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Dental Science

PROPINQUITY BETWEEN ANEMIA AND PERIODONTITIS - A REVIEW ARTICLE.

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ABSTRACT

Anemia is a state of low level of hemoglobin in blood below the reference range appropriate for age and sex. About 24.8% of world population is affected with anemia. Periodontitis is an inflammatory condition of periodontium- the supporting structure of tooth. It has been reported that 95% of Indian population were suffering from periodontal problem. There are various studies proving that anemia is discern with periodontitis. Though there are controversial thoughts to this and also have proof for their controversies, many studies with follow up have proven that anemic patients after periodontal management showed significant increase in their blood parameters. Some also prove that blood values decrease with increase in severity of periodontitis. Though there is controversial thought of iron deficiency anemia related to periodontitis, anemia of chronic disease (ACD) which is "the anemia occurring in chronic infections, inflammatory conditions or neoplastic disorders that is not caused by marrow deficiencies or other diseases, and occurring despite the presence of adequate iron stores and vitamins" is proven to be related to periodontitis of various severity grading. Thus a kosher oral hygiene in preventing periodontal inflammation and management of the periodontal problem plays an important role in controlling anemia, thus giving a better life to live in.

KEYWORDS : Anemia, periodontitis, chronic disease, hemoglobin, oral hygiene.

INTRODUCTION

Anemia refers to a state in which the level of hemoglobin in blood is below the reference range appropriate for age and sex [1]. Worldwide anemia affects 1.62 billion people which correspond to 24.8% of the population. The highest prevalence is in preschool children with lowest prevalence in men. Periodontitis is defined as an inflammatory disease of supporting tissues of teeth caused by specific microorganisms, resulting in progressive destruction of the periodontal ligament and alveolar bone with periodontal pocket formation, gingival recession or both [2]. In the year 1978, WHO report stated that 'almost all the adult population has experienced periodontitis, gingivitis or both' [3].Anuja et al in the year 2016 concluded that 95% of Indian population have periodontal problem [4].

Periodontitis is seen to be associated with various systemic diseases. They are viewed as one of those manifestations of systemic diseases such as diabetes mellitus, immune compromised diseases etc [5]. Anemia is discerned to be associated with periodontitis. This article is to review the relationship between periodontitis and anemia, also to identify the possible reason behind it. So a proper oral hygiene can prevent plaque accumulation, calculus formation, prevent periodontal inflammation and hence can prevent the occurrence of anemia due to chronic inflammatory diseases.

HISTORY:

As early as 1945, Siegel et al had noted a decrease in the number of erythrocytes, apparently secondary to periodontal disease [6]. Laison (1968) et al proposed that there was a correlation between anemia and periodontitis with regards to erythrocyte count. But his study didn't give them a statistical significance between anemia and periodontitis for specific gender and type of anemia between mild to severe [7]. There are lot of researches which favored relationship between anemia and periodontitis with some researches controversial to their relation. (Table 1 and 2)

Etiology and pathogenesis:

Anemia of chronic disease is a anemia occurring in chronic infections, inflammatory conditions or neoplasms which is not caused by marrow deficiency or other diseases and occurring despite adequate iron and vitamin storage [8].

Cartwright [9] postulated three process of pathology and they are

- Shortened erythrocyte survival
- Failure of bone marrow to meet its demand
- Impair in release of iron from reticuloendothelial system.

Pro inflammatory cytokines were thought to act as suppressor for bone marrow thus reducing erythrocyte count. Cytokines such as interlukins IL-1a, IL-6 and TNF-a was related to suppression of marrow. Johnson et al [10] in his study introduced TNF-a in to a mice and found decrease in erythropoiesis. Faquin et al [11] reported that IL-1, TNF-a and TGF-b influenced production of erythropoietin by inhibiting it.

Inflammation of periodontium releases cytokines and is directly related to the severity of anemia. Thus increase in cytokines causes increased severity of anemic disease [12]. (Fig 1)

Anemia and periodontitis:

Literature search relating periodontitis leading to anemia in google scholar and pubmed revealed significant correlation between them. There were reports by Patel et al (2014)[13], Shetty et al (2014) [14] and Pradeep et al (2011)[15] in which they have nonsurgical management which revealed positive results. They did phase 1 treatment in periodontitis patient with anemia. They took blood parameters before treatment and at follow up 6months after treatment. It was found that there was an increase in blood values in 6 months of time after nonsurgical management of the patients.

This gives a positive report of propinquity between anemia and periodontitis. The nonsurgical management seems to provide a reduction in inflammation. This reduction in inflammation will reduce the inflammatory cytokines released in the body and there is less effect on bone marrow which involves in erythropoiesis. Thus the blood parameters increase when a nonsurgical management is performed in periodontitis patient with the scope of reducing the periodontal inflammations.

The literature search also provided various surveys comparing blood parameters in patients with periodontitis and healthy individuals. The reports by Alishag et al (2017) [16], Shetty et al (2017) [17], Anumalu et al (2015)[18], Nilofer et al (2016)[19], Gokhale et al (2012)[20] and Naik et al(2010)[21] revealed positive results. They found that the blood values in periodontitis patients were comparatively less and anemic in comparison to healthy individuals. Alishag et al (2017) [16] even gives a statistics of 89% of anemic patient had periodontitis.This results are mainly due to the inflammatory effect of periodontium on bone marrow by release of cytokine. Thus these studies prove a positive propinquity between anemia and periodontitis (Table 1).

Khan et al (2014) [22] compared anemia and periodontitis with regard to severity of disease in both. He categorized patients in 4 groups such as healthy periodontium, mild, moderate and severe periodontitis. It was curious that the severity of anemia was directly related to the periodontal status of the patient. The blood values decrease with increase periodontal inflammation. Hutter et al (2001) [23] compared periodontitis and blood values with regards to parameters such as gender and smokers. He concluded that there is a relationship between periodontitis and anemia. The periodontitis associated with anemia was more common in female gender and smokers compared to other individuals. The above two literature says that the anemia is related to inflammation of periodontium. When there is more of inflammation there is going to be more severity in anemia.

Iron deficiency anemia and periodontitis:

Souvik et al (2014) [24] compared iron deficiency anemia and periodontitis. He found there was correlation between two. He also concluded iron deficiency affected serum SOD but not salivary SOD. Singh et al 2013 [25] estimated periodontal status of patient with Beta Thalassemia and sickle cell disease. He concluded that B-thalassemic patient had more periodontal problem in comparison to sickle cell patient. But in these studies the anemia is more of iron deficiency and sickle cell rather than inflammatory conditions.

Positive correlation between anemia and periodontitis were elicited through 2 case reports by Hasan et al (2012) [26] and Lu et al (2010) [27]. Hasan et al reported a case of a 20 year old female with both iron and vitamin B12 deficiency leading to anemia. He found that the periodontal status of the patient was so poor. He concluded that there is relation between anemia and periodontitis but couldn't relate iron and B12 causing periodontitis. So the periodontal inflammation as cause of anemia may be of less significance in compared to iron and B12 deficiencies. This anemia is iron and B12 deficiency more than anemia due to chronic diseases. Lu et al (2010) [27] reported a case of 50 year old female with severe anemia and periodontitis. Blood values were recorded before the extraction procedure and were compared after 4 months post extraction of poor prognosis teeth. It was found that the blood values dramatically increased after 4 months. From this study/case report it is suggestive that once the etiology (i.e. periodontitis) is treated, there is reduction in inflammation. This allows bone marrow to regain its normal function due to reduction in inflammatory cytokines. This proves the propinquity between anemia and periodontitis.

Controversies on propinquity between anemia and periodontitis:

The literature search also provided us with reports that had controversial results on the propinquity between anemia and periodontitis. Haider et al (2015) [28], Enhos et al (2009) [29] and Hind et al(2006) [30] had reports that proved no relation between anemia and periodontitis.Haider et al in his study compared sickle cell disease with periodontitis and found no significance. Here the condition is sickle cell, where the there is no concept of inflammation of periodontium influencing the bone marrow in production of erythrocytes. Sickle cell anemia though a chronic disease it is not an inflammatory condition. This might be a reason for the controversy. Enhos et al compared iron deficiency anemia with periodontitis and proved they were not related. He also proved that serum ferritin and GCF ferritin doesn't have significant correlation. This might be of controversy because iron deficiency is the sole cause of anemia. The periodontal inflammation may not be a cause in this situation.Hind et al compared hemoglobin levels and severity of chronic periodontitis and reported no significance. In this study the author would have taken some healthy control to compare and relate the propinquity. This might have showed a statistical significance between anemia and periodontitis. The author itself has concluded that further longitudinal studies with large sample size may be needed to prove their relationships (Table 2).

CONCLUSION

Anemia is a disease of reduced hemoglobin for appropriate age and sex. Anemia can be of various reasons like bleeding, iron deficiency, B12 deficiency etc. Blood parameters prove that there is significant correlation with inflammatory conditions such as periodontitis with anemia. More importantly the nonsurgical management of anemic patients with periodontitis proved them to improve their blood parameters which adds on to the proof for anemia discern with periodontitis. Their etiopathogenesis requires a lot study to be done to prove its relation as the anemia might be due to more of iron and B12 deficiencies rather than inflammation.

Besides the controversies correlation between anemia and periodontitis, anemia is proven to occur due chronic diseases. This review emphasizes the need to explore the etiopathogenesis of anemia and its relation with periodontitis. However, it also emphasizes the need for maintaining good oral hygiene.

Fig 1: Etiopathogenesis of relationship between anemia and periodontitis.

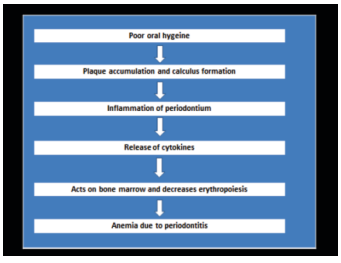

Table 1: Positive reports to relate anemia and periodontitis.

Author	Aim	Parameters	Inference
Alshigag et al -2017	Relationship between anemia and oral hygiene	Blood parameters such as Hb, clinical parameter for periodontium	89% of anemic patient had periodontitis.
Vardaan et al -2017	Estimate and compare hemoglobin in periodontitis and healthy patients	EC, MCV, MCH, MCHC, Hb.	Healthy patients had better blood values than periodontitis patient.
Anumalu et al-2015	Estimate relationship between anemia and periodontitis	EC, Hb, MCV, MCH, MCHC and GI, PI, PPD, CAL	Decreased level of hemoglobin with periodontits. Increase in WBC with periodontitis.

Khan et al -2014	Severity of anemia with severity of periodontitis	Blood parameters with clinical parameters. 4 groups with 20 each categorized into healthy, mild, moderate and severe periodontal inflammation.	Severity of periodontitis had direct influence on anemia. Increased inflammation showed decreased blood values.
Souvikchakaraborty et al 2014	Relationship between iron deficiency anemia with periodontitis	BOP,PPD,PI,GI and Hb. Serum SOD and salivary SOD	IDA patients had more periodontal problem. Iron deficiency affected serum SOD but not salivary SOD
Patel et al 2014	Blood parameters of periodontal patient after nonsurgical management and a follow up for 6 months	Estimate blood parameters before and 6 month after nonsurgical management.	Hb and RBC count increased after nonsurgical management after 6 month follow up.
Shetty et al 2014	Bloodparameters before and after 6 months of first phase treatment of periodontitis.	Hb, RBC count values before and 6 month after 1st phase of treatment.	There was significant improvement in blood value after 1st phase treatment.
Singh et al 2013	Prevelance of periodontitis in Beta thalassemic patient and sickle cell patients	Periodontal clinical parameters such as CAL, PPD	Thalassemic patient more prone to periodontitis followed by sickle cell patients.
Nilofer et al 2013	Relationship of periodontitis and anemia	MCV,MCH, Hb, HCT ,SI and TIBC. GI, CAL, BOP	Blood parameters where found decreased with increase in periodontal parameters.
Hasan et al 2012	Case report of advanced anemia	23 aged female with both iron and B12 deficiency	Severe periodontitis was observed. Possible etiopathogenesis is of controversy.
Gokhale et al 2012	Estimation of blood parameters in periodontitis and healthy individuals	Hb, RBC count.	Decreased Hb, RBC with periodontitis. Chronic periodontitis can lead to anemia.
Lu et al 2010	A case report of dramatic recovery from anemia after periodontal management.	50 year old female with severe anemia and periodontitis.	Four months after extraction dramatic increase in blood values.
Naik et al 2010	Estimation of blood values in periodontitis and healthy patients.	Hb, MCHC, erythrocyte count, PCV.	Periodontitis patients showed less blood values compared to healthy individuals.
Pradeep et al 2011	Estimation of blood parameters before and after nonsurgical therapy in periodontitis patient.	HB, RBC	Increase in blood values after 6 months of nonsurgical therapy.
Hutter et al 2001	Estimation blood parameters in periodontitis patient in categories such as gender and smokers	Hb, RBC	Blood values lesser in periodontitis with greater reduction in females and smokers.

Table 2: Controversial reports in relating anemia and periodontitis:

Author	Aim	Parameters	Inference
Haider et al 2015	Relationship between dental and periodontal patient in sickle cell disease.	CPI , plaque index.	No periodontal significance with sickle cell anemia.
Enhos et al 2009	Relate iron deficiency anemia with periodontitis	Compared serum ferritin and ferritin in GCF. Other blood parameters	Iron deficiency is not related to periodontitis. Serum ferritin and GCF ferritin doesn't correlate.
Hind et al 2009	Relate anemia with periodontitis	Hb, CAL	Hb doesn't correlate with CAL. Hence there is no periodontal significance with anemia.

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