

# Periodontal disease indicators in adults with and without physical activity: a comparative analysis

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## ABSTRACT

### Introduction

The intriguing link between periodontal disease severity and physical activity remains largely understudied, particularly in the Saudi Arabian population. Thus, the current research was intended to ascertain the effect of physical activity on the prevalence and indicators of periodontal diseases. Materials: The cross-sectional approach with convenience sampling was applied to the recruitment of 160 adult subjects attending gymnasiums, sports clubs, malls, primary health centres, and community dental health programs. Based on IPAQ scores, the participants were split into two distinct groups: a physically active group and a physically inactive group. The two study groups were compared with one another in terms of recorded parameters. The gathered data subsequently underwent statistical processing using SPSS 20.0. Results: Of the 160 subjects, 66.87% (n = 107) had gingivitis and 33.12% (n = 53) periodontitis. A lower mean PI (1.62±0.31) was observed in the physically active group compared to the physically inactive group (6.91±1.12). The physically active group had a mean BI of 19.01±4.53 and the inactive group 69.98±9.29. For physically active and inactive groups, mean PD measurements were 2.49±0.33 mm and 4.61±0.07 mm, respectively. Physically active individuals had a significantly lower mean CAL (2.98±0.88 mm) compared to the inactive group (5.37±1.02 mm). Parametric variances between groups are statistically significant (p<0.001). Conclusion: Insufficient engagement in physical activity has undeniably been identified as a risk factor for the development and severity of periodontal disease, marked by escalated indicators of gingivitis and periodontitis. The study findings unequivocally endorse the adoption of a consistent physical activity regimen as strategic initiatives to proactively address the incidence of inflammatory periodontal diseases. Many patients with different psychophysical characteristics seek periodontal therapy at dental clinics. This study alerts clinicians to the impact of physical inactivity in a wide-spectrum population and helps identify periodontal risk in sedentary patients. It also aids in treatment planning for these periodontally risky, physically inactive people.

### Keywords

Periodontal diseases, physical activity, chronic diseases

## INTRODUCTION

Engaging in physical activity is a widely acknowledged strategy to optimise overall well-being and promote homeostasis<sup>1</sup>. Research suggests that individuals who engage in regular and sufficient physical activity tend to exhibit a longer lifespan compared to those who lead sedentary lifestyles devoid of physical activity<sup>2</sup>. Physical inactivity is linked to a range of mental illnesses, such as depression, sleep problems, Alzheimer's disease, etc., as well as chronic illnesses, such as cardiovascular diseases, cerebrovascular diseases, coronary artery diseases, metabolic syndrome, bone diseases, cancers, etc.<sup>3-11</sup>. Regular physical activity has been shown to have a plethora of

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positive impacts on the human body, one of which is its astonishing capacity to combat inflammation. Numerous scientific studies have repeatedly shown that physical activity can significantly lower inflammation levels<sup>12,13</sup>. Physical inactivity corresponds to a higher degree of inflammation, while engaging in physical activity has been shown to alleviate inflammation<sup>14,15</sup>.

Among the prominent inflammatory dental diseases linked to physical inactivity are periodontal diseases. Insidious periodontal diseases are pervasive oral health challenges afflicting populations of all ages. Periodontal diseases encompass an entourage of inflammatory microbial infections primarily influencing the tooth-supporting periodontal constituents. Periodontal tissues are perpetually exposed to a persistent state of inflammation under the influence of periodontal diseases. When it comes to addressing the microbial threat and the subsequent development of periodontal diseases, a multitude of host responses come into play, and these responses encompass a broad spectrum of actions that begin with the mobilisation of various defence cells, including leukocytes, lymphocytes, and macrophages, among others, along with the release of a plethora of substances, such as interleukins, neuropeptides, interferons, anaphylatoxins, and more<sup>16</sup>. Furthermore, these processes involve the activation of different complement pathways, further enhancing the complexity and intricacy of the host immune response<sup>16</sup>. Originally, there was a proposition that microorganisms serve as etiological agents, establishing a connection between periodontal diseases and numerous systemic diseases within the human body. In recent times, it has been asserted that an elevated presence of biomarkers in the bloodstream, stemming from a low-grade inflammatory mechanism, is accountable for this correlation<sup>17-18</sup>. Physical activity has been found to render both antioxidant and anti-inflammatory actions, which in turn contribute to enhanced periodontal health and reduced susceptibility to periodontal diseases<sup>19-20</sup>. In contemporary times, the emergence of obesity has taken centre stage as a significant perilous element for periodontitis, forging a unique connection between periodontal and systemic diseases. In this modern era, the emergence of obesity has taken centre stage as a significant perilous element for periodontitis, forging a clear connection between periodontal ailments and various systemic conditions. Combating obesity can be accomplished by upholding an adequate degree of physical activity, and engaging in regular physical

activity not only facilitates weight loss but also enhances systemic health<sup>21</sup>.

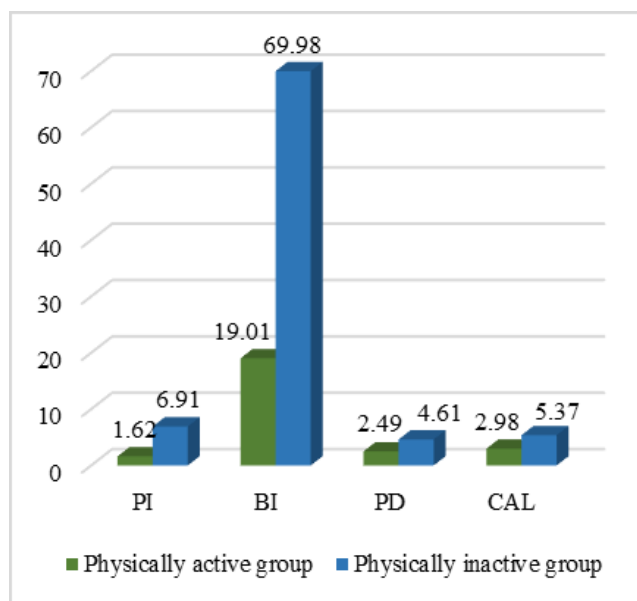
The vast expanse of research points to a remarkable correlation between physical activity and the reduced occurrence of periodontitis<sup>22-23</sup>. Yet, the intriguing link between periodontal disease severity and physical activity remains largely understudied, particularly in the Saudi Arabian population. Consequently, the current research was intended to ascertain the impact of physical activity on the prevalence and indicators of periodontal disease in adults.

## MATERIALS AND METHODS

The current research was given the go-ahead by the committee of ethical clearance and a cross-sectional approach with convenience sampling was applied with the recruitment of adult participants who provided informed consent, ensuring a diverse representation of both genders. The study recruited a sample size of 160 participants, adhering to predetermined inclusion and exclusion criteria. The selection of subjects attending gymnasiums, sports clubs, malls, primary health centres and community dental health programs, was based on an evaluation of their compliance with the established eligibility criteria. Individuals under the age of 18, as well as those with medical conditions or those under the influence of risk factors and medications known to alter the course of periodontal diseases, were excluded. According to the ratings obtained from the international physical activity questionnaire (IPAQ)<sup>24</sup>, the participants were split into two distinct groups: a physically active group and a physically inactive group. A proforma was adopted to record descriptive data as well as periodontal findings. A thorough evaluation of periodontal clinical parameters was performed for each participant, documenting the measurements for the Sillness and Loe Plaque Index (PI), Ainamo and Bay Bleeding Index (BI), probing pocket depth (PD), and clinical attachment loss (CAL) as per the diagnostic considerations of Trombelli et al (2018)<sup>25</sup>. The measurements of PD and CAL were acquired at six different points per tooth using the UNC-12 graduated probe. The gathered data subsequently underwent statistical processing using SPSS 20.0. The two study groups were compared with one another in terms of recorded parameters.

## RESULTS

The study covered a sample of 160 subjects, whose ages ranged from 18 to 63 years with mean age of  $36.79 \pm 5.53$  years. Among the aforementioned subjects, the male population constituted 60.62% ( $n=97$ ), while the female population accounted for 39.37% ( $n=63$ ). It emerged that 66.87% ( $n=107$ ) of the subjects were suffering from gingivitis, whereas 33.12% ( $n=53$ ) from periodontitis. Of the 160 individuals, 61.25% ( $n=98$ ) engaged in regular physical activity, while 38.75% ( $n=62$ ) were physically inactive. It was found that the mean PI was lower ( $1.62 \pm 0.31$ ) in the physically active group compared to the physically inactive group ( $6.91 \pm 1.12$ ). The mean BI was found to be  $19.01 \pm 4.53$  in the physically active group and  $69.98 \pm 9.29$  in the physically inactive group. The mean PD measurements were  $2.49 \pm 0.33$  mm and  $4.61 \pm 0.07$  mm in the groups categorised as physically active and physically inactive, respectively. The average probing depths were greater in the physically inactive group compared to the physically active group. The physically active group had a substantially lower mean CAL ( $2.98 \pm 0.88$  mm) compared to the physically inactive group ( $5.37 \pm 1.02$  mm). The observed disparities between the groups in terms of the parameters are at a statistical significance level of  $p < 0.001$ . The disparity in the periodontal parameters observed between the groups is highlighted in the figure-1.



**Figure 1** highlights the disparity in the periodontal parameters observed between the groups.

## DISCUSSION

The current correlational investigation was conducted on a sample of individuals who frequent gymnasiums, sports clubs, malls, primary health facilities, and community dental health programs. This population sample was observed to be a suitable representative of the target adult population (aged  $>18$  years) of Saudi Arabia. The majority of study designs examining the prevalence rate of periodontal disease have been conducted in hospital settings rather than within the general population. This phenomenon can be attributed to the heightened frequency of consultations occurring within hospitals.

In the current investigation, the average age of the participants was 36.7 years, with a higher representation of males. Kumar A et al. (2018) found that the likelihood of periodontitis was higher among young males, with the mean age being 26.6 years<sup>17</sup>. The participation of individuals from a younger age cohort in their research may be attributed to their selection of subjects within the 20–40-year age range. In contrast, our study encompasses participants from various age groups. According to the findings of our research, the proportion of physically inactive individuals (38.7%) within the population under investigation was significantly lower than that of physically active individuals. On the other hand, this ratio is significantly higher than the global ratio of physical inactivity, which the WHO estimated at 27.5% in 2022<sup>26</sup>.

The gingivitis and periodontitis rates among the participants in the present investigation came in at 66.87% and 33.12%, respectively. These findings are greater than those noticed in the study by Nabeeh et al. (2017) in the Aseer region, which indicated a prevalence of 48% for gingivitis and 14.7% for generalised chronic periodontitis<sup>27</sup>. This disparity can be explained by the fact that the latter study did not take into account the presence of localised periodontitis. The reports of González et al. (2017) and Guimarães et al. (2020) have identified the lack of physical activity as a significant contributing factor for the onset of obesity, compromised immunological function, metabolic syndrome, and several chronic diseases<sup>28-29</sup>. In turn, this may raise the vulnerability to periodontal diseases.

The physically inactive subjects had notably greater scores on periodontal clinical parameters compared to the subjects who engaged in physical activity. These

findings matched up with what Bawadi et al. (2011) as well as Wakai et al. (1999) found in their investigations<sup>20, 23</sup>. Al-Zahrani et al. (2005) advocated that the incidence of periodontal diseases decreases with oral hygiene measures like regular dental check-ups, flossing, brushing, a healthy diet, with physical activities<sup>22</sup>. They noticed a reduction of 13 to 16% in the incidence of periodontal disease due to physical activities<sup>22</sup>. This could be linked to the effects on the production and modulation of cytokines (mainly C-reactive protein) due to physical activity<sup>30-31</sup>. Maleki et al. learned that physical exercise and training reduce levels of pro-inflammatory biomarkers (IL-1 $\beta$ , IL-8, IL-6, and TNF- $\alpha$ ), minimising the incidence of periodontitis, and stated that regular exercise is required to maintain cytokines and interleukin levels, as these can revert to their initial levels after 30 days of no physical activity<sup>32</sup>.

The primary limitation of the current study is its single-centre design, which restricts the generalizability of the findings to the entire population of Saudi Arabia. Additionally, the investigation was conducted with a small sample size and lacked a follow-up component. As a result, caution should be exercised when extrapolating the results to the broader community. The consequences of the frequency, nature, and intensity of physical activity on periodontal diseases have not been thoroughly investigated in this research. In order to gain a comprehensive understanding of the pathophysiological connection between physical activity and periodontal diseases, it is recommended that future research endeavours include long-term longitudinal studies with larger sample sizes.

## CONCLUSION

Insufficient engagement in physical activity has certainly been identified as a risk factor for the development of periodontal disease, marked by an escalated indicator

of gingivitis and periodontitis. The study findings strongly advocate for the implementation of a regular physical activity regime as a strategic measure to effectively mitigate the occurrence of inflammatory periodontal diseases. Dental clinics engage a diverse population with varying psychophysical characteristics, many of whom seek periodontal treatment. This study serves to raise awareness among clinicians regarding the potential consequences of physical inactivity across various populations while also aiding in the identification of periodontal risks among patients who lead sedentary lifestyles. Additionally, it is beneficial for the development of appropriate treatment plans for individuals at risk of periodontal disease who are experiencing physical inactivity during this period.

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