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Analysis of emergency dental visits of pediatric patients in the National Health Insurance of Taiwan in 2020

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Abstract *Background/purpose:* The unconventional state associated with acute dental problems may lead people to seek emergency visits for dental care and abandon routine dental services. The aim of this study was to analyze the emergency dental visits of pediatric patients in the National Health Insurance (NHI) of Taiwan in 2020.

Materials and methods: Data on the population and medical records of NHI were obtained from the websites of Ministry of the Interior and the NHI Administration. The pediatric dental patient data were divided into 3 age groups (0–4, 5–9, and 10–14 years) to investigate and analyze emergency dental visit records claimed in 2020.

Results: In Taiwan, the two most common oral diseases of children treated in emergency dental visits were diseases of pulp and periapical tissues, and gingivitis and periodontal diseases. Children in the 5–9-year age group had the highest number of emergency dental visits per 10,000 people (12.68 visits), followed in a descending order by all patients in the overall population (12.01 visits), children in the 0–4-year age group (9.65 visits), and children in the 10–14-year age group (7.13 visits). The male pediatric patients usually had higher number of emergency dental visits than female pediatric patients.

Conclusion: We conclude that some children seek for dental emergency cares but do not continue to receive routine dental cares, especially in children of the 0–4-year age group.

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Therefore, it is imperative to continuously raise public awareness of emergency dental visits and reduce the use of dental health insurance resources incorrectly.

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Introduction

For patients who have acute clinical problems but do not have timely access to primary care services, emergency visits are often needed after business hours or under unscheduled condition. These visits often disrupt clinical routine health care as these patients often arrive in clinics without appointments. Those patients who need frequent emergency visits often overlook regular dental care and their underlying systemic health problems.¹ According to the US National Hospital Ambulatory Medical Care Survey (NHAMCS) and Nationwide Emergency Department Sample (NEDS) survey, the number of emergency dental visits per year increased from 1.1 million in 1997/1998 to more than 2 million in 2007/2008, and emergency dental visits accounted for approximately 1.0% of all emergency room visits from 2008 to 2010.^{2,3} The average number of emergency dental visits among children and adolescents increased from 2008 to 2010 in south-east Queensland, Australia.⁴ In Taiwan, a 2-year retrospective study (from January 2012 to December 2013) shows that trauma and toothache are the two most common reasons for pediatric emergency dental visits in one hospital emergency center.⁵

Taiwan implemented the National Health Insurance (NHI) in 1995. This system is a single-payer compulsory health insurance. The coverage rate of the insured population has reached as high as 99%. In 2014, it covered 99.9% of Taiwan inhabitants' outpatient, emergency, and inpatient medical services.⁶ The medical services of NHI also include outpatient, emergency, and inpatient services of dentistry. In fact, the real emergency dental services in NHI of Taiwan refers to emergency dental services provided by hospital emergency departments. Currently, only 58 hospitals in Taiwan provide emergency dental services. All dental clinics and hospitals in outlying islands do not provide emergency dental services. Despite this, Taiwanese can choose any level of contracted medical institutions without a formal referral. Taiwan may be the most convenient country for medical care. However, seeking care in an emergency dental visit often results in a temporary treatment with only symptomatic relief prescribed by antibiotics or anesthetics, which does not definitively treat the underlying oral disease process.^{7,8} Therefore, the usage of emergency dental visits for dental problems may be a marker for disparities in dental care quality.

In this study, we extracted the medical records of children's visits to the hospital emergency room due to oral diseases in 2020 from the NHI database and analyzed the types of children's oral diseases and their expenses for emergency dental cares. We hope that the results of this study can be used as a reference for the formulation of the children's oral health care policy.

Materials and methods

This study adopted the methods of the secondary data analysis. The population data in mid-2020 of Taiwan were obtained from the Ministry of the Interior. The medical records of emergency dental visits, including the numbers of patients who received dental services of NHI, emergency dental visits and their medical expense NHI points, and disease classifications, were obtained from the website of the NHI Administration. The above data were also classified by the gender. This study only investigated and analyzed emergency dental treatment records claimed in 2020. In this study, in order to match the 3 age groups published by the Ministry of the Interior, the pediatric dental patient data were divided into 3 age groups (0–4, 5–9 and 10–14 years), and all patients were used for comparison.

According to the emergency dental patients who received NHI services in 2020, the numbers of emergency dental patients without outpatient visit, emergency dental visits and their medical expense NHI points, the above parameters per 10,000 people, and the mean medical expense NHI points per emergency dental visit were analyzed in the 3 age groups of pediatric patients and all patients based on various oral-related diseases by the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10). The number of emergency dental patients without outpatient visit was calculated by the difference between the numbers of dental patients who received NHI services (including emergency) and those received NHI services (excluding emergency). This study further compared the profile of emergency dental utilization in each age group of pediatric patients and in all patients, and their differences between male and female pediatric patients in Taiwan in 2020.

Results

The numbers of emergency dental patients without outpatient visit, emergency dental visits and their medical expense NHI points, the above parameters per 10,000 people, and the mean medical expense NHI points per emergency dental visit for various types of oral diseases in different age groups of pediatric patients in Taiwan in 2020 are shown in Tables 1–4. According to ICD-10, dentistry-related diseases of the children are classified into: disorders of tooth development and eruption (K00), embedded and impacted teeth (K01), dental caries (K02), other diseases of hard tissues of teeth (K03), diseases of pulp and periapical tissues (K04), gingivitis and periodontal diseases (K05), other disorders of gingiva and edentulous alveolar ridge (K06), other disorders of teeth and supporting

Table 1 The numbers of emergency dental patients without outpatient visit, the numbers of emergency dental visits, and the medical expense National Health Insurance (NHI) points for various types of oral diseases in the overall population in Taiwan in 2020.

	Number of emergency dental patients without outpatient visit			Number of emergency dental visit			Medical expenses (1000 NHI points)			Mean medical expenses per emergency dental visit (one NHI point)		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
K00	39	24	15	77	45	32	90	50	39	1169	1111	1219
K01	38	23	15	89	54	35	46	35	11	517	648	314
K02	277	154	123	951	527	424	597	352	245	628	668	578
K03	459	253	206	642	362	280	435	214	221	678	591	789
K04	1239	740	499	4090	2322	1768	4538	2592	1946	1110	1116	1101
K05	727	466	261	4678	2800	1878	4992	3007	1984	1067	1074	1056
K06	172	93	79	181	94	87	149	72	76	823	766	874
K08	482	277	205	735	414	321	563	354	210	766	855	654
K09	3	3	0	6	5	1	4	4	1	667	800	1000
K11	15	4	11	22	6	16	26	5	21	1182	833	1313
K12	1354	729	625	2813	1479	1334	4384	2359	2025	1558	1595	1518
K13	50	30	20	75	50	25	59	29	30	787	580	1200
K14	13	9	4	15	9	6	11	7	4	733	778	667
Others	5039	2715	2324	13,957	7540	6417	10,996	6132	4863	788	813	758
Overall	1400	852	548	28,331	15,707	12,624	26,888	15,211	11,677	949	968	925
	Number of emergency dental patients without outpatient visit per 10,000 people			Number of emergency dental visit per 10,000 people			Medical expenses per 10,000 people (1000 NHI points)					
	Total	Male	Female	Total	Male	Female	Total	Male	Female			
K00	0.02	0.02	0.01	0.03	0.04	0.03	0.04	0.04	0.03			
K01	0.02	0.02	0.01	0.04	0.05	0.03	0.02	0.03	0.01			
K02	0.12	0.13	0.10	0.40	0.45	0.36	0.25	0.30	0.21			
K03	0.19	0.22	0.17	0.27	0.31	0.24	0.18	0.18	0.19			
K04	0.53	0.63	0.42	1.73	1.99	1.49	1.92	2.22	1.64			
K05	0.31	0.40	0.22	1.98	2.40	1.58	2.12	2.57	1.67			
K06	0.07	0.08	0.07	0.08	0.08	0.07	0.06	0.06	0.06			
K08	0.20	0.24	0.17	0.31	0.35	0.27	0.24	0.30	0.18			
K09	<0.01	<0.01	0	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			
K11	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.01	<0.01	0.02			
K12	0.57	0.62	0.53	1.19	1.27	1.12	1.86	2.02	1.70			
K13	0.02	0.03	0.02	0.03	0.04	0.02	0.03	0.02	0.03			
K14	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			
Others	2.14	2.32	1.95	5.92	6.45	5.40	4.66	5.25	4.09			
Overall	0.59	0.73	0.46	12.01	13.44	10.61	11.40	13.01	9.82			

Expenses: The value of one NHI point is settled quarterly, and one NHI point fluctuates around NT\$0.8–1.2.

Table 2 The numbers of emergency dental patients without outpatient visit, the numbers of emergency dental visits, and the medical expense National Health Insurance (NHI) points for various types of oral diseases in the 0-4-year age group of pediatric patients in Taiwan in 2020.

	Number of emergency dental patients without outpatient visit			Number of emergency dental visit			Medical expenses (1000 NHI points)			Mean medical expenses per emergency dental visit (one NHI point)		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
K00	3	2	1	4	3	1	4	2	1	1000	667	1000
K01	0	0	0	0	0	0	0	0	0	—	—	—
K02	3	1	2	20	12	8	11	6	5	550	500	625
K03	35	20	15	43	27	16	28	15	13	651	556	813
K04	21	14	7	53	30	23	57	29	27	1075	967	1174
K05	22	14	8	55	33	22	62	38	24	1127	1152	1091
K06	5	3	2	5	3	2	4	1	3	800	333	1500
K08	23	15	8	26	16	10	28	17	11	1077	1063	1100
K09	0	0	0	0	0	0	0	0	0	—	—	—
K11	0	0	0	0	0	0	0	0	0	—	—	—
K12	11	8	3	26	18	8	34	21	13	1308	1167	1625
K13	2	2	0	2	2	0	1	1	0	500	500	—
K14	0	0	0	0	0	0	0	0	0	—	—	—
Others	295	175	120	683	413	270	543	321	222	795	777	822
Overall	98	56	42	917	557	360	768	451	317	838	810	881

	Number of emergency dental patients without outpatient visit per 10,000 people			Number of emergency dental visit per 10,000 people			Medical expenses per 10,000 people (1000 NHI points)		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
K00	0.03	0.04	0.02	0.04	0.06	0.02	0.04	0.04	0.02
K01	0	0	0	0	0	0	0	0	0
K02	0.03	0.02	0.044	0.21	0.24	0.17	0.12	0.12	0.11
K03	0.37	0.41	0.33	0.45	0.55	0.35	0.29	0.30	0.28
K04	0.22	0.28	0.15	0.56	0.61	0.50	0.60	0.59	0.59
K05	0.23	0.28	0.17	0.58	0.67	0.48	0.65	0.77	0.52
K06	0.05	0.06	0.04	0.05	0.06	0.04	0.04	0.02	0.07
K08	0.24	0.30	0.17	0.27	0.32	0.22	0.29	0.35	0.24
K09	0	0	0	0	0	0	0	0	0
K11	0	0	0	0	0	0	0	0	0
K12	0.12	0.16	0.07	0.27	0.37	0.17	0.36	0.43	0.28
K13	0.02	0.04	0	0.02	0.04	0	0.01	0.02	0
K14	0	0	0	0	0	0	0	0	0
Others	3.10	3.6	2.62	7.19	8.39	5.89	5.71	6.52	4.85
Overall	1.03	1.14	0.92	9.65	11.31	7.86	8.08	9.16	6.92

Expenses: The value of one NHI point is settled quarterly, and one NHI point fluctuates around NT\$0.8–1.2.

Table 3 The numbers of emergency dental patients without outpatient visit, the numbers of emergency dental visits, and the medical expense National Health Insurance (NHI) points for various types of oral diseases in the 5-9-year age group of pediatric patients in Taiwan in 2020.

	Number of emergency dental patients without outpatient visit			Number of emergency dental visit			Medical expenses (1000 NHI points)			Mean medical expenses per emergency dental visit (one NHI point)		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
K00	10	5	5	15	6	9	11	4	7	733	667	778
K01	0	0	0	0	0	0	0	0	0	—	—	—
K02	6	3	3	59	38	21	45	26	18	763	684	857
K03	41	24	17	49	28	21	25	13	12	510	464	571
K04	53	29	24	192	118	74	217	132	83	1130	1119	1122
K05	29	18	11	101	62	39	123	73	50	1218	1177	1282
K06	5	2	3	6	2	4	3	1	2	500	500	500
K08	31	19	12	47	27	20	41	20	20	872	741	1000
K09	0	0	0	0	0	0	0	0	0	—	—	—
K11	0	0	0	0	0	0	0	0	0	—	—	—
K12	44	29	15	81	50	31	93	60	32	1148	1200	1032
K13	2	1	1	2	1	1	2	1	1	1000	1000	1000
K14	0	0	0	0	0	0	0	0	0	—	—	—
Others	325	207	118	769	480	289	563	363	201	732	756	696
Overall	36	26	10	1321	812	509	1122	696	426	849	857	837

	Number of emergency dental patients without outpatient visit per 10,000 people			Number of emergency dental visit per 10,000 people			Medical expenses per 10,000 people (1000 NHI points)		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
K00	0.10	0.09	0.10	0.14	0.11	0.18	0.11	0.07	0.14
K01	0	0	0	0	0	0	0	0	0
K02	0.06	0.06	0.06	0.57	0.70	0.42	0.43	0.48	0.36
K03	0.39	0.44	0.34	0.47	0.52	0.42	0.24	0.24	0.24
K04	0.51	0.54	0.48	1.84	2.19	1.47	2.08	2.45	1.65
K05	0.28	0.33	0.22	0.97	1.15	0.78	1.18	1.35	1.00
K06	0.05	0.04	0.06	0.06	0.04	0.08	0.03	0.02	0.04
K08	0.30	0.35	0.24	0.45	0.50	0.40	0.39	0.37	0.40
K09	0	0	0	0	0	0	0	0	0
K11	0	0	0	0	0	0	0	0	0
K12	0.42	0.54	0.30	0.78	0.93	0.62	0.89	1.11	0.64
K13	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
K14	0	0	0	0	0	0	0	0	0
Others	3.12	3.83	2.35	7.38	8.89	5.76	5.40	6.73	4.00
Overall	0.35	0.48	0.20	12.68	15.04	10.14	10.77	12.89	8.49

Expenses: The value of one NHI point is settled quarterly, and one NHI point fluctuates around NT\$0.8–1.2.

Table 4 The numbers of emergency dental patients without outpatient visit, the numbers of emergency dental visits, and the medical expense National Health Insurance (NHI) points for various types of oral diseases in the 10-14-year age group of pediatric patients in Taiwan in 2020.

	Number of emergency dental patients without outpatient visit			Number of emergency dental visit			Medical expenses (1000 NHI points)			Mean medical expenses per emergency dental visit (one NHI point)		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
K00	2	2	0	3	3	0	1	1	0	333	333	—
K01	1	1	0	1	1	0	0	0	0	0	0	—
K02	2	1	1	12	7	5	7	4	3	583	571	600
K03	23	14	9	38	27	11	36	23	13	947	852	1182
K04	22	16	6	70	39	31	67	30	36	957	769	1161
K05	18	13	5	60	43	17	58	40	19	967	930	1118
K06	1	0	1	1	0	1	1	0	1	1000	—	1000
K08	22	12	10	31	19	12	31	18	13	1000	947	1083
K09	0	0	0	0	0	0	0	0	0	—	—	—
K11	0	0	0	0	0	0	0	0	0	—	—	—
K12	13	4	9	25	10	15	40	11	29	1600	1100	1933
K13	0	0	0	0	0	0	0	0	0	—	—	—
K14	0	0	0	0	0	0	0	0	0	—	—	—
Others	151	108	43	468	335	133	365	277	88	780	827	662
Overall	25	16	9	709	484	225	605	403	201	853	833	893
	Number of emergency dental patients without outpatient visit per 10,000 people			Number of emergency dental visit per 10,000 people			Medical expenses per 10,000 people (1000 NHI points)					
	Total	Male	Female	Total	Male	Female	Total	Male	Female			
K00	0.02	0.04	0	0.03	0.06	0	0.01	0.02	0			
K01	0.01	0.02	0	0.01	0.02	0	0	0	0			
K02	0.02	0.02	0.02	0.12	0.13	0.11	0.07	0.08	0.06			
K03	0.23	0.27	0.19	0.38	0.52	0.23	0.36	0.44	0.27			
K04	0.22	0.30	0.13	0.70	0.75	0.65	0.67	0.58	0.76			
K05	0.18	0.25	0.11	0.60	0.83	0.36	0.58	0.77	0.40			
K06	0.01	0	0.02	0.01	0	0.02	0.01	0	0.02			
K08	0.22	0.23	0.21	0.31	0.37	0.25	0.31	0.35	0.27			
K09	0	0	0	0	0	0	0	0	0			
K11	0	0	0	0	0	0	0	0	0			
K12	0.13	0.08	0.19	0.25	0.19	0.32	0.40	0.21	0.61			
K13	0	0	0	0	0	0	0	0	0			
K14	0	0	0	0	0	0	0	0	0			
Others	1.52	2.08	0.90	4.71	6.45	2.80	3.67	5.34	1.85			
Overall	0.25	0.31	0.19	7.13	9.32	4.73	6.08	7.76	4.23			

Expenses: The value of one NHI point is settled quarterly, and one NHI point fluctuates around NT\$0.8–1.2.

structures (K08), cysts of oral region, not elsewhere classified (K09), diseases of salivary glands (K11), stomatitis and related lesions (K12), other diseases of lip and oral mucosa (K13), diseases of tongue (K14), and others.

In 2020, the overall population of Taiwan was 23,582,179 (11,689,476 males and 11,892,703 females), and there were 1400 emergency dental patients without outpatient visit, 28,331 emergency dental visits, 26,888 thousand NHI points for the medical expenses, and a mean of 949 NHI points per emergency dental visit (Table 1). In addition, there were 0.59 emergency dental patient without outpatient visit per 10,000 people, 12.01 emergency dental visits per 10,000 people, and 11.40 thousand NHI points per 10,000 people for the medical expenses (Table 1). Among male patients, the above parameters were 852, 15,707, 15,211 and 968, as well as 0.73, 13.44 and 13.01 per 10,000 people, respectively. Moreover, each parameter value of male patients was generally higher than that of female patients (Table 1).

The population of the 3 age groups of children were 950,552 (492,530 males and 458,022 females) in the 0-4-year age group, 1,041,754 (539,766 males and 501,988 females) in the 5-9-year age group, and 994,568 (519,135 males and 475,433 females) in the 10-14-year age group. They accounted for 4.03%, 4.42% and 4.22% of the overall population, respectively. Among the 3 age groups of children, children in the 0-4-year age group had the highest number of emergency dental patients without outpatient visit (98 patients), followed in a descending order by children in the 5-9-year age group (36 patients) and children in the 10-14-year age group (25 patients). Children in the 5-9-year age group had the highest values of emergency dental visits and medical expenses (1321 visits and 1122 thousand NHI points, respectively), followed in a descending order by children in the 0-4-year age group (917 visits and 768 thousand NHI points, respectively) and children in the 10-14-year age group (709 visits and 605 thousand NHI points, respectively) (Tables 2-4). Moreover, children in the 10-14-year age group had the highest mean value of medical expenses per emergency dental visit (853 NHI points), followed in a descending order by children in the 5-9-year age group (849 NHI points) and children in the 0-4-year age group (838 NHI points) (Tables 2-4). Furthermore, except the mean medical expenses per emergency dental visit in the 0-4-year and the 10-14-year age groups, each parameter value of male pediatric patients was generally higher than that of female pediatric patients in all 3 age groups of children (Tables 2-4).

Comparison of various parameters per 10,000 people in the overall population and in all 3 age groups of children, children in the 0-4-year age group had the highest number of emergency dental patients without outpatient visit per 10,000 people (1.03 patients), followed in a descending order by all patients in the overall population (0.59 patient), children in the 5-9-year age group (0.35 patient), and children in the 10-14-year age group (0.25 patient). Children in the 5-9-year age group had the highest number of emergency dental visits per 10,000 people (12.68 visits), followed in a descending order by all patients in the overall population (12.01 visits), children in the 0-4-year age group (9.65 visits), and children in the 10-14-year age group (7.13 visits) (Tables 1-4). All patients in the overall population

had the highest value of medical expenses per 10,000 people (11.40 thousand NHI points), followed in a descending order by children in the 5-9-year age group (10.77 thousand NHI points), children in the 0-4-year age group (8.08 thousand NHI points), and children in the 10-14-year age group (6.08 thousand NHI points). Moreover, each parameter value per 10,000 people of male patients was generally higher than that of female patients in the overall population and in all 3 age groups of children (Tables 1-4).

It should be noted that the sum of the number of emergency dental patients without outpatient visit of various oral diseases was greater than the overall number of emergency dental patients without outpatient visit of various oral diseases because a patient might have medical records of more than 2 oral diseases. For emergency dental patients without outpatient visit, the two oral diseases with the highest numbers of patients in the overall population were stomatitis and related lesions (K12, 1354 patients) and diseases of pulp and periapical tissues (K04, 1239 patients) (Table 1). In addition, these two oral disease in the 0-4-year age group were other diseases of hard tissues of teeth (K03, 35 patients) and other disorders of teeth and supporting structures (K08, 23 patients), those in the 5-9-year age group were diseases of pulp and periapical tissues (K04, 53 patients) and stomatitis and related lesions (K12, 44 patients), and those in the 10-14-year age group were other diseases of hard tissues of teeth (K03, 23 patients) and diseases of pulp and periapical tissues (K04, 22 patients) or other disorders of teeth and supporting structures (K08, 22 patients) (Tables 1-4).

For emergency dental visits and medical expenses, the two most common oral diseases were diseases of pulp and periapical tissues (K04) and gingivitis and periodontal diseases (K05) in the overall population and in all 3 age groups of children (Tables 1-4).

For mean medical expenses per emergency dental visit, the two oral diseases with the highest mean medical expenses per emergency dental visit were stomatitis and related lesions (K12, 1558 NHI points) and diseases of salivary glands (K11, 1182 NHI points) in the overall population, stomatitis and related lesions (K12, 1308 NHI points) and gingivitis and periodontal diseases (K05, 1127 NHI points) in the 0-4-year age group, gingivitis and periodontal diseases (K05, 1218 NHI points) and stomatitis and related lesions (K12, 1148 NHI points) in 5-9-year age group, and stomatitis and related lesions (K12, 1600 NHI points), other disorders of gingiva and edentulous alveolar ridge (K06, 1000 NHI points) and other disorders of teeth and supporting structures (K08, 1000 NHI points) in the 10-14-year age group (Tables 1-4).

For diseases of pulp and periapical tissues (K04), children in the 5-9-year age group had the highest values of emergency dental visits per 10,000 people (1.84 visits) and medical expenses per 10,000 people (2.08 thousand NHI points), followed in a descending order by all patients in the overall population (1.73 visits and 1.92 thousand NHI points), children in the 10-14-year age group (0.70 visit and 0.67 thousand NHI points), and children in the 0-4-year age group (0.56 visit and 0.60 thousand NHI points) (Tables 1-4).

For gingivitis and periodontal diseases (K05), all patients in the overall population had the highest number of

emergency dental visits per 10,000 people (1.98 visits), followed in a descending order by children in the 5-9-year age group (0.97 visit), children in the 10-14-year age group (0.60 visit), and children in the 0-4-year age group (0.58 visit) (Tables 1–4). Moreover, all patients in the overall population had the highest value of medical expenses per 10,000 people (2.12 thousand NHI points), followed in a descending order by children in the 5-9-year age group (1.18 thousand NHI points), children in the 0-4-year age group (0.65 thousand NHI points), and children in the 10-14-year age group (0.58 thousand NHI points) (Tables 1–4).

Furthermore, with a few exceptions, for oral diseases in all patients and pediatric patients, the value of medical expenses per 10,000 people in male patients was generally higher than that in female patients in the overall population and in all 3 age groups of children (Tables 1–4).

Discussion

The emergency treatment is mainly to carry out urgent and appropriate treatments for patients with acute illness and serious trauma in order to save their life, shorten the course of disease, preserve their limbs, or maintain their limbs function. The emergency department is essentially relay station for treatment. The emergency room also assigns the patients to another treatment area or discharges the patients when appropriate treatments had been given. Currently, the dental emergency in Taiwan's NHI system is divided into the following two categories: general dental emergency for treatments of toothache and loose teeth, and severe oral and facial emergency for treatments of facial bone trauma, tooth and alveolar bone trauma, head and neck infection, jaw dislocation, bleeding after dental surgery, etc. Currently, only 58 hospitals' emergency departments in Taiwan provide emergency dental services. Of the 58 hospitals, 39 have the capacity to deal with severe oral and facial emergencies. Some hospitals' emergency departments even rule out tooth pain (not reaching vital signs of instability), dentures falling out, scaling due to gingivitis, and emergency treatments due to the inconvenience for regular dental treatments.

Our results showed that male patients and male pediatric patients needed more frequent emergency dental visits and paid more medical expenses than female patients and female pediatric patients in the overall population and in all 3 age groups of children, indicating that the males tend to be unaware of their oral health.

It should be noted that there was a larger difference in the frequency between male and female pediatric patients, and in the 10-14-year age group, the number of emergency dental visits was higher than twice in male pediatric patients than in female pediatric patients. In addition to the differences in oral health cognition between male and female pediatric patients, it is worth further discussion whether there are also differences in parental attitudes towards male and female parenting under Taiwan's traditional social concept. Moreover, in the overall population the mean medical expenses per emergency dental visit were about 900 NHI points per emergency dental visit, and about 800 NHI points per emergency dental visit in all 3 age groups of children, indicating that

the content of emergency dental treatments or the severity of oral diseases may vary among the overall population and 3 different age groups of children.

According to the statistics of Ministry of Health and Welfare, in Taiwan's NHI system, emergency dental visits accounted for 0.26% of all emergency room visits in 2020. For the 3 age groups of children, they accounted for 0.16% in the 0-4-year age group, 0.41% in the 5-9-year age group, and 0.33% in the 10-14-year age group, respectively.⁹ Although emergency dental visit is usually associated with the unwillingness of some dentists to accept uninsured or state Medicaid-covered patients in the United States, emergency dental visits accounted for approximately 1.0% of all emergency room visits from 2008 to 2010.^{1,3} However, dental care insurance in Taiwan is as high as 99% coverage.⁹ The utilization of dental emergency in Taiwan is much lower than that in the United States, which is related to the popularity of dental clinics in Taiwan, the convenience of dental treatment, and emergency policies. Since 2010, the Ministry of Health and Welfare has implemented the new emergency examination standard, which determines the order of emergency visits based on the priority of the diseases. However, among pediatric emergency visits of the same age group, the utilization of dental emergency in the 5-9-year and 10-14-year age groups was much higher than that in the 0-4-year age group, which was related to insufficient self-care ability of young children and high incidence of dental trauma in adolescents.

In Taiwan's NHI system, the profile of emergency visits differs greatly between medical and dental emergencies. In 2020, emergency medical visits accounted for 1.95% of all medical outpatient visits (including emergency). For the 3 pediatric groups of the same age group, emergency medical visits accounted for 2.34% in the 0-4-year age group, 1.59% in the 5-9-year age group, and 1.87% in the 10-14-year age group. On the other hand, emergency dental visits accounted for 0.07% of all dental outpatient visits (including emergency). For the 3 pediatric groups of the same age group, emergency dental visits accounted for 0.10% in the 0-4-year age group, 0.04% in the 5-9-year age group, and 0.04% in the 10-14-year age group.⁹ Based on emergency visits to all outpatient visits, the utilization rate of emergency for dental treatment was much lower than that for medical treatment, which was related to the high convenience for patients to seek for dental services in Taiwan's NHI system.

In our study, emergency dental visits per 10,000 people in the 5-9-year age group (12.68 visits) was much higher than that in the overall population (12.01 visits), that in the 0-4-year age group (9.65 visits), and that in the 10-14-year age group (7.13 visits). The reason may be that the 5-9-year-old children who are now in the beginning period of mixed dentition are more prone to have toothache emergency due to their insufficient self-care ability. However, due to the high convenience for patients to seek for dental services in Taiwan's NHI system, many children with urgent oral diseases or trauma may have been properly treated in the private dental clinics or the dental departments of hospitals before they even think of seeking for dental emergencies.

In our study, gingivitis and periodontal diseases (K05), diseases of pulp and periapical tissues (K04), stomatitis and

related lesions (K12), and dental caries (K02) were the top 4 diagnoses for emergency dental visits in the overall population. In other study, pulpitis, cellulitis and abscess of oral soft tissues, aggressive and acute periodontitis, and dental caries were the top 4 diagnoses for the non-traumatic dental conditions in 1997–2002 and 2003–2013, respectively.¹ From the NEDS survey, dental caries, pulpal diseases, periapical abscess, gingival or periodontal conditions, and facial cellulitis were the main reasons for non-traumatic emergency dental treatments.³ These results were similar to our findings. However, in our study, the top 2 diagnoses were diseases of pulp and periapical tissues (K04) and gingivitis and periodontal diseases (K05) in the 3 pediatric groups, but the third diagnosis was other diseases of hard tissues of teeth (K03) in the 0-4-year and 10-14-year age groups, and stomatitis and related lesions (K12) in the 5-9-year age group. Although the order of common oral diseases for emergency dental visits among different age groups was slightly different, the main reasons for emergency dental treatments in the overall population and children were the same, and both pulp and periodontal diseases were the main reasons seeking for emergency dental visits. Although our study did not distinguish between non-traumatic and traumatic conditions, our results demonstrated that there were more non-traumatic conditions than traumatic conditions. We consider that non-traumatic conditions such as general oral diseases should return to routine dental care in dental clinics or dental departments of hospitals, while emergency rooms should focus on dealing with traumatic conditions.

In our study, patients without outpatient visit referred to those who did not return to the dental outpatient clinic for follow-up after seeking for emergency dental care. Children in the 0-4-year age group had the highest number of emergency dental patients without outpatient visit per 10,000 people (1.03 patients) than that in the overall population (0.59 patient), the 5-9-year age group (0.35 patient), and the 10-14-year age group (0.25 patient). This may be due to parents' lack of oral health awareness and their tendency not to take younger children to the dental outpatient clinic for further follow-up.

In the United States, the emergency room is an important place of care for dental-related complaints, especially for individuals who lack private insurance or uninsured individuals belonging to minority groups with the low socioeconomic status.^{7,10,11} Taiwan's national conditions and health care system are different from those of the United States. Therefore, we should conduct further researches on the reasons and motivations of individuals who seek for dental care in the emergency room, especially those who seek for dental care in the emergency room but do not continue to receive routine dental care in the general dental outpatient clinic. Moreover, how to establish a comprehensive dental care chain is also an important issue for the policy makers.¹²

In conclusion, our study used NHI data for a simple descriptive analysis of dental emergencies and presented meaningful findings on emergency dental visits of children. It is imperative to continuously raise public awareness of emergency dental visits and reduce the use of dental health insurance resources incorrectly. These results can also be used as a reference for relevant authorities to improve the current status of using dental emergencies. For example, the policymakers in Taiwan are supposed to strengthen the oral health care system for children and improve the quality of dental care for the entire population.

Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

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