Volume 07, Issue 05 (September-October 2024), PP 79-86 **www.ijmsdr.org**
ISSN: 2581-902X

International Journal of Medical Science and Dental Research

The relationship between dental health behavior and dental health status in patients with diabetes mellitus

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Abstract: Systemic diseases such as diabetes mellitus are one of the risk factors for dental caries. People with diabetes mellitus have reduced saliva so that food sticks to the surface of the teeth, and if the food that sticks is from the carbohydrate group mixed with germs on the surface of the teeth and is not immediately cleaned, it can cause acidity in the mouth to decrease, which can lead to dental caries. Worse in people with diabetes, they generally rarely clean their teeth, this is because it is to avoid ulceration of the gums. Because when brushing their teeth, patients complain that their gums bleed easily. So these patients choose other alternatives, namely only using mouthwash such as regular mouthwash without brushing their teeth again, this is very important in maintaining dental health behavior in people with diabetes mellitus. **Purpose**: The study aims to analyze the relationship between dental health behavior and dental health status in patients with diabetes mellitus. **Method:** This type of research is descriptive analytical with a cross-sectional design. The population in the study were patients with type 2 diabetes mellitus who underwent treatment at the Dentica Pondok Labu dental clinic, South Jakarta. The sampling method was purposive sampling that met the inclusion and exclusion criteria. Data collection was obtained through a questionnaire of knowledge, attitudes and actions and examination of dental caries status, periodontal dental hygiene. As for data analysis with the chi-square test. **Results:** The results of the chi-square test obtained both knowledge, attitudes and actions towards dental caries status, dental hygiene status and periodontal tissue status with a p value <0.05. **Conclusion** : There is a relationship between dental health behavior and health status in patients with diabetes mellitus.

Keywords - *behavior; dental health status; patients; diabetes mellitus.*

I. INTRODUCTION

Caries and periodontal disease are two dental and oral diseases that are major problems for dental and oral health in Indonesia. This is proven by the results of the 2018 Basic Health Research showing that the prevalence of caries in the 35-44 year age group was 92.2% and the prevalence of periodontal disease was 77%.[1, 2]

The prevalence of caries tends to increase with age, which means there is a tendency for a decrease in dental health status with increasing age. Age and gender are factors that can affect the incidence of dental caries. Several studies have shown that the prevalence of dental caries in women (59.1%) is higher than in men (40.9%), other studies have shown a greater difference between women (65.5%) and men (34.5%) meaning that

the incidence of dental caries can be influenced by age, where the older the age, the higher the incidence of caries.[3, 4]

Systemic diseases such as diabetes mellitus are one of the risk factors for dental caries. Diabetes mellitus is a chronic disease, with typical signs of increased glucose levels in the blood and urine.[5, 6] Diabetes mellitus sufferers in 2011 had reached 366 million people, and are estimated to increase to 552 million in 2030. Strengthened by the results of the 2013 Basic Health Research, the proportion of the Indonesian population aged ≥ 15 years with diabetes mellitus in 2013 was 6.9% spread across urban (7%) and rural (6.8%) areas and was more common in women (7.7%) compared to men (5.6%).[7, 8]

Common oral complications in diabetes mellitus are periodontitis, dry mouth, and dental caries. Diabetes Mellitus is a predisposing factor for the increase in the occurrence and number of caries. This condition is thought to be because in diabetes the blood flow contains a lot of glucose which acts as a cariogenic substrate. In patients with diabetes mellitus it is known that the amount of saliva decreases so that food sticks to the surface of the teeth, and if what sticks is food from the carbohydrate group mixed with germs on the surface of the teeth and is not immediately cleaned, it can cause acidity in the mouth to decrease, which can result in dental caries.[9–11]

Previous research results showed that most diabetics, namely 74%, had high caries levels. Another study proved that diabetics had a very high caries index of 82% and high caries of 14%.[9, 12] Preventive measures such as regular proper brushing, flossing, and regular visits to the dentist should be observed, all of which will not only prevent so many complications due to diabetes but will also reduce the morbidity rate due to oral manifestations of diabetes sufferers. In addition, the behavior of Diabetes Mellitus sufferers in maintaining dental and oral health is also very important to note, where the treatment depends on a number of factors both from the dentist and the sufferer of this disease.[13]

II. METHODS

This type of research is descriptive analytical with cross-sectional design. The population in the study were patients with type 2 diabetes mellitus who underwent treatment at the Dentica Pondok Labu dental clinic, South Jakarta. The sampling method was purposive sampling that met the inclusion and exclusion criteria, with a total of 61 respondents. The research instrument used to measure the knowledge and attitudes of elderly patients was a knowledge questionnaire consisting of 10 questions and an attitude questionnaire consisting of 10 questions and an action questionnaire consisting of 10 questions, the correct answer was given a score of 1 and the wrong answer was given a score of 0. The standard for assessing knowledge is good knowledge: if the correct answer is scored > mean and poor knowledge: if the correct answer is scored <mean. The attitude questionnaire instrument uses a Likert scale, good attitude assessment: if the correct answer is scored > mean and poor attitude: if the correct answer is scored <mean. good action assessment: if the correct answer is scored > mean and poor action: if the correct answer is scored <mean. Meanwhile, the instrument for measuring the DMF-T index is the DMF-T index measurement form, as follows: high caries if it has caries > 1 and low caries if it has caries < 1. The Dental Hygiene Status Instrument is measured with the OHI-S Index and Periodontal Tissue Status is measured with CPITN. As for data analysis with the chi-square test.

III. RESULT

Table 1. Frequency distribution of respondent characteristics

Respondent characteristics	Frequency	Persentage (%)
Age		
< 60 years	7	11,5
≥ 60 years	54	88,5
Gender		
Male	33	54,1
Female	28	45,9
Education		
College	4	6,6
High school	47	77,0

Junior school	10	16,4
Type diabetes mellitus		
DM type I	0	0
DM type II	61	100

Table 1 shows that respondents were mostly aged ≥ 60 years, male, with a high school education level and had a history of type II diabetes mellitus.

Table 2. Frequency distribution of knowledge, attitudes and actions of diabetes mellitus patients

Variable	Frequency	Persentage (%)
Knowledge		
Good	11	18,0
Poor	50	82,0
Attitudes		
Good	14	23,0
Less	47	77,0
Actions		
Good	5	8,2
Less	56	91,8

Table 2 shows that most respondents have knowledge, attitudes and actions to maintain dental health that are less than adequate.

Table 3. Frequency distribution of dental health status in diabetes mellitus patients

Variable	Frequency	Persentage (%)
Dental caries status		
Low	6	9,8
High	55	90,2
Dental hygiene status		
Good	4	6,6
Moderate	35	57,4
Bad	22	36,1
Periodontal tissue status		
Good	9	14,8
Poor	52	85,2

Table 3 shows that the majority of respondents have high criteria for dental caries status, medium criteria for dental hygiene status and poor criteria for periodontal tissue status.

Table 4. Statistical test of the relationship between knowledge and dental caries status

No	Knowledge	Dental caries status				Total		*p-value*
		Low		High				
		f	**%**	**f**	**%**	**f**	**%**	
1	Good	6	9,8	5	8,2	11	18,0	0,000
2	Poor	0	0	50	82,0	50	82,0	
	Total	6	9,8	55	90,2	61	100	

Table 4 shows that respondents with good knowledge with low dental caries status were 6 people (9.8%) and high dental caries status were 5 people (8.2%) while respondents with poor knowledge with high dental caries status were 50 people (82%) and there were no respondents with poor knowledge with high dental caries status. The test results obtained a p-value of 0.000 ($p < 0.05$) which means there is a relationship between dental health knowledge and dental caries status in diabetes mellitus patients.

Table 5. Statistical test of the relationship between knowledge and dental hygiene status

No	Knowledge	Dental Hygiene Status						Total		*p-value*
		Good		Moderate		Poor				
		f	**%**	**f**	**%**			**f**	**%**	
1	Good	4	6,6	6	9,8	1	1,6	11	18,0	0,000
2	Less	0	0	29	47,5	21	34,4	50	82,0	
	Total	6	4	6,6	22	36,1	35	57,4	61	

Table 5 shows that respondents with good knowledge with good dental hygiene status numbered 4 people (6.6%), moderate dental hygiene status numbered 6 people (9.8%) and poor dental hygiene status numbered 1 person (1.6%) while respondents with poor knowledge with moderate dental hygiene status numbered 21 people (34.4%), poor dental hygiene status numbered 29 people (47.5%) there were no respondents with poor knowledge with good dental hygiene status. The test results obtained a p-value of 0.000 ($p < 0.05$) which means there is a relationship between dental health knowledge and dental hygiene status in diabetes mellitus patients.

Table 6. Statistical test of the relationship between knowledge and periodontal tissue status

No	Knowledge	Periodontal tissue status				Total		*p-value*
		Good		Poor				
		f	**%**	**f**	**%**	**f**	**%**	
1	Good	6	9,8	5	8,2	11	18,0	0,026
2	Poor	0	0	50	82,0	50	82,0	
	Total	6	9,8	55	90,2	61	100	

Table 6 shows that respondents with good knowledge with good periodontal status numbered 4 people (6.6%) and poor periodontal status numbered 7 people (11.5%) while respondents with poor knowledge with good periodontal status numbered 5 people (8.2%) and poor periodontal status numbered 45 people (73.8%). The test results obtained a p-value of 0.026 ($p < 0.05$) which means there is a relationship between dental health knowledge and periodontal status in diabetes mellitus patients.

Table 7. Statistical test of the relationship between attitude and dental caries status

No	Attitude	Dental caries status				Total		*p-value*
		Low		High				
		f	**%**	**f**	**%**	**f**	**%**	
1	Good	5	8,2	9	14,8	14	23,0	0,000
2	Poor	1	1,6	46	75,4	47	77,0	
	Total	6	6	9,8	55	90,2	61	

Table 7 shows that respondents with good attitudes with low dental caries status numbered 5 people (8.2%) and high dental caries status numbered 9 people (14.8%) while respondents with poor attitudes with high dental caries status numbered 47 people (77%) and respondents with poor attitudes with low dental caries status numbered 1 person (1.6%). The test results obtained a p-value of 0.000 ($p < 0.05$) which means there is a relationship between dental health attitudes and dental caries status in diabetes mellitus patients.

Table 8. Statistical test of the relationship between attitude and dental hygiene status

No	Attitude	Dental Hygiene Status						Total		*p-value*
		Good		Moderate		Poor				
		f	**%**	**f**	**%**	**f**	**%**	**f**	**%**	
1	Good	4	6,6	8	9,8	2	3,3	14	23,0	0,000
2	Less	0	0	27	44,3	20	32,8	47	77,0	
	Total	6	4	6,6	35	57,4	22	36,1	61	

Table 8 shows that respondents with good attitudes with good dental hygiene status numbered 4 people (6.6%), moderate dental hygiene status numbered 8 people (9.8%) and poor dental hygiene status numbered 2

people (3.3%) while respondents with poor attitudes with moderate dental hygiene status numbered 35 people (57.4%), poor dental hygiene status numbered 22 people (36.1%) there were no respondents with poor attitudes with good dental hygiene status. The test results obtained a p-value of 0.000 (p <0.05) which means there is a relationship between dental health attitudes and dental hygiene status in diabetes mellitus patients.

Table 9. Statistical test of the relationship between attitude and periodontal tissue status

No	Attitude	Periodontal tissue status				Total		*p-value*
		Good		Poor				
		f	%	f	%	f	%	
1	Good	4	6,6	10	16,4	14	23,0	0,047
2	Poor	5	8,2	42	68,9	47	77	
Total		6	9	14,8	52	85,2	61	

Table 9 shows that respondents with good attitudes with good periodontal status numbered 4 people (6.6%) and poor periodontal status numbered 10 people (16.4%) while respondents with poor attitudes with good periodontal status numbered 5 people (8.2%) and poor periodontal status numbered 42 people (68.9%). The test results obtained a p-value of 0.047 (p <0.05) which means there is a relationship between dental health attitudes and periodontal status in diabetes mellitus patients.

Table 10. Statistical test of the relationship between action and dental caries status

No	Action	Dental caries status				Total		*p-value*
		Low		High				
		f	%	f	%	f	%	
1	Good	4	6,6	1	1,6	5	8,2	0,000
2	Poor	2	3,3	54	88,5	56	91,8	
Total		6	6	9,8	55	90,2	61	

Table 10 shows that respondents with good actions with low dental caries status were 4 people (6.6%) and high dental caries status was 1 person (1.6%) while respondents with less actions with high dental caries status were 55 people (90.2%) and respondents with less actions with less dental caries status were 2 people (3.3%). The test results obtained a p-value of 0.000 (p <0.05) which means there is a relationship between dental health actions and dental caries status in diabetes mellitus patients.

Table 8. Statistical test of the relationship between action and dental hygiene status

No	Action	Dental Hygiene Status						Total		*p-value*
		Good		Moderate		Poor				
		f	%	f	%	f	%	f	%	
1	Good	3	4,9	1	1,6	1	1,6	5	8,2	0,000
2	Less	1	1,6	34	55,7	21	34,4	56	91,8	
Total		6	4	6,6	35	57,4	22	36,1	61	

Table 11 shows that respondents with good actions with good dental hygiene status numbered 3 people (4.9%), moderate dental hygiene status numbered 1 person (1.6%) and poor dental hygiene status numbered 1 person (1.6%) while respondents with poor actions with moderate dental hygiene status numbered 34 people (55.7%), poor dental hygiene status numbered 21 people (33.3%) and there was 1 person (1.6%) with poor actions with good dental hygiene status. The test results obtained a p-value of 0.000 (p <0.05) which means there is a relationship between dental health actions and dental hygiene status in diabetes mellitus patients.

Table 12. Statistical test of the relationship between a action and periodontal tissue status

No	Action	Periodontal tissue status				Total		*p-value*
		Good		Poor				
		f	%	f	%	f	%	
1	Good	3	4,9	2	3,3	5	8,2	0,003
2	Poor	6	9,8	50	82,0	56	91,8	
Total		6	9	14,8	52	85,2	61	

Table 12 shows that respondents with good actions with good periodontal status numbered 3 people (4.6%) and poor periodontal status numbered 2 people (3.3%) while respondents with poor actions with good periodontal status numbered 6 people (9.8%) and poor periodontal status numbered 50 people (82%). The test results obtained a p-value of 0.003 ($p < 0.05$) which means there is a relationship between dental health actions and periodontal status in diabetes mellitus patients.

IV. DISCUSSION

Oral health behavior is influenced by various factors. One of them is the lack of knowledge of oral health. Knowledge is a very important domain for the formation of a person's behavior. Behavior is formed from knowledge which then stimulates attitudes and actions.[14, 15] The results of the study showed that knowledge of dental caries status, dental hygiene status and periodontal tissue status with $p < 0.05$ which means there is a relationship between dental health knowledge and dental caries status, dental hygiene status and periodontal tissue status in patients with diabetes mellitus. Low knowledge in patients with diabetes mellitus can cause poor dental health status, as evidenced by the majority of respondents having high criteria for dental caries status, moderate criteria for dental hygiene status and less criteria for periodontal tissue status.

Lack of knowledge about dental and oral health in people with diabetes mellitus can be a major factor in low behavior, because behavior is formed from knowledge which then stimulates attitudes and actions. Factors that influence knowledge include the level of education.[16–18] In addition, one of the causes of poor knowledge is limited access to information. One of the factors that influences knowledge is the level of education, in this study it was found that the majority were high school graduates. Level of education influences their ability to think, a person will think more rationally and be able to explain in capturing information, one of which is influenced by the level of education. One of the factors that influences education is external factors, namely information, social, cultural and environmental. Knowledge is not only obtained from the level of education taken but is also supported by information received, for example from the mass media, newspapers, magazines, the internet, television. Motivation also affects a person's knowledge, because it will increase curiosity about something, increasing curiosity will motivate a person to seek sources of information.[19, 20]

Knowledge is a predisposing factor that influences health behavior and a person's or community's behavior about health is determined by knowledge, to behave healthily knowledge is needed. For example, regular dental health checks, knowledge is needed about the benefits of regular dental checks. Knowledge is the result of knowing, and this happens after people sense a particular object. Knowledge or cognitive is a very important domain in shaping a person's actions (overt behavior). Experience and research prove that behavior based on knowledge will be more lasting than behavior that is not based on knowledge.[20]

The results of the statistical test of the attitude of diabetes mellitus patients with dental health status showed that attitudes towards dental caries status, dental hygiene status and periodontal tissue status with $p < 0.05$ which means there is a relationship between dental health attitudes and dental health status in diabetes mellitus patients. Attitudes are formed due to stimulation from knowledge. Knowledge, thoughts, beliefs and emotions play a very important role in determining attitudes. Poor attitudes are caused by poor knowledge, so that the attitudes of respondents who are included in the category of lacking in maintaining dental and oral health are caused by the lack of respondent knowledge about maintaining dental and oral health.[21, 22]

Attitude is a positive evaluation, meaning that if the evaluation result is positive then someone will tend to approach the object, for example the evaluation result conducted by someone regarding the benefits of gargling with mouthwash, it turns out that the benefits of gargling can increase self-confidence in socializing and help clean the mouth, then the person will agree to gargle. It is explained that attitude is a reaction of someone who is still closed to a certain stimulus or object, which already involves the factors of opinion and emotion concerned.[20]

The results of statistical tests on dental health maintenance actions of diabetes mellitus patients with dental health status showed that actions on dental caries status, dental hygiene status and periodontal tissue status with $p < 0.05$, which means there is a relationship between dental health actions and dental health status in diabetes mellitus patients. This is in accordance with the theory that states that the actions taken by a person are based on their attitude. A poor attitude will form poor actions.[23] This is also in line with the theory that states

that an action is not automatically realized if a real difference from the action requires supporting factors or a condition that allows it, including facilities and also requires support factors from other parties.[20]

The results of the study showed that the dental caries status of patients with diabetes mellitus was higher. The findings of this study support the theory that states that the high incidence of caries in people with diabetes mellitus is due to the inability to control blood glucose which results in high levels of glucose in saliva, especially people with diabetes mellitus who rarely or even clean debris or food scraps that stick to the surface of their teeth. The food scraps that stick then mix with bacteria in the oral cavity, especially Streptococcus which causes the formation of thick plaque. Debris that has mixed with bacteria and causes plaque will lower the pH of saliva. The results above are not much different when compared to the results of other studies which show that patients with diabetes mellitus who have moderate criteria for dental caries status are 2 people (4%), high criteria for dental caries status are 7 people (14%) and very high criteria are 41 people (82%).[9, 12]

The results of the study showed that the dental hygiene status of patients with diabetes mellitus was included in the moderate criteria and even tended to be poor. There are several mechanisms that play a role in the increased risk of poorer oral hygiene in patients with DM. Increased sugar levels in gingival crevicular fluid and saliva can be a stimulus for increased growth of fungal and bacterial colonies such as Mutans streptococcus and lactobacilli in the oral cavity which then increases the risk of DM patients experiencing caries. In addition, microvascular complications of DM in the form of peripheral neuropathy can cause salivary dysfunction which results in xerostomia, which is one of the risk factors for plaque formation on the teeth.[24, 25]

The results of the study showed that the status of the dental tissue of patients with diabetes mellitus was included in the criteria of lacking. Periodontal disease is a condition and degeneration of soft tissue and bone supporting teeth and is chronic, cumulative, and progressive. Etiological factors in periodontal disease include bacteria in plaque, calculus, white matter, and food debris. However, some systemic diseases such as diabetes mellitus and certain disorders can reduce or change the host's defense and response. Uncontrolled diabetes mellitus can weaken the immunity of periodontal tissue, conversely untreated periodontal disease will worsen blood sugar balance so that periodontal tissue damage will occur. Patients with diabetes mellitus have a fairly high prevalence of experiencing periodontal tissue damage. Periodontal tissue damage will be worse if the patient does not have good knowledge and behavior to maintain dental and oral health. Good knowledge and behavior about the importance of maintaining dental and oral health will reduce and even prevent the side effects of diabetes mellitus for sufferers. Along with the increasing number of diabetes mellitus sufferers and the importance of dental and oral health, especially periodontal tissue in patients with diabetes mellitus.[5, 26]

V. CONCLUSION

on the results of the study, it can be concluded that there is a relationship between dental health behavior and health status in patients with diabetes mellitus.

Acknowledgments

The authors thank Health Polytechnic of Jakarta I, all participants and research assistants for funding this research.

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