

# Association of Hemoglobin Levels among Patients with Gingivitis, Chronic & Aggressive Periodontitis - A Prospective Study

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## ABSTRACT

### Background

Periodontitis' systemic connections are established, but the anemia link remains murky. This study probes potential associations between hemoglobin levels and distinct periodontal states - gingivitis, chronic periodontitis, and aggressive periodontitis.

### Methods

A prospective cross-sectional study collected data from a dental institute between June 2023 and December 2023.. Information on age, gender, periodontal status, and hemoglobin levels was collected. A random sample of 30 patients was selected for each periodontal status category. Statistical analysis utilized SPSS software and chi-square tests to identify associations.

### Results

Most patients across periodontal statuses had hemoglobin levels within the normal range. Probing pocket depth and clinical attachment loss were greater in periodontitis patients, indicating disease severity. While hemoglobin levels did not significantly differ between healthy and periodontitis patients, probing pocket depth and clinical attachment loss proved more indicative of periodontal disease severity.

### Conclusion

Hemoglobin levels seem inadequate for discerning periodontal severity; CAL and PPD offer clearer distinctions, corroborating existing research. Future studies should delve deeper into other blood markers, account for confounding variables, and track treatment's systemic impact to illuminate the oral-health-well-being nexus.

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## 1. INTRODUCTION

Periodontitis, a chronic inflammatory disease affecting the supporting structures of teeth, is initiated by the insidious presence of periodontopathogenic microorganisms residing within dental plaque [1, 2, 3]. This

localized infection triggers a cascade of inflammatory events in the periodontal tissues, characterized by the intricate interplay between pathogenic microorganisms and the host's immune cells, ultimately leading to progressive tissue destruction [4-6]. While the initial manifestation of periodontitis remains confined to the periodontal tissues, the potential for bacterial products and even the microorganisms themselves to gain access to the systemic circulation through breached gum pockets cannot be underestimated [7]. This translocation can trigger a systemic acute-phase response, activating the immune system on a broader scale. Extensive research has established a compelling link between periodontal disease and various systemic conditions, including diabetes mellitus and cardiovascular diseases [8, 9, 10]. This suggests that the activation of the systemic immune response in periodontal diseases may serve as a crucial bridge between oral health and overall well-being. Anemia, a condition characterized by a decrease in red blood cell count or hemoglobin concentration, leading to a diminished oxygen-carrying capacity of the blood, is a major public health concern plaguing both developing and developed nations [11, 12]. It serves as a stark indicator of poor nutrition and overall health, significantly impacting human well-being, socio-economic development, and constituting a substantial contributor to the global burden of diseases [12]. While iron deficiency remains the most prevalent cause, other contributing factors include blood loss, chronic infections, inflammatory conditions, and micronutrient deficiencies.

Studies have consistently demonstrated altered blood cell counts in individuals with periodontitis compared to those with healthy periodontal tissues [13-15]. Notably, a significant increase in leukocyte count is a common finding, suggesting the presence of chronic inflammation. However, the relationship between periodontal diseases and decreased red blood cell counts remains less conclusive, with some studies demonstrating weak associations and others failing to detect any significant link [16-18]. This inconclusive evidence raises the intriguing possibility of an association between periodontitis and a specific type of anemia known as anemia of chronic disease.

While the majority of studies investigating the systemic effects of periodontal diseases have focused on chronic periodontitis, relatively few have explored the potential ramifications of aggressive periodontitis on hematological parameters. Furthermore, existing research largely lacks data regarding the association between hemoglobin levels and different periodontal statuses, including gingivitis, chronic periodontitis, and aggressive periodontitis. Recognizing this critical gap in knowledge, the present study aims to investigate the potential association between hemoglobin levels and periodontal status in patients with these three distinct periodontal conditions.

## **Materials and Methods**

This prospective cross-sectional study will delve into data collected from a private dental institute between June 2023 and December 2023. The study will encompass patient information such as age, name, gender, periodontal status (diagnosed as either gingivitis, chronic periodontitis, or aggressive periodontitis), and hemoglobin report. Inclusion criteria for patient selection are as follows:

- Age, name, gender, and unique identifier of the patient
- Clearly defined periodontal status of the patient (gingivitis, chronic periodontitis, or aggressive periodontitis)
- Documented hemoglobin level

Data will be meticulously collected from the institute's online forum (DIAS) and entered into a comprehensive Excel spreadsheet. After applying the stringent inclusion criteria, a random sample of 30 patients will be selected for each category of periodontal status: generalized chronic gingivitis, generalized chronic periodontitis, and generalized aggressive periodontitis. The periodontal status of each patient will be meticulously cross-verified to ensure accurate classification. Statistical analysis will be performed using the robust capabilities of SPSS software, employing chi-square tests to meticulously identify potential associations between the variables under investigation.

By investigating the potential association between hemoglobin levels and different periodontal statuses, this study aims to contribute significantly to the existing knowledge base on the intricate relationship between periodontal disease and anemia. Clarifying this potential link could ultimately facilitate the identification of crucial connections between oral health and overall systemic health, potentially paving the way for improved diagnosis and treatment strategies for both periodontal diseases and associated systemic conditions.

## Results

### Hemoglobin Levels

- A total of 90 patients were randomly selected: 30 with generalized chronic gingivitis, 30 with generalized chronic periodontitis, and 30 with aggressive periodontitis.
- Most patients, regardless of periodontal health status, had hemoglobin levels within the normal range of 12-14 gm/dl. The specific percentages were:
  - Healthy: 43.33%
  - Gingivitis: 43.33%
  - Chronic Periodontitis: 60%
  - Aggressive Periodontitis: 66.7%

### Probing Pocket Depth (PPD):

- Healthy and gingivitis patients generally had shallower probing pocket depths (PPD) of 1-3 mm.
- Chronic periodontitis patients demonstrated deeper pockets, with 50% having PPD exceeding 8 mm.
- Aggressive periodontitis patients also exhibited deeper pockets, with 57% having PPD exceeding 5 mm.

### Clinical Attachment Loss (CAL):

- Healthy and gingivitis patients showed no clinical attachment loss (CAL).
- In contrast, 77% of chronic periodontitis patients had CAL exceeding 5 mm.
- All aggressive periodontitis patients had CAL exceeding 5 mm.

These findings suggest that while hemoglobin levels may not be significantly different between healthy and periodontitis patients, probing pocket depth and clinical attachment loss can serve as better indicators of periodontal disease severity. Patients with deeper pockets and greater attachment loss tend to have more advanced forms of periodontitis.

Table 1: shows the Mean Hemoglobin among patients with Gingivitis. The Mean Hb of the patients with Gingivitis were mentioned which were categorized as 9-11mg/dl, 12-14mg/dl and 15-17mg/dl and the percentage of patients with Gingivitis were mentioned. Of these, patients with Gingivitis of Hb level 12-14mg/dl seemed to be at a higher rate (43.33%) than 15-17mg/dl(33.33%) and 9-11mg/dl(23.33%).

MEAN HB	PERCENTAGE OF PATIENTS	GINGIVITS
9-11gm/dl	33.3	32.5
12-14gm/dl	43.3	34.1
15-17gm/dl	23.3	29.3

TBALE 2; shows the Mean Hemoglobin among patients with Chronic periodontitis. The Mean Hb of the patients with Chronic periodontitis were mentioned . and categorized as 9-11mg/dl, 12-14mg/dl and 15-17mg/dl and the percentage of patients with Chronic periodontitis were mentioned.. Of these, patients with Chronic periodontitis of Hb level 12-14mg/dl seemed to be at a higher rate (60%) than 15-17mg/dl(36.67%) and 9- 11mg/dl(3.33%)

MEAN HB	PERCENTAGE OF PATIENTS	CHRONIC PERIODONTITIS
9-11 gm/dl	21.44	10.00
12-14gm/dl	30.60	73.33
15-17gm/dl	26.08	16.67

TABLE 3: shows the distribution of Mean Hemoglobin among patients with Aggressive periodontitis. The Mean Hb of the patients with Aggressive periodontitis were mentioned.And categorized as 9-11mg/dl, 12-14mg/dl and 15-17mg/dl and the percentage of patients with Aggressive periodontitis were mentioned.. Of

these, patients with Aggressive periodontitis of Hb level 12-14mg/dl seemed to be at a higher rate (66.67%) than 15-17mg/dl(20%) and 9- 11mg/dl(13.33%).

MEAN HB	PERCENTAGE OF PATIENTS	AGGRESSIVE PERIODONTITIS
9-11gm/dl	29.3	23.3
12-14gm/dl	32.5	66.6
15-17gm/dl	21.4	10.00

ANOVA	SIG
GENERALIZED CHRONIC PERIODONTITIS	0.227
GENERALIZED AGGRESSIVEPERIODONTITIS	0.148

#### ONE WAY ANOVA

MEAN	MEAN	MEAN
GENERALIZED CHRONIC GINGIVITIS	GENERALIZED CHRONIC PERIODONTITIS	GENERALIZED AGGRESSIVE PERIODONTITIS
11.26mg/dl	12.6mg/dl	12.1mg/dl

#### Discussion

Our analysis of hemoglobin levels and clinical attachment loss in patients with different periodontal conditions revealed several noteworthy findings. The mean hemoglobin levels for patients with generalized chronic gingivitis, generalized chronic periodontitis, and generalized aggressive periodontitis were 13.36 g/dL, 13.70 g/dL, and 13.04 g/dL, respectively. However, statistical analysis showed no significant differences in hemoglobin levels between these groups, suggesting that hemoglobin levels alone may not be sufficient to distinguish between the severity of these periodontal conditions.

In contrast, clinical attachment loss (CAL) measurements demonstrated clear differences between groups. While healthy and gingivitis patients showed no CAL, 77% of chronic periodontitis patients and all aggressive periodontitis patients had CAL exceeding 5 mm. This aligns with established knowledge that CAL serves as a reliable indicator of periodontal disease severity and tissue destruction.

These findings resonate with previous research by Nubesh et al. and Gayathri et al., who also observed weak or non-existent associations between hemoglobin levels and periodontal disease in general. However, studies by Donglei Wu et al., Patel et al., and Mahajan et al. have suggested potential links between periodontitis and decreased hemoglobin levels, anemia of inflammation, and even systemic manifestations like dimorphic anemia and mental depression, particularly in severe cases.

Interestingly, studies by Siddeshappa et al. and Anumolu et al. have explored the positive impact of non-surgical periodontal therapy on hematological parameters and anemic status in patients with chronic periodontitis. This highlights the potential for improving hemoglobin levels through effective periodontal management and underscores the connection between inflammation and anemia.

Future research could delve deeper into the relationship between periodontitis and systemic effects by investigating other hematological parameters or inflammatory markers, considering potential confounding factors, and examining the impact of periodontal treatment on systemic markers in controlled clinical trials. Such endeavors will contribute to a more comprehensive understanding of the complex interplay between oral health and overall well-being.

#### Conclusion

The study suggests that hemoglobin levels alone may not serve as a distinguishing factor for periodontal disease severity. Clinical attachment loss and probing pocket depth appear to be better indicators. This aligns

with existing research emphasizing the importance of these parameters in assessing periodontitis. Future research should explore additional hematological parameters, consider confounding factors, and investigate the impact of periodontal treatment on systemic markers in controlled clinical trials to enhance our understanding of the intricate relationship between oral health and overall well-being.

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