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Higher Education  
& Scientific Research AL-  
Muthanna University  
College of Science  
Department of Biology**



**Bacterial study and Biofilm production  
among Diabetes Mellitus patients  
with Dental Caries in  
Al-Muthanna-Province**

A Thesis Submitted to the Council of college of Science /Al Muthanna  
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Master of Science in Biology

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## **Abstract:**

The oral cavity can serve as a reservoir for many pathogens of medical importance, which are present in the oral cavity and associated with various oral problems, such as gingivitis, tooth decay, and systemic diseases. Dental caries is a chronic, widespread disease caused by caries-causing bacteria attached to teeth that metabolize sugars to produce acid, which over time demineralizes the tooth structure. The current study is conducted to detect some bacterial species (aerobic and anaerobic) that cause tooth decay in patients with type 1 and type 2 diabetes, which may contribute to the development of diabetes due to their ability to form biofilms.

The study conducted during the period from August 2023 to January 2024 at the Specialized Dental Center and Specialized Center for Endocrine Diseases and Diabetes in Muthanna Governorate, the specimens are collected from a total of 150 individuals (100 diabetic patients and 50 non-diabetic patients) under sterile conditions, with ages ranging from (4–70) years old. The children's ages ranged between (4-12) years. Their percentage is (9%). The ages of the adolescents ranged between (13-17) years, with a percentage of (12%), the ages of the youth ranged between (18-45) years, with a percentage of (27%), and the ages of the elderly ranged from (46-70) years, and their percentage was (52%). All specimens were cultured in specialized agar media including chromogenic agar media and selective media such as Mitis-Salivarius agar, Mutans-Sangias agar medium, Lactobacillus MRS agar, Acetamide agar, and HiCrome Bacillus agar. A total of (443) bacterial isolates are obtained from diabetic patients suffering from tooth decay, consisting of 365 Gram-positive isolates and 78 Gram-negative isolates. Bacterial isolates belonging to the following strains are detected in both groups: (*Streptococcus* sp., *Enterococcus* sp., *Bacillus* sp., *Lactobacillus* sp., *Staphylococcus* sp., *K.pneumonia*, *E.coli*, *P.aeruginosa*, and *C.freundii*). *S.mutans* recorded the highest

frequency at 9.54% isolates, while the lowest frequency for *P.auroginosa* was 0.62% . A total of (207) bacterial isolates were obtained from the control group, which suffering from dental caries but with non-diabetes mellitus, consisting of 176 Gr<sup>+</sup> isolates, and 31 Gr<sup>-</sup> isolates (*S.mutans* recorded the highest frequency at 4.92%, while the lowest frequency for *P.auroginosa* was 0.92%). The effect of some risk factors and their relationship to the development of tooth decay was also studied, including age, sex, geographical location, and type of diabetes. The prevalence of biofilms was determined for some major *S.mutans* pathogens, with the results that 0% had a strong biofilm, 2% had a moderate biofilm, 8% had a weak biofilm, and 2% had no biofilm formation. In this current study, only about four bacterial isolates were detected for *S.mutans* by molecular methods and conventional PCR. The NCBI BLASTn engine showed up to 99% sequence identity between the sequenced samples (designated W1–W4) and the intended reference bacterial target sequences for *S.mutans* .These samples were screened to partially amplify the sequence of the *streptococci gtfC* gene, which is important in producing glucans that support the biofilm. In general, the frequency of bacterial isolates recovered from caries lesions in diabetic patients was higher than in the control group. This may explain the bidirectional relationship between the effect of diabetes on the development of dental caries.