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Original Article

# Overview of dental assistants in Taiwan from 2009 to 2021



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## KEYWORDS

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**Background/purpose:** The development of dental assistants in Taiwan has been over a century. This study explored mainly the profile of dental assistants and the occupation survey about them in Taiwan from 2009 to 2021.

**Materials and methods:** This study used the documentary analysis and secondary data analysis to survey mainly the changes of manpower of dental assistants in Taiwan from 2009 to 2021, and the association of their wages with economic indicators.

**Results:** According to occupation survey from government, the number of dental assistants increased from 4315 in 2009–7909 in 2021. When estimated based on the data of the United States showing 1.86 dental assistants per dentist, the estimated number of dental assistants increased from 21,113 in 2009 to 28,698 in 2020. Although the mean monthly wage of dental assistants increased from 22,127 NT dollars in 2009 to 26,795 NT dollars in 2021, the proportion of the mean annual wage of dental assistants to the gross domestic product per capita decreased from 47.43% in 2009 to 34.78% in 2021. Moreover, the proportion of the mean monthly wage of dental assistants to the basic monthly wage of labor decreased from 128.05% in 2009 to 111.65% in 2021.

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**Conclusion:** In Taiwan, although the manpower and work content of dental assistants are important for dentists, they usually work with a low wage from 2009 to 2021. It is imperative to continue to promote the certification system for dental assistants to improve the professionalism and the wage structure of this occupation.

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## Introduction

Dental assistants are important members of the dental team as they are employed in every type of dental practice. They are the backbone of a successful dental practice. They support dentists to provide more effective and efficient patient care.<sup>1</sup> In fact, this profession has a long history in Taiwan. Taiwanese society entered modernization during the Japanese colonial period (1895–1945). The western medical system was first introduced to Taiwan during this period, and the dental industry and the license management system for dentists were also introduced into Taiwan.<sup>2</sup> Therefore, medical personnel in the role of dentists and dental assistants began to appear in Taiwan. In 1896 (Meiji 29), Dr. Chiyomatsu Sakai applied for permission by the government to open a dental clinic on the main street in Taipei City. He was the first officially licensed dental clinician in Taiwan on record. In 1906 (Meiji 39), Taiwan Government Taipei Hospital set up a dental treatment room in the Department of Surgery and appointed Dr. Masayoshi Tomisawa as the director. This was considered to be the beginning of Taiwanese hospital dentistry.<sup>3–7</sup>

Furthermore, in 1897 (Meiji 30), the nurse training program started in Taipei Hospital, and in 1898 (Meiji 31), there were the first batch of the nurse graduates. According to the subject schedule of nurse training program announced in 1923 (Taisho 12), there were learning hours of “nursing methods for dental patients”, indicating the necessity of a dental nurse who received formal dental training to care dental patients at that time.<sup>8</sup> In addition to dental technicians, it is reasonable to consider that the paramedical personnel in Taiwan’s dental industry also includes dental assistants at that time. There should also be staff in the role of a dental assistant at the time. Therefore, it is also reasonable to consider that the development of dental assistants in Taiwan is synchronized with the development of dentists and has been over 120 years. It is a pity that, under the premise that the development of the dental industry is centered on dentists, although dental assistants are extremely important personnel for dentists and have a large number, even not less than dentists, the records and documents about dental assistants are very scarce.

Today, excellent and skilled dental assistants are indispensable in quality-assurance dental care. However, Taiwan has not had a reasonable certification system for dental assistants for a long time, resulting in a lack of career prospects for relevant dental personnel. As a result, the turnover rate of dental assistants remains high, and

dentists repeatedly waste their time to train newly-employed dental assistants, which affects the quality of dental care.

This study used the documentary analysis and secondary data analysis to find various information about dental assistants and tried to piece together the appearance of the dental assistant profession in Taiwan, including the specification of their job content, manpower estimates, and wage conditions. The results of this study would be used as a reference for the establishment of the system of dental assistant profession.

## Materials and methods

This study used the methods of the documentary analysis and the secondary data analysis to find the information about dental assistants in Taiwan. The definition or work content of dental assistants was obtained from three regulations or documents, the Standard Occupational Classification System of Taiwan, the Taiwan Dental Association Certification Rules for Dental Assistants, and the document of the Ministry of Health and Welfare for the work content of dental assistants.

The data of the number of dental assistants and all employees in the healthcare service industry in Taiwan and their monthly wages from 2009 to 2021 were obtained from the Survey on Earnings by Occupation in the website of the Ministry of Labor. Therefore, we examined the changes of the number and wage of dental assistants from 2009 to 2021 and their relationship with all employees in the healthcare service industry. In addition, the economic indicator, including the consumer price index (CPI) and the gross domestic product per capita (capita GDP) for the corresponding years were obtained from the website of the Directorate-General of Budget, Accounting and Statistics. The government-mandated minimum basic monthly wage of labor for the corresponding years were also obtained from the website of the Ministry of Labor. With the data collected above, we calculated the monthly wage equivalent to 2016 purchasing power of dental assistants, the proportion of mean annual wage of dental assistants to capita GDP, and the proportion of mean monthly wage of dental assistants to basic monthly salary of labor, and analyzed their changes from 2009 to 2021.

Furthermore, the total population at the end of each year were obtained from the website of the Ministry of the Interior. Moreover, the numbers of practicing dentists from 2009 to 2020 were available from the website of the

Ministry of Health and Welfare. We also estimated the numbers of dental assistants in Taiwan from 2009 to 2021 according to the data of the United States, which show 1.86 dental assistants per dentist and 108.69 dental assistants per 100,000 people.<sup>9</sup>

## Results

### The definition of dental assistants in the Standard Occupational Classification System of Taiwan

The Directorate-General of Budget, Accounting and Statistics announced the trial implementation of the Standard Occupational Classification System of Taiwan in January 1967, and added dental assistants in the 2nd revision (December 1975). This is the first appearance of dental assistants in Taiwan's official regulations. According to the 6th revision (May 2010), the occupational definition of a dental assistant is a person who assists a dentist in the prevention, diagnosis, treatment of dental and oral diseases or the preparation of dental instruments, equipment, and materials. Their work content includes:

- (1) Assisting dentists during dental surgery procedures.
- (2) Preparation, cleaning and disinfection of dental instruments and equipment after examination or treatment.
- (3) Assisting dentists to perform photography of oral and dental imaging.

### The Taiwan Dental Association certification rules for dental assistants

The Taiwan Dental Association announced its certification rules for dental assistants in December 2011. This is the first time that the Taiwan Dental Association promotes a certification system for dental assistants in the whole areas of Taiwan, but it is not mandatory. According to the certification rules, a dental assistant is defined as "a person who performs the work of assisting a dentist in a qualified dental clinic under the personal supervision and direction of a dentist." The scope of work content of dental assistants includes:

- (1) Demonstrating oral health education under the guidance of a dentist.
- (2) Recording necessary examinations as instructed by a dentist.
- (3) Taking clinical pictures.
- (4) Cleaning and preparation for X-ray photography.
- (5) Cleaning and preparation of the operating area.
- (6) Cleaning of various devices before and after use.
- (7) All preparations after oral preparation and before impression.
- (8) Preparation for prophylaxis and prevention.
- (9) In addition to the above-mentioned items, under the principle of not engaging in medical practice, providing necessary assistance to dentists at any time.

### The document of the Ministry of Health and Welfare for the work content of dental assistants

In 2020, the Ministry of Health and Welfare agreed to review the non-medical behaviors of dental assistants proposed by the Taiwan Dental Association, which is based on the current Taiwan's laws and the relevant historical correspondence of the Ministry of Health and Welfare and the American Dental Assistants Association (ADAA) dental assisting core competencies. This is a document that officially recognizes the work content of dental assistants. The work content includes:

- (1) Receiving patients and preparation for dental treatment, including getting on the dental chair, adjusting the dental chair, and placing scarves.
- (2) After dentists has fulfilled the obligation to explain and inform, assisting in explaining the instructions before and after dental surgery procedures, including general communication and response that are not under the obligation of dentists to explain.
- (3) Dental equipment preparation, instrument delivery, and assistance in operation.
- (4) Preparation and modulation of dental materials outside the oral cavity.
- (5) Daily maintenance of medical equipment and instrument cleaning, disinfection, and sterilization.
- (6) General oral health education unrelated to treatment cases.
- (7) Pouring and removing the plaster mold.
- (8) Assisting in the suction of saliva to maintain a clear view of the oral cavity during dentist operation.
- (9) Teaching patients to tie rubber bands.
- (10) Assisting dentists to adjust the direction of light source in the process of resin photopolymerization and luminescence for tooth whitening.
- (11) Assisting dentists to write the written instruction documents to dental technicians, which are then signed or stamped by dentists after confirmation.
- (12) Other non-medical behaviors recognized by the central competent health authority.

### The numbers of dental assistants and all employees in the healthcare service industry in Taiwan and their monthly wages from 2009 to 2021

According to the Survey on Earnings by Occupation, in Taiwan, the number of dental assistants increased from 4315 in 2009–7909 in 2021 (Table 1). The total increase was 3594 dental assistants from 2009 to 2021 with a mean annual increment of 299.5 dental assistants, a total increase rate of 83.29%, and a mean annual increase rate of 6.94% from 2009 to 2021. Meanwhile, the number of all employees in the healthcare service industry increased from 289,338 in 2009 to 400,367 in 2021. The total increase was 111,029 employees from 2009 to 2021 with a mean annual increment of 9252.42 employees, a total increase rate of 38.37%, and a mean annual increase rate of 3.20% from 2009 to 2021 (Table 1). The ratio of dental assistants to all employees was between 1.49% and 2.30% from 2009 to

**Table 1** The numbers of dental assistants and all employees in the healthcare service industry in Taiwan and their mean monthly wages from 2009 to 2021.

Year	Number				Mean monthly wage			
	A	B	A/B (%)	Ranking	A	B	A/B (%)	Ranking
2009	4315	289,338	1.49	5/17	22,127	54,589	40.53	17/17
2010	5595	298,488	1.87	5/16	22,791	53,683	42.45	16/16
2011	6251	307,243	2.03	8/25	25,960	53,973	48.10	25/25
2012	6798	316,194	2.15	6/25	24,204	55,533	43.58	25/25
2013	7572	328,515	2.30	7/25	21,472	56,240	38.18	25/25
2014	7126	325,363	2.19	7/26	23,966	56,337	42.54	26/26
2015	6392	334,031	1.91	7/26	23,573	59,927	39.34	26/26
2016	6819	341,483	2.00	6/26	24,563	60,013	40.93	26/26
2017	6969	352,310	1.98	7/26	25,423	60,483	42.03	26/26
2018	7057	366,712	1.92	8/28	24,405	62,579	39.00	28/28
2019	7585	379,328	2.00	7/28	24,073	63,075	38.17	28/28
2020	7634	391,729	1.95	7/28	26,722	63,240	42.25	28/28
2021	7909	400,367	1.98	7/28	26,795	61,103	43.85	28/28
Total increase	3594	111,029	—	—	4668	6514	—	—
Mean annual increase	299.5	9252.42	—	—	389	542.83	—	—
Total increase rate (%)	83.29	38.37	—	—	21.10	11.93	—	—
Mean annual increase rate (%)	6.94	3.20	—	—	1.76	0.99	—	—

A: Dental assistants.

B: All employees in the healthcare service industry, including dental assistants, physicians, paramedical personnel, and other employees.

Ranking: Ranking of dental assistants among various occupations in the healthcare service industry according to the number and the mean monthly wages.

2021. Excluding administrative staff and employees unrelated to serving patients and institutional maintenance, among 16–28 occupations in the healthcare service industry, the number of dental assistants was ranked in the top 5–8 from 2009 to 2021 (Table 1).

Furthermore, the mean monthly wage of dental assistants increased from 22,127 NT dollars in 2009 to 26,795 NT dollars in 2021 (Table 1). The total increase was 4668 NT dollars from 2009 to 2021 with a mean annual increment of 389 NT dollars, a total increase rate of 21.10%, and a mean annual increase rate of 1.76% from 2009 to 2021. Meanwhile, the mean monthly wage of all employees in the healthcare service industry increased from 54,589 NT dollars in 2009 to 61,103 NT dollars in 2021. The total increase was 6514 NT dollars from 2009 to 2021 with a mean annual increment of 542.83 NT dollars, a total increase rate of 11.93%, and a mean annual increase rate of 0.99% from 2009 to 2021 (Table 1). The ratio of the mean monthly wage of dental assistants to that of all employees was between 38.17% and 48.10% from 2009 to 2021. However, among 16–28 occupations in the healthcare service industry, the mean monthly wage of dental assistants was the lowest (Table 1).

### The relationship between the wage of dental assistants and the economic indicators in Taiwan from 2009 to 2021

In Taiwan, the CPI increased from 92.92 in 2009 to 104.32 in 2021 (Table 2). The total increase was 11.4 from 2009 to 2021 with a mean annual increment of 0.95, a total increase

rate of 12.27%, and a mean annual increase rate of 1.02% from 2009 to 2021. In addition, the capita GDP increased from 559,807 NT dollars in 2009 to 924,619 NT dollars in 2021. The total amount of increase was 364,812 NT dollars from 2009 to 2021 with a mean annual increment of 30,401 NT dollars, a total increase rate of 65.17%, and a mean annual increase rate of 5.43% from 2009 to 2021. Meanwhile, the basic monthly wage of labor increased from 17,280 NT dollars in 2009 to 24,000 NT dollars in 2021. The total amount of increase was 6720 NT dollars from 2009 to 2021 with a mean annual increment of 560 NT dollars, a total increase rate of 38.89%, and a mean annual increase rate of 3.24% from 2009 to 2021 (Table 2).

To consider the ratio of the wage of dental assistants to economic indicators in Taiwan, the mean monthly wage equivalent to 2016 purchasing power of dental assistants increased from 23,813 NT dollars in 2009 to 25,685 NT dollars in 2021 (Table 2). The total increase was 1872 NT dollars from 2009 to 2021 with a mean annual increment of 156 NT dollars, a total increase rate of 7.86%, and a mean annual increase rate of 0.66% from 2009 to 2021. In addition, the proportion of the mean annual wage of dental assistants to capita GDP decreased from 47.43% in 2009 to 34.78% in 2021. The total decrease was 12.65% from 2009 to 2021 with a mean annual decrement of 1.05%, a total decrease rate of 26.68%, and a mean annual decrease rate of 2.22% from 2009 to 2021. Meanwhile, the proportion of the mean monthly wage of dental assistants to the basic monthly wage of labor decreased from 128.05% in 2009 to 111.65% in 2021. The total decrease was 16.4% from 2009 to 2021 with a mean annual decrement of 1.37%, a total decrease rate of 12.81%, and a mean annual decrease rate

**Table 2** The relationship between the wage of dental assistants and economic indicators in Taiwan from 2009 to 2021.

Year	Economic indicators			Wage of dental assistants per economic indicators		
	CPI	Capita GDP	Basic monthly wage of labor	Purchasing power	Proportion of mean annual wage of dental assistants to capita GDP (%)	Proportion of mean monthly wage of dental assistants to basic monthly wage of labor (%)
2009	92.92	559,807	17,280	23,813	47.43	128.05
2010	93.82	607,596	17,280	24,292	45.01	131.89
2011	95.15	614,922	17,880	27,283	50.66	145.19
2012	96.99	630,749	18,780	24,955	46.05	128.88
2013	97.76	654,142	19,047	21,964	39.39	112.73
2014	98.93	694,680	19,273	24,225	41.40	124.35
2015	98.63	726,895	20,008	23,900	38.92	117.82
2016	100.00	746,526	20,008	24,563	39.48	122.77
2017	100.62	763,445	21,009	25,266	39.96	121.01
2018	101.98	779,260	22,000	23,931	37.58	110.93
2019	102.55	801,348	23,100	23,474	36.05	104.21
2020	102.31	839,558	23,800	26,119	38.19	112.28
2021	104.32	924,619	24,000	25,685	34.78	111.65
Total increase	11.4	364,812	6720	1872	-12.65	-16.4
Mean annual increase	0.95	30,401	560	156	-1.05	-1.37
Total increase rate (%)	12.27	65.17	38.89	7.86	-26.68	-12.81
Mean annual increase rate (%)	1.02	5.43	3.24	0.66	-2.22	-1.07

CPI: Consumer price index, based on 2016.

Capita GDP: Gross domestic product per capita.

Basic monthly wage of labor: Government-mandated minimum basic monthly wage of labor.

Purchasing power: The monthly wage equivalent to 2016 purchasing power of dental assistants.

of 1.07% from 2009 to 2021 (Table 2). Obviously, the increase rate in the wage of dental assistants has not kept pace with economic growth and the increase rate in the basic monthly wage of labor in Taiwan from 2009 to 2021.

### The estimated numbers of dental assistants in Taiwan from 2009 to 2021

The number of dental assistants in the Survey on Earnings by Occupation is an estimate, however, which is not in line with our experience. Therefore, according to the 2009–2013 American Community Survey (ACS), we estimated the numbers of dental assistants in Taiwan from 2009 to 2021 according to the data of the United States, which show 1.86 dental assistants per dentist and 108.69 dental assistants per 100,000 people.<sup>9</sup> If estimated by the total number of dentists, the estimated number of dental assistants increased from 21,113 in 2009 to 28,698 in 2020. Moreover, if estimated by the number of the population, however, the estimated number of dental assistants increased very slowly from 25,128 in 2009 to 25,406 in 2021 (Table 3). This is due to the stagnant population growth in Taiwan from 2009 to 2021.

### Discussion

It is relatively simple to become a dental assistant in Taiwan. In fact, the current laws and regulations in Taiwan do not require people in this profession to have educational qualifications and certificates, although they are important personnel to the dentists. According to the Labor Standards Act, as long as individuals over the age of 18 want to apply for this position, there are basically no entry requirements. If the applicants have no working experience as a dental assistant, they will usually be arranged to receive on-the-

job training under the supervision of a senior assistant or a dentist. It usually takes one to two months before they can work relatively smoothly in their workplace. Although the Ministry of Health and Welfare does not implement a licensing system for dental assistants, they are indeed common and numerous in the dental departments of the hospitals and the dental clinics.<sup>10</sup> In this wave of COVID-19 outbreak, among the publicly funded vaccines recipients announced in 2021, dental assistants are also the first-ranked group (medical personnel) based on the reasons of the maintenance of medical capacity and the fact that they are non-medical personnel of the medical institutions. This means that although they are not legally registered medical personnel, in medical practice they are one type of medical professional. Furthermore, based on the reason that dental assistants assist dentists in the operation of X-ray equipment, they are also radiation workers under the Ionizing Radiation Protection Act. Therefore, according to the Labor Occupational Accident Insurance and Protection Act, they also have the right to seek health examinations to prevent occupational diseases due to the protection for ionizing radiation workers. Therefore, it is hard not to think of a dental assistant as a type of medical professional.

According to the results of this study about the work content of dental assistants, we can assume that dental assistants are responsible for almost all aspects of the daily operations of a dental clinic, except for behaviors that directly involve treatment of dental patients. Although they are important personnel to the dentists or dental institutions, this occupation is not regulated by government health departments. Therefore, it is not easy to understand what this profession actually looks like. Based on the 2009–2013 American Community Survey (ACS) results, there were 180,007 dentists, 335,569 dental assistants, and 179,664 dental hygienists in the United States.<sup>9</sup> The ratios of dental assistants and dental hygienists to dentists were

**Table 3** The estimated numbers of dental assistants in Taiwan from 2009 to 2021 according to the data of the United States, which show 1.86 dental assistants per dentist and 108.69 dental assistants per 100,000 people.

Years	By dentist		By population	
	Number of dentists	Estimated number of dental assistants	Population	Estimated number of dental assistants
2009	11,351	21,113	23,119,772	25,128
2010	11,656	21,680	23,162,123	25,174
2011	11,992	22,305	23,224,912	25,243
2012	12,391	23,047	23,315,822	25,341
2013	12,794	23,797	23,373,517	25,404
2014	13,178	24,511	23,433,753	25,407
2015	13,502	25,114	23,492,074	25,533
2016	13,912	25,876	23,539,816	25,585
2017	14,379	26,745	23,571,227	25,619
2018	14,717	27,374	23,588,932	25,638
2019	15,127	28,136	23,603,121	25,654
2020	15,429	28,698	23,561,236	25,608
2021	N/A	N/A	23,375,314	25,406
Total increase	4078	—	255,542	—
Mean annual increase	370.73	—	21,295.17	—
Total increase rate (%)	35.93	—	1.11	—
Mean annual increase rate (%)	3.27	—	0.09	—

1.86 and 1.00, respectively. In addition, a 2004 report for the assessment of the needs of dental assistants by dentists in Taipei showed that 38.6% of dentists believe that a dentist should be accompanied by one assistant, and 46.3% of dentists believed that a dentist should be accompanied by two assistants. This means that more than 80% of dentists believe that the ideal practice type should have 1–2 dental assistants for each dentist.<sup>11</sup> Therefore, according to this information, we estimated that the dental assistant manpower in Taiwan is approximately 28,000 in 2020 and this estimation should be reasonable. In this study, the estimates of Taiwan's dental assistant workforce by the Ministry of Labor may be underestimated. Furthermore, if Taiwan implements the licensing system for dental hygienists in the future, it is estimated that the ideal manpower requirement for dental hygienists may be approximately 15,000 based on the data showing one dental hygienist per dentist in the United States.<sup>9</sup>

Dental assistants in the United States are predominantly female, with a mean age of 35 years. Approximately 32.3% of them are between 25 and 34 years old. The majority (92.7%) of them work in private for-profit dental practices. In contrast, 3% of them work for non-profit organizations and 1–2% of them work for either local, state, or federal entities. Approximately 30.6% of them receive some college-level education without obtaining a formal degree. Moreover, 29.4% of them have a high school diploma which is their highest level of education obtained. Between 2009 and 2013 the full-time dental assistants work 34 h per week on average. In addition, the part-time dental assistants work fewer weeks per year than the full-time dental assistants.<sup>9</sup>

Unlike the United States, which has a well-established management system for dental assistants, there is no licensing system for chairside dental assistants in Japan. The survey of practicing healthcare professionals does not include chairside dental assistants.<sup>12</sup> Moreover, Taiwan also has a similar situation to Japan. Therefore, it is not easy to detect the actual workforce of dental assistants. To the best of our knowledge, there is still no census study on dental assistants in Taiwan up to date. However, there is a questionnaire study in 2010 with a valid sample of 443 dental assistants.<sup>13</sup> In this study, the demographics of subjects showed that dental assistants are predominantly female (99.3%), with a mean age of 33.0 years. The majority of dental assistants work in the dental clinics (57.4%), while 40.7% of them worked in the dental departments of the hospitals. For the educational attainment of the dental assistants, most of them have an associate degree (37.3%), followed in a descending order by the high school diploma (32.1%), the bachelor's degree (29.0%), the post-baccalaureate degree (1.1%), and the degree less than a high school diploma (0.5%). Of these 443 dental assistants, 32.7% graduate from nursing-related majors, and 50.5% have participated in the dental assistant training courses organized by the dental associations. Their seniority in this occupation is 7.5 years and the mean number of working days per week is 5.4 days. The work content of dental assistants mainly includes assisting dentists in the dental clinics, equipment cleaning, disinfection and preparation, patient reception, administrative affairs, environmental cleaning, and oral hygiene instruction. In addition, their

work locations are mainly in the municipalities or metropolitan areas of cities and counties.<sup>13</sup> Our previous studies found that the uneven distribution of dental resources in Taiwan is a long-term problem.<sup>14–17</sup> In addition to the concentration of dentists in the metropolitan areas, dental students are also mostly from municipalities or cities.<sup>18–20</sup> Therefore, it is inevitable that dental institutions or dentist-related staff are also concentrated in the metropolitan areas of Taiwan.

According to a report by 104 Corporation (Job Bank in Taiwan) with a valid sample of 872 dental assistants in June 2022, the demographics of subjects showed that dental assistants are predominantly female (98%).<sup>21</sup> They are mostly 25–29 years old (39%), followed in a descending order by 30–34 years old (25%) and 35–39 years old (14%). For the educational attainment of the dental assistants, most of them have a bachelor's degree (53%), followed in a descending order by the high school diploma (32%), the associate degree (14%), and the post-baccalaureate degree (1%). Their seniority in this occupation is 1–3 years at most (29%), followed in a descending order by 5–10 years (26%), 3–5 years (20%), less than 1 year (11%), 10–15 years (10%), and more than 15 years (4%). Their job content is to assist dentists in the prevention, diagnosis, treatment of dental and oral diseases or the preparation of dental equipment and materials under the guidance and supervision of dentists. Their job task is to recognize, operate, and maintain dental equipment and to assist patients with oral hygiene and health care.<sup>21</sup> This indicates that dental assistants are well-qualified jobs for most people after a proper training.

Occupational Employment Statistics (OES) estimates indicate that dental assistants in the United States earned a mean annual wage of \$36,260 and a mean hourly wage of \$17.43 in 2014.<sup>9</sup> Thus, the annual wage/capita GDP for dental assistants in the United States is 65.87%. Compared with the wage of dental assistants in the United States, the wage of our dental assistants is obviously much lower. Even though their wage has increased year by year, the rate of increase is not as good as the rate of economic growth and the rate of increase in basic wage of labor. On the contrary, their annual wage/capita GDP fell from 47.43% in 2009 to 34.78% in 2021. In fact, they were also the group of subjects with the lowest wage among all occupations in the healthcare service industry. However, according to the report of 104 Corporation (Job Bank in Taiwan), the monthly wage of a novice dental assistant is 28,866 NT dollars, while the monthly wage of an experienced dental assistant is 33,719 NT dollars, which is still relatively low.<sup>21</sup>

Although the number of dental assistants is large and they are also the top 10 employees among all occupations in the healthcare service industry, including dental assistants, physicians, paramedical personnel, and other employees. There are also many licensing systems of paramedical personnel of dentistry in Taiwan, which have not yet been established.<sup>10</sup> These paramedical personnel of dentistry are mainly dental technicians, oral hygienists, dental nurses, and dental assistants. At present, only the establishment of the legal system for dental technicians has been completed in 2009. In fact, from the post-war period till now, the nursing education in Taiwan also has not focused on the field of dental nursing. This may be related to the development history of dentistry in Taiwan. In 1916

(Taisho 5) during the Japanese colonial period, the government announced the Taiwan Dentist Order to recognize the dentist as a kind of legal physician. However, the post-war Taiwan's dental profession experienced a difficult time. The post-war Kuomintang government did not recognize the dentists as a kind of legal physician in the legal system. It was not until the new Physicians Act of 1975 that dentists were recognized as legal physicians.<sup>2</sup> We can infer that before the legal system for dentists themselves has been established, the time schedule of the establishment of the legal systems for other paramedical personnel of dentistry must also be delayed.

In addition, during the Japanese colonial period, there was a license system for dentists with restricted practice areas. After the dental apprentices learned dental techniques in a hospital or a clinic, they could obtain a conditional dentist license through an examination. From the post-war period until the new Physicians Act implemented in 1975, which recognized a dentist as a legal physician, there were also many dental apprentices who engaged in dental work after learning dental techniques. However, they did not violate the Physicians Act and were not banned and recognized as dental fraud by the government in those days. This historical background has caused the dental profession to adopt a negative attitude towards the implementation of the licensing system for dental assistants.<sup>2</sup>

Now the environment is different from the past. Taiwan's dental profession has begun to develop towards a comprehensive dental specialty system in 2017.<sup>22</sup> Not only general dentists, but also various dental specialists need more professional paramedical personnel, which of course also includes dental assistants. The Taiwan Dental Association started promoting the certification system for dental assistants in 2011, which was considered to be a good start. Based on the results of this study, we conclude that the manpower and work content of dental assistants in Taiwan are important to dentists. The dental assistants are numerous in number but they usually work with a relatively low wage. It is imperative to continue to promote the certification system for dental assistants. This action may improve not only the professionalism of this occupation, but also the wage structure of this occupation, so that the relevant practitioners can consider that this is a promising occupation and the dental assistants can become a stable and positive part of the field of dentistry.

## Conflict of Interest

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

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