Impact of the COVID-19 pandemic on pro-health behaviors in the field of oral health, hygiene habits and attitude to dental care among children and youth in Poland

Wojciech Frąckiewicz[1], Gabriela Niewczas[1], Katarzyna Załęska[1], Magdalena Ziętek[1], Marta Ludwiczak[1], Ewa Jurkowska[1], dr n. med. Agnieszka Kus-Bartoszek[2], dr n. med. Anna Jarząbek[2]

[1] Student Scientific Society at Independent Laboratory of Paediatric Dentistry, Faculty of Medicinie and Dentistry, Pomeranian Medical University in Szczecin, 70-111 Szczecin, Poland

[2] Independent Laboratory of Paediatric Dentistry, Faculty of Medicinie and Dentistry, Pomeranian Medical University in Szczecin, 70-111 Szczecin, Poland

Number of pages: 15

Number of figures: 10

Number of tables: 2

Number of references: 23

Anna Jarząbek ORCID 0000-0001-7717-6141

Agnieszka Kus-Bartoszek ORCID 0000-0001-8190-2724

Corresponding author:

Wojciech Frąckiewicz

SSS at Independent Laboratory of Paediatric Dentistry, PMU in Szczecin

Mail: woj.frackiewicz@gmail.com

Phone number: +48517981503

ABSTRACT

Introduction: At the turn of 2019 and 2020, the world was taken over by the COVID-19 pandemic, caused by the SARS-CoV-2 virus. During the pandemic, there have been major changes in the health sector, including the functioning of dental offices. The virus spread mainly through droplets, and dentists who were working in an environment of water aerosol and contact with patients' saliva and then dental offices were considered to be particularly high-risk places. Many of them have been closed for several months, while others have limited admission to emergency situations only. Access to a dentist was therefore difficult for a long time. This may have contributed to the deterioration of the patients' oral health.

Aim of the study: The aim of the study was to assess the impact of the Covid-19 pandemic on pro-health behaviors regarding the oral health of children and their visits to dental offices.

Materials and methods: A questionnaire survey was conducted with 103 parents of children aged 0-18.

Results: The study showed that the pandemic has affected the health sector and oral health. New devices and materials have appeared in dental offices that increase patient safety and reduce the risk of COVID-19 infection. 84.3% of respondents felt safe in them, and 56% noticed new elements related to safety. The frequency of visits to dental offices decreased in most of the respondents. The reasons for limiting visits were: parents' lack of time (17.6%), lack of available visits (6.9%), fear of treatment during a pandemic (13.7%). During the pandemic, the oral hygiene condition of 59.3% of children was maintained at the same level, and deteriorated for 15.5%. 62.2% of children did not change their diet, while the deterioration of dietary habits affected 19.4% of the respondents. The main source (67%) from which parents obtained knowledge about fluoride was the Internet.

Conclusions: During the COVID-19 pandemic, most children did not change their dietary and hygienic behavior. The frequency of children's follow-up visits has decreased, which may contribute to the deterioration of their oral health.

Key-words: children, dietary habits, oral hygiene, SARS-CoV-2, Covid-19

Introduction:

COVID-19 disease is an infectious disease caused by the SARS-CoV-2 virus, which, causing severe acute respiratory distress syndrome, can lead to serious complications, even to the death of the patient. People can become infected mainly by droplet infection, and the average incubation time for the initial variants was 5-14 days. The high contagiousness of the disease is caused by its initial asymptomatic course, which means that carriers who are unaware of their own infection spread the virus to a larger number of people [1]. The first reports of the virus appeared in Wuhan (China) on November 17, 2019, and six months later, on March 11, 2020, the World Health Organization recognized the COVID-19 epidemic as a pandemic. It should be borne in mind that the interest in the virus is wave-like. Semantic analysis showed that the most frequently searched topics focus on the areas of threat, fear and prevention. Due to the route of transmission of the virus, dental offices, where most procedures are carried out in direct contact with water aerosol, have been recognized as places with a high risk of infection (not only because of the specificity of the procedures, but also due to the high probability of infection between patients, staff and physicians in a given facility) [2]. In Poland, this resulted in the temporary closure of many dental offices or the limitation of visits only to emergency and urgent cases. Delayed visits to the dentist can result in a deterioration of the oral health of patients. Data from monitoring studies conducted in Poland before the pandemic confirm the cumulative increase in the frequency of caries with the age of the respondents - from 53.8% in 3-year-old children to 93.9% in 18-year-old adolescents [3]. There is a decrease in the frequency and intensity of caries in the group of twelve-year-olds, but this is an apparent reduction resulting from the replacement of teeth [4]. Due to these high rates of caries, it is necessary to regularly monitor and educate patients in the field of diet and hygiene, implement preventive measures and treat caries as early as possible. Hygienic and dietary negligence, lack of access to a dentist, lack of prophylaxis at a young age can lead to serious dysfunctions of the entire masticatory system. The aim of the study was to assess the impact of the Covid-19 pandemic on diet, oral hygiene, dental treatment of children and their parents' health awareness.

Materials and methods:

103 parents/guardians with children aged 0-18 participated in the survey based on our own survey. The survey containing 24 questions was available as a link in Google Forms on the Internet

(https://docs.google.com/forms/d/e/1FAIpQLSfBBRYG_3LlGzWp4wf6kDMfPyeqQKJBM9mHeINZNv5SyqQcXg/viewform) and in paper form at the Paediatric Dentistry Clinic UDC PMU.

Results:

The age distribution of children is presented in Figure 1.

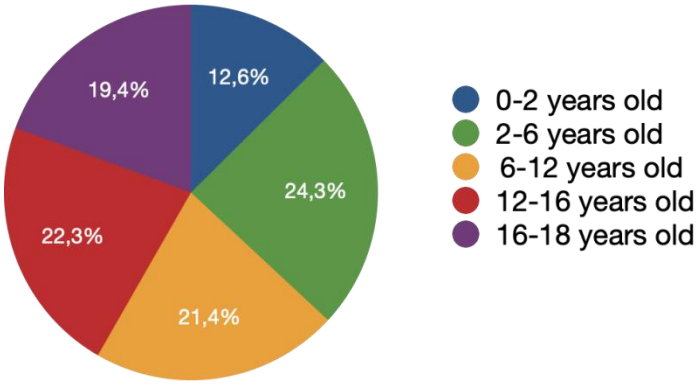

Figure 1. Age distribution of children

The answers of the respondents to the question about the frequency of visits to the dentist during the pandemic are presented in Figure 2. 27.2% of children did not attend any visit during the pandemic/lockdown. A similar percentage of carers (28.2%) declared one visit a year.

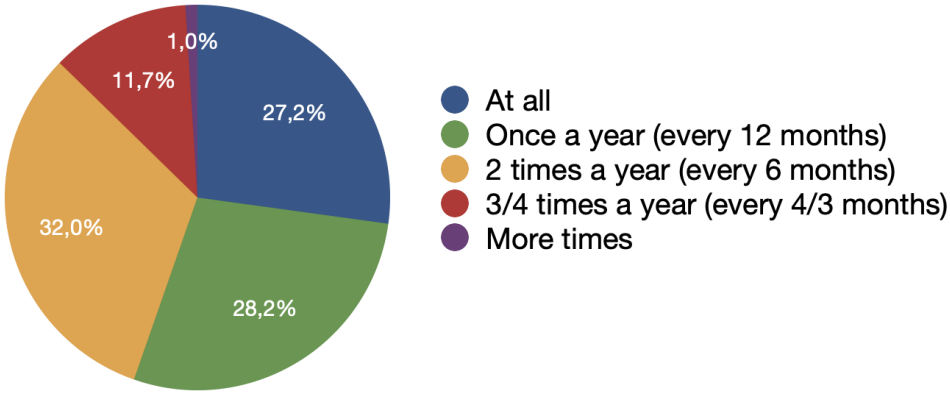

Figure 2. Frequency of visits to the dentist during the pandemic

The frequency of reporting for visits did not change for 30% of the respondents and a similar percentage (31.4%) could not indicate a specific reason for limiting the number of visits during the pandemic. For 13.7% of the respondents, the reason for limiting visits was the fear of treatment during the pandemic. (Fig.3).

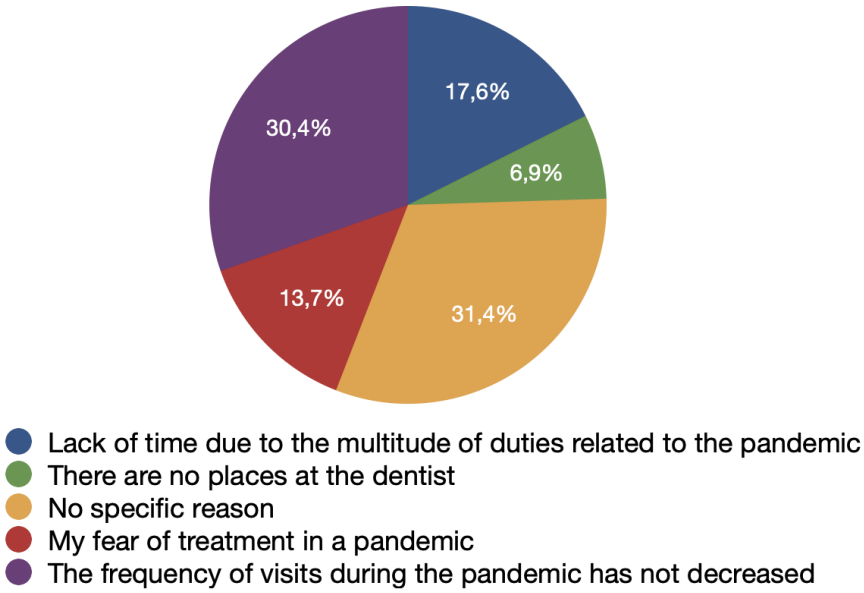

Figure 3. Reasons for reducing the frequency of dental visits during the pandemic

Every fifth child (19%) came to the surgery because of a sudden pain or post-traumatic situation. On the other hand, more than half of the children (60.8%) reported for the continuation of planned treatment or a follow-up visit (Fig. 4).

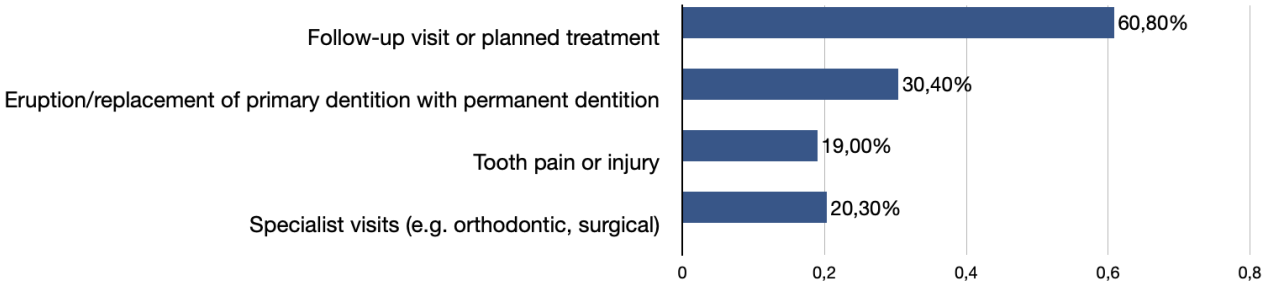

Figure 4. Reasons for visiting the dentist during the pandemic

The parents' answers to the question of how the infection affected the oral health of children who contracted COVID-19 are presented in Table 1. Among the changes occurring in the oral cavity, the respondents most often mentioned: single aphthae, pustules, engorgement, discoloration or single eruptions, which after time were cured.

Two questions in the survey concerned patient safety during a pandemic during a visit to the dentist's office. The overwhelming majority of respondents (84.3%) felt safe in them. People who were afraid of a visit, as the main reason, indicated the possibility of coronavirus infection as a result of contact with the dentist, other children and parents. More than half of the surveyed patients (56%) noticed new equipment, materials and/or equipment in the office, which increased their safety during the visit.

Has your child contracted COVID?	Yes 38,8%	No 27,2%	I don't know 34%	
Has the COVID infection affected your child's oral health?	Yes 10%	No 60%	I don't know 30%	
Do you feel safe coming to the dental office for a visit?	Yes 84,3%	No 2%	Not completely 13,7%	
When was your child's last visit to the dentist?	A month ago 29,5%	3 months ago 25,3%	Half a year ago 13,7%	A year ago or more 31,6%
What does your child use for daily oral hygiene, apart from toothpaste?	Interdental threads 5,8%	Rinses for daily mouthwash 17,5%	Interdental floss and rinses for daily mouthwash 4,9%	I do not use additional measures (only paste) 71,2%

Table 1. Parents' answers to the survey questions

Brushing teeth twice a day by children was declared by 58.3% of the respondents, while 39% did not help their children with this activity (Fig. 5, Fig. 6).

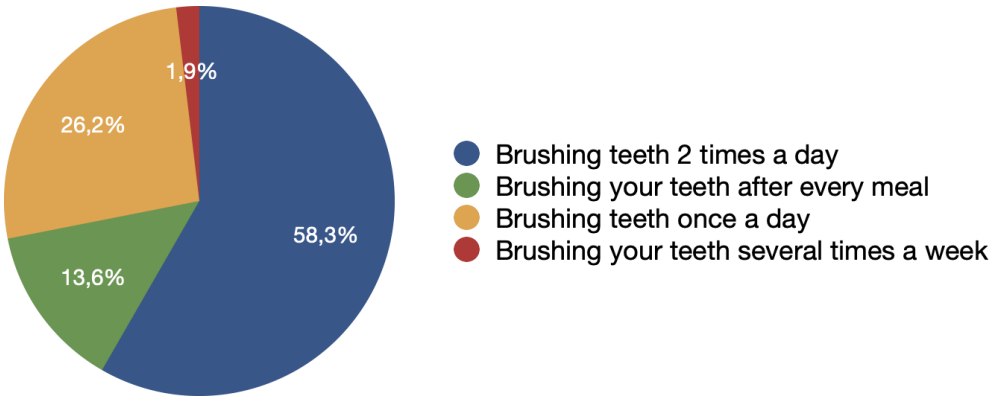

Figure 5. Frequency of brushing teeth during the pandemic

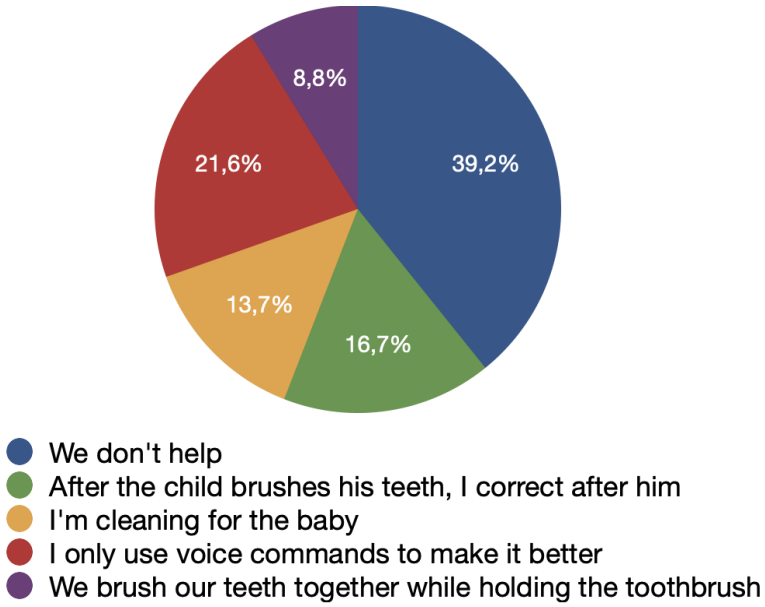

Figure 6. Ways parents helped their children take care of oral hygiene during the pandemic

Nearly 60% of parents believed that their children's oral hygiene was maintained at the same level during the pandemic, and a similar percentage declared that their children's dietary habits had not changed either (Fig. 7. Fig. 8.).

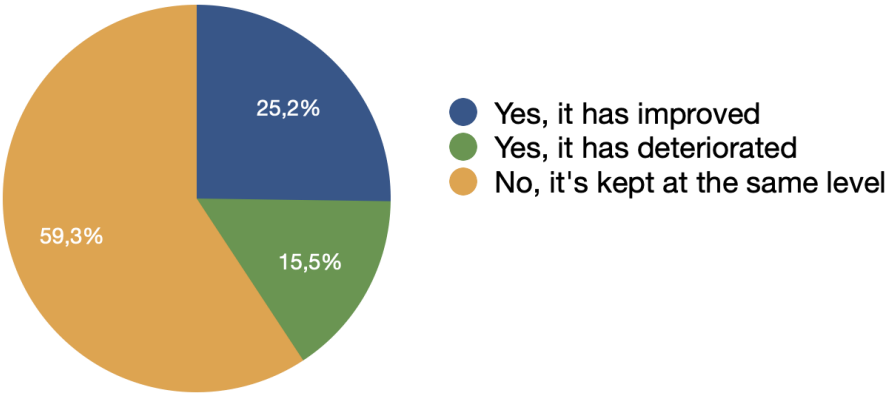

Figure 7. Change in children's oral hygiene during the pandemic

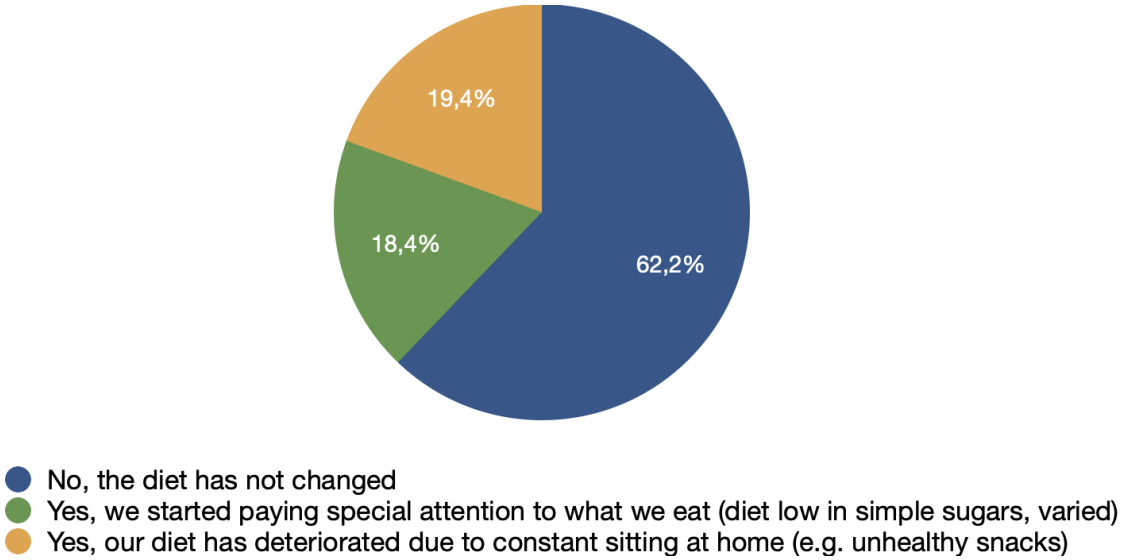

Figure 8. Presence and possible causes of changes in nutrition during the pandemic

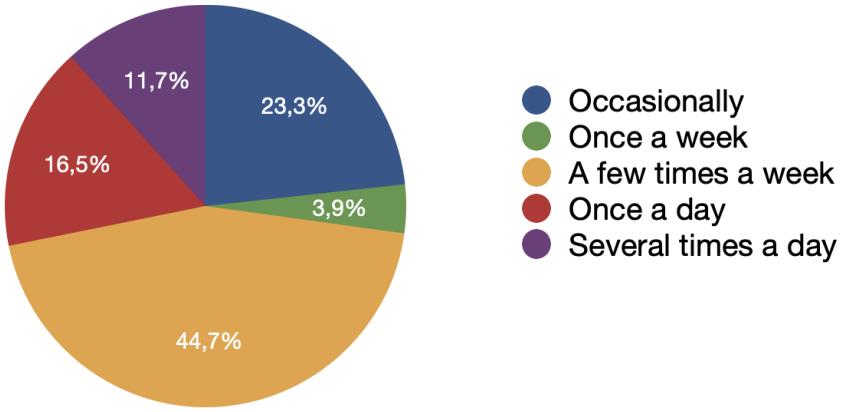

Figure 9. Frequency of consumption of sweet snacks and/or drinks

The last questions concerned the use of fluoride (Table 2). Every fifth child (19.4%) brushed their teeth with fluoride toothpaste, recommended by a dentist. Nearly 60% of the respondents, when choosing a toothpaste for a child, were guided only by the age indicated

on the packaging, without checking its composition. Fluoride-free toothpaste was used by 11.7% of children, and 10.7% of the respondents used toothpaste with reduced fluoride content in their children.

	Yes	No
In your opinion, is the use of fluoride safe?	83,5%	16,5%
Did the doctor explain to you the principles of fluoride use?	36,9%	63,1%

Table 2. Parents' responses to fluoride survey questions

Most of the parents (67%) obtained information about fluoride from the Internet (Fig. 10).

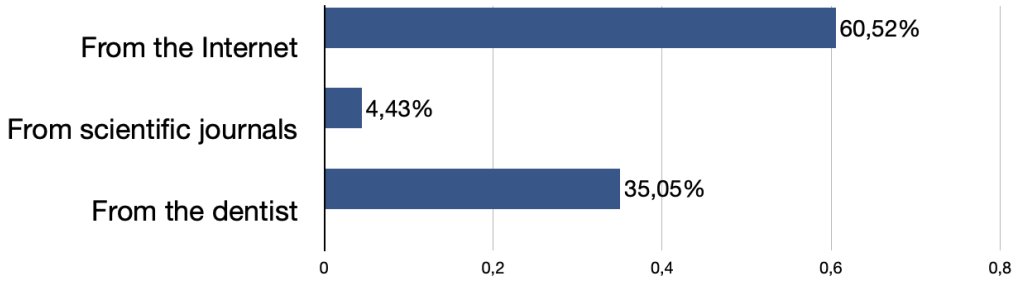

Figure 10. Sources from which parents/guardians obtain information about fluoride

Discussion:

The coronavirus pandemic had and still has a huge impact on the everyday life of Polish people. Everyone had to find themselves in a new reality. This particularly affected parents who, due to the closure of teaching facilities and the need to switch from normal working mode to remote one, had problems reconciling everyday life with dental treatment of children. Fear of possible infection limited visits for some, and the closure of dental offices limited access to dentists for those who were not afraid of visiting themselves. In the early period of the COVID-19 pandemic in the USA, the oral health of children deteriorated [5]. According to Lyu and Wehby, this was due, among other things, to less access to specialist

medical care. Based on NSCH[1] results in 2020, 75% of children had poor dental health compared to 2019. In addition, it was reported that children were 16% less likely to retain perfect teeth. These differences were noticed mainly in socio-economic and demographic subgroups, while in previous years such differences did not occur. This may indicate an indirect impact of the pandemic on the condition of children's teeth, by lowering parents' earnings and closing facilities in individual regions of the country. In own research, a decrease in the number of dental check-ups during the pandemic was noted. Only 30% of children did not limit the frequency of visits. Unfortunately, as many as 27.2% did not attend any visits, another 28.2% had fewer visits. In the study by Sari et al. [6], the percentage of patients hesitating before going to the dentist was 50.4%. Caregivers of children in the Pittsburgh study reported that the greatest need not met during the pandemic was dental care (16%). On the other hand, general medical care and vaccinations were the most important unmet need for 5% of the respondents [7]. This demonstrates the importance of adequate access to the dentist for children's health.

It is surprising that only 13.7% of parents from their own research resigned from their child's visits to the dentist for fear of treatment in a pandemic. For 17.6%, finding time in the new, changed organization of the day was a problem. One in three could not give a specific reason why they limited the frequency of visits to the dentist. It is possible that one of the reasons was the increase in prices for dental services, related to the need for doctors to purchase additional personal protective equipment. It is also possible that parents' earnings decreased as a result of the pandemic, as reported by Lyu and Wehby [5].

The fact that dentists were unavailable due to self-infection with the virus could also have reduced visits. According to research by Goriuc et al. [8], the dental staff was severely affected by the COVID-19 pandemic. However, as indicated by the data presented by the COVIDental Collaboration Group [9], despite the increased exposure of dental staff to the virus, the incidence of COVID-19 among dentists did not differ significantly from that reported for the general population in a given country.

The increase in the cost of treating patients and the doctors' fear of infection caused the temporary closure of many dental facilities, which made it difficult for patients to make appointments. Maintaining regular visits ensuring the continuity of the prophylactic and therapeutic process has a huge impact on oral health. In the prevention of caries, regular visits

[1] The NSCH is a nationally representative cross-sectional survey (web and paper) conducted to obtain information on several aspects of children's health and health care. National Survey of Children's Health

to the dentist's office are as important as performing hygienic procedures at home and following a balanced, healthy diet [3,4]. The results of monitoring studies [3] have shown that regular and frequent follow-up visits are correlated with the occurrence and severity of caries (negative index values). In addition, a relationship was found between the treatment rate and hygiene and dietary behaviors. Reducing the frequency of visits may worsen oral health indicators in the long term.

Safety in dental offices is one of the issues that has affected parents visiting the dentist during the pandemic. Our own research shows that as many as 84.3% of the respondents felt safe coming to the dentist. Only every sixth parent (15.7%) was partially or completely afraid of the visit. In the study of Sharma et al. [10], the percentage of parents who were afraid of visits during which their children were exposed to COVID-19 infection was much higher (37%). According to respondents from Italy, dental offices were and still are places with an increased risk of contracting COVID-19, and despite the improvement of the pandemic situation in 2021, as many as 16% of them did not return to dental treatment [11]. The research of the COVIDental Collaboration Group [9] shows that COVID-19 did not significantly affect the provision of children's oral health services, despite the fact that access to visits was significantly limited. The profession of a dentist has been recognized as a high-risk profession, mainly due to the conditions in the offices and the ways of spreading the virus. Infection can occur directly, i.e. through the transmission of the virus between the staff and the patient, or indirectly, i.e. by leaving droplets containing the virus on tools or surfaces [12]. The infection is influenced by the necessity of continuous work in the water aerosol environment. In order to reduce transmission of the virus, patients should rinse their mouth before or at the beginning of the visit. Recent studies [13] have shown that rinses with chlorhexidine are ineffective against coronavirus. However, it is sensitive to agents with oxidizing properties and for pre-treatment oral disinfection, the following are recommended: 1% hydrogen peroxide or 0.2% povidone [14].

The data obtained in the survey show that the least common reason for visiting the dental office was tooth pain and trauma. During the lockdown period, sports facilities were closed and the possibility of using public space facilities was significantly limited. Children and teenagers were less active, did not practice sports, so there were fewer accidents and injuries. In the studies of Olszewska et al. [15], no differences in the frequency of extractions were noted between April 2019 and April 2020, but a significant increase in temporary fillings in primary and permanent teeth was observed: from 6.4% in 2019 to to 19.3% in 2020, despite

the fact that the total number of procedures performed at that time decreased. This may indicate a change in the nature of visits to a more interventional one, instead of planned full treatment, and/or an increase in the intensity of caries in children. Similar research results were presented by Matsuyama et al. [16], who compared data obtained from school dentists. They showed that the intensity of dental caries in children slightly increased after the pandemic.

Diet has a huge impact on the proper development of teeth in children [3,4]. It is important to educate parents about the cariogenic effects of carbohydrates, the content of which in children's diets is alarmingly increasing. This fact was pointed out by Małkiewicz et al. [17]. The diet of most children (60%) from our own research has not changed during the pandemic. Unfortunately, in every fifth family, due to the temporary confinement at home, the diet has deteriorated. Although most of the surveyed children did not change their dietary behavior, it should be recalled that monitoring studies [3] show that the dietary habits of Polish children are not satisfactory, and the diet of young Poles is rich in sugar. The pandemic has kept it that way. The only hope is that some parents (19.4%) began to pay more attention to the quality of nutrition in this period. On the other hand, the deterioration of dietary behavior during the pandemic was observed by researchers from Spain and Portugal. During the pandemic, 41.2% of the children in these studies ate 2 snacks between meals. Every fifth child (21.3%) ate as many as three snacks a day [18]. For comparison, our own research shows that sweet snacks were consumed by most children (44.7%) several times a week. Every tenth child ate sweets several times a day.

Oral hygiene is a key element in the prevention of caries, to which school-aged children are particularly exposed [3,4]. Steina et al. [19] observed a positive impact of the pandemic period on oral hygiene in only ⅕ of the respondents. And the research by Goswami et al. [20] shows that the general attitude and practices of parents regarding oral health during the pandemic were unsatisfactory. As many as 60.8% of parents reported the need for dental treatment of their child during the lockdown period, but only 33.3% of carers made additional efforts to maintain their child's oral hygiene, and 45% introduced nutritional changes in the child's diet to prevent caries. Hygiene procedures of 2/3 of children from own research did not change during the pandemic. It should be noted, however, that the hygienic habits of Polish children are not sufficient, as reported by the results of monitoring studies. Every second three-year-old and every third six-year-old did not brush their teeth twice a day [3]. In own research, it was noted that 60% of children brushed their teeth twice a day, but this

group included not only small children, but also older children and adolescents up to 18 years of age. It is not common among young Poles to use dental floss and additional oral hygiene products, which was also confirmed by the results of our research - 71.2% of children did not use either floss or mouthwash, but only toothpaste.

The surveyed parents were divided on the beneficial effects of fluoride. Some of them used fluoride-free toothpaste for fear of the negative effects of its supply, despite the fact that scientific research clearly proves its beneficial effect on maintaining oral health [4, 21, 22]. The exogenous supply of this element is especially important, among others, in toothpastes. Easy access to information on the Internet has increased parents' awareness of the use of fluoride preparations and its mode of action and impact on children's teeth. The study shows that the main source from which parents obtained information about fluoride was the Internet (67%), followed by a dentist (38%). Internet sources can convincingly present inaccurate and often false information that spreads rapidly, weakening and/or discrediting the opinion of experts [23]. The lack of control over the content posted on the Internet, which may contradict scientific reports, should be a cause for concern. Parents need to be made aware of the credibility of the sources they refer to and use.

Conclusions:

Knowledge about the SARS-CoV-2 virus is ambiguous. Despite concerns about Covid-19, the parents of most children did not change their children's dietary and hygiene behavior and did not completely abandon treatment. Although 84.3% of the respondents felt safe coming to the dental office for visits, the frequency of these visits decreased. This fact may contribute to the deterioration of oral health in the long term, and more research is needed on the impact of the pandemic on oral health.

References:

1. Anuraj Singh Kochhar, Ritasza Bhasin , Gulsheen Kaur Kochhar, Himanshu Dadlani, COVID-19 Pandemic and Dental Practice, Int J Dent 2020 Jul 9. eCollection 2020.

2. Faccini M, Ferruzzi F, Mori AA, Santin GC, Oliveira RC, Gobbi de Oliveira RC, Queiroz PM, Samira Salmeron *et al.* Dental Care during COVID-19 Outbreak: A Web-Based Survey. Eur J Dent. 2020 Dec; 14(Suppl 1): 14–19.
3. https://www.gov.pl/web/zdrowie/monitorowanie-stanu-zdrowia-jamy-ustnej-populacji-polskiej-w-latach-2016-2020
4. Olczak-Kowalczyk D, Szczepańska J, Kaczmarek U. Współczesna stomatologia wieku rozwojowego. Otwock: Med Tour Press; 2017. 856 s.
5. Lyu W, Wehby GL. Effects of the COVID-19 pandemic on children's oral health and oral health care use. J Am Dent Assoc. 2022 Aug;153(8):787-796.e2.
6. Sari A, Bilmez ZY. Effects of Coronavirus (COVID-19) Fear on Oral Health Status. Oral Health Prev Dent. 2021 Jan 7;19(1):411-23.
7. Burgette JM, Weyant RJ, Ettinger AK, Miller E, Ray KN. What is the association between income loss during the COVID-19 pandemic and children's dental care. J Am Dent Assoc. 2021 May;152(5):369-76.
8. Goriuc A, Sandu D, Tatarciuc M, Luchian I. The Impact of the COVID-19 Pandemic on Dentistry and Dental Education: A Narrative Review. Int J Environ Res Public Health. 2022 Feb 22;19(5):2537.
9. Campus G, Diaz Betancourt M, Cagetti MG, Giacaman RA, Manton DJ, Douglas G, et al. The COVID-19 pandemic and its global effects on dental practice. An International survey. J Dent. 2021 Nov;114:103749.
10. Sharma P, Dhawan P, Rajpal S, Bhat A. Knowledge, Attitudes, and Perception of Parents toward Dental Treatment of Children during the COVID-19 Outbreak. Int J Clin Pediatr Dent. 2021;14(5):693-9.
11. Martina S, Amato A, Faccioni P, Iandolo A, Amato M, Rongo R. The perception of COVID-19 among Italian dental patients: an orthodontic point of view. Prog Orthod. 2021 Apr 7;22(1):11.
12. Luzzi V, Ierardo G, Bossù M, Polimeni A. Paediatric Oral Health during and after the COVID-19 Pandemic. Int J Paediatr Dent. 2021 Jan;31(1):20-6.
13. Lamba G, Nagpal DI, Chowdhari P, Hotwani K, Gunwal MK. Oral Healthcare Management of Children after COVID-19 Outbreak. Int J Clin Pediatr Dent. 2021;14(2):293-7.
14. Peng X, Xu X, Li Y, Cheng L, Zhou X, Ren B. Transmission routes of 2019-nCoV and controls in dental practice. Int J Oral Sci. 2020 Mar 3;12(1):9

15. Olszewska A, Paszynska E, Roszak M, Czajka-Jakubowska A. Management of the Oral Health of Children During the COVID-19 Pandemic in Poland. Front Public Health. 2021; 9: 635081.
16. Matsuyama Y, Isumi A, Doi S, Fujiwara T. Impacts of the COVID-19 pandemic exposure on child dental caries: Difference-in-differences analysis. Caries Res. 2022 Nov 28: 1-9. Doi: 10.1159/000528006.
17. Małkiewicz EH, Borkowska T, Wierzbicka M. Świadomość stomatologiczna i zachowania zdrowotne opiekunów dzieci, zainteresowanych programami profilaktycznymi. Probl Hig Epidemiol 2012, 93(1): 90-96.
18. Costa AL, Pereira JL, Franco L, Guinot F. COVID-19 Lockdown: Impact on Oral Health-Related Behaviors and Practices of Portuguese and Spanish Children. Int J Environ Res Public Health. 2022 Nov 30;19(23):16004.
19. Stein C, Santos NML, Hilgert JB, Hugo FN. Effectiveness of oral health education on oral hygiene and dental caries in schoolchildren: Systematic review and meta-analysis. Community Dent Oral Epidemiol. 2018 Feb;46(1):30-7.
20. Goswami M, Grewal M, Garg A. Attitude and practices of parents toward their children's oral health care during COVID-19 pandemic. J Indian Soc Pedod Prev Dent. 2021;39(1):22-8.
21. Pollick H. The Role of Fluoride in the Prevention of Tooth Decay. Pediatr Clin North Am. 2018 Oct;65(5):923-40.
22. Iracki J, Wierzbicka M. Skuteczność aktywnych składników past do zębów jako element stomatologii opartej na dowodach. Czas Stomat., 2005, LVIII, 6.
23. Burgette JM, Dahl ZT, Yi JS, Weyant RJ, McNeil DW, Foxman B, et al. Mothers' Sources of Child Fluoride Information and Misinformation From Social Connections. JAMA Netw Open. 2022 Apr 1;5(4):e226414.