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Dental Caries Prevalence and BMI Before and After COVID-19 Lockdown of The Schools Among School Children Aged 6–13-Year-Old in Tikrit City (A Comparative Study)

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Abstract

The COVID-19 pandemic has been correlating with many changes in the maintenance of children's dental health. This may be due to the emergency lockdown of school and physical activity which affected the lifestyles and eating habits of the children.

The aim: to investigate the prevalence of dental caries and the changing in the BMI before and after the pandemic among school children.

Method: a total sample of 455 healthy children aged 6-13 years attended to the preventive department in dental college of Tikrit university. The data from 236 children were collected before COVID-19 and 219 children after COVID-19. Dental caries was registered according to WHO criteria, 1987 were decayed, missing, and filled with permanent dentition (DMFS) and deciduous teeth (dmfs). Height and weight for each child was registered to get the BMI-for- age.

Result: For the total sample, the mean value of dmfs, DMFs and BMI were significantly higher after COVID-19 than before COVID-19. Regarding the boys, the mean value of dmfs, DMFs and BMI were significantly higher after the pandemic than before COVID19. For the girls, the mean value of dmfs and DMFs were significantly higher after COVID-19 than before COVID-19 while the mean value of BMI was non - significantly higher after COVID-19 than before COVID-19.

Conclusion: A significant number of children altered their eating, drinking, and brushing habits during the lockdown, which raised their risk of tooth decay.

Introduction:

Our world has changed dramatically the recent years due to a new pandemic, a new form of coronavirus that has created a global emergency [(1)]. This pandemic initially targeted communities in China, Europe, and the United States, and continues to spread globally. The rate of global COVID-19 infections has increased clearly in a short period of time, posing significant challenges for dental schools and medical. In response to this pandemic, WHO declared a public health emergency of international concern [(2)].

This global emergency and lockdown cause a major impact on the lives, societies, and diet habits of the world population. These include physical distancing, less socialization, more time spent at home, digital education, remote working environments, reduction of socialization, and limited physical activity. School closures are having a devastating effect on children's learning and well-being. The most vulnerable children and those without access to distance learning struggle to return to the classroom [(1)]. The first COVID-19 case in Iraq was reported on 24 February 2020. WHO coordinated and the Ministry of Health coordinated several key actions at the central and regional levels. These early actions included improved assortment and planning among all stakeholders and partners at national and international levels. Educate communities about the risk of COVD, how to prevent it, and ensure the capacity to identify, test, isolate, trace all cases of all contacts [(3)].

When the pandemic started, all non-essential businesses were closed, and people were advised to employ online and stay at home. Shops were gradually opened, and people returned to their previous daily lives [(4)]. People were encouraged to wear masks, preserve social distance (1m at least) and wash their hands many times through the day. The lockdown has affected a wide variety of people, including teenagers and children [(5)]. Altering in diet habits happened through the lockdown. Anxiety and depression have increased. The combination of lockdowns and the emotional struggles has led to dietary changes, with people starting to eat foods high in sugars and calories. These new habits may increase the risk of dental caries [(4)]. Tooth decay is the most prevalent in children's diseases and persists in adulthood [(6)]. worldwide, 2.3 billion individuals bear a load from permanent tooth decay, and above 530 million children suffer from primary tooth decay. Risk factors for pathological decay are generally due to sugars containing diet, inadequate fluoridation, salivary dysfunction, and poor oral hygiene, whereas preventive factors include good nutrition, brushing of the teeth with fluoride toothpaste at least two-time daily, professional topical fluoride, application of the sealant for pits and fissure, and normal salivary function [(7)]. The estimation of caries risk is very complex due to various social, cultural, behavioral, and socioeconomic factors [(8)]. The decay of the tooth is a biofilm-mediated, sugar-paid, multifactorial, dynamic characterized by leakage of the mineral of the tooth surfaces and by the discrepancy between the demineralization and remineralization phase of enamel tooth surfaces. Caries' risk factors change the balance toward demineralization, tooth decay, and lesion progression, so the prophylactic factors enhance the remineralization, lesion arrest, or recession [(7)]. Even though dental decay has a bacterial cause, nutrition with a high level of sugar was the most important risk factor [(9)]. Many kids had changed. Early childhood dietary habits are clearly apparent. The early months of life are crucial for a person's ability to learn how to taste and subsequently accept food, especially nutritious food. One of the most significant risk factors for the establishment of juvenile caries is an early-life diet high in sugar [(10-12)]. The total amount of calories consumed from food each day, including protein, fat, total carbohydrates (free sugars plus endogenous sugars plus lactose), and macronutrients including fiber, is known as the overall energy intake [(13)].

The World Health Organization (WHO, Geneva, Switzerland) recommends

reducing free sugars intake to less than 10% of the total energy intake, preferably less than 5% of the total energy intake in both adults and children and reducing free-sugar intake throughout life is recommended [13]. Many studies in literature often estimated the addition of sugars, rather than free sugars, and their association with pediatric dental caries [14]. Added sugars are more strictly defined than free sugars, as mono and disaccharides added to diet and beverages by the cook, therefore, eating of free sugar may be higher than that found in most national data [15]. The recent COVID-19 pandemic has negatively modified many of these risk factors, increasing the risk of dental caries. Years of restrictions imposed due to the COVID-19 pandemic have left children vulnerable to unhealthy lifestyles and altered behavioral profiles [16]. Longer stays indoors due to lockdown have resulted in a sedentary lifestyle, less physical activity outdoors, changes in eating habits, especially increased cravings for snacks and junk food, and more screen time. Also, increased TV use exposes children to caries-causing foods and drink commercials. Several studies have linked these factors to increased rates of childhood obesity and dental caries [17]. Accordingly, the American Dental Association (ADA), National Health Service of the United Kingdom, and National Health Commission of China, along with other dental associations worldwide, urged dentists to postpone elective dental procedures and provide only emergency dental treatments this is because of the primary route of transmitted the COVID-19 is direct transmission via respiratory droplets [18]. The virus can be emitted between the dentist themself, between the dental assistant, and children through the droplets produced during coughs and sneeze or through the dental care itself. Indirect transmission can happen when virus-laden droplets land on instrument surfaces, and infection occurs when pediatric dentist, chair assistants, and other patients encounter contaminated surfaces.

This is like the use of an ultrasonic scaler, high-speed hand piece, and air syringe produces an aerosol of blood, saliva and other fluids that remain suspended in the air for extended periods of time increases the risk of infection [19].

Material and Methods

A total sample of 455 healthy children aged 6-13 years were selected from different schools located in Tikrit city that attended the preventive department in dental college of Tikrit university. The data from 236 children were collected before COVID-19 pandemic between 2018 and 2019. The survey was conducted after COVID-19 for 3 months, from October to December 2021, among school children in the same geographic area for 219 children. The data was collected through oral examination for the total sample. The examination of dental decay was gained by using ordinary mouth mirrors and bland explorers. In this study the radiographic X-ray was not used. Dental caries was registered according to WHO criteria, 1987 [20] were decayed, missing, and filled with permanent teeth (DMFS) and primary teeth (dmfs). Height and weight registered for each child to obtain BMI-for- age. BMI of children were gained as weight in kilogram (kg) divided by height in meter square (m2) and then match with WHO standard growth reference for the same age and gender [21]. The data was analyzed as descriptive statistics include mean, percentage, frequency, standard deviation (SD), and degree of freedom (df). Statistical analyses were done using SPSS version 25 (Statistical Package for Social Sciences). Comparison between groups of the study done by using chi square test and student t-test, to find the relation between variables. The P-value < 0.05 was considered as a level of significance.

Results

A total sample of 455 aged 6-13 years – old of healthy children consist of 234 boys (51.43%) and girls 221 (48.57%) were selected from different schools located in Tikrit city as seen in Table (1). The data from 236 children consist of 120 boys (50.85% and 116 girls (49.15%) were collected **before** COVID-19 pandemic between 2018 and 2020. The commonest

age group before COVID-19 among boys was 10-11 years 40 (16.95%), while among the girls was 8-9 years 39 (16.53%), this relation was statistically not significant X^2=2.5, df=3 (P value 0.47 > 0.05) as shown in Table (2). The survey was conducted **after** COVID-19 for 3 months, from October to December 2021 among school children in the same geographic area for 219 children were the boys 114 (52.05%) and the girls were 105 (47.95%). The commonest age group after COVID-19 among boys were 10-11 years 34 (15.53%), while among the girls was 8-9 years 36 (16.44%), this relation was statistically not significant X^2=6.19, df=3 (P value = 0.102 > 0.05) as shown in Table (3). Regarding the **total sample**, the mean value of dmfs was significantly higher after COVID-19 (17.21± 5.26) than before COVID-19 outbreak (16.7±3.36), (P value < 0.05). The mean value of DMFs was significantly higher after COVID-19 (6.49 ± 3.79) than before COVID-19 outbreak (3.95 ± 2.58), (P value < 0.05). The mean value of BMI was significantly higher after COVID-19 (16.59 ± 2.40) than before COVID-19 outbreak (15.38 ± 0.96), (P value < 0.05), as shown in Table (4). Regarding the **boys**, the mean value of dmfs was significantly higher after COVID-19 (17.7± 6.58) than before COVID-19 outbreak (16.5± 4.05), (P value < 0.05). The mean value of DMFs was significantly higher after COVID-19 (6.8 ± 4.2) than before COVID-19 outbreak (3.6 ± 3.0), (P value < 0.05). The mean value of BMI was significantly higher after COVID-19 (17.5 ± 2.4) than before COVID-19 outbreak (15.4 ± 1.3), (P value < 0.05), as shown in Table (5). For the **girls**, the mean value of dmfs was significantly higher after COVID-19 (16.75 ± 5.34) than before COVID-19 outbreak (15.4± 2.7), (P value < 0.05). The mean value of DMFs was significantly higher after COVID19 (6.15 ± 4.13) than before COVID-19 outbreak (4.28 ± 2.46), (P value < 0.05). The mean value of BMI was non- significantly higher after COVID-19 (15.71 ± 2.38) than before COVID-19 outbreak (15.37 ± 0.64), (P value > 0.05), as shown in Table (6).

Discussion

From our knowledge, this study considers the first study is done in Iraq and one of the fewer studies that find the prevalence of dental caries among school children before and after COVID-19 lockdown of school children. Since this is a serious and highly contagious public health emergency, social distancing measures have been put in place, forcing people to stay indoors and closing schools. This has had an impact on the daily activities of many students worldwide. It is generally accepted that diet and nutrition play a major role in maintaining good health and preventing disease [22,23]. Poor diet and nutrition are clearly linked to the development of dental caries in children [24,25]. Following the COVID-19 outbreak, the World Health Organization (WHO) [26] recommended eating more fresh, unprocessed foods and reducing intake of foods and beverages high in fat, salt, and sugar, such as flavored milk, cakes, and cookies [27]. Our study showed an increased incidence of dental caries and BMI for the total sample size during the COVID-19 pandemic. The link between COVID-19 and the increased incidence of dental caries and obesity has been demonstrated in multiple studies [28, 29]. This observation is attributed to the lockdown, and the changes that took place in the home routine as families stayed at home, online learning and homeschooling become more prevalent and compulsory in some areas. Online learning became the norm during the pandemic, cellphones and social media became the main method of communication, video games and online games became more prevalent. In person social gatherings and physical activities have decreased significantly. All these lifestyle changes have led to decreasing physical activity, the availability of food and drinks at home while spending time studying, participating in online meetings, or playing video games made easier to consume food and drinks. All these changes together have led to an increased frequency of meals, snacks, and sugar drinks intake during the CONID-19 pandemic [30 - 32]. Additionally, conceivable changes in children's sleep schedules

(remain awake at night and waking up late in the morning) may have driven more recurring eating at night and diminished the frequency of toothbrushing. Thus, these children may have been at a higher chance of developing new carious injuries [33 - 37]. One counterargument is that family presence at home during the quarantine increased supervision of the children, resulting in improved hygiene habits and intake of more healthy food. Another effect of the COVID-19 outbreak is the warnings about the risk of getting dental treatment during this time. The risk of virus infection during dental operations may be increased by the enhanced aerosol distribution during scaling and drilling, as well as by the close physical contact between patients and dentists in the waiting area. Therefore, during the COVID -19 pandemic the Centers for Disease Control and Prevention and numerous other health organizations around the world advised dental staff members to only treat emergencies and advised the general population to out of getting dental checkups and non-essential procedures. Many parents may have put off their children's dental appointments because they followed these warnings and were concerned about contracting an infection [38]. The prevalence of dental caries for dmfs and DMFS after COVID-19 showed higher than the prevalence (both dmfs and DMFS) before the pandemic even in study since 2016 [39]. Our study agrees with Regina study which said that TV may affect the eating habit among schoolchildren especially cariogenic foods, thus increase the dental caries [40].

Conclusion

At the time of the pandemic and lockdown, the risk of dental decay was increased among school children, and this may be due to these children changing their pattern in eating, drinking, and toothbrushing.

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Conflicts of interest:

The authors claim to have no conflicting interests.

Table (1) distribution of the total sample according to the age groups and gender.

Age groups	Boys		Girls		Total	
	No	%	No	%	No	%
6-7	55	12.09	46	10.11	101	22.20
8-9	55	12.09	75	16.48	130	28.57
10-11	74	16.26	61	13.41	135	29.67
12-13	50	10.99	39	8.57	89	19.56
Total	234	51.43	221	48.57	455	100

Table (2) the distribution of the total sample **before** COVID-19 (2018-2019) by age and gender groups

Age groups	**Boys**		**Girls**		**Total**	
	No	%	No	%	No	%
6-7	26	11.01	28	11.86	54	22.87
8-9	32	13.56	39	16.53	71	30.10
10-11	40	16.95	34	14.41	74	31.36
12-13	22	9.33	15	6.35	37	15.67
Total	120	50.85	116	49.15	236	100

X^2=2.5, df=3, P value =0.47 > 0.05 not significant

Table (3) the distribution of the total sample **after** COVID 19 (2021) by age and gender groups.

Age groups	**Boys**		**Girls**		**Total**	
	No	%	No	%	No	%
6-7	29	13.24	18	8.22	47	21.46
8-9	23	10.51	36	16.44	59	26.95
10-11	34	15.53	27	12.33	61	27.85
12-13	28	12.78	24	10.98	52	23.74
Total	114	52.05	105	47.95	219	100

X^2=6.19, df=3, P value =0.102 > 0.05 not significant

Table (4) the mean value of dmfs, DMFS, and BMI for the **total sample** before and after COVID 19 infection.

	Before		**After**		P(t)
	Mean	**Std. Deviation**	**Mean**	**Std. Deviation**	
dmfs	16.7	3.36	17.21	5.26	< 0.05(-3.67)
DMFs	3.95	2.58	6.49	3.79	< 0.05(-4.7)
BMI	15.38	0.96	16.59	2.40	< 0.05(-5.13)

Table (5) the mean value of dmfs, DMFS, and BMI for the **boys** before and after COVID 19 infection.

	Before		After		P(t)
	Mean	**Std. Deviation**	**Mean**	**Std. Deviation**	
dmfs	16.5	4.05	17.7	6.58	<0.05(-1.68)
DMFs	3.6	3.0	6.8	4.2	<0.05(-6.7)
BMI	15.4	1.3	17.5	2.4	<0.05(-8.3)

Table (6) the mean value of dmfs, DMFS, and BMI for the **girls** before and after COVID 19 infection.

	Before		After		P(t)
	Mean	**Std. Deviation**	**Mean**	**Std. Deviation**	
dmfs	15.4	2.7	16.75	5.34	<0.05(-2.3)
DMFs	4.28	2.46	6.15	4.13	< 0.05(-3.58)
BMI	15.37	0.64	15.71	2.38	>0.05(-1.5)

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