

# Evaluation and Amalgamation of Hemoglobin and MCV levels in 3-12-year-old Children with Dental Caries in Abha Maternity and Children Hospital- Saudi Arabia

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## Abstract

**Objective:** The purpose of this study was to see the amalgamation between the hemoglobin levels and MCV levels with dental caries in a random sample of pediatric patients who visited the Abha Maternity Hospital, Abha. **Design:** Cross-sectional study. **Setting:** Hospital based. **Subjects:** Total 122 children aged 3-12 years. **Intervention:** Dental caries using dmft index and laboratory data of hb and mcv were obtained from patients medical records. **Main outcome measure:** Evaluation and amalgamation of hemoglobin and mcv levels in children with dental caries. **Results:** In this cross-sectional study there was no significant difference in mean age ( $6.3 \pm 2.7$  years) mean dmft was 3.79 (S.D.=4.2) and mean Hb was 11.69 (S.D.=1.8). Pearson's correlation coefficient showed there was a strong inverse correlation between Hb levels and dental caries; but no association was found with MCV levels and dental caries. **Conclusion:** This study concluded that children with high caries experience were found to be suffering from low Hb levels. The need for further longitudinal studies needs to be conducted to the association between the two conditions.

**Keywords:** Dental Caries; Hemoglobin; Iron; MCV

## Introduction

Dental caries is one of the most prevalent unachieved health needs of children and is associated with unusual dietary practices. [1] The cause being *Streptococcus mutans* bacteria which is present in the oral cavity and also is the main bacteria which lead to dental caries in human. Dental caries can cause pain which interferes with the nutritional intake including iron and thus can result in iron deficiency anemia. [2] Iron deficiency anemia is defined as circulating hemoglobin with insufficient iron and represents 90% of all types of anemia worldwide. Although it has declined over the past years, but it remains an issue for pediatric public health. [3] The prevalence of anemia as estimated by The WHO is about 7.6% in Canada and 3.1% in U.S.A. However, iron deficiency is not the cause of anemia in all the cases. [4]

The WHO has determined Hemoglobin levels at which concentration health care providers can confidently diagnose anemia. These concentrations are 11 g/dL or below in patients aged 5 years or younger 11.5 g/dL or below in patients aged 5-11 years. [3] Iron deficiency can impede physical and mental development in children and can affect cellular immunity as well. [5]

Those Individuals which are classified as iron deficient have insufficient iron and hence are not able to maintain the normal function of tissues which rely on this micronutrient Dentistry has an obvious role in preventing medical and dental complications

for anemic children. These patients are more prone to systemic and dental diseases that need modified treatment plans. [6]

However, psychological problems and infections are manifestations commonly encountered in anemic children. The lifestyle and regular hospitalization of such children increases the prevalence of dental caries due to improper oral hygiene and the continuous use of specific medications. [7] Hence this study was conducted to explore an association between Hb levels and MCV levels with dental caries in children aged 3-12 years.

## Research Methodology

This study was approved by the scientific research committee at King Khalid University, College of Dentistry and Administration office of Abha Maternity and Children Hospital, Abha, KSA. In this cross-sectional study a total of 122 outpatients (boys-60 and females-62) who attended the Abha maternity hospital with an age range of 3-12 years and no medical problems were included in this study. Dental caries was assessed using DMFT/dmft index. The examination was done using a mouth mirror, probe and torch light. A tooth was diagnosed as decayed (d) if its

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color was changed and if any evidence of primary or recurrent caries existed. The (m) included missing teeth (extracted) as a result of caries and (f) component included restored teeth with no caries. White spots were not taken into consideration. The Hb (Hemoglobin) and MCV (Mean corpuscular Volume) levels were recorded and correlated with dental caries. The Hb and MCV levels were obtained from the blood reports prescribed by consulting pediatrician. Hb and MCV were taken as they are one of the key biochemical indicators of iron status. Hemoglobin was selected as an indicator of iron status as the protein relies on iron to function and is recorded as indicator of anemia. MCV was assessed as low levels may serve as an indicator of microcytic anemia. Data analysis included descriptive statistics and Pearson’s correlation coefficient.

### Results

A total of 122 children (48% boys and 52% females) were included in this cross-sectional study. The mean age of children was  $6.3 \pm 2.7$  years. There was no significant difference in mean age. Mean dmft was 3.79 (SD=4.2) and Hb was 11.69 (SD= 1.8) as shown in Table 1. Among the study population 28 were anemic whereas 94 were non-anemic. Most of the anemic children 92.8% (25) experienced dental caries while only 72% (2) were found to be caries free. On the other hand, 78.7% (74) of non-anemic children experienced dental caries while 21.3% were caries free as shown in Figure 1.

Pearson correlation was conducted to determine the relationship between DMFT/dmft (dental caries) and Hb (hemoglobin levels of children). There was a strong inverse correlation between dental caries and Hb levels: higher caries experience was found in those children suffering from low Hb levels which was statistically significant ( $r = 0.340$ ,  $n=122$ ,  $p=0.000$ ). No relationship was found between MCV levels and dental caries when Pearson’s correlation was used as in Table 2 and Table 3.

### Discussion

Dental caries, a multifactorial transmissible bacterial infection, is the most common chronic disease of human population along with it diet plays a massive role in the development and clinical features of this infection. [8] Nutritional anemia and dental caries are still the most prevalent diseases in some countries. Till today there has been minimal research in the area of iron status and dental caries. This study provided an opportunity to explore the amalgamation by comparing the Hb levels and MCV levels with children having dental caries.

In this cross- sectional study a total of 122 children (48%

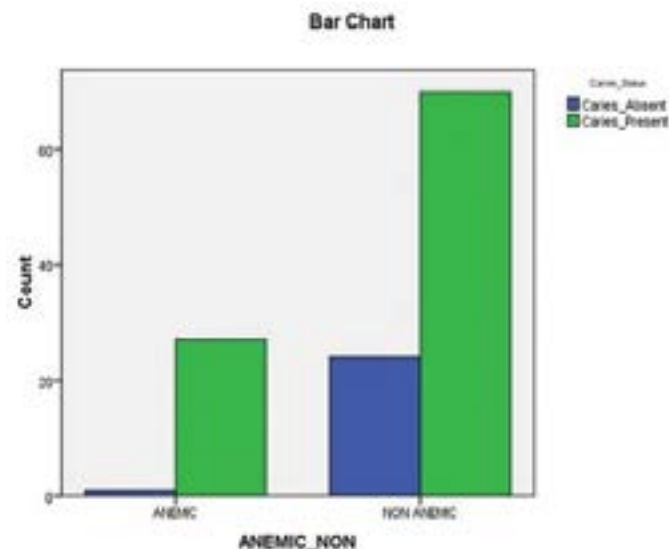


Figure 1: Histogram interpretation of dental caries and anemia.

	Co- relation	Hb	DMFT/dmft
Hb	Pearson Correlation	1	-0.340**
	Sig. (2-tailed)		0.000
	N	122	122
Dmft	Pearson Correlation	-0.340**	1
	Sig. (2-tailed)	0.000	
	N	122	122

	Co- relation	DMFT/dmft	MCV
Dmft	Pearson Correlation	1	-0.094-
	Sig. (2-tailed)		0.308
	N	122	121
MCV	Pearson Correlation	-0.094-	1
	Sig. (2-tailed)	0.308	
	N	121	121

boys and 52% females) were included. The statistical analysis indicated a strong inverse correlation between dental caries and Hb levels, higher caries experience was found in those children suffering from low Hb levels, which was statistically significant ( $r=0.340$ ,  $n=122$ ,  $p=0.000$ ). No relationship was found between MCV levels and dental caries. In a cross-sectional study done by Abdallah et al., it was found that children with lower Hb levels had significantly higher DMFT/dmft index. [3] Similar results were showed in study by Sadegh et al. [9]

Numerous theories have been proposed as to why the iron levels of a child are related with the presence of dental caries. One theory is that the baby’s inflammatory response which may accompany various forms of dental caries (especially those involving pulpitis or abscesses), results in low hemoglobin levels often observed in severe cases of early childhood caries. Inflammation as a result of dental caries trigger series of events which lead to the production of cytokines, hence it inhibit erythropoiesis which results in low level of hemoglobin in the blood and hence level of iron is reduced. Second theory is that functioning of salivary gland in children is often impaired with

Table 1: Frequency statistics of age and DMFT/dmft.

Variables	AGE	DMFT/dmft	Hb
Valid	122	122	122
Mean	6.37	3.79	11.63
Std. Deviation	2.728	4.226	1.811
Skewness	0.498	1.571	-0.381-
Std. Error of Skewness	0.219	0.219	0.219
Minimum	3	0	7
Maximum	13	20	16

iron deficiency, thus causing reduced salivary secretion resulting in low buffering capacity which leads to dental caries. [10] It is seen that the pain and discomfort experienced by children with dental caries may affect their eating habits, which may affect the absorption of nutrients in the gut due to poorly masticated food and can lead to nutritional deficiencies including low iron levels. [4]

### Conclusion

Based on the results of the study, it showed an inverse amalgamation between the Hb levels and dental caries, whereas no relation was evident with MCV levels and dental caries. An early warning sign of low iron levels can be in form of dental caries hence allowing patient to take necessary precautions before severe sequelae of iron deficiency take place. Further investigation of this association overtime, using longitudinal study design may be appropriate.

### Conflict of Interest

The authors declare that they have no conflict of interests.

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