INTRODUCTION

Periodontitis is a complex multifactorial disease with high prevalence in Indonesia and in the world. According to the Indonesian national survey on domestic health (SKRT 2003), dental and oral diseases ranked first of the 10 groups of the most common diseases that people complained about, and of dental and oral diseases, periodontal disease was the most common complaint after caries. The survey of the following year (SKRT 2004) indicated a prevalence of 96.6% for periodontal disease [1]. In comparison, 50% of the population aged 16–80 years in Denmark had a healthy periodontium and 50% suffered from gingivitis and periodontitis in 1981. In America, 95% of the population aged 65 years or older is experiencing periodontal attachment loss in at least one side of the mouth. Among all age groups, men have higher levels of periodontal destruction than women [2]. In India, 76.7% of the population of outpatients aged 18–48 years showed periodontitis in 2008, and in Mexico, the prevalence of periodontitis was 62.7% in the male population in 2007 [3].

Periodontitis is an inflammatory disease in the supporting structures of the teeth caused by specific microorganisms and results in progressive destruction of the periodontal ligament and alveolar bone with pocket formation, recession, or both [4]. The interaction between host and bacteria of the oral cavity are very important to understand the formation, recession, or both [4]. The interaction between host and bacteria of the oral cavity are very important to understand the formation, recession, or both [4]. This work aimed to clarify the association of the severity of periodontitis and polymorphism in osteoprotegerin (OPG) (T950C) in Indonesian men.

METHODS

For DNA extraction, blood serum samples were used from 100 consenting Indonesian males for whom also the status of periodontitis had been classified as mild, moderate, or severe. Polymerase chain reaction and restriction fragment length polymorphism techniques were applied to evaluate OPG (T950C) polymorphism, using Hind II restriction enzyme and electrophoresis on agarose gel to separate the indicative fragments.

RESULTS

The genotype distribution of the OPG (T950C) polymorphism had an appearance of an increasing percentage of TT genotype (allele T) with increasing severity of periodontitis. The CC genotype was relatively rare (1%) in the tested Indonesian male population.

CONCLUSIONS

The results show no significant association between the severity of periodontitis and polymorphism of OPG (T950C) in Indonesian men.

Keywords: Periodontitis, Osteoprotegerin, Polymorphism.

© 2019 The Authors. Published by Innovare Academic Sciences Pvt Ltd. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/) DOI: http://dx.doi.org/10.22159/ijap.2019.v11s1.18333
RESULTS

Table 1 shows the distributions of genotypes and allotypes of OPG (T950C) polymorphism in all 100 male subjects. It is seen that the TT genotype (70%) dominates and CC is rare (1%), with corresponding dominance of allele T (84.5%). Table 2 presents the distribution of genotypes according to the severity of periodontitis. The TT genotype appears to become increasingly common from mild to severe periodontitis, and the TC genotype is correspondingly less frequent. Table 3 shows the distribution of alleles according to the severity of periodontitis. Allele T appears to become more frequent from mild to severe periodontitis, and allele C shows an opposite trend. However, the trends are not statistically significant.

DISCUSSION

The results suggest an increasing frequency of the TT genotype (T allele) of the OPG (T950C) polymorphism with increasing severity of periodontitis in Indonesian males. In case of mild periodontitis, one-half of the subjects were of the TT genotype but >80% in case of severe periodontitis. In principle, this could suggest some oral health benefits carried by the TT genotype, but it should also be noted that the CC genotype appears to be rare (1%) in the test population. This, in turn, may suggest a disadvantage carried by the CC genotype, unless the low frequency of CC is coincidental.

Previously, Park et al. suggested that OPG polymorphism is significantly associated with chronic periodontitis [17]. However, several other studies have shown no association between chronic periodontitis and aggressive periodontitis with polymorphisms of OPG [18-22]. Considering the wide variation of the genotype distribution between populations, as indicated by Table 4, and the population-dependent prevalence of periodontal disease, it is likely that the strength of such an association, if present, varies between populations. In general, one would not expect that a single polymorphism of a single gene, although an important gene in the control of alveolar bone resorption, would alone show an overwhelming association to the pathogenesis of periodontitis. Although not statistically significant, this trend may suggest a significant association for a larger sample population. Nevertheless, any association would be unlikely to be very strong for the tested polymorphism alone.

CONCLUSIONS

There was an increasing frequency of the TT genotype (T allele) of the OPG (T950C) polymorphism with increasing severity of periodontitis.

| Genotype | Frequency (%) |
|----------|---------------|
| TT       | 169 (84.5) |
| TC       | 31 (15.5)  |
| CC       | 0 (0)       |

Table 1: Genotype and allotype distribution of the subjects

| Issue | Genotype | Allele |
|-------|----------|--------|
|       | TT       | TC     | CC     | Total |
|       | 70       | 29     | 1      | 100   |
|       | 70       | 29     | 1      | 100   |
| Number| 169      | 31     | 200    |
| Frequency (%)| 84.5 | 15.5 | 100 |

Table 2: Distribution of genotypes according to the severity of periodontitis

| Genotype | Severity |
|----------|----------|
|          | Mild n (%)| Moderate n (%)| Severe n (%) |
| TT       | 5 (50.0)  | 31 (63.3)     | 34 (82.9)    |
| TC       | 5 (50.0)  | 17 (34.7)     | 7 (17.1)     |
| CC       | 0         | 1 (2.0)       | 0            |
| Total    | 10 (100)  | 49 (100)      | 41 (100)     |
Table 3: Distribution of allotypes according to the severity of periodontitis

| Allele | Mild n (%) | Moderate n (%) | Severe n (%) |
|--------|------------|---------------|--------------|
| T      | 15 (75.0)  | 79 (80.6)     | 75 (91.5)    |
| C      | 5 (25.0)   | 19 (19.4)     | 7 (8.5)      |
| Total  | 20 (100)   | 98 (100)      | 82 (100)     |

Table 4: Genotypes of OPG (T950C) in some populations

| Population (n) | Genotype |
|----------------|----------|
|                | TT (%)   | TC (%)   | CC (%)   |
| Brazil (50)    | 82       | 12       | 6        |
| Germany (90)   | 66       | 32       | 2        |
| Slovenia (103) | 25.2     | 53.4     | 21.4     |
| Japan (361)    | 37.7     | 44.9     | 17.4     |
| Denmark (266)  | 23.7     | 53.4     | 22.9     |
| This work (100)| 70       | 29       | 1        |

OPG: osteoprotegerin

In Indonesian males. However, the trend was not statistically significant for the tested sample size.

ACKNOWLEDGMENT

Financial support from the Indonesian Ministry of Research, Technology and Higher Education through the University of Indonesia is greatly appreciated (EIA, Grant number 569/UN2.R3.1/HKP.05.00/2018-2019).

CONFLICTS OF INTEREST

There are no conflicts of interest to declare.

REFERENCES

1. Statistics Survey. Survey of Demographic and Health in Indonesia. Available from: http://www.datastatistik-indonesia.com/sdzi. [Last accessed on 2011 Oct 09].

2. Loe H, Morrison E. Epidemiology of Periodontal Disease. Contemp Periodontics 2003;2003:106-16.

3. Roohan T, Rao A, Joshua E, Ranganathan K. Dental and oral health status in drug users in Chennai, India: A cross sectional study. J Oral MaxilloFac Pathol 2008;12:16-21.

4. Newman MG. The Normal Periodontium. Carranza’s Clinical Periodontology. St. Louis, Missouri: Elsevier Saunders; 2003. p. 16.

5. Offenbacher S, Barros SP, Beck JD. Rethinking periodontal inflammation. J Periodontol 2008;79:1577-84.

6. Borrell LN, Papapanou PN. Analytical epidemiology of periodontitis. J Clin Periodontol 2005;32 Suppl 6:132-58.

7. Michalowicz BS, Diehl SR, Gunsolley JC, Sparks BS, Brooks CN, Koczor TE, et al. Evidence of a substantial genetic basis for risk of adult periodontitis. J Periodontol 2000;71:1699-707.

8. Michalowicz BS, Aeppli D, Virag JG, Klump DG, Hinrichs JE, Segal NL, et al. Periodontal findings in adult twins. J Periodontol 1991;62:293-9.

9. Tabor HK, Risch NJ, Myers RM. Candidate-gene approaches for studying complex genetic traits: Practical considerations. Nat Rev Genet 2002;3:391-7.

10. Mogi M, Otogo J, Ota N, Togari A. Differential expression of RANKL and osteoprotegerin in gingival crevicular fluid of patients with periodontitis. J Dent Res 2004;83:166-9.

11. Crotti T, Smith MD, Hirsch R, Soukoulis S, Weeden H, Capone M, et al. Receptor activator NF kappaB ligand (RANKL) and osteoprotegerin (OPG) protein expression in periodontitis. J Periodontal Res 2003;38:880-7.

12. Bostanci N, Igenil T, Eminil G, Afacan B, Han B, Tör H, et al. Gingival crevicular fluid levels of RANKL and OPG in periodontal diseases: Implications of their relative ratio. J Clin Periodontol 2007;34:370-6.

13. Auerkari EI, Suryandari DA, Umami SS, Kusdhany LS, Siregar TW, Rahardjo TB, et al. Gene promoter polymorphisms of RUNX2 and risk of osteoporosis in postmenopausal indonesian women. SAGE Open Med 2014;2:2050312114531571.

14. Auerkari E, Suhartono A, Djiamal N, Verisfa F, Suryandari D, Kusdhany L, et al. CRP and IL-1B gene polymorphisms and CRP in blood as periodontal disease. Open Dent J 2015;7:88-93.

15. Tanjaya J, Auerkari EI. IL-18 genetic polymorphism in menopause women as periodontal disease risk factor. J Dent Indonesia 2011;18:1-5.

16. Auerkari EI, Kusdhany L, Umami SS, Rahardjo TB, Talbot C. Polymorphism of methylenetetrahydrofolate reductase (a1298c) as a risk factor for osteoporosis in post-menopausal indonesian women. Asian J Pharm Clin Res 2017;10:172-5.

17. Park OJ, Shin SY, Choi Y, Kim MH, Chung CP, Ku Y, et al. The association of osteoprotegerin gene polymorphisms with periodontitis. Oral Dis 2008;14:440-4.

18. Baiomi CS, de Souza CM, Ribeiro Braosi AP, Lucyzsny SM, Dias da Silva MA, Ignácio SA, et al. Analysis of the association of polymorphism in the osteoprotegerin gene with susceptibility to chronic kidney disease and periodontitis. J Periodontal Res 2008;43:578-84.

19. Wagner J, Kaminski WE, Aslandis C, Moder D, Hiller KA, Christgau M, et al. Prevalence of OPG and IL-1 gene polymorphisms in chronic periodontitis. J Clin Periodontol 2007;34:823-7.

20. Park OJ, Shin SY, Choi Y, Kim MH, Chung CP, Ku Y, et al. The association of osteoprotegerin gene polymorphisms with periodontitis. Oral Dis 2008;14:440-4.

21. Wohlfahrt JC, Wu T, Hodges JS, Hinrichs JE, Michalowicz BS. No association between selected candidate gene polymorphisms and severe chronic periodontitis. J Periodontol 2006;77:426-36.

22. Soedarsono N, Rabello D, Kamei H, Fuma D, Ishihara Y, Suzuki M, et al. Evaluation of RANK/RANKL/OPG gene polymorphisms in aggressive periodontitis. J Periodontal Res 2006;41:397-404.