ORIGINAL ARTICLE

Prevalence of Gingivitis and its Severity in β-thalassemia Major (TM-β) Patients at a Thalassemia Center in Karachi, Pakistan

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ABSTRACT

Objective: To determine the prevalence of gingivitis and categorize the severity of the disease in β-thalassemia major (TM-β) patients according to gender at a thalassemia center in Karachi, Pakistan.
Methodology: In this cross-sectional observational study, patients were screened via consecutive sampling over a duration of three months from November 2021 to February 2022. A total of 36 patients (18 males and 18 females) fulfilling the selection criteria were assessed. Clinical examination for gingivitis was carried out with a periodontal probe (UNC-15) according to Loe & Silness Gingival Index (GI). The results were analyzed using Microsoft Excel 2019 and IBM SPSS statistics version 23.0. Categorical data (gender, severity of gingivitis) was expressed as percentages and frequencies. Age, GI score was presented as mean and standard deviation.
Results: 86% of the assessed individuals had gingivitis, out of whom 6% had mild gingivitis, 44% had moderate and 36% had severe gingivitis. However, there was no gender predilection observed for the distribution of severity of disease.
Conclusion: Thalassemia patients present with increased prevalence of gingivitis due to compromised immune function. The need to manage the disease burden and identifying the apprehensions of a general dentist in treating these patients is required. Moreover, awareness about neglected oral health is needed for all the stake holders involved in the preventive and therapeutic management for this cohort.

Key Words: β-Thalassemia major, gingivitis, oral health

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INTRODUCTION

Globally, thalassemia is the most commonly prevalent, yet preventable genetic disorder, in which the impaired haemoglobin synthesis results in life threatening anaemia and mandates regular blood transfusion for survival[1]. Along with gene drifts and founder effects, consanguineous marriages are cited as reasons for increased prevalence of thalassemia in the Sub-continent, Middle East, Mediterranean countries and North and Central Africa[2]. The World Health Organization (WHO) has proposed priority in the control of blood disorders, particularly β-thalassemia, in the third world countries[3]. Pakistan represents one of the highest thalassemia burdened countries in the world[4]. Despite the overwhelming disease burden, there is unfortunately no baseline registry available, but a figure of 100,000 transfusion dependent thalassemia patients is a commonly quoted statistic[4]. The estimated carrier rate is 5–7% with approximately 9.8m carriers, with around 5000 children diagnosed with TM- β every year in Pakistan[5].

β Thalassemia major (TM- β) exhibits distinctive oral and facial features alongwith their systemic manifestations. Protruded maxilla, severe crowding, open bite, protruded upper lip, flattened nose bridge and glossitis are some of the observed oral features in these patients[6-8]. TM- β patients have reduced number of T-cells which negatively affects the activity of B-cells, thus rendering the immune system compromised against the infectious agents. Due to reduced haemoglobin, compromised immune activity and higher

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susceptibility to infection, special considerations are warranted for dental patients[9]. Along with these factors, xerostomia in these patients further reduces salivary defense mechanism and hence they demonstrate significantly high periodontal and gingival inflammation[10].

Due to regular transfusions, iron accumulation and surplus amounts of iron in systemic tissues of the thalassemia patients is well documented[11]. Iron deposits have also been found in the gingival tissues of TM- β patients[12]. Breakdown of haemoglobin leads to accumulation of bilirubin in the dentinal tubules of these patients leading to characteristic yellow discoloration of their teeth[13] [fig 1].

Figure 1: Intra oral picture of a thalassemia patient showing Pre (A) and post (B) scaling appearance. The blue arrows point at the characteristic yellow discoloration of the teeth

Despite Pakistan being one of the heaviest burdened countries with TM- β, no registered surveys are available about any aspect of thalassemia in the country, including treatment needs (specially focusing on dental health), treatment facilities and their access and resources to control and prevent the disease.

The aim of this cross-sectional study was to identify gingival health status in TM- β patients and prompt attention to the possible neglected oral care in these individuals alongwith highlighting the need for nationwide registry that reports baseline data for gingival diseases in these patients. Without the basic information, it is difficult to direct the attention of health policy makers to allocate necessary resources in providing oral healthcare to this cohort of the community.

METHODOLOGY

This cross-sectional observational study was a joint collaboration of Ziauddin College of Dentistry (ZCD), Karachi and Afzaal Memorial Thalassemia Foundation (AMTF), Karachi. The ethical approval for the research was obtained from the Ethical Research Committee (ERC) at the Ziauddin University, bearing the reference code (0780119AHOM). A signed informed consent and minor assent form was filled by all study participants and their guardians.

Sample size was calculated with Open Epi version 3, where confidence interval (Z) was 95%, margin of error (E) at 5% (0.05) and expected prevalence (P) of 50%, resulting in a total sample size of 32[6]. Accounting for non-participation, Four participants were included additional to the original sample size. Participants were screened via consecutive sampling technique. A total of 36 patients (18 males, 18 females) between the age range of 10 and 20 years, fulfilled the selection criteria and were included in the study. All patients diagnosed with TM- β, age >10 years, patients who received or were currently receiving iron chelation therapy with deferasirox, calcium, vitamin D, and regular erythrocyte transfusion were selected. All patients with any systemic comorbidities, history of antibiotic use during the past three months, history of dental prophylaxis during the past six months, history of active infection with HIV, Hepatitis B and Hepatitis C, were excluded.

The study followed the Strengthening The Reporting of Observational Studies in Epidemiology (STROBE) guidelines[14]. Every selected participant and their guardian were briefed about the study protocol and objectives. They were assured that the gathered information was to remain confidential and will only be reproduced for educational and research purposes. The participation was fully voluntary and the participants were allowed to withdraw from the study at any time they wanted with no negative consequences. Upon understanding and agreement, an informed consent form and a minor assent form was signed by the guardian and the participant <18 years of age, in the presence of the chief investigator and verified by the research assistant. All the patients who presented with gingivitis were provided with cost free, appropriate Non-Surgical Periodontal Therapy (NSPT) and relevant adjuncts (at AMTF), which is the continuing arm of this research.

The primary clinical parameter to assess the prevalence and severity of gingivitis was Bleeding on Probing (BoP) and was recorded with the Gingival Index Score (GI) by Silness and Löe[15][Table 1].

Table 1 Gingival Index Score (GI) by Silness and Löe

Scores	Interpretation
0	Normal gingiva
1	Mild inflammation — slight change in colour, slight edema. No bleeding on probing
2	Moderate inflammation — redness, edema, glazing, bleeding on probing
3	Severe inflammation — marked redness and edema, ulceration, tendency towards spontaneous bleeding

This index provides high sensitivity and reproducibility, given the examiner has adequate knowledge of periodontal tissues. The bleeding was assessed by conducting periodontal probing using UNC-15 probe (Hu-Freidy, Chicago, USA) lightly along the gingival wall of the sulcus of all non-restored teeth except the third molars. The scores of four areas per tooth (mesio-buccal, disto-buccal, mesio-lingual and disto-lingual) were summed and divided by 4 to give the GI of the particular tooth. A sum of all the values and dividing it by the total number of teeth examined provides the GI of the individual. The score was interpreted as follows:

0.1 – 1 = mild inflammation
1.1 – 2.0 = moderate inflammation
2.1 – 3.0 = severe inflammation

The recordings were noted on the periodontal chart produced for the research. The results were expressed in percentages and frequencies for all the categorical data.

RESULTS

To check for the intra-examiner reliability, kappa statistical analysis was performed on 5 readings with research assistant being the rater and chief investigator being the examiner. At kappa agreement value of 1.000, there was almost perfect level of agreement achieved. The overall prevalence of the gingival diseases in the assessed individuals was 86% with 14% healthy individuals. Among the 86%, 6% cases had mild gingivitis, 44% had moderate gingivitis as illustrated in Fig 2.

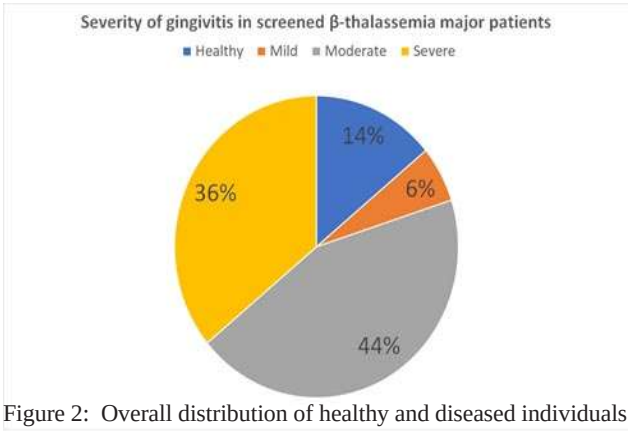

Figure 2: Overall distribution of healthy and diseased individuals

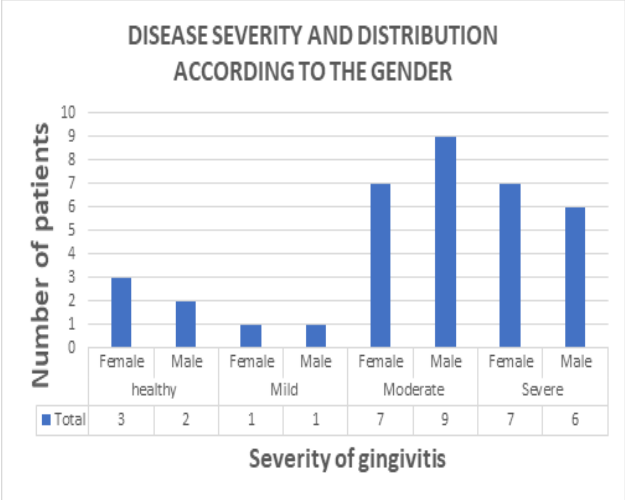

Figure 3 Distribution and severity of gingival disease according to gender

The prevalent severity of gingivitis in the study population and disease distribution according to the gender, as measured by GI score is shown in Table 2 and illustrated in Figure 3. No gender predilection was observed for the distribution of disease severity.

DISCUSSION

Despite extensive study on the pathophysiology of thalassemia, there is little information about the association between periodontal diseases and thalassemia. The available researches provide conflicting results, where some studies have found positive correlation between thalassemia and higher prevalence of gingival diseases while others negate the effect. Our study has shown that 86% of the participants presented with gingivitis which is in accordance with the results of a study by Nuraini et al. Who reported 100% prevalence of gingivitis, among their study population in comparison with healthy controls[12]. Akcalý et al. In their systematic review, reported the results from 14 studies showed higher GI in the thalassemia major patients, with significantly higher values (P < .001) than were seen in the control group[6]. Another study in Iran which is yet another highly affected country with TM- β, reports increased prevalence of periodontal diseases in these patients[16]. However, Gümüs et al. Reported no significant differences in the clinical parameters for gingival

Table 2: Gingival Condition Status of the Study Participants Based on GI Score Interpretation

Gingival Condition No. of patients (n)	Healthy n=5	Mild Gingivitis n=2	Moderate Gingivitis n=16	Severe Gingivitis n=13
GI score (Mean ± SD) (male:female)	0 (3:2)	0.85 ± 0.21 (1:1)	1.47 ± 0.31 (7:9)	2.33 ± 0.29 (7:6)
Confidence Interval	--	(1.15-0.55)	(1.63-1.32)	(2.49-2.16)

diseases among the test (Thalassemic) and control (healthy) group, while Al-Raeesi et al. In their cross-sectional study report significantly less prevalence of gingivitis in TM- β[17,18]. And yet, in a very recent study, increased prevalence of gingivitis in thalassemic children was reported[19].

The literature suggests that there is increased prevalence of gingival and periodontal diseases in TM- β patients, as observed in the current study as well. However, the severity of disease distribution in TM- β patients has not been reported. This study reports the overall prevalence of gingivitis in TM- β patients in a Pakistani population and also stratifies the severity of gingivitis according to gender. It was interesting to note that the severity of gingivitis in TM- β patients shows no gender predilection [Fig 3]. With the majority of the study participants presenting with moderate (44%) and severe (36%) forms of gingivitis, it is essential that attention should be directed to oral healthcare protocols in this group.

Despite the disease burden, unfortunately there are no reported studies in the country regarding any aspect of thalassemia, specially catering to oral health. During literature search, we found one study which was conducted in Karachi which reported higher prevalence of gingival diseases in the thalassemia patients[20].

Although there are thalassemia prevention legislations in Sindh and Balochistan, there exists regulatory oversight in their planning since the legislations did not take into account any public and professional dialogue with the thalassemia community[21,22]. Management of thalassemia in countries like Pakistan pose a major challenge. It is a disease that is easily preventable but keeps increasing the burden because of lack of preventive measures and protocols. There are more than 40 thalassemia centers currently operating across the country yet majority of them are just focusing on transfusional support[23]. These centers lack the multi-specialty treatment facilities mostly because of the lack of government support and unawareness about other systemic health challenges, including oral health. There is a dire need to establish facilities for thalassemia patients where dental care is met for these patients by expert dental practitioners in liaison with the healthcare professionals.

Although poor oral hygiene and general unawareness and disregard towards oral health by the individuals and their families is a contributing factor towards concerning oral health condition in this cohort, it has been observed that dentists lack expertise in treating patients with thalassemia[6,8,24,25]. Consequently, seeking help and access to appropriate care becomes problematic. Thalassemia requires multi-specialty approach in the treatment of dental disorders and a general dentist may not be well-versed with the implications of the disorder[9,23,26]. Therefore, they might fail to liaise with the haematology experts where required. Moreover, fear of the unknown leads to reluctant behavior in the dentists where there is a need to provide more than just the basic dental care to these individuals[8].

Within the limits of the study, the results demonstrate increased prevalence of gingivitis in thalassemia patients. The aim is to highlight the prevalence of increased gingival diseases and prompt attention of the dentists, the thalassemia centers and the governing bodies to devise appropriate steps and expedite the measures to cater to the oral health of this cohort.

Limitation and future recommendation: A small sample size might not accurately represent the entire target population, leading to potential selection bias and reduced generalizability of findings. It can also limit the statistical power of the study to detect significant associations or differences. Collaborating with multiple centers and using stratified sampling techniques can enhance diversity and increase the robustness of the study.

CONCLUSION

The current study shows high prevalence of gingivitis among TM- β patients as is reported in several other studies. There has been adequate commentary about the pathophysiology of the disease but the actual burden of the disease remains unreported, especially in Pakistan. As no clinical and epidemiological statistics for the oral health conditions of thalassemia patients exist, it is difficult to direct resources for the prevention and management of periodontal condition in these patients. These surveys will help provide recommendations in improved management of the thalassemia situation and will gradually ease the burden on an already resource-constrained healthcare system. Additionally, these endeavors are expected to provide patients with improved avenues for accessing appropriate dental care.

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Authors' Contribution: AH: Primary author, conducted the research, wrote the manuscript, and collected data; KK: Assisted in data collection, patient screening, and clinical therapy and management.

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