

Misztal Zofia, Pawlicka Marta, Mroczek Anna, Balabuszek Kamil, Ochyra Dorota, Pawlicki Mateusz. **Diabetes and oral health.** *Journal of Education, Health and Sport.* 2018;8(9):1083-1089 eISSN 2391-8306. DOI <http://dx.doi.org/10.5281/zenodo.1420211>
<http://ojs.ukw.edu.pl/index.php/johs/article/view/6008>

The journal has had 7 points in Ministry of Science and Higher Education parametric evaluation. Part b item 1223 (26/01/2017).
1223 Journal of Education, Health and Sport eissn 2391-8306 7

© The Authors 2018;

This article is published with open access at Licensee Open Journal Systems of Kazimierz Wielki University in Bydgoszcz, Poland
Open Access. This article is distributed under the terms of the Creative Commons Attribution Noncommercial License which permits any noncommercial use, distribution, and reproduction in any medium, provided the original author (s) and source are credited. This is an open access article licensed under the terms of the Creative Commons Attribution Non commercial license Share alike.
(<http://creativecommons.org/licenses/by-nc-sa/4.0/>) which permits unrestricted, non commercial use, distribution and reproduction in any medium, provided the work is properly cited.

The authors declare that there is no conflict of interests regarding the publication of this paper.

Received: 02.08.2018. Revised: 18.08.2018. Accepted: 15.09.2018.

Diabetes and oral health

**Zofia Misztal¹, Marta Pawlicka², Anna Mroczek², Kamil Balabuszek²,
Dorota Ochyra², Mateusz Pawlicki²**

¹Medical University of Lodz, Poland

²Chair and Department of Epidemiology and Clinical Research Methodology, Medical
University of Lublin, Poland

Corresponding author: Zofia Misztal, e-mail: zosia.misztal6@gmail.com

ORCID ID

Zofia Misztal <https://orcid.org/0000-0003-2317-9667>

Marta Pawlicka <https://orcid.org/0000-0002-6631-979X>

Anna Mroczek <https://orcid.org/0000-0003-0077-5343>

Kamil Bałabuszek <https://orcid.org/0000-0002-1352-153X>

Dorota Ochyra <https://orcid.org/0000-0002-8076-5622>

Mateusz Pawlicki <https://orcid.org/0000-0001-8318-6573>

Abstract

The main aim of this review is to pay attention to correlation between increasingly common disease all over the world, which is diabetes and oral cavity disorders. There were many retrospective studies and researches which improve this relationship but in some of them there exist doubts. There occurs two-way link between this diseases. On one way diabetes may

increase the risk of developing periodontitis and on the other periodontal disorders might have impact on glycaemic control. In some cases was reported that periodontitis have influence on appearance of other complications not related to diabetes such as cardiovascular diseases, proteinuria, stroke, angina, retinopathy. Appropriate oral hygiene and controlling the diabetes leads to better glycaemic control and lower play scores and lower HbA. There is need to cooperation between physical and dentists to improve better condition of oral cavity to patients with diabetes and to better glycaemic control.

Keywords: diabetes, oral health, dental carries

Introduction

According to WHO (World Health Organization) in 2014 about 422 million people suffered from diabetes. Only in Europe there was 64 million incidence of diabetes. It is estimated that 1.5 million of deaths were caused indirectly by diabetes worldwide [1]. Diabetes became an epidemic and the number of individuals with diabetes still increases, especially in developed and developing countries. Diabetes is metabolic disease, that is associated with changes in carbohydrate metabolism and elevated glucose level in blood [2]. The American Diabetes Association (ADA) classified diabetes into following types:

- a) Type 1 diabetes caused by β -cell destruction
- b) Type 2 diabetes due to a progressive loss of β -cell insulin secretion usually associated with insulin resistance
- c) Gestational diabetes mellitus (GDM) – diabetes diagnosed in pregnancy women in the second or third trimester.
- d) Specific types of diabetes caused e.g. monogenic diabetes syndromes, diseases of the exocrine pancreas and drug-chemical-induced diabetes [3]

The oral health depends from general health. In recent years scientists focused on potential impact of diabetes on oral heaths. Oral diseases related to diabetes included: dental caries, periodontal disease and tooth mobility. Chronic elevated glucose level could led to microvascular changes, impaired tissue metabolism and reduced response od immunological system [4]. To oral conditions caused by diabetes belong also xerostomia, burning mouth, gingivitis and infections. Oral complications play a role in quality of life of diabetes patients [5]. It has been shown that salivary dysfunctions included physical and biochemical parameters

are potentially associated with diabetes [6]. Both dental caries and diabetes are associated with carbohydrates ingestion. Elevated salivary glucose level and hyposalivation could be caused by insulin deficiency [5].

Description of knowledge

Johnson et al. observed lower pH, flow rate and salivary amylase in diabetes group compare to non-diabetics. Levels of salivary glucose, total proteins, sodium and potassium were elevated in diabetic group, while level of calcium was lower in the same group in comparison to control group. This findings indicate that salivary parameters could be effective for screening, diagnosis and monitoring of diabetes [6]. Ekta et al. conducted study, in which 120 diabetics and 120 non-diabetics individuals were included. They examined dental carries occurrence in study group. Data was also extracted from semi-closed-ended questionnaire. Dental carries occurrence was significantly higher in diabetic group 73.33% vs 33.33%. Individuals with uncontrolled diabetic characterized by higher dental carries prevalence in comparison to controlled diabetics [5]. Also animal studies indicates potential association between elevated glucose level in the blood and oral health [7]. There are other studies which confirm that diabetes have an impact on oral cavity and contiguous structures condition. The most common oral complications of diabetes are periodontal disease and dental caries. There exist correlation between the diabetes which may increase the risk of developing periodontitis and periodontal disorders which may negatively affect the glycaemic control. “Two-way” relationship was confirm in the study conducted on population of Gila River Indian community. The occurrence of severe periodontal entail poor glycaemic control which was measured on the basis of HbA (HbA>9%) [8]. Moreover some studies reports that severity of periodontitis has impact on appearance of other complications not related to diabetes. Another report based on Gila River Indian community shows that severe and moderate periodontitis causes 3.5 and 2.3 times higher opportunity to occur the end-stage renal disease than none or mild periodontitis [9]. There is also association between elevated risk of cardiovascular diseases (CVD) and gingivitis and between CVD and periodontitis, which was reported in prospective observational study in Cameroon [10]. In other researches it was noticed that diabetics exhibited severe periodontal disease in compare to diabetics with gingivitis or mild periodontal disease have higher prevalence of proteinuria, stroke, angina, intermittent claudication and retinopathy [11]. In cross-sectional study carried out in Pima Indians from Arizona, it was shown that the incidence of periodontal disease was 2.6 times higher in group with diabetes type 2 mellitus compared to non-diabetic group [12]. There is no statistically significant differences between types of diabetes. Similar dependency exist in

young patients under 18 years with known type 1 diabetes mellitus. It was demonstrated that children with diabetes had higher attachment and bone loss in contrast to control group [13]. Another research also shows that there is relationship between diabetes and oral cavity disorders with some exceptions. In this study Portuguese children were divided into two groups based on diagnosis of type 1 diabetes and evaluated on the basis of seven parameters. In control group there were elevated ratio of bleeding on probing, plaque and calculus index whereas no significant correlation with dental caries and salivary parameters in both groups has been found. Furthermore the meaningful differences in salivary pH and metabolic control were noticed [14]. In the literature are reports suggesting that coronal caries appear in diabetics and those without the disease. In addition there are many other factors which may influence the caries experience, such as intake of cariogenic food [15,16]. On the contrary, the retrospective study carried out in Korean adults indicate increased risk of untreated caries in type 2 diabetes group compared to participants with normal glucose tolerance levels [17]. Furthermore there is establishment that type 2 diabetes mellitus increases the rate of root caries but has no impact on coronal caries [18]. Several researches based on animal model have emphasized the correlation between dental caries and diabetes [19,20], while other report contradict this dependence [21]. Comparing two tested groups of rats it was noticed that there was slightly difference between the state of mandibular and maxillary molar caries in both genders. Male diabetic rats were characterized by increased ratio in compare to nondiabetic female rats. More evident connection exist between hyperglycaemic condition and caries formation which is enhanced in diabetic rats. In population of diabetic in Finland it was show that self-efficacy is important in controlling the diabetes and oral hygiene. Diabetic individuals with better tooth brushing were characterized by lower plaque scores and lower HbA_{1c} levels compared to group of diabetic with poorer self-efficacy [22]. Moreover patients with successful management of gingivitis were reported with better glycaemic control and also were characterized by lower HbA_{1c} levels than participants with ineffective management of gingivitis [23].

Conclusion

Most analysed studies confirm the relationship between diabetes and oral cavity diseases. Wherefore it ought to concentrate on cooperation between physician and dentists. It also may be helpful consulting with nutritionist which may advise appropriate nutrition to reduce the effects of oral cavity disorders. That should be appropriate to focus on existence of this connection because it might find to be helpful in early diagnosis and prevention of periodontitis

and other disorders. It was validate that periodontal therapy conducted for diabetic is linked with improvements in controlling glycaemic which may influence on diabetes management.

References

1. World Health Organization, Global report on diabetes, Geneva, Switzerland 2016.
2. Orbak R., Simsek S., Orbak Z., Kavrut F., Colak M., Yonsei Med J., The Influence of Type-1 Diabetes Mellitus on Dentition and Oral Health in Children and Adolescents, 2008;49(3):357-365.
3. Professional Practice Committee: standards of Medical Care in Diabetes – 2018. Diabetes Care 2018;41:13-27.
4. Singh I., Singh P., Singh A., Singh T., Kour R., Diabetes inducing factor for dental caries: A case control analysis in Jammu, J Int Soc Prev Community Dent. 2016;6(2):125–129.
5. Ekta A. Malvania, Sona A. Sheth, Ashish S. Sharma, Saloni Mansuri, Faizan Shaikh, and Saloni Sahani, Dental caries prevalence among type II diabetic and nondiabetic adults attending a hospital, J Int Soc Prev Community Dent. 2016;6(3): S232–S236.
6. Johnson P., Ganesh M, Subhashini A.S., Evaluation of Salivary Profile among Adult Type 2 Diabetes Mellitus Patients in South India., J Clin Diagn Res. 2013;7(8):1592-5.
7. Kodama T., Matsuura M., Sano S., Nakahara Y., Ozaki K., Narama I., Matsuura T., Diabetes Enhances Dental Caries and Apical Periodontitis in Caries-Susceptible WBN/KobSlc Rats, Comp Med. 2011;61(1): 53–59.
8. Taylor G.W., Burt B.A., Becker M.P et al. Severe periodontitis and risk for poor glycemic control in patients with non-insulin-dependent diabetes mellitus. J Periodontol. 1996;67:1085–1093.
9. Shultis W.A., Weil E.J., Looker H.C. et al. Effect of periodontitis on overt nephropathy and end-stage renal disease in type 2 diabetes. Diabetes Care. 2007;30:306–311.
10. Belinga L.E.E., Ngan W.B., Lemougoum D. et al. Association between periodontal diseases and cardiovascular diseases in Cameroon. *Journal of Public Health in Africa*. 2018;9(1):761.
11. Thorstensson H., Kuylenstierna J., Hugoson A. (1996) Medical status and complications in relation to periodontal disease experience in insulin-dependent diabetics. J Clin Periodontol 23:194–202.
12. Nelson R.G., Shlossman M., Budding L.M., et al. Periodontal disease and NIDDM in Pima Indians. Diabetes Care. 1990;13:836–840.
13. Cianciola L.J., Park P.H., Bruck E., Mosovich L., Genco R.J. Prevalence of periodontal disease in insulin-dependent mellitus (juvenile diabetes) J Am Dent Assoc. 1982;104:653–660.

14. Estima da Cunha Coelho A.S., Carneiro A.S., Pereira V.F, Pereira Paula A., Macedo A.P., Palmeirão Carrilho E.V. Oral Health of Portuguese Children with Type 1 Diabetes: A Multiparametric Evaluation. *Journal of Clinical Pediatric Dentistry*: 2018;42(3):231-235.
15. Taylor G.W., Manz M.C., Borgnakke W.S., Diabetes, periodontal disease, dental caries and tooth loss: a review of the literature, *Compend Contim Educ Dent*, 2004;25:179–92.
16. Lamster I.B.. Diabetes and oral health—current concepts regarding periodontal disease and dental caries. *US Endo- crinol*. 2012;8(2):93–97.
17. Song, I.S., Han, K., Park, Y.M., Ryu, J.J., Park, J.B. Type 2 diabetes as a risk indicator for dental caries in Korean adults: the 2011–2012 Korea national health and nutrition examination survey. *Community Dent Health*. 2017;34:169–175
18. Hintao J., Teanpaisan R., Chongsuvivatwong V., Dahlen G., Rattarasarn C., Root surface and coronal caries in adults with type 2 diabetes mellitus. *Community Dent Oral Epidemiol* 2007; 35:302-9.
19. Borghelli R.F., Devoto F.C., Lazzari R.N., Erausquin J., Foglia V.G., *J Dent Res.*, Effect of insulin on caries activity in the rat. 1971 Jul-Aug; 50(4):888-91
20. HARTLES R.L., LAWTON F.E. *Br J Nutr*. Experimental dental caries in the albino rat; the effect of single subcutaneous injections of alloxan on the incidence of dental caries. 1958; 12(3):286-92.
21. NICHOLS M.S, SHAW J.H. *J Dent Res.*, The effect of alloxan diabetes on caries incidence in the albino rat,1957; 36(1):68-74
22. Syrjala A.M., Kneckt M.C., Knuuttila M.L. Dental self-efficacy as a determinant to oral health behaviour, oral hygiene and HbA1c level among diabetic patients. *J Clin Periodontol*. 1999;26:616–621.
23. Kneckt M.C., Syrjala A.M., Knuuttila M.L. Attributions to dental and diabetes health outcomes. *J Clin Periodontol*. 2000;27:205–211.