International Journal of Research in Medical Sciences
Shoyeb AKM et al. Int J Res Med Sci. 2026 Oct;14(10):4427-4434
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20263506

Original Research Article

Association of transfusion burden with serum ferritin among patients with transfusion-dependent thalassemia: a cross-sectional study from Bangladesh

A. K. M Shoyeb[1]*, Tareq Ahmed[2], M. Toufiq Hasan Khan[3]

Department of Transfusion Medicine, Sirajganj Medical College, Sirajganj, Bangladesh
Department of Transfusion Medicine, Northern International Medical College, Dhaka, Bangladesh
Department of Anatomy, Sirajganj Medical College, Sirajganj, Bangladesh

Received: 16 August 2026
Revised: 18 September 2026
Accepted: 19 September 2026

***Correspondence:**
Dr. A. K. M Shoyeb,
E-mail: akmshoyeb@gmail.com

ABSTRACT

Background: Regular red-cell transfusion is essential for patients with transfusion-dependent thalassemia (TDT) but causes progressive iron loading. Where MRI-based tissue iron assessment is not routinely available, serum ferritin remains a practical marker. This study evaluated the association between transfusion burden and serum ferritin in patients with TDT.

Methods: This cross-sectional study included 150 patients with TDT at Sirajganj Medical College Hospital, Bangladesh, from July 2025 to June 2026. Transfusion exposure, pre-transfusion hemoglobin, thalassemia phenotype, chelation adherence, splenectomy status, and serum ferritin were assessed. Associations were examined using Spearman correlation and multivariable linear and logistic regression.

Results: Mean age was 17.06±6.87 years; 60.7% were male. Median annual transfusion burden was 144.08 ml/kg/year (IQR 126.95–161.41) and median ferritin was 1965.00 ng/mL (IQR 1329.28–2723.51); 31.3% had ferritin ≥2500 ng/mL. Annual transfusion burden correlated positively with ferritin (coefficient=0.231, p=0.004). After adjustment, each additional 10 ml/kg/year was associated with 5.9% higher ferritin (B=0.057, 95% CI 0.030–0.083; p<0.001) and 27% higher odds of ferritin ≥2500 ng/mL (aOR 1.27, 95% CI 1.08–1.50; p=0.004). Poor chelation adherence was strongly associated with ferritin ≥2500 ng/mL (aOR 6.92, 95% CI 2.84–16.85; p<0.001).

Conclusions: Greater transfusion burden and poor chelation adherence were independently associated with higher serum ferritin. Tracking transfusion volume, serial ferritin, and chelation adherence may improve iron-overload monitoring in resource-constrained TDT care.

Keywords: Transfusion-dependent thalassemia, Serum ferritin, Transfusion burden, Iron overload, Chelation adherence, Bangladesh

INTRODUCTION

Thalassemia comprises inherited disorders of globin-chain synthesis that cause ineffective erythropoiesis and chronic anemia of variable severity. Patients with transfusion-dependent thalassemia (TDT) require regular red-cell transfusion to maintain adequate hemoglobin, suppress ineffective erythropoiesis, support growth, and prevent anemia-related complications.[1-3] Modern transfusion programs have markedly improved survival, but lifelong transfusion creates a parallel burden of transfusional iron accumulation.[1,4,5] Each transfused red-cell volume contributes iron that cannot be actively excreted in sufficient quantity, so iron progressively accumulates in

the liver, heart, endocrine organs, and other tissues.[4-6] The clinical consequences include hepatic injury, cardiomyopathy, endocrine dysfunction, impaired growth, and other long-term complications. Iron chelation is therefore a core component of TDT care, and sustained exposure to effective chelation is important for maintaining a safe body-iron balance.[5-7]

Assessment of iron burden combines serial biochemical monitoring with organ-specific imaging when available. Cardiac T2* magnetic resonance imaging (MRI) permits early detection of myocardial iron, while liver MRI provides quantitative information on hepatic iron stores.[8,9] Serum ferritin remains widely used because it is inexpensive, repeatable, and accessible, although it is an imperfect surrogate for tissue iron and may be influenced by inflammation, infection, and liver injury.[1,10] Accordingly, ferritin trends are most informative when interpreted together with transfusion exposure, chelation history, and clinical context.

In Bangladesh, patients with TDT often receive lifelong transfusion in settings where MRI-based tissue-iron assessment is not universally accessible. Quantifying transfusion burden in a weight-standardized manner may provide additional clinical information beyond simple transfusion counts. This study therefore evaluated the association between annual red-cell transfusion burden and serum ferritin among patients with TDT at a tertiary care center in Sirajganj, Bangladesh. Secondary objectives were to assess graded changes in ferritin across transfusion-burden quartiles and to identify clinical and treatment-related factors independently associated with higher ferritin and with markedly elevated ferritin (≥2500 ng/ml).

METHODS

Study design and setting

This cross-sectional analytical study was conducted from July 2025 to June 2026 at the Department of Transfusion Medicine, Sirajganj Medical College Hospital, Sirajganj, Bangladesh. The study evaluated transfusion exposure and serum ferritin among patients receiving regular red-cell transfusion for TDT.

Participants and study variables

Patients were eligible for the analytical cohort if they had a documented diagnosis of transfusion-dependent thalassemia, were receiving regular red-cell transfusions at the study center during the study period, and had the principal exposure and outcome variables available for analysis. The final analytical cohort comprised 150 patients. Recorded variables included age, sex, thalassemia phenotype (HbE/β-thalassemia or β-thalassemia major), duration of transfusion dependency, number of transfusions per year, cumulative transfusion exposure, pre-transfusion hemoglobin, splenectomy status, chelation adherence, annual red-cell transfusion burden, and serum ferritin.

Assessment of transfusion burden, ferritin, and chelation adherence

Annual transfusion burden was expressed as milliliters of transfused red cells per kilogram of body weight per year (ml/kg/year). Cumulative transfusion exposure was summarized as the total number of documented transfusion episodes; transfusions per year and duration of transfusion dependency were retained as complementary exposure measures. Serum ferritin was used as the biochemical indicator of iron burden. For descriptive analyses, ferritin was categorized as <1000 ng/ml, 1000–2499 ng/ml, and ≥2500 ng/ml. Ferritin ≥2500 ng/ml was treated as a marker of markedly elevated biochemical iron burden for logistic regression; it was not interpreted as a direct measurement of cardiac or hepatic tissue iron. Chelation adherence was analyzed using the recorded binary clinical classification (poor versus satisfactory adherence) dataset.

Statistical analysis

Continuous variables were summarized as mean±standard deviation (SD) or median with interquartile range (IQR), as appropriate; categorical variables were summarized as frequencies and percentages. Because ferritin was positively skewed, rank-based analyses were used for univariable associations and ferritin was natural-log transformed for multivariable linear regression. Spearman rank correlation assessed associations between ferritin and transfusion- and patient-related variables. Annual transfusion burden was divided into quartiles to evaluate overall group differences and ordered trends in ferritin and in the proportion with ferritin ≥2500 ng/ml. Multivariable linear regression modeled ln(ferritin), and multivariable logistic regression modeled ferritin ≥2500 ng/ml. Both models included annual transfusion burden (per 10 ml/kg/year), age, sex, thalassemia phenotype, pre-transfusion hemoglobin, splenectomy status, and chelation adherence. A secondary logistic model compared transfusion-burden quartiles with Q1 as the reference, and interaction between transfusion burden and chelation adherence was assessed. Two-sided $p<0.05$ was considered statistically significant. Statistical analyses were performed using SPSS version 26.

Ethical considerations

The study protocol was approved by the Institutional Ethics Committee. Written informed consent was obtained from all participants prior to enrollment. Participant confidentiality and privacy were strictly maintained throughout the study, and participation was entirely voluntary, with the right to withdraw at any time without any consequences.

RESULTS

Participant characteristics

A total of 150 patients with TDT were included. The mean age was 17.06±6.87 years, and 91 (60.7%) participants were male. HbE/β-thalassemia was the predominant phenotype (101, 67.3%), while 49 (32.7%) had β-thalassemia major. Median duration of transfusion dependency was 14.26 years (IQR 10.01–20.31), and

patients received a median of 16 transfusions per year (IQR 13–18). The median standardized annual red-cell transfusion burden was 144.08 ml/kg/year (IQR 126.95–161.41). Poor chelation adherence was recorded in 59 (39.3%) patients, and 44 (29.3%) had undergone splenectomy (Table 1).

Table 1: Demographic, clinical, and transfusion characteristics of the study population (n=150).

Characteristics	Value
Age, years, mean±SD	17.06±6.87
Male sex, N (%)	91 (60.7)
Female sex, N (%)	59 (39.3)
HbE/β-thalassemia, N (%)	101 (67.3)
β-thalassemia major, N (%)	49 (32.7)
Duration of transfusion dependency, years, median (IQR)	14.26 (10.01–20.31)
Transfusions per year, median (IQR)	16 (13–18)
Annual transfusion burden, mL/kg/year, median (IQR)	144.08 (126.95–161.41)
Cumulative transfusion exposure, median (IQR)	219 (140–318)
Pre-transfusion hemoglobin, g/dl, mean±SD	8.67±0.63
Poor chelation adherence, N (%)	59 (39.3)
Previous splenectomy, N (%)	44 (29.3)

Serum ferritin distribution

Serum ferritin was positively skewed. The median ferritin concentration was 1965.00 ng/ml (IQR 1329.28–2723.51), with a range of 397.07–8954.31 ng/ml. Only 16 (10.7%) patients had ferritin <1000 ng/ml; 87 (58.0%) had 1000–2499 ng/ml; and 47 (31.3%) had ≥2500 ng/ml. Overall, 134 of 150 patients (89.3%) had ferritin ≥1000 ng/ml (Table 2 and Figure 1).

Table 2: Distribution of serum ferritin concentrations.

Serum ferritin category	N	%
<1000 ng/ml	16	10.7
1000–2499 ng/ml	87	58.0
≥2500 ng/ml	47	31.3
Total	150	100.0

Median ferritin (IQR): 1965.00 ng/ml (1329.28–2723.51); range: 397.07–8954.31 ng/ml.

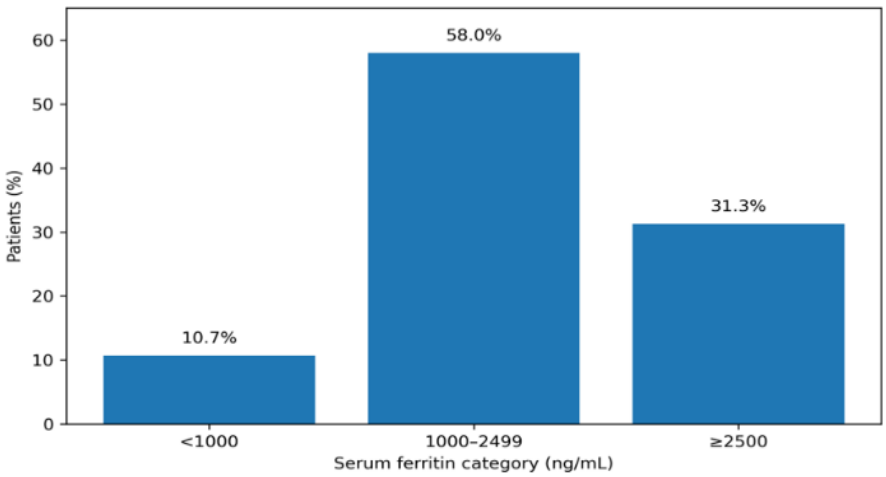

Figure 1: Distribution of patients across serum ferritin categories.

Association of transfusion exposure with serum ferritin

Higher transfusion exposure was associated with higher serum ferritin. Annual transfusion burden showed a significant positive correlation with ferritin (Spearman rank coefficient=0.231, p=0.004). Positive associations were also observed for cumulative transfusion exposure (coefficient=0.277, p<0.001), duration of transfusion dependency (coefficient=0.231, p=0.004), and age (coefficient=0.240, p=0.003). Transfusions per year showed a weaker but statistically significant association (coefficient=0.161, p=0.049), whereas pre-transfusion hemoglobin was not significantly associated with ferritin (coefficient=0.095, p=0.249) (Table 3).

Table 3: Correlation of clinical and transfusion-related variables with serum ferritin.

Variable	Spearman coefficient	P value
Annual transfusion burden, ml/kg/year	0.231	0.004
Cumulative transfusion exposure	0.277	<0.001
Transfusions per year	0.161	0.049
Duration of transfusion dependency	0.231	0.004
Age	0.240	0.003
Pre-transfusion hemoglobin	0.095	0.249

Table 4: Serum ferritin according to quartiles of annual transfusion burden.

Quartile	N	Median burden (ml/kg/year)	Median ferritin, ng/ml (IQR)	Ferritin ≥2500, N (%)
Q1, Lowest	38	110.51	1641.14 (1138.13–2297.15)	8 (21.1)
Q2	37	134.68	1865.17 (1228.21–2436.20)	9 (24.3)
Q3	37	151.25	2155.15 (1636.42–2530.56)	12 (32.4)
Q4, Highest	38	173.74	2354.41 (1478.01–3424.76)	18 (47.4)

p for trend for serum ferritin=0.006; p for trend for ferritin ≥2500 ng/ml=0.011.

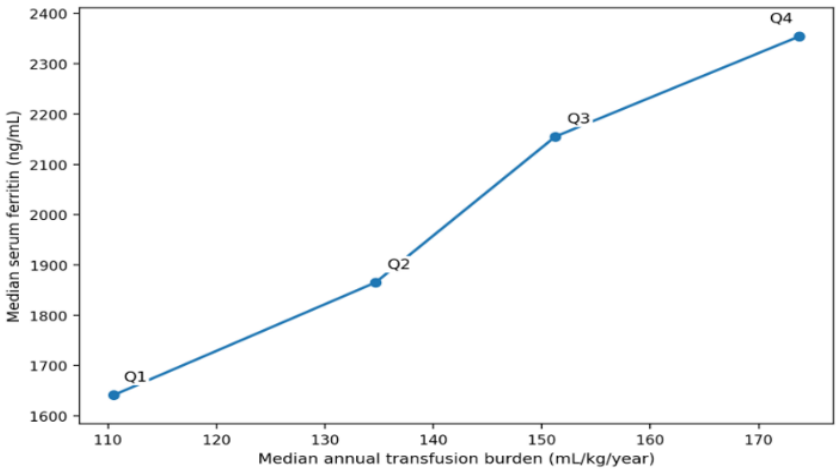

Figure 2: Graded association between annual transfusion burden and median serum ferritin across quartiles.

When participants were grouped by quartiles of annual transfusion burden, median ferritin rose progressively from 1641.14 ng/ml in Q1 to 2354.41 ng/mL in Q4. The proportion with ferritin ≥2500 ng/ml increased from 21.1% in Q1 to 47.4% in Q4. The overall difference in

ferritin across quartiles was borderline on the omnibus test (p=0.052), but the ordered trend in ferritin was significant (p for trend=0.006). The proportion with ferritin ≥2500 ng/ml also increased significantly across quartiles (p for trend=0.011) (Table 4 and Figure 2).

Multivariable analyses

Before multivariable adjustment, patients with poor chelation adherence had a higher median ferritin concentration than those with satisfactory adherence (2375.07 vs 1591.30 ng/ml; p<0.001), and ferritin ≥2500 ng/ml was more frequent in the poor-adherence group (47.5% vs 20.9%). Table 5 summarizes the multivariable linear regression of ln(ferritin). Annual transfusion burden remained independently associated with ferritin after adjustment for age, sex, thalassemia phenotype, pre-

transfusion hemoglobin, splenectomy status, and chelation adherence. Each additional 10 ml/kg/year of annual transfusion burden corresponded to approximately 5.9% higher ferritin (B=0.057, 95% CI 0.030–0.083; p<0.001). Poor chelation adherence (B=0.562; p<0.001), increasing age (B=0.021 per year; p<0.001), and male sex (B=0.197; p=0.011) were also independently associated with higher ferritin. The model explained 34.6% of the variability in log-transformed ferritin (adjusted R^2=0.346).

Table 5: Multivariable linear regression of factors associated with log-transformed serum ferritin.

Predictor	Adjusted B	95% CI	P value
Annual transfusion burden, per 10 mL/kg/year	0.057	0.030–0.083	<0.001
Age, per year	0.021	0.010–0.032	<0.001
Male sex	0.197	0.046–0.348	0.011
Poor chelation adherence	0.562	0.411–0.712	<0.001
Previous splenectomy	0.060	−0.107–0.227	0.477
Pre-transfusion hemoglobin	0.089	−0.030–0.207	0.140
HbE/β-thalassemia phenotype	−0.017	−0.174–0.140	0.832

Adjusted R^2=0.346. B represents the adjusted regression coefficient for natural-log-transformed ferritin.

Table 6: Multivariable logistic regression for serum ferritin ≥2500 ng/ml.

Predictor	Adjusted OR (aOR)	95% CI	P value
Annual transfusion burden, per 10 ml/kg/year	1.27	1.08–1.50	0.004
Age, per year	1.13	1.06–1.21	<0.001
Male sex	1.33	0.58–3.07	0.498
Poor chelation adherence	6.92	2.84–16.85	<0.001
Previous splenectomy	0.72	0.29–1.83	0.493
Pre-transfusion hemoglobin	1.37	0.74–2.53	0.321
HbE/β-thalassemia phenotype	0.92	0.39–2.19	0.851

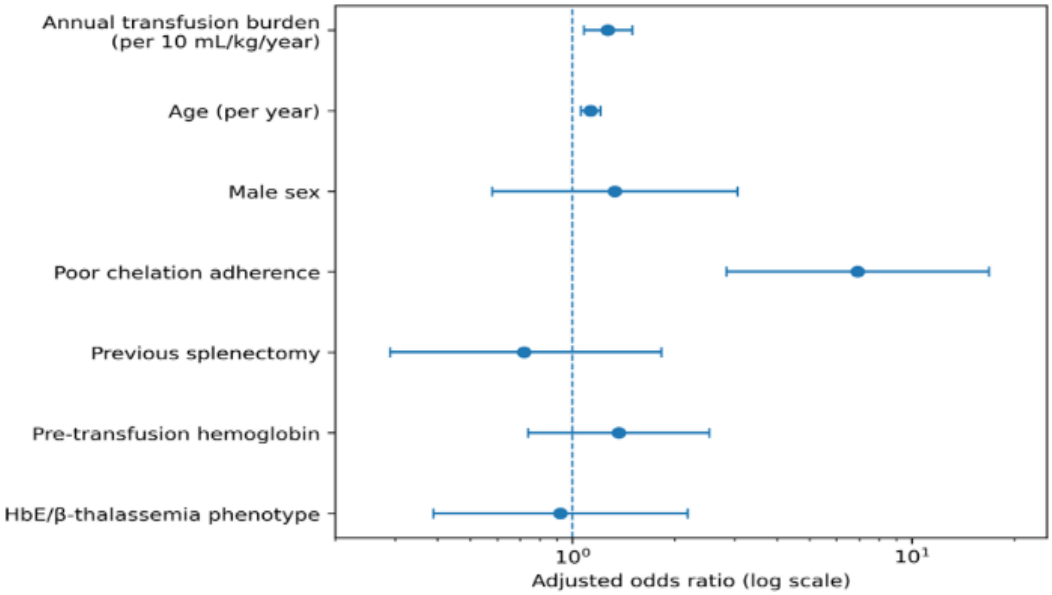

Figure 3: Adjusted odds ratios for factors associated with serum ferritin ≥2500 ng/ml.

For markedly elevated ferritin, Table 6 and Figure 3 show the multivariable logistic model. Each 10 mL/kg/year increase in annual transfusion burden was associated with 27% higher adjusted odds of ferritin ≥2500 ng/ml (aOR 1.27, 95% CI 1.08–1.50; p=0.004). Poor chelation adherence showed the strongest independent association (aOR 6.92, 95% CI 2.84–16.85; p<0.001), while age was also significant (aOR 1.13 per year, 95% CI 1.06–1.21;

p<0.001). Male sex, previous splenectomy, pre-transfusion hemoglobin, and thalassemia phenotype were not independently associated with ferritin ≥2500 ng/ml.

In the additional quartile-based adjusted analysis using Q1 as the reference, the aORs for ferritin ≥2500 ng/ml were 1.31 (95% CI 0.38-4.50) for Q2, 1.77 (95% CI 0.54-5.83) for Q3, and 6.47 (95% CI 1.90-22.06) for Q4. Only Q4 was individually statistically significant, indicating a graded pattern with substantial uncertainty in the intermediate quartiles. No significant interaction was detected between annual transfusion burden and chelation adherence (p for interaction=0.866).

DISCUSSION

In this cross-sectional study of 150 patients with TDT, greater transfusion exposure was consistently associated with higher serum ferritin. Annual weight-standardized red-cell burden, cumulative transfusion exposure, duration of transfusion dependency, and transfusions per year all showed positive univariable associations with ferritin. Ferritin also increased across ordered quartiles of annual transfusion burden, and annual burden remained independently associated with ferritin in both linear and logistic multivariable models. Poor chelation adherence emerged as an additional strong correlate of higher ferritin and of ferritin ≥2500 ng/ml. These findings are consistent with the broader TDT literature showing the clinical utility and limitations of serum ferritin as a marker of iron burden and the importance of chelation practice and adherence in iron control.[11-13]

The biochemical iron burden in this cohort was substantial: median ferritin was 1965 ng/ml, 89.3% of participants had ferritin ≥1000 ng/ml, and 31.3% had ferritin ≥2500 ng/ml. This pattern is consistent with reports from Bangladesh and neighbouring South Asian settings. Islam et al reported a mean ferritin of 2462.6 ng/ml among Bangladeshi patients with TDT, while Akter et al found a mean ferritin of 3740.7 ng/ml in transfused thalassemia-major children in Chattogram.[14,15] Shah et al similarly documented inadequate chelation and high ferritin among multiply transfused patients in western India, and Riaz et al reported very high ferritin levels in multi-transfused children in Pakistan.[16,17] Differences in age, chelation practice, transfusion intensity, and the use of mean versus median ferritin limit direct numerical comparison, but the overall regional evidence indicates persistent biochemical iron loading in regularly transfused populations.

The positive relationship between transfusion exposure and ferritin also agrees with prior clinical studies. Shah et al observed greater iron burden with repeated transfusion exposure, and Riaz et al reported increasing ferritin with advancing age and cumulative transfusion experience.[16,17] In the present study, cumulative transfusion exposure showed the strongest rank correlation among the transfusion-history variables, whereas annual ml/kg/year burden remained independently associated with ferritin after adjustment. This is clinically relevant because a weight-standardized volume measure captures both transfused red-cell quantity and patient body size, rather than treating every transfusion episode as equivalent.

The quartile analysis provided additional evidence of a graded association: median ferritin rose from 1641.14 ng/ml in Q1 to 2354.41 ng/ml in Q4, and the proportion with ferritin ≥2500 ng/ml increased from 21.1% to 47.4%. Comparable studies have shown that greater transfusion history and higher ferritin are associated with more severe hepatic iron loading. Kurban et al demonstrated clinically useful relationships between ferritin and hepatic iron on T2*-MRI, while Mehta et al found that transfusion frequency and duration were associated with moderate-to-severe hepatic iron overload in pediatric TDT.[18,19] Large cross-sectional data also show that higher ferritin accompanies a broad burden of iron-related complications.[20] Because the present study is cross-sectional and the intermediate quartile confidence intervals were wide, the findings support a graded association rather than a causal dose-response claim.

Chelation adherence was one of the strongest treatment-related correlates in this cohort. Poorly adherent patients had higher median ferritin and markedly greater adjusted odds of ferritin ≥2500 ng/ml. Studies focused on chelation behavior have repeatedly shown that route, formulation, tolerability, treatment burden, and patient behavior influence adherence. Haghpanah et al reported higher compliance with oral deferasirox than with deferoxamine; Oyedeji et al found clinically meaningful differences in adherence between deferasirox formulations; and Al-Kloub et al identified multiple predictors of non-adherence among adolescents receiving deferasirox.[23-25] The broader literature also links poor chelation adherence with worse clinical and economic outcomes.[26] These observations support incorporating a structured adherence assessment into routine TDT follow-up rather than interpreting ferritin solely as a function of transfusion burden.

The association between age and ferritin in the adjusted models is also plausible because age partly reflects accumulated years of transfusion exposure and chelation challenges. Kurban et al found that incorporating age improved ferritin-based prediction of myocardial iron.[18] Male sex was associated with log-transformed ferritin in the linear model but not with ferritin ≥2500 ng/ml in the logistic model. This mixed pattern should be interpreted cautiously. In a large T2*-MRI cohort, Marsella et al reported sex differences in cardiac disease despite broadly similar risk of myocardial iron accumulation, underscoring that sex-related outcome differences are more complex than ferritin concentration alone.[21]

Serum ferritin remains clinically useful but should not be equated with organ-specific iron. Taher et al demonstrated a relationship between ferritin and liver iron concentration measured by R2 MRI, whereas MRI studies have shown that myocardial iron can diverge substantially from serum

ferritin.[22] Kurban et al found stronger diagnostic performance of ferritin for hepatic than myocardial iron, and recent pediatric data likewise support the relationship between ferritin and hepatic MRI iron burden.[18,19] Early cardiac T2* studies show that myocardial iron may occur even in young patients, particularly when chelation is delayed or adherence is poor, while R2*-MRI validation studies support quantitative hepatic iron assessment when available.[32,33] Thus, the present findings are best interpreted as biochemical iron burden; MRI-based liver and cardiac assessment should complement ferritin when clinically indicated and accessible.

The clinical implications are particularly relevant in resource-constrained thalassemia services. Accurate recording of transfused red-cell volume, serial ferritin trends, and active assessment of chelation adherence are feasible measures that can help identify patients who need intensified review. Evidence from transfusion-associated iron-overload cohorts shows that persistent high ferritin can accompany hepatic, endocrine, and other organ complications.[27] Treatment studies also demonstrate that effective chelation whether with established monotherapy or selected combination regimens can reduce iron burden, although tolerability and adherence remain central to success.[28-31] For patients with high annual transfusion burden, persistently rising ferritin, or poor adherence, earlier chelation optimization and prioritization for MRI-based organ-iron assessment are reasonable clinical strategies.

Strengths and limitations

A strength of this study is the use of complementary transfusion-exposure measures, including a weight-standardized annual red-cell burden, with consistent correlation, quartile-based, and multivariable analyses adjusted for clinically relevant covariates. Important limitations are the cross-sectional, single-center design; reliance on serum ferritin without organ-specific MRI or contemporaneous inflammatory markers; unavailable assay and transfusion-timing details; and binary chelation-adherence classification without a validated score or dose information. These factors limit causal interpretation and may contribute to residual confounding.

CONCLUSION

Among patients with transfusion-dependent thalassemia at a tertiary care center in Bangladesh, greater annual and cumulative transfusion exposure was associated with higher serum ferritin. The association persisted after adjustment for major clinical covariates, and patients in the highest annual transfusion-burden quartile had the greatest likelihood of markedly elevated ferritin. Poor chelation adherence was an additional strong correlate of high ferritin. Routine care should combine accurate documentation of transfused red-cell volume, serial ferritin monitoring, and active assessment of chelation adherence, with MRI-based organ iron assessment when clinically indicated and available.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Farmakis D, Porter J, Taher A, Cappellini MD, Angastiniotis M, Eleftheriou A. 2021 Thalassaemia International Federation guidelines for the management of transfusion-dependent thalassemia. HemaSphere. 2022;6(8):e732.
2. Rund D, Rachmilewitz E. β-Thalassemia. N Engl J Med. 2005;353(11):1135-46.
3. Galanello R, Origa R. Beta-thalassemia. Orphanet J Rare Dis. 2010;5:11.
4. Coates TD. Iron overload in transfusion-dependent patients. Hematology Am Soc Hematol Educ Program. 2019;2019(1):337-44.
5. Marsella M, Borgna-Pignatti C. Transfusional iron overload and iron chelation therapy in thalassemia major and sickle cell disease. Hematol Oncol Clin North Am. 2014;28(4):703-27, vi.
6. Saliba AN, Harb AR, Taher AT. Iron chelation therapy in transfusion-dependent thalassemia patients: current strategies and future directions. J Blood Med. 2015;6:197-209.
7. Cappellini MD, Bejaoui M, Agaoglu L, Canatan D, Capra M, Cohen A, et al. Iron chelation with deferasirox in adult and pediatric patients with thalassemia major: efficacy and safety during 5 years' follow-up. Blood. 2011;118(4):884-93.
8. Anderson LJ, Holden S, Davis B, Prescott E, Charrier CC, Bunce NH, et al. Cardiovascular T2-star (T2*) magnetic resonance for the early diagnosis of myocardial iron overload. Eur Heart J. 2001;22(23):2171-9.
9. Kirk P, Roughton M, Porter JB, Walker JM, Tanner MA, Patel J, et al. Cardiac T2* magnetic resonance for prediction of cardiac complications in thalassemia major. Circulation. 2009;120(20):1961-8.
10. Spasiano A, Meloni A, Costantini S, Quaia E, Cademartiri F, Cinque P, et al. Setting for 'normal' serum ferritin levels in patients with transfusion-dependent thalassemia: our current strategy. J Clin Med. 2021;10(24):5985.
11. Majd Z, Haghpanah S, Ajami GH, Matin S, Namazi H, Bardestani M, et al. Serum ferritin levels correlation with heart and liver MRI and LIC in patients with transfusion-dependent thalassemia. Iran Red Crescent Med J. 2015;17(4):e24959.
12. Theppornpitak K, Trakarnsanga B, Lauhasurayotin S, Poparn H, Chiengthong K, Sosothikul D, et al. A study to assess and improve adherence to iron chelation therapy in transfusion-dependent thalassemia patients. Hemoglobin. 2021;45(3):171-4.

13. Pinto VM, Forni GL. Management of iron overload in beta-thalassemia patients: clinical practice update based on case series. Int J Mol Sci. 2020;21(22):8771.
14. Islam KA, Baqi SMA, Rahman MAU, Azam MS, Sharmin M, Kabir AL, et al. Serum ferritin level of transfusion dependent thalassaemia patients: a single centre study. Haematol J Bangladesh. 2021;5(2):47-9.
15. Akter A, Siddiqui SRA, Barua M, Das S, Yeasmin S. Correlation of serum ferritin with age and growth in thalassemia major children. Chattagram Maa-O-Shishu Hosp Med Coll J. 2024;23(2):34-8.
16. Shah N, Mishra A, Chauhan D, Vora C, Shah NR. Study on effectiveness of transfusion program in thalassemia major patients receiving multiple blood transfusions at a transfusion centre in Western India. Asian J Transfus Sci. 2010;4(2):94-8.
17. Riaz H, Riaz T, Khan MU, Aziz S, Ullah F, Rehman A, et al. Serum ferritin levels, socio-demographic factors and desferrioxamine therapy in multi-transfused thalassemia major patients at a government tertiary care hospital of Karachi, Pakistan. BMC Res Notes. 2011;4:287.
18. Kurban LA, Almarri BK, Alshamsi MH, Abdelrahman SS, Alwahshi SG, Alhorani Q, et al. Optimized serum ferritin prediction of iron overload in transfusion-dependent thalassemia: likelihood ratio and age-adjustment approach. Ann Saudi Med. 2023;43(2):90-6.
19. Mehta A, Parveen S, Kumar A, Ahmad K. Hepatic iron overload in transfusion-dependent paediatric thalassemia (TDT) patients: association of magnetic resonance imaging with serum ferritin level. Egypt Liver J. 2025;15:37.
20. Faranoush M, Faranoush P, Heydari I, Foroughi-Gilvaee MR, Azarkeivan A, Parsai Kia A, et al. Complications in patients with transfusion dependent thalassemia: a descriptive cross-sectional study. Health Sci Rep. 2023;6(10):e1624.
21. Marsella M, Borgna-Pignatti C, Meloni A, Caldarelli V, Dell'Amico MC, Spasiano A, et al. Cardiac iron and cardiac disease in males and females with transfusion-dependent thalassemia major: a T2* magnetic resonance imaging study. Haematologica. 2011;96(4):515-20.
22. Taher A, El Rassi F, Isma'eel H, Koussa S, Inati A, Cappellini MD. Correlation of liver iron concentration determined by R2 magnetic resonance imaging with serum ferritin in patients with thalassemia intermedia. Haematologica. 2008;93(10):1584-6.
23. Haghpanah S, Zarei T, Zahedi Z, Karimi M. Compliance and satisfaction with deferasirox (Exjade) compared with deferoxamine in patients with transfusion-dependent beta-thalassemia. Hematology. 2014;19(4):187-91.
24. Oyedeji CI, Crawford RD, Shah N. Adherence to iron chelation therapy with deferasirox formulations among patients with sickle cell disease and β-thalassemia. J Natl Med Assoc. 2021;113(2):170-6.
25. Al-Kloub MI, A Bed MAA, Al Khawaldeh OA, Al Tawarah YM, Froelicher ES. Predictors of non-adherence to follow-up visits and deferasirox chelation therapy among Jordanian adolescents with thalassemia major. Pediatr Hematol Oncol. 2014;31(7):624-37.
26. Delea TE, Edelsberg J, Sofrygin O, Thomas SK, Baladi JF, Phatak PD, et al. Consequences and costs of noncompliance with iron chelation therapy in patients with transfusion-dependent thalassemia: a literature review. Transfusion. 2007;47(10):1919-29.
27. Gao C, Li L, Chen B, Song H, Cheng J, Zhang X, et al. Clinical outcomes of transfusion-associated iron overload in patients with refractory chronic anemia. Patient Prefer Adherence. 2014;8:513-7.
28. Hassan MAM, Tolba OA. Iron chelation monotherapy in transfusion-dependent beta-thalassemia major patients: a comparative study of deferasirox and deferoxamine. Electron Physician. 2016;8(5):2425-31.
29. Zargari A, Wu S, Greenway A, Cheng K, Kaplan Z. Effects of dual chelation therapy with deferasirox and deferoxamine in patients with beta thalassaemia major. Vox Sang. 2022;117(5):733-7.
30. Takpradit C, Viprakasit V, Narkbunnam N, Vathana N, Phuakpet K, Pongtanakul B, et al. Using of deferasirox and deferoxamine in refractory iron overload thalassemia. Pediatr Int. 2021;63(4):404-9.
31. Saliba AN, El Rassi F, Taher AT. Clinical monitoring and management of complications related to chelation therapy in patients with β-thalassemia. Expert Rev Hematol. 2016;9(2):151-68.
32. Borgna-Pignatti C, Meloni A, Guerrini G, Gulino L, Filosa A, Ruffo GB, et al. Myocardial iron overload in thalassaemia major. How early to check? Br J Haematol. 2014;164(4):579-85.
33. Hankins JS, McCarville MB, Loeffler RB, Smeltzer MP, Onciu M, Hoffer FA, et al. R2* magnetic resonance imaging of the liver in patients with iron overload. Blood. 2009;113(20):4853-5.

Cite this article as: Shoyeb AKM, Ahmed T, Khan MTH. Association of transfusion burden with serum ferritin among patients with transfusion-dependent thalassemia: a cross-sectional study from Bangladesh. Int J Res Med Sci 2026;14:4427-34.