

## Knowledge, Attitude, Practice Towards Plaque Disclosing Agent Among Dentists in West Java, Indonesia

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### Abstract

The primary etiology of periodontal disease and tooth decay is bacterial plaque, attached to the tooth surfaces. Bacterial or dental plaque can be detected accurately by plaque disclosing agents. However, it is discovered that dentists hesitate to use plaque disclosing agents due to lack of knowledge and limited time allocated for each dental visit. The present study aimed to measure the level of knowledge, attitudes, and practices toward plaque disclosing agents among dentists in West Java.

We conducted a survey involving 210 participating dentists in West Java, Indonesia. A questionnaire was developed and uploaded in an online survey tool (google form). Data were collected consisting of questions regarding dentist's opinions, viewpoints, and recommendations about disclosing agents.

This study showed only 42% of dentists had a high level of knowledge and only half of the participating dentists were aware of importance of using disclosing agents at home and in dental practice.

Under limitation of the present study, it was revealed that half of the participating dentist had a low level of category in terms of knowledge, attitude and practice.

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### Introduction

Oral diseases that often occur in Indonesia are periodontal disease and tooth decay. Both are associated with poor oral hygiene and can be influenced by microbiological control measures by the community or health workers.<sup>1</sup> Periodontal disease of particular concern is periodontitis and gingivitis. The prevalence of periodontitis in Indonesia is still very high compared to other countries, an Indonesian Basic Health Research shows that 74.1% of the population suffer from periodontitis and the prevalence of dental caries reaches 88.8%.<sup>2</sup> Periodontitis is a chronic inflammation of the periodontal tissue preceded by gingivitis. Gingivitis is an inflammation of the gums that

initially does not cause pain and asymptomatic. If left untreated, it can potentially lead to loss of attachment and alveolar bone damage.<sup>3</sup> Periodontitis can be caused by various factors, but the main cause is plaque formation. Plaque is caused by an attachment of bacteria to hard surfaces in the oral cavity such as tooth surfaces, restorations, orthodontic appliances, and prostheses due to neglect of oral hygiene.<sup>4</sup> Commonly, bacterial complexes that frequently detected in the subgingival are red complex bacteria and *Treponema lecithinolyticum* (TI).<sup>5</sup>

Plaque reduction cannot be performed only by gargling, but it is necessary to use mechanical and chemical methods. Mechanical methods such as tooth brushing and dental floss are considered more effective in reducing plaque. In comparison, the combination of the two methods, fluoride and chlorhexidine, is significantly effective in controlling plaque.<sup>6</sup> Whilst, recent studies have shown that propolis fluoride could arrest dentinal caries activity.<sup>7</sup> Accurate detection with plaque disclosing agents can support the effectiveness of plaque removal. Usually, plaque color is transparent, so it is

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difficult to evaluate the amount and location of plaque by laypeople, even some dentists.<sup>8</sup> Toothbrush and instructions for using a disclosing agent are proven to be more effective in improving oral hygiene.<sup>9,10</sup>

Disclosing agents are selective dyes used to visualize and identify plaque on the tooth surface.<sup>11</sup> Various kinds of plaque disclosing agents have been found, such as iodine, gentian violet, food coloring, erythrosine, basic fuchsin, fast green, fluorescein, and two or three-tone solutions.<sup>12</sup> Several studies have analyzed the use of disclosing agents and shown a positive effect on oral hygiene.<sup>13</sup> However, study shown that disclosing agents can change the color of dental restorative materials.<sup>14</sup> A disclosing solution is considered less effective because it has a liquid consistency that messy, leaves stains on the teeth or lip for some time after its use, and its color causes trauma to pediatric patients.<sup>15</sup>

According to research by Namrata (2019), it was found that most dental students were not aware and ignored the importance of using disclosing agents in maintaining proper oral hygiene in patients. Other studies have shown that many dentists abandon the use of disclosing agents.<sup>16,17</sup> Evaluation of the use of disclosing agents in dentists needs to be carried out to determine the use of disclosing agents and awareness of the importance of prevention in plaque control in the community. Choosing a dentist in West Java because the number of dentists and dental specialists ranks third in Indonesia,<sup>18</sup> but the prevalence of periodontal disease is still above the average proportion of dental and oral disease.<sup>2</sup> The purpose of this study was to measure the level of knowledge, attitude, and practice among dentists toward plaque disclosing agents.

### Materials and methods

This is a descriptive or exploratory study, using a cross-sectional design through a survey in the form of primary data.<sup>19</sup> The population of this study was all dentists in West Java Province, consisting of 23 regencies and cities. The target population was a total of 5000 dentists. The sampling was conducted using the purposive sampling technique (non-probability or non-random sampling), which uses specific considerations in collecting data sources.

Determination of the sample used in the purposive sampling technique is not based on statistical calculations but is obtained until the data saturation is reached.<sup>20</sup> Data saturation in this study occurred when it reached 220 respondents and when no new responses were found. The criteria set by the researcher are in the form of inclusion criteria, which include; (1) dentists who have been registered with the Indonesian Dental Association e-certification of West Java Province as of November 2, 2020; (2) Dentists who are still undergoing practice (outside of pandemic conditions); (3) Dentists who are willing to be a research subject and fill out a complete questionnaire. Exclusion criteria in this study are (1) questionnaires submitted after the data collection deadline; (2) duplicate data. Purposive sampling uses a maximum of variation to obtain sample heterogeneity which can reduce bias from non-random sampling.<sup>21</sup> Variations in data were obtained from the sampling frame, the origin of respondents from various branches of the Indonesian Dental Association (PDGI) of West Java.

The research instruments used by the researcher in this study to collect data was online questionnaire with several questions that had developed based on the conclusions of previous research conducted by Namrata (2019).<sup>16</sup> The questionnaire distribution was conducted for a month from April 2021 – May 2021. The questionnaires in this research were divided into four parts, which include (1) brief research information, respondent consent, and filling in identity in the form of demographic data, name, qualification, age, phone number, and related questions; (2) Knowledge of the form, method, advantages, disadvantages, dosage, and composition of plaque disclosing agent to be measured using the Guttman scale through a questionnaire consisting of 6 questions; (3) Attitudes consisting of 8 questions include important roles, ease of plaque detection, motivating patients, preparations and brands that readily available in Indonesia, lack of plaque disclosing solution, side effects, and development of plaque disclosing agent. These were measured using a Likert scale; (4) Practice in conducting treatment procedures through 5 questions, including the concrete actions from the dentist using disclosing agent, how often they are used, the brands and preparations used. These were measured using the Guttman and

Likert scales.

A validity and reliability test were conducted. The validity test has been accomplished through two approaches, including the face validity test to 5 experts and the content validity test to 25 people that match the sample inclusion criteria. Content validity was conducted using the Pearson product-moment correlation test. Two items with an r count value were obtained below the r table; thus, they were excluded from the questionnaire. The reliability test was conducted using the Cronbach's Alpha test, and the test results were 0.92 (knowledge), 0.865 (attitude), and 0.816 (practice). The test was conducted with a significance level of  $\alpha = 0.6$ . The reliability value of the three variables is above the significance level. In conclusion, this questionnaire had established good qualities of validity and reliability.

The research procedure begins with preparing study designs, research instruments, informed consent, approval of research ethics, obtaining permits, and coordinating with Indonesian Dental Association. The research was carried out by distributing questionnaires to respondents by means of online media, WhatsApp application containing a Google form link, from April to May 2021. The data collected was analyzed through two methods, data analysis and statistical analysis with IBM SPSS for Windows, version 26 (IBM Corp., Armonk, N.Y., USA). Data analysis begins by calculating a knowledge score by giving 1 point for each correct answer and 0 points for incorrect answers. The attitude variable was calculated by giving a score of 4 for strongly agree answers, 3 for agree answers, 2 for disagreeing answers, and 1 for strongly disagree answers. While the measurement of practice scores; on the first 2 items uses the Guttman scale; one item with the Likert scale uses the same score calculation as attitude; and the last two items, by giving a score of 2 for correct answers, 1 for incorrectly scores and 0 points for not answering. The total score per item is processed then presented, and the total score of the respondents is grouped based on 2 assessment intervals on each variable, obtained from the median value. Further, statistical analysis was carried out using univariate analysis to produce each research variable's percentage figures and frequency distribution.<sup>21</sup> Univariate analysis was used to obtain the mean, median, standard deviation,

and cross-tabulation. This research has obtained a research permit from the Indonesian Dental Association (PDGI) and research ethics approval from the Research Ethics Commission of Universitas Padjadjaran with ethics number 106/UN6.KEP/EC/2021

## Results

The respondents involved in this study were 220 dentists, with 10 respondents not meeting the inclusion criteria. Data processing was carried out on 210 respondents with univariate statistical analysis tests to see the description of the characteristics of the respondents in Table 1.

Respondents' Characteristics (n=210)		f	%		
<b>Qualification</b>					
General dentist		176	83,8%		
Specialist dentist		34	16,2%		
<b>Age</b>					
<30		41	19,5%		
30-50		140	66,7%		
>50		29	13,8%		
<b>West Java Regencies and Cities</b>					
<b>Branch</b>	<b>f</b>	<b>%</b>	<b>Branch</b>	<b>f</b>	<b>%</b>
Bandung Regency	12	5,7%	Purwakarta Regency	1	0,5%
West Bandung Regency	6	2,9%	Subang Regency	4	1,9%
Bekasi Regency	12	5,7%	Regency and City of Sukabumi	4	1,9%
Bogor Regency	7	3,3%	Sumedang Regency	6	2,9%
Ciamis, Banjar, Pangandaran Regency	2	1%	Regency and City of Tasikmalaya	8	3,8%
Cianjur Regency	4	1,9%	Bandung City	65	31%
Cirebon Regency	5	2,4%	Bekasi City	14	6,7%
Garut Regency	2	1%	Bogor City	6	2,9%
Indramayu Regency	4	1,9%	Cimahi City	14	6,7%
Karawang Regency	4	1,9%	Cirebon City	5	2,4%
Kuningan Regency	2	1%	Depok City	18	8,6%
Majalengka Regency	5	2,4%			

**Table 1.** Respondents' Characteristics.

Question	True		False	
	f	%	f	%
The currently available dosage form of plaque disclosing agent	70	33,3%	140	66,7%
Methods of using disclosing agent from various preparations	48	22,9%	162	77,1%
In dentistry, the material used for disclosing agent	146	69,5%	64	30,5%
The disadvantages of using disclosing agent	130	61,9%	80	38,1%
The dosage of disclosing agent	20	9,5%	190	89,5%
The essential of composition contained in disclosing agent	70	33,3%	140	66,7%

**Table 2.** The results of the answers to the dentist's knowledge questionnaire (n = 210).

There are more general practitioners (83.8%) than specialist dentists (16.2%). The average age of the respondents is 30-50 years, included in the productive age group. The distribution of respondents is evenly distributed in each region to represent the samples per region. Most of the respondents came from Bandung City (31%), which has 65 dentists. A map of the

distribution of respondents can be seen through figure 1.

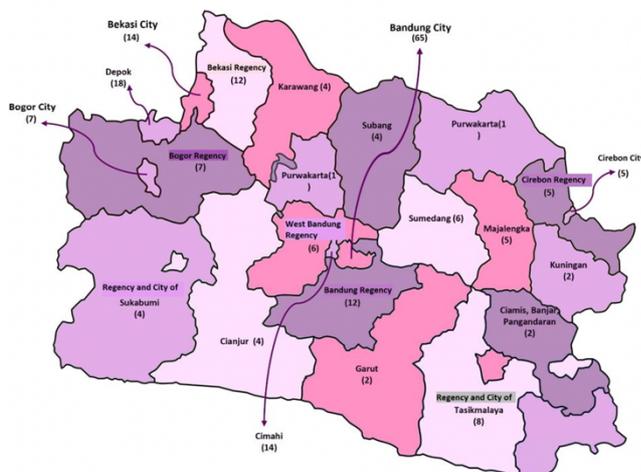


Figure 1. A density map to visualize the geographic distribution of respondents.

Table 2 shows the results of dentists' knowledge of disclosing agents based on Likert questionnaire responses. The most questions answered correctly were the use of disclosing agents in dentistry by 146 respondents (69.5%), while the question with the most incorrect answers was the dose of disclosing agents by 190 respondents (89.5%).

Question	SA (4)		A (3)		DA (2)		SDA (1)	
	f	%	f	%	f	%	f	%
Aware of the important role of using disclosing agent to maintain oral hygiene	126	60%	72	34%	9	4,3%	3	1,4%
Disclosing agents make it easier for you to detect plaque	170	81%	35	16,7%	3	1,4%	2	1%
Disclosing agents can be used to motivate patients to maintain oral hygiene.	171	81,4%	34	16,2%	4	1,9%	1	0,5%
Currently, disclosing agents are available from various brands that are easily available	66	31,4%	94	44,8%	42	20%	8	3,8%
Presently, various dosage forms of disclosing agents are available in Indonesia	56	26,7%	94	44,8%	49	23,3%	11	5,2%
The disclosing solution is messy and leave unwanted stains when used	102	48,6%	76	36,2%	29	13,8%	3	1,4%

Table 3. The results of the answers to the dentist's attitude questionnaire (n = 210).

\*Footnotes: Strongly agree (SA), Agree (A), Disagree (DA), Strongly Disagree (SDA).

Table 3 shows the dentist's attitude to the disclosing agent's questionnaire containing the choices strongly agree, agree, disagree, and strongly disagree. The most agreed statement was the benefits of disclosing agents to motivate (81.4%), while the states with the most strongly disagreed response was that disclosing agents had side effects by 43 respondents (20.5%).

The overview of dentist's practice shown in table 4. The majority of dentists (87.6%) felt the benefits, howbeit 107 (51%) dentists still

used plaque disclosing agents and were able to continue filling out the questionnaire to the next section. Out of the 107 dentists, only 46.7% used disclosing agents in any prophylactic procedure, 21.5% of them did so by recall. The majority of dentists (88.1%) know the dosage form and 72% know the brand they use.

Pertanyaan	f	%
<b>Do you use disclosing agents in carrying out OHI in practice? (N = 210)</b>	107	51%
Yes	103	49%
No		
<b>Do you feel the benefits of using disclosing agents? (N=210)</b>	184	87,6%
Yes	26	12,4%
No		
<b>How often do you use disclosing agents? (N =107)</b>	50	46,7%
Every profilactic prosedure	5	4,7%
Once in a week	29	27,1%
Once in a month	23	21,5%
Recall		
<b>What dosage form of disclosing agent do you use? (N = 107)</b>	95	88,8%
Fill in the answer	12	11,2%
Do not know		
<b>What brand of disclosing agent do you use? (N = 107)</b>	72	67,3%
Fill in the answer	35	32,3%
Do not know		

Table 4. The results of the answers to the dentist's practice questionnaire.

Variabel	Range Score		Mean	Standar Deviation	Median
	Poor	Good			
Knowledge of dentist toward disclosing agent	0,00-2,00	3,00-6,00	2,30	1,27	2,00
Attitude of dentist toward disclosing agent	4,00-26,00	27,00-32,00	25,71	3,04	26,00
Practice of dentist toward disclosing agent	0,00-5,00	6,00-10,00	4,42	3,77	5,00

Table 5. Univariate test.

Variable	f	%
<b>Category of knowledge</b>		
High knowledge	88	42%
Low knowledge	122	58%
<b>Category of attitude</b>		
Good attitude	121	58%
Poor attitude	89	42%
<b>Category of practice</b>		
Good practice	107	51%
Poor practice	103	49%

Table 6. Frequency Distribution.

The results of the univariate statistical test in table 5 showed that the knowledge variable obtained an average (mean) of 2.30, a standard deviation of 1.27, and a median value of 2.00.

The attitude variable obtained a mean of 25.71, a standard deviation of 3.04, and a median value of 26.00. The practice variable obtained a mean of 4.42, a standard deviation of 3.77, and a median value of 5.00. Additionally, analysis was carried out normality test using the Kolmogorov-Smirnov method to determine the distribution of random and specific data over 50 samples. The normality test results stated that the data were not normally distributed with p value less than 0.05. So that in determining the category of each variable using confidence interval of the median value. As seen in table 6, in the knowledge variable, if the individual's total score (x) is less or equal to the median, it is categorized as low, while  $x > \text{median}$  is categorized as high. On the attitude and practice variables, if  $x \leq \text{median}$ , then it is categorized as bad, and  $x > \text{median}$ , then it is categorized as good.

Knowledge	Attitude				Total	
	Good		Bad		f	%
	f	%	f	%		
High	49	56%	39	44%	88	100
Low	72	59%	50	41%	122	100

Knowledge	Practice				Total	
	Good		Bad		f	%
	f	%	f	%		
High	47	53%	41	47%	88	100
Low	60	49%	62	51%	122	100

**Table 7.** Cross tabulation of dentists' knowledge with attitudes and practices.

From table 7, a cross-tabulation test was carried off to analyze the correlation between 3 categorical data by crossing the knowledge variable with attitudes and practices that were considered related, so that the relationship between these variables would be readily understood descriptively.

## Discussion

Based on table 2, the first question of the questionnaire is the preparation of plaque disclosing agents, which are available in forming a solution, tablets, wafers, lozenges, mouth-rinses, and toothpaste containing disclosing agents.<sup>23,24</sup> The results found that dentists (33,3%) knew the available forms of plaque disclosing agents, and dentists (66,7%) answered incorrectly by choosing capsules as a form of disclosing agent. The dentist must know

the variety of dosage forms to consider the choice of plaque disclosing agents to be used in order to avoid allergic reactions in patients.<sup>25</sup> There have been reports of allergic reactions to plaque disclosing tablets in patients with eczema.<sup>12</sup> Plaque disclosing agent which is ingested more than 0,6 mg can cause allergic reactions such as dizziness, chest pain, shortness of breath, and skin irritation.<sup>26</sup>

Various methods of using plaque disclosing agents can be conducted according to the preparations. The first step that needs to be undertaken before using plaque disclosing agents is to evaluate the oral mucosa. Evaluation of the gums is critical because the color of the plaque disclosing agents can resemble inflamed gums.<sup>23</sup> After that, apply the plaque disclosing agents according to their composition, including (1) disclosing solution by direct application method. It begins by drying the teeth with a compressed air device, using a cheek and tongue retractor, then using cotton or cotton pellets (carried with cotton pliers) to apply the plaque disclosing solution to the tooth's crown. Then, the patient is asked to swish the mixture around in their mouth with their tongue; (2) Disclosing mouth-rinses can be made by mixing a few drops of the concentrated dosage and water in a glass for dilution, ask the patient to swish and rinse with the mixed solution; (3) Disclosing tablets or wafers can be considered the most effective because the staining is more controlled than other forms. The method can be done by directly asking the patient to chew it, and let it mix with the saliva, then swish the saliva around for about 30 to 60 seconds and spit it out, then rinse with water.<sup>27</sup> (4) Toothpaste that contains disclosing agent can be used like regular toothpaste, and can disclose the plaque left on the teeth so the patient can see it.<sup>24</sup> The results of this study showed that dentists (77,1%) did not know the proper method of using disclosing agents, and only 22,9% of the dentists could answer correctly.

Knowledge of the advantages and disadvantages of plaque disclosing agents is essential for dentists to maximize their use. This study showed that dentists (69,5%) know the benefits of plaque disclosing agents. It can detect plaque accurately, instruct and motivate patients, evaluate group dental health programs (clinical and instructional), evaluate the effectiveness to maintain oral hygiene, and assist the

implementation of research studies in obtaining the latest information on the formation and incidence of dental plaque, the effectiveness of specialized tools for controlling dental plaque and anti-plaque agents.<sup>27</sup> Many dentists (30,5%) stated that the benefits of plaque disclosing agents are for detecting leukoplakia. This statement is not correct because plaque disclosing agents is not used directly to detect leukoplakia. Based on an in vitro study by Garg (2012) stated that erythrosine could be used as a photosensitizing agent in localized tumors for photodynamic therapy (PDT), which cannot detect cancer cells directly but needs to be activated using light with a suitable wavelength for tumor cell destruction.<sup>28</sup> The results showed that dentists (61,9%) were aware of the disadvantages of plaque disclosing solutions, and dentists (38,1%) considered these solutions expensive and difficult to obtain. According to Jocelin (2012), the requirements for plaque disclosing agents must be cheap, accessible, efficient, reproducible, with high sensitivity and specificity, and able to report accurate results.<sup>29</sup> Especially in Indonesia, plaque disclosing solution can be prepared from food coloring that is quite affordable and accessible.<sup>30</sup>

Knowledge of the dosage of use of plaque disclosing agents is important. This study found that only 9.5% dentists answered the dose correctly, and 90.5% of them responded with the dose of plaque disclosing tablets of 1-20 mg. Citing to Block (1971), the dosage for plaque disclosing solution can vary from about 600-1200 mg per 100 ml of water. While plaque disclosing tablets and plaque disclosing wafers have the exact dosage of 20-100 mg.<sup>31</sup> The composition and the important features of plaque disclosing agents is essential to be known by dentists. Such as, the staining should last for a long time, so it should not be easily rinsed off with the usual rinsing method, especially if exposed to saliva; it should not irritate the oral mucosa or other body tissues; has a relatively low level of viscosity that making it easy to apply to the narrow gaps of the teeth, but thick enough to provide an intensive color to the plaque; the intensity must be higher than gingiva so that the contrast between the plaque and the normal color of the surrounding oral cavity can be seen; has a pleasant taste and comfortable; water-soluble; and biocompatible.<sup>11</sup> The results of this study found that dentists (33.3%) knew the essential of disclosing agents.

In contrast, dentists (66.7%) could not answer correctly by assuming that disclosing agents has a short staining duration.

Attitude can be interpreted as a tendency to behave in certain patterns that come from within as a result of feelings and attitudes towards an object. Attitudes measurement techniques in this study, can be broadly categorized into two, including a positive attitude that tends to agree or strongly agrees with something and a negative attitude predispose to disagree or strongly disagree toward the object.<sup>32</sup> The description of the dentist's attitude towards plaque disclosing agents can be seen in table 2. Most dentists have a positive attitude by answering strongly agree (60%) and agree (34%) on the critical role of using plaque disclosing agents. The benefits of plaque disclosing agents including the easy way of detecting plaque, which also received a strongly agreed-upon response of up to 81% and strongly disagreed only by 1% respondents. Dentists' attitudes towards plaque disclosing agents can motivate patients to maintain dental and oral hygiene, which received a strongly agreed response of up to 81.4% and strongly disagreed by 0.5%. The results of these 3 items are in accordance with the research conducted by Peker (2011) regarding the positive attitudes of dental students towards plaque disclosing agents to maintain dental and oral health.<sup>33</sup> Based on the results of this study, many dentists have difficulties obtaining disclosing agents in their area. The availability of various brands and dosage forms of plaque disclosing agents received a positive response which was relatively low, below 32%. This result is consistent with Handayatun (2020) that it is difficult to find plaque disclosing agents in Indonesia.<sup>30</sup> However, it is not in line with this study because it is available at e-commerce and many alternatives materials are available that can be used for disclosing agents.<sup>26,34</sup>

Half of respondents (48.6%) strongly agree, and 36.2% dentists agree with disadvantages of plaque disclosing solution, which is difficult to control, and it is consistent with the statement by Dixit (2019) that the plaque disclosing solution is time-consuming, messy, and unpredictable.<sup>35</sup> In addition, there are side effects of disclosing agents containing erythrosine and fluorescein, which are cytotoxic to the oral mucosal epithelium that in long term can cause thyroid and liver cancer and

may harm the environment, which is difficult to dispose of the waste.<sup>36</sup> The results of this study show that only 9.5% dentists were aware and strongly agreed on the side effects of disclosing agents. However, apart from the side effects of disclosing agents, the development of these materials and the use of plaque disclosing agents have been highly advanced. Nowadays, disclosing agents are used to identify dental plaque, but many studies have explained its additional function to assess the risk of dental caries.

The caries risk assessment was conducted by identifying cariogenic microorganisms using a three-tone plaque stain to identify old plaque. This material has 3 different dyes including Rose Bengal, Brilliant Blue, and FCF, which will respond selectively from pH based on the acid production produced by plaque and mixed with a dye solution containing glucose to detect plaque age.<sup>37</sup> Moreover, a recent study stated the use of a disclosing agents to assist photodynamic therapy (PDT) in identifying the *Streptococcus* sp. and *Porphyromonas* sp. bacteria. PDT is an alternative method for treating certain types of cancer and neurovascular age-related macular degeneration. This therapy is also considered to have no serious side effects and can be repeated as well as can be used for sterilization.<sup>38</sup> Plaque disclosing agents containing photosensitizers such as Rose Bengal, Erythrosine, Toluidine, and Methylene Blue can be used for PDT.<sup>39</sup> The results of this study showed that 32.9% dentists strongly agree and 48.1% dentists agree.

Based on the stimulus-response, behavior can be divided into two, which include covert behavior, a response or reaction to a stimulus that is still limited to perception, attention, knowledge or awareness and cannot be clearly observed by others; and overt behavior, the stimulus is clear in practice and easy to observe by others. This study does both and its measurement is through recall which is conducted indirectly through questions to individuals about actions or activities.<sup>40</sup> Based on table 4, the implementation of dental practice regarding the use of disclosing agents, it was found that half of the respondents (51%) performed it. In comparison, 49% dentists did not apply any disclosing agents. While the majority of respondents (87.4%) found the benefits of

disclosing agents and only 12.4% of them did not. The results of this study are consistent with the research conducted by Balabaskaran (2013) with the ratio of dentists using plaque disclosing agents of 62%, and 38% of dentists have abandoned their use.<sup>17</sup>

After assessing the score and conducting the univariate test, the frequency distribution of each variable was found in two categories listed in Table 6. Dentists' knowledge of disclosing agents was in the high category of 42% and the low category of 58%. The low proportion of dentist knowledge is in line with the research of Namrata (2019), which states that dentists (67%) have low level of knowledge. The lack of provision of studies at preclinical and clinical trials of disclosing agents to maintain dental and oral health can be one factor for this to occur.<sup>16</sup> The overview of dentists' attitudes towards plaque disclosing agents is good by 58%, and there are still poor attitudes by 42%. This poor attitude is mostly obtained from the dentists' lack of knowledge about the disadvantages, availability, and side effects of plaque disclosing agents. Meanwhile, many theories state this, as discussed in the previous paragraph. This good attitude is manifested in the good response of dentists who are differentiated or formed in individual attitudes due to having knowledge, experience, intelligence, and individual abilities.<sup>41</sup> Respondents who performed tooth prophylaxis using plaque disclosing agents with a good category is 51%, and the poor category is by 49%. The results of this study are higher when compared to study conducted by Al-ak M (2020), that only 40.7% of dentists use plaque dye every time they detect plaque.<sup>42</sup>

Based on the results of the cross-tabulation in table 7, it can be seen that dentists who have high knowledge are in accordance with the attitude and practice variables. Highly knowledgeable dentists will have a good attitude by 56% and have a good practice by 53%. This is consistent with the low knowledge of dentists that will have a bad practice category that is equal to 51%. However, the results of low knowledge on bad attitudes showed different results by 41%. Knowledge, attitudes, and practices of dentists on the use of disclosing agent materials will significantly affect the dental and oral hygiene of the community, especially on periodontal health status.

We expect to find good knowledge,

attitude and practice among dentists towards this special aid in showing the patient about their plaque accumulation, but in fact we still have to educate and encourage dentists even in this particular area in West Java, Indonesia, despite their more advance practice compared to other provinces in Indonesia.

However, this study has limitations, the description of knowledge, attitudes, and practice variables using a research instrument in the form of a recall questionnaire to be prone to bias. In addition, purposive sampling with the criteria determined by the researcher is subjective, and the sample measurement is not critical and has a limited time so that it is less representative of the research population. Suggestions for further research are to increase the variety of respondent's characteristics, doing observations that include the separation between routine and non-routine users of disclosing agents, knowing the reasons and purpose of using disclosing agents, observed several dental practices to represent samples in data collection.

### Conclusions

The level of knowledge of most dentists on disclosing agents is in a low category, especially on the dose and method of use. However, the majority of dentists have a positive attitude and practice towards disclosing agents, which is categorized as good. Highly knowledgeable dentists have good attitudes and practices towards disclosing agents. It is important to give more education and encouragement via continuing dental education to all dentist in this particular issue of revealing dental plaque accumulation and increasing patient motivation.

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### Declaration of interest

The authors report no conflict of interest.

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