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The Bacteria on Saliva of Diabetes Mellitus Patients in Arifin Achmad General Hospital, Riau Province

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ABSTRACT

Diabetes Mellitus (DM) is a chronic non-communicable disease often found in the community. Patients with long-standing diabetes and uncontrolled blood glucose cause high salivary glucose levels and decreased salivary flow. This can be a medium for the growth and development of bacteria that can cause discomfort and various infections in the oral cavity. This research to know the characteristics of DM patients and the description of bacteria in the saliva of DM patients. The study was conducted by consecutive sampling method on DM patients who signed the informed consent, saliva samples were taken at the Arifin Achmad General Hospital, and the Microbiology Laboratory Faculty of Medicine, Universitas Riau for in vitro culture and identification of bacteria. Data processing is done manually and reported in the form of a frequency distribution table, expressed in percentages. The characteristics of research subjects from 30 samples obtained 14 men (46.66%), 16 women (53.33%), aged 33-67 years, elementary education 3 people (10%), junior high school 0 people (0%), high school 14 people (46.66%), PT 13 people (43.33%). DM status was controlled in 24 people (80%), and in uncontrolled 6 people (20%). The types of bacteria identified were Streptococcus sp 7 samples (17.5%), Streptococcus alpha hemolytic 2 samples (5%), Negative Coagulase Staphylococcus (CNS) 15 samples (37.5%), Staphylococcus aureus 2 samples (5%), Klebsiella sp 14 samples (35%). The conclusion of the research subjects are 33-67 years old, and most are women, with high school education, and controlled DM status. The most bacteria were *Coagulase Staphylococcus (CNS*) and *Klebsiella sp*.

Keywords: Bacteria, DM Patients, Saliva

Introduction

Diabetes Mellitus (DM) is one of the chronic non-communicable diseases that are often found in the community and ranks fourth non-communicable diseases after cardiovascular disease (coronary heart disease, stroke), cancer, and chronic respiratory diseases (asthma, and chronic obstructive pulmonary disease) (Perkeni, 2021). The current prevalence of DM in the world is 285 million people and this number will continue to increase to reach 438 million people in 2030. The number of people with DM in 2030 in Indonesia is estimated to reach 21.3 million people. In Indonesia, it currently has increased from 1.5% in 2013 to 2.0% in 2018. In Riau Province, it was currently around 1.4% (Perkeni, 2021; Depkes, 2015; Kemenkes, 2018).

Patients with long-standing diabetes with uncontrolled blood glucose levels cause high levels of glucose in saliva. This can cause various health problems in the oral cavity. Currently, the oral health problem of Indonesia is 57.6% (Kemenkes, 2018). Salivary dysfunction has a significant

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effect on diabetic patients. In addition, untreated oral disease can increase the risk of poor metabolic control (Ferizi et al., 2018). According to Mohamed et al. (2013), there are implications between DM and oral dental health. Increased blood glucose levels, salivary secretions, and poor oral hygiene will affect the prevalence of caries and periodontal disease in DM patients (Gupta et al., 2014).

The study by Ferizi et all reported that the salivary buffer capacity of children with DM had a lower buffer capacity (45.0%) than children without diabetes who had a higher buffer capacity (39.4%) (Ferizi et al., 2018). Research by Lubis WH and Prakash K showed that more DM patients experienced dental caries (77.0%) with poor salivary viscosity (80.3%) and low salivary buffer in DM patients (67.2%) (Lubis & Prakas, 2019).

High levels of glucose in saliva, and low salivary buffer capacity so that reduced salivary flow can be a medium for the growth and development of bacteria that can cause discomfort and various infections in the oral cavity. The types and compositions of bacteria found in infections in the mouth are different. Bacteria that are often found in routine cultures from the oral cavity are Streptococcus alpha-hemolyticus. In addition, bacteria that have the potential to cause infection in the oral cavity are *Staphylococcus aureus, Enterococcus faecalis, Streptococcus pneumoniae, Streptococcus pyogenes, Neisseria meningitidis* and the *Enterobacteriaceae* family, Haemophilus influenza and Actinomycetes (Suchi & Praveen, 2015).

A previous study reported that bacteria that were identified in dental caries in DM patients were Gram-positive (47.4%) consisting of Streptococcus sp (26.3%), Staphylococcus areus (5.3%), Coagulase Negative Staphylococci (CNS) (15.8%), and Gram-negative (52.63%) consisted of Escherichia coli (10.53%) and Klebsiella sp (42.10%) (Endriani et al., 2020).

The number of bacteria in the saliva of DM patients facilitates the occurrence of various infections in the oral cavity of DM patients on the teeth, gingiva, periodontium, and other soft tissues. Therefore, it is important to examine the bacteria in the saliva of DM patients to prevent various infections that can occur in the oral cavity of DM patients caused by bacteria.

Based on the above background, the author aims to determine the characteristics of DM patients and the types of bacteria in the saliva of DM patients at Arifin Achmad Hospital, Riau Province.

Material and Methods

This study is a prospective descriptive study with consecutive sampling from August to October 2022. The research data comes from primary data from bacterial identification and secondary data from medical records of DM patients. The research was preceded by obtaining a research permit at the Arifin Achmad Hospital, Riau Province. DM patients who came for treatment to the internal medicine polyclinic who met the inclusion criteria and were willing to participate in the study by signing the informed consent. The patient previously rinsed his mouth with sterile distilled water and waited for about 10 minutes, the saliva was taken by the patient looking down, the spit was melted and collected in a sterile pot, then the pot was closed and taken to the microbiology laboratory for culture on blood agar and Mc. Conkey. After incubation, the bacteria were identified macroscopically, microscopically, and through other tests such as catalase, coagulase, and biochemical reactions. This research has gone through an ethical review procedure and has received a graduation statement from the research and health ethics unit of the Faculty of Medicine, University of Riau No. B/101/UN19.5.1.1.8/UEPKK/2022.

Results and Discussion

During the study period, a sample of 30 DM patients was obtained. After collecting and analyzing data from the medical records of DM patients, the characteristics of the research subjects were obtained which can be seen in Table 1.

Table 1. Characteristics of research subjects

Characteristics	Amount/ N	%
Gender		
- Male	14	46.66 %
- Female	16	53.33 %
Age		
- 33 yo -67 yo	30	100 %
Education		
- Elementary school/equivalent	3	10 %
- Junior high school/equivalent	0	0 %
- High school/equivalent	14	46.66 %
- Collage	13	43.33 %
Work		
- PNS/TNI/POLRI/Retirees	12	40 %
- Swasta	9	30 %
- Farmers/ Traders	1	3.3 %
- Housewife	8	26.66 %
DM Status		
- Controlled	24	80%
- Uncontrolled	6	20%
Total	**30**	**100**

Based on the table above, it was found that the sample aged 33 to 67 years was mostly female, with 16 samples (53.33%), high school education/equivalent as many as 14 samples (46.66%), and occupations in the form of civil servants/TNI/POLRI/retirees as many as 12 samples. (40%). The most DM status was controlled by as many as 24 people (80%).

This result is the same as the research by Hasan G et all (2013) with the highest number of DM sufferers found in women (61.0%). Based on Riskesdas (2018), it was found that the prevalence of DM was the same in terms of gender and occupation, namely 1.8% more often in women and employment as civil servants/BUMN/TNI/POLRI by 4.2% but differed in terms of the 55-64 years age group by 6.3% and 2.8% higher education level. Research reports that there are more women with DM (76.93%) than men (23.07%) and the age ranges from 39-92 years (Majbauddin et al., 2019).

The number of female DM sufferers can be caused by various factors including the influence of various hormones on women such as the hormones estrogen, progesterone, cortisol, prolactin, and placental lactogen. This hormone will affect insulin receptors in cells thereby reducing insulin affinity and increasing the risk of DM (Nurfalah et al., 2017). Saliva that has been obtained from DM patients is then cultured and identified for bacteria. The results of the identification of bacteria showed the growth of more than one type of bacteria in some research samples so the number of bacteria was 40. The results of bacterial identification can be seen in the following table 3.

Table 3. Types of bacteria in the saliva of patients with DM

Type of Bacteria	Amount / **N**	**%**
Gram-positive		
- *Streptococcus sp*	7	17.5 %
- *Streptococcus alfa*	2	5 %
- *CNS*	15	37.5 %
- *Staphylococcus aureus*	2	5 %
Gram-negative		
- *Klebsiella sp*	14	35 %
Total	**40**	**100**

Based on the table above, the most bacteria obtained were Gram-positive as many as 26 bacteria (65%) dominated by Coagulase Negative Staphylococcus (CNS) bacteria in as many as 15 samples (37.5%) followed by *Streptococcus* sp as many as 7 samples (17.5%). The Gram-negative bacteria identified were Klebsiella sp as many as 14 samples (35%).

The results of this study are the same as those of Suchi K, Praveen J, (2015) who reported the results of routine oral cultures in the form of *Streptococcus alpha-hemolyticus, Staphylococcus aureus, Enterococcus faecalis, Streptococcus pneumoniae, Streptococcus pyogenes, Neisseria meningitidis* and the *Enterobacteriaceae* family including *Klebsiella* sp.

Another study reported bacteria in dental caries that were also found in the saliva of DM patients in the form of Streptococcus sp (26.3%), *Staphylococcus areus* (5.3%), CNS (15.8%), Escherichia coli (10.53%) and Klebsiella sp (42.10%) (Endriani R, et all. 2020).

Most of the bacteria found were normal flora in saliva. This is possibly related to DM status in the study sample, dominated by the controlled DM status of 24 people (80%). High blood glucose levels in DM patients are often detected too late so various manifestations of infection in the oral cavity of DM patients were found to be an indication of

Conclusion

Based on the research above, it can be concluded that the characteristics of the research subjects are 33-67 years old, most of them are women, high school education, civil servants/TNI/POLRI/retirees work, and controlled DM status. The bacteria identified in the saliva of DM patients at Arifin Ahmad Hospital, Riau Province were Gram-positive bacteria consisting of *Streptococcus* sp, *Streptococcus alpha haemolyticus*, Negative Coagulase Staphylococcus (CNS) and *Staphylococcus aureus*. Gram-negative bacteria in the form of *Klebsiella* sp.

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