Overview of oral hygiene and knowledge of dental and oral health in diabetes mellitus patients at Puskesmas Lampa, Duampanua, Pinrang

Gambaran kebersihan gigi dan mulut serta pengetahuan tentang kesehatan gigi dan mulut pada pasien diabetes melitus di Puskesmas Lampa, Duampanua, Pinrang

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ABSTRACT
To determine the description of oral hygiene and knowledge level and the relationship between knowledge level and oral hygiene with periodontal status of diabetes mellitus (DM) patients at Lampa Health Centre, Duampanua, Pinrang. Samples were determined based on inclusion criteria, namely outpatients diagnosed with type 1 or 2 DM aged ≥8 years, and willing to become research subjects. At the initial stage, knowledge about the relationship between DM and oral health was measured using a questionnaire. The implementation of activities began with DHE using leaflets and banner stands, plaque control using disclosing agents and initial therapy in the form of scaling root planing in people with DM who experience periodontal disease. Oral hygiene status was assessed using OHI-S and periodontal disease status was assessed using Periodontal Diseases Index. The relationship between knowledge level and OHI-S and periodontal status was analysed using Kolmogorof Smirnof test ($p < 0.05$). Patients with poor GDS/GDP scores had poor OHI-S status and poor periodontal status. All study subjects had problems in their supporting tissues, 50% gingivitis and 50% periodontitis. It is concluded that there is a relationship between the level of knowledge with OHI-S status and periodontal status in DM patients at Puskesmas Lampa, Duampanua, Pinrang.
Keywords: diabetes mellitus, oral hygiene, OHI-S, Periodontal Diseases Index, periodontal status

ABSTRAK
Untuk mengetahui gambaran kebersihan mulut dan tingkat pengetahuan serta hubungan antara tingkat pengetahuan dan kebersihan mulut dengan status periodontal pasien diabetes melitus (DM) di Puskesmas Lampa, Duampanua, Pinrang. Sampel ditentukan berdasarkan kriteria inklusi, yaitu pasien rawat jalan yang terdiagnosis DM tipe 1 atau 2 berusia ≥8 tahun, dan bersedia menjadi subjek penelitian. Pada tahap awal dilakukan pengukuran pengetahuan mengenai hubungan DM dan kesehatan gigi dan mulut dengan menggunakan kuesioner. Pelaksanaan kegiatan diawali dengan pendidikan kesehatan gigi dan mulut (DHE) menggunakan leaflet dan *stand banner*, kontrol plak menggunakan *disclosing agent* dan melakukan terapi awal berupa *scaling root planing* pada penyandang DM yang mengalami penyakit periodontal. Status kebersihan mulut dinilai dengan menggunakan OHI-S dan status penyakit periodontal dinilai dengan menggunakan *Periodontal Diseases Index*. Didapatkan hubungan antara tingkat pengetahuan dengan OHI-S dan status periodontal dianalisis menggunakan uji Kolmogorof Smirnof ($p < 0,05$). Pasien dengan skor GDS/GDP yang buruk memiliki status OHI-S yang buruk dan status periodontal yang buruk. Semua subjek penelitian bermasalah pada jaringan pendukungnya, 50% gingivitis dan 50% periodontitis. Disimpulkan bahwa ada hubungan antara tingkat pengetahuan dengan status OHI-S dan status periodontal pada pasien DM di Puskesmas Lampa, Duampanua, Pinrang.
Kata kunci: diabetes melitus, kebersihan mulut, OHI-S, *Periodontal Diseases Index*, status periodontal

INTRODUCTION

Health according to the WHO is a condition that perfect both physically, mentally, socially and even free from disease or disability.[1] A person's health is not only assessed by general health but also includes dental and oral health. Oral cavity is a window to general health, which is why the cliche appears "*You cannot have good general health without good oral health.*"[2] The oral cavity is home to a diverse group of microorganisms consists of bacteria, fungi and viruses which play an important role in maintaining oral and systemic health. When the balance of the oral microbiota is disturbed, active pathogens will avoid it. Host immune response produces a variety of systemic responses disease. This condition is known as *microbial dysbiosis*.[2] Disruption of the microbiota balance will result in the risk of various systemic diseases, one of which is diabetes mellitus.[3]

Diabetes mellitus (DM) is a chronic endocrine metabolic disease with a multifactorial and heterogeneous substrate characterized by high blood glucose levels. It usually occurs when pancreas does not produce enough insulin or when the body is unable to use the insulin it produces effectively, or when both conditions are experienced by the patient.[4] Diabetes is called the *silent epidemic* and is a serious public health problem because it reportedly accounts for 9% of deaths worldwide.[5] DM can attack adults, teenagers and children.[6] There are two main types of DM, type 1 and type 2, with several less common secondary types.[7] Type 2 DM is the most common form of DM, and accounts for 90-95% of all cases diagnosed in adults.[7] People with type 2 DM often don't realize they have the disease until severe symptoms or complications occur.[8]

There are no specific oral lesions associated with DM but long-term hyperglycemia can have oral manifestations, such as a burning sensation in the oral mucosa, xerostomia, dental caries, and periodontal disease (gingivitis and periodontitis) which can cause a person to lose teeth.[9] Diabetes and periodontitis have a *two-way* relationship where one affects the other.[6] The effect of DM on the periodontium has long been studied but it is still difficult to draw definite conclusions about the specific effects of DM on the periodontium. There are no typical phenotypic features in periodontitis accompanied by DM.[10] Periodontitis as a cause of diabetes is not unique, but DM is a predisposing factor that can have an impact on the

development of periodontitis.[10] The most striking changes in patients with uncontrolled DM are a decrease in defense mechanisms and an increase in susceptibility to infection, causing periodontal disease to become more destructive.[11,12] Much evidence exists regarding specific mechanistic pathways in the pathogenesis of periodontitis in patients with DM.[10] According to the new classification of periodontitis, the level of glycemic control in diabetic patients influences the grading of periodontitis.[10]

Proper oral hygiene can reduce inflammation and slow periodontal degradation in patients with DM. Visiting the dentist and brushing your teeth regularly can reduce the prevalence of periodontitis by 34%, whereas poor OH can increase the risk of periodontitis by 2-5 times.[13,14] The prevalence of periodontitis can be reduced by providing education to high-risk communities as one of the foundations of disease control.[15] Data shows that DM sufferers do not receive enough information regarding the increased risk of oral disorders and the relationship between DM and periodontal disease.[16] Health promotion refers to empowering individuals and communities to better control factors that can influence health and improve health status. One of the principles of the *Ottawa Charter* is to promote individual health and skills, such as cleaning teeth and mouth, increasing knowledge, strengthening hygienic behavior, and developing a sense of participation, cooperation, and support.[17]

The 2018 Riskesdas report on the prevalence of DM based on doctor's diagnosis in residents of all ages in South Sulawesi Province is 1.3% with a total population of 50,127 people and for Pinrang district with a percentage of 1.02% with a total population of 2.142 people.[18] Referring to the data,[19] the people of Pinrang district had problems with their periodontal tissue, such as swollen gums or pus discharge at 14.84% and 15.24% of gums bleed easily. Treatment for treating periodontal problems is also very small, namely tartar cleaning 0.94% and gum or periodontal treatment 0.28%.[19] Based on these data, it can be assumed that it is likely that the public does not understand the problem of periodontal disease because there are no complaints in the early phase of the disease. Apart from that, referring to data on treatment of dental and oral problems, drug treatment and tooth extraction are the most common treatments, 57.47% and 13.28%.[19] People with missing teeth due to extraction or loss themselves have a percentage of 26.16%.[19] Periodontal disease is likely to play a role as one of the factors causing tooth loss in Pinrang district. Apart from that, data was also obtained that almost all people brush their teeth every day, namely 93.65%, but only 3.62% brush their teeth at the correct time (after breakfast and before bed).[19] Based on these data, it can be concluded that the people of Pinrang district still have very minimal knowledge regarding periodontal disease, treatment and maintaining proper oral hygiene.

Duampanua[20] is a sub-district in Pinrang district, at South Sulawesi which has 10 villages and 5 sub-districts. This area is also the second sub-district with the largest area and the second sub-district with the largest population, making Duampanua one of the largest sub-districts in the Regency Pinrang. Duampanua is also rich in large natural resources in its area, the diversity of the population is also very diverse in this sub-district. The government center at the sub-district level is in Lampa and the largest community activity center is in Pekkabata.

Based on the data obtained, it is known that knowledge and oral health problems, especially periodontal disease, are still very lacking in the Pinrang Regency area. Duampanua is the sub-district with the second largest area and has the largest population, so it can be used as an illustration of the dental and oral health problems of the entire Pinrang district community.

METHODS

This research was an observational study using a cross-sectional design using the population was patients who came for treatment at Puskesmas Lampa, in April-June 2024. The sampling technique used was accidental sampling, namely sampling all subjects encountered during the research and deemed suitable as data sources.[21] The sample was determined based on the inclusion criteria, namely outpatients who were diagnosed with type 1 or 2 DM at Puskesmas Lampa, Duampanua, Pinrang who were ≥8 years old, and were willing to become research subjects. Data collection was obtained through questionnaires and periodontal status examination.

The tools and materials used in this research are *informed consent sheets* and questionnaires, educational leaflets and banners, OHI-S and Periodontal Diseases Index (PDI) examination sheets, stationery, flashlights, tray, handskoen and masks, diagnostic tools, trash cans, disclosing solution, alcohol, plastic cup, water, and tissue. Research permits have been conveyed to the relevant parties. The initial stage was to measure the subject's knowledge regarding the relationship between DM and oral health using a questionnaire. The implementation of the activities began with dental and oral health education using leaflets and *banner stands*, plaque control using *disclosing agents* and conducting *initial therapy* in the form of scaling *root planing* (SRP) for people with DM who experience periodontal disease. Oral hygiene status was assessed using the OHI-S index and periodontal disease status was assessed using the PDI. Each research subject involved in the study signed *an informed consent* as agreement to take part in the research and fill out the questionnaire. Data analysis is presented in the form of a frequency distribution table.

RESULTS

Tables 1 and 2 show the percentage of respondents based on gender and age. It can be seen that almost all respondents who suffered from DM were female patients with the highest percentage aged 51-60 years.

Tables 3 and 4 show the distribution of knowledge and

Table 1 Distribution of respondents based on gender

Gender	n	%
Man	4	16.7
Woman	20	83.4
Total	24	100

Table 2 Distribution of respondents based on age

Gender	n	%
20-30	1	4.17
31-40	1	4.17
41-50	7	29.17
51-60	12	50
61-70	3	12.5
Total	**24**	**100**

Table 3 Distribution of research subjects based on assessment of dental and oral health knowledge level

Knowledge level	n	%
Good	10	41.7
Not enough	14	58.3
Total	**24**	**100**

Table 4 Distribution of oral cavity hygiene and periodontal status of research subjects

OHIS Score	Oral Hygiene Status	n	%
0-1.2	Good	6	25
1.3-3	Currently	7	29.17
3.1-6	Bad	11	45.83
PDI Score	**Peridontal Status**		
0	Healthy	0	0
1-3	Gingivitis	12	50
4-6	Peridontitis	12	50

Table 5 Distribution of OHI-S values by value (GDS/GDP)

Diabetes Mellitus (GDS/GDP)	OHI-S					
	Good		Currently		Bad	
	n	%	n	%	n	%
Good	1	4.17	2	8.33	0	0
Currently	5	20.83	5	20.83	2	8.33
Bad	0	0	0	0	9	37.5
Total	**6**	**25**	**7**	**29.17**	**11**	**45.83**

its distribution on OHI-S and PDI. Table 3 shows that the highest percentage of knowledge of research subjects with OHI-S status is 58.3%. Table 4 shows that patients suffering from DM have problems with their oral cavity, either gingivitis or peridontitis. Oral hygiene of patients with poor status had the largest percentage, namely 45,8%.

Table 5 shows the OHI-S value based on the GDS/GDP value. Research subjects with poor GDS/GDP scores tended to have OHI-S scores with poor status, namely 37,5% of all research subjects. Research subjects with moderate GDS/GDP scores had OHI-S scores with good and moderate status with the same percentage, namely 20,83% and poor at 8,33%.

The answers to the questionnaire given can be seen in Table 6 and the relationship between knowledge and OHI-S and PDI status can be seen in Table 7.

DISCUSSION

The aim of this research is to look at the oral hygiene and periodontal status of DM sufferers and to see their relationship with the level of knowledge. Diabetes is a chronic disease treatment requires a cooperative attitude sufferers should regularly control levels his blood sugar. Poor blood glucose control in DM sufferers will cause various complications such as: nephropathy, retinopathy, stroke, and coronary arteries.[22] Other studies also show that DM sufferers are 2-3 times more susceptible to periodontal disease compared to healthy people.[15,22] Several studies have also been done It is proven that there is a reciprocal relationship between periodontal disease and DM. Uncontrolled DM can cause periodontitis, otherwise periodontitis It can worsen existing diabetes.[12,22]

This study showed that the OH examined by 24 DM sufferers at Puskesmas Lampa, Duampanua, Pinrang was highest in poor OHI-S status (45,83%), followed by moderate OHI-S status (29,17%). This is in line with research conducted by Ruiz et al using the *Silness and Loe* plaque index in Brazil and Libya in 2011 which showed that cleanliness the mouths of DM sufferers are in the moderate category[23] and research conducted by Ferizi et al regarding the OH of DM sufferers was included in the poor criteria.[24] Some research suggested that people with uncontrolled DM tend to have index higher OH than controlled DM sufferers.[25,26] The research is in accordance with this research results, there is a higher OHI-S score in

Table 6 Distribution of research subjects based on dental and oral health knowledge

No	Question	Yes		No	
		n	%	n	%
1	Do you know that you must maintain oral hygiene to keep your teeth and mouth healthy?	24	100	0	0
2	Do you know that unclean teeth and mouth can be a risk factor for several oral diseases?	22	91,7	2	8,3
3	Do you know that dental and oral disease is a disorder that arises from unclean teeth and mouth?	21	87,5	3	12,5
4	Do you know that severe inflammation of the gums can lead to damage to other tissues supporting the teeth?	14	58,3	10	41,67
5	Do you know that type 2 diabetes mellitus can affect your dental and oral health?	9	37,5	15	62,5
6	Do you know that diabetes mellitus type 2 can worsen inflammation of the gums?	7	29,17	17	70,83
7	Do you know that brushing your teeth is a cheap and easy way to maintain oral hygiene?	20	83,3	4	16,67
8	Do you know that the frequency of brushing your teeth is at least 2 times a day?	20	83,3	4	16,67
9	Do you know that it is best to brush your teeth after breakfast and before going to bed at night?	15	62,5	9	37,5
10	Do you know that the best way to brush your teeth is done using a combination of methods, namely vertically, horizontally and with a roll?	0	0	24	100

Table 7 Relationship between level of knowledge and oral hygiene status and periodontal status

Knowledge	OHI-S						p value	PDI						p-value
	Good		Currently		Bad			Healthy		Gingivitis		Peridontitis		
	n	%	n	%	n	%		n	%	n	%	n	%	
Good	6	25	7	29.17	1	4.17	0.00008	0	0	12	50	2	8.33	0.0003
Bad	0	0	0	0	10	41.67		0	0	0	0	10	41.67	

*Kolmogorof Smirnof; *significant (p<0.05)*

patients with poor control or high GDP/GDS values were compared patients with good control or low GDP/GDS values. Table 5 shows that 11 people with DM had high GDP/GDS values, 9 of whom had poor OHI-S status.

The distribution of periodontal status assessed using PDI showed that all research subjects had periodontal problems, namely 50% had gingivitis and 50% had periodontitis. Table 4 shows that moderate to poor oral health status causes periodontal problems, both gingivitis and periodontitis. This is because poor blood sugar control greatly affects the health of gingival tissue in DM sufferers. Uncontrolled DM disease damages leukocyte cells[27] and the response to inflammation increases due to increased inflammatory cytokine responses[28], as a result periodontal tissue is more susceptible to infection.[27,28]

The results of the questionnaire regarding how much knowledge the research subjects with DM had regarding the effect of DM on periodontal disease can be seen in Table 6. It can be seen that 62.5% of the subjects did not know that DM disease could affect dental and oral health. The research subjects did not know that DM disease could worsen gum inflammation with a percentage of 70.83%. The knowledge of the research subjects regarding when to brush their teeth and the frequency of brushing their teeth is above 50%, so it can be concluded that the research subjects understand how to maintain oral hygiene. All research subjects also knew that dental and OH must be maintained to keep their teeth and mouth healthy, but all research subjects did not know how to brush their teeth properly using the combined method technique. Maybe this is the reason why more than 45.83% of research subjects had poor OHI-S status.

Table 7 shows the relationship between level of knowledge with OHI-S status and periodontal status. The relationship between the three was tested using *the Kolmogorof Smirnof test* and the results showed that there was a relationship between the level of knowledge and OHI-S status and the level of knowledge and periodontal status with a $p<0.05$. This is in line with research conducted on patient at home Jordan's main concern is periodontal status. The results of this study showed that 106 type 2 DM patients showed more severe periodontal disease compared to 106 non-diabetic patients.[29]

Although in this study the effect of periodontal disease on the occurrence of DM disease, it is important to know that the two have a 2-way relationship that mutually influence each other.[30] Poorly controlled DM is associated with various oral health complications. Patients with uncontrolled DM have an increased risk of infection, xerostomia and impaired wound healing.[31] Diabetic patients respond differently to bacterial plaque because increased levels of cytokines in gingival tissue and increased glucose concentrations in crevicular fluid can change bacterial composition.[30] Periodontal disease can also have systemic effects. The systemic response to periodontal disease results in an increase in inflammatory mediators such as *tumor necrotizing factor alpha* and interleukins. These inflammatory mediators may lead to increased insulin resistance and therefore make it more difficult for patients to maintain glycemic control.[30,32]

It is concluded that there is a relationship ($p<0,05$) between the level of knowledge and OHI-S status as well as a relationship between the level of knowledge and the periodontal status of DM patients at Puskesmas Lampa, Duampanua, Pinrang. Poor GDS/GDP scores (uncontrolled DM) have poor OHI-S status and experience periodontal disease, either gingivitis or periodontitis. Knowledge about the importance of oral hygiene is very good among DM sufferers but knowledge about the relationship between DM and oral health and periodontal disease is still lacking. They understand the time and frequency of brushing their teeth, but do not understand the technique of brushing their teeth. Therefore, providing education regarding the relationship between DM and periodontal disease, how to maintain oral hygiene and tooth brushing techniques is appropriate for DM patients.

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