

Periodontal status and serum creatine kinase levels among young soccer players: A preliminary report

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Abstract

Objectives: It is hypothesized that soccer players with periodontal disease exhibit raised serum creatine kinase (CK) levels as compared to those without periodontal disease. We assessed the clinical gingival status and serum CK levels among young soccer players.

Materials and Methods: Demographic data were collected through a structured questionnaire. Full mouth bleeding on probing (BOP) and probing pocket depth (PPD) were assessed. Blood samples (4 mL) were collected for measurement of serum CK levels. All blood samples were collected from a vein in the antecubital region. Total CK activities in serum were determined with an optimized spectrophotometric method. Statistical analysis was performed using one-way analysis of variance, and $P < 0.05$ was considered statistically significant.

Results: Twenty-seven male soccer players volunteered to participate in the present study. The mean age of the participants in Groups 1 ($n = 14$) and 2 ($n = 13$) were 18.2 ± 2.3 years and 19.1 ± 0.6 years, respectively. Mean scores of BOP were significantly higher among individuals in Group 2 (56.8%) compared with individuals in Group 1 (19.4%) ($P < 0.001$). Mean scores of PPD ≥ 4 mm were significantly higher among subjects in Group 2 (12.1%) as compared to individuals in Group 1 (0.8%) ($P < 0.001$). Levels of CK were significantly higher among individuals in Group 2 (292.7 U/L) as compared to those in Group 1 (52.3 U/L) ($P < 0.01$).

Conclusion: Increased BOP and PPD are associated with increased serum CK levels in young soccer players.

Key words: Periodontal disease, serum creatine kinase, soccer players

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Introduction

Abundant evidence has shown that periodontal inflammatory conditions (such as gingivitis and periodontitis) are associated with systemic diseases such as diabetes mellitus, cardiovascular disorders, and psychological illnesses.^[1-8] It

has also been reported that poor oral health status influences the quality of life of an individual.^[9] Some of these inflammatory biomarkers have also been associated with biochemical events occurring during muscle injury.^[10] In a cross-sectional study, Needleman *et al.*^[11] investigated the effect of oral health status on the well-being, training, and performance of athletes participating in the London 2012 Games. In this study,^[11] 302 athletes from Africa, the United states of America, and Europe were recruited. The results

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demonstrated that nearly 50% of the athletes interviewed had not undergone a dental examination and/or hygiene care in the 12 months.^[11] The result also demonstrated that dental caries, dental erosion, and periodontal inflammatory conditions were commonly manifested in these individuals.^[11] Twenty-eight percentage athletes reported that their poor oral health status had a negative impact on their quality of life and 18% stated that it jeopardized their training and performance.^[11] The study concluded that the oral health status of athletes attending the dental clinic of the London 2012 games was poor which with negatively influenced their well-being, training, and performance.^[11]

Creatine kinase (CK) is a protein that is commonly used to screen muscle injury among athletes and sports players.^[12,13] This is primarily due to the fact the CK has a relative predominance in the skeletal muscles, is readily released during muscle injury, and is not falsely elevated by hemolysis.^[14] In another study, Lombao Iglesias *et al.*^[15] performed a study to evaluate the validity of CK values as an indicator of muscle lesions. In this study, postoperative CK levels were assessed in 96 patients who had undergone spinal surgery. Serum CK levels were assessed on the first postoperative day.^[15] The results showed that measurement of serum CK concentration is a valid marker of surgical muscle injury.^[15]

The present cross-sectional study was based on the hypothesis that soccer players with periodontal disease exhibit raised serum CK levels as compared to those without periodontal disease. To our knowledge from indexed literature, the aforementioned hypothesis has not been tested before. With this background, the aim of the present cross-sectional study was to investigate the association between periodontal disease and serum CK levels in young soccer players.

Materials and Methods

Ethical guidelines

The study was approved by the research ethics review committee of the King Khalid Hospital, Riyadh, Saudi Arabia. A written consent form was presented to all subjects who volunteered to participate in the present study. It was mandatory for all individuals to have read and signed the consent form before being included in the present investigation.

Questionnaire

Data regarding age, gender, smoking habits, tobacco chewing, last visit to an oral healthcare provider, and medication use were collected through a structured questionnaire.

Periodontal examination

All periodontal examinations were performed by a single trained and calibrated investigator (MA). Full mouth

bleeding on probing (BOP) and probing pocket depth (PPD) were assessed as described elsewhere. A graded probe was used to measure PPD to the nearest millimeter.^[8] These parameters were assessed at six sites per tooth (mesiobuccal, mid-buccal, distobuccal, mesiolingual, midlingual, and distolingual) excluding bilateral maxillary and mandibular third molars. The overall kappa score for the intraexaminer reliability was 0.88.

Based on the periodontal status, participants were divided into two groups. In Group 1, subjects with BOP and PPD ≥ 4 mm in $<30\%$ sites were included. Individuals in Group 2 comprised subjects exhibiting BOP and PPD ≥ 4 mm and BOP in more than 30% sites were included.

Measurement of serum creatine kinase levels

Blood samples (4 mL) were collected for measurement of serum CK levels. All blood samples were collected from a vein in the antecubital region. After sampling, blood samples were centrifuged at 3500 revolutions/min for 10 min at 4°C. Serum was stored in Eppendorf tubes and preserved at -20°C until analysis. All serum samples were assessed within 6 weeks of collection. Total CK activities in serum (reference interval: 0–100 U/L) were determined at 37°C with an optimized spectrophotometric method (CK UV test, no. 3388; Merck, Darmstadt, F.R.G.) using a discrete analyzer (ABA 100; Abbott Labs., North Chicago, IL, USA 60064).^[16] The linearity limit was 1500 U/L. Dilutions were made in heat inactivated serum, in the ratio 1:10 or, exceptionally, 1:100.

Statistical analysis

Statistical analysis was performed using a software program (SPSS version 18, Chicago., IL, USA). Periodontal parameters and serum CK levels were compared between the groups using one-way analysis of variance. $P < 0.05$ was considered statistically significant.

Results

Study participants and periodontal parameters

In total, 27 male soccer players volunteered to participate in the present study. The mean age of the participants in Groups 1 ($n = 14$) and 2 ($n = 13$) were 18.2 ± 2.3 years and 19.1 ± 0.6 years, respectively. Mean scores of BOP were significantly higher among individuals in Group 2 (56.8%) compared with individuals in Group 1 (19.4%) ($P < 0.001$). Mean scores of PPD ≥ 4 mm were significantly higher among subjects in Group 2 (12.1%) as compared to individuals in Group 1 (0.8%) ($P < 0.001$).

Serum creatine kinase levels

Levels of CK were significantly higher among individuals in Group 2 (292.7 U/L) as compared to those in Group 1 (52.3 U/L) ($P < 0.01$).

Discussion

The present study was based on the hypothesis that soccer players with periodontal disease exhibit raised serum CK levels as compared to those without periodontal disease. The present results support these results since serum CK levels were significantly higher among young soccer players with BOP and PPD ≥ 4 mm in more than 30% sites as compared to individuals who exhibited the former in $<30\%$ sites. To the best of our knowledge from indexed literature, the present study is the first one to assess a relationship between periodontal disease and serum CK levels. Moreover, the present results support a previous study in which serum CK concentration was labeled as a marker of muscular injury.

It has been reported that advancing age is a factor that influences muscular injury.^[17-20] This parameter does not seem to have influenced the serum CK levels among patients in Groups 1 and 2 since there was no significant difference in the mean age among individuals in Groups 1 and 2 (18.2 ± 2.3 years and 19.1 ± 0.6 years, respectively). An explanation for the possible relationship between serum CK levels and periodontal disease may be associated with the production and accumulation of proinflammatory cytokines (such as interleukin [IL] 1beta, IL-6, and IL-1) in the gingival crevicular fluid of patients with periodontal disease. It is worth mentioning that IL-6 and IL-8 are not only stimulated in periodontal disease, but also in muscle injury.^[21-23] There is an increased likelihood that these proinflammatory cytokines accumulated in the gingival crevices of soccer players with periodontal disease increases the overall systemic burden of inflammation thereby augmenting muscular injury. Tidball^[24] also suggested that an increased accumulation of circulating cytokine can result in some damage to soft tissues including muscles. Moreover, experimental results on genetically engineered mice by Tsujinaka *et al.*^[25] demonstrated that over expression of IL-6 is associated with an increased degradation of muscular proteins.

Studies^[26,27] have reported that nonsurgical periodontal therapy (NSPT) is effective in reducing periodontal inflammation and also reduces the burden of proinflammatory cytokines (such as IL-6, IL-1beta, and matrix metalloproteinase) accumulated in the gingival crevicular fluid. It is therefore hypothesized that NSPT besides reducing clinical and immunological markers of periodontal inflammation also reduces serum CK levels. However, to our knowledge, this hypothesis is yet to be tested. Hence, further studies are needed in this regard. A limitation of the present study is that tobacco smokers were excluded from the present study. It is well-known that habitual smoking jeopardizes periodontal health and also negatively affects the outcomes of periodontal surgical interventions.^[18,28] It is therefore likely that serum CK levels might vary in smokers as compared to the results reported in the present investigation.

Conclusion

Increased BOP and PPD are associated with increased serum CK levels in young soccer players. Increased serum CK level may be indicative of a compromised oral health status.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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