

## Original Research Article

### ANALYSIS OF WHITE BLOOD CELL COUNT AND ITS DIFFERENTIAL IN BLEEDING GUM PATIENTS

Running title: Association between bleeding gums and white blood cell count and its differential

#### Abstract

##### Aim:

To measure and observe the WBC count and its differentials by testing the blood from patients with bleeding gums

##### Background:

Bleeding gums is caused primarily due to the buildup of plaque and calculus. This eventually leads to gingivitis or periodontitis. Other causes of bleeding gums can be due to improper flossing, over brushing of the teeth and gums, hormonal changes due to pregnancy, ill-fitting dentures, or any other dental appliances. These bleeding gums can also indicate serious health problems like leukemia, scurvy, idiopathic thrombocytopenic purpura, vitamin k deficiency, a bleeding disorder. Persistent gum bleeding is a sign of serious medical problems like leukemia and platelet disorders. Leukemia is a group of cancer where there is an increased number of immature or abnormal white blood cells. In this study, the WBC and their differential count is analyzed in patients with bleeding gums to check the possibilities for the patient to get cancer

##### Materials and Methods:

The study was conducted in the clinical pathology lab at Saveetha Dental College and Hospitals, Chennai. 100 subjects were taken for the study. Subjects with chief complaint bleeding gums, with systemic diseases like diabetes, hypertension, and patients with the age of above 20 were included in the study.

##### Results and Conclusion:

No significant correlation was found between bleeding gums and white blood cells & their differential count in this study.

#### Comment [AA1]:

Too long background in the abstract, this is only abstract!!

#### Comment [AA2]:

This is not clear in the aim

#### Comment [AA3]:

I can't see the results!!  
more details in the conclusion should be written!!

**Keywords:** WBC, differential count, neutrophil, eosinophil, bleeding gums, innovative method

## Introduction

Bleeding gums is caused primarily due to the buildup of plaque and calculus. This eventually leads to gingivitis or periodontitis. Other causes of bleeding gums can be due to improper flossing, over brushing of the teeth and gums, hormonal changes due to pregnancy, ill-fitting dentures, or any other dental appliances. These bleeding gums can also indicate serious health problems like leukemia, scurvy, idiopathic thrombocytopenic purpura, vitamin k deficiency, a bleeding disorder. (1)

The WBC count and differential is the most basic measure. White cells may be counted manually or with automated counters in specially built chambers (Neubauer). The latter is commonly used because it offers greater precision and speed than manual techniques. A drop of blood is thinly scattered over a glass slide, air-dried, and stained with a Romanowsky stain, most commonly the Wright or May-Grunwald-Giemsa method, to assess the differential. After that, 200 cells are counted and classified. Machines have been developed to perform automated differential counts, but they are still inferior to manual techniques as far as reliability and ability to discover morphologic abnormalities. (2)

The absolute number of each type of WBC, often more informative than its proportion, can be calculated if the differential and the total number of leukocytes per volume unit are known.

Neutrophil chemotaxis and phagocytic activity may be assessed in the laboratory. The skin window method is semiquantitative, but it has the benefit of being easy. An abrasion is produced in the epidermis, which is then sealed with a glass cover slide for a few hours and stained to look for attached granulocytes. More complex in vitro systems have been developed, the majority of which are focused on neutrophils' ability to navigate a specific obstacle to reach an appealing stimulus.(2,3)

The white blood cell and its differential count determine the total number and each type of white blood cell present in the blood. Generally, each WBC type has its unique feature. Neutrophils serve as the primary defense against infection. Eosinophils play a role in allergic disorders and in

**Comment [AA4]:** Reference !!!

combat/ing parasitic infections. Basophils digest bacteria and other foreign bodies (phagocytosis) and also have some role in an allergic reaction, monocytes respond to inflammation, infection, and foreign bodies by ingesting and digesting the foreign particles(4) Lymphocytes play both an immediate and delayed role in response to infection or inflammation(5). **Our team has extensive knowledge and research experience that has translate into high quality publications (6).(7-20)(21-25)** This study aims to analyze the total WBC count and differential counts in the bleeding gum patients.

### Materials and methods

This study was conducted in the clinical pathology lab at Saveetha Dental College and Hospitals, Chennai. 100 subjects were taken for the study. Subjects with the age of above 20 years were included in the study and chief complaint bleeding gums, without any systemic diseases like diabetes, hypertension, and patients with infections. Written consent was taken from the subjects regarding using their blood for our study purposes. A blood sample of about 2ml was collected from each patient in EDTA vacutainer tubes and was fed into 3 part automated colter counter method and analyzed. **Only the total WBC count and their differential count were included in this study.** A Student t-test was performed to find out the significance of WBC and its differential count among patients with bleeding gums.

### Results and Discussion

Among the 100 patients, 60 were males and 40 were females. WBC count was normal for 97 subjects. WBC count was less than normal (<4000 cells per cubic mm) for 2 subjects and greater than normal (>11000 cells per cubic mm) for 1 subject. Neutrophil count was normal for almost all the patients. It was less than normal (<40%) for one subject and more than normal (>75%) for 2 patients. Lymphocyte count was normal for 86 subjects, more than normal (>40%) for 13 subjects, and less than normal (<20%) for 1 patient. The Eosinophil count was normal (2-6%) for all the subjects. No significant difference was found in the WBC and its differential count between the male and female subjects.

**Comment [AA5]:**

This is scientifically and ethically prohibited, it is not allowed to cite (19 references) from your previous work, without clear scientific contents,

Delete all of them

**Comment [AA6]:**

There is no approval from the investigation board of the responsible authorities

**Comment [AA7]:**

There is no gender- related sample size

How was the sample calculated

**Comment [AA8]:**

Age of the patients is not determined, not accepted to mention only more than 20 years

**Comment [AA9]:**

How was it counted, which technique?

What analysis you did to differentiate between them?  
Not clear

**Comment [AA10]:**

No details in the statistical analysis?  
Under which significance?  
Error estimation?

**Comment [AA11]:**

In this section, the authors presented their findings with only very few phrases discussing these results

Expand more in the discussion section

Age (In years)	Total count WBC	Neutrophil	Lymphocyte	Eosinophil
10-20	9042.9	57.9	38	4.2
20-40	8160.7	62.7	33.9	3.7
>40	8687.5	62.3	33.9	3.7

Table 1: Average total count of white blood cells, neutrophils, lymphocytes, eosinophils in males

**Comment [AA12]:** Patients start from 10 years, in the method section, they are older than 20 years !!!

Age (In years)	Total count WBC	Neutrophil	Lymphocyte	Eosinophil
10-20	8925	61	35.5	3.5
20-40	7942.9	61.5	34.7	3.7
>40	8633.3	57.8	38.6	3.5

Table 2: Average total count of white blood cells, neutrophils, lymphocytes, eosinophils in females

Total count WBC	4000-11000 cells/mm <sup>3</sup>
Neutrophil	40-75%
Lymphocyte	20-40%
Eosinophil	1-6%

Table 3: Normal value of total white blood cell count, neutrophil, lymphocyte, and eosinophil

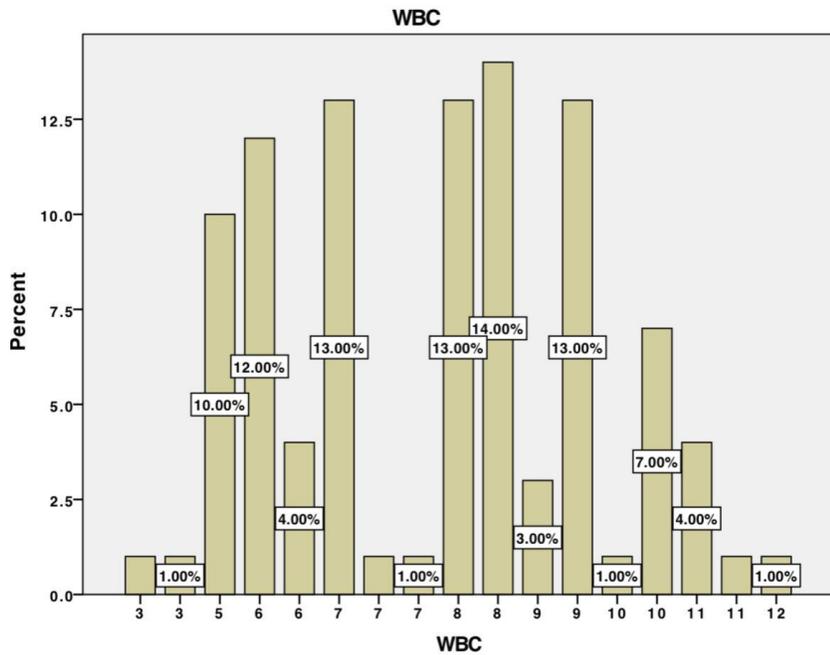


Fig 1: Percentage distribution of white blood cells in the study subjects, Y-axis representing the percentage of population and X-axis representing WBC count. The least 1% of population have 3000 cells, 7000cells, 10,000 cells and 12,000cells per cubic millimeter of blood, 10% have 5000 cells per cubic millimeter of blood, 16% have 6000 cells per cubic millimeter of blood, 13% of population have both 7000 cells and 9000 cells per cubic millimeter of blood. 14% of the people involved in this study are have around 8,000 cells per cubic millimeter of blood, 3% have 9000 cells per cubic millimeter of blood, 7% of population have 10,000cells per cubic millimeter of blood, 4% of the population have 11,000 cells per cubic millimeter of blood.

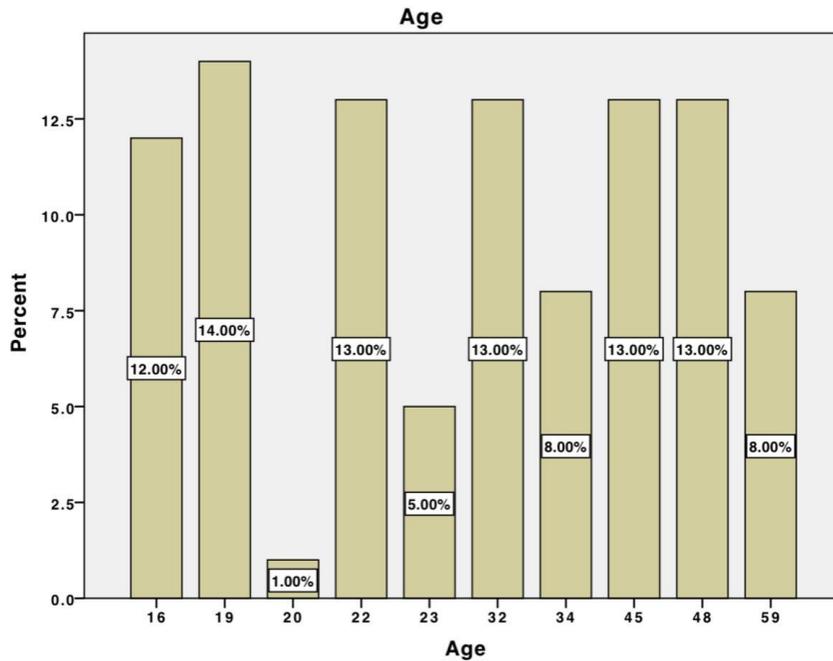


Fig 2: Percentage population among the various age groups, Y-axis representing the percentage population and X-axis representing the age. 12% of the population in the study belongs to age group of 16 years, 14% belongs to 19 years, 1% belongs to 20 years, 13% belongs 22 years, 5% belongs to 23 years, 13% belongs to 32 years, 8% belongs to 34 years, 13% belongs to 45 years to 48 years, 8% of population belongs to above 50 years of age.

This study was conducted to analyze the WBC count and differential count among the patients with bleeding gums. Figure 1 shows the Percentage distribution of white blood cells in the study subjects. The highest percentage observed in the graph is 14% of the people involved in this study are having around 8,000 cells per cubic millimeter of blood and the least is 1% of people are involved in this study are having 3,000 and 12,000 cells per cubic millimeter of blood. Fig 2 shows the Percentage population among the various age groups. The highest percentage observed is 14% of the total population are the age group of 19 years and least observed is only 1% of the age group of 20 years.

The research was conducted on 100 patients with chronic periodontitis. In the subjects, there were no evident changes in the values of clinical parameters of periodontitis when compared to normal values(26). Table 1 shows the average value of the total count of white blood cells, neutrophils, lymphocytes, eosinophils in males. Males with bleeding gums, in the age group of 10-20 years showed a mean value of total WBC count was 9042.9 cells/cubic mm, in the age group of 20-40 years have a mean value of total WBC count was 8160.7cells/cubic mm and in the age group of above 40 years showed a mean value of total WBC count was 8687.5 cells/cubic mm. When we compared all the age groups, the mean value of the WBC count is more in the age group of 10-20 years when compared to other age groups. The chi-square analysis was done to rule out the association, in which we found that there is no significant association between the age group of males with bleeding gums and the WBC counts(27,28).

Table 2 shows the average total count of white blood cells, neutrophils, lymphocytes, eosinophils in females. Females with bleeding gums, in the age group of 10-20 years showed a mean value of total WBC count was 8925 cells/ cubic mm, in the age group of 20-40 years showed a mean value of total WBC count was 7942.9cells/cubic mm and females of the age group of above 40 years showed a mean value of total WBC count was 8633.5 cells/cubic mm. When we compared the WBC count among the different age groups of females who have bleeding gums, males females with 10-20 years have a higher WBC count than the other age groups. Chisquare analysis showed that there is no significant difference in the age groups of females with bleeding gums and WBC counts. A study done by Ajmani et al in 2017, showed that drug-induced pancytopenia leads to bleeding gums. In this study, the author highlighted that WBC count in females with elderly age group had a low total count, which was well correlated with our study(29).

Table 3 shows the value of total white blood cell count, neutrophil, lymphocyte, and eosinophil. Except for neutrophils, other WBC differentials which are lymphocyte and eosinophil are normal in both males and females in the bleeding gum patients, but when analyzing the neutrophils, a slight increase in the number of neutrophils is observed in the bleeding gum patients in both males and females by comparing table 1 and table 2 with table 3. The mean value of WBC and

**Comment [AA13]:**

This is not the same as bleeding gums

How have you determined and assessed the Chronic periodontitis?

**Comment [AA14]:**

How did you compare with the normal value?

its differential count was normal in both males and females with bleeding gums. It was found correlated with the previous study done in 2021 by Alnor et al.(30)

The mean value of WBC and its differential count was normal in both males and females. The normal value of the WBC is 4000 to 11000 cells/cm(31), the normal value for neutrophils is 40-75%, the normal value of lymphocytes is 20-40% and the normal value of eosinophil is 1-6%. Earlier studies (32) have demonstrated elevation of total leukocyte count in periodontitis(33,34) and lowering of leukocyte levels following periodontal therapy(33,35). Exaggerated leukocytes and neutrophils of host response are a very important component in the pathogenesis of the periodontal disease. Hyper-reactive white blood cells can be induced in patients with infections such as periodontal disease and promote atherosclerosis at distant sites, particularly in areas of disturbed blood flow (Johnstone et al., 2007). This hyper-reactivity might be due to their circulating through the periodontal lesions or might be a constitutive feature of patients with periodontal disease(34). The minor bleeding from the gums, may not alter the WBC counts and differential counts for both males and females. Vice versa, the moderate to a severe reduction in WBC counts and differential counts leads to bleeding gums in both males and females.

This study included the patients with only bleeding gums, no other systemic illnesses were included. These limitations may be overcome in the future by including systemic illnesses which cause bleeding gums as defining criteria.

### **Conclusion**

Within the limitations of the study, we conclude that there is no association between the WBC count and differential counts among the males and females with bleeding gums. The statistical analysis also proved the same. Hence, minor bleeding from the gums will not produce any changes in the WBC parameters.

**Comment [AA15]:**  
Another referencing method, different to what mentioned before  
Its not even in the reference list !!!

## Reference

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