DESCRIPTION OF SALIVA MELATONIN LEVELS IN GINGIVITIS PATIENTS AT RSGM UNJANI CIMAHI INDONESIA

(GAMBARAN TINGKAT MELATONIN DALAM SALIVA PADA PASIEN GINGIVITIS DI RSGM UNJANI CIMAHI INDONESIA)

Andi Supriatna[1]*, Tichvy Tammama[2], Fahira Salma Khoirunnisa[3]
[1]Department of Periodontics, Faculty of Dentistry, Universitas Jenderal Achmad Yani, Cimahi, Indonesia
[2]Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Universitas Jenderal Achmad Yani, Cimahi, Indonesia
[3]Faculty of Dentistry, Universitas Jenderal Achmad Yani, Cimahi, Indonesia

*Corresponding author
andii.drg14@gmail.com

JHDS.unjani.ac.id/jite
Doi: 10.54052/jhds.

Article History
Received:23/02/2023
Accepted:20/03/2023

ABSTRACT

Periodontal disease is a dental and oral disease that often occurs in Indonesian society. According to Riskesdas in 2018, the Prevalence of dental and oral diseases in Indonesia was 57.6%, with most cases being dental caries and periodontal disease, while according to Purwakarta Health Profile in 2017, the periodontal disease prevalence in West Java was 85.6%. One of the most common periodontal diseases in Indonesia is Gingivitis. According to Riskesdas, in 2018, the Prevalence of Gingivitis in Indonesia reaches 74%. Gingivitis is an inflammatory process in the gum tissue of the oral cavity. The body has a hormone that acts as an anti-inflammatory and antioxidant in periodontal diseases, namely melatonin. melatonin hormone will decrease if there is inflammation in the body, increased free radicals, bone damage, immune system disorders, oxidative stress, and circadian rhythm disorders. This study aimed to describe the melatonin level in gingivitis patients' saliva.

This study used cross-sectional quantitative descriptive research as its methodology. The level of melatonin in the saliva is low if <2 pg/ml, normal: 2-4pg/ml, and high: >4pg/ml. The results showed that the mean melatonin level in the saliva of gingivitis patients at RSGM Unjani was 13.8 pg/ml, with a minimum melatonin level of 6.9 pg/ml and a maximum of 48.5 pg/ml. The results of the research and data analysis concluded that the level of melatonin in the saliva of patients with Gingivitis at RSGM Unjani is elevated, which is caused by various factors that affect melatonin levels.

Keywords: *anti-inflammatory; gingivitis; melatonin hormone; saliva*

ABSTRAK

Penyakit periodontal merupakan penyakit gigi dan mulut yang sering terjadi pada masyarakat Indonesia. Menurut Riskesdas tahun 2018 prevalensi penyakit gigi dan mulut di Indonesia adalah 57,6% dengan kasus terbanyak yaitu karies gigi dan penyakit periodontal, sedangkan menurut profil kesehatan Purwakarta tahun 2017 prevalensi penyakit periodontal di Jawa Barat mencapai 85,6%. Salah satu penyakit periodontal yang banyak terjadi di Indonesia adalah gingivitis. Menurut Riskesdas tahun 2018 prevalensi gingivitis di Indonesia mencapai 74%. Gingivitis merupakan suatu proses inflamasi yang terjadi pada gingiva di rongga mulut. Tubuh memiliki hormon yang berfungsi sebagai anti inflamasi dan anti oksidan pada penyakit periodontal yaitu hormon melatonin. Hormon melatonin akan menurun jika terdapat inflamasi pada tubuh, terjadi peningkatan radikal bebas, kerusakan tulang, terdapat kelainan sistem imun, stress oksidatif, dan kelainan ritme sirkardian. Penelitian ini bertujuan untuk mengetahui gambaran tingkat melatonin dalam saliva pada pasien gingivitis. Jenis penelitian yang digunakan pada penelitian ini adalah deskriptif kuantitatif dengan pendekatan cross-sectional. Tingkat melatonin dalam saliva rendah jika <2 pg/ml, normal: 2-4pg/ml dan tinggi: >4 pg/ml. Hasil penelitian menunjukkan nilai rata-rata tingkat melatonin dalam saliva pada

pasien gingivitis di RSGM Unjani sebesar 13,8 pg/ml dengan nilai minimum tingkat melatonin adalah 6,9 pg/ml dan maksimum sebesar 48,5 pg/ml. Dari hasil penelitian dan analisis data yang telah dilakukan, didapatkan kesimpulan bahwa tingkat melatonin dalam saliva pada pasien gingivitis di RSGM Unjani adalah tinggi yang disebabkan oleh berbagai faktor yang dapat mempengaruhi tingkat melatonin.

Kata kunci: *anti inflamasi; gingivitis; hormon melatonin; saliva*

INTRODUCTION

Periodontal disease is a dental and oral disease that often occurs in Indonesian society. According to the 2018 Riskesdas, the Prevalence of dental and oral disease in Indonesia is 57.6%, with the most cases being dental caries and periodontal disease, while according to Purwakarta's health profile in 2017, the Prevalence of periodontal disease in West Java reaches 85.6%. [1,2]According to classification International Workshop for a Classification of Periodontal Diseases and Conditions in 2017, Periodontal diseases are gingival disease, periodontitis, and other conditions affecting the periodontium.[3] In general, periodontal disease is divided into periodontitis and Gingivitis.[4] One of the most common periodontal diseases in Indonesia is Gingivitis. According to the 2018 Riskesdas, the Prevalence of Gingivitis in Indonesia reaches 74%.[5]. Gingivitis is an inflammatory process that occurs in the gingiva in the oral cavity. Gingivitis is an inflammatory process that occurs in the gingiva in the oral cavity. The clinical feature of Gingivitis is redness of the gingival margin, the disappearance of keratinization on the gingival surface, swelling, and loss of texture of the free gingiva.[6]

The body has a hormone that is an anti-inflammatory and antioxidant in periodontal disease, melatonin. Melatonin is a hormone secreted by the pineal gland. The melatonin hormone has many bodily functions, including antioxidant and anti-inflammatory, which can regulate the immune system by reducing acute and chronic inflammation. Besides that, melatonin hormone also functions as an immunomodulator by regulating the secretion of IL-2, INF-a, due to the activation of CD4+ lymphocytes and stimulates the proliferation and synthesis of type I collagen.[7,8] The level of the hormone

melatonin in the body can decrease and increase due to several factors. The melatonin hormone will decrease if there is inflammation, increased free radicals, bone damage, immune system disorders, oxidative stress, and circadian rhythm disorders. Melatonin will also increase when a person sleeps at night.[8]

Universitas Jenderal Achmad Yani Oral and Dental Hospital (RSGM Unjani) is a health service facility that provides dental and oral health services, including general dental services, periodontics, conservation of teeth, prosthodontics, pedodontics, orthodontics, radiology, and periodontics. Based on the description above, this study aimed to find out about the level of melatonin in saliva in gingivitis patients.

METHOD

The research has received ethical approval from Universitas Padjadjaran (Unpad) research ethics committee with number 132/UN6.KEP/EC/2023. This type of research was a quantitative descriptive study with a cross-sectional approach. The research was at RSGM Unjani, and Unpad integrated research laboratory in January 2023. The population in this study were all patients suffering from Gingivitis at RSGM Unjani, Cimahi, Indonesia. The subjects in this study were 20 people who met the inclusion and exclusion criteria. The inclusion criteria were patients willing t be respondents, patients diagnosed with Gingivitis, and generally in good health. Exclusion criteria were smokers, had periodontitis, the amount of saliva taken from patients was <3 Ml. The sampling method uses non-probability sampling with a purposive sampling technique. The sample size calculation used the following estimation formula:

$$n = \frac{{Z_{\alpha/2}}^2 \cdot \mathrm{p} \cdot \mathrm{q}}{d^2}$$

n = research sample size
p = Prevalence of periodontal disease in West Java (86%)
q = 1-p (14%) Zα/2 = Normal curve price α = 5% (1.96)
d = margin of error (15%)

$$n = \frac{1{,}96^2 \cdot 0{,}86 \cdot 0{,}14}{0{,}15^2}$$

n = 20,55
n≈ 20

Saliva sampling was carried out without stimulation using the 3-4 ml spitting method Low-intensity light was used because high-intensity light sources can reduce melatonin secretion. Saliva was collected for 1 minute in the oral cavity, then spit out into the centrifuge tube through a funnel. The saliva collection was carried out five times for 5 minutes. The saliva samples were stored in an ice box. The researchers sent the saliva samples to the laboratory, and then the saliva was centrifuged at 3,000 rpm for 20 minutes, and the clear supernatant was stored at -20°C. After that, the salivary melatonin

level was determined by Enzyme-Linked Immunosorbent Assay (ELISA).[9,10 11]

RESULT

The study on 20 research subjects diagnosed with Gingivitis at RSGM Unjani took saliva from gingivitis patients at RSGM Unjani and measured melatonin levels using a competitive Enzyme-linked Immunosorbent Assay (ELISA).

Table 1. Characteristics of research subjects

Characteristics	Total	Presentation
Gender		
Female	14	70%
Male	6	30%
Age		
15-30	12	60%
30-50	6	30%
>50	2	10%

Table 1 shows that the research subjects in this study were primarily female, as many as 14 people (70%), while male sex, as many as six people (30%). The reason is because female patients dominate patients at RSGM Unjani who experience Gingivitis. Based on the age of the research subjects, they were 15-50 years old, with 12 years (60%) of 15-30 years old subjects, six people (30%) 30-50 years old, and people above 50 years old.

Table 1. Levels of melatonin in saliva in gingivitis patients at RSGM Unjani

	Mean	Median	SD	Min-Max
Levels of melatonin in saliva	13,8	10,2	9,5	6,9-48,5

Table 2 shows that the average melatonin level of saliva in gingivitis patients at RSGM was 13.8 pg/ml, with a minimum melatonin level of 6.9 pg/ml and a maximum of 48.5 pg/ml.

Melatonin is a hormone the pineal gland produces enzymatically from the amino acid tryptophan.[12] The pineal gland has neuroendocrine receptors. Light impulses from the retina will be conveyed to the pineal gland through the suprachiasmaticus nucleus in the hypothalamus through the sympathetic nervous system, with norepinephrine as a neurotransmitter. Synthesis and secretion of melatonin are stimulated by dark and inhibited by bright light. The photoreceptors in the retina hyperpolarize if light is present, which prevents norepinephrine secretion. Melatonin secretion decreases due to the suppression of the retinal hypothalamus-pineal pathway. The photoreceptors release norepinephrine without light, activating the retinal, hypothalamus, and pineal systems—increasing alpha- and beta-adrenergic receptors in the pineal gland. Contact between norepinephrine and its receptors activates arylalkylamine N-

acetyltransferase (AA-NAT). This enzyme will start the synthesis of melatonin and its secretion (Kaczor, 2010).[13] Melatonin also has antioxidant, anti-inflammatory, and anti-apoptotic effects.[14]

Gingivitis is an inflammation in the gingiva caused by the accumulation of subgingival plaque bacteria, including gram-negative anaerobic bacteria such as *Porphyromonas gingivalis*.[15,16] Clinical features of Gingivitis include redness and oedema of the gingiva, and it bleeds easily, however, there is no alveolar bone destruction.[15,17] The severity of inflammatory response in Gingivitis is associated with massive free radical generation. The action of melatonin as an anti-inflammatory and antioxidant agent may be beneficial for reducing inflammation in Gingivitis.

This research found that the average melatonin level in 20 subjects was 13.8 pg/ml, with a minimum melatonin level value of 6.9 pg/ml and a maximum of 48.5 pg/ml. These findings differed from a study conducted by Srinath et al (2010) where the average hormone melatonin level in Gingivitis was 0.67 pg/ml. Research conducted by Hajati et al. (2011) showed that the average melatonin hormone in Gingivitis was 4.35 pg/ml but lower than that in healthy subjects, namely 5.29 pg/ml. The average level of melatonin in saliva during the day is 2-4 pg/ml, low if <2 pg/ml, and high if >4 pg/ml.[18] Decreased level of melatonin indicates inflammation. The decreased level of melatonin during inflammation results from faster use of melatonin because it functions as an antioxidant in detoxifying free radicals whose production increases during inflammation.[18] Factors that can cause melatonin to decrease include inflammation in the body, an increase in free radicals, bone damage, immune system disorders, oxidative stress, and circadian rhythm disorders.[7] Other factors such as smoking, light exposure, alcohol consumption, and ageing can also reduce salivary melatonin levels, while gender does not affect its levels.[19]

This study found melatonin levels in gingivitis patients at RSGM Unjani are high. It could be due to inflammation in some patients with less severe Gingivitis. Melatonin levels decrease as the severity of the disease increases. The study by Cutando et al., which measured the relationship between salivary melatonin and the degree of periodontal disease in humans, found an inverse correlation between them. As the severity of periodontal disease increases, the salivary melatonin level decreases. It is related to melatonin which functions quickly as an antioxidant.[19,20]

Synthesis and secretion of

melatonin are affected by time. At night melatonin in the body increases as a person sleeps. In dark conditions, the electrical signal nerves that the central nervous system has received will be forwarded to the pineal gland and release norepinephrine to start melatonin synthesis. The pineal gland is very light-sensitive, so it is active at night. In ordinary people, melatonin production increases at night, around eight to eleven o'clock, with maximum secretion at two to four AM.[7,21] Normal melatonin hormone levels can reach 50 pg/ml at night. Because the level of melatonin obtained is a product when melatonin secretion begins with an average level of 1-5 pg/ml. The timing of saliva sampling depended on the presence of patients diagnosed with Gingivitis so that it could affect the results of the level of melatonin.

Foods and drinks consumed before saliva collection can also affect high levels of melatonin, such as sour cherries, rice, walnuts, cucumbers, coffee, tea, beer, and wine, because they contain melatonin[18]. When collecting saliva samples, there should be no food in the mouth during sampling.[12] Ideally, before collecting saliva, respondents were instructed not to eat and drink for 60 minutes. However, due to obstacles in finding gingivitis patients in this study, they ignored this, affecting the melatonin levels results.

Depression can also increase levels of melatonin. The reason is that anxiety increases oxidative stress in the body, so melatonin is produced more because its antioxidant action effectively protects the body.[22] Another factor affecting melatonin levels in this study was the poor specificity of the antibodies that can cause high melatonin levels. ELISA have a cross-reactions of 1.2% with N-acetyl serotonin and 2.5% for 5-methoxy tryptamine, and 0.02% for serotonin. Measuring the level of melatonin by ELISA is so sensitive that other substances in the sample, the pH of the sample, and the high viscosity of the sample can also affect the reading of the level of this hormone.[23]

CONCLUSION

From the research results and data analysis, the conclusions are that the level of melatonin in the saliva of gingivitis patients at RSGM Unjani was high. Future studies should examine the factors affecting melatonin levels during saliva sampling and other research differences in salivary melatonin levels in gingivitis patients with other periodontal diseases.

CONFLICT OF INTEREST

There is no conflict of interest in writing this article.

ACKNOWLEDGEMENT

The writer acknowledges the

professionals who have assisted in the research and preparation of papers, such as the Unpad integrated research laboratory assistant.

REFERENCE

1. Oedijani S. Infeksi periodontal sebagai faktor risiko kondisi sistemik. ODONTO Dent Journal. 2019;6(2):141–52.
2. Kementrian Kesehatan. Profil Kesehatan Kabupaten Purwakarta. Purwakarta; 2017. 38 p.
3. Caton JG, Armitage G, Berglundh T, Chapple ILC, Jepsen S, Kornman KS, et al. A new classification scheme for periodontal and peri-implant diseases and conditions – Introduction and key changes from the 1999 classification. J Periodontol. 2018;89(S1):S1–8.
4. Rizkiyah M, Oktiani BW, Wardani IK. Prevalensi dan analisis faktor risiko kejadian gingivitis dan periodontitis pada pasien diabetes melitus. Dentin J Kedokt Gigi. 2021;V(1):32–6.
5. Umniyati H, Amanah SP, Maulani C. Hubungan Gingivitis dengan Faktor-Faktor Risiko pada Ibu Hamil. Padjadjaran J Dent Res Student. 2020;4(1):36–42.
6. Fitri H, Fajrin FN. Efek pemberian zink pasca scaling root planning terhadap kadar mmp-8 saliva pada pasien gingivitis. B-Dent J Kedokt Gigi Univ Baiturrahmah. 2019;6(2):132–41.
7. Gofur NR et al. Decrease of Salivary Melatonin Level in Periodontal Disease : A Review Article. J Med reserach adn Heal Sci. 2021;4(3):1192–8.
8. Ferlazzo N, Andolina G, Cannata A, Costanzo MG, Rizzo V, Currò M, et al. Is melatonin the cornucopia of the 21st century? Antioxidants. 2020;9(11):1–29.
9. Hagh Golpasand L, Ahangarpour A, Zakavi F, Hajati S. Relationship between Salivary Melatonin Level and Periodontal Diseases. Djh. 2011;3(1):13–9.
10. Almughrabi OM, Marzouk KM, Hasanato RM, Shafik SS. Melatonin levels in periodontal health and disease. J Periodontal Res. 2013;48(3):315–21.
11. Mayang Pramudya Sari, Sri Wahyuningsih Rais SRPD. Perbandingan laju alir saliva lansia penderita diabetes miletus pengguna dan bukan pengguna gigi tiruan lepasan. ODONTO Dent J. 2019;6:88–94.
12. Kennaway DJ. Measuring melatonin by immunoassay. J Pineal Res. 2020;69:1–25.
13. Sandra Y. Melatonin dan Kanker Payudara. Maj Kesehat PharmaMedika. 2011;3(2):286–91.
14. Konecna B, Chobodova P, Janko J, Banasova L, Babickova J, Celec P, Tothova L.. The Effect of Melatonin on Periodontitis. Int J Mol Sci. 2021;22:1–

11.
15. Rohmawati N, Santik YDP. Status Penyakit Periodontal pada Pria Perokok Dewasa. HIGEIA. 2019;3(2):286–97.
16. Nitawati NPM, Robin DMC, Syafriadi M. Respon Limfosit T Sitotoksik Pada Gingivitis Setelah Pemberian Kurkumin (Citotoxic T Lymphocytes Response in Gingivitis After Curcumin Given). e-Jurnal Pustaka Kesehat. 2014;2(1):42–9.
17. Trombelli L, Farina R, Silva CO, Tatakis DN. Plaque-induced Gingivitis: Case definition and diagnostic considerations. J Clin Periodontol. 2017;45:S44–67.
18. Reiter RJ, Rosales-Corral SA, Liu XY, Acuna-Castroviejo D, Escames G, Tan DX. Melatonin in the oral cavity: Physiological and pathological implications. J Periodontal Res. 2015;50(1):9–17.
19. Srinath R, Acharya A, Thakur S. salivary and gingival crevicular fluid melatonin in periodontal health and disease. J Periodontol. 2010;81(8):277–83.
20. Permuy M, López-Peña M, González-Cantalapiedra A, Muñoz F. Melatonin: A review of its potential functions and effects on dental diseases. Int J Mol Sci. 2017;18(4):1–13.
21. Middleton B. Measurement of melatonin and 6-sulphatoxymelatonin. Methods Mol Biol. 2013;1065:171–99.
22. Ito Y, Iida T, Yamamura Y, Teramura M, Nakagami Y. Relationships between Salivary Melatonin Levels , Quality of Sleep , and Stress in Young Japanese Females. nternational J Tryptophan Res. 2013;6(Suppl 1):75–85.
23. Kennaway DJ. A critical review of melatonin assays: Past and present. J Pineal Res. 2019;67(1):1–14.