Original

Trends in domiciliary dental care including the need for oral appliances and dental technicians in Japan

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Abstract: The need for domiciliary dental care (DDC) for people requiring long-term nursing care is increasing as the super-aged society of Japan grows still older. Dysphagia diagnosis and rehabilitation are becoming more important in DDC; thus, the need for prostheses used for dysphasia rehabilitation is presumed to be increasing. To identify DDC trends in Japan, as well as the need for prostheses and dental technicians for DDC, we sent a self-administered questionnaire to dentists providing DDC and analyzed responses from 138 dentists (valid response rate, 39.8%). The results showed that 37.7% of respondents reported treating ≥ 50 patients per month. The most frequently performed procedures were removable prosthetic treatment and oral care, followed by dysphagia rehabilitation. Use of palatal augmentation prostheses was experienced by 54.3% of respondents, and most indicated that the prostheses were effective for improvement of oropharyngeal function. The rates of cooperation with primary care doctors and nursing care professionals were 76.8% and 85.5%, respectively. Only 6.5% of respondents reported accompanying dental technicians to DDC.

The present analysis of trends in DDC indicates that oral care and dysphagia rehabilitation have become more frequent and that cooperation with healthcare professionals other than dental technicians has increased in recent DDC.

Keywords: domiciliary dental care; dysphagia rehabilitation; oral appliance; team approach; dental technician.

Introduction

The aged population of Japan has increased rapidly, reaching 27.3% in 2016 (http://www8.cao.go.jp/kourei/whitepaper/w-2017/html/gaiyou/s1_1.html). This trend has greatly increased the number of individuals needing long-term nursing care. Because the capacity of nursing care facilities is insufficient for the population requiring this type of specialized care, many elders live in the community and require doctor visits at home. Similarly, the need for domiciliary dental care (DDC) is believed to have increased recently. However, a few questionnaire studies (Hirata et al., J J Gerodont 27, 276-284, 2012) (1) of DDC provided by members of dental associations in Tokyo reported a relatively low rate of DDC service provision by dentists: 36.6% in 2006 and 29.2% in 2011. These findings suggest that DDC services may not be expanding in metropolitan areas, even though the number of patients was reported to be increasing gradually. Rising rates of aspiration pneumonia have been a public health concern for the elderly population of Japan (<http://www.mhlw.go.jp/toukei/saikin/hw/jinkou/kakutei16/>

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Table 1 Questionnaire on domiciliary dental care (DDC) (questions and response options)

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1. How many patients do you treat in DDC per month? (approximate cumulative total number)
() patients/month
 2. How much time do you devote to DDC?
() % of total clinical time, () days/week
 3. Choose all options for origins of DDC requests.
• Patient or family • Regional dental association • Community general support center
• Home-visit nursing care station • Primary care dentist • Hospital • Others ()
 4. Choose all options for DDC visiting sites.
• Patient's home • Elder care facility • Facility for the disabled • Hospital • Others ()
 5. Choose all options for DDC procedures performed.
• Removable prosthetic treatment • Restorative treatment • Periodontal treatment
• Surgical treatment including tooth extraction • Dysphagia rehabilitation • Oral care • Others ()
 6. Do you implement assessments of eating and swallowing functions?
• Yes • No
↓ If you chose "Yes", answer the next question.
 - 6-1. Choose all options for assessment procedures.
• Medical interview • Screening test (RSST, MWST, Food test) • Oral diadochokinesis
• Videofluoroscopic examination of swallowing • Videoendoscopic examination of swallowing
• Others ()
 7. Have you ever used a palatal augmentation prosthesis (PAP) for improvement of dysphagia?
• Yes • No
↓ If you chose "Yes", answer the additional questions.
 - 7-1. Number of cases () cases
 - 7-2. In your opinion, how effective is PAP for improving dysphagia?
• Extremely effective • Quite effective • Fairly effective • Rather ineffective • Ineffective
 8. Have you ever used a palatal lift prosthesis (PLP)?
• Yes • No
↓ If you chose "Yes", answer the additional questions.
 - 8-1. Number of cases () cases
 - 8-2. In your opinion, how effective is PLP for improving oral function?
• Extremely effective • Quite effective • Fairly effective • Rather ineffective • Ineffective
 9. Do you cooperate with a primary care doctor in DDC?
• Closely cooperate • Fairly cooperate • Rarely cooperate • Do not cooperate
 10. Do you cooperate with nursing care professionals such as care managers in DDC?
• Closely cooperate • Fairly cooperate • Rarely cooperate • Do not cooperate
 11. Do you accompany dental hygienists to DDC?
• Always • Often • Occasionally • Rarely • Never
 12. Do you accompany dental technicians to DDC?
• Always • Often • Occasionally • Rarely • Never
 13. How do you feel about the following statement: "Accompanying DTs to DDC is helpful"?
• Agree • Rather agree • Rather disagree • Disagree
 - 13-1. If you chose "agree" or "rather agree", choose all reasons for your answer.
• Decreases time required for denture repair and adjustment
• Improves prosthesis quality • Role-sharing reduces the burden of dentists
• Enables use of DT professional knowledge and skills • Others ()
 - 13-2. If you chose "rather disagree" or "disagree", choose all reasons for your answer.
• Manpower of dentists and DHs is sufficient for DDC practice • Insufficient need for DTs in DDC
• Insufficient dental service remuneration for DT work • Others ()
 14. How do you feel about the following statement: "Allowing DTs to touch the inside of patients' mouths will improve DDC"?
• Agree • Rather agree • Rather disagree • Disagree
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RSST: repetitive saliva swallowing test (Oguchi K et al., Jpn J Rehabil Med 37, 383, 2000), MWST: modified water swallowing test, FT: food test.

dl/00_all.pdf). Therefore, DDC procedures for dysphagia diagnosis and rehabilitation are increasingly important. In this treatment context, there is likely a greater need for oral appliances used for dysphagia rehabilitation, such as palatal augmentation prosthesis (PAP) and palatal lift

prosthesis (PLP). However, few studies have examined the need for these appliances in DDC.

Comprehensive community care for people requiring long-term care is expanding in Japan, and interprofessional cooperation and team approaches are essential for

Fig. 1 Status of domiciliary dental care (DDC) practice: number of patients per month, ratio of clinical time spent on DDC, and days per week spent on DDC. The class and number of respondents are indicated in each bar.

such care. In team dental care in DDC, dentists perform dental treatments, and dental hygienists (DHs) provide oral care and assume an important role in managing long-term in-home dental care (2,3). In contrast, dental technicians (DTs) are rarely involved in DDC. However, inclusion of DTs in the DDC team could improve work efficiency and DDC quality. To identify current trends in DDC practice, the need for prostheses in DDC, and the expected role of DTs in DDC, we conducted a self-administered questionnaire study of dentists providing DDC in Japan.

Materials and Methods

Self-administered questionnaires were mailed to 347 dentists who were members of the “Home Dental Care Net” and providing DDC in Japan. The respondents were requested to answer the questions and send back the completed questionnaire, only if they understood the questionnaire explanation of the objective and significance of the study and its privacy protections and were willing to cooperate with this study. The survey was conducted from June through July 2016. The questionnaire included items on conditions of DDC practice, the need for oral appliances such as PAP and PLP, cooperation with other healthcare professionals, and the role of DTs in DDC (Table 1).

The collected data were tabulated, and associations between question items were analyzed by using Spearman rank correlation coefficients, the chi-square test, or the Fisher exact test. Multiple logistic analysis using a stepwise method was utilized to identify factors affecting provision of dysphagia rehabilitation. A P -value of <0.05 was considered to indicate statistical significance. Statistical analyses were performed with SPSS version 23.0 (IBM Corporation, Armonk, NY, USA) for Windows

A. Origin of DDC request (Multiple choice)

B. Visiting site (Multiple choice)

Fig. 2 A: Origins of domiciliary dental care (DDC) requests. “Care manager” and “elder care facility” were extracted from the response “others”. B: Types of visiting sites. The percentages of respondents are indicated at the right of each bar.

(Microsoft Corporation, Redmond, WA, USA). This study was conducted with the approval of the Ethics Committee of Faculty of Dentistry, Tokyo Medical and Dental University (approval no. D2016-008).

Results

Respondents

Of the 347 dentists who were sent questionnaires, 139 responded to the survey (response rate, 40.1%), and 138 questionnaires (39.8%) were deemed valid and analyzed.

Status of DDC

DDC practice

Approximately 54% of respondents were treating fewer than 50 patients per month, while 20.3% were treating 100 or more (Fig. 1). Regarding time spent on DDC, 56.5% of respondents answered $<20\%$ of total clinical time, and 18.1% answered $>40\%$. When respondents were asked to describe the time spent on DDC in days per week, 47.8% of respondents answered <3 days and 27.5% answered 5-7 days. In addition, the number of patients treated per month was highly positively correlated with the ratio of time spent on DDC to total clinical time ($r = 0.617$, $P < 0.001$, Spearman rank correlation coefficient) and days per week spent on DDC ($r = 0.657$, $P < 0.001$).

In the analysis of the origin of DDC requests, the patient or family was selected most (94.2%), followed by home-visit nursing care stations (56.5%) and community general support centers (50.0%) (Fig. 2A). The most selected visiting sites were the patient's home (89.9%)

Table 2 Associations of number of patients per month with the study variables

Factor		Number of patients/month		<i>P</i> -value*
		<35 <i>n</i> (%)	≥35 <i>n</i> (%)	
Origin of DDC request				
Home-visit nursing care station	Yes	28 (39.4)	43 (60.6)	0.013
	No	34 (61.8)	21 (38.2)	
Community general support center	Yes	26 (40.0)	39 (60.0)	0.033
	No	36 (59.0)	25 (41.0)	
Primary care dentist	Yes	0 (0.0)	12 (100.0)	<0.001
	No	62 (54.4)	52 (45.6)	
Visiting site				
Elder care facility	Yes	43 (41.3)	61 (58.7)	<0.001
	No	17 (89.5)	2 (10.5)	
Hospital	Yes	30 (39.5)	46 (60.5)	0.009
	No	30 (63.8)	17 (36.2)	
Facility for the disabled	Yes	11 (32.4)	23 (67.6)	0.024
	No	49 (55.1)	40 (44.9)	
Cooperation with nursing care professionals	Yes	50 (45.5)	60 (54.5)	0.027
	No	12 (75.0)	4 (25.0)	

*Chi-square test or Fisher exact test.

DDC: domiciliary dental care.

A. Procedures performed during DDC (Multiple choice) **B. Contents of dysphagia assessment (Multiple choice)** **Fig. 3** Procedures performed during domiciliary dental care (DDC) (A), and procedures used for dysphagia assessment by respondents performing such assessments (B). The percentages of respondents are indicated at the right of each bar. VE: video endoscopic examination of swallowing; Oral-DDK: oral diadochokinesis test; VF: videofluoroscopic examination of swallowing.

and elder care facilities (79.0%) (Fig. 2B).

When respondents were divided into two groups in relation to the median number of patients per month, number of patients per month was significantly associated with several factors, including origin of request, visiting

site, and cooperation with other healthcare professionals ($P < 0.05$, chi-square test or Fisher exact test) (Table 2).

Content of DDC

Multiple-choice responses to the question on DDC procedures performed revealed that removable prosthetic treatment and oral care were performed by 96.4% and 90.6% of respondents, respectively, followed by dysphagia rehabilitation (provision rate, 64.5%) (Fig. 3A).

In addition, eating and swallowing function were assessed by 81.2% of all respondents, and by virtually all (96.6%) of respondents providing dysphagia rehabilitation. Multiple-choice responses on the content of assessment among respondents practicing assessment revealed that a medical interview was performed by 96.4% of respondents and that a screening test including a repetitive saliva swallowing test (4,5), modified water swallowing test (6-8), and food test (6) was performed by 93.8% of respondents (Fig. 3B). Furthermore, video endoscopic examination of swallowing (VE) was performed by 43.8% of respondents, and an oral-diadochokinesis (oral-DDK) testing was performed by 34.8%.

Factors that were significantly associated with provision of dysphagia rehabilitation are shown in Table 3 ($P < 0.05$, chi-square test). As compared with respondents not providing dysphagia rehabilitation services, respondents who did provide such services were treating a larger number of patients, receiving more DDC requests from

Table 3 Associations of provision of dysphagia rehabilitation with the study variables

Factor		Provision of dysphagia rehabilitation		<i>P</i> -value*
		Yes <i>n</i> (%)	No <i>n</i> (%)	
Number of patients per month	<35	36 (58.1)	26 (41.9)	0.027
	≥35	49 (76.6)	15 (23.4)	
Origin of DDC request				0.017
	Hospital			
	Yes	46 (75.4)	15 (24.6)	0.017
	No	43 (55.8)	34 (44.2)	
Visiting site				0.007
	Elder care facility			
	Yes	77 (70.6)	32 (29.4)	0.007
	No	10 (41.7)	14 (58.3)	
Hospital				0.013
	Yes	59 (73.8)	21 (26.2)	
	No	28 (52.8)	25 (47.2)	
Cooperation with other professionals				0.017
	Primary care doctor			
	Yes	74 (69.8)	32 (30.2)	0.017
	No	15 (46.9)	17 (53.1)	
Nursing care professional				0.049
	Yes	80 (67.8)	38 (32.2)	
	No	9 (45.0)	11 (55.0)	

*Chi-square test.

DDC: domiciliary dental care.

Table 4 Multiple logistic regression analysis using a step-wise method for provision of dysphagia rehabilitation

	Odds ratio	95% CI	<i>P</i> -value
Number of patients per month	2.689	1.001-7.223	0.049*
Origin of DDC request			
Regional dental association	0.550	0.229-1.318	0.180
Primary care dentist	0.309	0.069-1.387	0.125
Hospital	2.052	0.796-5.290	0.137
Elder care facility	1.943	0.643-5.873	0.239
Visiting site			
Elder care facility	1.441	0.420-4.939	0.561
Cooperation with other professionals			
Primary care doctor	3.295	1.117-9.718	0.031*
Nursing care professional	1.382	0.376-5.078	0.626
Attitude toward accompanying DTs	1.631	0.675-3.943	0.277

CI: confidence interval, DDC: domiciliary dental care.

DTs: dental technicians.

*Statistically significant (i.e., $P < 0.05$).

hospitals, visiting more elder care facilities and hospitals, and cooperating more with primary care doctors and nursing care professionals. Moreover, multiple logistic regression analysis of provision of dysphagia rehabilitation yielded an odds ratio of 2.689 (95% confidence interval, 1.001-7.223) for number of patients and 3.295 (1.117-9.718) for cooperation with primary care doctors (Table 4).

Need for oral appliances used in dysphagia rehabilitation

The rate of respondents with treatment experience using

PAP was 54.3%, 92.0% of whom reported that PAP was effective for improvement of swallowing function (Fig. 4A). However, the number of patients treated was small: 76.0% of the respondents had treated fewer than 10 patients (Fig. 4B). In contrast, 29.7% of respondents had treatment experience using PLP, 92.7% of whom reported that PLP was effective for improvement of oral function. The number of patients treated was even smaller: 75.6% of the respondents had treated fewer than four patients.

A. Effectiveness of the oral appliances

B. Number of cases

Fig. 4 A: Effectiveness of oral appliances, such as palatal augmentation prosthesis (PAP) and the palatal lift prosthesis (PLP), for oropharyngeal function. The numbers of respondents are indicated in each bar. B: The numbers of PAP and PLP cases are for respondents who performed such treatment. The numbers of cases and respondents are indicated in each bar.

Interprofessional cooperation and team dental care in DDC

Cooperation with primary care doctors and nursing care professionals in DDC was reported by 76.8% and 85.5% of respondents, respectively (Fig. 5A). Regarding team dental practice, only 6.5% of respondents reported accompanying DTs to DDC, while 92.0% reported accompanying DHs (Fig. 5B).

Attitudes regarding the need for accompaniment of DTs to DDC were evenly divided: 50.7% responded positively and 47.8% negatively. The most frequent reason for a positive response was that collaboration with DTs shortens removable prosthetic treatment time in DDC. Less frequent reasons were that it reduces the dentist's workload and improves prosthesis quality. The most frequent reason for a negative response was the limited need for DT services in DDC.

Respondents were asked about their attitude regarding allowing DTs to touch the inside of patients' mouths, which is currently prohibited by the Dental Technicians Act of Japan: 68.1% responded positively and 21.0% responded negatively regarding such permission. A positive attitude to the permission was significantly associated with a positive attitude to accompaniment of DTs to DDC ($P < 0.001$, chi-square test).

A. Cooperation with other professionals in DDC

B. Accompaniment of dental professionals

Fig. 5 Interprofessional cooperation and team dental care. A: Cooperation with primary care doctors and nursing care professionals. B: Accompaniment of dental technicians (DTs) and dental hygienists (DHs) to domiciliary dental care (DDC). The numbers of respondents are indicated in each bar.

Discussion

Previous studies reported relatively low rates of DDC service provision (approximately 30%) among dental association members in metropolitan areas and thus could not comprehensively describe DDC trends. Therefore, we used a questionnaire survey to investigate DDC services provided by dentists practicing DDC throughout Japan. The respondents reported treating a significantly larger number of patients than those in previous reports, and 27.5% of the present respondents spent 5 to 7 days per week on DDC suggesting that they were specialized DDC practitioners.

The patient or family, home-visit care station, and hospital were selected as origins of DDC requests by 94.2%, 56.5%, and 44.2% of respondents. These rates are significantly higher than those reported in a previous study (Hirata et al., J Gerodont 27, 276, 2012) (1). With regard to DDC visiting sites, approximately 90% of respondents reported providing DDC services at a patient's home, which was consistent with the previous report (1). However, the rates of respondents visiting elder care facilities and hospitals were much higher than those in the previous report. These results suggest that cooperation with other healthcare professionals has increased in the 5 years since the previous survey.

The most frequently selected DDC procedure was removable prosthetic treatment, which is consistent

with previous reports from Japan (1) and Britain (9). The trends of DDC services in the present study were incremental oral care and dysphagia rehabilitation. The increased focus on incremental oral care is likely attributable to heightened recognition that oral care is essential for holistic health and prevention of aspiration pneumonia (2,3,10-14). For this reason, treatment fees for DDC have been revised several times in Japan, and fees for visit dental hygiene instruction provided by an accompanying DH were added to the domiciliary dental service payment schedule (www.mhlw.go.jp/bunya/iryouhoken/iryouhoken15/dl/h24_01-07-5.pdf). These factors may explain the high percentages of oral care provision and accompanying DHs in the present study. A substantial proportion of respondents, about 65%, reported providing dysphagia rehabilitation. Furthermore, assessment of eating and swallowing function was performed by most respondents (81.2%). These results suggest that the respondents were highly motivated to dysphagia rehabilitation because they recognize the importance of improving and maintaining oropharyngeal function in the prevention of aspiration pneumonia and holistic health, as indicated by several previous studies (15-18). Another potential contributing factor is that the 2010 revision of the Japanese health insurance system increased the fee for dysphagia rehabilitation. Besides, functional assessment by VE was performed by 43.8% of the respondents, which indicates that a considerable number of respondents had acquired competences needed to perform VE and diagnose swallowing disorders.

PAP and PLP are useful for rehabilitation of swallowing and oral function (19-21) and were used by a substantial proportion of the respondents. Virtually all acknowledged the effectiveness of PAP and PLP for improving oropharyngeal function, thereby confirming the benefits of these appliances.

Cooperation with other healthcare professionals is essential in DDC, and a high number of respondents reported cooperating with primary care doctors and nursing care professionals, which indicates that cooperation between various professionals engaged in long-term nursing care has become more common. The importance of team dental care is widely acknowledged, and most respondents reported that they accompanied DHs to DDC. In contrast, most did not accompany DTs, because they felt that DTs had little role in the current DDC paradigm. However, most respondents had positive attitudes about accompaniment of DTs to DDC and future legal permission for DTs to touch the inside of patients' mouths; therefore, there is an expectation that the role of DTs in DDC might expand in the future. To

make it realized, DTs should acquire the skills necessary for fabricating appliances such as PAP and PLP, assessing oropharyngeal function, and communicating with patients, their families, and other professionals. They should also increase their knowledge of systemic diseases and their ability to manage difficult cases, which are essential aspects of DDC practice.

Because the present study surveyed dentists who were already providing DDC services, caution is advised when attempting to generalize these results to DDC practices throughout Japan. Nevertheless, the present results likely reflect current trends in DDC, namely, an increase in patient numbers, greater practice of oral care and dysphagia rehabilitation procedures, increased use of oral appliances for dysphagia rehabilitation, and greater cooperation among healthcare professionals engaged in long-term care of patients. These trends are likely to continue because of the rapid aging of the population and progress in integrated community care in Japan.

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Conflict of interest

The authors have no conflict of interest to declare.

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