

Investigating DMFT Indicator and its Correlation with the amount of Serum Ferritin and Hemoglobin in Students with Beta-thalassemia Major in Ahvaz, South West of Iran

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Abstract

Background: Thalassemia is the most common single-gene disorder that carries along many difficulties and effects such as oral and dental problems in patients. This study aimed to determine DMFT indicator and its correlation with the amount of serum ferritin and hemoglobin in patients with thalassemia major.

Materials and Methods: This cross-sectional study has been conducted by descriptive-analytical method, in 2015 with the participation of 50 patients with thalassemia major referring to Shafa hospital in Ahvaz and 50 healthy samples who were demographically similar to patients. Then, DMFT indicator was investigated in both groups; the amount of hemoglobin and serum ferritin was considered in patients, too.

Results: In the patient group, the average of DMFT indicator was 4.94 with a standard deviation of 1.5 and in control group 5.8 with a standard deviation of 2.04 ($P < 0.05$). There was a significant difference between the averages of the filled teeth in two groups ($P < 0.05$); but there was not any significant relationship between the amounts of hemoglobin and serum ferritin on the one hand and DMFT indicator on the other ($P < 0.05$).

Conclusion: Considering that the results showed that thalassemic patients are not in appropriate condition regarding the oral and dental hygiene and dental health and referring to dentist. Educational these patients and their families about the increasing use of dental care and oral hygiene and treatment are recommended.

Key Words: Beta-thalassemia, Dental decay, DMFT indicator, Ferritin, Hemoglobin.

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1- INTRODUCTION

Thalassemia is the most common single-gene disorder and the type of the homozygous beta-thalassemia major is known as the most common form of congenital hemolytic anemia that is manifested just after the first few months of life (1-5). This disease is one of the common genetic diseases in Iran, so that Iran is among the countries in the world that have located on the thalassemia belt. Prevalence of beta-gene carriers in Iran is about 4% and according to the latest statistics, about three million thalassemia carriers and more than 25 thousand patients suffering from thalassemia major have been identified in the country; this is more common in the North provinces and South coasts, including Khuzestan (4 and 6). Hallmarks of this disease is a decrease or a defective in production of blood hemoglobin gains that may be let to disturbance in the process of erythropoiesis and, consequently, severe anemia and in adolescents that is let to the delayed puberty (6-8). Individuals suffering from deficiency in the structure of hemoglobin and consequently anemia become afflicted with various effects. Among the effects of this disease is the existence of the severe bone injury due to the body's effort to increase the production of red blood cells. The blood transfusion in long-term causes to improve the oxygen transport to the tissues, suppression of ineffective erythropoiesis and prolongation of life (2, 4). Also, due to effects and difficulties resulting from appearance of this disorder, one of the locations or organs that are affected, is oral and dental system (3 and 9). Difficulties of the mouth, jaw and face are the main concerns of patients suffering from thalassemia major and as an example of these difficulties we can refer to dental decays and gum disease (1).

Given that the risk of infection with dental and non-dental origin is very serious in these patients, the preventive measures

should be considered for preventing tooth decay (10, 11). On the other hand, the requisite of prevention and treatment measures of oral and dental diseases in every region is recognizing the existing situation of that region (12). The results of epidemiology of dental health status are provided often in the form of average set of filling, missing and decayed teeth in permanent teeth (DMFT) or in milk teeth (dmft)(13). Several studies have been conducted in relation to amount of DMFT in thalassemic patients; the different results have been reported. Some studies have reported higher DMFT in thalassemic patients (9, 14-16), while other ones have refuted this relationship (17-20). Therefore, it is necessary to be done a further evaluation about the health status of teeth of these patients. In addition, these patients need to receive periodically blood for surviving. After some time, due to red blood cell lysis, the amount of ferritin in the body of these patients increases and sinks down in different tissues; this can cause damage to tissues. Ferritin sediment in the salivary glands can cause damage to the salivary glands and drying the mouth and consequently tooth decay (3). However, so far for determining the relationship between serum ferritin level and hemoglobin in these patients on the one hand and the dental decay and DMFT on the other, it has not been carried out any considerable research.

According to what mentioned and due to the climate and geographical impacts on indicators related to oral and dental health (21), so far, concerning the orofacial problems in the patients with thalassemia major, a few studies have been conducted in the Khozestan province, Iran, this study aimed to determine DMFT indicator and its relationship with serum ferritin level and hemoglobin in patients with thalassemia major and compare it with the control group, among the patients referring to Shifa Hospital of Ahwaz in 2015.

2- MATERIALS AND METHODS

This cross-sectional study has been conducted by descriptive-analytical method in 2015 in which the required data were collected in a specified period. It has been confirmed by the ethical committee of Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran. The study population included all patients with thalassemia major who referred to Shafa hospital in Ahvaz; after making a list of their names which was available in the archive of hospital, the researchers selected randomly 50 subjects as samples under study. These samples had the role of a case in the study.

In order to determine the control group, the case group individuals have been asked that they introduce an individual or several individuals from between their relatives and family members with whom they have affinity in gender, age, educational level, place of residence, economic and cultural conditions and do not suffer from the thalassemia disease or other specific disease. Implementation method and the research purpose have been explained orally and in writing to all participants; in case group, if they had any questions in this regard, it has been answered by the project manager and at the end the written conscious consent was taken. Participating in this research was completely voluntary, and lack of participants, have not had any negative consequence for the individual.

The participants have been given assurance that the study information will be considered as secret and used only in line with the research purposes and will not be in the hands of irresponsible individuals. For being confident of participants, the Name and Family name of patient have not been registered on the form of information.

After selecting the samples having the inclusion criteria, all samples were examined by the researcher, on a dental

chair and under the unit light and using dental flat mirror; the desirable cases in the DMFT indicators were investigated and were recorded in a check-list designed for this purpose. DMFT indicator that has been presented by the World Health Organization for epidemiological investigation of tooth decay in population-consists in the abbreviations Decay, Missing, Filled (DMF). Firstly, each of these three cases were separately investigated and recorded and finally they were calculated by adding these cases and dividing it to total number of teeth of individual's DMFT indicator. Also, for assessing the level of serum ferritin and hemoglobin in patients with thalassemia major, their most recent results of the blood test that were available in the file, were used and the relationship of these variables with dental decay indicator was evaluated.

2-1. The inclusion criteria for participation in the study in case group:

- Having 13 to 18 years;
- Being student;
- Having a medical file in Shafa hospital of Ahvaz;
- Being definitively diagnosed of suffering from thalassemia major;
- Willingness to participate in the study.

2-2. The inclusion criteria for participation in the study in control group:

- Having 13 to 18 years;
- Being student;
- Willingness to participate in the study;
- Being healthy.

2-3. Data collection tool

Data collection tool in this study included the check-list; the examination and questions by researcher were recorded in the check-list related to each sample. The check-list used in this study contained the

following cases: suffering or not suffering from thalassemia major, age, gender, amount of blood hemoglobin, amount of serum ferritin, the number of decayed teeth, number of missing teeth and total score of DMFT.

2-4. Data analysis

SPSS version 18 (PASW Statistics for Windows, Chicago: SPSS Inc.) was used to analyze the data set. The P- value less than 0.05 were considered as significant.

3- RESULTS

The findings of this study showed that from 50 samples in the patient group, 18 (36%) individuals were men and 32(64%) individuals were women and in control group of 50 people, 19 (38%) individuals were men and 31 (62%) individuals were women. Using Fisher's exact test, there was no significant relationship between gender and having disease ($P > 0.05$). Also, most of samples in the patient group, 15(30%) individuals and in control group, 19(38%) individuals referred to a dentist at the proper time. Using the Chi-square test, there was a significant relationship between the times of visiting a dentist and having disease ($P > 0.05$). Most of samples in the patient group, 16 (32%) people, and in control group, 30(60%) people brushed their teeth once a day. Using the Chi-square test, there was a significant relationship between the tooth brushing condition of samples and having disease ($P > 0.001$); this means that distribution of the tooth brushing condition was not the same in two control and case groups. Also, most of samples in the group of patients, 36 (72%) patients and most of samples in control group, 39(78%) population did not

use the floss. Thus using the Chi-square test, there was no significant relationship between the use of floss in samples and having disease ($P > 0.05$).

In terms of DMFT indicator, the results showed that the mean of DMFT indicator in the patient group was 4.94 with a standard deviation (SD) of 1.5 and in control group was 5.8 with standard deviation of 2.04. Using the Mann-Whitney test, there was a significant difference between the two groups in terms of DMFT indicator ($P < 0.05$).

Also, the average of decayed teeth in the patient group was 7.7 ± 3.3 and in control group was 6.9 ± 1.9 . In other words, the number of decayed teeth was higher in the patient group, but this difference was not statistically significant ($P > 0.05$). The average of missing teeth was 0.34 ± 0.7 in the patient group and 0.58 ± 0.9 in control group. The number of missing teeth was higher in healthy subjects; this difference was not statistically significant ($P > 0.05$). The average of filled teeth was 0.54 ± 1.1 in the patient group and 2.4 ± 2.2 in control group. In other words, the number of filled teeth was higher in healthy subjects and this difference was statistically significant ($P < 0.05$). Finally, in this study the correlation among the amount of blood transfusion, ferritin, hemoglobin and DMFT indicator was examined in the patient group and for investigating these variables, the Spearman correlation coefficient was used; the results have been presented in (Table.1), according to which there was not any significant relationship between DMFT indicator and other blood indicators in the patient group ($P > 0.05$).

Table 1: Correlation between DMFT indicator and some blood indicators

Variables		Blood indicators		
		Hemoglobin(g/dl)	Ferritin (ng/mL)	Amount of blood reception (cc/kg)
DMFT	Correlation coefficient	-0.152	0.022	-0.047
	P-Value	0.146	0.439	0.379

4- DISCUSSION

Regarding the importance of oral and dental health and its impacts on individuals' life quality especially in patients with thalassemia and also due to the different results of different studies on the condition of dental decay in patients with thalassemia, in this study the "DMFT indicator and its relationship with the amount of serum ferritin and its comparison with the control group were studied in a sample of patients suffering from beta-thalassemia major".

On the prevalence of DMFT in patients with thalassemia, there are various studies and the different results have been reported. For example, in Kaur & Hiremath's study (2012) examined the experience of decay and periodontal status in patients with thalassemia; their study findings showed that the average of DMFT in the patient group is 3.45 ± 4.20 and in the control group 1.82 ± 2.51 ; the average of DMFT in patient group was 2.82 ± 3.22 and in group control 1.44 ± 1.79 (16). In Iran in a study of Asl Aminabadi et al. (2009) that was conducted for determining the amount of tooth decay in children with thalassemia major and comparing it with healthy children, the results showed that the amount of decay experience in milk teeth, $dmft = 4$, and permanent teeth, $DMFT = 5.6$, in children with thalassemia was significantly higher than the healthy control group ($P < 0.05$) (3). Hattab, Aran and Pedulla in the separate studies came to conclusion that DMFT in patients with thalassemia was higher compared to control groups (14, 22, 23). While in other studies Sculellari, Luglie, Hara and Jahangirnezhad showed that DMFT in thalassemic patients and the control group was similar (17-20). The findings of the present study showed that the average of DMFT indicator in the patient group was 4.94 with the standard deviation of 1.5 and in healthy group was 5.8 with the standard deviation of 2.4; this difference was

statistically significant. This difference in results may be related to the different demographic combination in these studies and different way of measuring DMFT indicator and the difference in standards of inclusion and exclusion for participation in different studies. In addition, DMFT indicator is a multidimensional indicator and different factors such as nutritional status, emotional state, general health status and economic conditions can affect it; these conditions are usually different in different populations under study, which can influence the results (24-26).

In the separate studies, Schroth, Clark and Shaoul showed that the patients who have low level of ferritin, have greater chance for being afflicted with tooth decay (27-29). So the ferritin that represents the level of iron in the body and acts as a reservoir for the iron, can be important in reducing tooth decay. The results of the present study also support this view, because the lower DMFT of thalassemic patients compared to the control group may be caused by high amount of ferritin in these patients. However, concluding that the ferritin can reduce the decay in thalassemic patients, should be considered with caution.

For deducing a certain conclusion, we recommend that a future research is done independently in order to evaluate the efficacy and the proper amount of ferritin level for exerting the anti-decay effects on teeth. Findings of this study also showed that an average of the filled teeth in the patient group was 0.54 ± 1.1 and in control group was 2.4 ± 2.2 , respectively. This shows that the number of filled teeth was higher in healthy individuals and this difference was statistically significant ($P < 0.05$). These results could suggest that healthy individuals' dental visits are more than thalassaemic patients. This indicates that the thalassemic patients do not utilize of dental services, the cause of which is their involvement with life-threatening

problems and this makes them stay unaware of the importance of dental care.

In the study of Hattab et al. (2001) 54 samples considered as sum total, only 17.4% of children of age 6-9 years and 21.4% of 12-18 years were without the decay; but in this study, only 1.4% of examined teeth were restored (14). The results of the study of Kaur and Hiermath (2012) showed that the prevalence of dental decay in patients with thalassemia major was significantly higher than the healthy control group (16). In the study of Asl Aminabadi et al. (2009), by children with thalassemia, the average number of decayed and missing teeth (DM = 5.67, dm = 4, 0.22) compared to control group (DM = 1.8, 0.17, dm = 2.74, 0.03) increased and the average number of filled teeth in healthy children (FF = 0.82, 0.45) was higher (3). Results of the study of Al-Vahdany et al. (2002) showed also that the average of D, M, and F in patients with thalassemia was almost two times higher than healthy control group (9). In a study of Honarmand et al. (2011), the average experience of decay in permanent teeth by patients with thalassemia was higher than the control group (4).

Therefore, as you can see, tooth decay is one of common difficulties in patients with thalassemia, but on the contrary, this group of patients, do not use satisfactorily the dental treatment services. In addition, that which is very important in the treatment process of the persons suffering from thalassemia, is failing to timely treatment; this has been manifested with the lower number of restored teeth compared to decayed teeth in comparison with the healthy control group in this study. In this regard, some researchers believe that due to involvement in patient's systemic difficulties, the parents of these patients pay less attention to their dental conditions and only when the child has a toothache, are looking for dental treatment. Therefore, for preventing dental diseases,

it should be emphasized on teaching this group of individuals (4, 30). The other main objective of this study was to evaluate DMFT and ferritin level for patients with thalassemia. It was found that DMFT in patients has not any correlation with ferritin amount, like the results of several studies that have examined the lack of relationship between the thalassemia effects and serum ferritin level. Sunil did not show any relationship between ferritin level and physical growth (31).

Shahramian et al. did not observe any relationship between serum ferritin level and the amount of Troponin levels in patients with thalassemia (32). In their study, Hashemi et al. showed that there was no relationship between hypothyroidism and ferritin level (33). Asif showed that there is a weak relation between ferritin and liver enzyme level (34). Mahmoudi et al. also showed that there was no relationship between the indexes of echocardiography and serum ferritin level (35). We can somehow say that the results of these studies are consistent with present study. Therefore, we can conclude that there is no correlation between serum ferritin level and thalassemia children.

In this study, the hygiene status and treatment of samples were studied in two groups. The results showed that most of samples in both groups brushed their teeth once a day and more than half of both groups did not use floss and toothpicks; the overwhelming majority of them did not use also the mouthwash. These results represent a broadly weak status of oral and dental health in both groups, especially the group of patients. It is noteworthy that the low sanitation in thalassemic patients has been shown also in studies of Jahangirnejad and Arana that in this respect are consistent with the present study (20, 22). In the study of Asl Aminabadi et al. (2009), the mean frequency of using tooth brush in control

population was higher and its difference with the thalassemic population was significant ($P < 0.05$), but there was not observed any significant difference between two groups in the use of dental floss (3). The study of Hattab et al. (2001) showed a weak oral hygiene in more than half of children with thalassemia (14). The similar studies confirm this result (9).

In this study, if the level of tissue iron and its correlation with DMFT was used, it could be better; because it was more accurate indicator. However, the determination of tissue iron is an invasive procedure and could increase the cost of research.

5-CONCLUSION

Findings of this study showed that there was not any correlation between the DMFT indicator and the level of tissue ferritin. Also the oral and dental hygiene by patients has not an appropriate status; this factor along with insufficient use of dental services such as decay treatment paves the way for further dental difficulties in these patients and thus reduction of their life quality. Educational these patients and their families about the further use of dental services and more observance of the oral and dental hygiene are recommended.

6- CONFLICT OF INTEREST: None.

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