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DENTAL CARIES EPIDEMIOLOGY

According to the national survey results, dental caries prevalence for 5-6 year-old children decreased from 89.38% (1997) to 79.32% (2011) (Figure 1). In the meantime, deft index decreased from 7.31 to 5.44 (Figure 2). It is clear that much more efforts are indicated to meet the target for the year 2000 set by WHO for the 5-year-old that caries prevalence should be less than 50%.

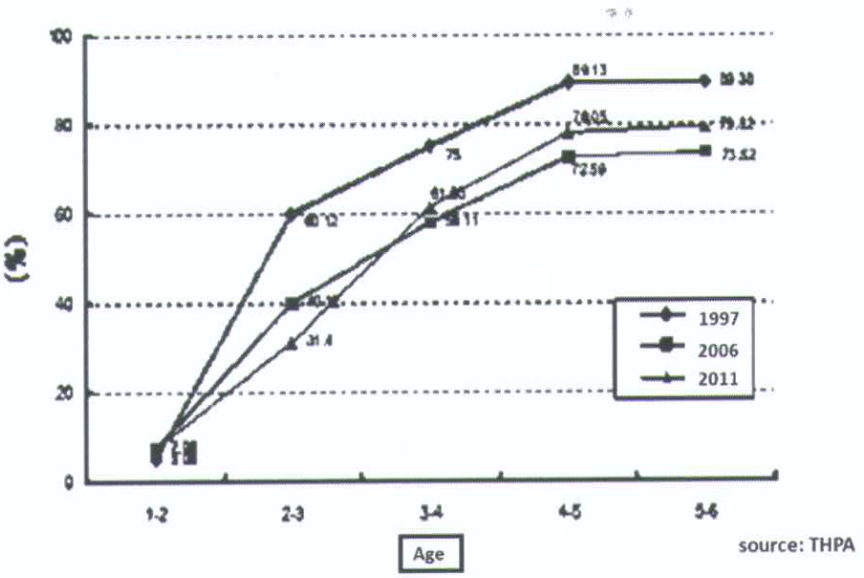

Figure 1: Secular trend of prevalence of dental caries among preschool children in Taiwan, 1997-2011.

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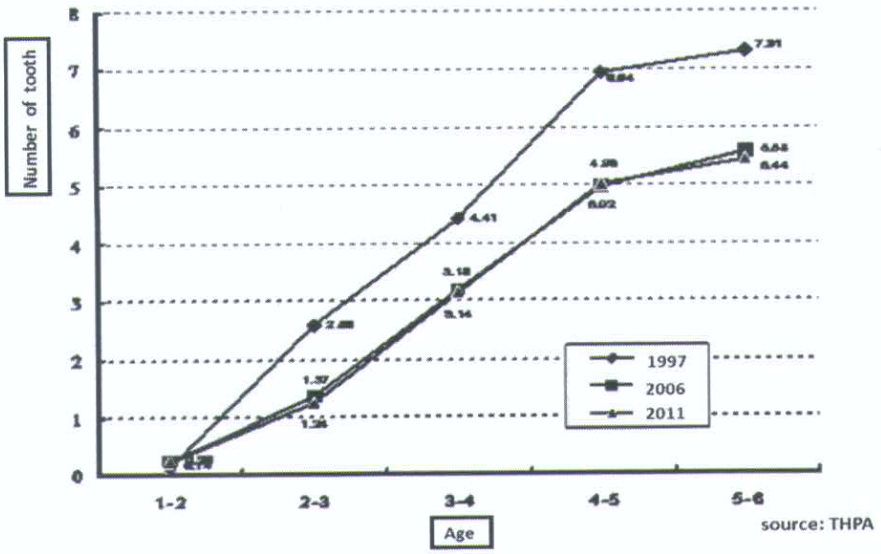


Figure 2: Secular trend of deft among preschool children in Taiwan, 1997-2011.

Table 1: DMFT and DMFS of schoolchildren in Taiwan, 2006

Age (year)	DMFT index	DMFS index
6	0.25	0.33
7	0.48	0.60
8	0.94	1.18
9	1.07	1.50
10	1.33	1.88
11	2.00	2.79
12	2.58	3.91

While the WHO goal for 12-year-old in 2000 was DMFT less than 2.0, schoolchildren in Taiwan did not meet that goal in 2006. The DMFT of 12-year-old in Taiwan was 2.58 and DMFS 3.91 in 2006 (Table 1). It should be noted that DMFT is a composite index and changes in its value need to be interpreted cautiously. For example, Taiwan had its National Health Insurance launched in 1995, which provided most dental services, including operative dental services, to more than 98% of its 23 million population. While the decrease in total DMFT was not satisfactory, the significant increase in F (Filling) component needs to

be taken into consideration (Table 2).

Table 2: DMFT and its components of 12-year-old in Taiwan, 2000-2012

Year	DMFT	DT	MT	FT
2000	3.31	1.35 (41%)	0.03 (1.0%)	1.93 (58%)
2006	2.58	1.15 (45%)	0.12 (5.0%)	1.31 (51%)
2013*	**2.50**	0.82(33%)	0.01 (0.4%)	1.67(67%)

** preliminary results*
Source: YH Huang (2013)

Table 3: Prevalence of dental caries and DMFT among people aged 18+ in Taiwan, 2004 (N=2660)

	Prevalence			DMFT		
	n	%	p-value	mean	SD	p-value
Gender						
Male	1145	84.64	<0.0001	7.1	6.94	<0.0001
Female	1196	91.46		9.73	6.84	
Age group						
18-34	842	83.63	<0.0001	6.59	7.93	<0.0001
35-44	397	90.91		7.27	6.01	
45-49	405	88.94		7.85	7.14	
50-64	488	92.48		9.99	6.49	
65-74	150	92.41		15.81	5.3	
75+	59	82.47		15.45	5.68	
Area						
Metropolitan	184	94.24	<0.0001	9.20	5.19	0.0312
City	393	95.55		8.90	7.18	
County	1724	85.79		8.25	7.96	
Mountainous village	40	90.1		6.49	2.08	
Total	2341	87.99		8.39	7.01	

Source: YH Yang (2006)

Prevalence of dental caries among elderly people (65 years old and over) in Taiwan was 89.36% in 2004, with mean±SD of DMFT index as

15.71±5.43. There was significant urban-rural difference as 9.20±5.19 and 6.49±2.08, respectively (P<0.0001) (Table 3).

While women had a higher prevalence (61.24%) of filling for dental caries than men (47.87%), men had in average more remaining teeth (24.03±6.41 teeth) than women (22.41±6.70 teeth) (p<0.0001). Those aged 65+ had a lowest filling rate (43.55%) and least remaining teeth (14.35±5.65 teeth) among all age groups (both p<0.0001).

Table 4: Prevalence of filling for dental caries and the number of remaining teeth among people aged 18+ in Taiwan, 2004 (N=2660)

	Prevalence of Filling			No. of remaining teeth		
	mean	SD	p-value	mean	SD	p-value
Gender						
Male	47.87	40.16	<0.0001	24.03	6.41	<0.0001
Female	61.24	35.91		22.41	6.70	
Age group						
18-34	56.28	58.56	<0.0001	25.70	6.06	<0.0001
35-44	57.01	38.75		24.58	4.73	
45-49	58.08	43.66		23.65	6.05	
50-64	52.09	31.65		21.00	6.09	
65-74	46.33	21.40		14.31	5.69	
75+	36.50	18.01		14.43	5.60	
Area						
Metropolitan	39.64	26.68	<0.0001	24.77	4.26	0.004
City	58.85	43.81		22.75	7.34	
County	56.09	42.48		23.17	7.51	
Mountainous village	23.54	13.73		23.86	1.67	
Total	54.70	38.46		23.23	6.62	

Source: YH Yang (2006)

As far as living area was concerned, people living in the mountainous areas had a lowest filling rate (23.54%), while people living in cities had least remaining teeth (22.75±7.34 teeth) (p<0.0001 and p=0.004, respectively) (Table 4). Women had a higher prevalence of edentulism (2.2%) than men (1.2%) (p=0.067). As would be expected, those aged 65+ had the highest prevalence of edentulism (13.6%) among all age groups (p<0.0001). Adult inhabitants living in metropolitans had a higher prevalence of edentulism (2.6%) than those living in mountainous villages, but the difference was not statistically

significant (P=0.67) (Table 5).

Table 5: Prevalence of edentulism among people aged 18+ in Taiwan, 2004 (N=2660).

		Edentulism			
		n	case	%	p-value
Gender	Male	1353	17	1.2	0.067
	Female	1307	28	2.2	
Age group	18-34	1007	0	0	<.0001
	35-44	437	1	0.2	
	45-49	455	5	1.1	
	50-64	527	8	1.5	
	65-74	163	19	11.7	
	75+	72	13	18.1	
Area	Metropolitan	195	5	2.6	0.67
	City	411	8	2.0	
	County	2009	32	1.6	
	Mountainous village	45	0	0.0	
Total		2660	45	1.69	

Source: YH Yang (2006)

Table 6: Oral health status of disabled people in Taiwan, 2005

Age	DMFT	DT	MT	FT	% Caries	% Filling
12	3.14	1.95	0.39	0.80	69.43	35.93
13-18	6.60	3.98	0.58	2.04	87.89	36.06
19-44	10.31	4.67	3.29	2.35	93.27	32.86
>44	17.68	4.68	11.50	1.50	98.73	20.70

Source: National oral health survey of disabled people in Taiwan (2005)

There were 953,214 registered disabled people in 2006, which accounted for 4.2% of the total population. The DMFT of the 12-year-old disabled people were 3.14, in which DT was 1.95 (62.1%) – both were significantly higher than their counterparts in the non-disabled population. However, the FT component was 0.80 (25.5%) and significantly lower than the nondisabled population (1.17 and 45.3%), indicating that there was a disparity in oral health services provided to and/or used by the disabled population (Table 2, 6 and 7).

Table 7: Oral health status between disabled and non-disabled people aged 6-18 in Taiwan, 2005.

Age	DMFT		DT		MT		FT	
	ND	D	ND	D	ND	D	ND	D
6	0.20	0.21	0.12	0.18	0.00	0.01	0.09	0.02
9	1.36	1.64	0.52	1.11	0.06	0.17	0.78	0.37
12	2.58	3.14	1.20	1.95	0.13	0.39	1.17	0.80
15	4.67	6.22	2.39	3.79	0.19	0.58	2.09	1.84
18	4.92	7.44	1.87	4.19	0.30	0.69	2.75	2.57

Source: National oral health survey of disabled people in Taiwan (2005)

COMMUNITY DENTAL CARIES PREVENTION PROGRAM

Topical fluoride application has been one of the most effective measures to prevent dental caries. Fluoride varnish, used by dentists to prevent caries for more than three decades, has been shown to reduce caries in the permanent dentition by 46% and primary dentition 33%. Taiwan Health Promotion Administration (THPA), Ministry of Health and Welfare, has provided topical fluoride application service to all children aged 5 years or less twice a year since 2004, extended to those aged 6 years or less in 2013.

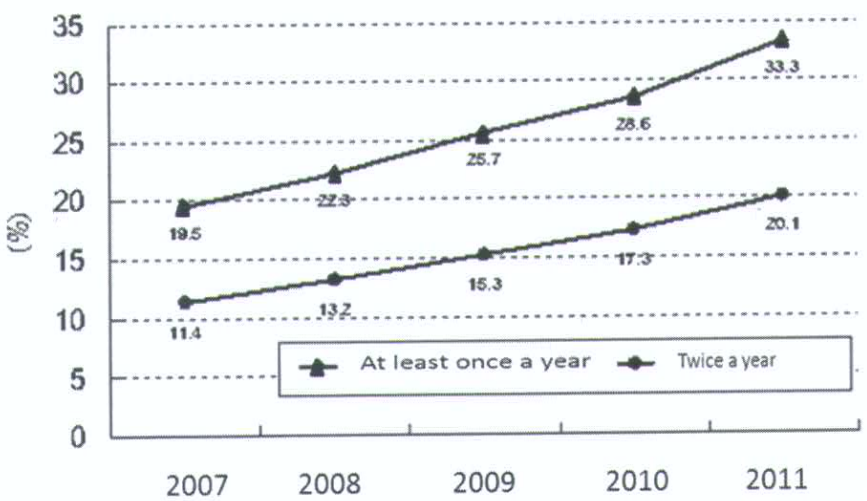


Figure 3: Utilization rate of topical fluoride application service among preschool children in Taiwan, 2007-2011

For children of special need, including those of low-income families, indigenous areas, remote areas, and those disabled, the service has extended to 12-year-old and four times a year. The utilization rate increased from 11.4% in 2007 to 20.1% in 2011 (figure 3), and THPA expected to significantly improve the utilization rate by sending dentists into the kindergartens/ nurseries since 2013.

Studies have shown that more caries happened in occlusal surface of posterior teeth than on smooth surfaces. Pit & fissure sealant (PFS) has been regarded as a more effective measure to prevent occlusal caries than fluoride-containing materials. Traditionally public PFS programs have been offered to targeted groups of high risk in developing dental caries, partly due to its relatively high cost. THPA launched a free PFS service to the underprivileged schoolchildren since 2010, and is preparing to extend the service to all first-grade schoolchildren (around 195,000 children) in Taiwan starting from 2014.

Being unable to fluoridate drinking water, Taiwan Dental Association (TDA) has chosen to promote fluoridated mouthwash in primary schools as an alternative strategy to prevent dental caries since 1997 with sponsorship from the government. An earlier pilot study carried out by Taiwan Academy of Pediatric Dentistry showed that daily use of 0.05% NaF mouthwash had a better effect of caries reduction (44%) than weekly use of 0.2% NaF mouthwash (36%). However, the later scheme was chosen due to administrative considerations. For the past 16 years more than 98% of Taiwan's 1.9 million schoolchildren used 10c.c. mouthwash containing 0.2% NaF after lunch weekly during school days (Table 8).

In fact, TDA has done a lot in oral health education. National oral hygiene skill competition of schoolchildren had been one of the major yearly events to promote schoolchildren's motivation of oral hygiene from 1993 to 2004. The competition grinded to a halt due to shortage of government budget and changes in health promotion strategy.

Table 8: Coverage rate of NaF mouthwash program of schoolchildren, 1997-2004.

Year	No. of Counties & Cities	No. of Schools	No. of Students	Coverage rate (%)
1997	10	34	40,640	2.1
1998	13	48	52,281	2.7
1999	16	368	457,773	23.8
2000	21	1,959	1,414,000	73.4
2001	25	2,429	1,819,495	94.5
2002	25	2,632	1,903,357	98.0
2003	25	2,627	1,883,509	98.2
2004	25	2,638	1,882,186	98.4

The Ministry of Education (MoE) launched Health Promoting School (HPS) program in 2005, and 'oral health' has been listed as one of nine optional themes. More than one third of the HPSs chose oral health as their focus in 2006. MoE tried to establish a network of school dentists in 2009, which ended up with less than 20% of the 2500 primary schools did find a school dentist, and the program is practically suspended now.

HOME CARE FOR DENTAL CARIES CONTROL

A national campaign 'National Oral Health Week' will take place during the last week of October since 2010. The national associations of dentists join forces with TPHA to provide the latest information of the epidemiology of oral diseases and methods of prevention. In addition to brushing teeth regularly with fluoridated toothpaste, people are also advised to use dental floss to promote periodontal health. Bass method has been chosen as the 'standard method' of brushing teeth. However, people are also encouraged to visit dentists every 6 months to discuss the best way to keep their oral hygiene in a high standard. It should be noted that Taiwan's national health insurance provide most of dental services free of charge to about 98% of the national population except the prosthetic and orthodontic treatment.

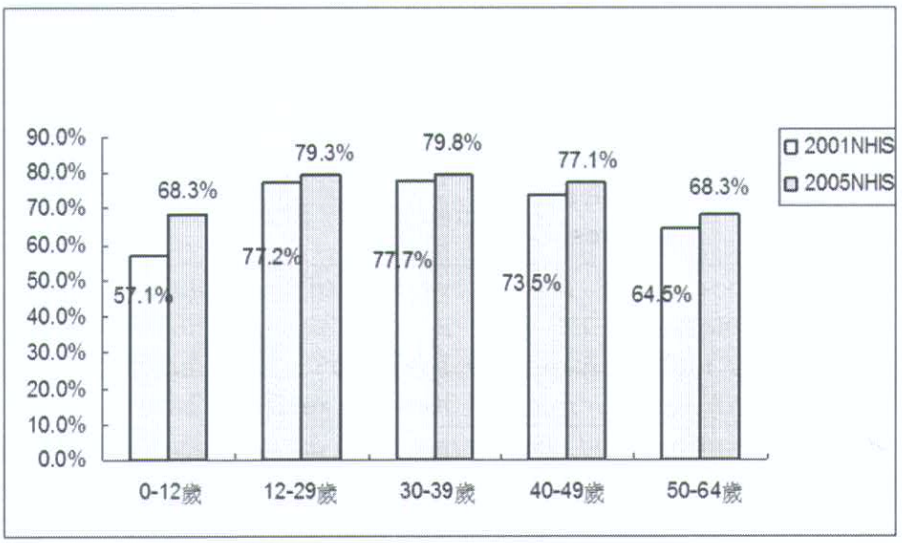


Figure 4: Percentage of people brushing their teeth before sleep by age group in Taiwan, 2001and 2005 *(source: TPHA)*

According to a national survey carried out by TPHA in 2005, about one quarter of the population went to bed in the night without brushing their teeth. Compared to the survey results in 2001, there was a significant improvement in the percentage of people brushing their teeth every day (98.2% in 2005), mean number of toothbrushing per day (1.87 times in 2005), and the percentage of people using dental floss regularly (17.8% in 2005). The improvement was most obviously among those aged 12 and less. Females performed better than males and the better the education the better the oral hygiene practice.

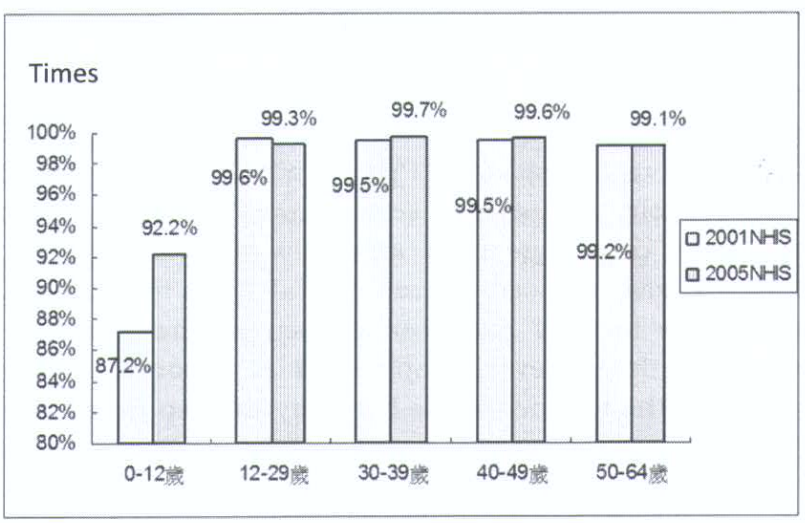


Figure 5: Percentage of people brushing their teeth everyday by age group in Taiwan, 2001and 2005. *(source: TPHA)*

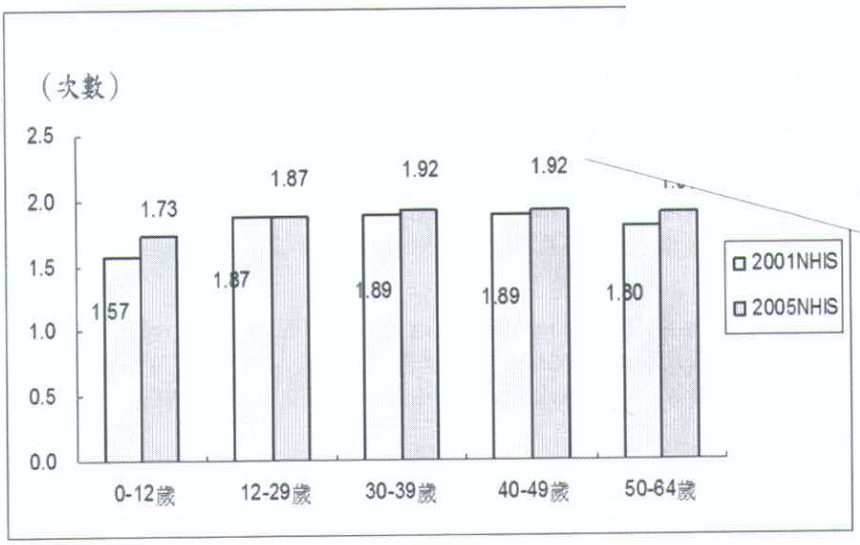


Figure 6: Mean number of toothbrushing per day by age group in Taiwan, 2001and 2005 *(source: TPHA)*

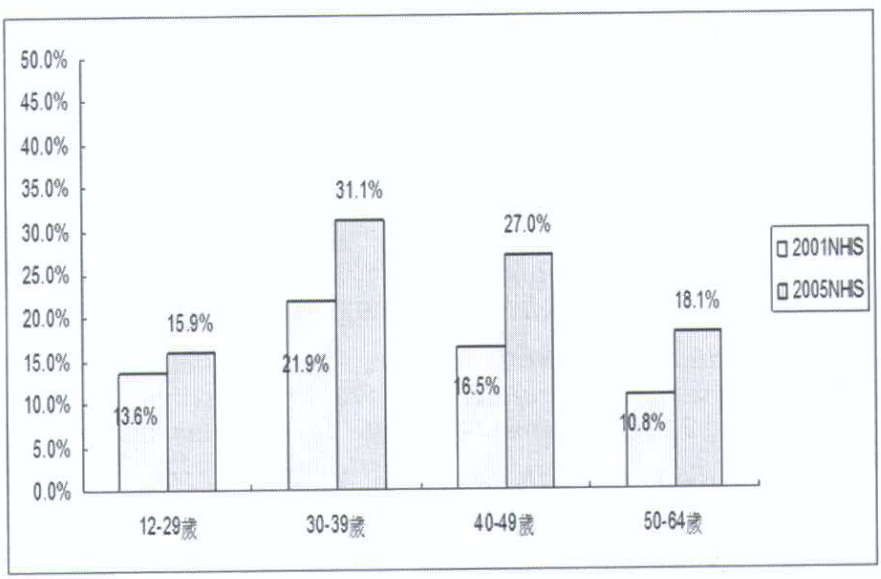
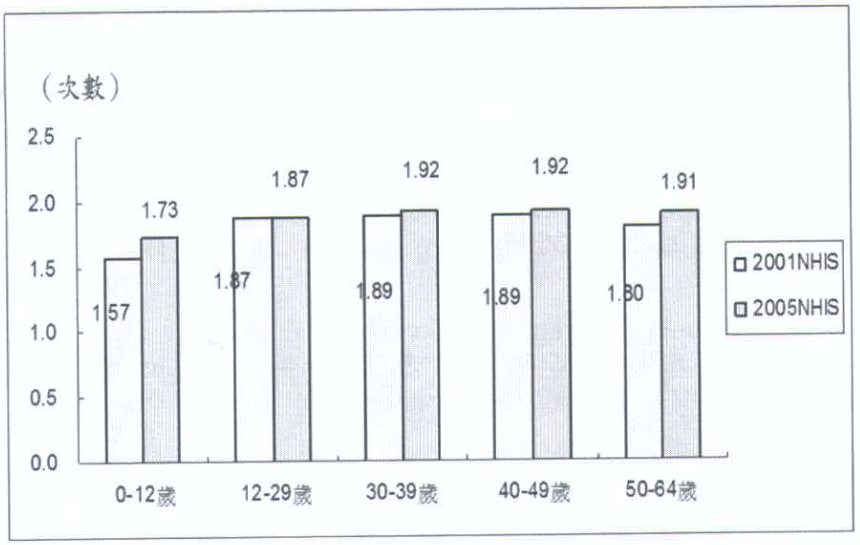


Figure 7: Percentage of people flossing their teeth every day by age group in Taiwan, 2001and 2005 *(source: TPHA)*

DENTAL EDUCATION IN CARIOLOGY IN DENTAL SCHOOL

There are 7 universities in Taiwan boast a department of dentistry – 5 of them have a school of dentistry/Stomatology. Most of the undergraduate students came from local high schools, and studied for 6 years (including 1-year internship) before graduation. Cariology is



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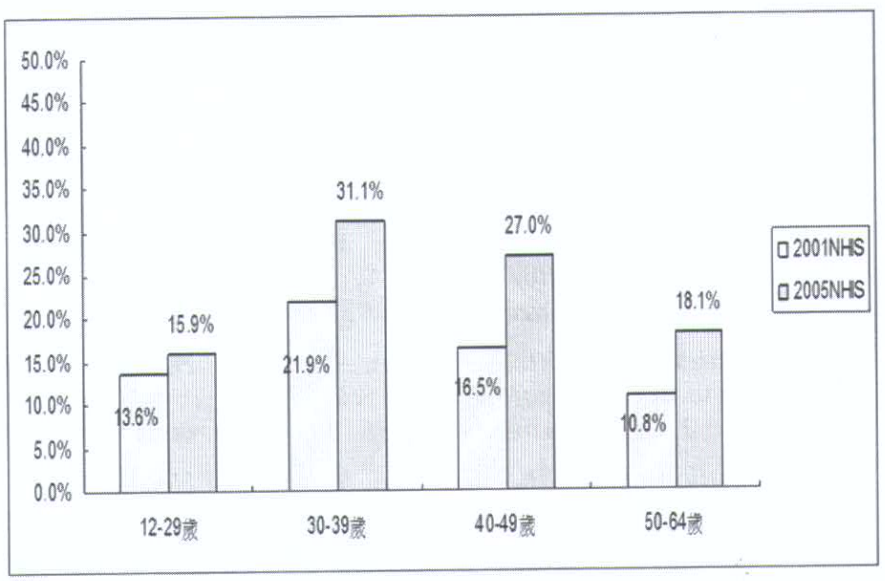

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not offered as an independent course but instead the relevant knowledge and discussion are disseminated into many required courses such as: oral histology, oral pathology, oral radiation, operative dentistry, endodontics, and dental public health. Almost every dental department in Taiwan offers postgraduate course – most of them focus on specialties of clinical dentistry, and some of them have an independent institute of oral medicine/biology for studying basic dental sciences.

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