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The International Journal of Oral Health is a peer reviewed journal and the authors are advised to submit manuscripts in the form of original articles, review articles, case-reports, short communications and letters on any aspect related to the oral health.

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All manuscripts submitted to the Journal must comply with these instructions. Failure to do so will result in return of the manuscript and possible delay in publication.

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- All pages should be numbered consecutively in the top right-hand corner, beginning with title page
- Submit 2 hard copies and 1 soft copy on a diskette/CD in Microsoft Word 2007 format.
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An abstract should not exceed 250 words in length and must state purpose, methodology, main findings and conclusion of the study. The abstract should not contain abbreviations and references. Five key words should be supplied below of the abstract.

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In the manuscript, use only Systeme Internationale (SI) Units and standard abbreviations. The full term for which an abbreviation stands should precede its first use in the text unless it is a standard unit of measurement.

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The Vancouver system of referencing should be used (examples are given below). In the text, references should be cited using superscript Arabic numerals in the order in which they appear. If cited in tables or figure legends, number according to the first identification of the table or figure in the text. In the reference list when there are more than six authors to a paper, cite the first three, then indicate et al. All citations mentioned in the text,tables or figures must be listed in the reference list. In general, abstracts are not acceptable as references. Limit to 30 references only.

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2. Book:
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Scientific articles are papers that report significant clinical or basic research in dentistry. They should contain the following sections: (i) structured abstract, consisting of no more than 250 words divided into four paragraphs (background, methods, results and conclusions); (ii) introduction; (iii) materials and methods; (iv) results; (v) discussion; and (vi) references (no more than 30).

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Generally, review articles intended to be focused on reviews of basic and clinical science related to all aspects of dentistry, Reviews should be no more than 10 Journal pages in length including figures, tables and references. They should contain the following sections: (i) abstract (350 words or less); (ii) introduction; (iii) body; and (iv) references.

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Case reports and clinical notes manuscripts will emphasize all aspects of clinical dentistry. They should describe: (i) unique cases; (ii) expected association of two or more diseases; (iii) adverse or unexpected treatment response; (iv) any other clinical observation based upon well-documented cases that provides important new information; or (v) a new or revised clinical technique or procedure. They should be concise and occupy no more than three Journal pages.

Case reports and clinical notes should contain the following sections; (i) structured abstract consisting of no more than 250 words and four paragraphs (background, methods, results and conclusions); (ii) introduction; (iii) case description and results; (iv) discussion; and (v) references.

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Greeting on the successful 12th AAPD

Dear friends and colleagues,

We were able to successfully complete the 12th International Conference of Asian Academy of Preventive Dentistry（12th AAPD）at Tokyo Medical and Dental University, Japan, which was convened May 27th – 29th 2016. The conference was held as a joint meeting with the 65th Japanese Society for Oral Health（65th JSOH）, with the main theme of "The better oral health, the happier daily life." I would like to express our heartfelt gratitude to everyone who attended the conference. The number of participants exceeded 1,000 and we were blessed with good weather, though I sincerely apologize for the inconvenience caused by the somewhat smaller venue.

The program implemented scientific oral and poster presentation sessions, a keynote speech, special lectures, forums, joint symposia and education seminars. The contents of some of the program are presented as featured articles in the current volume.

During the conference, the AAPD and the JSOH decided to take an active role in advocating tobacco control strategies. With an aim to promote a tobacco-free environment in the region, the "Declaration on Tobacco Control" was announced（Page4）. This is the first AAPD declaration in its 22-year history. I expect not only tobacco control but also other preventive dentistry related activities will be put into practice in many Asian countries.

Finally, I really appreciate the warm support and cooperation from all of you, including our conference members, executives, staff, co-sponsors and all other stakeholders. Thanks to the efforts of the many people involved, we could successfully carry out the conference and engage in productive international exchanges between AAPD and JSOH participants. I am hoping for further development of your academic and scientific research endeavors, as well as personal fulfillment, and greater prosperity of this society.

I look forward to meeting all of you at the next 13th AAPD in Thailand.

Yoko KAWAGUCHI, DDS, PhD
President of the 12th AAPD
Professor
Department of Oral Health Promotion
Tokyo Medical and Dental University
Tokyo, Japan

Greeting from the 13th President of the AAPD

The Asian Academy of Preventive Dentistry (AAPD) would like to invite you to Khon Kaen, Thailand, for the 13th International Conference of the Asian Academy of Preventive Dentistry (AAPD 2018). The Conference will be held during October 25-27, 2018. Please join us for a stimulating Conference with state-of-the-art scientific program on all aspects of preventive dentistry and dental public health.

The Conference, with the theme of "Improving Health through Oral Health", emphasizes that oral health is an essential component of human health. It also highlights the values of oral health promotion and preventive dentistry in the improvement of health outcomes for patients and population.

The scientific program of AAPD 2018 will focus on timely and interesting topics and we would like to cordially invite you to submit abstracts of your latest work to be presented orally or as posters. Moreover, the AAPD 2018 will provide a platform for networking between oral health personnel in all related disciplines and from all over Asia.

The Conference will be held in Khon Kaen, the center of Thailand's northeastern region or '*Isaan*' which has been chosen by CNN as one of the world's top 17 destinations in 2017. Khon Kaen is one of the fastest growing cities in Thailand and serves as a major hub of education, transport and commerce for the region. Khon Kaen University plays an important role as a center of higher education, medicine, science and technology for the Greater Mekong Sub-region. With convenient flight connections and public transportation, Khon Kaen is also a popular destination for tourists looking for rich culture and a glimpse of the traditional Thai way of life, as well as a good base to explore fascinating historical and archaeological sites in the *Isaan* region.

We are confident that the Conference will provide all participants a memorable personal and professional experience, and we look forward to welcoming you to Khon Kaen.

Waranuch PITIPHAT, DDS, MPHM, MSc, ScD, FRCDS
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Dean, Faculty of Dentistry, Khon Kaen University, Khon Kaen, Thailand

Towards a Tobacco-Free World

Declaration on Tobacco Control

Smoking among men is high in the Asian Pacific Region, and the smoking uptake among youth and women has been a critical issue. Several areas in the region have the world's highest mortality rates from oral cancer due to the habit of chewing of betel quid and areca nut mixed with tobacco.

Despite current knowledge of the harm caused by tobacco to health, oral health professionals remain insufficiently involved in tobacco cessation, even though they are in a position to reduce the burden of oral and systemic diseases by influencing tobacco use. Tobacco prevention activities can be integrated into existing oral health policies or translated through new community programs. Dental professional organizations are required to participate in tobacco control measures at the national and regional levels. The WHO Framework Convention on Tobacco Control calls for international collaboration and strengthening of the participation of oral health professionals in tobacco cessation.

In such circumstances the Asian Academy of Preventive Dentistry (AAPD) and the Japanese Society for Oral Health (JSOH) should take active participation in advocating tobacco control interventions. Aiming for a tobacco-free environment in the region, the AAPD and the JSOH urge their members to implement the following tobacco control measures:

1. Promoting research in the area of tobacco cessation
2. Sharing of evidence, best practices and expertise in tobacco control
3. Distributing knowledge about the harmful effects of tobacco among its members, other health professionals and the general public
4. Integrating tobacco cessation into other oral health education and clinical activities
5. Promoting tobacco cessation among oral health professionals and dental students
6. Integrating tobacco-related subjects into dental curriculums and programs of continuing education
7. Promoting a tobacco-free environment at conference venues and including tobacco control in the agenda of the conference

The 12th International Conference of the Asian Academy of Preventive Dentistry
The 65th General Meeting of Japanese Society for Oral Health
Tokyo, Japan, May 29, 2016

Review Article

Disaster Dentistry
— Management of Oral Infectious Diseases to Prevent Aspiration Pneumonia —

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Abstract: The practice of Japanese dental disaster-relief started in 1993 with the identification of victims using dental records. In 1995, programs for emergency dental care and individual oral health promotion were introduced. In 2007, systemic oral health promotion for local communities, specifically medium to long term initiatives for the elderly were introduced, with the goal of maintaining oral health and preventing aspiration pneumonia. In 2011, the Ministry of Health and Welfare and the Japan Dental Association started managing a nationwide dispatch of dental professionals. These past efforts served as valuable lessons for the 2016 response and should be shared among the dental community. Quick and widespread deployment of oral health support is critical for communities affected by disasters, and such support should continue until communities recover. Multidisciplinary management of oral health, especially for people in disaster areas who are most vulnerable to infectious diseases, must be standardized.

Key words: disaster dentistry, oral health promotion, aspiration pneumonia, vulnerable people, disaster related death

Modern History of Disaster Dentistry in Japan

The modern history of disaster dentistry can be traced back to the Japan Airlines aircraft crash on the mountain slope in the deep forest in 1985. In 1994 there was another crash of a China Airlines aircraft close to its destination in Nagoya, Japan. In both cases, dental records were used to identify victims of the crashes.

Emergency dental treatment following disaster situations can be traced back to 1993 when an earthquake in the Sea of Japan created a tsunami which inundated the island of Okushiri, southwest off of Hokkaido. One of the consequences of the tsunami was that many of the 5,000 or so residents of the island lost their dental prostheses and suffered difficulty eating. The dental school of the Health Sciences University of Hokkaido was recruited for emergency provision of dentures to the island's residents[1].

Once again in 1995, the Hanshin Awaji earthquake necessitated provision dental care on an emergency basis. Many dental clinics, universities and hospitals were torn down or otherwise incapacitated. Mobile dental clinics and dental buses were organized to meet the emergency oral health needs of the affected population.

At that time, it was obvious that there were widespread, acute oral conditions, including problems related to dentures and oral infections. A small study was set up throughout 8 shelters in Kobe, on the day 4 and the days 5 after the disaster. Founding was that 34.5% of people had some form of mucositis or oral mucosa infection, and 22.3% had denture-related complaints[2].

Health Consequences and Oral Health Promotion Following Natural Disaster

Oral diseases in prolonged stressful situations have been documented since at least the first world war, when "trench mouth" was noted. Emotional stress, physiological stress, poor oral hygiene, poor nutrition, smoking and other factors led to conditions such as oral mucositis and acute gingivitis.

With regards to systemic health, it was found that the incidence of pneumonia in the Hanshin Awaji area was significantly higher in 1995 than in the preceding and following years[3]. Furthermore, it was observed that around a quarter of disaster-related deaths could be attributed to pneumonia[3].

In 1999 studies[4] suggested that good oral care decreased the incidence of pneumonia following natural

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Table 1　Objective of Dental Aid

Objective		Act	Cooperation
Victims		Victim Identification	Police Japan Coast Guard medical examiner etc.
People who have health problem	Pain/swelling scheduled to visit troubles with denture	Medical care	Disaster key hospital DMAT / JMAT Red Cross etc.
People who have no health problem	Vulnerable people Elders (Dysphasia) Illness or sick (Diabetes, etc.) Infants, Children, Pregnant women	Health care	municipality Health Center etc.

Dental healthcare support is provided not only for the people with health problems, but also for vulnerable population who might have troubles with insufficient conditions later on.

disasters, leading to improved oral care service provision for elderly people in hospitals or nursing homes in subsequent disaster situations.

In the aftermath of the 2004 Niigata Chuetsu earthquake, building upon researches carried out during previous disasters, oral health promotion activities were conducted in addition to the provision of emergency dental treatment. Although the direct effect of oral health promotion efforts may not be known, it was found that after the Niigata Chuetsu earthquake, the proportion of deaths due to pneumonia was 15% – lower than the quarter of deaths due to pneumonia after the Hanshin Awaji earthquake[3].

In 2007 Niigata Chuetsu was again struck by an earthquake. Oral health care following this again included oral health promotion activities, as well as emergency treatment, especially for vulnerable people such as the elderly[5, 6] (Table 1).

2011 the Great East Japan Earthquake

In 2011 the Tohoku region experienced the Great East Japan earthquake. The region saw catastrophic devastation due to the 9.0 magnitude of the tremor– one of the most powerful in recorded history– and ensuing tsunami. At that time, the Minister of Health and Welfare and the Japan Dental Association sent dental professionals from non-affected prefectures, mainly from the west side of Japan, to the Tohoku area (Fig. 1, 2).

In one case in the Tohoku earthquake-tsunami disaster, an institution running two nursing homes had one of their buildings destroyed. All residents were moved into a single nursing home, causing very crowded situation of the residents in the home. Emergency oral health care services were provided by the School of Life Dentistry at Niigata, the Nippon Dental University, which found that staffs in the nursing home were overwhelmed with tasks such as maintaining the water supply, maintaining nutrition for the residents and performing daily bodily hygiene routines. The nursing home staffs could not find time for oral hygiene procedures. With the encouragement of the School of Life Dentistry at Niigata, the Nippon Dental University, oral hygiene provision by the nursing home staff was gradually incorporated into the post-disaster routine at the care home until it was eventually back to pre-disaster level. A study of nursing home oral care around the time of this disaster found that staffs reported that they performed oral hygiene for residents before the earthquake but ceased to do so after. Three months following the disaster, staff reported that they were again providing oral health care, but the level of this care was found to be insufficient. This study stressed the necessity of long term support for welfare institutions[7].

2013 the study of Kessenuma, in the Tohoku region, again looked at pneumonia incidence[8]. The study combined data from 3 hospitals, from March 2010 to June 2011, and found that: a marked increase in the incidence of pneumonia was observed during the 3-month period following the disaster; the weekly incidence of pneumonia hospitalizations and pneumonia-associated deaths increased by a factor of 5.7 and 8.9 times, respectively; the highest incidence occurred during the first 2-weeks after the disaster. The highest rate of pneumonia cases is at the 2-week point and after 3 months the incidence recedes to the normal rate. An interesting finding was that only 8 cases developed after near-drowning situations; most cases were in nursing home residents. This suggests that

Fig. 1　Oral healthcare activities after the Great East Japan Earthquake
a) Individual oral hygiene instruction at evacuation center - Gymnasium, b) Temporary Dental Clinic at a hall of nursing home, c) Temporary housings, d) Oral health promotion at the meeting room in temporary housings

vulnerable people who experience a drop in the quality of their living environment, even if they are not evacuated, suffer a greater risk of developing pneumonia. Due to the potential link between pneumonia and oral health status, the provision of optimum living conditions, medical checkups and oral hygiene care must be a priority for older and vulnerable people after natural disaster.

It also reported not all of the patients evacuated from affected hospital to the other hospital were survived. It suggests emergency support for daily care such as oral care after disaster is necessary for nursing homes and hospitals where many wounded or infected people are treated[9] (Table 2, Fig. 3).

2016 Kumamoto Earthquakes

In the evening of April 14th, a magnitude 6.2 earthquake struck the Kumamoto prefecture in western Japan, causing destruction and 9 deaths across the region. Unfortunately, this turned out to be only a foreshock. It was followed by at least 140 aftershocks and, in the early hours of April 16th, a magnitude 7.0 main shock struck. A total of 50 lives were lost, and 2,753 injured as a direct result of the earthquakes.

Just after the disaster, 180,000 people were displaced from their homes by April 18th. Many homes were completely destroyed. Roads and bridges were also cracked in the affected area. Electricity, water supply, telecommunication, and transportation were severely damaged, and affected to the daily life. Some people who could not reside in their homes were able to use their garage as a temporary shelter. Others who sustained partial destruction to their homes used tarpaulin to build makeshift shelters. Others slept inside their vehicles in parking lots, reserving their parking space with various objects before leaving to attend work during the day, and returning to the same spot in the evening.

Many houses that outwardly seemed to be undamaged were nevertheless deemed not to be safe upon inspection by engineers. Such homes were marked as unsafe to enter. One can only imagine the disappointment and sadness of people who were subsequently forced to abandon their homes. Many people in the area were evacuated to shelters such as schools or gymnasiums, for up to 6 months maximum. Dental healthcare support are provided many dental professionals after the 2016 Kumamoto Earthquake, for three months and a half[10] (Fig. 4).

One nursing home in the affected area was isolated because of a blocked road. Many staffs were unable to

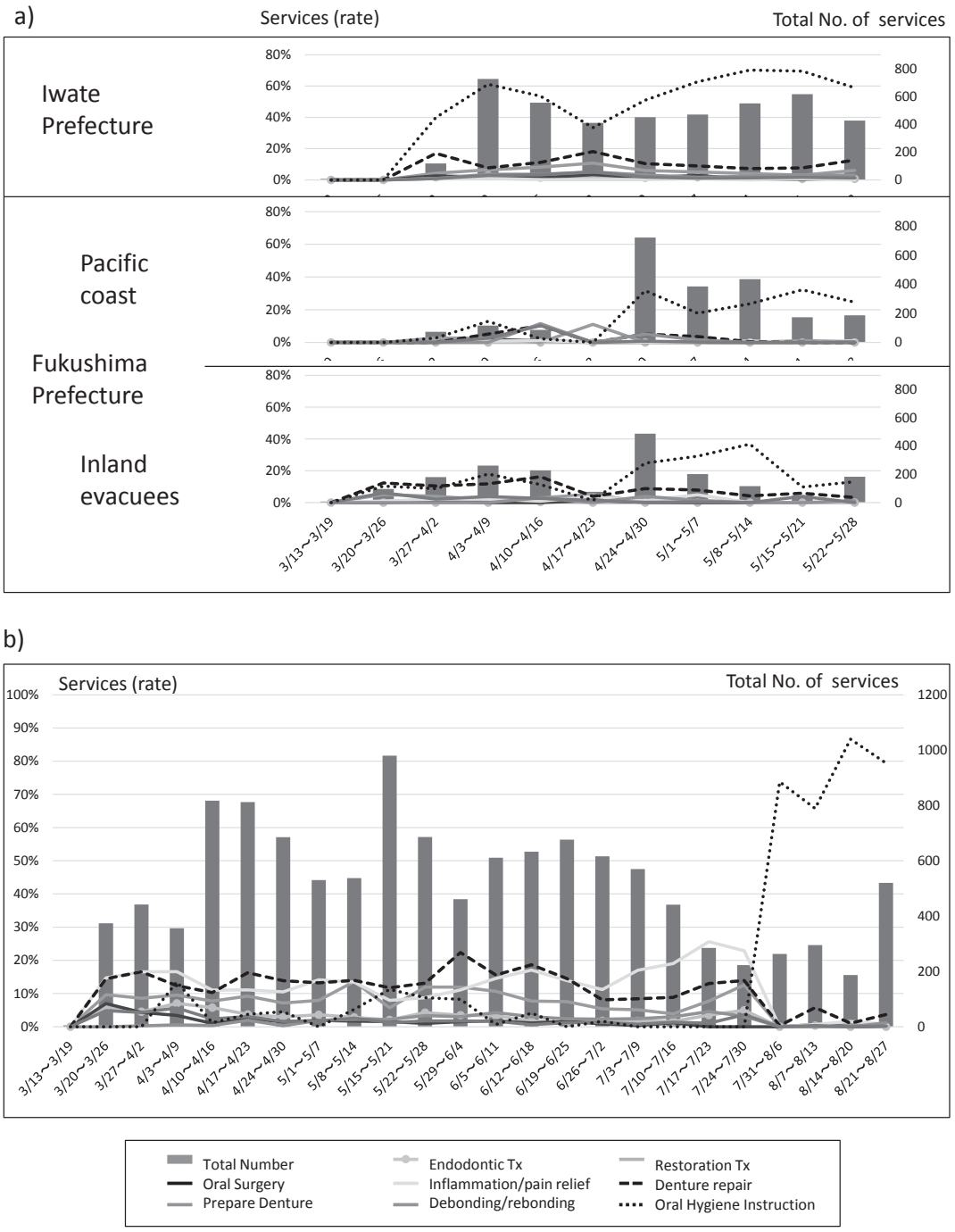


Fig. 2 Changes of dental services after the Great East Japan Earthquake, a) Iwate and Fukushima Prefecture for two months, b) Miyagi prefecture for five months

It is known oral mucous inflammation and denture problems occurred just after disasters, and treatment for denture is needed for certain period. While, providing oral care needs are increasing by time, until the insufficient life will last. Dental healthcare aid may continuously needed until many affected people are living in shelters, from the data of Fukushima prefecture showing the same proportion in the coast and inland evacuees.

In Miyagi Prefecture, it was provided only by dental hygienists in the fifth month after the disaster.

Table 2　Oral care after disaster

Timing	Target	Place	Problems	Issues	Human power
Super acute ～ Acute phase	Person with disease	Hospital	Easily infected	Strict individual oral care	Nurse, Dental Hygienist, Dentist, etc.
Super Acute ～ long term	Vulnerable people	Welfare Shelter, Elders/disabled institution	Lack of nursing care and lifeline	Individual oral care/instruction, oral care product supply	Dental Hygienist, Dentist, Speech Therapist, Care Worker, etc.
		residence	Lack of nursing care and lifeline, Independence		
Acute ～ Chronic Phase	General	Shelter	Lack of environment such as washroom	oral care, promotion, oral care product supply	Dental Hygienist, Dentist, Public Health Nurse, etc.
Chronic Phase ～ Long term	General, Vulnerable people	Temporary housing, Disaster recovery public housing	Lack of nursing care and lifeline, Independence	oral care, promotion, oral function maintenance/ improving	Dental Hygienist, Public Health Nurse, etc.

Oral care is strongly suggested to be provided starting right after the disaster for the easily infectious and vulnerable people, and continue availability throughout. Dental professionals should step in to support shorthanded staffs of the affected hospitals and nursing homes.

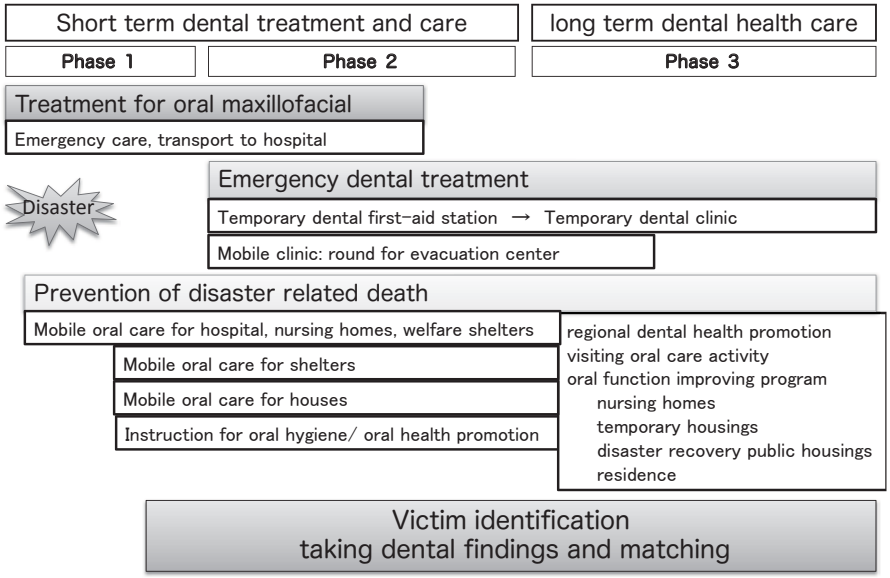
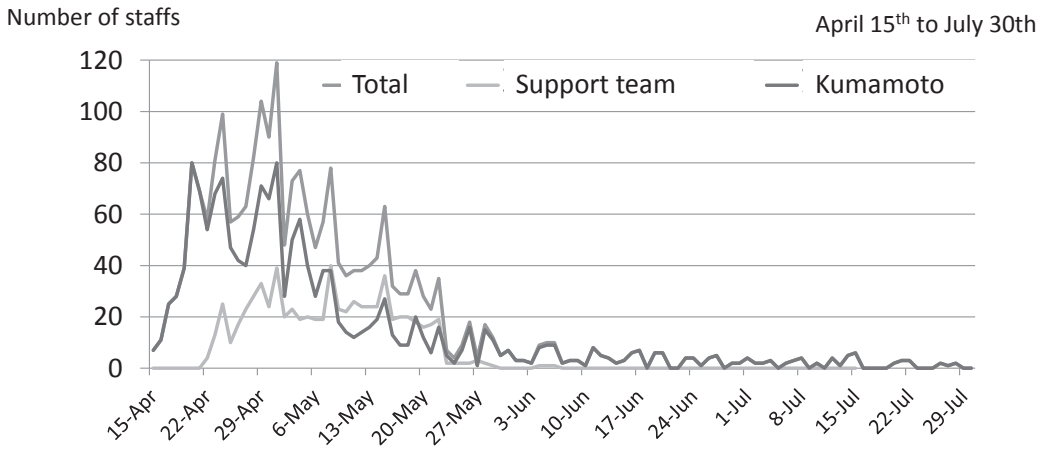


Fig. 3　Chronological change of dental healthcare aid

In the early stage, dental healthcare should be provided for the totally damaged area, with oral care for the vulnerable people. Temporary dental clinic will last until the area and the dental facilities are recovered. Dental and Oral healthcare promotion are simultaneously started and continued to the evacuation shelters, temporary housings, and disaster recovery public housings.



	Dentists	Dental Hygienists	Others	Total
Kumamoto Prefecture *	882	517	173	1572
Support Team from other prefecture	413	282	6	701
Total	1295	799	179	2273

* Including volunteer staffs

Fig. 4 Number of staffs in dental healthcare support in the 2016 Kumamoto Earthquake
Dental healthcare support are provided for three months and a half. From one week after starting, support team from outside of Kumamoto prefecture are dispatched to help and substitute the public services of the local affected dental professionals, for one month.

reach the home and the water supply was disrupted. In order to provide sufficient care for residents, they all had to be gathered into one room. After 1 week the road was reconstructed and our dental team could reach the home. All the residents were examined by standardized dental health assessment tool[11], and classified as the priority. By the priority, dental and oral care was provided in corporation with medical assistance team and public health nurses. In addition, meal support by interdisciplinary approach was provided in corporation with speech therapist and dietitian[12] (Fig. 5, 6).

Dental Education

The core curriculum for dental education has, since 2010, included the line "To explain the necessity of dental health after disaster." As a result of experiences after the great eastern earthquake, the dental national board added "dental healthcare management in emergency/disaster including large scale disaster" in to their agenda. This has had a positive impact on faculties to cover the topic, it increased the participation number from around a half in 2014[13] to almost all as of now. We have to reflect the disaster respond experience each time, and make improvements with the disaster dental health assistance procedure.

Conclusion

Japan experiences one of the highest frequencies of natural disasters in the world and has developed extensive experience in the area of disaster dentistry. The provision of dental emergency treatment is of course essential. However, Japan's experience and research has shown that oral health promotion must also be carried out from acute phase following every disaster. Particular attention needs to be given to vulnerable people in nursing homes, not only because the elderlies are particularly susceptible to ill health following disasters, but also due to the fact that, being a super-aged society, Japan has a high proportion of its population living in such residences.

Oral health promotion in shelters, temporary housings, and disaster recovery public housings are important guidance as a public health activity in disaster situations, and can contribute to improved quality of life and rapid restoration of health following disasters.

To establish effective and continuous oral health support after the disaster, it may be at importance to have multi-disciplinary meal support system in each local area, for the elderlies in nursing homes and local residents.

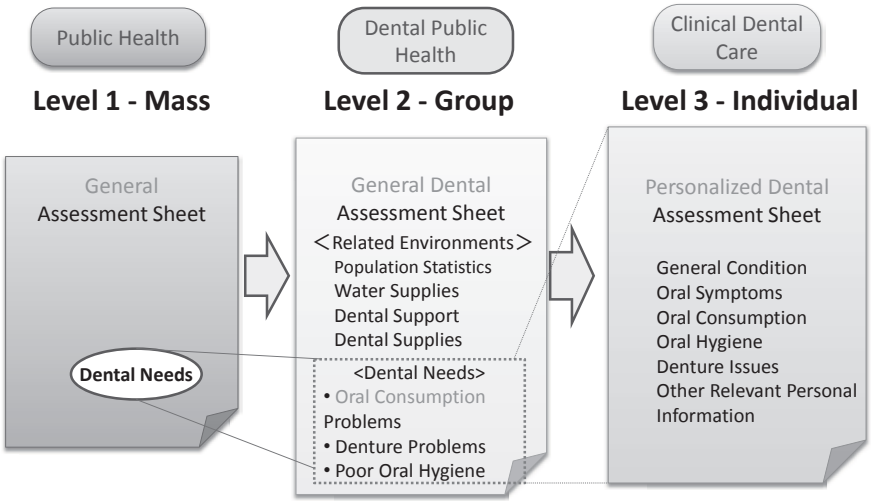


Fig. 5　Standardized Dental Health Assessment Levels

Following the standardized public health assessment of shelters or evacuation center, dental assessment is performed by priority, and provided suitable dental support.

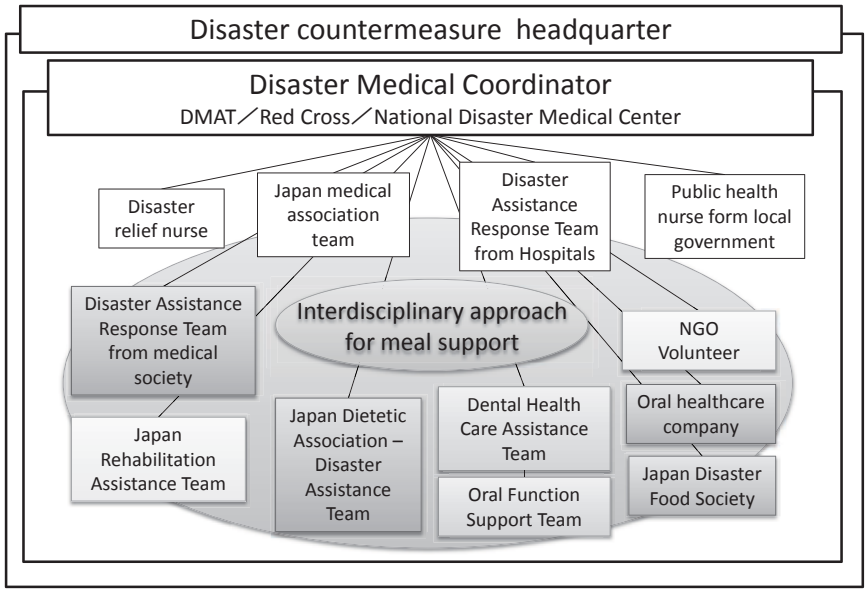


Fig. 6　Interdisciplinary approach for meal support

It is important to sharing information in many institutions and associations, to provide quick and effective support. In terms of oral care to prevent aspiration pneumonia, establishing multi-disciplinary meal support system for the vulnerable people is needed.

This article is based on the lecture given at the 12th AAPD, with a brief history of disaster dentistry in Japan and the research carried out in this field to date.

Acknowledgement

The author would like to thank the supports from the Japan Dental Association, Japan Dental Hygienists' Association, Miyagi and Kumamoto Prefecture Dental Association, and Kumamoto Prefecture Dental Hygienists' Association.

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Review Article

Perspectives for Tele-dental System in Space and Antarctic Environments

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Abstract: There are several reports about the dental or oral diseases affecting astronauts during spaceflight. A Russian astronaut was reported to have suffered incapacitating dental pain during the last two weeks of his 96-day flight. The National Aeronautics and Space Administration (NASA) has identified six dental problems, such as "Abscess", "Avulsion / Tooth Loss", "Caries", "Crown Replacement", "Exposed Pulp / Pulpitis" and "Filling Replacement" in Design Reference Missions (DRMs), the proposed future missions for lunar and Mars explorations. To focus on another isolated environment, dental problems were the third most frequent medical problem in the Antarctic environment (12%), followed by surgical and orthopedic events and internal medical problems. Some of these issues can be related to poor oral hygiene along with the absence of a dentist in isolated environment. For the purpose of the astronaut's oral health promotion, the author launched "Space Oral Health Promotion (SOHP) project" which tackles the urgent research tasks and the operational countermeasures in space dentistry. In SOHP project, the dental department of Tokyo Medical and Dental University and the research and the health management teams of the Japan Aerospace Exploration Agency (JAXA) cooperate to develop the countermeasures against the current and the possible dental or oral problems in future long-term space flight. For the oral health of the Japanese Antarctic Research Expedition (JARE) team, the authors conducted an oral health program with three components. Firstly, the oral examination procedures during recruitment of JARE team were assessed. The authors developed a more detailed examination which checks DMFT scores, periodontal pocket depths, bleeding, calculus and plaque scores, oral mucosal disease and temporomandibular joint dysfunction. Secondly, a dental training program was developed for medical doctors attached to the expedition. The authors determined that simple instruments and materials should be made available to the physicians who should be trained in their use. Finally, the authors developed a remote dental system, an intra-oral camera, to allow attending medical doctors at the Antarctic location to diagnose expedition members with the help of dentists situated elsewhere. Our oral health program of instruction and remote assessment may also help in other areas such as disaster medicine in times of natural disaster.

Key words: tele-dental system, oral health program, space environment, antarctic environment, oral health promotion

Introduction

Since 1998, the International Space Station (ISS) has been orbiting the Earth at a distance of 400 km, travelling at speeds of around 7.66 km/s. One orbit takes about 90 minutes. At present, there are six crew members working on the ISS. Currently, ISS is the only space environment.

One of the most profound differences between the terrestrial and space environments is the absence of gravity. The absence of gravity has a number of physiological implications. Astronauts need the proper amount of exercise in order to mitigate loss of muscle strength and bone density. Absence of gravity causes a redistribution of body fluids. On the ground, fluid is drawn to the feet by the effect of gravity. However, in space there is no up and there is no down. Water is redistributed so that there is swelling of the face.

In space, there is a decline in various physiological functions. There is an increase in fatigue, reduction in ability to perform tasks, loss of balance, loss of bone density, loss of muscle mass and strength and psychological effects. There is increased exposure to radiation due to the absence of the Earth's atmosphere's protective effect against galactic cosmic rays and solar radiation. Astronauts receive a dose of 1 milliSievert per day, which is equivalent to the dose received from background radiation on Earth over the course of six months.

In this paper, the possible dental and oral problems in

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Table 1 Dental incidents estimated by NASA

Condition	Incidence (in events per person-year)
Caries	0.39
Abscess (periodontal)	0.02
Exposed Pulp/ Pulpitis	0.02
Avulsion/ Tooth Loss	0.003
Crown Replacement	0.005
Filling Replacement	0.005

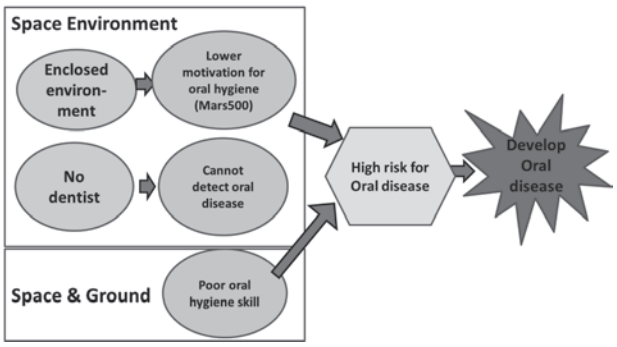

Fig. 1 Oral Disease Mechanisms in Space

the space environment and the current dental management of astronauts by NASA are described and the countermeasures will be discussed. Moreover, we report the dental problems and countermeasures in the Antarctic environment which is as enclosed and isolated as the space environment.

Dentistry in Space Environment

1. The dental incidences estimated by NASA

A Russian astronaut was reported to have suffered incapacitating dental pain during the last two weeks of his 96-day flight on Salut6 in 1978 [1]. A crown displacement in-flight occurred on the Space Station MIR from 1995 to 1998. Altogether, dental events comprised 1% of the medical events in spaceflight on the Space Station MIR 2. It was reported that an astronaut suffered from pulpitis 90 days before his launch and another at post-flight. Displacements of crown and tooth fractures were also reported [2].

In the Integrated Medical Model (IMM), a Monte Carlo simulation-based tool designed to quantify the probability of medical risks and potential consequences that astronauts could experience during spaceflight, the probabilities of the six dental problems in DRMs are estimated as follow: Caries 0.39, Abscess 0.02, Exposed pulp or Pulpitis 0.02, Avulsion (Tooth Loss) 0.003, Crown Replacement 0.005, and Filling Replacement 0.005 events per person-year [3, 4] (Table. 1). These 6 dental problems are listed also in the Space Medicine Exploration Medical Condition List (SMEMCL) [5].

2. Oral hygiene in space environment

Some of these issues can be related to poor oral hygiene (Fig. 1). In ISS, Water is very expensive to take and therefore a scarce resource. Water is not used to gargle after brushing. Excess toothpaste is expelled into a towel. Lee et al. has reported the increase of dental plaque and dental calculus, and aggravation of gingivitis in Skylab Oral Health Studies [6].

3. Effect of space food

Dietary changes also present an increased risk of oral disease. For example, it has been found that periodontitis-associated bacterial levels increase in the space environment [6]. This may be due to the fact that space food is soft and sticky. This is again due to the low water content of food but food cannot be powdery, as the absence of gravity means it would disperse inside the spacecraft, and thereby present risks such as trauma to the eyes of astronauts. Soft foods may contribute to the increased plaque levels in astronauts' mouths.

4. Oral symptom in Simulated Space Environment

In the simulated space environments (enclosed environment or head-down tilted (HDT) bed rest experiments which simulated body fluid shift change), some dental/ oral problems were reported.

In the "Mars-500" project, which tried to evaluate the influence of enclosed environment on human health and performance, oral mucous membranes were changed in some of the members during dynamic monitoring in the project. There is a report that some of the research participants did not keep the discipline for dental hygiene, due to the loss of motivation during the project [7].

Rai et al. have reported deterioration of periodontal status, decrease of salivary flow and aggravation of stress markers (Cortisol, CgA and amylase) in saliva, within HDT bed rest study for six weeks [8-10]. The results of these reports suggest that the deterioration of oral defensive functions occurs in the simulated space environments [11].

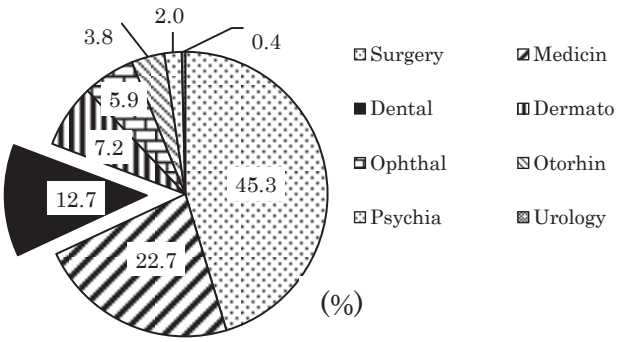

Fig. 2　Illnesses and injuries of the Japanese Antarctic Research Expedition (JARE) members

5. Countermeasure of oral health in space environment

In order to improve preventive and risk management capabilities with regards to oral disease, Tokyo Medical and Dental University (TMDU) formed a multidisciplinary Space Dentistry team. It is tasked with carrying out basic research, diagnosis and treatment and prevention and countermeasures for dental problems in space.

The team collaborates with JAXA to provide training on how to perform simple oral self-examination using a dental mirror. A training video has been developed. An intra-oral camera is provided so that any problems found in space can be downloaded to the control room and a dentist can diagnose and provide advice. On the ground, astronauts are also provided with oral health instruction on proper tooth brushing techniques and the use of toothpaste.

Dentistry in the Antarctic Environment

1. Dental problem in the Antarctic Environment

Concurrently, TMDU is collaborating with the Japanese Antarctic Research Expedition (JARE) to conduct research on the oral health management in the Antarctic environment. JARE sends out annual expeditions to the Antarctic, where expedition members will live at the Showa station for one year and research on biology, climate and other areas is conducted.

Illness and injuries experienced by expedition members between 1956 and 1999 were reported, and 4233 incidents were recorded [12] (Fig. 2).

Dental problems were the third most frequent, at 12%; first were surgical and orthopedic events and second were internal medical problems. Most common dental problem was crown dislocation, followed by dental caries, periodontitis, endodontic pathology and dental trauma.

Our hypothesis for the high occurrence of dental problems on these expeditions is insufficient oral health promotion along with the absence of a dentist in the Antarctic area.

2. Oral health promotion program for JARE

1）Dental Examination at time of hiring JARE members

Firstly, the oral examination procedures during recruitment were assessed. It was found that dental screening for recruiting JARE members recorded only teeth present and DMFT scores. However, as periodontitis and endodontic problems have been reported on these expeditions, a more detailed examination during screening at recruitment is necessary. We developed a more detailed examination protocol which checks DMFT scores, periodontal pocket depths, bleeding, calculus and plaque scores, oral mucosal disease and temporomandibular joint dysfunction. Orthopantomogram radiographs are taken and assessed. From these inspection results, a diagnosis is made and observations are noted. For example, if endodontic therapy is necessary, the new recruit will be advised to visit a dental clinic or the TMDU team to receive treatment.

2）A dental training program for the attending doctor

A dental training program was developed for medical doctors that join the expedition. There are usually one or two physicians present at the Showa station. However, we observed that the dental equipment taken to the stations was inappropriate for use by the expedition physicians. We determined that simple instruments and materials should be made available to the physicians who should be trained in their use. At TMDU we developed a training program with input from various teams including periodontal, preventive dentistry, cariology and oral surgery, to provide instruction for medical doctors. In addition, a 10-page manual has been produced that physicians can refer to in an acute dental situation.

3）Construction of remote dental system

Finally, we developed a remote dental system, the intra-oral camera (Dental Eye®), allowing attending physicians at the Antarctic location to examine members with the aid of dentists situated elsewhere. This technology has already been used in three situations: a debonded inlay, dental fracture and a periodontal draining sinus/fistula. The Dental Eye has also been used to perform routine examinations, record the gingival PMA index, tongue

coating etc., and to send this information to TMDU every three months. Our team can then provide relevant advice. Further tests to assess risk for oral disease include bacterial counts, perioscreen and more recently a salivary multi-test system which detects cariogenic bacteria, blood leukocytes and proteins and the oral presence of ammonia.

Conclusion

We hope the small steps we have taken in the development of remote dentistry will lead to giant leaps in oral and general health care provision in enclosed or isolated environments such as space and the Antarctic. Our oral health program of instruction and remote assessment may also help in other areas such as disaster medicine in times of natural disaster.

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Original Article

Challenges in Implementation of "Toddlers' Adoption Programme" − Dental Nurses Perspectives −

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Abstract : Background: "Toddlers' Adoption Programme" had been introduced to strengthen oral healthcare amongst children in the state of Pahang since 2009 to increase the percentage of "Caries-Free-Mouth". Aims: It is timely to evaluate the implementation of program and the challenges faced by dental nurses. Hence this study aimed to explore the challenges from the 3 batches of toddlers completed from the programme. Methods: In-depth-interviews were conducted among eight dental nurses who were involved in the programme and had experienced at least two toddlers dropout and experienced caries from the programme. Purposive sampling was used. Each interview session took about 25 to 30 minutes after written consent was obtained. The interviews were audio-taped, transcribed verbatim and analysed thematically. Results: Six challenges were identified that lead to shortfalls of the programme which were: (1) Loss of follow-up due to parents transferred, mothers undergoing confinement at hometown, loss of contact and spouse dependent. (2) Parental attitude included mother's role as multitasking, lack of parenting at home, lack of father's involvement, spouse dependent/single parent, misunderstanding about the effect of treatment and failure to follow post-operative advice. (3) Sugary diet due to flavoured milk, bottle feeding while sleeping, pampered child and child's accessibility to sweets. (4) Child's oral hygiene neglected at home. (5) Child's behaviour such as un-cooperative and fear. (6) Violation from standard operation procedure by dental nurses. Conclusions: Successful implementation of Toddlers' Adoption Programme requires mutual cooperation and commitment from parents/caregivers and dental nurses. The challenges highlighted provide information to stakeholder on further strengthen the programme through policy making.

Key words : toddlers, challenges, fluoride varnish, dental nurses

Introduction

The disease of Early Childhood Caries (ECC) is the presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces of any primary tooth in a child age six years old and below[1]. It is a significant public health problem in both developed and developing countries which continues to affect babies and preschool children worldwide[1, 2]. Although it is not life-threatening but it may contribute to suboptimal health and failure to thrive[3, 4]. National Oral Health Survey of Preschool Children in 1995 and 2005 showed only slight improvement in caries status among 5-year-olds over a 10-year period, with a decrease in caries prevalence from 87.1% (1995) to 76.2% (2005) and a decrease in mean *dft* score from 5.82 (1995) to 5.50 (2005)[5, 6]. In the state of Pahang, the caries prevalence was even higher at 85.1% and mean *dft* score was 6.0 (2005)[6]. In other words the percentage of Caries-Free-Mouth (CFM) status was only 14.9% and ranked 10th amongst the 14 states in Malaysia[6]. Recognizing the importance on prevention of dental caries to begin at an early age as possible, the Oral Health Division, Ministry of Health had introduced a guidelines 'Early Childhood Oral Healthcare: Never Too Early to Start' in the year 2008[7].

Following that, Pahang State Health Department had adopted, innovated and introduced a Standard Operating Procedure (SOP) called "Toddlers' Adoption Program" in the year 2009. A total of five toddlers attending Maternal and Child Health (MCH) Clinic aged 6 to 9 months in which their parents/caregivers or other sibling(s) with caries experience within the last 23 months were recruited for adoption by a dental nurse. The dental nurse

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act as an "Adoptive Mother" for a period of 4 years. "Adoptive mothers" were responsible to explain about the programme to the parents/caregivers to obtain consent, fixing appointment date during school holidays in June and December, Dental Record recorded in Child's Dental Health Card, encouraging the parents/caregivers to observe their child's oral health on diet and oral hygiene habit, always willing to help at any time required and to give the best service, shows full of warmth and affection towards the children and the adopted families. The dental nurse is also expected to be creative in her efforts to get full commitment from the parents/caregivers on their child's oral health care. Oral healthcare messages and anticipatory guidance were delivered to the parents/caregivers by giving oral health talk and 'Grouped Dental Exhibition'. Mouth examination and fluoride varnish (FV) application using 5% Sodium Fluoride [22,600 ppm] on the deciduous teeth were carried out by a method of "Knee-to-knee" position and "Lift the lips" technique during every visit. Frequency of administration depends on the child's caries risk, and recommended for every 6 month [8]. Toddlers so called "Adopted child", were recruited at their first visit in December and reviewed 6 monthly by scheduled appointments strictly given in the month of June and December which is during school holiday. Failure to attend two consecutive visits, the toddler was excluded from the programme and considered 'dropout'. Hence, it is crucial for the parents to come for follow-up without fail. Compliance refers to those "Adopted toddlers" who attended all their seven scheduled appointments from the age of one to four years old at every 6 months interval. Percentage of children with Caries-Free-Mouth (CFM) status upon graduation was the impact indicator monitored to analyze the success of the programme. Three batches of toddlers graduated from this programme that is in 2012 (batch of 2009-2012), 2013 (batch of 2010-2013) and 2014 (batch of 2011-2014). However, a downward trend was observed for compliance rate that is from 86.4% (2012), to (68.1%) (2014). In addition, percentage of CFM decreases from 82.3% (2012) to 68.1% (2013) and 63.8% (2014). Hence, the aims of the study were to explore the challenges on the implementation of "Toddlers' Adoption Program". Determination of the right explanation will expectantly give impact to increase percentage of CFM among toddlers. It is hope valuable recommendations could be outlines from the study findings.

Methodology

A qualitative study involving in-depth-interviews were conducted among eight dental nurses (coded as DN1 to DN8) who were involved in the program and had experienced at least two 'adopted toddlers' dropout and experienced carious lesions from the programme upon graduation. They must also be willingly agreed to willingly share experience and ready to be interviewed between 25 to 30 minutes after which written consent was obtained. For the purpose of confidentiality subject were given identification number for research. The consent and information sheet included information on the aim of the study, subject selection, voluntary participation, time, risk and benefit, confidentiality and contact person information.

The interviews were conducted in an office setting by a moderator to gain the insights. Four relevant questions were structured pre-determinedly and explored, (Q1) How many of your "adopted children" dropouts from those graduated in the year 2012 to 2014? (Q2) How many of your "adopted children" did not achieve Caries-Free-Mouth (CFM) status upon graduation? (Q3) In your opinion, why dropouts happened among your "adopted children"? (Q4) In your opinion, why your "adopted children" did not achieve Caries-Free-Mouth (CFM) status? The interviews were recorded and transcribed. Data were familiarized followed by the thematic analysis to identify the themes and sub-themes. Ethical approval for the study was obtained from the Medical Research and Ethics Committee (MREC), Ministry of Health, Malaysia.

Results

Table 1 showed the respondents' characteristics, whereby the mean years of service among the respondents was 10.5 years. A total of 33 and 42 'adopted toddlers' dropout and did not achieve CFM status respectively out of 120 children graduated in the year 2012, 2013 and 2014. Eight dental nurses who participated in this study demonstrated their ability of cooperation and passion during the interview. They were attached to eight dental clinics in the state of Pahang. All of them experienced challenges in maintaining their 'adopted toddlers' status of 'CFM'. There were six primary factors that pose challenges in implementing 'Toddlers' Adoption Programme' namely loss of follow-up, parental attitude, sugary diet, children's oral hygiene neglection, child's behaviour and violation from standard operation procedure.

Table 1 Socio-demographic of Respondents and Number of Adopted Toddlers with None Achievable 'Caries-Free-Mouth' Status

Dental Nurse's code	Years of service	Number of Dropout	Number of None 'CFM' [†] Toddlers	Total 'Adopted Toddlers'
DN1	7	7	4	15
DN1	7	7	4	15
DN2	14	5	6	15
DN3	7	1	10	15
DN4	9	5	3	15
DN5	5	4	3	15
DN6	15	4	4	15
DN7	11	5	6	15
DN8	16	2	6	15
TOTAL	10.5 [‡]	33	42	120

[†] CFM: Caries-free-mouth
[‡] Mean (years of service)

Loss of Follow-up

Overall failures to turn-up (dropout) among parents were due to them transferring to other state, mother went back to their hometown during confinement and loss of contact.

'… dropped out because the parents of adopted toddlers had transferred out of the state so we could not follow up their case' [DN1]

'… transferred out, as in, they (child) follow their parents who are teachers. It means they moved out, changed places, the rest could not be contacted. And I, I did not only give them the clinic's number, I also gave my handset number so it will be easy for them (parents) to contact me, but they (parents) did not. I called many times but could not get through.' [DN4]

'… When the mother gave birth, she came back to her hometown, it's like going back to the hometown (aaa) , it's like she was having her confinement in her hometown and could come for appointment although she is still interested in our program. '[DN2]

'… she changed her (mother) telephone number. We tried to contact her but the number was not listed anymore. Then, they (parents) are difficult to attend the appointment.' [DN1]

'Sometimes the husband was working. When we called she said "It's difficult to come to the appointment" for several times… The next time that we (dental nurse) followed up, she said she will come another time… However, she did not come at all' [DN1]

Parental Attitude

Some of the mothers could not pay full attention during the oral health talk because the condition was rather unpleasant having to take care of their other children at the same time.

'… During our talk session or we can say advise session with the parents, they will bring their other children too. So when we were giving the advice they did not really pay attention because while we were demonstrating on the child, the other children will disturb or what not, so the parents could not focus while we were giving the talk'. [DN2]

Nowadays, both parents working and some of them send their children to be taking care by the grandparents. Therefore, there is lack of time for parenting at home by parents.

'One more, some of them stayed with their grandparents… it's usual for the grandparents to take care their grandchildren, the mother was working, the father was working... stayed with the grandmother.' [DN3]

At the same time parents that are both husband and wife should consider sharing the role of parenting in taking care of the oral health of their child, without handing it merely to the wife. In other situation there were wives who were too dependent on their husband.

'If the mother alone brings the child, she is the only one who listens to the talk, the father does not, so how, I have three such patients, how is that'. [DN4]

'For the year 2010, the reason was (mmm…) the father was the caregiver, the mother is a health department staff nurse, she was furthering her studies, and the child, taking care by the father, completely did not get any oral care, the father did not supervise.' [DN5]

'Sometimes the father is not there, the father is furthering his studies" she is on her own'. [DN6]

There were parents who misunderstood about fluoride varnish (FV), whereby they thought that FV application alone was enough to prevent caries without the need to maintain oral hygiene.

'There are some parents' perception that when we have applied the fluoride it is okay if they do not brush their child's teeth… Some parents are too pampering to their children's whims… They assume that when we apply the fluoride onto their children's teeth, they will not decay, when in fact we have told them' [DN6]

Parents should follow the advice not to brush their

child's primary teeth or chew food for at least 4 hours after procedure. During this time only fluids and soft foods are allowed to safeguard FV absorption into the enamel surface effectively.

'although we have given the advice to them, after the fluoride varnish application they immediately let their children eat or drink milk…'[DN6]

'We saw that right after the fluoride application, although we have instructed them not to let the child eat anything such as milk or whatever, right after the application she will let go of her child and give the child the bottle' [DN6]

Sugary Diet

Parents are responsible and should act positively to ensure the oral health of their child. By giving flavoured milk e.g.; chocolate flavoured milk was unwise for dental health of their child.

"… maybe because they drink milk… some of my adopted children drink flavoured milk.. Honey… chocolate…" [DN3]

"… Another thing is, there was this child who bottle feeds while sleeping, the bottle is in his mouth, and if it is removed the child will throw tantrums. Replaced with a bottle filled with plain water, he refuses it" [DN4]

Although the parents had been briefed on the impact of sweetened diet, nevertheless they let their child exposed to sweets. Parents pampered their child with sweets to make them behave and stop crying.

'… I saw the one that like to eat sweets, then… maybe the 2009 liked to eat sweets, then the parents had the tendency to follow the child… ' [DN3]

'… maybe the child was the type that if we force them they would cry loudly and maybe the mother did not like to hear it or she lets them eat those type of sweets'. [DN3]

Environmental factors play an important role in ensuring that children are not exposed to sweetened foods sold at retail shops near to their residential homes.

'… Grocery shops are only near houses right… Like one of them, his mother is a seamstress/tailor of course the surrounding area is near shops' [DN3]

Children's Oral Hygiene Neglected

There were still parents who neglected their children's oral hygiene at home. They let the children perform brushing teeth alone and left unattended, especially among children with special need who depend entirely on the parents.

'Sometimes the parents let their children brush their teeth on their own, with no supervision at all. When we asked them, "Aaa… Maam… did aaa… Your child brushes his teeth or not? ", they answered, "He did, but I let him do it on his own'. [DN1]

'Aaa… It's not that she didn't brush; she said that her child did not want the mother to brush; he wants to hold the brush himself. The child was more than a year old, so, when the child brushed his own teeth, she lets him do it. So she did not brush her child's teeth. I did tell her 'you can't, you must brush his teeth'. [DN5]

'… his hands are a bit lame so it is quite difficult for him to brush, the parents must really (help)'. [DN3]

Child's Behaviour

Child and dental nurse's cooperation is crucial to make the "Toddlers' Adoption programmed" successful. If the child refuse to open their mouth it makes the procedures become difficult. Creativity should be practiced to ensure good rapport and trust between adopted child and the dental nurse which ultimately will allay fear and anxiety among the children.

'… It means when we (dental nurse) want to apply (FV) it he (child) cried and struggled, so when we (dental nurse) want to apply on the inside he did not want it anymore, we were only able to swipe it on the front part'.[DN3]

'… it's like they were scared from the very beginning. There were one or two who were like that. So it was difficult for us to control, especially if it was the child of a staff, how are we to force the staffs' children?'. [DN3]

'… A majority of them (children) will cry when it's time for the fluoride application. Just looking at us they will hug and not let go of their mother, they do not want'.[DN6]

'… When they come, even at the clinic's door the children will see me and (huaa..) they will start crying. This program is to foster relationship too right? Like, some which are ok, are ok,' [DN7]

Parents must develop positive attitude towards oral health even though their children are crying. Most of the parents stop tooth brushing their children's teeth when their children cried and let them do the brushing on their own. Parents should brush their children's teeth because these children are not able to brush properly as their hand coordination is still not developing well.

'… Then, those who have caries, sometimes even with their mothers they do not want to open their mouths, do not want to brush their teeth'. [DN4]

Violation from Standard Operating Procedure

Technologically appropriate method is essential during application of FV to make it effective. A method of 'knee-to-knee' position allows the child to see his/her mother's face and the child feels safe and contented as compared to lying on the dental chair. Consequently, it helps the dental nurse to apply the FV effectively.

During the interview, questions were asked related to FV application to the child and the common practice adopted by nurses is as illustrated below.

[Interviewer] *'When you have to make FV application to your adopted child, do you practice 'knee-to-knee' position or you park them on the dental chair?'*

Answered: *'on the dental chair'. [DN8]*

The answered showed that dental nurse violated from the standard operating procedure that she had to comply with.

Sometimes difficulties experienced during the procedure and had tried their best to ensure that children get the preventive treatment.

'… It means when we want to apply FV he cried and struggled, so when we want to apply further on the posterior teeth he did not want it anymore, we were only able to apply on the front part of the teeth…' [DN1]

There were occasion where dental nurses did not follow-up their 'adopted toddlers' closely. They let their other college to apply the FV during the follow-up interchangeably and therefore, there was no dedicated 'adopted toddler' for each dental nurse.

'….we (dental nurses) keep track our 'adopted toddlers' files ourselves but when a child came for follow-up, any dental nurse available at the clinic would attend the child regardless who it was belongs to …. [DN8]

Discussion

The study addressed some of the gaps in assessing the feasibility of implementing a preventive programme among toddlers as listed in Table 2. No doubt, parent is the agent or role model to their children. Positive attitudes towards oral healthcare may lead to the early establishment of good oral hygiene habits at home. Furthermore, knowledge without practice is worthless, especially on feeding practice, controlling on high sugary diet and child's oral hygiene care. Father must support the wife and care on their child's oral healthcare as well by participating in all the activities in the programme. Although it is understood mothers were of particular concern on her children's oral health[9], however both parents should be exposed to the knowledge on oral healthcare and not only among the mothers. When parents have positive attitude towards the oral healthcare of their child, their child's oral hygiene will be taken care of without miss. The child depends totally on the parent to maintain oral cleanliness. They should not let the child brush their own teeth unattended as they will miss to educate and demonstrating effective teeth brushing.

The parents should be made to understand well that the FV application alone will not guarantee their child to achieve CFM. Healthy feeding and diet plays an important role in maintaining the oral health of the child. Dental nurses agreed that flavored bottle-feeding practices such as honey, chocolate and vanilla caused early childhood caries. In even worse conditions, some parents pampered their children by giving sweetened food as an easy way out in persuading them to stop crying or tantrums. Children were also exposed to sugary foods when they could easily get it from shop nearby, especially when they were cared by their grandparents.

Appointments for follow-up 6 monthly and usually given during the school holidays only should be revised. There were mothers who were incapable to attend because they depended on their husband to bring them and not because they do not want to. As a mother they also have multiple roles at home such as daily chores. However, this can be overcome with coping mechanism such as considerable adjustments at the individual level and at the workplace which helps the mother to fulfill the dual responsibilities of career and motherhood[10]. Win-win approach should be encouraged to obtain a higher impact in the implementation of the programme. On the other hand, unavoidable situations such as moving out of state and telephone number not contactable were undoubtedly out of control. Organization should not depend merely on the mobile phone number since it may keep on changing. Sharing of fixed phone numbers such as home or office phone numbers, e-mail addresses between operators and both the mother and father as well as the caregivers would be a very good practice to guarantee no break in connection.

Child neglect is described as the willful failure of parents or other people in a position of trust to provide basic child-needed care[11]. Parental ignorance and low dental intelligence prevent them from meeting their child's dental care needs especially on the oral hygiene at home. The consequences of child dental neglect may extend to

Table 2 Themes which emerged from interviews with dental nurses in relation to the Challenges in Implementation of 'Toddlers' Adoption Program'

Domain	Challenges		Suggestion for improvement
	Themes	Sub-themes	
Parents / caregivers	Loss of follow-up	- Transferred - Confinement at home town - Loss of contact - Dependent on spouse	- Re-schedule appointment: 'Win-Win Approach'
	Parental attitude	- Mothers' role: Multitasking-not focus	- Conducive environment for parents during talks
		- Lack of time parenting at home: Grandparents raising grandchildren	- Advice on Quality time
		- Lack of fathers' involvement	- Fathers involvement
		- Spouse dependent/ Single parent	- Win-Win approach
		- Misunderstanding on Fluoride Varnish effect	- Ideal 'Dental Health Talks' Checklist
		- post-operation advice compliance	- put emphasis on the benefit
	Sugary Diet	- Flavoured milk - Bottle feeding while sleeping - Pampered the child with sweets - Child's accessible to sweeten food	- Main point in -Ideal 'Dental Health Talks' Checklist
	Child's oral hygiene neglected	- Let the child brushing alone, unattended	
Children	Child's behaviour	- Un-cooperated during procedure of FV application - Fear of dental nurse	- Training on child's behaviour management
Dental Nurses (Health Care Providers)	Violation from SOP	- didn't apply knee-to-knee position during procedure - incomplete FV application	- Refresher course - Strengthen on SOP compliant

† CFM: Caries-free-mouth
‡ Mean (years of service)

older ages and have major impacts on wellbeing. Parents are responsible to pursue health related necessities of their children. In this regard, the lack of parents or guardian's attention has destructive impact on the child's oral status. One responsibility of dental nurse is to provide a constructive educational and therapeutic relationship with the family. This dental neglect results in poorer oral health of children [12]. It is well documented that early initiation of teeth brushing of a child helps maintain good oral hygiene and secure primary dentition from cavity formation at an early age. Healthy baby teeth is an assurance that well-maintained primary dentition lead to safe and healthy permanent dentition. It is found difficult to train the young child but it is a duty of the caregivers to brush and facilitate as the child will gain the skills as they grows [13].

It is proven that baby bottle caries can cause ECC where the most prevalent habit was sweetened milk, honey, and juices [14]. Therefore, dietary and nutrition counseling on cariogenic food is crucial information to be delivered by dental nurse to the parents as suggested by other studies although it was done among the preschoolers [13,15]. The caregivers should be able to control the sweetened food and make it less accessible to the child as suggested by a study on ECC in Pakistan [13].

In order to gain a full child's cooperation during procedure, a dental nurse should be able to assess the child's developmental level, dental attitude and character and to anticipate the child's reaction to dental care. The response to oral healthcare is complex and influenced by multiple factors such as fears, painful experience and their cultural factors [16]. Therefore the dental nurse should be trained and to upgrade their knowledge and skills on the management of child behaviors and be able to interact with chil-

dren of different background and cultures. Other studies also suggested that improving verbal conversational skills, emphasizing certain strategies and improving linguistic abilities will contribute to better communication between child and the health care providers and to better cooperation and success in treatment [17].

Early identification of children at high risk of developing ECC can ensure these children to be managed accordingly [18]. Fluoride varnish added to caregiver counseling is efficient in reducing ECC incidence among young children [19]. Dental nurse must comply with the standard operating procedures issued by the supplier to ensure the product is effective in preventing caries. Knee-to-knee position is the best technique to be used. By perfectly following the procedure, FV application could prevent dental caries, FV on by contacting with enamel results in the formation of calcium fluoride on the tooth surface, providing a fluoride reservoir for protection against cariogenic acid attack. Moreover, instructions after the procedure must be notified to parents which is to avoid eating and vigorous teeth brushing within 4 hours after application of FV. Fluoride has three major effects on teeth that is, it inhibits demineralization, enhance remineralization and inhibits the plaque bacteria's metabolism, therefore decreasing acid production [20]. Each 'adopted toddler' should be assigned to a dedicated dental nurse for four years. The mutual relationship would be formed if the dental nurses sincerely cared for their 'adopted toddlers' over 4 years; otherwise it probably explained the mark shortfall of achievement of compliance and CFM between 2012 and 2013 / 2014.

It is very important to explore the role and challenges in terms of knowledge, attitude, belief and practice of parents in inculcating good dietary and oral hygiene habits to their children particularly on feeding habits and baby bottle caries. In addition, dietary control and feeding practice at the child care center should also be explored especially to those children cared by child minders during the working hours of the parents. It has been proven that and community engagement and collaboration with healthcare providers is beneficial in assuring the success of oral healthcare programme [21, 22]. Hopefully, full commitment of good oral healthcare by parents / caregivers and child minders can be determined and practiced to improve the oral health status or the young children.

Conclusion

The study had determined six challenges in implementing the "Toddlers' Adoption Program" such as parental attitude, loss of follow-up, un-cooperated child, violation from standard operation procedure, sugary diet and children's oral hygiene neglection. These challenges provide invaluable information in drawing up new strategies and charting the way forward in improving and obtaining better impact on the oral health status of young children.

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Original Article

Effects of Tooth Brushing, Mouth Washing and Tongue Cleaning on Three Volatile Sulfur Compounds – A Randomized Clinical Trial –

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Abstract : Objective: The purpose of this study was to assess the effects of tooth brushing, mouth washing and tongue cleaning on three volatile sulfur compound (VSC) concentrations. Methods: Thirty male volunteers were randomly assigned into group A and B. Both groups brushed their teeth for the first one week. During the next three weeks, group A used chlorine dioxide (ClO_2) mouthwash and group B performed tongue cleaning in addition to tooth brushing. Both groups practiced the combination of tooth brushing, mouth washing and tongue cleaning for the finial one week. Clinical oral health status was examined, and concentrations of three VSC gases (ng/10mL): hydrogen sulfide (H_2S), methyl mercaptan (CH_3SH) and dimethyl sulfide ($(CH_3)_2S$), were measured. Results: At the 1st week examination, three VSC gases were decreased compared with the baseline in both groups, but there were no significant differences. In group A, H_2S concentration was significantly decreased from 5.59 ± 4.38 at the baseline to 1.01 ± 0.83 at the 4th week and to 0.91 ± 0.84 at the 5th week examinations ($p < 0.05$). CH_3SH and $(CH_3)_2S$ did not show significant reductions from the baseline. A similar trend was observed in group B. H_2S concentration was significantly decreased at the 4th week and 5th week examinations compared with the baseline. CH_3SH was also significantly reduced from the baseline to the 4th week examination, but $(CH_3)_2S$ was not. Conclusion: Mouth washing or tongue cleaning decreased VSC levels, especially H_2S. Further, the combination of mouth washing and tongue cleaning brought the greatest reduction of VSCs.

Key words : hydrogen sulphide, methyl mercaptan, dimethyl sulphide, oral malodor, halitosis

Introduction

Oral malodor, also called halitosis, is a common problem in many countries. Oral malodor affects our daily life by causing emotional stress, embarrassment and social disharmony [1]. According to previous epidemiological studies on oral malodor, 30% to 50% of the study populations had oral malodor [2-5]. The putrefaction of protein from epithelial cells by anaerobic bacteria produces the volatile sulphur compounds (VSCs) that cause the odor. The three main gases of VSCs are hydrogen sulphide (H_2S), methyl mercaptan (CH_3SH) and dimethyl sulfide ($(CH_3)_2S$) [6-9]. These VSCs can be measured by using sulphide monitoring devices such as Halimeter®, Breathtron®, Oral Chroma® and gas chromatography as well as the organoleptic test [10].

Multiple factors influence oral malodor. The origins of oral malodor are oral-health related problems and systemic diseases. Among these causes, 80% to 90% originate from the oral cavity. The main causal factors are periodontal diseases, tongue coating, poor oral hygiene, xerostomia and dental caries. The remainder is from systemic diseases such as upper respiratory tract problems, digestive diseases, chronic liver diseases, renal failure and metabolic disorders [9, 11]. Many studies found a strong association between tongue coating and oral malodor level [12-15]. The tongue, especially its dorsal surface, is the area where microorganisms, desquamated epithelium cells and food debris easily accumulate because of its distinct anatomical structure.

People try to use a variety of medications and products to improve their oral breath. In some cases, people

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decrease the frequency of meals and increase the consumption of mints, gums, candy and even tobacco and betel quid. However, there are scientifically proved ways to manage oral malodor, for example, removal of dental plaque by tooth brushing, reduction of tongue coating by tongue cleaning, and decreasing of oral bacteria counts by mouth washing [15].

There are very few studies comparing the effects of tooth brushing, tongue cleaning and mouth washing on individual VSC gas concentrations. Therefore, this study aimed to assess the effect of tooth brushing, tongue cleaning and mouth washing as well as the combination of these methods on the reduction of three main VSC gases.

Material and Methods

1. Study design and procedure

This was a randomized clinical trial with a single blind, 5-week parallel study design. The study was carried out in Yangon, Myanmar from September to October in 2013. Originally, forty-eight male volunteers signed a consent form to participate in this study. After screening by using the inclusion criteria, eighteen subjects were excluded. The inclusion criteria employed were: no known systemic diseases, no current use of antibiotics, no severe dental caries, no periodontal pocket more than 3 mm in depth, no history of allergy to any kind of mouthwash and no habit of smoking or betel quid chewing. The final number of the study subjects was 30.

Subjects were randomly divided into two groups: group A (n=15) and B (n=15). For the first one week, both groups were instructed to brush their teeth with a scrubbing method using their own toothbrush. From the 2nd to 4th week, group A used 12 mL of chlorine dioxide (ClO_2) Fresh® mouthwash (Bio-Cide International, Inc., Oklahoma, USA and Pine Medical Co., Tokyo, Japan) for 30 seconds twice daily, and group B performed tongue cleaning twice daily with a small toothbrush, in addition to daily tooth brushing. Subjects were instructed to practice mouth washing or tongue cleaning after waking up in the morning and before going bed at night. For the final (5th) week, all subjects were requested to practice all three oral hygiene methods.

2. Oral malodor measurement

Oral malodor was evaluated between 2 pm and 5 pm. Subjects were requested to refrain from any kind of drinking and eating as well as oral hygiene practice at least 2 hours before the measurement. The three VSC gas concentrations were measured using an Oral Chroma® (FIS Inc., Hyogo, Japan). The air inside the subjects' oral cavity was collected with a 1 mL syringe after closing the mouth for 3 minutes. A 0.5 mL air sample was then injected into the machine. The concentrations of the three VSC gases were calculated in units of ng/10 mL. The threshold values for each gas concentration were: 1.5 ng/10 mL H_2S, 0.5 ng/10 mL CH_3SH and 0.2 ng/10 mL $(CH_3)_2S$ [16].

3. Clinical oral health status

At the baseline, dentition status such as numbers of present teeth, decayed teeth (DT), filled teeth (FT), and missing teeth (MT), excluding third molars, was determined. The amount of plaque was evaluated by using the debris index (DI) scores of the Oral Hygiene Index (OHI) [17]. Gingival bleeding on probing (BOP) was recorded if bleeding was detected after examination with a periodontal probe.

Tongue coating was evaluated by a modified Winkel tongue-coating index: 0 = no tongue coating, 1 = thin tongue coating (visible papillae), 2 = thick tongue coating (invisible papillae) [18]. The tongue surface was divided into nine areas and the tongue coating index was calculated by adding the scores of all nine areas, producing a range from 0 to 18.

For saliva characteristics, subjects were requested to spit all the saliva pooled in the oral cavity into a collecting paper cup for 5 minutes. The flow rate of saliva was calculated as mL per minute and the pH of the saliva was determined by using a bromothymol blue test paper.

Dentition status and saliva characteristics were examined only at the baseline, and the VSC gas concentrations, debris index, bleeding on probing and tongue coating were recorded at the baseline as well as every examination interval. All the examinations were performed by an investigator who was blinded to subjects' assigned group.

4. Ethical approval

The ethical committee for human research at Tokyo Medical and Dental University approved this clinical study (No.850) and the study protocol was also approved by University of Dental Medicine (Yangon) in Myanmar.

5. Data analysis

Statistical analysis was performed using the Statistical Package for Social Science (SPSS 16 SPSS Japan Inc., Tokyo, Japan). The independent sample t-test was used to determine significant differences of means between the

two groups. The one-way repeated-measure ANOVA test was used to detect significant mean differences between the baseline and examination intervals. The significance level was set at $p<0.05$.

Results

1. Baseline characteristics of subjects

Table 1 shows the baseline characteristics of the subjects in groups A and B. There were no significant differences in any variables, including age, clinical oral health status: numbers of present teeth, decayed teeth, missing teeth, filled teeth, the debris index, bleeding on probing, saliva flow rate and pH, tongue coating and the three VSC gas concentrations between the two groups.

2. Changes of clinical oral health status

Table 2 shows the changes of the mean debris index (DI), bleeding on probing (BOP) and tongue coating scores at the baseline and each examination interval. Compared to the baseline, there was a significant reduction of the DI score at every examination interval in both groups ($p<0.05$). Similarly, BOP was significantly decreased at each examination interval compared with the baseline ($p<0.05$). There were no significant differences in DI or BOP between groups A and B at any examination interval.

In comparison with the baseline, no significant decrease of tongue coating was observed at the 1st week examination in either group. Tongue coating scores were significantly decreased from baseline to the 4th and 5th week examinations in both groups ($p<0.05$). At the 4th week examination the tongue coating score in group B (0.92 ± 1.80) was significantly lower than that in group A (5.60 ± 4.41, $p<0.01$). At the 5th week examination, DI, BOP and tongue coating scores were at their lowest levels in both groups, and no significant differences were detected between the two groups.

3. Changes of the three volatile sulphur compounds gas concentrations

Figure 1 shows the changes of the three VSC gas concentrations. H_2S concentration was decreased from baseline to the 1st week examination in both groups, although the differences did not reach statistical significance. In group A, H_2S concentration was significantly decreased from 5.59 ± 4.38 at the baseline to 1.01 ± 0.83 at the 4th week and 0.91 ± 0.84 at the 5th week examinations ($p<0.05$). A similar trend was observed in group B;

Table 1 Baseline characteristics of the subjects

Variables	Group A Mean ± SD	Group B Mean ± SD	p value*
Age (year)	19.8 ± 2.90	21.1 ± 3.50	0.27
Present teeth	27.6 ± 0.51	27.9 ± 0.35	0.11
DT	0.13 ± 0.35	0	0.16
FT	0.07 ± 0.26	0	0.33
MT	0.40 ± 0.51	0.13 ± 0.35	0.11
DI	0.83 ± 0.20	0.89 ± 0.24	0.47
BOP	12.5 ± 7.62	12.1 ± 8.97	0.90
Tongue coating	12.4 ± 4.19	11.5 ± 5.21	0.59
Saliva flow rate (mL/min)	0.58 ± 0.19	0.48 ± 0.17	0.14
Saliva pH	7.00 ± 0.39	7.05 ± 0.40	0.75
Hydrogen sulphide (ng/10 mL)	5.59 ± 4.38	7.07 ± 5.80	0.44
Methyl mercaptan (ng/10 mL)	1.27 ± 1.24	1.63 ± 1.38	0.46
Dimethyl sulphide (ng/10 mL)	0.72 ± 0.62	0.53 ± 0.58	0.38

*p value for mean differences between group A and group B.

H_2S concentration was significantly decreased from 3.44 ± 2.61 at the baseline to 1.97 ± 1.34 at the 4th week ($p<0.05$) and 0.77 ± 0.81 at the 5th week examinations ($p<0.01$).

There were no significant differences in CH_3SH and $(CH_3)_2S$ concentrations between the baseline and examination intervals, except the 4th week examination in group B. In group A, CH_3SH changed from 1.27 ± 1.24 at the baseline to 0.52 ± 0.72 at the 1st week, 0.48 ± 0.39 at the 4th week and 0.93 ± 1.34 at the 5th week examinations. $(CH_3)_2S$ was changed from 0.72 ± 0.62 at the baseline to 0.22 ± 0.34 at the 1st week, 0.36 ± 0.35 at the 4th week and 0.42 ± 0.50 at the 5th week examinations. However, these changes did not differ significantly from the baseline values.

In group B, CH_3SH showed a significant reduction from the baseline (1.63 ± 1.38) to the 4th week examination (0.53 ± 0.38). No significant changes from baseline were observed at other examination intervals. On the other hand, $(CH_3)_2S$ showed no significant changes from the baseline (0.53 ± 0.58) to the 1st week (0.35 ± 0.31), 4th week (0.34 ± 0.33), or 5th week (0.35 ± 0.39) examination.

Table 2 Changes of mean values in debris index (DI), bleeding on probing (BOP) and tongue coating

Variables	Group	Baseline Mean ± SD	1st week Mean ± SD	4th week Mean ± SD	5th week Mean ± SD
DI	A	0.83 ± 0.20	0.18 ± 0.15	0.24 ± 0.20	0.15 ± 0.16
	B	0.89 ± 0.24	0.26 ± 0.17	0.27 ± 0.20	0.13 ± 0.12
	p value*	0.47	0.20	0.74	0.70
BOP	A	12.5 ± 7.62	2.07 ± 5.11	0.53 ± 1.60	0.80 ± 3.09
	B	12.1 ± 8.97	4.20 ± 4.92	0.89 ± 0.24	0.27 ± 0.70
	p value*	0.90	0.25	0.90	0.52
Tongue coating	A	12.4 ± 4.19	9.00 ± 2.95	5.60 ± 4.41	0.20 ± 0.56
	B	11.5 ± 5.21	11.9 ± 4.63	0.92 ± 1.80	0.27 ± 0.79
	p value*	0.59	0.05	**<0.01**	0.79

**p* value for mean differences between group A and group B. Bold letter means a significant difference between groups.

Discussion

This study examined the effect of chemical and mechanical procedures on changes in VSC gas concentrations for five weeks. All three VSC gases were reduced by applying these procedures. To minimize the influence of systemic diseases and menstrual cycle on VSCs, healthy young male adults were recruited in the study [19]. All the subjects lived in the same place for professional monk training where they had the same frequency and content of meals, therefore, the effect of different dietary patterns on the oral malodor was negligible. The VSC concentrations were measured using an Oral Chroma® that has been widely used in epidemiological studies because of its portability, reliability and ability to assess three VSC gas concentrations separately [16].

A scrubbing method was chosen for tooth brushing because it was easy and effective for subjects to remove dental plaque [20]. Although the kind of toothpaste used was not specified for tooth brushing, the subjects were instructed how to brush their teeth with a scrubbing method prior to the study so that they could perform tooth brushing uniformly.

Tongue cleaning is a mechanical method to remove debris on the tongue surface, and its effectiveness depends on how well and how skillfully the subject performs tongue cleaning [21]. A previous study showed that around 43% of Myanmar people practiced tongue cleaning [22]. A tongue brush is not popular in Myanmar but a toothbrush is available everywhere. Thus, tongue cleaning was performed using a small toothbrush in this study.

Mouthwashes have been widely used as an oral malodor remedy around the world [18, 23-25]. Although some mouthwashes are reported to give harmful side effects such as mucosa staining, irritation, and taste alteration in long-term use, ClO_2 has no such side effects [26]. Therefore, in this study a ClO_2 mouthwash was used to evaluate the chemical effect on VSCs.

The debris index, bleeding on probing and tongue coating scores at the baseline indicated that the oral hygiene of subjects was not good enough. After one week of tooth brushing, DI and BOP scores were significantly reduced. The tooth brushing effectively improved the oral hygiene condition and gingival health, but there was no significant improvement on tongue coating. This is compatible with the result that tooth brushing can reduce oral malodor to some extent but that each VSC gas concentration remains above the threshold level [27]. At the 4th and 5th week examinations after adding mouth washing or tongue cleaning to tooth brushing, low levels of tongue coating scores in addition to lower DI, BOP scores were achieved.

For the change of individual VSC gas concentrations, both mouth washing and tongue cleaning significantly reduced the H_2S level. H_2S mainly originates from oral debris, in particular from tongue coating [26, 28]. Mouthwash reduced H_2S by a bactericidal action and a chemical action of converting VSCs to non-volatile substances [29].

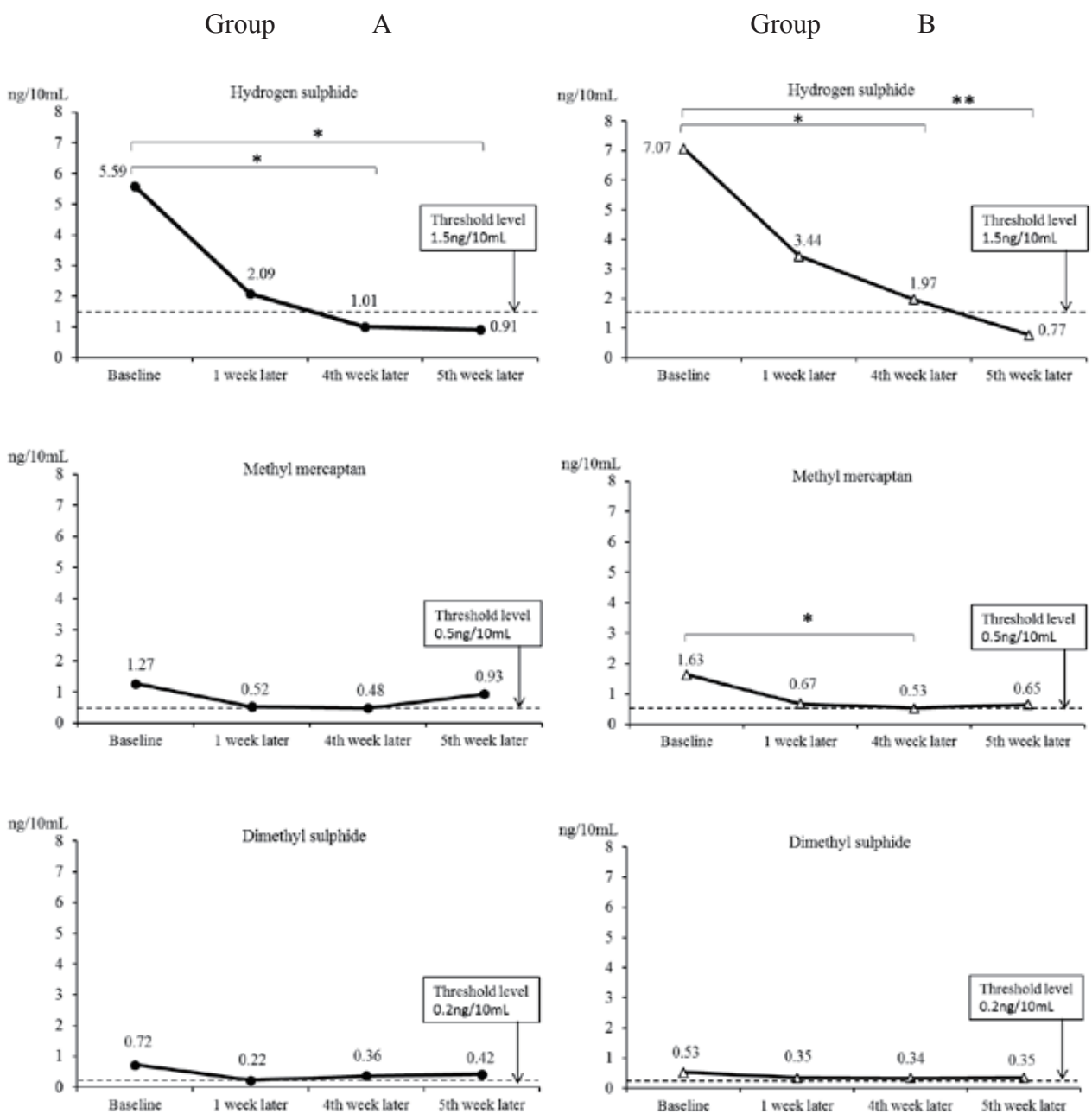

Fig. 1 Changes of mean H_2S, CH_3SH, $(CH_3)_2S$ gas concentrations in groups A and B
*p <0.05, **p <0.01

On the other hand, tongue cleaning mechanically reduces the total bacteria count on the tongue but it has no gas conversion mechanism like ClO_2 mouthwash has.

Further, it was reported that among the bacteria on the tongue surface, 75% are *Veillonella parvula, Actinomyces odontolyticus, Streptococcus intermedius* and *Clostridium innocuum*, and most of them produce H_2S [28]. Tongue cleaning reduces H_2S by removing these H_2S-producing bacteria. A previous study demonstrates that ClO_2 can reduce tongue coating by decreasing the total bacteria counts as well as specific bacteria in saliva and other oral debris like *Fusobacterium nucleatum* that can also produce H_2S [29].

At the baseline, CH_3SH and $(CH_3)_2S$ levels were not high compared with H_2S. CH_3SH and $(CH_3)_2S$ are associated with periodontal-disease-related bacteria and systemic conditions. A former study proved that periodontal pathogens were particularly responsible for CH_3SH

gas production, and the proportion of periodontal pathogens on tongue coatings was higher in subjects with periodontitis than those without [30]. Because current subjects were free from periodontitis, it seems plausible that little CH_3SH was produced. Systemic conditions often related with $(CH_3)_2S$ production are liver cirrhosis, metabolic disorders, anti-allergenic and suplatast tosilate drug use. Current subjects did not have such systemic diseases or take any medications, thereby $(CH_3)_2S$ was considered to be synthesized from methylation of methyl mercaptan.

Similar to H_2S, both CH_3SH and $(CH_3)_2S$ showed a decreasing pattern by mouth washing or tongue cleaning, but the changes were not prominent due to low concentrations at the baseline. At the final 5th week examination, CH_3SH in the mouth-washing group indicated a slightly increasing trend. Some bacteria, especially periodontal pathogens, might become resistant to ClO_2 mouthwash after 4 weeks of use, but a further research will be needed to confirm this hypothesis.

One of the limitations of this study was that the oral microorganisms were not investigated. An examination of the changes in oral bacteria could reveal more about the relationship of mouth washing and tongue cleaning with the three VSC gases. Another limitation was the length of the study. This was a 5-week study, therefore the long-term change of VSCs by continuous use of mouth washing and tongue cleaning remain unknown.

Nonetheless, there have been very limited studies that assessed the effect of tooth brushing, mouth washing and tongue cleaning on individual VSC gas concentrations. The current study gives useful information about how different methods affect individual VSC gas concentrations. Tongue cleaning and mouth washing mainly affect the H_2S concentration and they would be beneficial for the treatment of halitosis patients whose primary VSC gas is H_2S.

Conclusion

Both mouth washing, as a chemical method, and tongue cleaning, as a mechanical method, decreased VSCs, especially H_2S. Mouth washing and tongue cleaning had a similar effect on VSCs reduction. Further, the combination of mouth washing and tongue cleaning brought the best reduction of VSCs.

Competing Interests

The authors declare that there are no conflicts of interest in this study.

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Original Article

Integrating Tobacco Interventions into Oral Health Program – Pilot Implementation of the WHO Brief Tobacco Intervention Program in Japan –

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Abstract : Background: Oral health care providers are in the unique position of helping smokers to quit. We assessed the feasibility of a brief tobacco intervention program in dental settings. Method: We piloted integration of the World Health Organization (WHO) brief tobacco interventions into oral health programs. One-day training sessions were organized for two regional dental associations and one dental college hospital. Participants were asked to start interventions with each patient for 3 months in a standardized manner after the training. Smoking status of each patient was recorded during the last 7 days at the end of the intervention period. Result: After a 1-month recruitment period, 55 oral health professionals from 19 private clinics and 6 departments of the dental college hospital participated in the training. Training was effective with respect to perceived achievement of training objectives and confidence in intervention skills. Approximately 90% of dental clinics and 2 departments of the hospital began interventions with a total of 155 smokers. On average, 9.4 patients were registered per dental clinic, and each patient received interventions 4.4 times. Overall abstinence rate was 12.7%, which was approximately three to four times that of the population quit rates, though the rate and number of intervened smokers decreased in the following 2 months of the registration period. Conclusion: Piloting implementation of the WHO brief tobacco interventions into oral health programs in Japan was successful. An element of maintenance and implementation to an educational setting should be considered further for full integration.

Key words : brief tobacco intervention, dental setting, oral health, World Health Organization, tobacco control

Introduction

The smoking rate for men in Japan decreased rapidly from 30% to 20% after ratification of the World Health Organization (WHO) framework convention of tobacco control (FCTC), though a lessening of the decline has been apparent during the 2010–2016 period [1]. To achieve the national objective of a 12% smoking rate by 2022 [2], effective measures must be applied urgently. Treatment of tobacco dependence is an important measure in tobacco control. The guidelines for implementation of Article 14 of the WHO FCTC recommend integrating brief tobacco interventions into existing health care systems as one of the first steps [3]. Furthermore, oral diseases share common risk factors of noncommunicable diseases (NCDs), and can benefit from common responses to NCDs, such as quitting tobacco use [4]. Oral health care providers are in the important position to help tobacco users to quit. Oral healthcare providers have access to "healthy" smokers in the health care system, and they often have more time to spend with patients than many other clinicians, providing opportunities to advise smokers to quit [5]. Thus, global and national tobacco control efforts should involve oral health professionals to increase the capacity not only for tobacco control but also for prevention and control of NCDs, namely, the common

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risk factor approach [6].

The Cochrane review showed a significant effect of dental interventions to decrease tobacco use of a dental patient [7]. The combined odds ratio of interventions to cigarette smokers and users of smokeless tobacco was 1.71. Odds ratios for interventions were similar according to the type of tobacco use: 1.74 for cigarette smokers and 1.70 for users of smokeless tobacco. A feasibility study of intensive tobacco interventions consisting of 5 counseling sessions with an additional nicotine replacement regimen was conducted in Japan [8]. On an intent-to-treat basis, 3-, 6-, and 12-month continuous abstinence rates were significantly higher in the intervention group (51.5%, 39.4%, and 36.4%, respectively) than in the non-intervention group (13.0% throughout the observation period). The abstinence rates at 6 and 12 months were similar to those with physician intervention. Accordingly, dental interventions are effective in helping smokers to quit. Though the universal health insurance system covers treatment of nicotine dependence by a physician, Japanese dentists are not allowed to prescribe medicine for the purpose of treating nicotine dependence. Therefore, brief interventions would be a favorable measure in dental settings in Japan.

The WHO has developed technical resources/tools for integrating brief tobacco interventions into existing health care systems and also has identified a delivery model to integrate tobacco dependence treatment into a tuberculosis treatment program [9]. The successful integration of brief tobacco interventions in primary care [10] and in the tuberculosis treatment program [11] provides a basis for extending it to other health care programs, including oral health programs. Lack of training has been identified as the most significant barrier to implementing tobacco interventions into the dental setting [5]. Since the WHO resources/tools include a training program [9], the piloting implementation of the WHO program into the oral health care system is an important opportunity to evaluate the effectiveness of tobacco interventions in dental settings to build its role in global tobacco control and achieve a common risk factor approach to decrease major health burdens in Japan.

Materials and Methods

1. Schedule of piloting implementation

The WHO Tobacco Free Initiative has developed a guide for tobacco users to quit, a toolkit of brief tobacco interventions that requires only 3 to 5 minutes during daily practice in primary care, and a training program of the brief tobacco interventions for primary care providers [9]. Our task was to integrate the brief tobacco intervention into an oral health program based on the updated evidence. Previous arrangement was held on September 2015 followed by training sessions in November (Fig. 1). Following training, participants were asked to prepare interventions in their practice for approximately 1 month. The participants also were asked to start brief interventions at each clinic in January 2016, and to identify smoking status 3 months after the start of interventions. Approval of the piloting implementation was obtained from the Ethics Committee for Clinical Research of Fukuoka Dental College and Fukuoka College of Health Sciences (Approval No. 286).

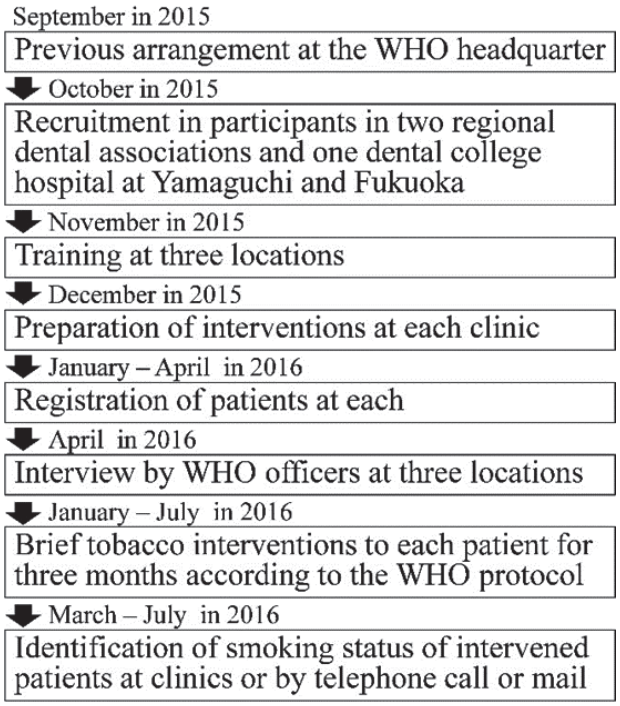

Fig. 1 Schedule of piloting implementation of the WHO tobacco intervention program into the oral health care system in Japan

2. Training

Figure 2 shows an algorithm for delivering brief tobacco interventions [9]. Each of the nine training modules was presented in a four-step format: preparation, presentation, practice, and evaluation. Modules 4 to 7 were included in the training for delivering brief interventions at each clinic after training. We developed a fact sheet using graphics based on updated evidence. Among

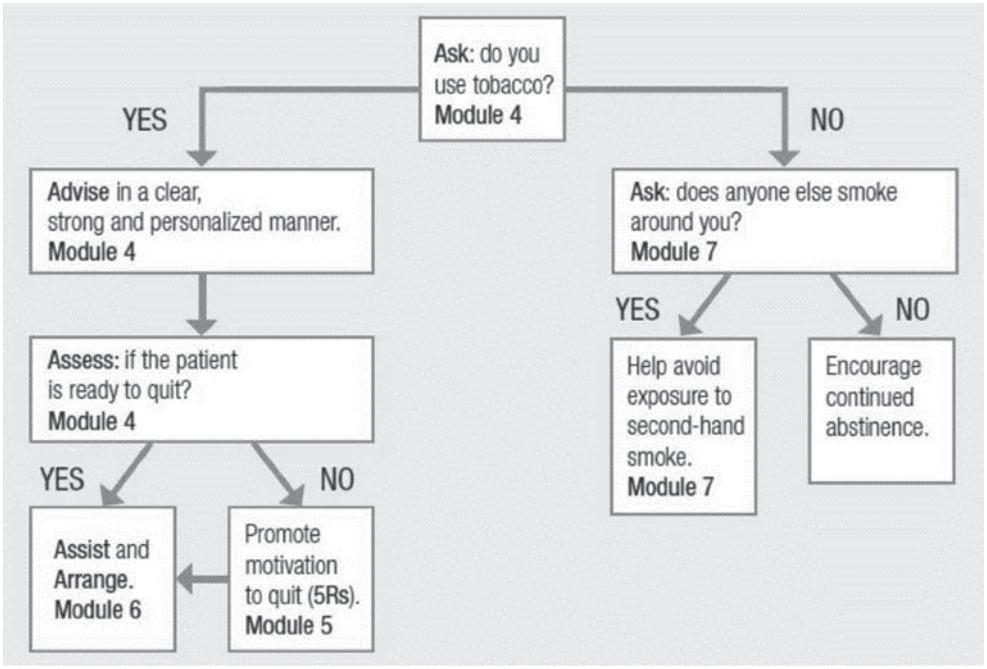

Fig. 2 Algorithm for delivering brief tobacco interventions in the WHO program

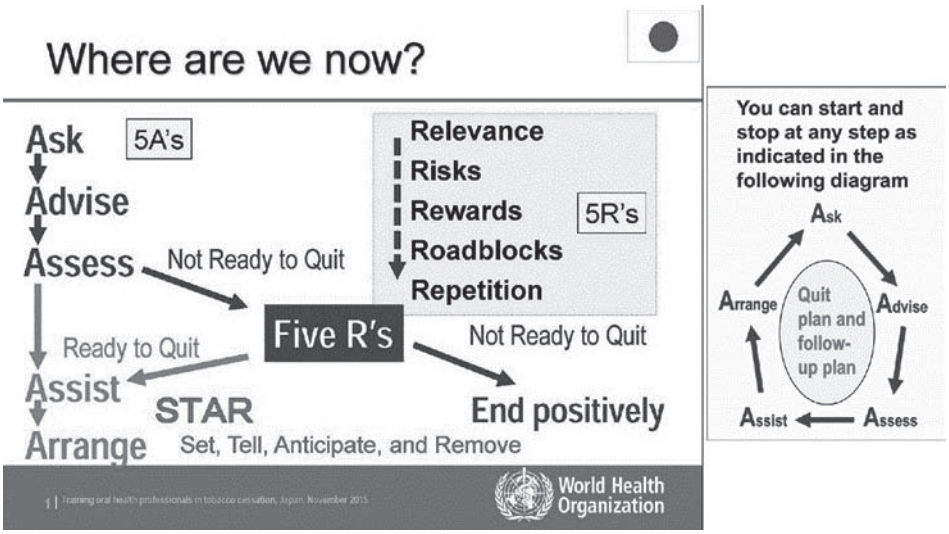

Fig. 3 Brief tobacco interventions delivered according to the 5A's and 5R's models

eight items, four items could be used for smokers and non-smokers to explain the danger of second-hand smoke (SHS) exposure. Each sheet, which explains the benefit of quitting or avoidance of SHS exposure, could be available during the brief tobacco interventions involving the 5A's and 5R's models (Fig. 3). Though the original training course for primary care providers requires 2.5 days, the training for oral health professionals in Japan ran for 1 day (Table 1). Role plays were implemented in three modules, and the pharmacotherapy module included practice to refer interventions by pharmacists and physicians. In the last part of training, participants watched a demonstration video of representative interventions according to the 5A's model, which ran for 3 minutes. Additional self-help materials for delivering brief interventions were provided to each participant.

Table 1 Example of agenda of the training course for oral health professionals in Japan

Time	Agenda Item
10:00–10:20	Welcome speeches
10:20–10:45	Tobacco use and oral health
10:45–11:10	Overview of brief tobacco intervention: purpose, population impact and delivery models
11:10–12:30 †	Asking, advising, and assessing readiness to quit
12:30–13:30	Lunch
13:30–15:00 †	Dealing with low motivation
15:00–15:15	Tea break
15:15–16:15 †	Assisting and arranging for follow-up
16:15–17:15 ‡	Introduction to pharmacotherapy
17:15–17:30	Closing session

Includes † role play and ‡ practice

3. Evaluation of training

Before and after training, participants were asked to choose one of five items on a Likert scale for each of nine questions about the perception of achievement of training objectives. The questions were designed to: (1) explain the role of primary care providers in tobacco control and tobacco dependence treatment; (2) describe prevalence and patterns of tobacco use in their country; (3) explain the health, social and economic consequence of tobacco use and benefits of quitting; (4) explain the biological, psycho-behavioural and social causes of tobacco dependence; (5) list existing effective tobacco dependence treatment methods; (6) describe and deliver brief interventions to assist tobacco users routinely in quitting according to the 5A's and 5R's models; (7) describe and deliver a brief intervention to help non-tobacco users avoid exposure to SHS according to a 5A's model; (8) apply tools to assess tobacco users' levels of nicotine dependence; and (9) list effective tobacco cessation medications and appropriately prescribe nicotine replacement therapy (NRT) products. The upper two items were combined as a positive perception of achievement.

Participants then were asked to mark the level of perceived competence on a straight line (0%–100% scale) regarding five counseling skills, such as: (1) ability to apply the knowledge of tobacco use and its harmful effects; (2) ability to use the 5A's brief intervention model to assist tobacco users who are willing to quit in making a quit attempt; (3) ability to use the 5R's brief intervention model to motivate tobacco users who are unwilling to quit to make a quit attempt; (4) ability to use the 5A's brief intervention model to help non-tobacco users avoid exposure to SHS; and (5) ability to advise on effective tobacco cessation medications and to appropriately explain NRT products.

4. Evaluation of intervention

Following a preparation period of approximately 1 month, participants were asked to register up to 15 patients per clinic and unit of the dental college hospital who agreed to participate in the interventions during the next 4-month period. Each patient underwent intervention according to the WHO protocol [9], and the interventions were recorded briefly at each occasion. Each clinic was asked to report the number of interventions every month. After the intervention period of 3 months for each patient, the patients were asked at dental clinic or by telephone call or mail whether they had smoked in the last 7 days. Finally, information on the number of interventions and smoking status of patients was gathered from each clinic and dentist in the college hospital.

5. Statistical analyses

In total, 55 oral health professionals participated in training sessions. Among 34 dentists, 23 were males. The 34 dentists included 21 of 38 total participants from 19 private clinics and 13 of 17 total participants from the dental college hospital. Questionnaires of three dental hygienists were incomplete, and those of 52 oral health professionals, 34 dentists and 18 dental hygienists were analyzed. Statistical analyses were performed to test the effectiveness of training on perceived achievement of training objectives and acquisition of ability to perform brief interventions. Differences in each item of the perceived achievement before and after training were tested on the basis of an individual Likert scale by the Wilcoxon signed rank test. The differences in each item of perceived competence were tested on the basis of a visual analogue scale by a paired t-test. Significant level was set at 5%.

Results

1. Training

Distribution of oral health professionals by age group and license category is shown in Table 2. Median ages for

Table 2 Distribution of participants of the training sessions who completed questionnaires before and after training

License category	Age Group (yrs)						Total
	20–29	30–39	40–49	50–59	60–	Unknown	
Dentist	4	10	6	12	1	1	34
Dental hygienist	5	8	4	1	0	0	18
Total	9	18	10	13	1	1	52

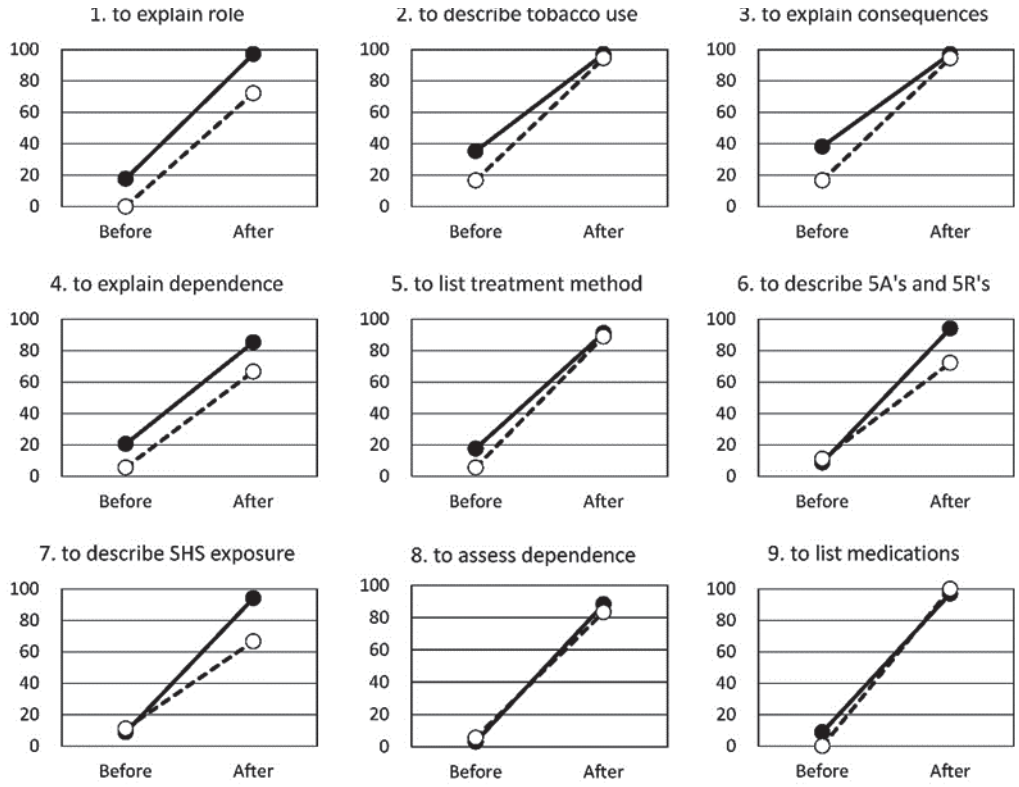

Fig. 4 Changes in percentage of dentists (closed circle) and dental hygienists (open circle) with positive responses to perceived achievement of nine items of training objectives after training

dentists and dental hygienists were 40 to 49 and 30 to 39 years, respectively, and modes were 50 to 59 and 30 to 39 years, respectively. Changes in the percentage of participants with positive responses to perceived achievement of nine training objectives is shown in Fig. 4. The difference in each item of the perceived achievement before and after training was statistically significant ($p<0.001$). Though small variations were observed between dentists and dental hygienists in seven questions (item numbers 1 to 7), the training was successful with respect to perceived achievement of training objectives. Changes in the average visual analogue scale score for the level of perceived competence of five counseling skills after training are shown in Fig. 5. The difference in each item was statistically significant ($p<0.001$). Furthermore, the level of confidence in achieving intervention increased by approximately three times after training, and variation between dentists and dental hygienists was small compared to perceived achievement.

2. Implementation of intervention

Approximately 90% (17 of 19) of dental clinics and 33%

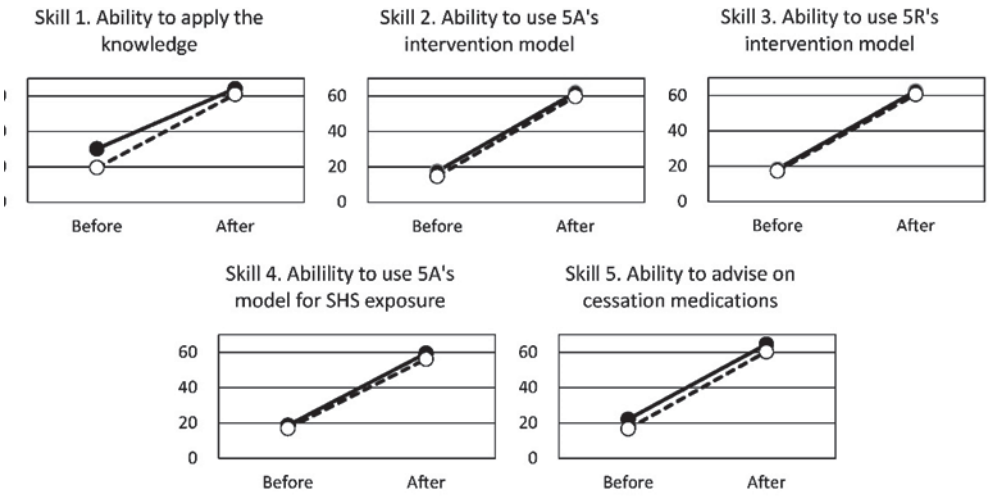

Fig. 5 Changes in the average visual analogue scale score of dentists (closed circle) and dental hygienists (open circle) for the level of perceived competence of five counseling skills after training

Table 3 Distribution of patients (quitters) in the dental clinics by age group and sex

Gender	Age Group (yrs)						Total
	20–29	30–39	40–49	50–59	60–70	70–	
Males	13 (2)	27 (4)	30 (2)	18 (3)	29 (3)	7	124 (14)
Females	3	10	13	14 (4)	3	3 (1)	46 (5)
Total	16 (2)	37 (4)	43 (2)	32 (7)	32 (3)	10 (1)	170 (19)

(2 of 6 departments) in the dental college hospital intervened in a total of 175 smokers who agreed to participate in the trial. Only three dentists in the periodontal and general dentistry departments intervened more than twice. In the interview to oral health professionals, important suggestions were obtained, including the necessity for a more standardized regimen, such as order of interventions, examples of teachable moments available for interventions such as waiting time after local anesthesia, and management of patient resistance, such as request of permission of the patient at the beginning of intervention.

3. Intervention

In dental clinics, 170 smokers aged 48.0 ± 14.0 years were registered for intervention (Table 3). The age was similar in males (48.2 ± 14.8 years) and females (47.4 ± 11.9 years). Among these patients, 150 (88%) underwent intervention more than twice. Three months after the intervention, 19 patients (14 males and 5 females, aged 47.8 ± 14.9 years) reported 7 days of continuous abstinence. Distributions of quitters by age groups were apparently different by sex. Male quitters (44.4 ± 15.1 years old) were seen in wide range of age groups, while female quitters (57.6 ± 10.1 years old) were limited to the older two age groups.

During the 4-month registration period, 9.4 patients underwent repeated interventions per clinic. Each smoker underwent interventions 4.4 times on average (Table 4). The abstinence rate was 12.7% and 11.2% among smokers who underwent interventions more than twice and once, respectively. There was no quitter among 20 smokers who underwent only a single intervention. During the first 2 months of registration period, the abstinence rate was 14.4% for 104 patients, while this rate decreased to 8.7% in 46 patients during the next 2 months of the registration period.

Discussion

The primary objective was to evaluate the effectiveness of the WHO brief tobacco intervention program in dental

Table 4 Abstinence rates of patients in the dental clinics by the period of registration

Period	Number of quitters	Interventions				Mean number of interventions
		More than twice		More than once		
		Number of patients	Abstinence rate (%)	Number of patients	Abstinence rate (%)	
January–February	15	104	14.4	121	12.4	4.5
March–April	4	46	8.7	49	8.2	4.1
Total	19	150	12.7	170	11.2	4.4

settings. However, a control group was not used for the project of piloting implementation of interventions. As a potential control of the abstinence ratio for this project, very limited information is available. An abstinence rate of 2.6%, which was validated by carbon monoxide in exhaled air, was reported in 230 subjects in the nonintervention group who attended total health check-ups during the 2011 to 2012 period [12]. In another study, a 3.1% 6-month continuous abstinence rate was reported in 1358 cohorts of smokers between 2005 and 2006 [13]. The 4.3% population quit rate was estimated for Japanese male smokers aged 40 to 74 years [14] would support estimation of an approximately 3% to 4% rate of smoking abstinence as the control for this project. The rate of quit attempts was 4.8% in the control group of 249 dental patients during a 6-month observational period [15]. However, this figure seemed to be overestimated because the abstinence rate would be lower than the rate of quit attempt, and patients in the nonintervention group may be motivated by frequent questioning on the stage of changing smoking behavior. Furthermore, 7.7% population quit rate was estimated in a scenario where 75% of smokers having an annual health checkup received brief intervention [14]. The abstinence rate of 12.7% in the present project could be comparable to the population quit rates in previous studies in Japan. Therefore, piloting implementation of the WHO brief intervention program was quite successful in dental clinics beyond the substantial problem of interventions in the college dental hospital. The major reason for the low participation rate at college hospitals was attributable to recent introduction of an electronic health record system, which could not easily identify patients who smoked by every visit. The periodontal department used specific periodontal record system that could be modified easily to identify smokers.

Total benefits of dental involvement with the brief tobacco interventions can be evaluated according to the RE-AIM framework, which is a standard method for determining translatability and public health impact of health promotion interventions [16]. The framework examines five dimensions: Reach into the target population; Effectiveness or efficacy; Adoption by target settings, institutions and staff; Implementation–consistency and cost of delivery of intervention; and Maintenance of intervention effects in individuals and settings over time. For the Reach element, the overall smoking prevalence among dental patients was similar to that reported by a national survey, and Japanese dentists may see one-third of male smokers [17]. The smoking rate of males was approximately three times that of females. In the present trial, male quitters were distributed in a wide range of age group. Therefore, dental interventions would be effective in the Reach element.

Effectiveness of interventions was already demonstrated in the study by a standardized method of evaluating effectiveness of intervention [7]. The increase in abstinence rate of approximately three to four times due to interventions of oral health professionals in dental clinics in the present trial may further support the excellent efficacy of the intervention program, because these professionals were trained during a shorter period than the standardized protocol for primary care providers (1 vs. 2.5 days). The perceived improvement in the training objectives and their skills of interventions would have really worked as demonstrated by the increased abstinence rate of dental patients. The excellent efficacy for abstinence rate may be further improved by exchanging information on their experience as suggested in the inter-

view during interventions. In the college hospital setting, the trial was beyond the findings in dental clinics. Since various barriers were identified in the clinical education of undergraduate students, further efforts may be necessary to continue to supply this important service in dental settings [18]. Introduction of an identification system of smokers in the electronic health record was a critical issue, which also was demonstrated in medical settings [19], and implementation of information on smoking in the electronic health record system is promising for effective interventions [20, 21].

There are several limitations to interpret results of this project. First, the project did not employ a control group due to the characteristics of health projects rather than research. Second, results of the trials in three locations cannot be generalized in Japan, because they are not a representative sample. Third, abstinence of smoking was not validated chemically. Finally, the excellent findings may be overestimated because the participants received notice that piloting implementation was requested by the WHO, and they may have made extraordinary efforts for the global project.

WHO and the International Olympic Committee signed an agreement to improve healthy lifestyles, including providing for Tobacco-Free Olympic Games [22]. The 2020 Olympic games in Tokyo must be held under a completely smoke-free environment. However, no smoke-free policy has been implemented in Tokyo as yet. The tobacco-free coalition in Japan recognizes the substantial problem of establishing smoke-free environment in the 2020 Olympic games in Tokyo. The Japanese Society of Oral Health, which declared establishment of a tobacco-free society in Japan in 2002 [23], joins the coalition. Public knowledge of the danger of exposure to SHS may be insufficient, and a policy of graphic warning labels on tobacco packages has not been implemented in Japan. Furthermore, evidence for health consequences of SHS exposure to the Japanese population has been established only recently. Since current evidence regarding the relationship between exposure to SHS and oral health are increasing, including roles of SHS exposure on pathogenicity of the oral microbiome, implementation of another module for non-smokers in the brief tobacco intervention program could be promising in the dental setting.

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Strategy for Oral Disease Prevention and Health Promotion —WHO Perspective—

Hiroshi OGAWA

World Health Organization

Prof. Hiroshi Ogawa delivered a keynote lecture on the ongoing work of the World Health Organization to improve oral health and general health. His presentation discussed the current status of global oral health surveillance and the issue of oral health as related to Non-Communicable Diseases and Common Risk Factors. He discussed the WHO's aim of achieving Universal Health Coverage and its Sustainable Development Goals for 2030. The lecture finished with some thoughts for the future of public health and oral health promotion.

Global Burden of Disease

The World Health Organization (WHO) carried out research five years ago on the concept of Global Burden of Diseases (GBDs). This research evaluated what the global situation and status of disease was. As part of this work, the WHO looked at untreated caries in deciduous and permanent teeth as well as severe periodontitis and tooth loss.

Between 1990-2010 it was found that the impact of caries and periodontal disease was increasing. This implies that globally, oral diseases are far from resolved and are in fact an increasing burden. The reason for this increase is due to the fact that the global population is living longer and the elderly population are experiencing more disease such as caries and periodontitis. Interestingly, the data shows a decline in severe tooth loss, though the teeth that are retained in the mouth have higher levels of caries and severe periodontal disease.

The burden of these diseases on populations varies by age group and sub region; in other words, inequality exists in disease status.

1. Lacking data for older age groups

This figure 1 shows global maps of periodontal status for two different age groups – 35-44 and 65-74.

This diagram demonstrates not only the global levels of periodontal disease, but also the fact that data is lacking for the older age group. For the older age group, 2012 data is available only for 32 countries out of 193 UN member states. Over the last 100 years, there has been a great focus on treating or preventing caries, but there is clearly a great need now to shift focus to periodontal disease. However, data to allow evidence based action is lacking – an important point for consideration for public health researchers.

2. Oral Health Surveys — Basic Methods 5th Edition

The WHO published the 5th edition of its publication *Oral Health Surveys – Basic Methods*, two years ago (Fig. 2). In this edition, the method of examination of periodontal status has changed. Dental professionals may be familiar with the Community Periodontal Index (CPI), which is focused on periodontal evaluation in the community setting and so is simple to use. However, amongst researchers and stakeholders, the CPI index has received some negative comment and feedback, specifically that it may actually be useless in recording the true periodontal status of individuals. Following up on this sentiment, the WHO decided to shift from the CPI method to one that records scores for all teeth, as opposed to sextants only. Further, the newer method records both pocket and bleeding statuses separately. Using the newer method, more complex information can be obtained. The 5th edition of this manual has been translated from English into various other languages, including Japanese.

Oral Health, Non-Communicable Diseases (NCDs) and Common Risk Factors

1. This figure 3 shows the distribution of ageing populations worldwide

The diagram shows that much of the world's population

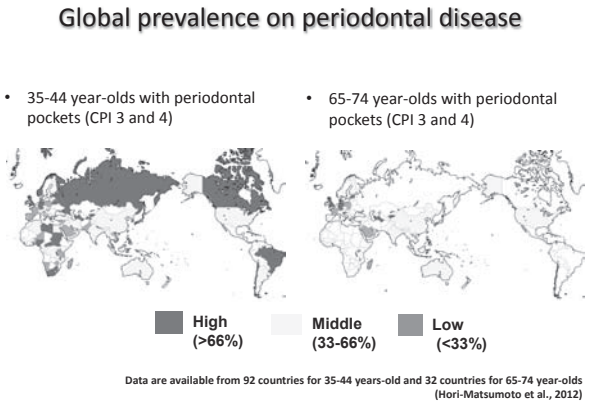

Fig 1. Global prevalence on periodontal disease

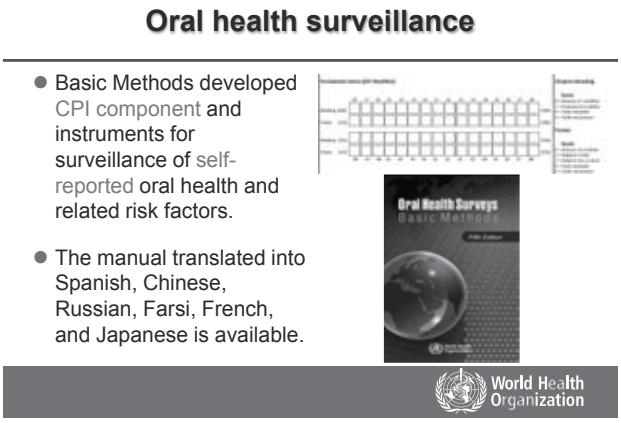

Fig 2. WHO Oral Health Survey Basic Method 5th edition

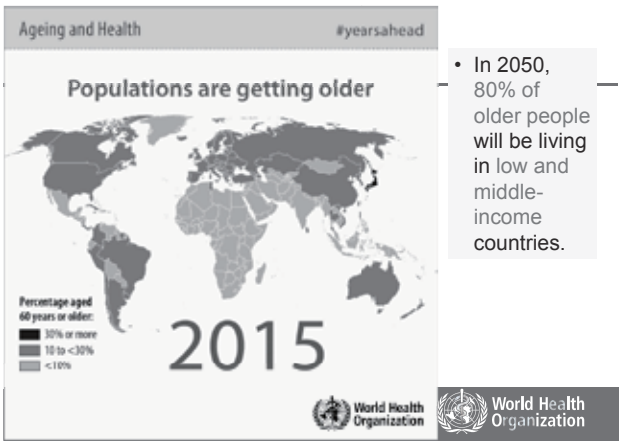

Fig 3. Global status of ageing population

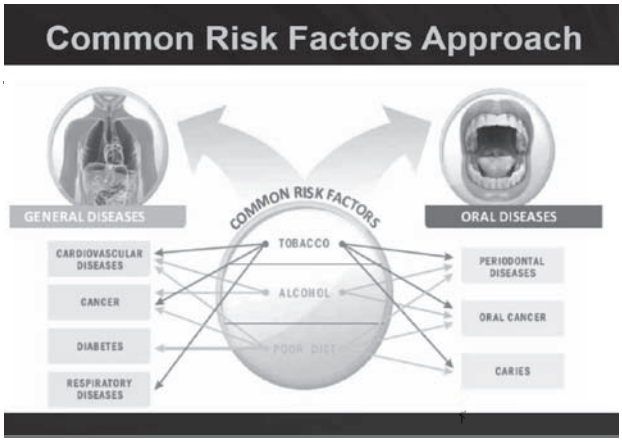

Fig 4. Common risk factors approach

is ageing, Japan particularly so. However, global trends are such that eventually the diagram above will show all nations worldwide in blue. Every country in the world will experience an aged population. In particular, 80% of the aged population will be in developing countries.

Information regarding the global burden of disease in middle-aged and elderly show that the causes of death in these aged groups are significantly more attributable to NCDs rather than infectious disease, maternal, perinatal and nutritional conditions or traumatic injuries. The number of people dying per year due to NCDs is now approximately 16 million. The greatest increase in deaths attributable to NCDs in recent years is in the South East Asia and Western Pacific regions.

2. Oral Diseases

In 2011 the UN made a political declaration in New York that NCDs should be expanded to include oral diseases and eye diseases, as they pose a significant global health burden and share common risk factors with other NCDs. To reduce the oral disease burden and disability effectively, the WHO Oral Health Program suggests that "population-directed prevention and health promotion be established in all countries."

This figure 4 shows the Common Risk Factor (CRF) approach as it applies to general diseases and oral diseases.

The WHO has suggested a list of targets for all nations to strive to achieve in order to reduce the global burden of disease. These targets are illustrated.

3. Tobacco

One of the best examples of a CRF is tobacco use. It has been found to be strongly linked to incidence of oral cancer, particular in Asian countries where it used in the betel quid. Tobacco is also strongly linked periodontal status, cardiovascular disease and diabetes, and so its use can be considered a CRF.

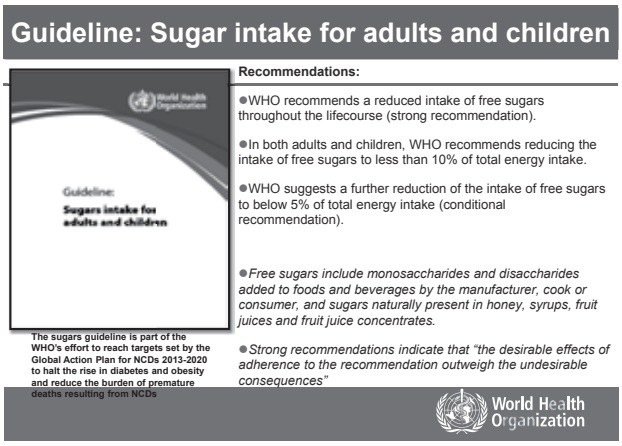

Fig 5. WHO guideline for sugars intake

Fig 6. Sustainable development goals

Fig 7. Good health and well-being in the SDF

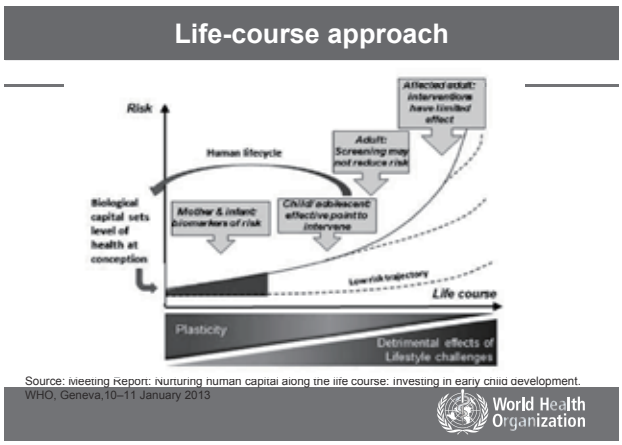

Fig 8. Concept of life-course approach

This year (2016) in Geneva, Margaret Chan, director-general of the WHO, made a clear statement that: "No country can hope to bring down the burden of NCDs in the absence of strong legislation of tobacco control." It is clear that tobacco control legislation is paramount. Currently the WHO is collaborating with Professor Takashi Hanioka in Japan to further the role of dentists and dental care professionals in providing brief tobacco cessation interventions. This work includes development of WHO policy recommendations and a toolkit which is set to be delivered within 2 years.

4. Sugar

Margaret Chan declared in 2014 that the WHO should use its authority to "alert to world to the need to reduce daily sugar consumption, based on evidence of the association with dental caries and obesity."

Research has found that at sugar intake levels of 10 kg per person per year (27.4 g per person per day), dental caries levels are low. At levels of 15 kg per person per year (40 g per person per day), dental caries experience increases. Sugar intake is also linked to high levels of obesity. A particularly concerning problem is childhood obesity. 42 million infants and young children are classed as obese and this figure is set to reach 70 million by 2025.

For these reasons, the WHO recommends a reduction of sugar intake to make up less than 10% of total energy intake, with a further conditional recommendation to reduce intake to less than 5% of total energy intake(Fig. 5). This figure shows the WHOs recommendations in order to end childhood obesity.

In January 2016, Mahidol University in Bangkok, Thailand hosted the Global Consultation on Public Health Intervention against Early Childhood Caries, in collaboration with the WHO. Points discussed at this meeting included the following:

- Global epidemiology of caries in the primary dentition

- Pattern and development of ECC within the mouth
- Overview of the etiology of ECC
- Infant feeding and diets of the young child
- Strategies for prevention, modifiable risk factors; socio-behavioral factors.

Following the consultation, the WHO is working to produce a toolkit to aid with the prevention and control of ECC.

Universal Health Coverage and Sustainable Development Goals

1. Universal Health Coverage (UHC)

The goal of UHC is to ensure that "all people obtain the health services they need without suffering financial hardship when paying for them" and that "everyone, everywhere, can access quality health services without being forced into poverty." The WHO's UHC agenda is not a new one. It dates back to the establishment of the WHO in 1948, when it declared that health is a fundamental human right. This was further reinforced in the 1978 Alma-Ata declaration, which mentioned "Health for All."

However, in order to achieve UHC, equality and equity is paramount. Countries must track progress not just across the national population but also within sub-groups of the population. The WHO states that several factors must be in place for UHC to be achieved:

1. A strong, efficient, well-run health system that meets priority health needs through people-centered, integrated care by:
   - informing and encouraging people to stay healthy and prevent illness;
   - detecting health conditions early;
   - having the capacity to treat disease; and
   - helping patients with rehabilitation.
2. Affordability – a system for financing health services so people do not suffer financial hardship when using them. This can be achieved in a variety of ways.
3. Access to essential medicines and technologies to diagnose and treat medical problems.
4. A sufficient capacity of well-trained, motivated health workers to provide the services to meet patients' needs based on the best available evidence.

2. Sustainable Development Goals (SDGs)

SDGs are 17 goals published by the United Nations that all member states have agreed to try to achieve by 2030 (Fig. 6). Among these, the third SDG pertains to good health and well-being (Fig. 7). This slide shows the 17 components that make up the SDGs.

The place of oral health within these SDGs needs to be considered as well as the role of the SDGs within oral health care.

Future Aspects

The ultimate goal in health care is to achieve improved quality of life. The life course approach is very much important (Fig. 8). Increasing longevity means that adjusting lifestyles as early as possible will have a greater impact for a longer period of time. For effective implementation regarding health promotion activities, the basic principles of the "3 S's" can be applied. These are:

- Sharing of information
- Selecting important issues
- Setting specific goals

For example, Japan has experienced extensive advancements in health care technology. As mentioned earlier, this is an important factor when aiming to achieve Universal Health Care, and so Japan should strive to share this information with other nations for the purpose of health promotion and improvement in quality of life.

Furthermore, multi-sectoral collaboration between different types of healthcare workers will further maximize the improvements that are achievable. Oral health is a part of general health, meaning the role of the dentist concerns not only oral health but also the maintenance of general health. Dentists must collaborate with several key professions such as physicians, nurses and nutritionists. Although the training courses of dental and medical schools differ drastically, systems must be put in place so that immediately upon graduation dentists and physicians are able to collaborate seamlessly.

The contributions that could be made by individual dental health professionals can be summarized as follows:

1. Set an example for a healthy lifestyle.
   - Quit tobacco, advocate for friends, family and colleagues to stop smoking
   - Reduce the harmful use of alcohol
   - Maintain a nutritious, well-balanced diet
   - Participate in physical fitness programs and exercise regularly
2. Become an advocate for reduction of risk factors, and screening and treatment for oral diseases in your community.
3. Be aware of the marketing of foods, alcohol and tobacco products and the impact such marketing can

have on your community.

4. Support health-promoting public spaces in your neighborhood such as parks and physical fitness.
5. Raise awareness about the NCD epidemic and share information to help others make healthy lifestyle decisions.

Regarding the last point, the population in general may still not be aware of the issue of NCDs. This means that health care professionals, including dentists have to provide more information. For this reason, counselling on NCD risk factors should be incorporated into dental curriculums, including undergraduate and postgraduate study.

A fundamental concept in health promotion is to "Think globally, act locally." This concept can, and should, be applied to oral health promotion activities as a simple, yet powerful guiding principle.

The International Journal of Oral Health 13: 46-48, 2017

Proceedings of 12th AAPD

Oral Health — A Focus on Prevention —

Tin Chun WONG

FDI World Dental Federation President 2013-2015

Dr. Tin Chun Wong delivered a keynote lecture at the Joint 12th AAPD and 65th JSOH conference. She opened with a discussion of the work of the World Dental Federation (FDI) and how it collaborates with the WHO. She spoke of the FDI's Vision 2020 strategy and the importance of World Oral Health Day. Dr. Wong emphasized the gravity of non-communicable diseases before moving on to the topic of inter-professional collaborative practice and inter-professional education. She talked briefly about the available evidence as related to quality of life, before ending with key messages. This article summarizes her keynote lecture and presentation.

Introduction

The theme of this 12th meeting of the AAPD and 65th meeting of the JSOH, "The Better Oral Health, The Happier Daily Life" captures the importance of prevention and the sentiment of specialists in preventive dentistry. Today, due to advances in science, improved living conditions and a variety of other factors, people are living longer. This is becoming a key subject of debate within governments, media and members of the general public. Longevity is one of humankind's greatest desires. We all try our best to live as long as we can. In health policy thinking this can be seen as a burden, due to the cost it imposes on society. Congresses such as this one can reverse such negative thinking by clearly demonstrating that investing in health, throughout the life course, can reduce the cost of health provision and enable our population, young or old, to live full, happy lives.

The FDI

The FDI is a non-governmental organization based in Geneva, Switzerland. It has 200 National Dental Associations (NDAs) and specialist group members. It is present in some 150 countries and is the official representative body for over one million dentists worldwide.

Its vision is "Leading the World to Optimal Oral Health". This substantial task is widening as the FDI expands its role into promotion of oral health linked to the promotion of general health.

What the FDI does

- Advises multilateral agencies on oral health policy.
- Carries out oral health advocacy at international level.
- Explores and debates emerging worldwide trends in oral health and dentistry.
- Supports NDAs and builds capacity.
- Undertakes oral health promotion and disease prevention through oral health literacy.
- Promotes and undertakes continuing education.

Over the years, the FDI has developed initiatives, campaigns, policies and congresses, with a view to occupying a space that no other charity group or not-for-profit-group can claim.

The FDI works in close collaboration in a bilateral relationship with the WHO in order to deliver policy related to oral and general health.

The World Health Organization

In December 2013 the WHO published a report entitled "Multi-sectoral action for a life course approach to healthy ageing." This document outlines the facts and expected trends pertaining to health and aging. The report details the challenges to health systems, to the work force, to social systems and to gender politics, and points out gaps in our knowledge and in general leadership. Also of concern are the changing disease patterns. For example, type 2 diabetes and obesity, which in the past, mainly afflicted the middle-aged or elderly population, is now seen in increasingly younger populations, and occasionally in very young children.

The WHO's report suggests that actions are needed to respond to these challenges and outlines recommendations for achieving these responses. These recommendations define the best steps that countries, at different levels of development, can take to build and integrate a continuum of care throughout the life course. They prof-

fer means of identifying evidence-based strategies to create such environments. The report recommends development of models and standards for monitoring and quantifying the health of populations, elaborate strategies for capacity building, workforce development to address the health needs of the populations and to identify sustainable financing models, to ensure access to services.

On the topic of Prevention for Health, Dr Margaret Chan, Director-General of the WHO, declared in 2012 that: "*The dental profession is a highly respected member of the public health family. After all, dentistry pioneered the concept of preventive medicine, turning it into an art as well as a science. A profession that makes prevention a driving incentive deserves our highest regard.*"

World Health Day

The WHO focuses on international advocacy as a prime means of ensuring that the centrality of health is understood and that the opportunities arising from it are fully appreciated. It highlights the annual World Health Day to get the message across, with each year having an associated theme. The theme for the year 2012 is particularly noteworthy: "Good Health adds Life to Years." This was emphasized with promotional posters which showed, for example: a lady of 70, salsa-dancing with her grandson in Cuba; a 92-year-old gentleman sky diving in Germany; a shepherdess at the age of 67, herding her goats and sheep in the mountains of the Andes in Peru; and in China, a gentleman ascending steps unaided, at over the age of 95. This type of promotional campaign is invaluable to deliver the core message and communicate the meaning of a healthier and happier life.

FDI Vision 2020

In response to the WHO, the FDI gathered a group of experts to establish a strategic plan for dentistry, resulting in Vision 2020. Vision 2020 highlights two fundamental principles for the profession: that oral health is a fundamental right for every member of the population; and that oral health must be included in all policies. The FDI endeavors to encourage governments to consider oral health in areas such as town planning, education, engineering and budget making.

Vision 2020 focuses on 5 key areas:

- Meeting the increasing need and demand for oral health care.
- Expanding the role of oral health care professionals.
- Shaping a responsive educational model.
- Mitigating the impacts of socio-economic dynamics.
- Fostering fundamental and translational research and technology.

World Oral Health Day

In order to carry its work further, the FDI has held a World Oral Health Day (WOHD) for a number of years. Recently these have been themed to increase the health-promotional impact. For example, in 2014 the theme focused around smiling, laughing and happiness. In 2015, the slogan was "Smile for Life." This year the slogan was "Healthy Mouth, Healthy Body."

Non-Communicable Diseases

It is becoming increasingly clear and accepted that groups of non-communicable diseases (NCDs) such cardiovascular diseases, cancer, diabetes, respiratory diseases and oral diseases share common risks such as tobacco use, an unhealthy diet, physical inactivity and immodest use of alcohol. Subsequent to the United Nations Political Declaration on the Prevention and Control of Non-Communicable Diseases (2011), the FDI acknowledges the common risk factor approach and has collaborated with other members of the World Health Professional Alliance (WHPA) to publish the Health Promotion Card, a tool for members of populations and health care professionals to address common risk factors for non-communicable diseases.

The FDI also supports the development a mobile application (app) by the WHPA for use on smartphones. Already in widespread use are apps that utilize, for example, the pedometer functionality of smartphones to measure physical exercise, or the microphone to assess how the user is sleeping. The FDI is keen to utilize this technology to help populations track general health from a common risk-factor approach, and thereby prevent NCDs.

Inter-professional Collaborative Practice & Inter-professional Education

The WHO's urgent announcement on type 2 diabetes made on 6 April 2016 exemplifies the need for inter-professional collaborative practice between dental professionals, physicians and other health care workers. The statement highlighted the fact that there has been a four-fold increase in type 2 diabetes worldwide in the last 25

years, with a total of 422 million people now affected.

The rise in prevalence of NCDs along with increasing complexity of health issues, a worldwide shortage of health workers and fragmented health systems call for an integrated approach to health care - Collaborative Practice. The FDI supports expanding dialogue on intra- and inter-professional collaborative practice and inter-professional education, facilitating the policy and advocacy work undertaken by National Dental Associations (NDAs) for the planning of the future oral health workforce and enhancing the ability of the dental profession to lead change, rather than have solutions imposed upon them. Dentists work with a number of other health care professionals and so are in a position to provide encouragement and incentives, and be leaders in a preventive program.

Evidence and Quality of Life

In September 2015, in Bangkok, the FDI presented a policy statement on oral health-related quality of life (OHRQoL), which was subsequently adopted by the general assembly. It emphasizes that:

"*Oral Health is related to general health and quality of life*"

"*Dental caries may cause impaired chewing, decreased appetite, sleep problems, and poor school and work performance*."

"*Measures such as the 'oral health-related quality of life' (OHRQoL), have been developed to measure the extent to which oral conditions affect individuals' behaviour and social functioning, and complement the conventional clinical assessments of oral health*."

The FDI recommends/recognizes that:

- OHRQoL should be incorporated into assessments of oral healthcare needs of populations for a comprehensive approach to planning oral health services.
- All national oral health surveys should include a validated OHRQoL measure.
- OHRQoL measures should be used to determine the cost-effectiveness of treatments and public health interventions.
- OHRQoL measures are essential in advocacy for oral health policy.
- NDAs play an important role in advocating for all these recommendations.

An invaluable resource with regard to this, and other areas in public health, has been produced by Dr. Kakuhiro Fukai and in the form of a compendium of the review of literature regarding oral health as related to general health for achieving healthy longevity in an ageing society by the Japan Dental Association.

Key Messages and Conclusion

In order to promote lifelong oral health as a part of general health and thereby promotion of quality of life, oral health literacy must be improved. Preventive, rather than restorative, approaches to oral health care should be adopted. Low cost procedures such as minimal intervention dentistry should be considered in order to increase access to dentistry. Oral health and other health professionals must pursue, develop and strengthen cross-discipline collaboration. Policymakers must develop innovative strategies to ensure a 'health-in-all-policies' and 'oral-health-in-all-policies' approach to policy making and to develop oral health plans, in the light of population ageing.

The next FDI world dental congress will be held in September 2016 in Poland. There is a call to respond to the WHO's strategies, and the work to achieve improved oral health, general health and healthy aging will continue.

The Dental Health and Treatment System in Japan

Junko TAKATA

Ministry of Health, Labour and Welfare, Japan

Dr. Junko Takata spoke at the 12th AAPD and 65th JSOH joint conference on the topic of the Japanese dental health system. Her presentation included a discussion of the dental education system and career paths within dentistry. She also talked about recent changes in Japan's dental health system and problems that will need to be addressed in the future. Her talk is summarized here.

Dental Education, Licenses and Careers

In Japan, there are three national licenses for dental treatment and care; namely for dentists, dental hygienists and dental technicians.

Dentists

The dentist is responsible for dental and oral treatment. The number of dentists is about 104,000. The proportion of female dentists is about 20%. However, in the younger generation, female dentists make up 40-50%. The pass rate of the national exam is about 70%; about 2000 every year. There are 11 national universities, one prefectural school and 17 private schools. Many private schools are not universities, but colleges.

After graduating from high school, there is an entrance exam for dental schools. After six years of study at dental school, dental students must take the national examination. Since 2006, all newly graduated dentists have to complete clinical training after getting their dental license. After clinical training, some dentists go back to university to do postgraduate courses and some work in dental clinics. After perhaps 10 years, around the age of 35-40, dentists may open their own dental clinic. The latter is the career path of the majority of dentists in Japan.

In the dental clinic, the average total number of staff, including the director, is 4.6. The average number of dentists in one clinic is 1.4, with full time dentists averaging at 1.2, and part time averaging at 0.2. So, unless a family member is an owner of a dental clinic, it's difficult to find a post as a part time dentist. There is a growing problem of job applicants outnumbering job vacancies for dentists.

The proportion of dentists working in hospital is 2.9%. Those working at universities are 9.7%. In total, hospital and university workers make up around 13%. The remainder of the dentist workforce works in clinics, with around 60% as employers and the rest as employees. In comparison, around 65% of medical doctors work in hospital and around 35% working in clinics.

Dental Hygienists

Hygienists also need a national license, and work as co-dental staff. The curriculum is 3 years long, but Tokyo Medical and Dental University (TMDU) provides a high-level curriculum of 4 years. The rate of passing national exam is around 95%; around 6500 every year.

The workplace of almost all dental hygienist is in dental clinics. A few work in hospitals. Other types of work include city officer or nursing home positions.

Dental Technicians

Dental technicians are also co-dental staff, working to create crowns, bridges and dentures, after receiving two years of education and taking a national exam. Their work is as follows:

1. The dentist makes the diagnoses, cuts teeth and takes an impression.
2. The dental technician is sent a prescription to make the prosthesis.
3. The technician makes the prosthesis.
4. The prosthesis is delivered to the dental clinic.
5. The dentist checks the prosthesis and fits it.

Changes in the Dental Health Care System

Dental treatment in the 1980s was focused on dental caries, as this was a serious issue. Patients visited dental clinics when in pain. Now, fewer people attend dental clinics only for toothache and more go for routine assessments of their oral health. For children, dmft scores have

shown a steady decline in recent decades.

Furthermore, we are now in an aged society. Many elderly people have medical illnesses, and so dental clinics often cooperate with medical hospitals. It is expected that by 2025, one third of Japan's population will be elderly. At present, there are not enough beds in hospitals and not enough care staff. It is therefore important to direct more funding, manpower and services to care of the elderly. Dental health care provision will undergo a shift in the types of treatment provided. There will be proportionately less cutting of carious teeth and reconstructing the tooth structure using inlays, composite resin, and prosthetics, and more rehabilitation of functions such as chewing and swallowing. A recent study group on the elderly placed emphasis on the term "oral frailty," which can be defined as a decline in such functions.

Dental Checks in Japanese Society and Throughout Life

In Japan, dental examinations at the ages of 18 months and 3 years are compulsory. Children must be taken by their parents or guardians to attend these as part of general medical checks. As these checks are compulsory, almost all children receive them – perhaps 98%. Those that do not attend for checks at ages 18 months and 3 years are visited by city officers to ascertain the reason for not attending. The reason may be, for example, that the child is seriously ill and in hospital. However, in cases where neglect is suspected, child safe-guarding protocols are enacted and the child will be put into contact with social services.

It is compulsory for schools to provide dental checks for all children once a year. These checks also have the dual purpose of checking for dental disease and detecting problems within the family, and connecting the child to social services when necessary.

The government supports periodontal health checks at the ages of 40, 50, 60, and 70 years old. Last year, the guidelines for periodontal assessment were updated in accordance with the WHO Community Periodontal Index guidelines.

In the workplace, workers handling acidic vapors or dusts have to undergo dental checks compulsorily. However, desk workers do not. The ministry of health supports provision of compulsory checks for desk workers, but as of now there is little evidence on this matter. We support research from Professor Yoko Kawaguchi, to gather evidence regarding this.

Dental checks for over 75 year-olds were introduced 2 years ago, focusing on dental function. They provide an opportunity to gather evidence on effective assessment methods, not only of oral health but also general health.

In the recent history of oral health in Japan, there were two big turning points. Firstly, the launch of the 8020 campaign, which started in 1989. It has the aim of keeping 20 teeth until the age of 80. This campaign is very important as we shift the focus in oral health care provision from treatment to prevention. The number of people who have 20 teeth at 80 years of age is increasing. In 2011 the number of 8020 people is about 40%.

Secondly, in 2011 the Dental and Oral Health Promotion Law was approved. Under this law, it is specified that there is a "Duty of People," with regards to oral health promotion. What does this mean? The law says that the people themselves should "acquire the correct knowledge of oral health and work to prevent oral disease in daily life, throughout their lives. People should seek dental checkups and health guidance." This is an important and interesting entry in the law, as it acknowledges that, for example, even people who visit a dentist once a year have 364 more days in the year when they should take oral health into consideration.

How Many? How Much?

Convenience stores can be seen everywhere around TMDU, Tokyo and Japan. There are 6 in the immediate vicinity of TMDU. In Japan there are about 54,000 convenience stores. However, it may be surprising to hear that there are about 68,000 dental practices in Japan. Dental services are therefore certainly easy to access.

Many things can be bought at a convenience store. Bottled tea or water is approximately USD 1.5. Onigiri (rice ball) is around USD 1. Toothpaste is about USD 2.5 and a toothbrush around USD 2. A train ride costs about USD 1.5. However, a taxi ride costs around USD 7. A taxi from Narita airport to TMDU costs around USD 200. This is because in Japan, manpower is very expensive, whereas automated manufacture of goods is not so expensive. For example, a one-hour massage costs around USD 60. A haircut is around USD 40.

How about a full denture? The fee for a full denture is fixed, whether it is provided by a professor or general dental practitioner in a dental clinic. The diagnosis stage is about USD 10, impression USD 20. A full upper and lower denture costs about USD 600 in total. However, the

insurer pays 70% of this cost, so the cost to the patient is usually only around USD 180.

Going Forward

The national survey in Japan asks participants if they have attended a dental clinic for oral health checks. About 50% of participants' answer to this is "yes." However, this means that around 50% of participants answer "no." Even though people can easily access dental clinics, and payment is heavily subsidized, there is still a low attendance rate of people to oral health care services. A challenge going forward is spreading knowledge of oral health and improving the oral health literacy of all people.

Further Information

The Survey of Dental Diseases (2011)

http://www.mhlw.go.jp/toukei/list/dl/62-17c23-1.pdf
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Proceedings of 12th AAPD

Oral Health for Achieving Healthy Longevity in an Aging Society —Evidence and Policy—

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Dr. Kakuhiro Fukai gave a lecture about the current evidence in order to guide researchers and policymakers in achieving healthy longevity in an aging society. He spoke about recent advances and achievements in this field as well as challenges to be faced in the future. His presentation is summarized here.

Introduction

Japan has a rapidly-changing population structure and a super-aging society. Over the past three decades, many other countries worldwide have also started to experience this phenomenon. The pace of population aging is much faster than in the past.

For these reasons, all countries are challenged with the task of ensuring that their health and social systems are ready to make the most of this demographic shift. Many efforts to deal with global aging have been initiated in various fields of academic research as well as community settings.

Global aging is a celebrated accomplishment that satisfies humanity's historical desire for longevity. However, it is a well-known fact that aging causes an increase in multimorbidities and mental decline, which presents a financial burden on governments that provide health care to their citizens. In order to maintain a universal health coverage system, people must be provided with more effective and efficient health care. Furthermore, if we want to live lives that are not only long but also dignified and happy, we need to create a society where elderly people feel that they belong and are valued.

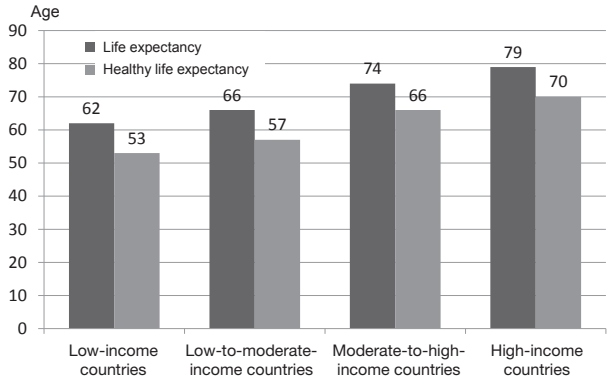
World Health Congress 2015

In March 2015, the Japan Dental Association hosted the World Congress 2015 in Tokyo. The congress was co-sponsored by the WHO, and the "Tokyo Declaration on Dental Care and Oral Health for Healthy Longevity" was drafted. Figure 1 shows the program for the event.

The Tokyo Declaration established the following six goals:

1. A concerted effort to accumulate scientific evidence of the contribution of dental care and oral health to longer healthy life expectancy and to formulate health policies based on such evidences.
2. Further investigation to verify the actual state of national dental health care policies and regional health activities supported by such evidences, and share results and related information among the various countries around the world.
3. Recognition that maintenance of oral and dental health throughout life is a fundamental factor for improving QOL, helping protect from NCDs and contributing towards preventing the further aggravation of such diseases. It can also contribute to longer healthy life expectancy.
4. Community dental care providers and institutions to

Fig. 1 Program for World Congress 2015



Source: WHO World Health Statistics 2014

Fig. 2 Life Expectancy and Healthy Life Expectancy by Economic Status

play a fundamental role in ensuring that in a super aging society, appropriate dental care is provided at all stages of life and that co-efforts to put oral health into practice are made at the national level.

5. Understanding that health policy should focus on how to recognize risks common to both oral diseases and NCDs into a common risk factor approach, prevent oral diseases and tooth loss, and maintain and revitalize oral function by the life course approach.
6. Appreciation that, in order to contribute to preventing NCDs and a decline in oral function in old age, dental and other health professionals create an environment that enables and encourages multi-professional collaborative practice.

Evidence and Strategies for Achieving Healthy Aging and Oral Health

Since 2000, a dramatic increase in global life expectancy, around 5 years, has been achieved. The aging of society is a phenomenon that should be celebrated. However, it brings many challenges. There has been a global population explosion over the past few decades. On the other hand, the global population expansion is predicted to slow down and stop from around 2050 to 2100. The WHO has reported the following key facts pertaining to aging and health:

- Between 2015 and 2050 the proportion of the world's population over 60 will nearly double from 12% to 22%.
- By 2020, people over 60 will outnumber children under the age of 5.
- In 2050, 80% of older people will be living in low- and middle-income countries.
- The pace of population aging is much faster than in the past.
- All countries face major challenges to ensure that their health and social systems are ready to make the most of this demographic shift.

The WHO has also found that there is an age gap between life expectancy and healthy life expectancy. The chart in Fig. 2 shows that this gap is around 9 years and exists regardless of a country's economic status.

Non-communicable diseases (NCDs) are known to influence life expectancy and healthy life expectancy, and are also known to be a major reason that people become dependent on others. For these reasons, NCD prevention must be prioritized. In 2013 the WHO published a global action plan to be achieved by 2020 for the prevention and control of NCDs. The global action plan consists of the 9 targets shown in Fig. 3.

Evidence for Achieving Healthy Aging and Oral Health

Since last year, the publication "The current evidence of dental care and oral health for achieving healthy longevity in an aging society 2015" has been available from the JDA and WHO websites. It is a systematic review and summary of evidence from one thousand research articles which survived a careful vetting process. The publication proposes a conceptual pathway from dental care and oral health to healthy life expectancy (Fig. 4) and offers evidence summaries regarding how oral health contributes to healthy life expectancy. For example, a great deal of research has indicated a relationship between number of teeth and life expectancy, and between oral hygiene and NCDs. Furthermore, this evidence summary is a useful resource when making policy decisions, especially when financial resources are limited.

Since the publication of the abovementioned document, new evidence has continued to accumulate, including the following findings:

- Missing teeth predict the incidence of cardiovascular events, diabetes, and death.
- Periodontal disease and tooth loss have been shown to be associated with coronary heart disease.
- A relationship between frequency of tooth scaling and reduced incidence of cardiovascular events has been reported.
- A link between obesity and tooth loss has been established.

Fig. 3 WHO Global Action Plan for Prevention and Control of NCDs

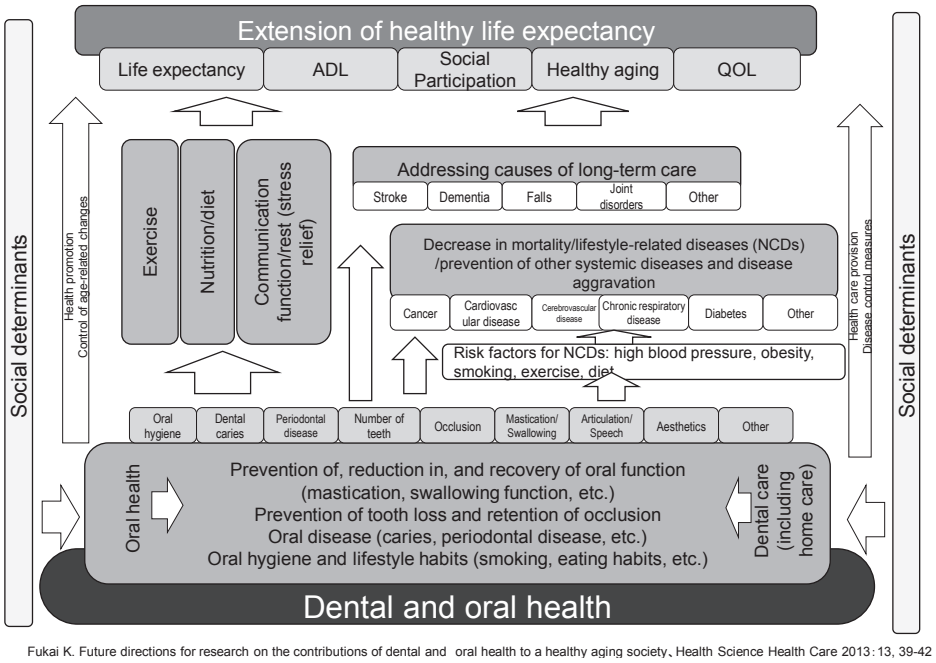


Fig. 4 Dental care/oral health and healthy life expectancy: Conceptual pathways

- Recent studies have indicated that eating quickly contributes to weight gain.
- Further support for the association between smoking and tooth loss has accumulated.
- A systematic review and meta-analysis has confirmed that tooth loss increases the risk of diminished cognitive function.

Evidence is accumulating quickly and continuously, but these studies and findings must not be left to fade away in isolation. Evidence must be collated and shared in order to adopt a more upstream approach and ensure that evidence is translated into policy change.

Japanese Health Policy Through 2025

The 8020 campaign, a community- and clinic-based initiative started in 1989, has contributed to a dramatic improvement in oral health in Japan. This was followed by an accumulation of evidence, which culminated in oral health being integrated into health policy in the form of the Dental and Oral Health Promotion Law 2011, for the purpose of oral disease prevention and general health improvement.

Table 1　Health Japan 21, First Phase - Oral Health Targets

Indicators			Target	Baseline data	Interim assessment data	Final assessment data	Results
Dental caries (preschool children)		Percentage of 3-year children who are dental caries free	80%	59.5% (1998)	68.7% (2003)	77.1% (2009)	improved
preventive factor	Fluoride application	Percentage of 3-year children who get topical fluoride application	50%	39.6% (1993)	37.8% (2004)	64.6% (2009)	achieved
	Sweets intake	Percentage of 1.5 year children who consume sweets 3 times or more per day	15%	29.9% (1991)	22.6% (2004)	19.5% (2009)	
Dental caries (school children)		DMFT at age 12	1	2.9 (1999)	1.9 (2004)	1.3 (2010)	improved
preventive factor	Fluoride use	Percentage of school children who use fluoride toothpaste	90%	45.6% (1991)	56.5 (2004)	86.3% (2009)	improved
	Oral hygiene behavior	Percentage of school children who get health instruction for tooth cleaning	30%	12.8% (1993)	16.5% (2004)	20% (2009)	improved
Periodontal disease (adults)		Percentage of persons who contract severe periodontitis (CPI code 3 or 4)	22% (ages 40)	32.0% (1998)	23.8% (2004)	18.3% (2009)	achieved
			33% (ages 50)	46.9%(1998)	36.8% (2004)	27.6% (2009)	achieved
preventive factor	Oral hygiene behavior	Percentage of adults who use interdental brush	50% (ages 40)	19.3% (1993)	39% (2004)	44.6% (2009)	improved
			50% (ages 50)	17.8% (1993)	40.8% (2004)	45.7% (2009)	improved
	Smoking cessation	Percentage of persons who know the harmful effect of smoking on general health	100%	27.3% (1998)	35.9% (2003)	40.4% (2008)	improved
		Percentage of local administrations that provide smoking cessation programs	100%	27.8% (2001)	32.2% (2003)	38.9% (2008)	improved
Tooth loss prevention		Percentage of persons who have more than 20 teeth at age 80	20% (ages 80)	11.5% (1993)	23% (2004)	26.8% (2009)	achieved
		Percentage of persons who have more than 24 teeth at age 60	50% (ages 60)	44.1% (1993)	54.3% (2004)	56.2% (2009)	achieved
preventive factor	Professional teeth cleaning	Percentage of persons who receive regular professional tooth cleaning and calculus removal each year	30% (ages 60)	15.9% (1992)	43.2% (2004)	43% (2009)	achieved
	Regular dental check-up	Percentage of persons who receive regular dental checkup each year	30% (ages 60)	16.4% (1993)	35.7% (2004)	36.8% (2009)	achieved

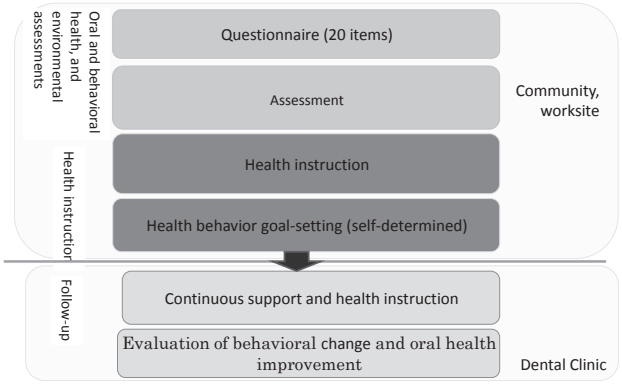


Fig. 6　A New Oral Care Plan for Adults – The Adult Oral Health Assessment and Instruction Program of the JDA (2009)

In order to continue this improvement, achieve a sustainable social security system, and fix our national health policy, two essential steps are needed:

a. Prevention and control of NCDs (such as the checkup and health instruction system started in 2008 for prevention of metabolic syndrome among people aged 40–79).

b. Establishment of community-based integrated health care systems by 2025 (effective and high-quality medical care, long-term care, and preventive care provided for all).

Japan has implemented a strategy called “Health Japan 21”, a two-stage plan (2000–2012, and 2013–2022) to improve health which began in 2000 and includes oral health components. The first phase was from 2000–2012 and included oral health targets pertaining to oral disease levels and oral health behavior. The table in Table 1 lists the oral health targets in the first phase of Health Japan 21.

These targets have all been either achieved or greatly improved. Compared to other areas in the Health Japan 21 strategy, for example physical exercise, nutrition, or alcohol consumption, oral health has achieved dramatic improvements.

The second phase also has very clear targets:

1. Prolonging healthy life expectancy and reducing

1. Do you have any concerns about your teeth or mouth?
2. If you answered "Yes" to Question 1, what type of concern do you have? (Circle all that apply.)
   1)difficulty chewing 2)poor appearance of teeth/mouth
   3) speech problems 4)bad breath
   5)tooth/oral pain 6)other (details: _____)
3. Can you bite with your back teeth (either natural teeth or dentures)?
4. Do your gums bleed when you brush your teeth?
5. Do you have swollen gums?
6. Do your teeth hurt when you consume cold or hot things?
7. Do have a dentist (or dental clinic) that you consider to be your personal or family dentist?
8. Are there times when you are too busy to go to the dentist?
9. Are you currently undergoing treatment for any of the following diseases or medical conditions?
10. Are the people close to you (including family) concerned about daily oral health and oral care?
11. Do you feel confident about your teeth, or do people sometimes compliment your teeth?
12. Do you usually brush your teeth at work or when you are out?
13. Do you consume sweets or sweet drinks between meals?
14. Do you smoke?
15. Do you brush your teeth before bed?
16. Do you use fluoride toothpaste?
17. Do you use floss or an interdental brush?
18. Do you chew your food slowly and carefully when you eat?
19. Have you ever received tooth brushing instruction at a dental clinic or elsewhere?
20. Do you visit a dental clinic for a regular checkup at least once a year?

Fig. 7 Oral Health Assessment Questionnaire of the JDA's Adult Oral Health and Instruction Program

health disparities.

2. Making an all-out effort to prevent people from contracting lifestyle-related diseases and to prevent such diseases from progressing; preventing non-communicable diseases (NCDs such as cancer, cardiovascular diseases, diabetes, and COPD).

3. Maintaining and improving functions required for social life.

4. Establishing social environments that support and protect health.

5. Improving lifestyles and social environments related to nutrition, eating habits, physical activity and exercise, rest, drinking, smoking, and dental and oral health.

Going forward, there are a number of current and planned nationally-funded programs that involve the provision of dental care and oral health services as a part of NCD policy:

• Health Japan 21 (Phase II) includes dental and oral health as basic components of initiatives to promote national health policy (2013–).

• Cooperation between medical and dental fields for cancer treatment (2013 −).

• In the dementia health policy called the New Orange Plan (2015–2025), community-based dental care plays a role in early diagnosis and prevention of dementia (2015–).

• The national policy for the prevention and control of diabetic nephropathy (an NCD) includes an oral health program designed to control periodontal disease and improve eating behavior (2016–).

• An oral health component will be added to the system of prevention and control of metabolic syndrome (2018–; currently being discussed in government advisory boards).

Dental Workforce Resources and Access to Clinics

In Japan, thanks to universal health coverage established in 1961, people can easily visit dental clinics and receive most dental care under their health insurance. The 8020 Promotion Foundation carried out research in 2015 to establish the reason for participants' most recent dental visit. This report shows that around 63% of patients visited a dentist due to pain. Around 25% visited for a routine checkup, and the remaining 10% visited for a routine checkup but also had a problem. The survey showed that though around 35% of patients attended for preventive purposes, while 65% still only attend in response to problems. The dental workforce should

change its practices so that it can be utilized to a greater capacity to prevent of oral disease. This should include a risk-based framework that allows risk-appropriate recall intervals to be suggested to patients.

The Adult Oral Health Assessment and Instruction Program of the Japan Dental Association started in July, 2009. It is a risk-based framework, as seen in Fig. 6. This program aimed to find and reduce risk factors for prevention and control of oral disease as well as contribute to NCD prevention and control through the common risk factor approach targeting both oral health and NCDs. In addition, this program can be implemented various healthcare fields, facilitating collaboration between and among health professionals. This is a very useful and effective approach for tackling the disease burden under the financial limitations of a sustainable social security system.

The questionnaire stage, Fig. 7, assesses common risk factors for NCDs .

Summary and Conclusion

Reducing the global burden of oral disease and disability should be one of the goals of an effective health program in an aging society. Furthermore, doing so simultaneously contributes to the prevention and control of NCDs.

Oral health policies should involve integration of oral health into national and community health programs, and oral health should be promoted as an essential, effective, and efficient part of policies designed to promote socioeconomic development. Common risk factors of oral diseases and NCDs should be specifically targeted.

Evidence that shows how dental care provisions yield systemic health improvements, and that clarifies the medico-economic effects of dental and oral health policies, should be accumulated and analyzed.

In order to continue achieving improvements to oral health and thereby healthy longevity, researchers, policymakers, and clinicians should collaborate to make preventive, upstream changes that are based on reviews of the available evidence.

As we face the rapid aging of our population, which is proceeding at a rate never before experienced by humankind, many efforts to deal with this problem have been initiated in various fields of academic research as well as in medical, health, welfare, and community settings. In order to realize a society where elderly people can live life in peace and with dignity, it is essential to develop health and medical care systems that provide appropriate healthcare services at the national and community level.

Developing oral health policies that are based on the integration of oral health into national health policy and community health programs, and promoting oral health as an essential, effective, and efficient part of policies designed to promote socioeconomic development is needed.

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The Deciduous Tooth Is the Parent of the Permanent Tooth

Mizuho NISHINO

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Professor Nishino gave a lecture on the concept that the deciduous dentition can be considered the parent of the permanent dentition. She described how the primary teeth can have profound influence on the secondary teeth, and thereby on people's lives. She discussed the importance of oral health education combined with the use of silver diamine fluoride in the primary dentition as a key strategy for achieving a caries-free society. Her talk is summarized here.

Introduction

The permanent tooth germ, from the central incisor to the second premolar, grows from the deciduous tooth germ, from the deciduous central incisor to the deciduous second molar. Therefore, we can say that the deciduous tooth is the parent of the permanent tooth.

A Caries-Free Society

People wish to keep their natural dentition throughout their lives, which now generally extend into their eighties. In the 1960s, Japan suffered from a flood of deciduous tooth caries. After tackling prevention and arrest of caries, there is, of course, no longer a flood of caries. However, Japan is not yet caries-free, even though nowadays the world is striving to achieve a caries-free society.

Primarily, we should achieve freedom from caries among 3-year-olds. The key factors to achieve this are:

- Frequency of feeding and how to use a nursing bottle
- Sugar control between meals
- Oral prophylaxis by the patient and caregiver, especially by the mother
- Topical fluoride application
- Caries prevention and treatment in the child's family
- Arrestment of early childhood caries

Dental caries is an infectious disease. Infection of cariogenic bacteria from mother to child has been proven in the past. Permanent tooth caries is strongly related to caries of deciduous dentition. If a permanent tooth erupts into a mouth with caries present, it can develop caries more easily. This is because the permanent tooth has not yet completed the post-eruptive maturation, namely not yet full calcification, but is erupting into an environment with an infectious disease, namely caries, present.

Health Education

Health education is important at the stage of infancy to secure lifelong fundamental oral health behavior. The behavior at the infant stage is carried over throughout life. Education should take place not only during clinical practice but also in the community. This includes at schools, health centers and community centers, amongst other places. Oral health care should be considered as comprising of: self-care, administered by the patient themselves; home care, administered by the mother or caregiver; professional care, administered by health care professionals such as dentists or dental hygienists; and community care, administered by school teachers, community health professionals and others.

Consequences of Deciduous Dental Caries

As mentioned, one consequence of caries of the deciduous dentition is that the child is more likely to develop caries of the permanent dentition. However, there are also a number of other possible consequences. If a child has severe dental caries, he or she will have an esthetic disorder. The child may not want to smile. Speech development may be affected, leading to speech disorders. There may be masticatory dysfunction, affecting growth and development. Malalignment and occlusal disturbances of the permanent dentition may result.

The Role of Silver Diamine Fluoride

Silver diamine fluoride plays a vital role in achieving a caries-free society. Research on the caries-arresting effects of silver diamine fluoride began in 1965. In 1969, Dr. Nishino reported the effects of silver diamine fluoride. Since then, a lot of experimental and clinical research has

Table 1　Applications of Silver Diamine Fluoride

Deciduous Dentition	Arrest of dental caries
	Prevention of recurrent caries
	Maintaining vitality of the pulpal tissues
Permanent Dentition	Desensitization
For Aged Patients	Prevention and arrest of root caries

been done. In 2009, Rosenblatt et al. reviewed those articles in the Journal of Dental Research and concluded:

"Silver diamine fluoride is a safe, effective, efficient and equitable caries-arresting and caries-preventive agent [that] appears to meet the criteria of WHO Millennium Goals."

38% silver diamine fluoride ($Ag(NH_3)_2F$) is manufactured under the brand name Saforide by Bee Brand Medicodental. It is used in Asia, Russia, the USA, Jordan, Mongolia, South America, South Africa and elsewhere. The applications of Saforide are summarized in Table 1.

After application of silver diamine fluoride, the areas of dental caries on the tooth can be seen clearly. This shows carious lesion where the mother and child were not aware of the presence before the application of silver diamine fluoride. Presence of dental plaque can also be visualized clearly. As the caries is stained black, plaque that is not completely removed can be recognized easily and clearly by the mother and child, due to the black background. Further, the black staining of caries is very effective in educating children and mothers about caries arrest and caries prevention. Closure of dentinal tubules is also achieved (Fig. 1).

When a child visits a dental office for treatment of dental caries, if the dentist elects to proceed with cavity preparation and restoration at the first visit, local anesthesia will need to be used. Cavity preparation causes severe pain due to the presence of wide dentinal tubules. Furthermore, cavity preparation causes damage to the pupal tissues and after a filling is placed, recurrent caries can occur easily.

Therefore, at the first visit, silver diamine fluoride application is necessary. During application, softened dentine is not removed. This is because, in deciduous teeth, the soft dentin present in caries is important for preventing pulpitis, preventing pain and acting as a reservoir of Ag^+ and F^-.

Once applied, silver diamine fluoride causes dentinal

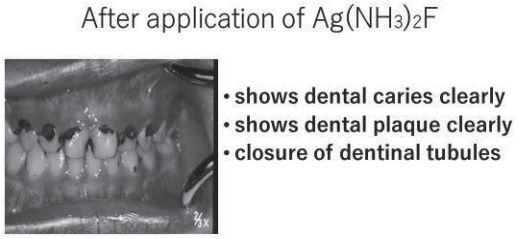

Fig. 1　Effectiveness of Silver Diamine Fluoride

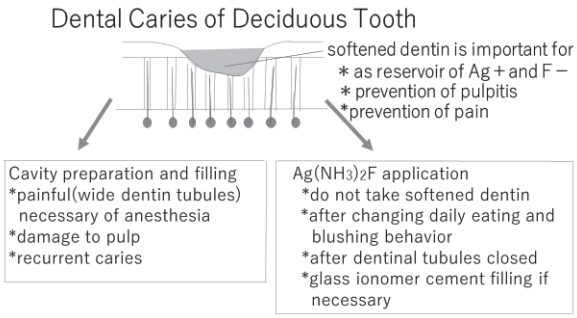

Fig. 2　Do not remove the softened dentin before application of Silver Diamine Fluoride

tubules to close by precipitation of calcium phosphate. After dentinal tubules are closed, restorative procedures can be provided more easily. As caries is the result of unsuitable daily eating habits and unsuitable oral hygiene behavior, daily eating and brushing behavior must be changed before restorative treatment, such as glass ionomer cement restoration, is carried out (Fig. 2) .

Conclusion

The deciduous dentition can be considered to be the parent of the permanent dentition and has profound impact on people's lives. Japan, Asia and the rest of the world is aiming to achieve a caries-free society. In order to achieve a caries-free society, caries in the primary dentition must be targeted. Silver diamine fluoride, along with oral health education, plays a key role in achieving the ultimate aim of a caries-free world.

Supplement

The New York Times has reported; "A Cavity-Fighting Liquid Lets Kids Avoid Dentists' Drills". Dr. Margherita Fontana, a professor of cariology at the University of Michigan said, "The upside, the great one, is you don't need to drill and you don't need an injection". In Oregon, silver diamine fluoride is already used in hundreds of dental offices, and at least 18 dental schools have started teaching the next generation of pediatric dentists how to use it. *www.nytimes.com/2016/07/12/health/silver-diamine-fluoride-dentist-cavities.html?_r=l*

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