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ORIGINAL ARTICLE

Frequency of Diabetes Mellitus in Thalassemia major patients presenting at Tertiary Care Hospital

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ABSTRACT

Introduction: Globally, the most prevalent hereditary hemoglobinopathy is thalassemia. Diabetes mellitus is a prevalent endocrine consequence in patients with thalassemia major, affecting 20-30% of patients

Objective: To determine the frequency of diabetes mellitus in thalassemia major patients presenting at tertiary care hospital

Methodology: Study design was descriptive cross sectional, conducted at Department of Hematology, Hayatabad Medical Complex, Peshawar for duration of six months from 13 January 2020 to 13 July 2020. In the current study a total of 193 patients presenting with thalassemia major were observed. Blood samples were taken and sent to hospital laboratory for the diagnosis of diabetes mellitus. All the collected information were entered and analyzed in statistical software SPSS version 22.

Results: Among 193 participants, 133(69%) patients were in age group 5-11 years, 60(31%) patients were in age group 12-18 years with mean age of 7 years and SD of ± 4.86. Gender distribution was analyzed as 108(56%) patients were male while 85(44%) patients were female. Based on frequency of diabetes mellitus, 10(5%) patients were observed as diabetic while diabetes mellitus was not observed in 183(95%) patients of thalassemia.

Conclusion: Our study concludes that the frequency of diabetes mellitus was high in thalassemia major patients in our population. In order to minimize endocrine disorders in Pakistan, there is a need of new policies and management strategies.

Key words: Diabetes mellitus; Thalassemia major; Morbidity

INTRODUCTION

Globally, the most prevalent hereditary hemoglobinopathy is thalassemia. Considering the risks of transplantation of hematopoietic stem cell, individuals with B-thalassemia major (TM) may benefit from a regular lifelong transfusion regimen to preserve development and growth and improve quality of life [1, 2]. Long-term transfusions, on the other hand, may cause an iron buildup in the body that can be fatal, affecting liver, heart and endocrine organs [3]. Deferoxamine, the first iron-chelating substance, was developed in 1962 [4]. Since then, it has been employed successfully to treat and prevent iron overload-associated problems. Following that, various researchers have speculated on the possibility of ototoxicity. However, the pathways and locations implicated are unknown. Furthermore, it is unknown if deferiprone (L1) has a comparable negative effect on auditory function [5]. With a carrier rate of 5% to 7% in Pakistan, the total number of carriers is predicted to reach ten million. Therefore in Pakistan, thalassemia is considered to be one of the most frequent diseases [6].

Diabetes mellitus is a prevalent endocrine consequence in patients with thalassemia major (TM), affecting 20-30% of patients [7]. The pathophysiologic mechanism that causes DM in TM is unknown; some believe that iron-induced pancreatic cytotoxicity is the most important factor. Although this was formerly thought to be the case, a recent theory proposes that the depletion of beta pancreatic cells after a long period of hyperinsulinemia may have a role in the DM development in TM patients [8]. The latter theory is backed up by studies that show TM patients had greater fasting insulin levels and beta cell functioning [9]. Thalassaemia-related diabetes mellitus has been shown to be more common in older individuals, and it is thought to be the cause of a high incidence of morbidity [10].

In TM, DM has been linked to an increased risk of cardiac problems and heart failure [11]. In fact, DM in TM patients may lead to continuing organ damage even with chelation therapy. Addressing the risk factors linked with thalassaemia-related DM is critical in terms of DM occurrence and comorbidities [12]. Diabetes mellitus was shown to be 8.8% common in thalassemia major children in one research done by Bazi A [13]. The incidence of diabetes among Iranian children with thalassemia major was reported to be 9% in another research [14].

This research will give us with the most up-to-date information on the prevalence of diabetes mellitus in patients with thalassemia major, since no relevant study has been undertaken in our population in the previous five years. With other health experts, this study results will be shared for proper diagnosis, management and future recommendations of diabetes mellitus in thalassemia major patients also the results will be used for other research work.

MATERIALS AND METHODS

Study design was descriptive cross sectional conducted at Department of Hematology, Hayatabad Medical Complex, Peshawar for duration of six months from 13 January 2020 to 13 July 2020. Sample size was 193 by keeping 8.8%[13] diabetes mellitus prevalence in thalassemia major children, 95% confidence level and 4% margin of error using WHO sample size calculator. Consecutive non-probability sampling technique was used for sample collection. The criteria for inclusion in our study include all patients presenting with thalassemia major with duration >6 month, age between 5-18 years and either gender were included in the study whereas exclusion criteria include all the patients already diagnosed cases of other cardiovascular complications on history and medical records and patients with family history of heart diseases were excluded from the study because they act as confounders and if included had introduce bias in the study results. After approval from the institutional ethical and research committee, consent form was signed from all the participants. Clinical and laboratory examination were performed for all participants to confirm thalassemia major. Blood samples were taken and were sent to hospital laboratory for the diagnosis of diabetes mellitus. Diabetes mellitus was considered positive if fasting blood glucose greater than 126mg/dl or random blood glucose greater than 200mg/dl. All the collected information's were entered and analyzed in statistical software SPSS version 22. Mean (standard deviation) was calculated for continuous variables like age and frequencies (%) and were computed for categorical variables like gender, family history thalassemia major**,** family history diabetes mellitus, diabetes mellitus. Diabetes mellitus was stratified among age, gender, number of transfusions, family history thalassemia major, family history diabetes mellitus to see the effect modifications by applying chi square test. A p value of $\leq$ 0.05 was considered as significant.

RESULTS

Totally, 193 participants were incorporated in this research work. Among 193 participants, 133(69%) patients were in age group 5-11 years, 60(31%) patients were in age group 12-18 years with mean age of 7 years and SD of ± 4.86. Gender distribution was analyzed as 108(56%) patients were male while 85(44%) patients were female. Number of blood transfusion per month was analyzed as 98(51%) patients had blood transfusion < 3 times per month while 95(49%) patients had blood transfusion > 3 times per month. Mean number of blood transfusion was 4 times with SD + 2.09. Family history of thalassemia was analyzed as 2(1%) patients had positive history of thalassemia while 191(99%) patients had negative history of thalassemia. Family history of diabetes mellitus was observed as 68(35%) patients had positive family history of diabetes mellitus while 125(65%) patients had negative family history of diabetes mellitus. (Table 1) Based on frequency of diabetes mellitus, 10(5%) patients were observed as diabetic while diabetes mellitus was not observed in 183(95%) patients of thalassemia. (Figure 1) Stratification of diabetes mellitus with respect to age, gender, number of transfusions, family history thalassemia major, family history diabetes mellitus is mentioned in table 2.

Table1: Demographic and clinical features of thalassemia patients

Parameter	Sub category	Frequency (%)
Age	5-11 years	133 (69%)
	12-18 years	60 (31%)
Gender	Male	108 (56%)
	Female	85 (44%)
Number of blood transfusion	Less than 3 times	98 (51%)
	More than 3 time	95 (49%)
Family history of thalassemia	Positive	2 (1%)
	Negative	191 (99%)
Family history of diabetes mellitus	Positive	68 (35%)
	Negative	125 (65%)

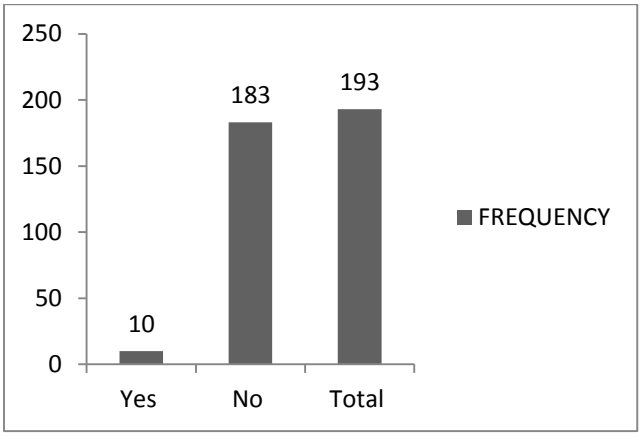

Figure 2: Frequency of diabetes mellitus in thalassemia major patients

Table 2: Stratification of diabetes mellitus with respect to age, gender, number of transfusions, family history thalassemia major, and family history diabetes mellitus

Parameter	Sub-category	Diabetes mellitus		P value
		Yes	No	
Age	5-11 years	6	27	0.5317
	12-18 years	4	56	
Gender	Male	6	106	0.8141
	Female	4	81	
Number of blood transfusions	≤3	5	93	0.9597
	>3	5	90	
Family history of thalassemia	Yes	1	1	0.0040
	No	9	182	
Family history of diabetes mellitus	Yes	8	60	0.0023
	No	2	123	

DISCUSSION

Globally, the most prevalent hereditary hemoglobinopathy is thalassemia. Considering the risks of transplantation of hematopoietic stem cell, individuals with B-thalassemia major (TM) may benefit from a regular lifelong transfusion regimen to preserve development and growth and increase quality of life [1, 2]. Long-term transfusions, on the other hand, may cause an iron buildup in the body that can be fatal, affecting liver, heart and endocrine organs [3]. Diabetes mellitus (DM) is a prevalent endocrine consequence with TM, affecting 20-30% of patients [7].

In our study, among 193 participants, 133(69%) patients were in age group 5-11 years, 60(31%) patients were in age group 12-18 years with mean age of 7 years and SD of ± 4.86. Gender distribution was analyzed as 108(56%) patients were male while 85(44%) patients were female. Number of blood transfusion per month was analyzed as 98(51%) patients had blood transfusion < 3 times per month while 95(49%) patients had blood transfusion > 3 times per month. Mean number of blood transfusion was 4 times with SD + 2.09. Family history of thalassemia was analyzed as 2(1%) patients had positive history of thalassemia while 191(99%) patients had negative history of thalassemia. Family history of diabetes mellitus was observed as 68(35%) patients had positive family history of diabetes mellitus while 125(65%) patients had negative family history of diabetes mellitus. Based on frequency of diabetes mellitus, 10(5%) patients were observed as diabetic while diabetes mellitus was not observed in 183(95%) patients of thalassemia. According to the literature the frequency of diabetes in thalassemia major patients ranges from 9.7-29% [15-18]. In accordance with our study, a previous study carried out by Bazi A et al. reported diabetic mellitus in 13 (8.8%) patients [13]. Similarly another study carried out by Azami M et al. reported comparable results to our findings. They reported that incidence of diabetes among Iranian children with thalassemia major was reported to be 9% [14]. The pathophysiologic mechanism that causes DM in TM is unknown; some believe that iron-induced pancreatic cytotoxicity is the most important factor. A current study reported that period of transfusion and age are important risk factors for diabetic mellitus in patients with thalassemia major [19]. In contrary to our results, another study done in china reported high frequency (29%) of DM in patients with TM [15]. Another study done in Egypt also reported high frequency (25%) of DM in patients with TM as compared to our study [16]. There is an increasing trend in prevalence of DM in patients with TM globally therefore it can be prevented by early diagnosis of DM in TM patients.

CONCLUSION

Our study concludes that the frequency of diabetes mellitus was high in thalassemia major patients in our population. In order to minimize endocrine disorders in Pakistan, there is a need of new policies and management strategies. Our study recommends, screening of thalassemia major patients for timely diagnosis of endocrine disorders mainly diabetes mellitus.

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