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Investigation of Awareness of Oral Care and Understanding of Oral Health among Patients Visiting a Community Pharmacy: A Questionnaire-Survey Study

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This distinctive single-center survey study aimed to assess the actual awareness of oral care and the understanding of oral health and periodontal disease among patients visiting not a dental clinic, but a community pharmacy. Out of the 225 patients who were given the questionnaire, 150 provided valid responses. Participants were divided into two groups based on the presence or absence of interest in oral care. The proportion of participants in the interested group who had relatives working in healthcare, visited the dentist frequently, and used oral care products was significantly higher than that of participants in the uninterested group. However, in each group, only a small proportion of participants understood parts of the oral cavity regarding the development of periodontal disease. More patients with diabetes were in the uninterested group. Participants in the uninterested group also tend to show a passive attitude for oral health. Furthermore, a large number of participants were unaware that pregnancy and genetics could be risk factors for periodontal disease. The results indicated that the one of the most important factors in improving oral care awareness is providing accurate information regarding oral hygiene and prevention of periodontal disease. Pharmacies and pharmacists serve as the most accessible healthcare institutions and professionals within the community. Therefore, to prevent periodontal disease and to improve oral health awareness, pharmacists need to provide information regarding oral health and pharmacies should serve as the first point of access for community residents.

Key words periodontal disease, community pharmacy, oral care

INTRODUCTION

One of the most important international problems regarding public health is oral disease. A report from the World Health Organization (WHO) revealed that approximately 45% of people of the world population have some type of oral disease.[1)] Representatives of these oral diseases include dental caries, periodontal diseases, lost teeth, and oral cancer. Diagnosis of oral disease markedly reduces the quality of life of patients. On the other hand, many aspects of oral disease are preventable, and in 2021, WHO announced the promotion primary and secondary preventive measures for oral disease to improve oral health.[2)]

Periodontal disease is one of the most common oral diseases, along with dental caries. Periodontal disease is defined as a chronic inflammatory disease affecting the gums, periodontal ligament, and alveolar bone.[3)] Globally, approximately 1 billion individuals are afflicted with periodontal disease,[1)] and in Japan, approximately 11.35 million people receive treatment for periodontal disease.[4)] Periodontal disease is classified into gingivitis and periodontitis. Gingivitis symptoms are relatively minimal and can improve with treatment. In contrast, periodontitis is an advanced stage of gingivitis, and its progression is irreversible.[5)] Severe periodontal disease is the major cause of tooth loss in Japan.[6)] Tooth loss poses a heavy psychological and socio-economic burden. Therefore, particularly,

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the primary and secondary prevention of periodontal disease holds significant potential for extending the healthy life expectancy in humans.

Proper tooth brushing, oral care, and improvement of lifestyle are prevention measures for oral disease. Notably, a dental visit is the most effective method for preventing oral disease. In fact, educational interventions by dentists for patients with periodontal disease had been shown to be effective in improving patients' awareness of oral care, including enhancing their self-care behaviors, such as increasing the duration and frequency of tooth brushing.[7] However, the number of people affected by oral diseases has increased by approximately 1 billion over the past 30 years. Additionally, the current reality is that many patients are missing opportunities for the prevention and treatment of oral diseases. In fact, in 2023, the proportion of people visiting dentists in Japan remains at 58.8%[8]; thus, approximately 40% of the population do not visit dentists regularly. This situation is also observed in many other countries, including the United States of America (USA),[9] and various factors prevent many people from visiting dentists regularly.[10] Therefore, the increase in the proportion of people who visit dentists is important to the prevention of oral disease.

In Japan, approximately 63,000 pharmacies are currently in operation.[11] Pharmacies have the distinct advantage of being highly accessible for health-related consultations from community residents.[12] Moreover, compared to hospitals, clinics, and dental offices, pharmacists are often perceived as more familiar and approachable by the public. Community pharmacists, equipped with advanced medical knowledge, are consistently available at pharmacies. In fact, Baseer, *et al*.[13] reported that pharmacists in certain regions abroad received consultations related to oral health issues at least once per week. Moreover, Iwata, *et al*.[14] reported that community pharmacists improved the screening rate of dental clinics by conducting saliva test and providing information regarding dental checkup and oral health for patients. Hence, pharmacies have the potential to the improvement of public oral health by serving as a first-line access point for healthcare services.

In 2022, the Japan society of oral care announced that "participation of pharmacists in the oral care around the clinical situation" and "enhancement of pharmacy education about the region of oral care in faculty of pharmacy" are important to develop oral care. In addition, the term of "oral care" was newly written in the Model core curriculum for pharmacy education (2022 revision) in Japan. That is to say, oral care will be one of the essential knowledges for pharmacists. However, research investigating the awareness of oral health among actual patients visiting pharmacies by pharmacists remains limited. Thus, in this study, we investigated the awareness of oral care, subjective symptoms in the oral cavity, and understanding of periodontal disease in patients who visited a community pharmacy in Japan, using a questionnaire surveillance.

METHODS

Participants A questionnaire was distributed to patients who visited the Dispensing Pharmacy Tsuruha Drug Koriyama-Eki Higashi Shop between January 10, 2024 and February 15, 2024. These patients were registered as participants in this study. Participants who did not consent to participate, used artificial teeth, or provided incomplete responses in the questionnaire were excluded from this study.

Questionnaire Surveillance The questionnaire (Table 1) was developed based on the standard medical questionnaire used at Dispensing Pharmacy Tsuruha Drug, relevant clinical practice guidelines,[15] and findings from numerous previous studies.[16,17] Patient's information (e.g., age, sex, smoking history, medical history), awareness of oral care and periodontal disease, and subjective symptoms in the oral cavity were included in this questionnaire. Individual risk for periodontal disease was also assessed using a scoring system outlined in Table 2, based on responses to questions Q2-8 in the questionnaire, which asked participants to select all symptoms currently associated with oral health.

Statistical Analysis In this study, participants were categorized into two groups based on their responses to question Q2-1 (How interested are you in "oral care" currently?) in the questionnaire. Thus, people answering "very interested" or "interested" were in the "interested group,"people answering "neutral," "slightly uninterested," or "uninterested" were in the "uninterested group," respectively. Student's *t*-test and Fisher's exact test were used for the comparison between two groups of continuous and categorical variable, respectively. All statistical analysis were conducted using JMP® Pro 16.2.0 (SAS Institute Inc., Cary, USA), and statistical significance was set at a p value < 0.05.

Ethical Consideration This survey study was conducted in accordance with the Ethical Guidelines for Medical and Biological Research Involving Human Subjects. This study also obtained the ethical approval of the Ethics Committee of Tsuruha Holdings Inc. (Approval No.: HD2026032). Participant consent was obtained through the questionnaire by having respondents check the item "I agree to participate in this study," in lieu of obtaining individual written informed consent. Moreover, all of this survey including answering the questionnaire was conducted anonymously.

RESULTS

Background of Participants In this study, we distributed the questionnaire to 225 participants who visited the Dispensing Pharmacy Tsuruha Drug Koriyama-Eki Higashi Shop between January 10, 2024 and February 15, 2024. Among them, we received a total of 150 (66.7%) valid answers. Of the 75 excluded individuals, two did not provide consent, eight were using artificial teeth, and 65 had incomplete answers in the questionnaire.

Participants were also divided into two groups—an interested group and an uninterested group—according to the answer to Q2-1. Table 3 summarizes the backgrounds of the participants in each group. A significantly higher proportion of participants in the interested group reported having relatives who are medical professionals compared to those in the uninterested group. Moreover, in the interested group, the proportion of participants who visit dentists regularly, the awareness of periodontal disease, the proportion of using items for oral care, and the frequency of tooth brushing were also significantly higher than the ones in the uninterested group. On the other hand, no significant difference was found between the interested group and the uninterested group regarding the proportion of participants who correctly understood the site of periodontal disease onset (16.0% and 12.5%, respectively). Furthermore, no significant differences were observed between the

Table 1. Questionnaire of This Study

Agreement to participate in this study

□ I agree to participate in this study.

Q1. Participant information

Q1-1. Age

_____ years old

Q1-2. Sex

□ Male □ Female □ No answer

Q1-3. Are there any medical workers in your relatives?

□ Yes □ No

Q1-4. Do you smoke on a daily basis?

□ Yes □ No

Q1-5. Do you have any diseases that you are currently being treated for? (Please select all that apply.)

□ Type 1 diabetes □ Type 2 diabetes □ Dementia □ Angina pectoris
□ Arrhythmia □ Osteoporosis □ Benign prostatic hyperplasia
□ Menopausal disorder □ Mental illness □ Hypertension □ Cancer
□ Allergic disease □ Others ( )

Q2. Regarding oral care

Q2-1. How interested are you in "oral care" currently?

□ Very interested □ Interested □ Neutral □ Slightly uninterested
□ Uninterested

Q2-2. Do you visit the dental clinic regularly?

□ Yes □ No

Q2-3. Do you know what kind of disease "periodontal disease" is?

□ Well know □ Slightly know □ Hardly know □ Don't know

Q2-4. Which part of the mouth do you think is affected by periodontal disease?

□ Only teeth □ Only gums □ Teeth and gums □ Gums and alveolar bones
□ Teeth, gums and alveolar bones □ Others ( ) □ Don't know

Q2-5. How old do you think you need to be careful about the risk of periodontal disease?

□ Teens or less □ 20s □ 30s □ 40s □ 50s □ 60s □ 70s or over

Q2-6. Please select all the factors that apply as risk factors that worsen periodontal disease.

□ Stress □ Smoking □ Pregnancy □ Bad tooth □ Dentition/bite □ Aging
□ Genetics □ Others ( ) □ Don't know

Q2-7. Please select all symptoms that you have been concerned about regarding oral care.

□ Plaque/Tartar □ Halitosis □ Tooth staining □ Bad tooth □ Hyperesthesia
□ Dry mouth □ Others ( ) □ Nothing

Q2-8. Please select all symptoms that apply to you regarding the following items that are currently said to be related to your oral health.

□ Your mouth feels sticky when you wake up.
□ You have been told you have halitosis.
□ You get things stuck in between your teeth.
□ You sometimes bleed from your gums.
□ Your gums sometimes swell up.
□ You have teeth that are loose. □ You smoke a lot.
□ You don't brush your teeth very often.
□ You only go to the dentist when your teeth hurt.
□ You often feel stressed. □ You have diabetes
□ You have been told you have low bone density.

Q2-9. Please select all the items that you currently use for oral care.

□ Dental floss □ Interdental brush □ Tooth brush □ mouthwash
□ Others ( )

two groups in terms of other background characteristics (age, sex, and proportion of smokers). According to the medical history of participants, no patient had dementia. The proportion of patients with type 2 diabetes in the uninterested group was significantly higher than the proportion in the interested group. In other disease backgrounds, no significant difference was found in each group.

Relationship between Interest in Oral Care and Risk of Periodontal Disease Table 4 presents the oral health status and periodontal disease scores for both the interested and uninterested groups. The proportion of participants in the uninterested group who answered "Not brush teeth very often", "visit a dental clinic only when teeth hurt", and "have a diabetes" were significantly higher than in the interested group. On the other hand, the mean value of the score of periodontal disease was not significantly different between the interested and uninterested groups.

Relationship between Interest in Oral Care and Awareness of Periodontal Disease Table 5 reveals the results of investigation in both the interested and the uninterested groups regarding Q2-6 (perceived risk factors for periodontal disease) and Q2-7 (symptoms of concern related to oral care) in the questionnaire. In the answer of Q2-6, the proportion of participants in the interested group who selected stress, smoking, bad tooth, and aging was remarkably higher than the proportion in the uninterested group. On the other hand, the propor-

tion of participants in the uninterested group who answered "don't know" was significantly higher than the proportion in the interested group. No significant differences were observed between the interested and the uninterested groups regarding the proportion of participants who selected pregnancy, dentition/bite, and genetics. In the answer of Q2-7, the proportion of participants in the interested group who selected plaque/tartar, halitosis, tooth staining, and bad tooth was significantly higher than the proportion in the uninterested group. On the other hand, the proportion of participants in the uninterested group who selected "nothing" was higher than the proportion in the interested group.

Table 2. Scorebook for the Evaluation of Risk of Periodontal Disease

Items	Score
Your mouth feels sticky when you wake up.	1
You have been told you have halitosis.	1
You get things stuck in between your teeth.	2
You sometimes bleed from your gums.	3
Your gums sometimes swell up.	4
You have teeth that are loose.	5
You smoke a lot.	1
You don't brush your teeth very often.	1
You only go to the dentist when your teeth hurt.	1
You often feel stressed.	1
You have diabetes.	1
You have been told you have low bone density.	1

Severity of periodontal disease risks are categorized as follows: 0 points (no risk), 1–4 points (presence of susceptibility factors), 5–9 points (high likelihood), and 10 points or more (disease progression).

DISCUSSION

In the present study, to elucidate circumstances of interest in oral care for patients who visit community pharmacies, we performed the investigation with the questionnaire and evaluation of differences between groups with/without interest in oral care. The results showed that in the interested group, the proportion of participants who have relatives who are medical workers, visit dentists regularly, and use various items for oral care was significantly higher than the proportion in the uninterested group. On the other hand, in the uninterested group, the proportion of participants who answered "do not know" and "nothing" in the questions regarding factors that worsen periodontal disease and subjective symptoms was significantly higher than the proportion in the interested group. This survey is considered one of the few studies investigating the relationship between interest in oral care and the risk of periodontal disease, specifically among patients visiting community pharmacies.

In our surveillance, a total of 94 participants (62.7%) demonstrated interest in oral care. The questionnaire surveillance by Hirotani, *et al.*[17] showed that a total of 89.5% of participants was interested in oral care. In this study, we added a new option "Neutral (not both interested and uninterested)" in

Table 3. Characteristics of the Participants

	All (n = 150)	Interested group (n = 94)	Uninterested group (n = 56)	*p* value
Age (y.o.)[1,a]	65.4 ± 12.8	64.2 ± 11.3	67.3 ± 15.0	0.1540
Male[2,b]	70 (46.7)	39 (41.5)	31 (55.4)	0.1279
Relatives in medical work[2,b]	30 (20.0)	24 (25.5)	6 (10.7)	0.0346 *
Smoking[2,b]	21 (14.0)	12 (12.8)	9 (16.1)	0.6299
Regular dental visits[2,b]	54 (36.0)	43 (45.7)	11 (19.6)	0.0015 **
Awareness of periodontal disease[2,b]	106 (70.7)	76 (80.9)	30 (53.6)	0.0007 ***
Understanding of periodontal disease[2,b]	22 (14.7)	15 (16.0)	7 (12.5)	0.6391
Oral care products currently used[2,b]				
Dental floss	28 (18.7)	23 (24.5)	5 (8.9)	0.0184 *
Interdental brush	68 (45.3)	55 (58.5)	13 (23.2)	< 0.0001 ***
Tongue cleaner	18 (12.0)	16 (17.0)	2 (3.6)	0.0177 *
Mouthwash or rinsing solutions	34 (22.7)	28 (29.8)	6 (10.7)	0.0083 **
Frequency of tooth brushing (/day)[1,a]	2.0 ± 0.9	2.2 ± 0.9	1.7 ± 0.8	0.0003 ***
Medical history[2,b]				
Type 1 diabetes	9 (6.0)	6 (6.4)	3 (5.4)	1.0000
Type 2 diabetes	36 (24.0)	13 (13.8)	23 (41.1)	0.0003 ***
Dementia	0 (0.0)	0 (0.0)	0 (0.0)	N/A
Angina pectoris	9 (6.0)	4 (4.3)	5 (8.9)	0.2948
Arrhythmia	18 (12.0)	11 (11.7)	74 (12.5)	1.0000
Osteoporosis	12 (8.0)	8 (8.5)	7 (7.1)	1.0000
Benign prostatic hyperplasia	10 (6.7)	9 (9.6)	1 (1.8)	0.0912
Menopausal disorder	2 (1.3)	1 (1.1)	1 (1.8)	1.0000
Mental illness	20 (13.3)	12 (12.8)	8 (14.3)	0.8076
Hypertension	72 (48.0)	42 (44.7)	30 (53.6)	0.3147
Cancer	32 (21.3)	20 (21.3)	12 (21.4)	1.0000
Allergic disease	12 (8.0)	9 (9.6)	3 (5.4)	0.5361
Others	44 (29.3)	31 (33.0)	13 (23.2)	

[1] Mean ± standard deviation, [2] n (%). N/A: Not applicable. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, p value was obtained from [a] Student's t-test, [b] Fisher's exact test.

Table 4. Relationship between Interest in Oral Care and Risk of Periodontal Disease

	Interested group (n = 94)	Uninterested group (n = 56)	OR (95% CI)	p value
Status of oral health[1,a]				
Mouth feels sticky upon waking up	26 (27.7)	17 (30.4)	0.9 (0.4 – 1.8)	0.8521
Have been told about bad breath	21 (19.4)	10 (17.9)	1.3 (0.6 – 3.1)	0.5406
Things are lodged between teeth	62 (66.0)	33 (59.0)	1.4 (0.7 – 2.7)	0.4838
To bleed sometimes from gums	32 (34.0)	12 (21.4)	1.9 (0.9 – 4.1)	0.1377
Gums sometimes swell up	28 (30.0)	16 (28.6)	1.1 (0.5 – 2.2)	1.0000
There are some wobbly teeth	15 (16.0)	9 (16.0)	1.0 (0.4 – 2.4)	1.0000
Smoke often	6 (6.4)	5 (8.9)	0.7 (0.2 – 2.4)	0.7474
Not brush teeth very often	7 (7.5)	13 (23.2)	0.3 (0.1 – 0.7)	0.0113 *
Visits a dental clinic only when teeth are hurting	26 (27.7)	26 (46.4)	0.4 (0.2 – 0.9)	0.0222 *
Often feel stressed	27 (28.7)	14 (25.0)	1.2 (0.6 – 2.6)	0.7064
Have diabetes	18 (19.1)	23 (41.1)	0.3 (0.2 – 0.7)	0.0046 **
Have been told about low bone density	8 (8.5)	5 (8.9)	0.9 (0.3 – 3.1)	1.0000
Scoring of periodontal disease[2,b]	5.8 ± 4.3	5.8 ± 3.8		0.9737

[1] n (%), [2] Mean ± standard deviation. OR: odds ratio; CI: confidence interval. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, p value was obtained from [a] Fisher's exact test, [b] Student's t-test.

Table 5. Relationship between Interest in Oral Care and Risk of Periodontal Disease

	Interested group (n = 94)	Uninterested group (n = 56)	OR (95% CI)	p value
Risk factor				
Stress	54 (57.5)	14 (25.0)	4.1 (2.0 – 8.4)	0.0002 ***
Smoking	48 (51.1)	14 (25.0)	3.1 (1.5 – 6.5)	0.0020 **
Pregnancy	10 (10.6)	3 (5.4)	2.1 (0.6 – 8.0)	0.3727
Bad teeth	68 (72.3)	27 (48.2)	2.8 (1.4 – 5.6)	0.0048 **
Dentition/bite	43 (45.7)	21 (37.5)	1.4 (0.7 – 2.8)	0.3940
Aging	62 (66.0)	16 (28.6)	4.8 (2.4 – 9.9)	< 0.0001 ***
Genetics	13 (13.8)	3 (5.4)	2.8 (0.8 – 10.4)	0.1698
Don't know	7 (7.5)	16 (28.6)	0.2 (0.1 – 0.5)	0.0008 ***
Symptoms				
Plaque/Tartar	50 (53.2)	9 (16.1)	5.9 (2.6 – 13.5)	< 0.0001 ***
Halitosis	37 (39.4)	11 (19.6)	2.7 (1.2 – 5.8)	0.0181 *
Tooth staining	27 (28.7)	7 (12.5)	2.8 (1.1 – 7.0)	0.0264 *
Bad tooth	33 (35.1)	9 (16.1)	2.8 (1.2 – 6.5)	0.0144 *
Hyperesthesia	14 (14.9)	5 (8.9)	1.8 (0.6 – 5.3)	0.3234
Dry mouth	39 (41.5)	15 (26.8)	1.9 (0.9 – 4.0)	0.0802
Nothing	8 (8.5)	21 (37.5)	0.2 (0.1 – 0.4)	< 0.0001 ***

n (%). OR: odds ratio; CI: confidence interval. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, p value was obtained from Fisher's exact test.

Q2-1, and a total of 31 participants selected this option. These participants were classified as part of the uninterested group, and degree of interest was lower than the previous research. However, these participants who select "Neutral" in Q2-1 might have a latent interest in oral care. If these participants were divided into the interested group, the proportion of interested group in all participants will be 83.3%, which is similar to the previous study. Thus, it is essential to raise awareness regarding the importance of oral care among this population.

The proportion of having medical staff as relatives, visiting dentists regularly, and using items for oral care in the interested group was also significantly higher than the proportion in the uninterested group. Gunta, *et al*.[18] reported that the awareness of health is different depending on the individual's socioeconomic status such as the educational level. Hence, the existence of medical workers as relatives may contribute in improving awareness of health. Moreover, Shimazaki, *et al*.[19] also reported that individuals with lower health awareness are less likely to engage in health-promoting behaviors. Interest in oral care, regular dental visits, and willingness to use oral care products are interrelated factors. Thus, a high level of interest in oral care may promote greater motivation for dental visits and the use of oral care products, while regular dental visits and consistent use of these products may further reinforce interest in oral care. The findings indicate that recommending items for oral care to patients visiting the community pharmacy, confirming their frequency of use, and assessing whether they receive regular dental checkups may contribute to enhancing patients' interest in oral care.

In the medical history (Table 3), the proportion of participants with type 2 diabetes in the uninterested group was significantly higher than the proportion in the interested group. On the other hand, no significant difference between groups was found in the proportion of participants with type 1 diabetes, possibly owing to the small number of applicable cases. Numerous previous studies had reported that diabetes, regardless of type, is associated with the development and progression of periodontal disease. Other studies[20-23] had also indicated that there was a relationship between systemic diseases (such as diabetes) and the development of periodontal disease, and there were many drugs affecting oral health.[7,24] Moreover, it had been reported that educational interventions for

patients with diabetes improve their awareness of oral care and enhance their oral self-care abilities.[25] Therefore, we suggested that interventions by medical professionals for patients with diabetes have the potential to contribute to the prevention of both the onset and progression of periodontal disease, and the community pharmacies and pharmacists can serve as the most accessible resources for the primary and secondary preventions for periodontal diseases.

In this study, we evaluated the cognition and the understanding of periodontal disease based on the results of Q2-3. and Q2-4 in the questionnaire, respectively. In the results, although the cognition in the interested group was significantly higher than in the uninterested group, the understanding was not significantly different in the groups. In the questionnaire, the correct choice in Q2-4 was "Teeth, gums, and alveolar bones" because periodontal disease was defined as a chronic inflammatory disease of the gums, periodontal ligament, and alveolar bone.[26] However, there were only 15 and 7 participants (16.0% and 12.5%) in the interested group and uninterested group, respectively, who selected the correct choice in Q2-4. This indicates that the public's understanding of periodontal disease remains inadequate or inaccurate. Therefore, one of the most effective strategies for healthcare professionals in preventing periodontal disease is to promote accurate knowledge and awareness of the condition.

According to the results shown in Table 4, participants in the uninterested group tended to show a lack of awareness regarding oral care. Previous studies[10] have reported that economic, psychological, and geographical factors act as barriers to receiving dental treatment. Additionally, as mentioned above, there is a potential interaction between regular dental visits and the level of awareness regarding oral care. Therefore, we also need to evaluate the relationship between awareness of oral care and various economic, psychological, and geographical factors. In this study, we also evaluated the risk of periodontal disease with the list used in the previous study. There was no significant difference in periodontal disease scores between the two groups, with both groups showing a mean score of 5.8. According to Table 2, scores were categorized as follows: 0 points (no risk), 1–4 points (presence of susceptibility factors), 5–9 points (high likelihood), and 10 points or more (disease progression). The slightly elevated mean scores in both groups suggest that some participants in this study may already have periodontal disease. We believe that one reason for the similar scores between the groups may be attributed to the variation in point values assigned to each item. Although all items that revealed a significant difference had a score of 1 point, items regarding "bleeding from gums," "swelling up of gums," and "wobbly tooth" were assigned higher scores, as these symptoms indicate the presence or elevated risk of periodontal disease. On the other hand, the study results indicated a tendency for the uninterested group to exhibit negative attitudes toward improving oral health. Therefore, medical staff such as pharmacists are encouraged to raise awareness on basic oral care such as tooth brushing and regular dental visits.

All of the risk factors listed in Q2-6 have been reported to contribute to the progression of periodontal disease. Thus, participants in the interested group demonstrated understanding to many of the risk factors. However, in terms of factors such as "pregnancy" and "genetics," the level of understanding was low at 10.6% and 13.8% in the interested and the uninterested groups, respectively. Pregnancy is recognized as a contributing factor in the development and progression of periodontal disease, with estrogen and progesterone believed to play a primary role.[27] Moreover, it is suggested that the development of periodontal disease during pregnancy has the potential to increase the risk of premature birth and gestational toxicosis.[28] Therefore, oral care during pregnancy is essential not only for the mother's health but also for the well-being of the baby. Furthermore, a previous study revealed that some genes are involved in the aggravation of periodontal disease.[29] As of now, there is almost no report regarding to provide information about pregnancy and genetics have the risk of periodontal disease contributes to avoid periodontal disease, which is, because most people don't know the information yet. Therefore, we expect that providing this information to community residents has a potential to improve the awareness of oral care and to avoid periodontal disease. That is, in this study, to enhance patient awareness of oral diseases, it is important to communicate those factors such as pregnancy and genetics can also contribute to the risk of conditions such as periodontal disease.

In Table 5, the uninterested group had low understanding for the risk of periodontal disease, and the proportion of participants in the uninterested group who selected "don't know" in Q2-6 and "nothing" in Q2-7 was significantly higher. In some regions of London, it has been reported that the proportion of people who recognized the relationship between smoking and periodontal disease was only 6%.[30] In Sweden, it has been reported that approximately 83% of patients with diabetes were not aware of the relationship between periodontal disease and diabetes.[31] Results obtained from this study revealed a similar tendency to these previous researches. We believe that one of the reasons participants identified as "uninterested" was due to a lack of information regarding oral care and the risks associated with periodontal disease. Thus, it is highly likely that individuals may develop an interest in their own oral care through exposure to awareness-raising initiatives led by healthcare professionals, including pharmacists.

This study has several limitations. First, this study was conducted in a single pharmacy only and valid answers were low at only 150. Therefore, results of this study may not be generalizable to the entire patient population. Furthermore, this study did not include data from individuals under the age of 20, and participants with dentures were excluded. Oral health status is affected by social and economic dimensions; thus, further data collection is necessary, including patients from various regions and those receiving care from other medical institutions. Second, in this study, participants who answered "neutral" in response to Q2-1 were classified as part of the uninterested group. However, the individual level of oral care awareness remains uncertain; indeed, it is possible that some participants with a certain degree of awareness were categorized within the uninterested group. Nevertheless, the results of this study exhibited trends consistent with those reported in several previous studies, supporting the generalizability of the findings. Third, this questionnaire was created in reference to some previous studies, and many of questionnaire's items included subjective factors for the participants. Therefore, there may be some bias in the results.

In summary, this distinctive study, which was conducted in

not a dental clinic but a community pharmacy, accomplished grasping the actual situation regarding the awareness of oral care and understanding of oral health in community residents. Consequently, we also elucidated the relationship between oral care awareness and factors such as dental visitation, frequency of tooth brushing, and understanding of periodontal disease. Additionally, this study also identified key challenges faced by healthcare professionals in providing oral care information to patients, including the limited understanding of pregnancy and genetics as risk factors for periodontal disease, the critical role of the amount and quality of information provided, and other related factors. Most patients come to pharmacies to want therapeutic medicine and its information from pharmacists. Many systemic diseases are related to oral diseases, and several drugs have adverse events in the oral cavity. Therefore, pharmacists have potentials to be able to provide information regarding the relationship between oral care and not only diseases, but also medicine. In conclusion, the findings suggest that educational interventions by pharmacists may contribute to enhancing oral care awareness and promoting positive behavioral changes among community residents.

Conflict of interest The authors declare no conflict of interest.

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