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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии
საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

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GMN: Georgian Medical News is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board since 1994. GMN carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

GMN is indexed in MEDLINE, SCOPUS, PubMed and VINITI Russian Academy of Sciences. The full text content is available through EBSCO databases.

GMN: Медицинские новости Грузии - ежемесячный рецензируемый научный журнал, издаётся Редакционной коллегией с 1994 года на русском и английском языках в целях поддержки медицинской науки и улучшения здравоохранения. В журнале публикуются оригинальные научные статьи в области медицины, биологии и фармации, статьи обзорного характера, научные сообщения, новости медицины и здравоохранения. Журнал индексируется в MEDLINE, отражён в базе данных SCOPUS, PubMed и ВИНТИ РАН. Полнотекстовые статьи журнала доступны через БД EBSCO.

GMN: Georgian Medical News – საქართველოს სამედიცინო სიახლენი – არის ყოველთვიური სამეცნიერო სამედიცინო რეცენზირებადი ჟურნალი, გამოიცემა 1994 წლიდან, წარმოადგენს სარედაქციო კოლეგიისა და აშშ-ის მეცნიერების, განათლების, ინდუსტრიის, ხელოვნებისა და ბუნებისმეტყველების საერთაშორისო აკადემიის ერთობლივ გამოცემას. GMN-ში რუსულ და ინგლისურ ენებზე ქვეყნდება ექსპერიმენტული, თეორიული და პრაქტიკული ხასიათის ორიგინალური სამეცნიერო სტატიები მედიცინის, ბიოლოგიისა და ფარმაციის სფეროში, მიმოხილვითი ხასიათის სტატიები.

ჟურნალი ინდექსირებულია MEDLINE-ის საერთაშორისო სისტემაში, ასახულია SCOPUS-ის, PubMed-ის და ВИНТИ РАН-ის მონაცემთა ბაზებში. სტატიების სრული ტექსტი ხელმისაწვდომია EBSCO-ს მონაცემთა ბაზებიდან.

WEBSITE

www.geomednews.com

К СВЕДЕНИЮ АВТОРОВ!

При направлении статьи в редакцию необходимо соблюдать следующие правила:

1. Статья должна быть представлена в двух экземплярах, на русском или английском языках, напечатанная через **полтора интервала на одной стороне стандартного листа с шириной левого поля в три сантиметра**. Используемый компьютерный шрифт для текста на русском и английском языках - **Times New Roman (Кириллица)**, для текста на грузинском языке следует использовать **AcadNusx**. Размер шрифта - **12**. К рукописи, напечатанной на компьютере, должен быть приложен CD со статьей.

2. Размер статьи должен быть не менее десяти и не более двадцати страниц машинописи, включая указатель литературы и резюме на английском, русском и грузинском языках.

3. В статье должны быть освещены актуальность данного материала, методы и результаты исследования и их обсуждение.

При представлении в печать научных экспериментальных работ авторы должны указывать вид и количество экспериментальных животных, применявшиеся методы обезболивания и усыпления (в ходе острых опытов).

4. К статье должны быть приложены краткое (на полстраницы) резюме на английском, русском и грузинском языках (включающее следующие разделы: цель исследования, материал и методы, результаты и заключение) и список ключевых слов (key words).

5. Таблицы необходимо представлять в печатной форме. Фотокопии не принимаются. **Все цифровые, итоговые и процентные данные в таблицах должны соответствовать таковым в тексте статьи**. Таблицы и графики должны быть озаглавлены.

6. Фотографии должны быть контрастными, фотокопии с рентгенограмм - в позитивном изображении. Рисунки, чертежи и диаграммы следует озаглавить, пронумеровать и вставить в соответствующее место текста **в tiff формате**.

В подписях к микрофотографиям следует указывать степень увеличения через окуляр или объектив и метод окраски или импрегнации срезов.

7. Фамилии отечественных авторов приводятся в оригинальной транскрипции.

8. При оформлении и направлении статей в журнал МНГ просим авторов соблюдать правила, изложенные в «Единых требованиях к рукописям, представляемым в биомедицинские журналы», принятых Международным комитетом редакторов медицинских журналов - <http://www.spinesurgery.ru/files/publish.pdf> и http://www.nlm.nih.gov/bsd/uniform_requirements.html В конце каждой оригинальной статьи приводится библиографический список. В список литературы включаются все материалы, на которые имеются ссылки в тексте. Список составляется в алфавитном порядке и нумеруется. Литературный источник приводится на языке оригинала. В списке литературы сначала приводятся работы, написанные знаками грузинского алфавита, затем кириллицей и латиницей. Ссылки на цитируемые работы в тексте статьи даются в квадратных скобках в виде номера, соответствующего номеру данной работы в списке литературы. Большинство цитированных источников должны быть за последние 5-7 лет.

9. Для получения права на публикацию статья должна иметь от руководителя работы или учреждения визу и сопроводительное отношение, написанные или напечатанные на бланке и заверенные подписью и печатью.

10. В конце статьи должны быть подписи всех авторов, полностью приведены их фамилии, имена и отчества, указаны служебный и домашний номера телефонов и адреса или иные координаты. Количество авторов (соавторов) не должно превышать пяти человек.

11. Редакция оставляет за собой право сокращать и исправлять статьи. Корректур авторам не высылаются, вся работа и сверка проводится по авторскому оригиналу.

12. Недопустимо направление в редакцию работ, представленных к печати в иных издательствах или опубликованных в других изданиях.

При нарушении указанных правил статьи не рассматриваются.

REQUIREMENTS

Please note, materials submitted to the Editorial Office Staff are supposed to meet the following requirements:

1. Articles must be provided with a double copy, in English or Russian languages and typed or computer-printed on a single side of standard typing paper, with the left margin of 3 centimeters width, and 1.5 spacing between the lines, typeface - **Times New Roman (Cyrillic)**, print size - 12 (referring to Georgian and Russian materials). With computer-printed texts please enclose a CD carrying the same file titled with Latin symbols.

2. Size of the article, including index and resume in English, Russian and Georgian languages must be at least 10 pages and not exceed the limit of 20 pages of typed or computer-printed text.

3. Submitted material must include a coverage of a topical subject, research methods, results, and review.

Authors of the scientific-research works must indicate the number of experimental biological species drawn in, list the employed methods of anesthetization and soporific means used during acute tests.

4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

5. Tables must be presented in an original typed or computer-printed form, instead of a photocopied version. **Numbers, totals, percentile data on the tables must coincide with those in the texts of the articles.** Tables and graphs must be headed.

6. Photographs are required to be contrasted and must be submitted with doubles. Please number each photograph with a pencil on its back, indicate author's name, title of the article (short version), and mark out its top and bottom parts. Drawings must be accurate, drafts and diagrams drawn in Indian ink (or black ink). Photocopies of the X-ray photographs must be presented in a positive image in **tiff format**.

Accurately numbered subtitles for each illustration must be listed on a separate sheet of paper. In the subtitles for the microphotographs please indicate the ocular and objective lens magnification power, method of coloring or impregnation of the microscopic sections (preparations).

7. Please indicate last names, first and middle initials of the native authors, present names and initials of the foreign authors in the transcription of the original language, enclose in parenthesis corresponding number under which the author is listed in the reference materials.

8. Please follow guidance offered to authors by The International Committee of Medical Journal Editors guidance in its Uniform Requirements for Manuscripts Submitted to Biomedical Journals publication available online at: http://www.nlm.nih.gov/bsd/uniform_requirements.html
http://www.icmje.org/urm_full.pdf

In GMN style for each work cited in the text, a bibliographic reference is given, and this is located at the end of the article under the title "References". All references cited in the text must be listed. The list of references should be arranged alphabetically and then numbered. References are numbered in the text [numbers in square brackets] and in the reference list and numbers are repeated throughout the text as needed. The bibliographic description is given in the language of publication (citations in Georgian script are followed by Cyrillic and Latin).

9. To obtain the rights of publication articles must be accompanied by a visa from the project instructor or the establishment, where the work has been performed, and a reference letter, both written or typed on a special signed form, certified by a stamp or a seal.

10. Articles must be signed by all of the authors at the end, and they must be provided with a list of full names, office and home phone numbers and addresses or other non-office locations where the authors could be reached. The number of the authors (co-authors) must not exceed the limit of 5 people.

11. Editorial Staff reserves the rights to cut down in size and correct the articles. Proof-sheets are not sent out to the authors. The entire editorial and collation work is performed according to the author's original text.

12. Sending in the works that have already been assigned to the press by other Editorial Staffs or have been printed by other publishers is not permissible.

**Articles that Fail to Meet the Aforementioned
Requirements are not Assigned to be Reviewed.**

ავტორთა საქურაღებოლ!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დაიცვათ შემდეგი წესები:

1. სტატია უნდა წარმოადგინოთ 2 ცალად, რუსულ ან ინგლისურ ენებზე დაბეჭდილი სტანდარტული ფურცლის 1 გვერდზე, 3 სმ სიგანის მარცხენა ველისა და სტრიქონებს შორის 1,5 ინტერვალის დაცვით. გამოყენებული კომპიუტერული შრიფტი რუსულ და ინგლისურენოვან ტექსტებში - **Times New Roman (Кириллица)**, ხოლო ქართულენოვან ტექსტში საჭიროა გამოვიყენოთ **AcadNusx**. შრიფტის ზომა – 12. სტატიას თან უნდა ახლდეს CD სტატიით.

2. სტატიის მოცულობა არ უნდა შეადგენდეს 10 გვერდზე ნაკლებს და 20 გვერდზე მეტს ლიტერატურის სიის და რეზიუმეების (ინგლისურ, რუსულ და ქართულ ენებზე) ჩათვლით.

3. სტატიაში საჭიროა გაშუქდეს: საკითხის აქტუალობა; კვლევის მიზანი; საკვლევი მასალა და გამოყენებული მეთოდები; მიღებული შედეგები და მათი განსჯა. ექსპერიმენტული ხასიათის სტატიების წარმოდგენისას ავტორებმა უნდა მიუთითონ საექსპერიმენტო ცხოველების სახეობა და რაოდენობა; გაუტკივარებისა და დაძინების მეთოდები (მწვავე ცდების პირობებში).

4. სტატიას თან უნდა ახლდეს რეზიუმე ინგლისურ, რუსულ და ქართულ ენებზე არანაკლებ ნახევარი გვერდის მოცულობისა (სათაურის, ავტორების, დაწესებულების მითითებით და უნდა შეიცავდეს შემდეგ განყოფილებებს: მიზანი, მასალა და მეთოდები, შედეგები და დასკვნები; ტექსტუალური ნაწილი არ უნდა იყოს 15 სტრიქონზე ნაკლები) და საკვანძო სიტყვების ჩამონათვალი (key words).

5. ცხრილები საჭიროა წარმოადგინოთ ნაბეჭდი სახით. ყველა ციფრული, შემაჯამებელი და პროცენტული მონაცემები უნდა შეესაბამებოდეს ტექსტში მოყვანილს.

6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანომრილი და სათანადო ადგილას ჩასმული. რენტგენოგრაფიების ფოტოასლები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შედეგის ან იმპრეგნაციის მეთოდი და აღნიშნოთ სურათის ზედა და ქვედა ნაწილები.

7. სამამულო ავტორების გვარები სტატიაში აღინიშნება ინიციალების თანდართვით, უცხოურისა – უცხოური ტრანსკრიპციით.

8. სტატიას თან უნდა ახლდეს ავტორის მიერ გამოყენებული სამამულო და უცხოური შრომების ბიბლიოგრაფიული სია (ბოლო 5-8 წლის სიღრმით). ანბანური წყობით წარმოდგენილ ბიბლიოგრაფიულ სიაში მიუთითეთ ჯერ სამამულო, შემდეგ უცხოელი ავტორები (გვარი, ინიციალები, სტატიის სათაური, ჟურნალის დასახელება, გამოცემის ადგილი, წელი, ჟურნალის №, პირველი და ბოლო გვერდები). მონოგრაფიის შემთხვევაში მიუთითეთ გამოცემის წელი, ადგილი და გვერდების საერთო რაოდენობა. ტექსტში კვადრატულ ფხიხლებში უნდა მიუთითოთ ავტორის შესაბამისი N ლიტერატურის სიის მიხედვით. მიზანშეწონილია, რომ ციტირებული წყაროების უმეტესი ნაწილი იყოს 5-6 წლის სიღრმის.

9. სტატიას თან უნდა ახლდეს: ა) დაწესებულების ან სამეცნიერო ხელმძღვანელის წარდგინება, დამოწმებული ხელმოწერითა და ბეჭდით; ბ) დარგის სპეციალისტის დამოწმებული რეცენზია, რომელშიც მითითებული იქნება საკითხის აქტუალობა, მასალის საკმაობა, მეთოდის სანდოობა, შედეგების სამეცნიერო-პრაქტიკული მნიშვნელობა.

10. სტატიის ბოლოს საჭიროა ყველა ავტორის ხელმოწერა, რომელთა რაოდენობა არ უნდა აღემატებოდეს 5-ს.

11. რედაქცია იტოვებს უფლებას შეასწოროს სტატია. ტექსტზე მუშაობა და შეჯერება ხდება საავტორო ორიგინალის მიხედვით.

12. დაუშვებელია რედაქციაში ისეთი სტატიის წარდგენა, რომელიც დასაბეჭდად წარდგენილი იყო სხვა რედაქციაში ან გამოქვეყნებული იყო სხვა გამოცემებში.

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

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DENTAL CAVITIES IN PEOPLE WITH TYPE 2 DIABETES MELLITUS: AN ANALYSIS OF RISK INDICATORS

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Abstract.

Background: Diabetes is associated with a greater number of dental cavities. It is unclear, therefore, how potential risk factors such as salivary glucose, glycemic control and blood sugar could impact the onset of dental caries between people that have type 2 diabetes (T2D).

Aim of the study: Analyzing the risk factors for oral cavity disease in T2D patients. We analyzed the patient data including their dietary habits, dental hygiene practices, age and control of glycemic.

Materials and methods: The Indian dataset was used. Individual patient observations include the patient's diabetes classification as a range of medical attributes such as age, pregnancy, pedigree, glucose, body mass index, skin, blood pressure and insulin. The research discovered a significant correlation between poorly managed glycemic levels and dental caries are more prevalent in people with T2DM. High sugar consumption and poor oral hygiene habits have been identified as risk factors.

Results: These results highlight the need for integrating diabetes treatment measures with dental care to reduce dental caries in this susceptible group.

Conclusion: Utilizing dental cavities into account improves oral health and has a positive impact on health outcomes for those with type 2 diabetes.

Key words. Dental caries, diabetes mellitus, type 2 diabetes, sugar, glucose.

Introduction.

Dental cavities are known as dental caries, and it is among the most prevalent chronic illnesses [1]. Fermentable carbohydrates and acid-producing tooth-adherent bacteria combine intricately to cause the condition. Due to the acids in dental plaque, the enamel and dentin in the tooth's smooth surfaces and fissures can demineralize [2]. A chronic metabolic disease with high plasma glucose levels is called diabetes mellitus (DM). Type 1 diabetes (T1DM), type 2 diabetes (T2DM), and gestational diabetic mellitus (GDM) are the three main types of diabetes mellitus [3]. Here, the research discuss about dental cavities in people with T2DM. T2DM is a metabolic disorder that is prevalent around the globe. The primary factors that contribute to its development are the inability of tissue that is insulin-sensitive to process insulin and a reduction of pancreatic β -cells' ability to produce insulin [4]. More than 90% of cases in diabetes

are type 2 and its etiopathogenesis involves both hereditary and environmental variables [5]. T2DM is a degenerative disease that is chronic and incurable but manageable, it is regarded as one of the chronic conditions that have the biggest impact on the standard life of the global population, and it is a true health concern. It is included in the category of conditions that lead to physical disability because of its numerous multi-organ complications and has increased in mortality and morbidity in recent years [6]. Rapid changes in culture, economy and society, aging populations, unplanned urbanization, dietary changes, reduced amounts of physical activity, overweight, harmful habits as well as patterns of behavior, malnutrition in fetuses and increased reveal of fetuses to pregnancy-related hyperglycemia are the contributing factors to this widespread and serious global health issue. While β -cell malfunction is necessary for T2DM development, the condition mostly affects adults, while a growing number of children and adolescents are impacted [7]. Although β -cell dysfunction is necessary for the development of T2DM, the condition primarily affects adults; however an increasing number of children and adolescents are afflicted. The disease's early stages observe a rise in absolute insulin levels as a result of resistance to the action of insulin and A small amount of insulin is produced in many type 2 diabetics (T2D) [8]. It analyzes the risk factors of T2DM patients having dental caries. Figure 1 demonstrates the healthy and T2DM. Blood glucose levels are normal in the healthy stage.

Literature Review.

The study [9] described among the most prevalent oral symptoms of uncontrollable DM is oral candidiasis, which has several co-factors linked to its development. Here, they report on the high incidence of oral Candida in a cohort of people with T2DM from Sri Lanka, along with the risk factors that put them at risk for this widespread fungal infection. Using multiplex-PCR and phenotypic analyses, oral rinse samples were obtained in order to identify Candida carriage. The resulting yeast growth was measured and classified. The research [10] examined that the publications try to determine how diabetes, metabolic regulation, the length of diabetes and dental caries are related. The Newcastle-Ottawa Quality Assessment Scale was used to evaluate the bias risk. Using the statistical platform R, random-effect models were used to conduct the meta-analyses. DMFT is much greater in type 1 diabetics than in normal. T1DM has a significant incidence of dental caries, as demonstrated by

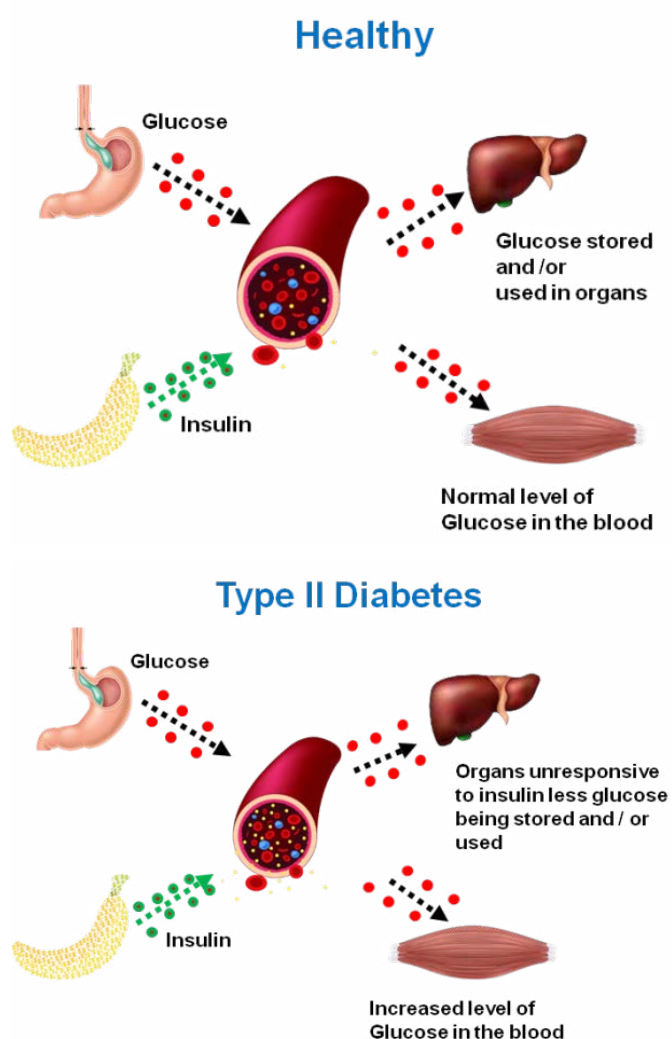


Figure 1. Healthy vs T2DM. [Source: <https://www.practo.com/health-wiki/diabetes-mellitus-type-2-symptoms-complications-and-treatment/65/article>].

the meta-analysis, although longitudinal investigations are necessary.

The study [11] analyzed how an oral health issues affect people with T2DM quality of life. 302 individuals chosen at random with T2DM who completed the OHIP-14 research and another one asked about socioeconomic and oral health features participated based on population. The oral health-related quality of life (OHRQoL) is greatly affected by the total rate of influence. The research [12] evaluated the interactions that occur in DM between the host immune response, oral cavity circumstances and the oral micro-biota. Identify the existence of certain diabetes mellitus risk factors and the interaction between the oral micro-biota, host immune response and oral cavity conditions. These findings further highlight the significance of DM comprehensive treatment and the need to improve the doctor-patient connection by concentrating on the systematic and oral states of those with the DM.

The study [13] examined if persons with diabetes mellitus (DM) have coronal and root caries. Six databases were used, and a gray literature search approach was modified. Five meta-analyses were carried out using Revman 5.3. Adults with root and

coronal caries can be more common in those with DM. Diabetes increased the risk of dental cavities in those with poor glycemic control. The study's [14] goal was to improve the understanding of oral symptoms and consequences related to DM. Diabetes-related oral symptoms and consequences including periodontal disease, gingivitis, dental caries and xerostomia, increased susceptibility to infection of the oral cavity, taste alteration, poor healing of wounds and burning mouth. It is important to avoid and manage chronic oral problems in these individuals since research suggests that they negatively impact blood glucose control.

The article [15] carried out a systematic review and comprehensive examination to look at the connection between usages of drugs and dental health. As independent factors, they assessed tooth loss, periodontal disease, or the index of decaying, missing and filled teeth. Utilizing Stata 12.0, the data were examined. Improving the overall quality of life of drug users requires developing programs to reduce possible confusion with different substances and attending to their dental health concerns. The research [16] was to compare the samples of non-diabetic controls to diabetes patients to identify diseases of the oral mucosa, the amount of yeasts available and it relate to risk factors. The department of microbiology processed the medical inspection of the oral mucosa and gathered the results of the laboratory examination. The findings suggested that the diabetic group had a considerable presence of changes to their oral mucosa.

The research [17] created the non-invasive complementary diagnosis design for diabetes that considers the variations in the salivary micro-biome. The MiSeq technology was used to identify the salivary micro-biota of 24 patients with T2DM who had not received treatment and 21 healthy individuals by gene sequencing utilizing 16S rRNA, the V3/V4 area is highlighted. The model for diagnosis offers a viable method for the auxiliary non-invasive detection of DM and these data provide light on the variations in salivary micro-biota composition among non-diabetic patients and T2D. The study [18] described the patients with radical surgical therapy for oral squamous cell carcinoma (OSCC) was studied to determine how metformin works medication and T2DM about the outlook. OSCC patients' prognosis was assessed using the five-year OSCC-free survival (OFS) measure. Treatment with metformin can lower the incidence of OSCC recurrent that is linked to T2DM.

Materials and Methods.

The dental cavities in individuals with type 2 diabetic mellitus, T2DM symptoms, risk factors for T2DM, dental cavities, and tooth cavities in individuals with T2DM can be discussed in this section using collection of data from India. We examined dental cavities in patients having T2DM by age and gender in the general population as well.

Dataset.

The Indian dataset [19] was used. It comprises individual patient observations that include the patient's diabetes classification and a range of medical attributes such as body mass index (BMI), diabetic pedigree operation, and age. Antibiotic prescription practices, triceps skin-fold thickness, plasma glucose concentration, 2-hour serum insulin, number

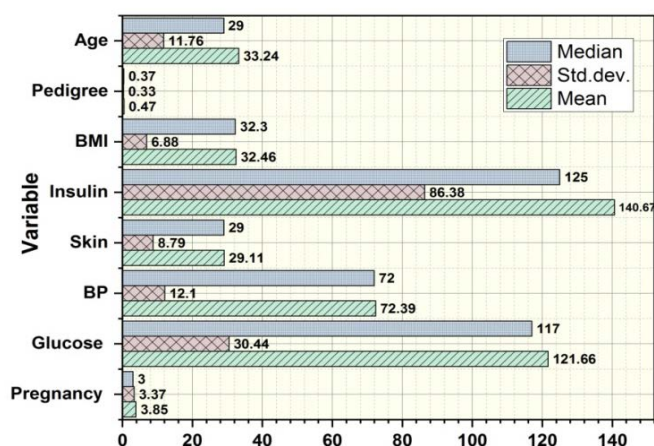


Figure 2. Summary statistics. [Source: <https://www.mdpi.com/1660-4601/18/14/7346>].

Table 1. Values for summary statistics.

Variable	Std.dev.	Median	Mean
Pregnancy	3.37	3.00	3.85
Age	11.76	29.00	33.24
Blood Pressure (BP)	12.10	72.00	72.39
Skin	8.79	29.00	29.11
Glucose	121.66	30.44	117.00
Body Mass Index	6.88	32.30	32.46
Pedigree	0.33	0.37	0.47
Insulin	140.67	86.38	125.00

[Source: <https://www.mdpi.com/1660-4601/18/14/7346>].

of pregnancies and diastolic blood pressure. Diabetes, response variable, would be 1 if a person was diagnosed with T2D and 0 otherwise. Their sample has 268 (34.9%) diabetic patients. There is one missing least value (indexed by zero) in five differentiators, blood pressure, skin thickness, insulin, glucose, and BMI. As a result, it changed every zero to its corresponding median value. It utilizes the statistical tool R version 4.0.5 to examine the data. Figure 2 and Table 1 display summary statistics for each and every predictor following the missing value imputation using the median value.

T2DM.

Diabetes mellitus type 2 is characterized by insufficient insulin production and excessive blood glucose levels based on insulin resistance. It appears in maturity and connects with lifestyle variables such as poor nutrition and sedentary activity. Dietary management, physical exercise, medication and, in rare cases, insulin are used to balance blood sugar levels and avoid problems.

T2DM Symptoms.

- **Thirst has increased:** Elevated blood sugar levels in T2DM cause frequent urination, which dehydrates the body and increases thirst as it tries to restore fluid balance.
- **Hunger has increased:** Polyphagia or increased hunger is a symptom of T2DM, when cells become resistant to insulin, and they are unable to use glucose as an energy source. The body feels the need for additional food to fuel itself.

- **Weight loss that was not anticipated:** Ineffective glucose utilization in T2D causes the body to burn down muscle and fat for energy, which accounts for an unexplained weight loss. It's a troubling indication with the potential to point improperly controlled diabetes.
 - **Fatigue:** In individuals with T2DM, insulin resistance, elevated blood sugar and abnormal energy metabolism can lead to fatigue. It causes a persistent sense of exhaustion as well as a decrease in both mental and physical energy.
 - **The vision is blurry:** The lens of the eye is affected by elevated blood sugar levels, which causes blurred vision in those with T2DM. One's capacity to concentrate and see clearly is impacted by these visual disruptions. It is essential to get regular eye exams.
 - **Sores that take a long time to heal:** Due to reduced blood flow and nerve damage, sores in T2DM heal slowly. High levels of sugar in the blood impair the body's capacity to repair it, resulting in delayed wound healing.
 - **Infections occur often:** Based on a rise in blood sugar inhibiting immunological function that increases the body susceptibility to infections in several bodily systems, T2DM patients get infections.
 - **Numbness or tingling sensations in the hands or feet:** Diabetes type 2 (diabetic neuropathy) causes nerve damage as a consequence of high blood sugar, which can cause numbness or tingling in the hands or feet. This condition can cause loss of motor control.
 - **Darkened skin patches, most often seen in the armpits and neck:** Acanthosis nigricans is the name for darkened skin patches that are observed in body folds like the neck and armpits. Skin thickening and darkening are caused by insulin resistance, which is linked to T2DM.
- ### Determinants of risk in T2DM.
- Some of the risk factors in T2DM are,
- **Dispersion of fat:** There is a higher danger when fat is stored in the belly as opposed to the hips and thighs. T2DM is more prevalent in men and women with waist circumferences are more than 40 and 35 inches.
 - **Inactivity in physical:** T2DM can arise as a result of a sedentary lifestyle and infrequent physical exercise.
 - **Family history:** Having first-degree relatives (parents or siblings) increases your chance of developing T2DM.
 - **Lipid levels in blood:** Insulin resistance can be caused by having decreased high-density lipoprotein (HDL) cholesterol, increased low density lipoprotein (LDL) cholesterol and levels of elevated triglyceride.
 - **Pre-diabetes:** Pre-diabetic conditions that improve impaired glucose tolerance (IGT) or impaired fasting glucose (IFG) are risk factors for type 2 diabetes.
 - **Hypertension (High Blood Pressure):** T2DM of increased risk and High blood pressure.

Statistical Analysis.

The analysis employed the chi-squared test to evaluate differences in tooth decay prevalence or oral health between groups with type 2 diabetes compared to people without the disease. To compare the average quantity of tooth decay between categories, the Mann-Whitney test was utilized. A

multilevel logistic structure, glmmPQL in R-package was utilized to quantify the existence of coronal or surface root cavities established inside people's teeth. To analyze the impact of type 2 DM, multiple-level linear model of the receding gums in millimeters was initially developed. It occurred by utilizing the R-package's lme function to determine that type 2 diabetes, affected exposed root surfaces.

Dental cavities.

Dental caries is more common in diabetic patients, both in its initial stages and in subsequent ones. Reduced salivary cleaning and buffering capacity, increased salivary glucose content, and higher levels of dental yeasts, mutans streptococci, and lactobacilli can all contribute to an increased risk of tooth decay. Irreversible pulpitis that results in pulp necrosis might be brought by chronic hyperglycemia.

Mutans streptococci and lactobacilli in dental cavities T2DM.

Mutansstreptococci, especially *Streptococcus mutans*, are microorganisms that cause dental cavities in persons with T2DM. Increased blood sugar levels can lead to a sugary dental environment that is perfect for the growth of these microorganisms. Through their metabolism of glucose, they produce acids that break down tooth enamel and cause cavities. The issue can worsen due to diabetes-related issues including decreased salivary flow and a weakened immune system. To battle mutansstreptococci and lower the incidence of dental cavities, people with T2DM must practice good oral hygiene, maintain consistent blood sugar control, and schedule routine dental examinations.

Acid-producing bacteria called lactobacilli can exacerbate dental cavities in patients with T2DM. These bacteria flourish in an environment that is conducive to their growth because elevated levels of sugar in the blood in diabetes allow them to feed on sweets and generate acids that exacerbate tooth damage. Diabetes-related problems, including decreased salivary flow and compromised immune systems encourage lactobacilli to proliferate in the oral cavity. People with T2DM have to prioritize controlling their blood sugar levels, practice good oral hygiene and visit a dentist to manage the effects of lactobacilli along with other variables that deteriorate their teeth. These measures will help reduce their risk of cavities.

Figure 3 and Table 2 illustrate the low risk (30%), moderate risk (18%) and high risk (48%) in mutans streptococci. Lactobacilli have a low risk (40%), a moderate risk (48%) and a high risk (5%).

Xerostomia in dental cavities T2DM.

Salivary dysfunction is a condition that affects people with diabetes and can result in altered salivary content and reduced salivary flow. Speaking, swallowing, and struggling to eat are a few of the issues that can result from xerostomia. In fact, the quality of life of patients can suffer as a result. Adults with diabetes have been shown to have reduced salivary function

Table 2. Values for mutans streptococci and lactobacilli.

	Low Risk	Moderate Risk	High Risk
Mutans Streptococci	30	18	48
Lactobacilli	40	48	5



Figure 3. Mutans streptococci and lactobacilli.

in several investigations. Although the exact cause is unclear, it could have been connected to autonomic neuropathies, Microvascular changes, polyuria, and changes to the salivary glands' basement membranes. There is a correlation between salivary glucose level and the degree of xerostomia. The highest level of salivary dysfunction is found in diabetics with inadequate glycemic control.

Mouth burning in dental cavities T2DM.

An angiopathy, neuropathy, Candida infection, poor glycemic control and metabolic alterations in the oral mucosa are associated with diabetic patient's dysesthesia in the oral cavity or burning sensation. In certain individuals, burning, electric shock, or stabbing sensations, neuropathic pain can present as tingling, which can be quite disabling. The degree of sleep disruption, anxiety and regret is connected to these pain feelings, which have a significant impact on both psychological and physical processes.

Dysfunctional taste in dental cavities T2DM:

Patients with poorly managed diabetes are at risk for developing taste impairment. A longitudinal analysis found that 5.7% of diabetic or pre-diabetic individuals had sweet taste issue and 8.6% exhibited salt taste abnormality. A rise in detection thresholds or a change in taste perception can result from salivary dysfunctional. Furthermore, neuropathy raises the taste sensitivity. Such sensory deficiency makes it difficult to keep a nutritious diet and contributes to impaired glucose management.

Oral mucosal changes in dental cavities T2DM.

Diabetes can be related with various oral mucosal changes, including geographic tongue, recurrent aphthous stomatitis, coated and fissured tongue, as well as certain premalignant diseases such as lichen planus. It is uncertain whether these people are susceptible to alterations in the oral cavity, while factors such as smoking, inadequate diabetes management, immunological changes, xerostomia and changes in the flow, content of saliva along with micro-circulatory abnormalities with decreased blood supply have been provided. In diabetics, acute hyperglycemia alters the immune system's response.

Slow healing of oral wounds in dental cavities T2DM.

Slower healing of the soft and hard tissues is a prominent danger of oral surgery in people with diabetes. Studies have

shown that a vascularization delay, reduced hypoxia, blood flow, a decrease in natural protection, a reduction in expanding element synthesis and mental tension are important contributors to these individuals for an extended wound healing. Figure 4 demonstrates the dental cavity complications related to T2DM, dental caries, tongue abnormalities, delayed wound healing, oral lichen planus, salivary dysfunction, gingivitis periodontitis, halitosis, taste abnormalities and oral infection.

Dental cavities in people with T2DM.

Dental cavities in people with T2D are a complicated problem driven by a variety of risk factors. Elevated blood glucose levels have a critical role in promoting the development of cavity-causing bacteria such as Mutansstreptococci and Lactobacilli in the mouth. One important risk factor is inadequate glucose management. Diabetes related issues such as decreased saliva flow (xerostomia) hinder the mouth's natural defenses against these germs, making it more prone to cavities. Furthermore, people with diabetes can have changed dietary patterns, eating more sugary or acidic foods and beverages, which can lead to the development of cavities. Medications that include sugar or cause dry mouth as a side effect might aggravate the problem. Maintaining rigorous blood sugar control, eating a tooth-friendly diet, practicing proper oral hygiene and getting frequent dental check-ups are important ways for persons with T2D to protect their oral health.

Dental cavities with T2DM by age and sex in overall population.

Figure 5 and Table 3 illustrate the whole population had 19.5% dental caries, while male had 23.9%. Female had (17.7%), ≤40 years (23.3%) and 41-68 years (24%).

Duration of the disease in dental cavities with T2DM.

Figure 6 and Table 4 illustrate the correlation between the duration of the illness in years and dental cavities in persons with T2DM.

Investigation of dental cavities with T2DM.

Dental cavities are common in people with T2DM because of things like high blood sugar, decreased salivary flow and changed oral microbiota. Plaque buildup and tooth damage can result from bacterial growth that is encouraged by the blood's high sugar level. By lessening the preventive properties of saliva, dry mouth caused by diabetes might make the issue worse. To

Table 3. Values for prevalence of dental cavities in T2DM.

	Prevalence (%)
Overall Population	19.5
Male	23.9
Female	17.7
< 40 years	23.3
41-68 years	24

Table 4. Values for Duration of disease in dental caries with T2DM.

Duration of the disease	
<4 years	12.2
4-8 years	15.6
> 8 years	19.4

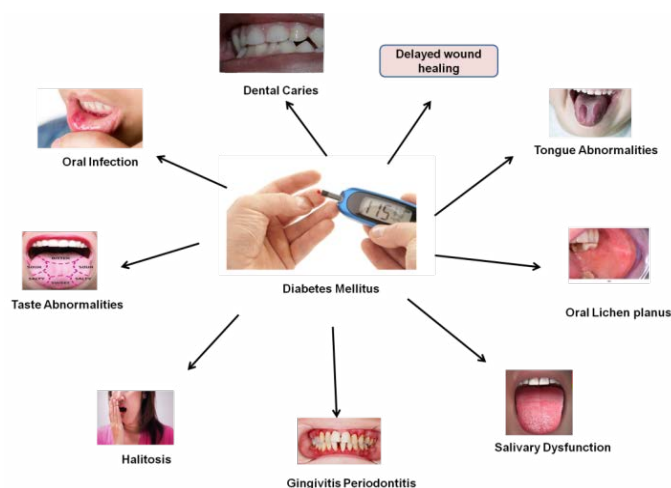


Figure 4. Dental cavity complications related to T2DM. [Source: <https://www.tandfonline.com/doi/full/10.2147/DMSO.S318972>].

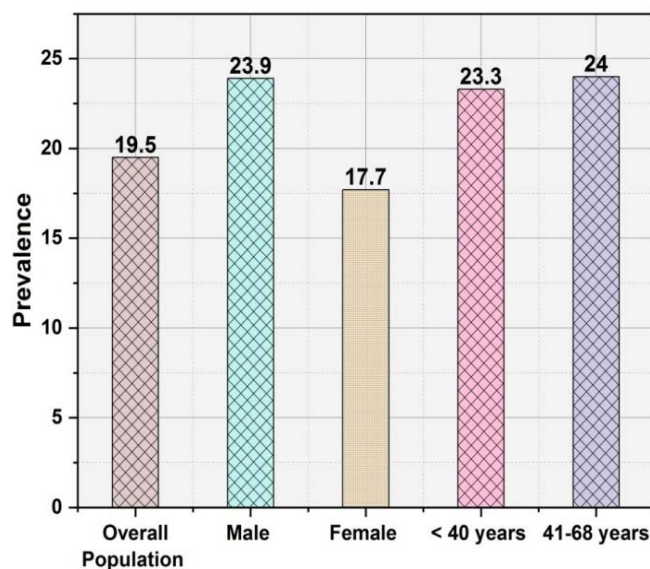


Figure 5. Prevalence of dental cavities in T2DM.

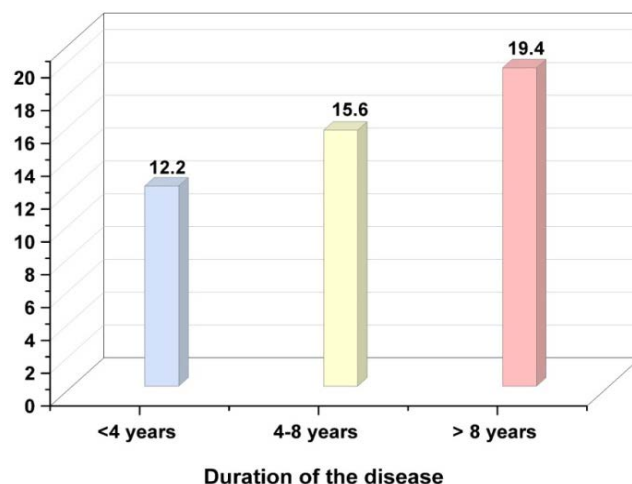


Figure 6. Duration of disease in dental caries with T2DM.

reduce their risk of dental cavities and preserve excellent oral health, patients with T2D must have regular dental checkups, practice strict oral hygiene, and manage their blood sugar levels.

Conclusion.

In the final analysis, dental caries in people with T2D provide a multidimensional difficulty. Diabetes is rarely associated with higher blood sugar levels as there's a correlation between diabetes and a greater number of dental cavities. Reduced salivary flow, changed oral flora, food choices and medication usage all contribute to diabetes individuals' vulnerability to cavities. As a result, in this demographic, a holistic approach to dental care is critical, combining rigorous oral cleanliness, frequent dental check-ups, and nutritional control. Furthermore, healthcare practitioners should be aware of the special requirements of diabetes patients and collaborate with dental specialists to improve their oral health. Managing dental cavities in people with T2DM improves oral health and adds to improved overall health outcomes.

Future work.

Future research on dental cavities in individuals with T2DM should concentrate on clarifying the intricate interactions between oral hygiene, dietary factors and glycemic control to create efficient preventative measures and customized treatment plans.

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