependent measures. 1993;14(4):319–30.

108. Ivancevich JM, Matteson MT, Preston C. Occupational stress, type A behavior, and physical wellbeing. Acad Manage J. 1982 Jun;25(2):373–91.

109. Carver CS, Scheier MF, Weintraub KJ. Assessing coping strategies: a theoretically based approach. J Pers Soc Psychol. 1989 Feb;56(2):267–83.

110. Carver CS. You want to measure coping but your protocol's too long: Consider the brief COPE. Int J Behav Med. 1997;4(1):92–100.

111. Allington D, Duffy B, Wessely S, Dhavan N, Rubin J. Health-protective behaviour, social media usage, and conspiracy belief during the COVID-19 public health emergency. Psychol Med. 2020 Jul;51(10):1763-69.

112. Lin CY, Broström A, Griffiths MD, Pakpour AH. Investigating mediated effects of fear of COVID-19 and COVID-19 misunderstanding in the association between problematic social media use, psychological distress, and insomnia. Internet Interv. 2020 Sep;21:100345.

113. Gao J, Zheng P, Jia Y, Chen H, Mao Y, Chen S, et al. Mental health problems and social media exposure during COVID-19 outbreak. PLoS One. 2020 Apr 16;15(4):0231924-34.

114. Ni MY, Yang L, Leung CMC, Li N, Yao XI, Wang Y, et al. Mental health, risk factors, and social media use during the COVID-19 epidemic and cordon sanitaire among the community and health professionals in Wuhan, China: A cross-sectional survey. JMIR Ment Health. 2020 May 12;7(5):e19009.

115. Ali KF, Whitebridge S, Jamal MH, Alsafy M, Atkin SL. Perceptions, knowledge, and behaviors related to COVID-19 among social media users: A cross-sectional study. J Med Internet Res. 2020 Sep 8;22(9):19913-22.

116. Ahmad AR, Murad HR. The impact of social media on panic during the COVID-19 pandemic in Iraqi Kurdistan: An online questionnaire study. J Med Internet Res. 2020 May 19;22(5):19556.

117. Pfefferbaum B, Newman E, Nelson SD, Nitiéma P, Pfefferbaum RL, Rahman A. Disaster media coverage and psychological outcomes: Descriptive findings in the extant research. Curr Psychiatry Rep. 2014 Sep;16(9)464.

118. Theorell T, Karasek RA. Current issues relating to psychosocial job strain and cardiovascular disease research. J Occup Health Psychol. 1996 Jan;1(1):9–26.

119. Maslach C. Burnout Inventory Manual. 4th ed. Washington, DC: Taylor & Francis; 1993 Jan. 19-32p.

120. Maslach C, Jackson SE. The measurement of experience burnout. J Organ Behav. 1981 April;2:99-113.

121. Salopek-Žiha D, Hlavati M, Gvozdanovi Z, Gaši M, Placento H, Jaki H, et al. Differences in distress and coping with the Covid-19 stressor in nurses and physicians. Psychiatr Danub. 2020;32(2):287–93.

122. Wang PW, Lu WH, Ko NY, Chen YL, Li DJ, Chang YP, et al. COVID-19-related information sources and the relationship with confidence in people coping with COVID-19: Facebook survey study in Taiwan. J Med Internet Res. 2020 Jun 5;22(6):20021.

123. Windarwati HD, Laras Ati NA , Paraswati MD, Ilmy SK, Supianto AA, Rizzal AF, et al. Stressor, coping mechanism, and motivation among health care workers in dealing with stress due to the COVID-19 pandemic in Indonesia. Asian J Psychiatr. 2020 Feb;56:102470.

124. Sanders MJ, Turcotte CM. Occupational stress in dental hygienists. Work. 2010;35(4):455–65.

125. Barnard SJA, Alexander BA, Lockett AK, Lusk JJ, Singh S, Bell KP, et al. Mental health and self-care practices among dental hygienists. J Dent Hyg. 2020 Aug;94(4):22–8.

126. Choy HB, Wong M. Occupational stress and burnout among Hong Kong dentists. Hong Kong Med J. 2017 Oct;23(5):480–8.

127. Malcolm N, Boyd L, Giblin-Scanlon L, Vineyard J. Occupational stressors of dental hygienists in the United States. Work. 2020;65(3):517–24.

128. Brown LW, Quick J. Environmental influences on individual burnout and a preventive approach for organizations. J of Appl Biobehav Res. 2013 Jun;18(2):104–21.

129. Jackson SE, Schwab RL, Schuler RS. Toward an understanding of the burnout phenomenon. J Appl Psychol. 1986 Nov;71(4):630–40.

130. Leiter MP, Schaufeli WB. Consistency of the burnout construct across occupations. Anx Stres Cop. 1996 Mar 11;9(3):229–43.

131. Lopresti S. Stress and the dental hygiene profession: risk factors, symptoms, and coping strategies. Can J dent Hyg. 2014;48(2):63-69.

132. Totterdell P, Holman D. Emotion regulation in customer service roles: testing a model of emotional labor. J Occup Health Psychol. 2003 Jan;8(1):55–73.

133. Bastani P, Mohammadpour M, Ghanbarzadegan A, Kapellas K, Do LG. Global concerns of dental and oral health workers during COVID-19 outbreak: A scope study on the concerns and the coping strategies. Systematic Reviews. 2021 Feb 2;10(1):45-54.

134. Melamed S, Shirom A, Toker S, Shapira I. Burnout and risk of type 2 diabetes: A prospective study of apparently healthy employed persons. Psychosom Med. 2006 Nov-Dec;68(6):863–9.

135. Jones F, Fletcher BC, Ibbetson K. Stressors and strains amongst social workers: demands, supports, constraints, and psychological health. Br J Soc Work. 1991;21(5):443–69.

136. University of Minnesota. Information technology [Internet]. Minneapolis (MN): University of Minnesota; 2020 [cited 2021 Mar 10]. Available from: https://it.umn.edu/services-technologies/qualtrics.

137. University of Minnesota. Information technology [Internet]. Minneapolis (MN): University of Minnesota; 2020 [cited 2021 Mar 10]. Available from: https://it.umn.edu/services-technologies/box-secure-storage.

138. Complete Medical Lists. Complete Medical Lists Inc [Internet]. Franconia (NH): Complete Medical Lists; 2022 [cited 2021 Mar 10]. Available from: https://www.completemedicallists.com/.

139. R Core Team. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. 2021 [cited 2021 Oct 11]. Available From: URL https://www.R-project.org/.

140. Bhandari N, Batra K, Upadhyay S, Cochran C. Impact of covid-19 on healthcare labor market in the United States: Lower paid workers experienced higher vulnerability and slower recovery. Int J Environ Res Public Health. 2021 Apr 8;18(8)3894.

141. Patel BM, Boyd LD, Vineyard J, LaSpina L. Job satisfaction, burnout, and intention to leave among dental hygienists in clinical practice. J Dent Hyg. 2021 Apr;95(2):28-35.

142. Arnett MC, Ramaswamy V, Evans MD, Rulli D. Impact of Covid-19 on dental hygiene educators: A national survey. J Dent Educ. 2022 Jan 14.

143. United State Bureau of Land Statistics: Occupational Outlook Handbook: Dental Hygiene [Internet]. Washington (DC) [cited 5 Feb 2022]. Available from: https://www.bls.gov/ooh/healthcare/dental-hygienists.html.

144. Shenoy N, Ballal V, Rani U, Kotian H, Lakshmi V. Assessment of knowledge, attitude and practices among dental practitioners on methods of infection control while carrying out dental procedures during novel coronavirus (COVID-19) pandemic. Pan Afr Med J. 2021 Aug 24;39:265.

145. Das G, Ahmed S, Ahmed AR, Tirth V, Jamil S, Muhammad AA, et al. A study on the severity and prevention measures of COVID-19 among dental professionals in clinical practice management. Work. 2021 Oct 13;70(2):387–93.

146. Alkhalifah FN, Tobbal AY, Fried JL. COVID-19 impact, knowledge and preparedness among dental hygienists in Saudi Arabia: A cross-sectional study. Int J Dent Hyg. 2021 Nov 1;19(4):464–73.

147. Karayürek F, Çebi AT, Gülses A, Ayna M. The impact of COVID-19 vaccination on anxiety levels of Turkish dental professionals and their attitude in clinical care: A cross-sectional study. Int J Environ Res Public Health. 2021 Oct 1;18(19):10373.

148. Brown SP, Westbrook RA, Challagalla G. Good cope, bad cope: adaptive and maladaptive coping strategies following a critical negative work event. J Appl Psychol. 2005 Jul;90(4):792–8.

149. Rippetoe PA, Rogers RW. Effects of components of protection-motivation theory on adaptive and maladaptive coping with a health threat. J Pers Soc Psychol. 1987 Mar;52(3):596-604.

150. Tasnim S, Hossain M, Mazumder H. Impact of rumors and misinformation on COVID-19 in social media. J Prev Med Public Health. 2020 May;53(3):171–4.

151. Venegas-Vera AV, Colbert GB, Lerma EV. Positive and negative impact of social media in the COVID-19 era. Rev Cardiovasc Med. 2020 Dec 30;21(4):561–4.

152. Gao J, Zheng P, Jia Y, Chen H, Mao Y, Chen S, et al. Mental health problems and social media exposure during COVID-19 outbreak. PLoS One. 2020 Apr 16;15(4):0231924.

153. Hall LH, Johnson J, Watt I, Tsipa A, O'Connor DB. Healthcare staff wellbeing, burnout, and patient safety: A systematic review. PLoS One. 2016 Jul 8;11(7):0159015.

154. Campus G, Diaz-Betancourt M, Cagetti MG, Carvalho JC, Carvalho TS, Cortés-Martinicorena JF, et al. Study protocol for an online questionnaire survey on symptoms/signs, protective measures, level of awareness and perception regarding Covid-19 outbreak among dentists. Int J Environ Res Public Health. 2020 Aug 3;17(15):5598-06.

155. Al-Khalifa KS, AlSheikh R, Al-Swuailem AS, Alkhalifa MS, Al-Johani MH, Al-Moumen SA, et al. Pandemic preparedness of dentists against coronavirus disease: a Saudi Arabian experience. PLoS One. 2020 Aug 19;15(8):0237630-43.

156. Sarfaraz S, Shabbir J, Mudasser MA, Khurshid Z, Al-Quraini AAA, Abbasi MS, et al. Knowledge and attitude of dental practitioners related to disinfection during the COVID-19 pandemic. Healthcare. 2020 Jul 25;8(3):232-8.

SECTION 6

Appendix A: Practical Application

Dental hygienists are at an increased risk of contracting COVID-19 due to the nature of their work, including being in close proximity with patients during procedures.[8,9,29–35] Practicing in a profession considered high risk for contracting a virus during a pandemic may increase occupational stress on the individual.[15,16]

Understanding how dental hygienists perceive their clinical environment may help better understand where stress is originating during a public health crisis. Enacting policies to reduce perceived risk may aid in increased wellbeing and practitioner satisfaction. Furthermore, understanding how dental hygienists are coping with the stress of practicing during a major public health event allows the profession to identify whether stress is fully mitigated and to identify successful coping strategies. The use of maladaptive coping strategies signals stress is not mitigated and the appraisal process, as explained by Lazaurus et al., continues.[15,16] Adaptive coping strategies, successful in mitigation stress, can be shared with the profession and promoted as strategies to increase wellbeing during trying time. Striving to increase practitioner wellbeing is also in alignment with the Quadruple Aim of healthcare.[21] This aim includes considerations for healthcare providers' mental and physical wellness among the other three aims.[21] Fostering provider wellbeing is also in the best interest of the patient. Poor patient outcomes and increased clinical errors have been correlated with provider burnout and reduced wellbeing.[153]

Dental hygienists who are not successfully coping with occupational stress, or who perceive the profession as hazardous, could be offered adaptive coping strategies or risk perception alterations may be recommended. Addressing new challenges that

accompany practicing dental hygiene during a public health crisis will aid in supporting the dental hygiene workforce and avoid a workforce shortage.

Appendix B: IRB Exemption Letter

UNIVERSITY OF MINNESOTA

Twin Cities Campus

Human Research Protection Program
Office of the Vice President for Research

Room 350-2
McNamara Alumni Center
200 Oak Street S.E.
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EXEMPTION DETERMINATION

April 29, 2021

Cyndee Stull

651-324-9099
stul0045@umn.edu

Dear Cyndee Stull:

On 4/29/2021, the IRB reviewed the following submission:

Type of Review:	Initial Study
Title of Study:	Perceived Risk and Coping Strategies of Dental Hygienists Practicing During the COVID-19 Pandemic
Investigator:	Cyndee Stull
IRB ID:	STUDY00012814
Sponsored Funding:	None
Grant ID/Con Number:	None
Internal UMN Funding:	None
Fund Management Outside University:	None
IND, IDE, or HDE:	None
Documents Reviewed with this Submission:	• Christensen Recruitment Material - Dental Hygienists' Risk Perceptions and Coping Strategies During COVID-19, Category: Recruitment Materials; • Perceived Risk and Coping Strategies of Dental Hygienists Practicing During the COVID-19 Pandemic, Category: IRB Protocol; • Christensen Survey - Dental Hygienists' Risk Perceptions and Coping Strategies During COVID-19, Category: Other; • Christensen Consent Form - Dental Hygienists' Risk

Driven to Discover℠

	Perceptions and Coping Strategies During COVID-19, Category: Consent Form; • Perceived Risk and Coping Strategies of Dental Hygienists Practicing During the COVID-19 Pandemic, Category: IRB Protocol

The IRB determined that this study meets the criteria for exemption from IRB review. To arrive at this determination, the IRB used "WORKSHEET: Exemption (HRP-312)." If you have any questions about this determination, please review that Worksheet in the HRPP Toolkit Library and contact the IRB office if needed.

This study met the following category(ies) for exemption:

- (2) Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording) if at least one of the following criteria is met: (ii) Any disclosure of the human subjects' responses outside the research would not reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, educational advancement, or reputation

Ongoing IRB review and approval for this study is not required; however, this determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these activities impact the exempt determination, please submit a Modification to the IRB for a determination.

In conducting this study, you are required to follow the requirements listed in the Investigator Manual (HRP-103), which can be found by navigating to the HRPP Toolkit Library on the IRB website.

For grant certification purposes, you will need these dates and the Assurance of Compliance number which is FWA00000312 (Fairview Health Systems Research FWA00000325, Gillette Children's Specialty Healthcare FWA00004003).

Sincerely,

Clinton Dietrich, MA, CIP
Senior IRB Analyst

We strive to provide clear, consistent, and timely service to maintain a culture of respect, beneficence, and justice in research. Complete a brief survey about your experience.

IMPORTANT: All human research conducted at the University of Minnesota must adhere to the IRB guidance and requirements, Office of the Vice President for Research guidance, and the Medical School/Office of Academic Clinical Affairs Sunrise

Implementation Plan in response to the COVID-19 pandemic. Non-medical school investigators should contact their Associate Dean for Research for information on the "sunrise" process.

Even with IRB approval, in-person research visits may not take place without documented approval by either the Medical School/OACA sunrise process or the Associate Dean for Research sunrise process. These reviews are intended to protect the health of all research participants and the broader University/Fairview communities during the COVID-19 pandemic. Researchers must inform the IRB of their approved sunrise plans. The IRB will document the approval status on ETHOS via a comment in the study history section Please note that IRB approved COVID-19 related research is exempt from the sunrise requirements.

All researchers should review the guidance for the IRB, the medical school and their own departments as guidance is updated frequently.

Appendix C: Recruitment Email

Recruitment letter

Subject: COVID-19, what has it changed for Dental Hygienists in the Midwest United States?

Hello fellow Dental Hygienist,

My name is Shelah Christensen, I am a student in the Master of Science in Dental Hygiene program at the University of Minnesota.

I am conducting research about COVID-19 and the effects it has had on the Dental Hygiene community.

This research will aid in identifying Dental Hygienists' risk perceptions and coping strategies from March 1, 2020 till now. This information will aid the profession in identifying if more resources such as education, mental health support, or practice changes are needed for Dental Hygienists during major public health events like COVID-19. This research will also aid in identifying employment trends related to COVID-19.

This survey is estimated to take 15 minutes.

All participation is voluntary and anonymous.

Your response will be greatly appreciated!

If you cannot complete this survey today it will be available until Saturday August 14th, 2021 and will close at midnight.

Follow this link to the Survey:
${l://SurveyLink?d=Take the Survey}

Or copy and paste the URL below into your internet browser:
${l://SurveyURL}

Thank you so much for your time and consideration to participate, it is greatly appreciated!

Shelah Christensen, RDH
E-mail: econo017@umn.edu

Follow the link to opt out of future emails:
${l://OptOutLink?d=Click here to unsubscribe}

Appendix D: Informed Consent

Title of Research Study: Perceived risk and coping strategies of dental hygienists practicing during the COVID-19 pandemic. University of Minnesota IRB STUDY00012814

Investigator Team Contact Information:
For questions about the research study, research results, or other concerns, call the study team at:
Investigator Name: Cyndee Stull
Investigator Departmental Affiliation: Department of Primary Dental Care
Phone Number: 612-626-3412
Email Address: stul0045@umn.edu
Student Investigator Name: Shelah Christensen
Phone Number: 605-212-4744
Email Address: econo017@umn.edu

Supported By: This research is supported by the University of Minnesota, Department of Primary Dental Care.
Key Information About This Research Study
The following is a short summary to help you decide whether or not to be a part of this research study. More detailed information is listed later on in this form.
The goal of this study is to identify dental hygienists' perception of risk, behavior changes or coping strategies used during the COVID-19 pandemic, from March 1, 2020 till now. Getting a better understanding of these perceptions, behaviors, and strategies will aid the profession in identifying if more resources such as education, mental health support, or practice changes are needed for dental hygienists during major public health events like COVID-19. This research will also aid in identifying employment treads related to COVID-19.

What is research?
The goal of research is to learn new things in order to help people in the future. Investigators learn things by following the same plan with a number of participants, so they do not usually make changes to the plan for individual research participants. You, as an individual, may or may not be helped by volunteering for a research study.

Why am I being invited to take part in this research study?
We are asking you to take part in this research study because you have been identified as a licensed dental hygienist in the Midwest United States. This research is asking dental hygienists in the Midwest United States questions about their experiences during the COVID-19 pandemic.
What should I know about a research study?

- Whether or not you take part is up to you.
- You can choose not to take part.
- You can agree to take part and later change your mind.
- Your decision will not be held against you.
- You can ask all the questions you want before you decide.
- Your answers will not be linked to your name.
- There will be not way to identify you from the answers you give.
- The survey will be available to answer for six weeks only.

Why is this research being done?

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The aim of this research is to find out how dental hygienists understand and experience the risks of practicing during a major public health crisis like COVID-19, and to find out what coping strategies helped dental hygienists deal with the stress of working during COVID-19.
Dental hygienists are working in new and changing environments since the start of COVID-19. They are required to wear more PPE, perform more infection control measures, and in some cases not use the ultrasonic scaler. This can lead dental Hhgienists to feeling more stressed and tired during the workday.
This research can help the profession identify if more support should be provided to dental hygienists' during a major public health crisis, if practice changes are needed, and how an event like COVID-19 has affected employment.

How long will the research last?
We expect the electronic survey to take approximately 15 minutes to answer.

What will I need to do to participate?
You will be asked to complete an online survey by answering multiple choice and scale response questions.
More detailed information about the study procedures can be found under "What happens if I say yes, I want to be in this research?"

Is there any way that being in this study could be bad for me?
There are no risks to participating in this study; all responses are anonymous and private.

Will being in this study help me in any way?
There are no benefits to you from taking part in this research. We cannot promise any benefits to others from your part in this research.

Detailed Information About This Research Study
The following is more detailed information about this study in addition to the information listed above.

How many people will be studied?
3,867 dental hygienists were invited to participate in this study. Participation is voluntary so the exact number of dental hygienists in the study will not be known until the end of the study.

What happens if I say "Yes, I want to be in this research"?
- You will be provided with a link to an electronic survey
- You can answer the questions in this survey on any electronic device
- This survey will take approximately 15 minutes to answer
- There is no time limit on the survey; you may take as much time as needed
- Once you start the survey you can stop at anytime, but answers will not be saved until completed
- Answers will not be saved unless all questions are answered
- Answers will not be used in the study unless all questions on the survey are answered
- The survey will be open until Saturday August 14th, 2021 and will close at midnight.
- You can take the survey until midnight the last day it is available

What happens if I say "Yes", but I change my mind later?
You can leave the research study at any time and no one will be upset by your decision.

Will it cost me anything to participate in this research study? There will be no cost to you for any of the study activities or procedures.

What happens to the information collected for the research?
We may publish the results of this research. However, we will keep your name and other identifying information confidential.

What will be done with my data when this study is over?
Your data will not be used for any future research after this study is complete. Data will be destroyed after this research is over.

Whom do I contact if I have questions, concerns or feedback about my experience?
This research has been reviewed and approved by an IRB within the Human Research Protections Program (HRPP). To share feedback privately with the HRPP about your research experience, call the Research Participants' Advocate Line at 612-625-1650 (Toll Free: 1-888-224-8636) or go to z.umn.edu/participants. You are encouraged to contact the HRPP if:

- Your questions, concerns, or complaints are not being answered by the research team.
- You cannot reach the research team.
- You want to talk to someone besides the research team.
- You have questions about your rights as a research participant.
- You want to get information or provide input about this research.

Will I have a chance to provide feedback after the study is over?
The HRPP may ask you to complete a survey that asks about your experience as a research participant. You do not have to complete the survey if you do not want to. If you do choose to complete the survey, your responses will be anonymous.
If you are not asked to complete a survey, but you would like to share feedback, please contact the study team or the HRPP. See the "Investigator Contact Information" of this form for study team contact information and "Whom do I contact if I have questions, concerns or feedback about my experience?" of this form for HRPP contact information.

By agreeing to participate, you are indicating that you are at least 18 years old, have read this document, have had all your questions answered, and voluntarily agree to take part in this research study.

Yes, I have read the informed consent and voluntarily agree to participate.

Appendix E: Follow Up Email

Follow up letter

Subject: COVID-19, what has it changed for Dental Hygienists in the Midwest United States?

Dental Hygienist,

My name is Shelah, I am a student at the University of Minnesota in the Master of Science in Dental Hygiene program. I am conducting research about COVID-19 and the effects it has had on the Dental Hygiene community.

This research will aid in identifying Dental Hygienists' risk perceptions and coping strategies from March 1, 2020 till now.

The survey is estimated to take 15 minutes and all participation is voluntary and anonymous.

Your response will be greatly appreciated!

Follow this link to the Survey:
${l://SurveyLink?d=Take the Survey}

Or copy and paste the URL below into your internet browser:
${l://SurveyURL}

You may have received this email already. Since you have not completed the survey this is a reminder email. If you do not wish to participate you may disregard this email.

Thank you for your time and consideration to participate, it is greatly appreciated!

Shelah Christensen, RDH
E-mail: econo017@umn.edu

Appendix F: Survey

Thesis survey

Have you been employed as a Dental Hygienists on March 1, 2020 or anytime after this date?

Yes

No

Demographics

Please answer the following demographic questions.

1. Age:
    a. 18-25
    b. 26-35
    c. 36-45
    d. 46-55
    e. 56 or over
2. Gender identity:
    a. Female
    b. Male
    c. Non-binary
    d. Transgender
    e. Prefer not to disclose
3. Marital status:
    a. Married / Life Partner
    b. Single
    c. Divorced / Widowed
    d. Prefer not to disclose
4. Race/Ethnicity: (check all that apply)
    a. American Indian / Alaskan Native
    b. Asian
    c. Black or African American
    d. Hispanic or Latino
    e. Native Hawaiian or Pacific Islander
    f. White
    g. Other
    h. Prefer not to disclose
5. Which state did you practiced dental hygiene in most of the time during the COVID-19 pandemic (March 1, 2020 to present):
    a. _____
6. Total years practicing as a licensed dental hygienist:
    a. 1-5
    b. 6-10
    c. 11-20
    d. 21-30
    e. 31 or more
7. Select the options that best describes the setting in which you practice (may select more than one).

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a. Private solo general practice
b. Private group general practice
c. Specialty practice
d. Corporate practice
e. Community/Public/Federally funded practice
f. Military
g. Academic setting
h. School-based setting
i. Other

8. Approximately how many coworkers do you regularly work with in a given week?
   a. _____
9. Approximately how many patients have you cared for in a given week since March 1, 2020?
   a. _____
10. Select the option that best describes your dental hygiene employment status on March 1, 2020:
    a. Full time
    b. Part time
    c. Temporary
    d. Not employed
11. Select the option that best describes your **current** dental hygiene employment status:
    a. Full time
    b. Part time
    c. Temporary
    d. Retired
    e. Not employed
12. Approximately how many of your close friends and/or family members have been diagnosed with COVID-19?
    a. 0
    b. 1-5
    c. 6-10
    d. 11-15
    e. 16-20
    f. More than 20
13. Approximately how many of your fellow coworkers have been diagnosed with COVID-19?
    a. 0
    b. 1-5
    c. 6-10
    d. 11-15
    e. 16-20
    f. More than 20
14. Have you cared for patients who have reported a history of COVID-19?
    a. Yes
    b. No
    c. Not sure
15. Have you been diagnosed with COVID-19?

a. Yes
b. No

16. Have you received a COVID-19 vaccine?
    a. Yes; fully vaccinated
    b. Yes; partially vaccinated
    c. No; plan to vaccinate
    d. No; do not plan to vaccinate
    e. Prefer not to respond

Employment

Please answer the following questions about your employment as a dental hygienist.

1. Have you left the profession of dental hygiene since March 1,2020?
    a. Yes
    b. No
2. Was your reason for leaving the profession associated with the COVID-19 pandemic? **(Branching logic: this question will show when Employment Q1 is "Yes")**
    a. Yes
    b. No
3. Do you plan to return to the profession of dental hygiene in the future? **(Branching logic: This question will show if Employment Q1 is "Yes")**
    a. Yes
    b. No
4. What factors contributed to your decision to leave the profession? **(Branching logic: This question will show if Employment Q1 is "Yes")**
    a. _____
5. What factors will influence your decision to return to the profession? **(Branching logic: This question will show if Employment Q3 is "Yes")**
    a. _____
6. Have you reduced your working hours as a dental hygienist during the COVID-19 pandemic?
    a. Yes
    b. No
7. Have you reduced your work hours due to the risk associated with practicing dental hygiene during the COVID-19 pandemic? **(Branching logic: This question will show if Employment Q6 is "Yes")**
    a. Yes
    b. No
8. Have you reduced your work hours due to family obligations during the COVID-19 pandemic? **(Branching logic: This question will show if Employment Q6 is "Yes")**
    a. Ye
    b. No
9. What other factors the contributed to your decision to reduce your working hours? (**Branching logic: This question will show if Employment Q6 is "Yes")**

a. _____

Perceptions

Please respond to the following questions as you reflect back to March 1, 2020, until today and indicate the level to which you agree or disagree with the following questions about your perception of practicing dental hygiene during the COVID-19 pandemic. This section contains 19 questions and is the second to last section.

1. Practicing dental hygiene during the COVID-19 pandemic put/puts me at increased risk of contracting the virus.
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor Disagree
    4. Agree
    5. Strongly Agree

2. Practicing dental hygiene during the COVID-19 pandemic put/pus me at a greater risk of contracting the virus than any other activity.
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor Disagree
    4. Agree
    5. Strongly agree

3. The level of risk experienced practicing dental hygiene during the COVID-19 pandemic is not acceptable.
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor Disagree
    4. Agree
    5. Strongly agree

4. The level of risk would have been considered acceptable if I had more PPE (Personal Protective Equipment).
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor Disagree
    4. Agree
    5. Strongly agree

5. The level of risk would have would be/have been considered acceptable if I had more training and/or education on infection control measures for personal safety.

1. Strongly disagree
2. Disagree
3. Neither agree nor Disagree
4. Agree
5. Strongly agree

6. The COVID-19 vaccine will/did help me feel I was at less risk while practicing dental hygiene.
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor Disagree
    4. Agree
    5. Strongly agree

7. I see/saw the risk of practicing dental hygiene during the COVID-19 pandemic as a threat to the health of my family and/or loved ones.
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor Disagree
    4. Agree
    5. Strongly agree
8. I was required to expend personal benefits (paid time off/vacation time) to maintain income during periods of shutdowns or closures.
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor Disagree
    4. Agree
    5. Strongly agree

9. I feel/felt my employer valued my safety as an employee.
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor Disagree
    4. Agree
    5. Strongly agree

10. I feel/felt I have/had enough time to allow for increased infection control measures.
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor Disagree
    4. Agree
    5. Strongly agree

11. I feel/felt my employer offered adequate support in the form of personal protective equipment (PPE).
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor Disagree
    4. Agree
    5. Strongly agree

12. I feel/felt safe with the amount and type of personal protective equipment (PPE) I was provided.
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor Disagree
    4. Agree
    5. Strongly agree

13. My employer did a good job maintaining communication with employees during shutdowns or closures.
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor Disagree
    4. Agree
    5. Strongly agree

14. My employer showed concern toward employees who were absent from work due to COVID-19 diagnosis/illness.
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor Disagree
    4. Agree
    5. Strongly agree

15. I have considered a different profession other than dental hygiene due to the experience of practicing dental hygiene during the COVID-19 pandemic. (I moved this to under question 14 in the electronic survey)
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor Disagree
    4. Agree
    5. Strongly agree

16. I feel/felt practicing dental hygiene is/was more physically demanding than before the COVID-19 pandemic.
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor Disagree

4. Agree
5. Strongly agree

17. I have considered leaving the profession due to increased **physical demands** of practicing during COVID-19. **(Branching logic: this question will show only when Employment Q1 " I left the profession" is No)**
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor disagree
    4. Agree
    5. Strongly agree
18. I left the profession due to increased **physical demands** of practicing during COVID-19. **(Branching logic: This question will show only when Employment Q1 " I left the profession" is YES)**
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor disagree
    4. Agree
    5. Strongly agree

19. I have considered leaving the profession due to **risk associated** with practicing during COVID-19. **(Branching logic: this question will show only when Employment Q1 " I left the profession" is No)**
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor disagree
    4. Agree
    5. Strongly agree
20. I have considered leaving the profession due to increased **stress** of practicing during COVID-19. **(Branching logic: this question will show only when Employment Q1 " I left the profession" is No)**
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor disagree
    4. Agree
    5. Strongly agree

21. I left the profession due to the **risk associated** with practicing during COVID-19. **(Branching logic: this question will show only when Employment Q1 " I left the profession" is YES)**
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor Disagree
    4. Agree
    5. Strongly agree

22. I left the profession due to increased **stress** of practicing during COVID-19.

(Branching logic: This question will show only when Employment Q1 " I left the profession" is YES)

1. Strongly disagree
2. Disagree
3. Neither agree nor Disagree
4. Agree
5. Strongly agree

Coping

Please respond to the following questions as you reflect back to March 1, 2020, until today and indicate the level to which you agree or disagree with the following questions about coping strategies you have used while practicing during the COVID-19 pandemic. This section contains 15 questions and is the last section.

23. I have engaged in practices to improve my mental health since the start of the COVID-19 pandemic.
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor disagree
    4. Agree
    5. Strongly agree
24. If you have engaged in practices to improve your mental health during the COVID-19 pandemic please explain what practices.
    a. _____

25. I have found my personal relationships have provided support for me during the COVID-19 pandemic.
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor disagree
    4. Agree
    5. Strongly agree
26. I have focused more on personal health in the form of diet since the COVID-19 pandemic.
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor disagree
    4. Agree
    5. Strongly agree
27. I have focused more on personal health in the form of exercise since the COVID-19 pandemic.
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor disagree
    4. Agree

5. Strongly agree

28. I have focused more on personal health in the form of spirituality since the COVID-19 pandemic.
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor disagree
    4. Agree
    5. Strongly agree
29. I have used social media more since the start of the COVID-19 pandemic.
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor disagree
    4. Agree
    5. Strongly agree
30. I have avoided social media more since the start of the COVID-19 pandemic.
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor disagree
    4. Agree
    5. Strongly agree
31. I have avoided social interactions as a coping strategy during the COVID-19 pandemic.
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor disagree
    4. Agree
    5. Strongly agree
32. I have found comfort in food to deal with the stresses of COVID-19.
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor disagree
    4. Agree
    5. Strongly agree
33. I have found comfort in alcohol to deal with the stresses of COVID-19
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor disagree
    4. Agree
    5. Strongly agree
34. I have found comfort in tobacco use to deal with the stresses of COVID-19
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor disagree
    4. Agree
    5. Strongly agree

35. I have spent more money on non-essential goods and services since the start of the COVID-19 pandemic.
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor disagree
    4. Agree
    5. Strongly agree
36. I have found myself becoming more easily agitated during the COVID-19 pandemic.
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor disagree
    4. Agree
    5. Strongly agree
37. My sleep patterns have changed since the COVID-19 pandemic.
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor disagree
    4. Agree
    5. Strongly agree
38. I have found myself worrying more because of the COVID-19 pandemic.
    1. Strongly disagree
    2. Disagree
    3. Neither agree nor disagree
    4. Agree
    5. Strongly agree

We thank you for your time spent taking this survey.

Your response has been recorded.