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Association between Oral Hygiene Practices and COVID-19 Infection and Severity in a Jordanian Population: A Cross-sectional Survey-based Study

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ABSTRACT

Objectives: Coronavirus disease 2019 (COVID-19) is a highly contagious viral illness primarily affecting the respiratory system. This study aimed to investigate the potential association between oral hygiene practices and COVID-19 infection and severity among adults in Jordan.

Materials and Methods: A cross-sectional survey was conducted using a structured Google Forms questionnaire comprising both open- and closed-ended questions in English. The survey was distributed *via* social media platforms across Jordan between April 2022 and February 2023 to minimize physical contact. Participants were informed about the study's purpose and provided consent before participation. Respondents were categorized into COVID-19-infected and uninfected groups.

Results: A total of 1,016 participants, predominantly residents of Irbid, completed the survey. Their mean age was 25 years, with females representing the majority. Most smokers reported using argileh. Most (71%) experienced mild symptoms and had a positive test for confirmed COVID-19 infection, and 41% contracted the virus before vaccination. While most participants reported using toothpaste, 48% were unaware of its fluoride content. While no statistically significant association was found between oral hygiene practices and COVID-19 diagnosis, oral health may still play an indirect role in general health outcomes. Significant associations were observed between gender and post-recovery effects ($p = 0.00$), area of residence and infection status ($p = 0.023$), symptom severity and infection ($p = 0.007$), and chronic comorbidities and frequency of infection ($p = 0.002$), as determined by Pearson's Chi-Square test.

Conclusions: Although no direct link was found between oral hygiene practices and COVID-19 infection, oral health may indirectly influence disease severity. The indirect effect is likely mediated through oral health's well-established role in influencing chronic comorbidities, which are known to impact COVID-19 outcomes. Improving oral hygiene could potentially reduce the risk of chronic comorbidities, thereby mitigating the impact of COVID-19.

Keywords: Covid-19, Jordan, Oral hygiene, Infection severity, Public health.

1. Introduction

In December 2019, a novel coronavirus emerged in Wuhan, China, causing severe pneumonia cases. Initially designated as the 2019 novel coronavirus (2019-nCoV) by the World Health Organization (WHO), the disease was later named coronavirus

disease 2019 (COVID-19), and the causative agent was officially termed severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (1,2). SARS-CoV-2 is a highly contagious, non-segmented, enveloped, positive-sense RNA virus belonging to the coronaviridae family (3,4). The virus has an incubation period ranging from 2 days to 14 days, with a median of approximately 5.2 days. However, some cases have reported incubation periods extending up to 24 days (4,5). In January 2020, the WHO declared the outbreak a Public Health Emergency of International Concern (PHEIC), and on March 11, 2020, it was officially classified as a global pandemic (6). As of November 17, 2020, over 54 million confirmed cases and 1.32 million deaths had been reported worldwide. In the Middle East, Egypt recorded 111,009 confirmed cases and 6,465 deaths, while Jordan reported 81,743 cases and 913 fatalities (7,8).

SARS-CoV-2 primarily spreads through respiratory droplets and secretions and indirectly *via* contaminated surfaces (4,9). The virus can remain viable on surfaces for varying durations depending on environmental conditions, such as temperature and humidity, ranging from several hours to days (5). Common clinical manifestations include fever, dry cough, dyspnea, and sore throat. Other symptoms may include fatigue, myalgia, headache, gastrointestinal disturbances, and anosmia or ageusia (4,9).

In the absence of a definitive antiviral treatment, preventive measures, such as hand hygiene, physical distancing, and respiratory precautions, remain the cornerstone of infection control (10). Healthcare professionals, particularly dentists, are at elevated risk of exposure due to the nature of dental procedures, which often involve close contact with patients and the use of aerosol-generating instruments, such as high-speed handpieces and ultrasonic scalers (11).

Extensive research has demonstrated a significant association between oral health and various systemic conditions, including cardio-vascular diseases, respiratory illnesses, systemic infections, and adverse pregnancy outcomes (12). Moreover, several studies have highlighted the protective role of proper oral hygiene in reducing the risk of viral acute respiratory infections (13).

The oral cavity is increasingly recognized as a potential reservoir for respiratory pathogens, harboring approximately 700 bacterial species or phylotypes (14). Viral respiratory infections can predispose individuals to secondary bacterial super-infections, which have been strongly linked to severe manifestations of COVID-19 (15).

In multiple studies, elevated viral loads of SARS-CoV-2 in the nasal and oral cavities have also been correlated with increased disease severity (16,17). Oral hygiene (OH) refers to maintaining a clean and healthy oral environment, primarily through the removal of microbial plaque from tooth surfaces. This practice is essential in preventing the onset and progression of oral and systemic diseases (14).

It is well established that oral hygiene is crucial in minimizing microbial colonization within the oral cavity, thereby reducing the risk of pathogen transmission to the upper and lower respiratory tracts. Maintaining optimal oral health is essential, because the oral cavity is a primary entry point for respiratory viruses, including SARS-CoV-2. Evidence suggests that good oral hygiene can significantly lower the incidence of hospital-acquired pneumonia, particularly by reducing the aspiration of oropharyngeal pathogens through regular self-administered or professionally delivered oral care practices (18).

Furthermore, studies have shown that tooth-brushing-induced bacteremia is more pronounced in individuals with compromised oral health due to breaches in the oral mucosa, gingival inflammation, or periodontal disease, which highlights the importance of maintaining oral hygiene, especially in critically ill or hospitalized patients, where the risk of systemic infection is elevated (19,20).

In the context of the COVID-19 pandemic, oral hygiene may serve as a supportive measure to reduce associated morbidity and mortality. Oral care should not be neglected as a fundamental aspect of personal hygiene. Ensuring the cleanliness and hygienic maintenance of toothbrushes, as well as adherence to rigorous oral hygiene protocols, are imperative. Oral health professionals play a vital role in promoting and reinforcing oral hygiene practices among the general population (21).

We hypothesize that the likelihood and severity of COVID-19 infection among adults in Jordan are correlated with their oral hygiene behaviors. This study aimed to examine the potential impact of assessing the link between oral hygiene practice and COVID-19 infection and severity among Jordanians.

2. Materials and Methods

2.1 Study Design

A cross-sectional study was conducted using a structured questionnaire comprising both open- and closed-ended questions in Arabic, designed to minimize physical contact and reduce the risk of transmission through paper-based or face-to-face interactions. The questionnaire was created using Google Forms and disseminated across Jordan *via* social media platforms, including WhatsApp and Facebook, between April 2022 and February 2023. The target population included Jordanian residents aged 18 years and older. Participants received a link containing a brief description of the study's background, objectives, voluntary nature of participation, assurances of confidentiality and anonymity, and instructions for completing the survey. Respondents were subsequently categorized into two groups: those who had been infected with COVID-19 and those who had not.

2.2 Methodology (Eligibility Criteria for Participants)

A combination of stratified and simple random sampling techniques was employed to obtain a nationally representative sample of the Jordanian population. Inclusion in the COVID-19-infected group was limited to participants who had received a positive PCR test result.

The conventional formula for cross-sectional research was employed to determine the sample size. A sample size of approximately 384 participants was determined by assuming a 95% confidence level, a 5% margin of error, and an estimated prevalence of appropriate oral hygiene practices in the general population of 50% (to optimize the sample size). Our objective was to increase the statistical power and facilitate sub-group analysis by recruiting a larger sample. 1,016 individuals ultimately completed the poll.

Data was collected using an anonymous, self-administered questionnaire consisting of two sections. The first section assessed participants' COVID-19 infection status by asking whether they had been diagnosed with COVID-19 or believed they had contracted it. Participants who responded negatively were directed to proceed to the second section.

The second section comprised a validated questionnaire that collected socio-demographic data (including age, sex, educational level, and place of residence) and evaluated participants' oral hygiene practices. The content of this questionnaire was adapted from Bokhari and Quadri (2020) to ensure content validity (22). To ensure the questionnaire's content validity, a panel of three experts in the field was assembled. Initially developed in English, the questionnaire was translated into Arabic and back-translated into English by an independent translator to ensure consistency with the original version. A pilot test was carried out on a sample of 30 participants, who were subsequently eliminated from the final analysis. The participants' feedback was taken into account when implementing modifications. The internal consistency of the questionnaire items was determined to be adequate with a Cronbach's alpha value of 0.78, which was used to evaluate the questionnaire's reliability. Completing the questionnaire was considered implied consent to participate in the study.

2.3 Statistical Analysis

Data entry and analysis were conducted with the support of a biostatistician using IBM SPSS Statistics software, version 25 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize the data, with means and standard deviations (SDs) calculated for continuous variables and frequencies and percentages reported for categorical variables. The Pearson Chi-Square test was employed to assess associations between categorical variables. A p-value of less than 0.05 was considered statistically significant.

2.4 Ethical Considerations

This study was conducted following the ethical principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the Institutional Review Board (IRB) of Jordan University of Science and Technology.

3. Results

3.1 Demographic Data

A total of 1,016 participants completed the questionnaire. The mean age was 25.1 ± 9.7 years, ranging from 18 years to 83 years. The majority of respondents (78%) were between 18 years and 28 years old. Females comprised 66% of the sample. Approximately 80% of participants held a bachelor's degree.

Regarding geographic distribution, most participants

(58%) resided in Irbid, 12% in Amman, and 7% in the combined areas of Ajloun and Jerash. Regarding smoking habits, 70% of respondents have been identified as non-smokers. Among those who smoked, 13% reported using argileh (water pipe), 8% smoked cigarettes, and 3% used electronic cigarettes.

3.2 Covid-19 Infection

In response to whether they had been diagnosed with COVID-19 or believed that they had contracted the virus, the majority of participants (71%) answered affirmatively. Among them, 55% reported a confirmed positive test result, while 44% believed that they had been infected without confirmation, and 1.4% reported experiencing symptoms consistent with COVID-19.

Regarding symptom severity, 62% of respondents reported experiencing moderate symptoms, 20% reported mild symptoms, 11% experienced severe symptoms, and 8% were asymptomatic. When asked about the timing of infection relative to vaccination, 41% indicated that they contracted the virus before receiving the vaccine, 39% reported that they contracted the virus after vaccination, and 18% reported being infected both before and after vaccination.

In terms of infection frequency, 66% of participants reported being infected once, 27% twice, and 7% more than twice. When asked about the variant of the virus that they contracted, 58% identified the original strain, 53% reported the Delta variant, and 7% indicated that they had been infected with the Omicron variant (Table 1).

Table 1: Participants responses to COVID-19 infection regarding their status. symptoms and number of times infected

Criteria	Variable	N	%
COVID-19 infected status	No	293	29.0
	Yes	716	71.0
How were you confirmed to be infected?	I think that	324	43.8
	Positive test	406	54.9
	Have the symptoms	10	1.4
The severity of your symptoms	No symptoms	56	7.5
	Mild	148	19.8
	Moderate	464	62.0
	Severe	80	10.7
Did you get COVID-19 before or after receiving the vaccine?	Before Vaccine	196	41.4
	After Vaccine	184	38.8
	Before and after vaccine	83	17.5
	Not Vaccinated	11	2.3
How many times have you been infected with COVID-19?	Once	485	65.5
	Twice	202	27.3
	More Than Twice	53	7.2
Wave of infection	Original	425	57.7
	Delta	393	53.3
	Omicron	161	21.8

In response to whether participants continued to experience the effects of COVID-19 after recovery, 45% reported no lingering symptoms. However, 39% indicated that they experienced post-COVID effects for up to two months following infection, while 16% reported symptoms persisting for more than two months.

When analyzed by gender, males predominantly reported no post-recovery effects. In contrast, 41% of

female participants reported experiencing symptoms for less than two months after recovery, whereas 20% of males reported symptoms lasting beyond two months. The association between gender and post-recovery effects was statistically significant, as indicated by the Pearson Chi-Square test (p = 0.00) (Table 2).

Table 2: Did you continue to feel the effects of COVID-19 after you recovered?

Gender	No		Yes, less than two months		Yes, more than two months		Total		P-value
	N	%	N	%	N	%	N	%	
Female	128	38.8	136	41.2	66	20.0	330	100.0	
Male	82	58.2	47	33.3	12	8.5	141	100.0	0.000
Total	210	44.6	183	38.9	78	16.6	471	100.0	

3.3 Oral Hygiene Methods

Responding to the oral hygiene instrument or material to clean their teeth, 77% claimed to use a brush to clean their teeth, and 97% claimed that they brushed their teeth with toothpaste. However, (48%) were unaware of that their toothpaste was fluoridated. Mouthwashes were used by 34% of the participants, and dental flossing was practiced by 14% of the participants (Figure 1).

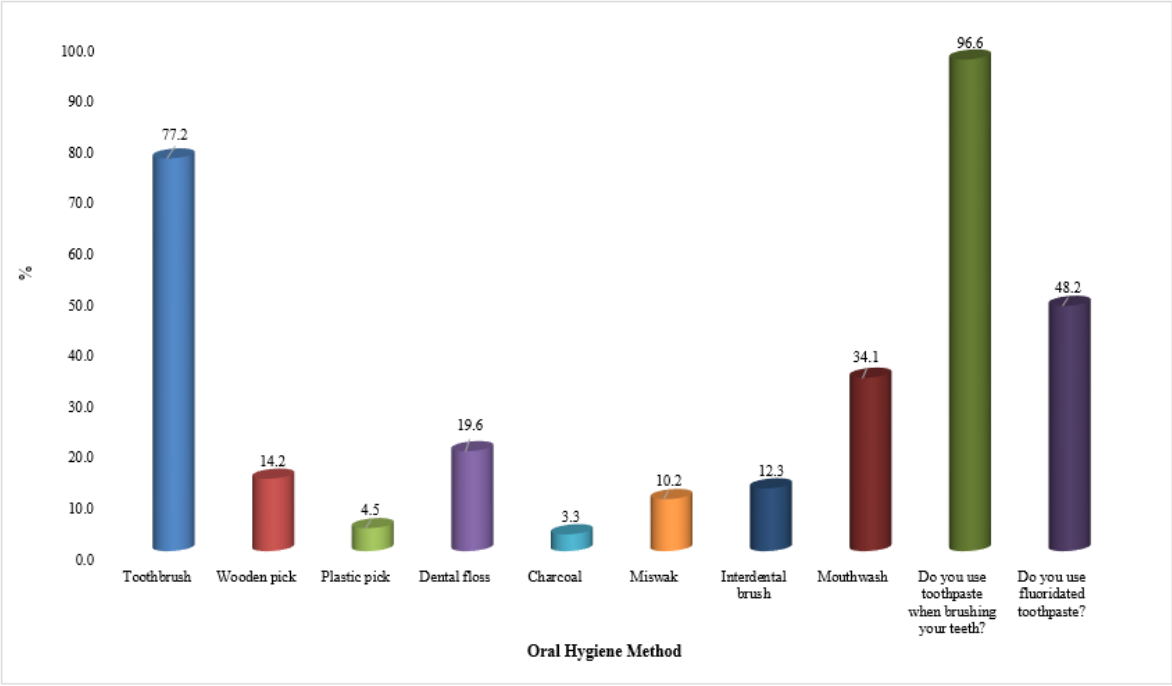

Figure 1: Oral hygiene methods practiced by the participants

The Pearson Chi-Square test was employed to identify a correlation between oral hygiene procedures and participants diagnosed with COVID-19 or believed to have been infected with COVID-19, demonstrating no statistical significance.

3.4 Rating General, Dental, and Gum Health

When asked to describe their general health condition, the majority of participants (66%) rated it positively, reporting their health as either very good or excellent. In contrast, only 2.4 % considered their health to be very poor. Additionally, a small portion of respondents (0.6 %) indicated that they were unsure about their health status.

When asked to describe the health of their teeth, the majority of participants gave a positive assessment: 34.1

% reported their dental health as very good, and 15.4 % described it as exceptional. In contrast, only 6.7 % reported their dental health as very poor. Additionally, a small portion of respondents (0.6 %) indicated that they were unsure about their dental health status.

When asked to describe the health of their gums, the majority of participants (49.5%) responded positively, reporting their gum health as either very good or excellent. In contrast, only 6.6 % reported their gum health as very poor (Figure 2).

3.5 Visits to the Dentist

When asked whether they had experienced a toothache or dental discomfort in the 12 months preceding the study, 42% of participants reported occasional pain or discomfort. In contrast, 14% stated that they had not experienced any, and 3% were unsure.

Regarding dental visits within the same period, 24% of participants reported visiting a dentist once, 16% visited a dentist twice, and 8% visited a dentist three times. However, 9% were uncertain about whether they had visited a dentist, and 32% stated that they had never been to a dentist. Among those who had seen a dentist, 45% did so due to pain, 29% attended for treatment or follow-up care, and 17% visited a dentist for a routine dental check-up (Table 3).

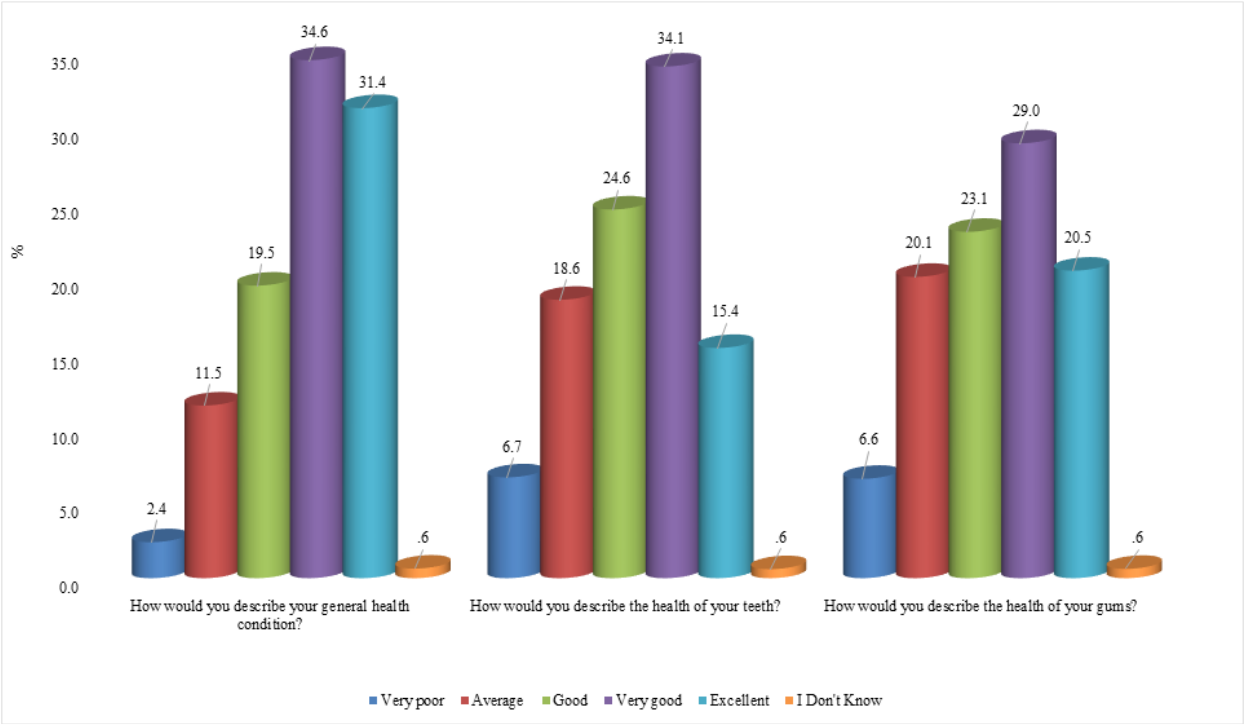

Figure 2: How participants described their general health condition, health of teeth, and the health of gums

3.6 Associations

Analysis of participants' residences revealed that 71% of rural residents reported being infected with COVID-19 at least once. In contrast, among urban residents, 30% reported being infected once, and 9% reported being infected more than twice. The Pearson Chi-Square test indicated a statistically significant association between area of residence and infection frequency ($p = 0.02$).

Regarding the relationship between COVID-19 infection and chronic comorbidities, 49% of participants with comorbid conditions reported being infected once, 36% twice, and 15% more than twice. This association was also statistically significant ($p = 0.002$) (Table 4).

When participants with chronic comorbidities were asked to assess the severity of their COVID-19 symptoms, 15% reported being asymptomatic, 13% experienced mild symptoms, 55% reported moderate symptoms, and 17% experienced severe symptoms. The Pearson Chi-Square test showed a statistically significant association between comorbidity status and symptom severity ($p = 0.007$) (Table 5).

Table 3: Participants' dental visits during COVID-19

During the past 12 months. have you ever had toothache or discomfort?	Never	137	13.5
	Rarely	248	24.4
	Occasionally	422	41.5
	Often	167	16.4
	Don't know	28	2.8
Number of visits to a dentist in the past 12 months	Never	317	31.2
	Once	237	23.3
	Twice	157	15.5
	Three times	84	8.3
	Four times	69	6.8
	More than four times	50	4.9
	Don't know	91	9.0
Reason for last visit to the dentist	Pain	307	30.2
	Treatment or follow-up	196	19.3
	Check-up	115	11.3
	Don't know	66	6.5
How often do you usually brush your teeth?	Never	37	3.6
	Rarely monthly (2-3)	51	5.0
	Once a week	53	5.2
	(2-6) a week	97	9.5
	Once a day	376	37.0
	Twice or more per day	389	38.3
Problems due to oral health during the past year?	Appearance	230	23.3
	I avoid smiling	89	9.0
	Others make fun of me	36	3.6
	Pain	131	13.2
	Difficulty biting hard	135	13.6
	Difficulty chewing	59	6.0

Table 4: The number of occasions the participants were infected with COVID-19 and had a chronic comorbidity condition If you have had COVID-19

Suffer from Chronic Conditions	Once		Twice		More Than Twice		Total		P-value
	N	%	N	%	N	%	N	%	
No	443	67.2	175	26.6	41	6.2	659		
Yes	36	49.3	26	35.6	11	15.1	73	100.0	0.002
Total	479	65.4	201	27.5	52	7.1	732		

Table 5: Participants infected with COVID-19 and had a chronic comorbidity condition and their description of the severity of symptoms

Suffer from Chronic Conditions	No symptoms		Mild		Moderate		Severe		P-value
	N	%	N	%	N	%	N	%	
No	43	6.5	136	20.5	419	63.0	67	10.1	
Yes	11	14.7	10	13.3	41	54.7	13	17.3	0.007
Total	54	7.3	146	19.7	460	62.2	80	10.8	

4. Discussion

On January 30, 2020, the World Health Organization (WHO) declared the COVID-19 pandemic a global health emergency. While age, gender, and underlying conditions, such as diabetes, hypertension, obesity, and cardio-vascular disease, have been identified as key risk factors for complications from COVID-19, these factors do not fully account for the remaining 52% of deaths among individuals who appeared otherwise healthy. This study aimed to explore the potential association between oral hygiene practices and the severity of COVID-19 infection. It also examined whether improved oral health could help reduce the risk of complications associated with the disease (23).

Maintaining good oral hygiene has been recognized as an effective way to prevent respiratory infections, particularly in individuals over 70 years old. The oral cavity hosts approximately 700 bacterial, viral, and fungal species. The bacterial flora of the healthy oral cavity is unique from that of oral illness. Numerous species are explicitly linked to periodontal disease, including *Porphyromonas gingivalis, Tannerella forsythia, and Treponema denticola*. It is imperative to conduct well-controlled clinical studies that analyze a larger number of clinical samples for the levels of all oral bacteria to rigorously evaluate the association of specific species or phylotypes with oral health or disease, as previously stated. Socransky et al. characterized the bacterial complexes implicated in periodontal disease through micro-biological investigations of 185 individuals, who represented approximately 13,000 plaque samples. These investigations were conducted using DNA probes to identify 40 bacterial cultivable species in checkerboard hybridization experiments. Among the predominant bacterial species are *Prevotella intermedia, Streptococcus mutans, Fusobacterium nucleatum, and Porphyromonas gingivalis.* These microorganisms, particularly in oral biofilms, are well-positioned to be aspirated into the respiratory tract, potentially contributing to the development or progression of conditions, such as pneumonia and sepsis (14,24,25).

The connection between oral and systemic health is further supported by evidence that high oral microbial loads can exacerbate systemic diseases, including cardio-vascular disease, cancer, neuro-degenerative disorders, and auto-immune conditions. Moreover, the same risk factors associated with severe COVID-19, such as age, gender, and comorbidities, are also known to influence the composition of the oral micro-biome. Elevated levels of *F. nucleatum, P. intermedia, and P. gingivalis* have been linked to diabetes, hypertension, and cardio-vascular disease, as well as the progression of periodontal disease. Individuals with periodontal disease face a 25% increased risk of cardio-vascular disease, a three-fold higher risk of developing diabetes mellitus, and a 20% greater risk of hypertension (26).

The majority of participants reported having been diagnosed with or believing that they had contracted COVID-19 at least twice during the pandemic. They also described varying levels of symptom severity, with most indicating moderate symptoms. Participants reported being infected by different virus variants, most commonly the original and Delta strains. Al Kuwaiti et al. noted that a positive COVID-19 diagnosis can significantly impact physical, mental, and social well-being and suggested that these effects may vary depending on individual circumstances. The authors further concluded that the social consequences of COVID-19 can be classified as either favorable or unfavorable. Bonds and support from family (husband/children/parents/maid/siblings), friends, work, health authorities, books, and media/audio entertainment are beneficial impacts. Loneliness and limitations on the ability to see relatives, friends, and children are among the unpleasant consequences. Additionally, it encompasses sentiments of remorse, stigma, stereotypes, and the inability to visit or care for parents, as well as feelings of humiliation and guilt, isolating or safeguarding others without establishing a connection (27).

SARS-CoV-2, the virus responsible for COVID-19, has been detected globally. Approximately 348 million people were infected with various virus strains within the first 18 months of the pandemic. The outbreak has profoundly and unprecedentedly impacted daily life worldwide, disrupting employment, social interactions, lifestyle habits, income, and overall health.

These widespread changes have caused considerable psychological distress among both adults and children. Numerous studies have recognized that posttraumatic stress syndrome can be induced by surviving critical illness. Consequently, the percentage of patients with PTSS was significantly elevated (96.2%) during their hospitalization for COVID-19 infection, which is significantly higher than the general population (7%).

Additionally, people with COVID-19 were discovered to have an elevated risk of depression. The consensus is that infections are connected with an increased risk of mood disorders, and the risk appears to be higher after severe illnesses, which is consistent with the findings of the SARS-CoV-1 outbreak, which revealed depressive symptoms among patients throughout the infection, where increased risk may be attributable to the coronavirus's direct or indirect impact on the brain, where a significant cytokine response may induce (27-29).

In the present study, most participants rated their general, dental, and oral health as good or very good. Given that the oral cavity is considered a primary entry point for the virus, maintaining oral health is essential in reducing the risk of infection. A high percentage of participants reported regular tooth brushing with toothpaste and dental floss, which aligns with findings by Ince and Aksoy (30), who observed an increase in tooth brushing frequency during the pandemic. Similarly, another study reported that 38.6% of participants brushed their teeth at least twice daily (31).

In the present study, participants with known systemic conditions reported a range of COVID-19 symptom severity, from asymptomatic to severe, with the majority experiencing moderate symptoms. Existing research has consistently shown that chronic illnesses, such as cardio-vascular and respiratory diseases, are associated with poorer outcomes following COVID-19 infection. A strong correlation has been established between COVID-19 and chronic conditions, including diabetes, cancer, and renal, cardiovascular, and respiratory disorders. The symptoms of patients in the study were comparatively moderate compared to those of the initial patients with SARS-Cov-2 infection in Wuhan. Currently, no vaccine or medication treatment is effective. It is imperative to produce treatments and vaccines to combat the SARS-CoV-2 infection (32-34).

Numerous studies have documented the heightened risks posed by comorbidities in patients infected with SARS-CoV-2 and related viruses, such as avian influenza (35) and the original SARS-CoV (36). Among the most common comorbidities linked to worse prognoses are cardio-vascular disease, kidney disease, respiratory illness, diabetes, hypertension, and cancer (37,38). Early data from China highlighted these associations, prompting public health authorities and global health organizations to prioritize individuals with comorbidities due to their increased vulnerability to severe COVID-19 outcomes. The results of individuals with any comorbidity were inferior to those without comorbidity among confirmed instances of COVID-19. Poorer clinical outcomes can be associated with a higher number of comorbidities; therefore, a comprehensive evaluation of comorbidities should have been taken into consideration when establishing risk stratification for patients with COVID-19 (39).

4.1 Limitations of the Study

Due to quarantine restrictions, the researchers were unable to perform clinical dental examinations. As an alternative, data was collected through a structured survey questionnaire. Furthermore, the use of the self-administered questionnaire has, in effect, produced a self-report and, to some appreciable degree, recall bias. Despite repeated calls for participation in the study, the data ultimately produced an over-representation of young and educated participants. Although we aimed to apply a stratified simple random sampling technique, convenience sampling was employed within the stratified framework to enhance participant recruitment. The over-representation of young and educated participants, without considering other groups, is another limitation of the study.

5. Conclusions

In conclusion, the results of the investigation suggest that the oral health status may play a role in influencing the severity of COVID-19 infection. The study produced no direct statistical association between oral health practices and COVID-19. Consequently, the current study should be approached cautiously, as it does not establish causality. Furthermore, the risk of COVID-19 infection can be mitigated by improving dental health, which may reduce the likelihood of systemic comorbidities in all age groups.

The implementation of special precautions, as recommended for maintaining and ideally improving oral hygiene, is essential to reduce the risk of bacterial super-nfections and microbial load in the oral cavity during COVID-19 infection. Poor oral hygiene should be considered a potential risk factor for post-COVID-19 complications, particularly in individuals with chronic conditions, such as diabetes, hypertension, or cardio-vascular disease, due to their susceptibility to altered oral bio-films. Since the oral cavity can serve as a

reservoir for pathogenic bacteria in severe COVID-19 cases, improving oral hygiene may help mitigate associated complications. Although a logical association exists between oral health and COVID-19 severity, further research is needed to substantiate this relationship through robust observational and clinical studies. The correlation between the frequency or severity of COVID-19 infection and specific categories of chronic comorbidities, such as hypertension, diabetes, and respiratory disorders should be investigated. Future research could also investigate the role of social media in promoting oral health behaviors during and after the COVID-19 pandemic (40). While the current study focused on the association between oral hygiene practices and COVID-19 infection and severity, further investigation is needed to assess whether exposure to oral health information on social media influences preventive behaviors, especially among younger populations.

Conflict of Interests

The authors have no conflict of interests, financial or otherwise, to declare.

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