

The Effect of the Transmission of Coronavirus Disease-2019 on the Mentality of Parents and Children After the First Wave of Infections

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Abstract

The purpose of this study is to evaluate the effect of the spread of a new type of coronavirus infection (COVID-19) on the mental state in school-age children and parents focusing on the aspects of sleep disorders and depression. A questionnaire survey was conducted for 123 parents and 108 school-age children who visited Department of Pediatric Dentistry, Kyung Hee University Dental Hospital at Gangdong from April 2, 2020 through April 25, 2020, via the direct writing method. Participants were assessed with Pittsburgh Sleep Quality Index, Generalized Anxiety Disorder (GAD)-7, Center for Epidemiology Scale for Depression. Logistic regressions were used with a level of significance of 5%.

The prevalence of GAD, depression, and poor sleep in parents were 34.1%, 17.1% and 44.7%, respectively. The prevalence of GAD in children was 20.4%.

Logistic regression showed that stress from Emergency Alert Messages about COVID-19 was associated with GAD and depression in parents. In children, the degree of emotional change after COVID-19 was associated with GAD.

This study confirmed that there was a change in the psychological status of children and guardians due to the epidemic of coronavirus disease-2019, and it would be necessary to consider their psychological status during dental treatment.

Key words : Coronavirus disease-2019, Depression, Generalized anxiety disorder, Poor sleep, Stress

I. Introduction

A new type of coronavirus infection (COVID-19) has spread throughout the world since it first was discovered in Wuhan, China, in December 2019. It is a respiratory syndrome caused by infection with SARS-CoV-2, an RNA virus[1].

In Korea, the first case of COVID-19 was confirmed in a citi-

zen who visited Wuhan on January 20, 2020. On April 9, 2020, only 100 days after the outbreak of COVID-19 was first reported in China, the cumulative number of confirmed cases in the international community reached 1,500,800, and 87,700 people had died from the disease[2]. Because of the spread and risks of COVID-19, the World Health Organization has declared a 'pandemic', which is a global epidemic[3]. The Korean Central

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Disaster and Safety Countermeasures Headquarters requested that citizens practice strong social distancing or refrain from going out altogether from March 22 to April 5, 2020. Citizens were also asked to postpone or cancel meetings, events, and travel within the time frame[4].

The spread of COVID-19 has changed people's daily lives. Religious activities were restricted as a result of large-scale outbreaks at Daegu religious meetings. At work, telecommuting was recommended during the social distancing period. In addition, the Korean Ministry of Education delayed the opening of kindergartens and elementary and secondary schools to prevent COVID-19 transmission. When the social distancing period was extended, online schooling began on April 10, and remote classes began to be conducted.

As a result, there are growing concerns about childcare for infants and school-age children. With postponement of school opening, parents and guardians are seeking ways to minimize care gaps, such as finding new care institutions or resources and taking vacations from work. Thus, parents and children are placed in stressful situations due to the combination of a limited social life, concerns over disease prevention, and childcare problems caused by COVID-19.

The outbreak of a new type of infectious disease causes emotional distress such as depression and anxiety[5]. In previous studies, the negative psychological experiences of the new epidemic were mainly examined from the perspective of fear or worry about the epidemic and emotional distress[5-7].

In February 2020, the number of new confirmed cases per month in Korea surged to 3,319 due to the mass infection centered on Daegu branch of the Shincheonji Church of Jesus, and the first wave of infections resulted in 6,636 confirmed cases in March 2020[8]. In April 2020, when the survey was conducted, the spread eased to 979 cases[8], but strong social distancing and online schooling were implemented. In Seoul, there were 372 confirmed cases in March 2020, and 183 confirmed cases in April 2020[8].

Against this background, this paper aims to study the effect of spread of COVID-19 on the mental state of school-age children and parents. Ultimately, the purpose of this study is to understand the potential emotional states within the coronavirus pandemic to determine needed considerations in the treatment and counseling process.

II. Materials and Methods

1. Participants

A survey was conducted for 113 school-age children and 123 parents of patients who visited Department of Pediatric Dentistry, Kyung Hee University Dental Hospital at Gangdong.

2. Study design

The survey, which was conducted from April 2, 2020 through April 25, 2020, consisted of a questionnaire that was administered via the direct writing method. The planning and informed consent process for this study was performed under the review of the Kyung Hee University Dental Hospital at Gangdong Institutional Review Board (IRB File No. KHNMC 2020-05-035).

In the questionnaire, basic questions asked of the adults were sex, age, occupation, monthly average household income, age of children, employment status of the couple, and primary caregiver for the child. To understand the changes in daily life caused by transmission of coronavirus infections, questions about recent weekly childcare arrangements, time spent retrieving coronavirus news and information, emotions around coronavirus related news, emotional changes due to the coronavirus pandemic, stress caused by closed schools and online learning, and the stress of contacting coronavirus related news were included. Self-examination scales for anxiety, depression and sleep disorders were included to measure the psychological state of the adults. The questionnaire for children consisted only of self-examination scale for anxiety, which can be answered relatively easily, to assess the psychological state of the children.

1) Generalized Anxiety Disorder-7 scale

The Generalized Anxiety Disorder-7 scale (GAD-7), one of the most widely used tools for anxiety self-examination, was developed in 2006 by Spitzer *et al.*[9]. It consists of a total of 7 questions, with each question answered on a scale of 0 - 3 points depending on the frequency of symptoms during the past 2 weeks (Fig. 1). The total scores ranged from 0 - 21, a score greater than 5 points indicates that anxiety is present[9].

2) Pittsburgh Sleep Quality Index

Sleep quality was assessed using the Pittsburgh Sleep Qual-

지난 2주일 동안 당신은 다음의 문제들로 인해서 얼마나 자주 방해를 받았는지 해당 번호에 ○ 표시해 주세요.

22. 지난 2주일간 나는...	전혀 방해 받지 않았다	며칠 동안 방해 받았다	7일 이상 방해 받았다	거의 매일 방해 받았다
(1) 초조하거나 불안하거나 조마조마하게 느낀다	0	1	2	3
(2) 걱정하는 것을 멈추거나 조절할 수가 없다	0	1	2	3
(3) 여러 가지 것들에 대해 걱정을 너무 많이 한다	0	1	2	3
(4) 편하게 있기가 어렵다	0	1	2	3
(5) 너무 안절부절 못해서 가만히 있기가 힘들다	0	1	2	3
(6) 쉽게 짜증이 나거나 쉽게 성을 내게 된다	0	1	2	3
(7) 마치 끔찍한 일이 생길 것처럼 두렵게 느껴진다	0	1	2	3

Fig. 1. Korean version of Generalized Anxiety Disorders-7 Questionnaire.

ity Index (PSQI), a self-report scale. It was developed by Buysse *et al.*[10] and was measured using the PSQI-K, the Korean version of the PSQI, which Sohn *et al.*[11] confirmed to ensure reliability and validity.

It consists of a total of 19 questions across the following 7 component areas: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, sleep drug use, and daytime dysfunction (Fig. 2). Scores for each component were calculated according to the PSQI evaluation method. The higher was the total score, the lower was the quality of sleep. A score greater than 5 points indicates a poor sleeper, while a score below 5 indicates a good sleeper.

3) Center for Epidemiologic Studies for Depression Scale

The Center for Epidemiologic Studies Depression Scale (CES-D) was developed by Radloff[12] in 1977 as a major screening tool for depression.

It consists of 20 questions that ask about the symptoms of the past week, with each question answered on a scale of 0 - 3 points (Fig. 3). A total score of 15 points or less is normal, 16 to 20 points corresponds to mild depression, 21 - 24 points corresponds to serious depression, and a score of 25 points or more corresponds to severe depression in need of expert treatment[12].

3. Statistical analysis

Frequency analysis was performed to analyze the basic characteristics of the participants. The following variables were analyzed among parents: employment status (employed or

unemployed), monthly household income (less than or greater than six million won), changes in childcare arrangements, and coronavirus-related information searching time (less than 30 minutes, 30 minutes to an hour, over an hour). The independent samples t-test was conducted to compare the GAD-7, CES-D, and PSQI scores. In addition, by performing logistic regression analysis, odds ratios (OR), significance levels, and 95% reliability were calculated to evaluate factors affecting sleep quality, general anxiety disorder, and depression. In school-age children, the independent samples t-test was conducted to compare the GAD-7 scores between sexes. In addition, factors affecting GAD of school-age children were evaluated through logistic regression analysis. An independent t-test was conducted to compare changes in emotional state, stress levels due to online learning and Emergency Alert Messages about COVID-19, actual sleep time, and GAD-7 scores of parents and school-age children. SPSS Statistics 22.0 (Statistical Package for Social Science, version 22.0, IBM corporation, Chicago, IL, USA) was used for statistical analysis of the collected data.

III. Results

A total of 132 parents and 113 students was surveyed. Of these, 9 parents and 5 students who gave insincere answers were excluded. Of the 123 parents who were included in the study, 63.4% (n = 78) experienced emotional changes after the occurrence of COVID-19, and 61.8% (n = 76) answered that they felt anxiety (Table 1). Of the parent respondents, 54.5% and 55% felt the stress due to postponement of their children's school and online learning and the stress of receiving Emer-

14. 다음은 지난 1달(4주) 동안 당신의 일상적인 수면습관에 관한 질문입니다. 지난 1달 동안 대부분의 일상에서 가장 적합한 답변에 V 표시 혹은 기록을 해주시기 바랍니다. [반드시 모든 질문에 답하여 주시기 바랍니다]

(1) 지난 한달 동안 , 당신은 평소 몇 시에 잠자리에 들었습니까?	보통 오전 / 오후 _____시 _____분에 잠자리에 든다
(2) 지난 한달 동안 , 당신은 밤에 잠자리에 들어서 잠이 들기까지 보통 얼마나 오래 걸렸습니까?	_____시간 _____분이 걸린다
(3) 지난 한달 동안 , 당신은 평소 아침 몇 시에 일어났습니까?	보통 오전 / 오후 _____시 _____분에 일어난다
(4) 지난 한달 동안 , 당신이 밤에 실제로 잠잔 시간은 얼마나 됩니까? (이것은 당신이 잠자리에서 보낸 시간과 다를 수 있습니다)	하루 밤에 _____시간 _____분

15. 다음 각 문항에서 가장 적합한 응답을 하나만 고르십시오. 모든 질문에 응답해주시기 바랍니다.

지난 한달 동안, 당신은 아래의 이유로 잠자는데 얼마나 자주 문제가 있었습니까? (우측 칸의 □에 표시하세요)	지난 한달 동안 없었다 (없다)	한 주에 1번 보다 적게 (주 1회 미만)	한 주에 1~2번 정도 (주 1~2회)	한 주에 3회 이상 (주 3회 이상)
(1) 취침 후 30분 이내에 잠들 수 없었다	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(2) 한밤중이나 새벽에 깬다	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(3) 화장실에 가려고 일어나야 했다	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(4) 편안하게 숨 쉴 수가 없었다	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(5) 기침을 하거나 시끄럽게 코를 골았다	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(6) 너무 춥다고 느꼈다	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(7) 너무 덥다고 느꼈다	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(8) 나쁜 꿈을 꾸었다	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(9) 통증이 있었다	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(10) 그 외에 다른 이유가 있다면, 기입해주세요 (이유는? _____)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
지난 한달 동안, 당신은 위에 기입한 이유로 잠자는데 얼마나 자주 어려움이 있었습니까?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16. 지난 한달 동안, 당신은 전반적으로 수면의 질이 어느 정도라고 평가하십니까?

- 매우 좋음 상당히 좋음 상당히 나쁨 매우 나쁨

17. 지난 한달 동안, 당신은 잠이 들기 위해 얼마나 자주 약을 복용했습니까?

- 지난 한달 동안 없었다 한 주에 1번보다 적게 한 주에 1~2번 정도 한 주에 3번 이상

18. 지난 한달 동안, 당신은 운전하거나, 식사 때 혹은 사회활동을 하는 동안 얼마나 자주 졸음을 느꼈습니까?

- 지난 한달 동안 없었다 한 주에 1번보다 적게 한 주에 1~2번 정도 한 주에 3번 이상

19. 지난 한달 간, 일을 해내는 데 충분한 의욕을 지니는 데 있어 얼마나 큰 문제를 가졌습니까?

- 아무 문제 없었다 단지 작은 문제만 있었다 어느 정도 문제가 있었다 아주 큰 문제가 있었다

20. 당신은 다른 사람과 같은 잠자리에 자거나 집을 같이 쓰는 사람이 있습니까?

- 같은 잠자리에 자거나 집을 같이 쓰는 사람이 없다 집에 다른 방을 쓰는 사람이 있다
 방을 같이 쓰지만 같은 잠자리에서 자지 않는다 같은 잠자리에 자는 사람이 있다

Fig. 2. Korean version of Pittsburgh Sleep Quality Index.

gency Alert Messages about COVID-19, respectively (Table 1). In 108 school-age children, 19.5% experienced emotional changes, while 48.1% responded that they felt anxiety (Table 1). The stress felt by the children due to receiving Emergency Alert Messages was lower than that of the parents (Table 2, $p = 0.000$), and there was no significant difference between children and adults in GAD-7 score (Table 2).

Sleep disorders were experienced by 44.7% of the parents, 34.1% had an anxiety disorder and 17.1% had at least mild depression (Table 1).

From logistic regression analysis, the factor related to GAD was emergency alert stress (Table 3, $p = 0.04$). The only risk factor identified for depression was emergency alert stress (Table 3, $p = 0.02$). Household income was associated with sleep disorder (Table 3, $p = 0.003$).

Most of the school-age children (88%) were elementary school students, and GAD was found in 20.4% (Table 1). The result of logistic regression analysis showed that the degree of emotional changes after COVID-19 was associated with GAD (Table 4, $p = 0.02$).

IV. Discussion

Previous research on new types of infectious diseases has focused on the fact that new types of infectious diseases induce severe, uncontrolled levels of distress that are more severe than stress in everyday life[13-15]. The outbreak of a new type of infectious disease causes emotional distress such as depression and anxiety[5]. In previous studies related to SARS and MERS, the negative psychological experiences of the new epidemic were mainly examined from the perspective of fear or worry about the epidemic and emotional distress[5-7]. This study investigated the emotional changes and stress of the participants due to COVID-19 and media usage time for collecting coronavirus-related information or news and compared them to identify differences between parents and children. GAD, CES-D, and PSQI were confirmed to investigate the psychological status of the participants. Finally, we investigated how individual characteristics of participants and coronavirus-related factors affect anxiety, depression, and quality of sleep.

The results of the study showed that 44.7% of the parents suffer from sleep disorders, 34.1% suffer from anxiety disorders, and 17.1% suffer from depression (Table 1). Most of the guardians were female, and the difference in mental health by gender was not confirmed. Some studies found that women

Table 1. Characteristics of study participants and frequency analysis results of each variables

	Parents (n = 123) N (%)	Children (n = 108) N (%)
Sex		
Male	26 (21.1)	56 (51.9)
Female	97 (78.9)	52 (48.1)
Age		6 - 17 years old
30s	39 (31.7)	
40s	79 (64.2)	
50s	5 (4.1)	
Employment status		
Employed	77 (62.6)	
Unemployed	46 (37.4)	
Monthly household income		
< 6 million won	65 (52.8)	
≥ 6 million won	58 (47.2)	
Marital employment		
Double income	66 (53.7)	
Single income	57 (46.3)	
Change of childcare mode due to COVID-19		
No	91 (74.0)	
Yes	32 (26.0)	
COVID-19 information or news searching time [‡]		
< 30 minutes	34 (27.6)	84 (77.8)
30 minutes to an hour	55 (44.7)	17 (15.7)
≥ an hour	34 (27.6)	7 (6.5)
Feelings when hear the coronavirus-related news		
Anxious	76 (61.8)	52 (48.1)
Fear	29 (23.6)	13 (12.0)
Anger	11 (8.9)	5 (4.6)
Shocked	4 (3.3)	18 (16.7)
Panic	2 (1.6)	19 (17.6)
Hateful	1 (0.8)	1 (0.9)
Emotional changes due to COVID-19		
No	45 (36.6)	87 (80.6)
Yes	78 (63.4)	21 (19.4)
Stress due to online lectures		
No	56 (45.5)	62 (57.4)
Yes	67 (54.5)	46 (42.6)
Stress due to Emergency Alert Message about COVID-19		
No	59 (48.0)	79 (73.1)
Yes	64 (52.0)	29 (26.9)
PSQI		
Good sleeper (score ≤ 5)	68 (55.3)	
Poor sleeper (score > 5)	55 (44.7)	
GAD-7		
No GAD (score < 5)	81 (65.9)	86 (79.6)
GAD (score ≥ 5)	42 (34.1)	22 (20.4)
CES-D		
No depression (score < 16)	102 (82.9)	
Depression (score ≥ 16)	21 (17.1)	

COVID-19 = A new type of coronavirus infection, PSQI = Pittsburgh Sleep Quality Index, GAD = Generalized Anxiety Disorder, CES-D = Center for Epidemiologic Studies for Depression, won = Korean won
[‡] Average time spent searching on the COVID-19 information or news every day

Table 2. Comparison between parents and children

		Mean (SD)	T	<i>p</i> value
Emotional changes due to COVID-19 ¹⁾	parents	3.59 (0.91)	7.07	0.000
	children	2.62 (1.16)	6.96	
Stress due to online lectures ¹⁾	parents	3.57 (1.04)	2.43	0.017
	children	3.20 (1.24)	2.43	
Stress due to Emergency Alert Message about COVID-19 ¹⁾	parents	3.53 (0.91)	5.13	0.000
	children	2.83 (1.15)	5.06	
Actual sleep time per day (hours)	parents	6.79 (1.32)	-13.07	0.000
	children	9.20 (1.49)	-12.97	
GAD-7 score	parents	3.88 (3.95)	1.16	0.246
	children	3.27 (4.00)	1.16	

p value from Independent t test

COVID-19 = A new coronavirus infection, GAD-7 = Generalized Anxiety Disorder-7, SD = standard deviation

¹⁾ Likert scale = 1 - 5 points (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree)

Table 3. Logistic regression analysis assessing factors associated with generalized anxiety disorder, depression, and poor sleep in parents

Variables	Categories	GAD			Depression			Poor sleep		
		Sig.	OR	95% CI	Sig.	OR	95% CI	Sig.	OR	95% CI
Parents	(n = 123)									
Demographic variables	Employment status	0.81	0.86	0.25 - 2.95	0.38	0.48	0.09 - 2.48	0.748	0.82	0.25 - 2.70
	Monthly household income	0.05	0.42	0.18 - 1.01	0.75	0.83	0.27 - 2.59	0.003	0.28	0.12 - 0.66
	Double income or single income	0.72	1.26	0.36 - 4.36	0.12	4.05	0.70 - 23.23	0.945	0.96	0.29 - 3.12
COVID-19 related variables	COVID-19 information or news searching time									
	< 30 minutes	0.58			0.39			0.443		
	30 minutes to 1 hour	0.71	0.83	0.30 - 2.27	0.22	0.44	0.12 - 1.64	0.398	0.66	0.25 - 1.72
	≥ 1 hour	0.55	1.40	0.47 - 4.19	0.93	0.94	0.25 - 3.60	0.207	0.50	0.17 - 1.47
	Emotional changes due to COVID-19	0.20	1.47	0.82 - 2.65	0.97	0.99	0.45 - 2.16	0.207	1.41	0.83 - 2.40
	Stress due to online lectures	0.97	0.99	0.63 - 1.57	0.11	1.69	0.88 - 3.25	0.710	1.09	0.70 - 1.69
	Stress due to Emergency Alert Messages about COVID-19	0.04	1.84	1.02 - 3.32	0.02	2.83	1.19 - 6.72	0.096	1.60	0.92 - 2.78

Logistic regression analysis

COVID-19 = A new coronavirus infection, GAD = Generalized Anxiety Disorder-7, Sig. = Significance probability, OR = Odds ratio, CI = Confidence interval

Table 4. Logistic regression analysis assessing factors associated with generalized anxiety disorder in children

Variables	Categories	GAD		
		Sig.	OR	95% CI
Children	(n = 108)			
Demographic variables	Sex	0.40	0.63	0.22 - 1.84
	COVID-19 information or news searching time	0.42	0.59	0.16 - 2.16
COVID-19 related variables	Stress due to Emergency Alert Messages about COVID-19	0.12	1.54	0.89 - 2.67
	Stress due to online lectures	0.33	1.26	0.79 - 1.99
	Emotional changes due to COVID-19	0.02	1.83	1.09 - 3.08

Logistic regression analysis

COVID-19 = A new coronavirus infection, GAD = Generalized Anxiety Disorder-7, Sig. = Significance probability, OR = Odds ratio, CI = Confidence interval

feel more anxious than men[16,17]. Since the number of participants was not enough to identify the differences according to gender, so more studies will be needed in the future.

One side, anxiety disorders occurred in 20.4% of the 108 children (Table 1). Children had less time for searching coronavirus-related information or news and more sleep time than parents (Table 2), but nearly half (42.6%) of children were stressed by online lectures and 48.1% felt anxious when hear the news about COVID-19 (Table 1). Based on this, it was found that the spread of a new coronavirus infection also affects the emotional state of children.

Logistic regression analysis was performed to determine the factors, among demographic variables and COVID-19-related variables, that affect mental status.

In Korea, when various disasters such as typhoons, floods, earthquakes, fine dust, wars, and pandemic infectious diseases occur, Emergency Alert Messages are sent to mobile phones through the Cell Broadcasting Service system. Because of this, it is possible to selectively display a customized alarm in the disaster area. Due to the spread of COVID-19, Emergency Alert Messages with information on safety rules and areas of confirmed cases occurrence are being sent to each person in the area[18]. The stress experienced when parents received Emergency Alert Messages was identified as a contributor to changes in mental status (Table 3). Whether the cause of the stress was simply fatigue due to frequent text reception or distrust of the government's ability to cope, further research seems to be necessary.

Household income had a significant impact on the quality of sleep. however, this study did not take into account the potential variables and effects associated with income levels such as changes due to coronavirus situation. further studies can evaluate the influence of these socioeconomic variables.

In this study, coronavirus-related news or information searching time had no effect on mental state, and it was similar to the results of previous research. The study on the distress experienced by the general public for MERS infection also showed that media use frequency collecting MERS-related information did not affect the emotional distress experience[6].

Looking at the analysis of changes in daily life caused by COVID-19, changes in the childcare methods used were found in 26% of the respondents, but this was not related to the emotional changes experienced by the parents ($p = 0.38$).

So far, no research has been conducted about the emotions and stress of children in pandemic situation. In this study,

emotional changes, stress, and anxiety caused by COVID-19 in children were investigated at an exploratory level in the absence of any previous studies on the psychological effects of the new infectious disease on school-age children. Future studies will be able to accumulate the results of our research and contribute to understanding the emotional state of children in a pandemic situation and applying them to medical treatment and counseling process. In children, 48.1% felt anxious when they heard the news about COVID-19 (Table 1) and anxiety disorders appeared as the level of emotional change after COVID-19 increased (Table 4). This mental status could cause anxiety about dental visits, which could ultimately lead not to visit appointments such as regular check-ups if children do not have symptoms, or poor cooperation in dental care. Behavior control and counseling with guardians are important part of the dental treatment in pediatric dentistry. Under the epidemic of new infectious diseases, we should understand the anxiety of children and guardians who report to the hospital and consider it in the dental care and counseling process.

Several studies have shown that psychological condition impacted on oral health. According to a study, people with depression brushed their teeth less frequently and more likely not to receive dental treatment even if they had dental problems[19]. A survey of adolescents showed both males and females who reported symptoms of depression had an increased poor hand and oral hygiene including brushing their teeth less than daily[20]. As children spend more time living at home due to the spread of COVID-19, the intake of sugars such as snacks and instant foods increases[21,22]. In Korea, tooth brushing after meals is not carried out in schools or kindergartens to prevent the transmission of coronavirus. Such changes of situations and oral health behavior due to mental status can have deleterious effects on oral health, such as an increased risk of caries. In this situation, Oral management and dental caries prevention education for children should be emphasized. If it were possible to compare oral hygiene status of children before and after COVID-19 situation, it might have been possible to study the effects of epidemics such as COVID-19 on the oral health of children. Further research on this may help to evaluate the relationship between the pandemic situation and oral health.

The first limitation of this study is the small sample size, which limits the generalizability of these results to the psychological state of all parents and children. Second, the questionnaire did not include many questions about changes in daily

life after COVID-19, so others factor may exist. Third, psychological evaluations were conducted using subjective scoring questionnaires, as opposed to through professional counseling. In addition, evaluation of changes in prevalence before and after COVID-19 situation was not possible.

V. Conclusion

In light of COVID-19 transmission in the community, a survey was conducted of parents and children who visited Department of Pediatric Dentistry. It was determined that 17.1% of parents had depression, 44.7% had sleep disorders, and 34.1% had anxiety. Of the children, 20.4% were experiencing anxiety. The higher was the stress due to receiving emergency alerts related to COVID-19, the more severe was the depression and anxiety symptoms. In children, the greater was the degree of emotional change felt after COVID-19, the more severe were the symptoms of anxiety.

Under the epidemic of new infectious diseases, we should understand the mental status of children and guardians who report to the hospital.

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References

1. Korea Disease Control and Prevention Agency : About COVID-19? Available from URL: <http://ncov.mohw.go.kr/baroView.do?brdId=4&brdGubun=41> (Accessed on July 10, 2020).
2. Wowtv : 1.5 million worldwide infected people on the 100th day of Corona 19...'The most common country to development'. Available from URL: <https://news.naver.com/main/read.nhn?mode=LSD&mid=sec&sid1=104&oid=215&aid=0000862935> (Accessed on July 10, 2020).
3. World Health Organization : Coronavirus disease 2019 (COVID-19) Situation Report - 51. Available from URL: https://www.who.int/docs/default-source/coronavirus/situation-reports/20200311-sitrep-51-covid-19.pdf?sfvrsn=1ba62e57_10 (Accessed on July 10, 2020).
4. Korea Disease Control and Prevention Agency : Regular briefing of the Central Disaster and Safety Countermeasures Headquarters (4.4.), two more weeks of enhanced social distancing. Available from URL: <http://ncov.mohw.go.kr/tcmBoardView.do?brdId=3&brdGubun=31&dataGubun=&ncvContSeq=1726&contSeq=1726&boardId=311&gubun=BDC> (Accessed on July 10, 2020).
5. Lau JT, Griffiths S, Choi KC, Tsui HY : Avoidance behaviors and negative psychological responses in the general population in the initial stage of the H1N1 pandemic in Hong Kong. *BMC Infect Dis*, 10:139, 2010.
6. Lee D, Kim J, Kang H : The emotional distress and fear of contagion related to Middle East Respiratory Syndrome (MERS) on general public in Korea. *Korean J Psychol Gen*, 35:355-383, 2016.
7. Nickell LA, Crighton EJ, Hanjrah S, *et al.* : Psychosocial effects of SARS on hospital staff: survey of a large tertiary care institution. *CMAJ*, 170:793-798, 2004.
8. Statistics Korea : Monthly data of COVID-19. Available from URL: https://kosis.kr/covid/covid_index.do (Accessed on February 4, 2020).
9. Spitzer RL, Kroenke K, Williams JB, Löwe B : A brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch Intern Med*, 166:1092-1097, 2006.
10. Buysse DJ, Reynolds CF, Kupfer DJ, *et al.* : The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry Res*, 28:193-213, 1989.
11. Sohn SI, Kim DH, Lee MY, Cho YW : The reliability and validity of the Korean version of the Pittsburgh Sleep Quality Index. *Sleep Breath*, 16:803-812, 2012.
12. Radloff LS : The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, 1:385-401, 1977.
13. Gunthert KC, Cohen LH, Armeli S : The role of neuroticism in daily stress and coping. *J Pers Soc Psychol*, 77:1087-1100, 1999.
14. Lee-Baggley D, DeLongis A, Voorhoeve P, Greenglass E : Coping with the threat of severe acute respiratory syndrome: Role of threat appraisals and coping responses in health behaviors. *Asian J Soc Psychol*, 7:9-23, 2004.
15. Main A, Zhou Q, Liu X, *et al.* : Relations of SARS-related stressors and coping to Chinese college students' psycho-

- logical adjustment during the 2003 Beijing SARS epidemic. *J Couns Psychol*, 58:410-423, 2011.
16. Gao W, Ping S, Liu X : Gender differences in depression, anxiety, and stress among college students: a longitudinal study from China. *J Affect Disord*, 263:292-300, 2020.
 17. Guo X, Meng Z, Su L, *et al.* : Meta-analysis of the prevalence of anxiety disorders in mainland China from 2000 to 2015. *Sci Rep*, 6:28033, 2016.
 18. Namuwiki : Emergency Alert Message. Available from URL: <https://namu.wiki/w/%EA%B8%B4%EA%B8%89%EC%9E%AC%EB%82%9C%EB%AC%B8%EC%9E%90> (Accessed on July 10, 2020).
 19. Park SJ, Ko KD, Kim HA, *et al.* : Association of oral health behaviors and status with depression: results from the Korean National Health and Nutrition Examination Survey, 2010. *J Public Health Dent*, 74:127-138, 2014.
 20. Ranasinghe S, Ramesh S, Jacobsen KH : Hygiene and mental health among middle school students in India and 11 other countries. *J Infect Public Health*, 9:429-435, 2016.
 21. FETIMES : Covid-19, 'sticking to home', raising childhood obesity. Available from URL: <http://www.famtimes.co.kr/news/articleView.html?idxno=499081> (Accessed on July 17, 2020).
 22. Save the Children : More than 90% of grandparents and children "have changed their daily lives because of Corona 19". Available from URL: <https://m.sc.or.kr/mobile/news/noticeView.do?NO=70611> (Accessed on July 17, 2020).

국문초록

1차 확산기 이후 코로나바이러스감염증-2019의 전파가 부모와 아동의 심리에 미치는 영향

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이 연구의 목적은 코로나바이러스감염증-2019의 전파가 학령기 아동과 부모의 심리에 미친 영향을 수면장애와 우울증의 측면에서 평가하는 것이었다.

2020년 4월 2일부터 2020년 4월 25일까지 강동 경희대학교 치과병원 소아치과를 방문한 123명의 부모와 108명의 학령기 아동을 대상으로 직접 기입 방식의 설문조사를 실시하였다. 참가자들은 Pittsburgh Sleep Quality Index, Generalized Anxiety Disorder (GAD) - 7, Center for Epidemiology Scale for Depression 로 평가되었다. 로지스틱 회기 분석은 유의 수준 5%로 시행되었다.

부모의 GAD, 우울증, 낮은 수면의 질은 각각 34.1%, 17.1%, 44.7%에서 나타났다. 아동의 GAD 유병률은 20.4%였다. 로지스틱 회기 분석 결과 코로나바이러스 관련 안전재난문자로 인한 스트레스가 부모의 불안장애, 우울증과 관련이 있었다. 아동의 경우, 코로나바이러스감염증 발생 이후의 감정 변화 정도가 GAD와 연관성이 있었다.

이 연구를 통해 코로나바이러스감염증-2019의 유행으로 인한 어린이와 보호자들의 심리적 상태 변화가 있음을 확인하였고, 치과 진료 시 이들의 심리상태를 고려해야 하겠다.