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What's new for the clinician– summaries of recently published papers

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1. Is there a clinical association between Periodontitis and COVID-19?

Whilst the COVID-19 pandemic continues throughout the world, dental professionals have been focusing on the oral signs and symptoms associated with the infection. Published studies have shown that almost 4 in 10 COVID patients experience impaired taste or total loss of taste, and an even greater proportion report having a dry mouth. Other oral manifestations include ulcer, erosion, bulla, vesicle, pustule, fissured or depapillated tongue, macule, papule, plaque, pigmentation, halitosis, whitish areas, haemorrhagic crust, necrosis, petechiae, swelling, erythema, and spontaneous bleeding.[1]

Periodontal disease is considered a pandemic in its own right, with the reported case load far exceeding that of COVID-19. There are several hypotheses that have pointed towards the possibility of a link between periodontal disease and COVID-19.[1] Detection of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in the gingival crevicular fluid (GCF) further gives credence to this theory and introduces the possibility of another point of entry.

SARS-CoV has been known to cause alterations in lung tissue due to numerous pathways, of which one involves mediation via matrix metalloproteinases (MMPs). These MMPs have been implicated in facilitating early virus entry into cells.1 MMPs are derived from polymorphonuclear leukocytes (PMNs) found in the diseased periodontium and an MMP-8 point-of-care (aMMP-8 POC) test has been developed for use in both adolescent and adult populations as a means to define active and inactive sites of periodontal disease, assess prognosis and evaluate patients in the treatment and maintenance phases. 1This particular point-of-care testing methodology possesses a sensitivity of 76–83% and specificity of 96% with results being returned within 5–7 minutes. [1]

A number of hypothetical models have been put forth to assess the possibility of a link between oral hygiene and/or periodontal disease and the COVID-19 disease process.[1] Gupta and colleagues from India (2022)[1] reported on a study that sought to assess the association of periodontal health on the complications of COVID-19. These researchers performed real-time clinical assessments of patients suffering from COVID-19 along with utilising a validated aMMP-8 point-of-care bedside diagnostic test kit in order to evaluate the presence of active periodontal disease among COVID-19 infected patients.

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MATERIALS AND METHODS

The cross-sectional analytical study involving 82 patients with COVID-19 infection confirmed by nasopharyngeal swab (NPS) testing. A patient information sheet was given to all the patients, and written informed consent was obtained from all the subjects. Pregnant ladies, patients less than 18 years old and those unwilling or not in a position to give written informed consent were excluded from the study. Demographic data was recorded, and chairside tests run for evaluating the expression of aMMP-8 at the site with maximum periodontal breakdown as well as via a mouthrinse-based kit for general disease activity. Covariates like age, sex, smoking habits and other COVID-19-related comorbidities/risk factors such as diabetes, hypertension, pulmonary disease, chronic kidney disease, cancer, coronary artery disease, obesity and any other comorbidities were recorded. Blood parameters relevant to the disease progression such as C-reactive protein (CRP), D-dimer, platelet count, ferritin, glycosylated haemoglobin (HbA1c), haemoglobin (Hb), vitamin D3, neutrophil/lymphocyte ratio (N/L), troponin, procalcitonin and N-terminal-pro-brain natriuretic peptide (NT-proBNP) were recorded. These parameters were noted from the patients' records, if available. Hence, the number of samples varied in each parameter.

Periodontal clinical examination was conducted by a single calibrated examiner using a 10-mm round-tip manual Williams's periodontal probe. All permanent teeth, excluding the third molars, were examined at six sites per tooth (disto-buccal, mid-buccal, mesio-buccal, disto-palatal, mid-palatal, mesio-palatal). Gingival recession (GR), gingival marginal level (GML), periodontal probing depth (PPD), bleeding on probing (BOP) and number of teeth present/missing/carious were recorded. Clinical attachment loss (CAL) was calculated. Patients were categorised into periodontally healthy, gingivitis and stage I–IV periodontitis, as per the new classification of periodontitis. No intra-oral radiographs were taken as this was not feasible.

Samples were collected using aMMP-8 PoC mouthrinse- and site-specific kits. These tests were conducted by a periodontist who was unaware of the clinical examination results. aMMP-8 chairside lateral flow mouthrinse immunoassay test (PerioSafe) and aMMP-8 chairside lateral flow site-specific immunoassay test (ImplantSafe) were done on patients. The colour changes due to immunoreactions were read after exactly 5 min. In both cases, a single blue line indicated aMMP-8 levels less than 20 ng/ml (negative; no risk), whereas two blue lines were representative of aMMP-8 levels more than 20 ng/ml (positive; increased risk), indicating active periodontal disease.

COVID-19-related complications such as presence of COVID-19 pneumonia, death due to COVID-19, type of hospital admission and need of assisted ventilation were also assessed. Patients requiring oxygen via high-flow nasal cannula (HFNC), non-invasive ventilation (NIV) or through intubation and ventilator were categorised as patients requiring assisted ventilation, whereas those able to maintain their status quo on room air were categorised as patients not requiring assisted ventilation. Admissions were categorised into those isolated at home and those admitted in the hospital either in the wards or in the ICU as per their disease severity and treatment requirements. An attempt was made to evaluate the presence of active periodontal disease using a validated aMMP-8 point-of-care bedside diagnostic test kit.

RESULTS

Forty-eight male patients and thirty-four female patients were enrolled in the study. There was an overall increase in age distribution with increasing stages of periodontitis in COVID-19 patients. Fifty-one patients had typical symptoms of COVID-19, whereas thirty-one were asymptomatic on presentation. Presence or severity of periodontal diseases was not found to be associated with gender or presence/absence of COVID-19 symptoms. Of the patients, 52.43% presented with one or more comorbidities. A statistically significant association was observed for diabetes mellitus, cardiovascular diseases and cancer. Predictors of COVID-19-related outcomes such as hospital admission, requirement of assisted ventilation, COVID-19 pneumonia and eventual survival were observed to increase with a concomitant rise in the stage of periodontitis. Particularly, patients with a higher stage of periodontitis underwent ICU admission as opposed to those with a healthy periodontium or gingival disease who were found to be under home isolation or ward admission.

The need for assisted ventilation was more prevalent among patients with stage III and IV periodontitis. Twenty-two patients presented with COVID-19 pneumonia and fourteen had ground-glass opacities on CT chest. Majority of the patients survived and 9.7% (n = 8) of the patients succumbed. These patients had a greater severity of periodontitis. One of the eight deceased patients had diabetes along with hypertension. Five of the deceased had other comorbidities like hypertension, CKD, history of CAD and acute necrotising pancreatitis. Bleeding on probing was commensurate with the stage of periodontal disease.

Bleeding on probing was not associated with any recorded blood parameter. Gingival recession and number of teeth missing due to periodontal reasons were associated with D-dimer and troponin values. Probing depth was significantly associated with HbA1c, CRP, D-dimer and ferritin levels. Higher CAL was associated with elevated levels of CRP, D-dimer, pro-BNP, troponin and procalcitonin. Subjects with more severe forms of periodontitis had higher levels of D-dimer, pro-BNP and troponin.

Patients with bleeding on probing had 4.14 odds of requiring assisted ventilation, 3.18 odds for hospital admission and 3.63 odds of suffering from COVID-19 pneumonia. Probing depth, gingival recession and CAL were significantly associated with all the included complications of COVID-19. Increasing probing depth, CAL and presence of gingival recession in these patients put them at increased odds for these complications. Patients with gingival recession required assisted ventilation (OR = 8.22), had less chances of survival (OR = 14.07), and 6.50 odds of COVID-19 pneumonia. However, missing teeth was only associated with increased odds of hospital admission (OR = 12.52). Also, it was found that deceased patients had significantly higher mean probing depth, gingival recession and CAL compared to the survivors. Periodontal status was associated with all the included complications of COVID-19 in the present study. Higher severity of periodontitis led to 7.45 odds of requiring assisted ventilation, 36.52 odds of hospital admission, 14.58 odds of death and 4.42 odds of COVID-19 pneumonia.

Subjects requiring admission in hospital had significantly elevated levels of HbA1c, CRP, D-dimer, ferritin, N/L ratio, haemoglobin, pro-BNP, troponin and procalcitonin. Survival was found to be associated with elevated N/L ratio and platelet count, whereas subjects with higher levels of HbA1c, CRP, D-dimer, ferritin and procalcitonin required assisted ventilation.

CONCLUSION

The researchers found that there was a direct association between periodontal disease and COVID-19-related outcomes. They further added that since periodontal disease was both reflective and deterministic of systemic health, it might also play an indirect role in worsening the status of comorbidities more directly associated with a poorer prognosis of COVID-19-related adverse outcomes.

Implications for practice

This study provided further evidence of the link between oral health and general health status- poor oral health indicators and markers are correlated by poor general health indicators and markers. Readers must be cautioned that a causal relationship in this paper cannot be established due to the cross-sectional design of the study.

REFERENCE

1. Gupta S, Mohindra R, Singla M., et al. The clinical association between Periodontitis and COVID-19 . Clin Oral Invest 2022; 26, 1361–1374.

2. Motivational interviewing for caries prevention in adolescents: a randomized controlled trial

Dental caries continues to be major public health problem globally with a huge unmet treatment burden in children and adults especially in developing countries. Providing dental care is expensive and most countries do not have the resources to manage the huge burden of unmet treatment needs. Hence, the focus, over the last few years, has been on providing health education and promotion interventions to prevent or reduce the initial caries burden. The prevention and control of dental caries rests primarily upon both upper-streaming approaches addressing social determinants and the adoption of healthy behaviours by individuals. [1] Early adolescence is a life stage in which many health behaviours are perpetuated and health interventions during early adolescence are likely to produce a long-term impact on one's health outcomes. [1]

Although adolescence is recognized as a critical period for health promotion, health intervention during adolescence is challenging as adolescents are often resistant to overt persuasion or direct advice provided by others. [1] Instead, they are more likely to accept particular values and goals that are central to their own identity, because personal identity establishment is one of the milestones of their growth and development.[1] Furthermore, since pursuits of personal autonomy gradually emerge, adolescents often have a strong desire to make their own decisions and regulate their own behaviours without undue controls from adults.[1]

Given its autonomy-granting and evocation-focused nature, motivational interviewing (MI) may play a unique role when working with adolescents. 1 As a collaborative conversational style, MI explores one's own good reasons for change and activates his/her own motivation, commitments, and resources for change 1. Originally developed for treating substance abuse, MI has been introduced to change other health-related behaviours and conditions, with promising.[1]

To facilitate dental MI, an interactive patient communication tool, Cariogram, could be incorporated into different stages of the counselling process. It graphically illustrates one's overall risk for dental caries along with a risk breakdown associated with various behaviours, such as cariogenic diet and poor oral hygiene. [1] Instead of prescribing a list of do's and don'ts, it demonstrates the possible health gains (risk reductions) through different behavioural changes and offers alternative solutions. It assists client's systematic reflection of his/her status quo and facilitates informed decision-making and goal setting. [1]

Wu and colleagues (2022)[1] reported on a randomized controlled trial (RCT) that sought to evaluate the effectiveness of three intervention schemes (prevailing health education, MI, and MI aided by Cariogram) in enhancing adolescents' oral health self-efficacy, changing their oral health behaviours (snacking and toothbrushing), and preventing dental caries. The null hypothesis was: There is no difference in changes of adolescents' oral health self-efficacy and behaviours and in caries increment among three intervention groups.

MATERIAL AND METHODS

Allowing for a 25% lost-to-follow-up rate, 147 subjects were needed for each group. Adolescents from 15 participating secondary schools in Hong Kong were recruited under the following inclusion criteria: (i) full-time students; (ii) 12 or 13 years old; and (iii) having unfavourable oral health behaviour, defined as "toothbrushing less often than twice a day" and/or "snacking three times or more a day." The exclusion criteria were (i) having any major systemic disease or (ii) unable to communicate in local languages. A screening questionnaire was used to identify eligible participants. Adolescents' assent and parental written consent were obtained.

Cluster randomization was applied and schools in each district were randomly assigned by drawing lots to three intervention groups (I) prevailing health education; (II) MI; and (III) MI aided by patient communication tool. The allocation ratio was 1:1:1. Allocation concealment was ensured by using sealed and opaque envelops.

The intervention for the control group was delivered through an oral health talk and pamphlets. The oral health talk was delivered to all participants of each school in group I. The talk lasted for about 30 min, including a 10-min session for raising questions. Each participant received an education package, comprising of three pamphlets titled "Cleaning teeth properly—you can do it," "How to use dental floss," and "Healthy diet, healthy teeth"

Each participant in group II joined a one-on-one face-to-face MI session, which lasted 15–30 min. The MI sessions followed a standardised approach that included four spirits (evocation, compassion, acceptance, and collaboration), four processes (engaging, focusing, eliciting, and planning), and four core skills (open questions, affirmation, reflection, and summary).

In group III, the patient communication tool, Cariogram, was used at appropriate stages of the one-on-one face-to-face MI session, depending on the participant's response, to stimulate his/her own thinking and help him/her to identify the discrepancy between the status quo and personal goals, to explore possible behavioural changes and their respective health gains (reduction in caries risk), to make informed decisions and set his/her own goal and agenda (what to change and to what extent).

For both group II and group III, the sessions were audio-recorded. To assist the start of behavioural change, maintain the change, and avoid relapse, each participant in groups II and III received five telephone calls at 2 weeks, 1 month, 2 months, 4 months, and 6 months after the initial counselling.

All interventions were delivered by two oral hygienists who were trained by an expert panel composed of a clinical psychologist and a behavioural scientist experienced in health promotion and MI in healthcare settings. The training sessions included lectures (3 h), group discussions (2 h), video analysis (2 h), demonstrations (1 h), role plays and real plays (4 h), and continuous feedback. All interventions were periodically reviewed to ensure they were delivered consistently. A total of 51 (15%) audio records were randomly selected and the fidelity of MI intervention was scored by using the Motivational Interviewing Treatment Integrity (MITI) Coding Manual 4.1. MITI generates global scores and behaviour counts. For global scores, a "relational" score measures "partnership" and "empathy," whereas a "technical" score measures "cultivating change talk" and "softening sustain talk." Both global scores range from 1 to 5; a higher score indicates a higher MI adherence. The behaviour counts can be converted into % CR (proportion of complex reflection) and R:Q (reflection question ratio). A % CR of 50% or above and an R:Q of 2 or above are considered as "good." A % CR of 40% or above and an R:Q of 1 or above are considered as "fair."

The effectiveness of the interventions was evaluated and compared using psychological outcomes (self-efficacy in controlling snacking and toothbrushing), behavioural outcomes (snacking and toothbrushing frequency), and clinical outcomes (plaque score and caries increment). Data were collected at baseline and 6, 12, and 24 months post-intervention. This paper reported the 24-month findings of the trial.

A self-administered questionnaire was completed to collect information on participants' demographic and socioeconomic background, oral health self-efficacy, and oral health self-care behaviours. To evaluate self-efficacy in controlling snacking and toothbrushing, participants were asked to what extent they agreed with the following statements: "I have the ability to control frequent sugar snacks between meals on all occasions" and "I can do a good job brushing my teeth thoroughly twice a day even when I am very busy." Response was solicited by using a five-point Likert scale and was converted to "positive self-efficacy" ("strongly agree" or "agree") and "negative self-efficacy" ("neutral," "disagree," or "strongly disagree"). Two questions were asked on their toothbrushing frequency and snacking frequency. "Snacking three times or more a day" and "toothbrushing less often than twice a day" were defined as unfavourable oral health behaviour. Participants were also asked to provide information on any dental visit and the treatments received at each follow-up time point (6, 12, and 24 months post-intervention).

Clinical examination was performed by an examiner, who was blinded to the participants' group allocation. The oral hygiene status was evaluated using Silness-Löe Plaque Index. Four surfaces (distal, buccal, mesial, and lingual) of 6 index teeth (16, 12, 24, 36, 32, and 44) were examined. The cleanliness of each surface was rated from score 0 to 3. No plaque disclosing agents were applied. Dental caries was recorded by visual and tactile inspection using illuminated mouth mirror and CPI probe. The International Caries Detection and Assessment System (ICDAS) was followed. Excluding wisdom teeth, 28 teeth were assessed for each participant. As required for the ICDAS assessment, supervised toothbrushing was conducted before the caries examination.

RESULTS

A total of 512 participants were recruited (161, 163, and 188 in groups I to III, respectively). Among them, 460 (89.8%) were followed up 24 months post-intervention. The reasons for drop out were "withdrawn from the school" (n = 24), "withdrawn from the study" (n = 10), and "absent from school" (n = 18). There was no significant difference in sociodemographic and behavioural variables, oral hygiene, and caries status between drop-outs and those who remained in the trial (p > 0.05).

All participants in group I attended the oral health talk and received the oral health pamphlets. All participants in group II and group III joined the MI session; most of them (91.4% in group II and 85.6% in group III) received all five phone calls after the session, with all receiving at least one phone call. The fidelity of MI intervention was rated as reasonably high. The mean (SD) global rating scores were 4.16 (0.60) and 3.80 (0.66) for "relational" and "technical" aspects, respectively, out of a highest possible score of 5. The mean % for CR (complex reflection) was 43.4%, whereas the mean R:Q (reflection question ratio) was 1.90. The percentages of MI sessions that were coded as "good" or "fair" for the "relational aspect," "technical aspect," "% CR," and "R:Q" were 94.1%, 92.2%, 70.6%, and 94.1%, respectively.

Among the 512 participants, 262 (51.2%) were boys and 250 (48.8%) were girls. The percentages of males were 34.2%, 50.3%, and 66.5% in group I to group III, respectively. Secondary school was the highest education level for 66.8% of parents; 70.8%, 65.0%, and 64.9% in groups I–III, respectively. Less than half (45.3%) of the participants snacked three times or more daily and around two-thirds (65.4%) performed toothbrushing once a day or less. The mean (SD) numbers of cavitated carious teeth (DICDAS II 3-6MFT) were 0.60 (1.20) for the whole sample; 0.61 (1.11), 0.74 (1.39), and 0.55 (1.07) in groups I–III, respectively.

There was no significant between-group difference in sociodemographic variables, oral health self-efficacy and behaviours, oral hygiene status, and tooth status (p > 0.05), except for gender. No significant difference was found among schools in parental socioeconomic status and children's caries status at baseline (p > 0.05). Compared with group I, (i) positive self-efficacy in controlling snacking and toothbrushing was more common in group II and group III (p < 0.001); (ii) significantly higher proportion of participants restricted frequent snacking and brushed their teeth twice a day in group II and group III (p < 0.001); (iii) mean plaque score was significantly lower in group II and group III (p < 0.001); and (iv) no significant difference was found in caries status of the three intervention groups 24 months post-intervention.

As compared with group I, (i) the improvement in self-efficacy in controlling snacking was more likely in group II

[OR (95% CI): 3.63 (1.02–12.94)]; (ii) positive behavioural change in snacking was more likely in both group II and group III, with ORs (95% CIs) of 3.91 (1.48–10.33) and 6.33 (2.46–16.27), respectively; (iii) group II and group III were more likely to change their negative self-efficacy in toothbrushing, with ORs (95% CIs) of 4.65 (1.86–11.63) and 4.30 (1.74–10.64), respectively; and (iv) participants in group III had a higher likelihood to start performing adequate toothbrushing [OR (95% CI): 4.80 (1.79–12.85)]. The greatest plaque score reduction was achieved in group III, followed by group II and then group I ($p < 0.001$); (ii) increment of cavitated lesions (ΔDICDAS II 3-6MFT) was lower in groups II and III than in group I (0.34, 0.12, and 0.11 for groups I to III; $p = 0.006$); and (iii) group III had lower total caries increment (ΔDICDAS II 1-6MFT) than group I (0.71 vs. 1.49; $p = 0.004$).

CONCLUSION

The researchers reported that MI outperformed prevailing health education in improving oral health behaviours and preventing dental caries among adolescents

Implications for practice: MI has been found to be a useful tool to incorporate in health promotion intervention targeted at adolescents.

REFERENCE

1. Wu L, Lo E, McGrath C, Wong M, Ho SM, Gao X. Motivational interviewing for caries prevention in adolescents: a randomized controlled trial. Clinical Oral Investigations. 2022; 26: 585-94.