RESEARCH PAPER

Impact of Quality of Life on Blood Transfusion in Thalassemia Major Patients in India: A Review

Shashank Sharma[1] and Ajit Kumar Lenka[2]

[1]PhD Scholar (Public Health), Noida International University, India.

[2]Assistant Professor (Public Health), Noida International University, India.

ABSTRACT

Background: Currently, the most common monogenetic diseases globally are inherited disorders of haemoglobin (Hb). Thalassemia, which is resulted by mutations affecting Hb's globin chain subunits, is the most common inherited disorder. Thalassemia Major, which is also called Cooley's anaemia, is the severe type. As TM's prevalence varies extensively across diverse regions as well as populations, it signifies a key global health burden.

Objective: TM in India is the prevalent genetic disorder, as specified by the national statistics report. Therefore, it requires frequent Blood Transfusions (BT) due to severe anaemia. This regular BT affects the Quality of Life (QoL) due to the Iron Overload (IO) in the transfusion received patients. This results in decreased QoL in the patients. Therefore, this review focuses on the impacts of QoL in blood-transfused TM patients in India. Besides, this review explores the risks and burdens related to the QoL in blood-transfused TM patients.

Conclusion: The QoL in the TM affected patients could be increased by exploring the clinical trials and case studies. This contributes to public health by highlighting the gap between regular BTs.

Keywords: Thalassemia major, Quality of Life, Blood transfusion, Transfusion Dependent Thalassemia, Beta Thalassemia, iron overload, economic burden, and social burden.

How to cite this article: Sharma S, Lenka AK. Impact of Quality of Life on Blood Transfusion in Thalassemia Major Patients in India: A Review. Int J Drug Deliv Technol. 2026;16(13s): 530-538. DOI: 10.25258/ijddt.16.13s.58

Source of support: Nil.

Conflict of interest: None

1. INTRODUCTION

In the global prevalence of individuals, the hereditary disorders of the Hb molecule are among the common as well as clinically severe genetic conditions. Thalassemia is one of the serious genetic conditions. Thalassemia can be defined as the most common hereditary red blood cell disorder that causes anaemia due to defective genes that, in turn, code for the synthesis of globin proteins in the body. Thalassemia is considered a growing global public health problem, distressing individuals originating as of the Mediterranean area, the Middle East, Central Asia, the Indian subcontinent, along with Southeast Asia. Predominantly, in Asia, India is considered to be the hotspot of Thalassemia [1]. This is due to the uneven thalassemia disease distribution amongst diverse endogenous populations. Moreover, the key issue is the failure to sustain adequate Hb levels as well as poor compliance with regular chelation therapy in Indian individuals [2]. Yet, lifelong management is required for a chronic disease like thalassemia. Hence, for enduring management, disease-specific therapy like regular BTs is essential, thus producing healthy Hb and preventing anaemia. As a result, those patients' life expectancy and survival have augmented via regular BT therapy introduction [3]. However, in BT, the high costs, management, along with complications have an adverse effect on QoL [4]. Thus, maintaining the QoL in the blood transfused thalassemia patients is challenging. This is because the management for thalassemia treatment is intricate and burdensome. It also requires recurrent hospital admissions and BTs, which often adversely affect the physiological and psychological well-being of the individuals.

Thus, this review explores the QoL and the impact of BTs on thalassemia patients in the Indian subcontinent. This review achieves the aim by exploring the clinical trials and the case studies done by various researchers in the domain of managing thalassemia in the Indian region. This contributes to public health by highlighting the gap between regular BTs and chelation therapy. Despite the advancements in life expectancy through BTs, patients face significant burdens and decreased health factors. This study is done to address those impacts on people in the Indian region. Ultimately, the application fields include the public health policy, haematological clinical practice, and psychosocial support systems. Also, the limitations include the unevenness of data and difficulty in

measuring QoL across diverse endogenous populations with varying access to healthcare.

Thus, the rest of this review is structured as: The Research Questions (RQs) as well as article selection strategy are given in ***"Section 2"***, followed by the literature review in ***"Section 3"*** and a review summary in ***"Section 4"*** that discusses the research gaps and the challenges. Finally, the conclusion is presented in ***"Section 5"***.

2. RQs AND ARTICLE SELECTION STRATEGY

The RQs, which signify the importance of the impact of QoL on blood-transfused Thalassemia patients in India, have been given as follows:

- What are the types of thalassemia affecting people in India?
- How does the BT treatment impact the thalassemia patients?
- What are the impacts of QoL in blood-transfused thalassemia patients?

The research articles used for this review were selected between the years 2016 and 2025. The selected studies were retrieved as of the reliable online databases, such as "Science Direct", "IEEE Explore", "Springer", along with "Web of Science (WoS)", by employing relevant keywords, such as "TM", "QoL", "BT", *"Transfusion Dependent Thalassemia (TDT)", "Beta Thalassemia", "*IO*", "economic burden" and "social burden*". A detailed flow diagram that adheres to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) and shows the article-selection strategy is displayed in Figure 1.

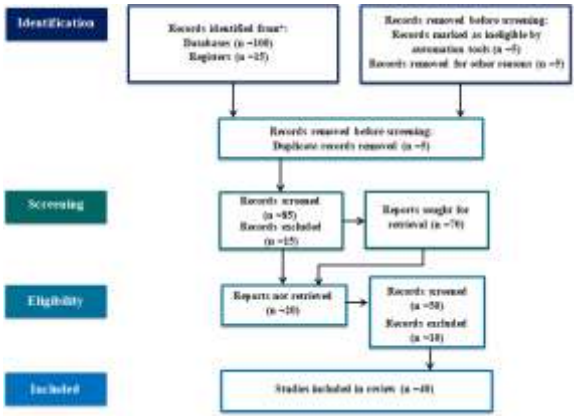

Figure 1: PRISMA Framework

3. LITERATURE REVIEW

It explores the types of thalassemia, the treatments for thalassemia, and the impact of thalassemia and its severity. Moreover, the QoL in patients affected by thalassemia is also explored in this literature review section.

3.1 Thalassemia: Overview And Types

Thalassemia is a type of hemoglobinopathy that is the normally encountered monogenic disorder of blood in humans, posing a key genetic as well as public health problem globally [5]. In thalassemia, there are diverse sorts. Some of them include α-thalassemia, β-thalassemia, and β- TM. In India, a higher frequency of thalassemia types is noted in certain communities like Sindhis, Gujaratis, Punjabis, Bengalis, etc. [6].

3.1.1 α-thalassemia

α-thalassemia are Hb's autosomal recessive disorders characterized by the lack or else diminished synthesis of α-chains. A-globin synthesis is controlled by '4' a-globin genes, '2' on every chromosome 16 (16p13.3), along with the standard a genotype is chosen as αα/αα [7]. In [8], the related alpha-thalassemia meant for screening cases in central India was predicted by employing HbS levels' trimodal distribution in sickle cell traits. From the results, it was found that the subjects were prophesied to be homozygous, as well as 338/933 were heterozygous alpha-thalassemia, grounded on HbS's trimodal distribution.

3.1.2 β-Thalassemia

It is a common genetic disorder in western India. Various strategies like populace, antenatal, premarital, cascade screening, etc., are adopted for the prevention of β-thalassemia. Various factors are identified to affect the outcome of the thalassemia prevention program [9]. In the research study [10], β Thalassemia carriers' demographic prevalence and other hemoglobinopathies in adolescents of the Tharu population was assessed. From the results, it was found that the increase in (2.1%) thalassemia was noted in the Tharu community in Lakhimpur Kheri district of Uttar Pradesh, India.

3.1.3 Thalassemia major

TM is also termed as Cooley's anaemia. It is defined as a severe inherited disorder characterized by the inability to produce structurally normal β-globin chains. Also, in TM patients, Endocrinopathies are common [11]**.** In the research study [12], the efficacy as well as safety of mutual oral chelation with deferiprone along with deferasirox in β- TM children were assessed. The results showed that drugs' combination was well tolerated as well as no adverse effects were observed. TM patients depicted lifelong Transfusion-Dependent (TD) haemolytic anaemia. Regular BTs along with intensive iron chelation therapies were treatment's mainstays [13]. Also, in Table 1, the characteristics and types of thalassemia are explored.

Table 1: Characteristics and types of thalassemia

Type of Thalassemia	Region	Patient group	Findings						Challenges	Ref
			Samples (n)	Age group	Gender		Fetal Haemoglobin (HbF)	Significance (p)		
					Male	Female				
α-thalassemia and β-thalassemia	India	Nil	120	5 to 60	44	16	18.5±8.2	0.01	No huge amount of data defined α-Thalassemia effects.	[5]
β-thalassemia	Manipur	Adults	453	1 to 80	125	328	90%	Nil	Abnormal genes might give rise to various combinations of Hemoglobinopathies and thalassemia	[6]
α-Thalassemia	Madhya Pradesh	Adults	435	Nil	Nil	Nil	1.0±0.7	<0.001	No ethnic-based prevalence from Central India was available.	[7]
α-Thalassemia	Central India	Children	5819	Nil	Nil	Nil	34.1-40%	Nil	While α-thalassemia coexisted with SCT, α-chain available became rate-limiting.	[8]
β-thalassemia	Western India	Adults and Children	398	35.2 (18-80)	245	153	19.6±24.2	0.33	Knowledge of β-thalassemia was limited.	[9]
β-thalassemia	Uttar Pradesh	Adolescents	4,93,108	Nil	96	297	1.45±1.41	0.002	No statistical difference between β-thalassemia was found.	[10]
Thalassemia major	India	Adolescents and Children	89	13.6	51	38	Nil	0.36	Compliance of patients was not assessed with oral iron chelation.	[11]
β-thalassemia major	North India	Adults and Patients	33	5 to 12.6	18	15	Nil	Nil	Just limited studies were accessible on the efficacy along with safety of combined oral chelation.	[12]
β-thalassemia major	Jamshedpur	Adults	85	18 to 35 years	24	21	Nil	<0.01	Increased serum CML and anaemia were not well defined.	[13]

From the table, it was found that the research study [6] showed a higher HbF value (<90%). On the other hand, the research study [7] had a lower HbF value of 1.0±0.7. Also, the challenge, like a lack of ethnic-based prevalence from Central India, was present in the study [7]. Next, in terms of significance (p), the research study [11] showed a higher significance of 0.36, while the research study [10] showed a lower significance of 0.002. Subsequently, challenges like limited knowledge of β-thalassemia [9], compliance of patients with oral iron chelation [11], etc., existed in the studies.

3.2 Blood Transfusion Therapy in Thalassemia Patients

The main therapy for patients suffering as of beta TM is steady BT along with chelation therapy owing to constraints in bone marrow transplantation. The most widely adopted treatment is BT therapy. Thalassemia can be treated by repeated BTs. However, thalassemia patients getting multiple BTs definitely suffer as of an increased tendency for pro-coagulant status [14].

The major type of thalassemia treatment requires regular BTs throughout life. In the intermediate type, the treatment only required periodic BTs, and symptoms appeared less frequently, while the minor type did not require special treatment and was usually asymptomatic [15]. As per the reports, in India, 10,000 - 15,000 TM cases are reported each year. As a result, Regular BT remained the cornerstone of management for TDT [16]. Therefore, in the research study [17], a cross-sectional study on BT as well as transfusion-linked infections' adequacy was done. The results showed that proper blood screening before transfusion could aid in minimizing these transfusion-transmitted infections. Besides, it was reported from other studies that the BT regimen promoted proper growth along with prevented bone marrow expansion, together with IO among most patients. Yet, complications in hemosiderosis form by repeated BT was reported in one case [18].

Further, [19] assessed thalassemia's mutational analysis in TD beta-thalassemia patients as of central India. The assessment results showed that abnormal Hb heterozygosity, like HbE, as well as β thalassemia, or else homozygosity meant for HbS, was found. The age at 1st diagnosis was > 2 years. Next, the research study [20] examined hepatitis B as well as C prevalence in thalassemia patients along with their relation with thalassemia type and BT frequency. Continuing with this, the research study [21] examined transfusion-transmitted infections prevalence amongst multiple blood-transfused patients of β- TM in a tertiary care hospital. It was found that there was a noteworthy link betwixt Transfusion Transmitted Infections (TTI) prevalence and transfusions; yet, no noteworthy link was detected with patients' age, sex, or blood group. In thalassemic patients, transfusions were IO's predominant cause; in such chronically transfused patients, hepcidin concentrations were higher when weighed against non-transfused patients, affecting the QoL of those respective patients [22]. Further, the results and parameters obtained from the BT therapy that are collected from the research articles are tabulated in Table 2.

Table 2: Results and parameters obtained from the blood transfusion therapy that are collected from the research articles

Region	Thalassemia type	Time period	Variables	Haemoglobin level	Findings				Challenges	Ref
					Samples	Mean	p	N%		
Maharashtra	TM	Nil	PAI-1(pg/ml)	Nil	30	3047 ± 414 pg/ml	< 0.05	150%	No previous history of thromboembolic events was assessed.	[14]
India	α-thalassemia, β-thalassemia, and TM	Nil	Ferritin	11.44 gr / dL	59	35.34%	Nil	4.76%	Frequent transfusions predisposed patients to iron overload and alloimmunization.	[15]
Nellore	Nil	Jan 2019 to May 2025	Nil	9–10 g/dL	8386 transfusions	Nil	8.30%	5%-30%	BMT accessibility was still limited in many rural areas.	[16]
West Bengal	α-thalassemia and β-thalassemia	1 Month	Haemoglobin Ferritin	9 gm/dl	116	63%	0.90%	1.50%	Adequacy was not reached in the study population after the transfusion.	[17]
India	Nil	2005 to 2014	Desferrioxamine	10 ± 1.6 g	183	5262.5 pmol/L	0.02%	100%	The anthropometric indices of thalassemia cases did not vary significantly with gender.	[18]
Central India	Nil	Nil	Nil	Nil	42	Nil	Nil	1.6% to 2.4%	lack of detection in either one or both mutations.	[19]
India	β-thalassemia	Nov 2016 to Jan 2017	Hepcidin	Nil	100	Nil	Nil	20%	The transfusions increased the exposure to blood-borne viruses.	[20]

From the table, it was found that the research study [16] showed a higher significance value of 8.30% when compared with the other studies. Next, the research study [18] used Desferrioxamine and showed an increased mean value of 5262.5pmol/L. However, thalassemia's anthropometric indices didn't vary significantly with gender. Subsequently, the research study [17] showed higher samples. On the other hand, the challenges, like a lack of detection in either one or both mutations [19] and increased exposure to blood-borne viruses [20], existed in the studies.

3.3 QoL in Blood Transfused Pediatric And Adult Thalassemia Major Patients in India

QoL is a central focus of comprehensive patient care. In patient care, Health-related QoL (HRQoL) is a key parameter to assess thalassemia patients' treatment outcome. This is a regular BTs result in IO as well as organ damage in these patients. QoL and survival are the important aspects for the provision of proper healthcare in both thalassemia-affected children and adults [23].

With regular BT strategies, TDT patients are living into adulthood, but they suffer as well as the disease chronicity along with its complications. Therefore, the research study [24] aimed to consider the HRQoL scores in paediatric TDT patients weighed against healthy controls. Patients with TDT, along with their parents rated minor HRQoL in each domain when analogized to the healthy population. Next, the research study [25] was conducted to assess the genetic mutations of TDT in paediatric patients. It was found that the QoL of thalassemia individuals was influenced by factors, including physical appearance and treatment modalities.

The genetic mutations significantly influenced the phenotypes of TDT patients and were essential in guiding management and prognosis. Also, thalassemia children's HRQoL was significantly lower when weighed against adults. So, the study [26] assessed the QoL amongst thalassemia children along with its relation with designated factors in selected hospitals of Delhi. The majority of children had moderate QoL, along with there was a important link in QoL of TM-affected children. Being a complicated along with long-lasting disease, thalassemia might affect the QoL of the patients along with their immediate family, social, instigating financial, physical, as well as psychological problems [27].

Also, the QoL, not just survival, gained importance with fresh advances meant for a chronic disease like thalassemia, where lifelong management was required. The [28] analysed the QoL in paediatric β- TM and the factors influencing the same due to the higher burden of thalassemia in Odisha.

From the analysis of the existing research in this section, it was clear that thalassemia adversely affected each aspect of patients' QOL as well as faced them with diverse physical along with psychosocial problems. Thalassemia patients entail diverse sorts of physical, psychological, together with emotional care [29]. In continuing with this, the research study [30] assessed the factors distressing the QoL in TDT children. It was found that the important factors were the emotional and financial burden, which affected the children's QoL. The financial strain on families was particularly pronounced due to the recurring costs of expensive drugs and ongoing treatments. Many of the supplementary care expenses associated with

Thalassemia were not covered by standard healthcare plans or government assistance programs. This lack of financial support placed a considerable responsibility on caregivers to navigate the challenges of providing comprehensive care for Thalassemia patients while managing the associated financial burdens associated with the health risks of the treatments. [31]. Further, the impacts of the QoL associated with the blood transfused pediatric and adult thalassemia patients are tabulated in the table 3.

Table 3: The impacts of the QoL associated with the blood transfused pediatric and adult thalassemia patients

Study Type	Focused patients	Factors	Findings					Challenges	Ref
			N	Mean	Significance	Duration	Variable Levels		
Research study	Paediatric patients and adults	HRQoL	80	76.63	0.025	44 months	21%	Frequent hospital visits and short stature affected the physical and psychological performance of the children	[24]
Experimental Study	Paediatric patients	Physiological and psychological factors	43	5.2 g/dl	0.003	12 months	87%	Patients with post-transfusion iron overload were at risk of long-term complications	[25]
Experimental Study	Paediatric patients and adults	HRQoL, Haemoglobin levels	12	86.58	0.05	5 years	37%	The recessive mode of inheritance was clearly studied.	[26]
Observational study	Paediatric patients and adults	HRQoL	56	45.7 ms	0.128	6 months	8.6 ± 1.1 gm.%	Somatic comorbidities and anxiety were associated with poor QoL.	[27]
Observational study	Paediatric patients	Demographic factors	200	49.19	0.05	Nil	40%	Low social aspect scores	[28]
Research study	Paediatric patients	Physiological and psychological factors	55	87	0.809	6 months	50.80%	Study groups didn't differ as of each other centered on aforementioned variables.	[29]
Experimental Study	Paediatric patients	QoL, HRQoL	11.8±3.2	74.24	0.0043	Nil	9g/dl %	Health facilities meant for blood transfusion were not accessible everywhere.	[30]

From the study, it was found that the research study [26] showed a higher mean value of 86.58% compared to the other studies. Subsequently, the research study [25] showed a lower significance of 0.003. On the other hand, the research study [28] had a higher number of samples performed on a low scale. However, challenges like low social aspect scores [28], no recessive mode of inheritance [26], etc., existed in the studies.

3.4 Treatment and Social Challenges Influencing QoL in Blood-Transfused Thalassemia Major Patients

In BT therapy for Thalassemia, the actuarial survival at 26.9 years was 50 % done in South India, underlying the gap in patients' comprehensive care with thalassemia as of childhood [32]. Along with the treatment risks, the presence of thalassemia placed a tremendous psychosocial along with economic burden on the patient as well as family. Hence, QoL assessment in children was vital.

Therefore, in the research study [33], health-related QoL as well as economic burden in beta TM aged 2-18years children were assessed. It was found that thalassemia's hostile impact was perceived in each domain of QoL by patients as well as caretakers. Particularly, medication as well as transport costs are responsible for the expenditure for every transfusion. Next, in the research study [34], transfusion-linked complications as well as QoL amongst the beta- TM patients in Jamnagar district were examined. The results revealed that TTIs' prevalence was higher in patients when weighed against general population. This indicated that the QoL was affected both economically and psychosocially. Continuing with this, the research study [35] conducted a comprehensive gap analysis of risk factors meant for TDT in siblings. It was found that insufficient awareness amongst parents, delayed diagnosis, and short intervals betwixt children's births were the main factors for the parents to have children diagnosed with TDT. HRQoL's each domain was lower in thalassemia children when weighed against healthy children. Also, the emotional as well as social functioning was most affected in thalassemia children [36].

Further, Continuous Care Model (CCM) impact on Patients' QoL with TM was assessed in [37]. It was stated that one among the ways to enhance the QoL was to employ the CCM. The CCM enhanced patients' QoL with chief thalassemia. It could be recommended as an involvement in nursing care to augment patients' QoL. With the help of CCM, it was suggested that low-cost as well as easily administered supplementation with omega-3 fatty acids, along with proteins, might minimize the obligation meant for repeated BT along with an increase in Hb level [38]. So, there was a necessity to indorse practice attitude in birth of thalassemia children prevention because the mere

knowledge concerning the disease wasn't enough [39]. Hence, it was important to design drugs to augment the life expectancy along with QoL for those living with thalassemia. Therefore, the patients could grow as well as develop normally, with a normal heart along with liver functions [40]. Further, the treatment-related risks and the social risks related to QoL in blood-transfused thalassemia major patients are tabulated in the table 4.

Table 4: Treatment-related risks and the social risks related to QoL in blood-transfused thalassemia major patients

Study Type	Thalassemia Type	Treatment-related risks			Social Risks / Burdens			Challenges	Ref
		Transfusion-related complications	Iron Overload	Adverse Side Effects	Economic Burden	Employment risks	Emotional Burden		
Research Study	Beta TM	✓	✓	Nil	✓	✓	✓	The inherited nature of the disease was not clear in most of the families.	[33]
Research Study	Beta TM	✓	✓	Cardiac disorder	✓	×	×	Increased risk of Iron overload	[34]
Clinical analysis	Beta TM	✓	✓	Genetic mutations and genetic disorders	×	×	×	Patients were unaware of the inheritance pattern of thalassemia	[35]
Observational Study	TDT	✓	×	Nil	✓	✓	✓	Age at diagnosis was not found to be significantly different among the parameters.	[36]
Clinical Trial Study	Alpha Thalassemia, Beta Thalassemia	✓	✓	Bone deformities	✓	×	✓	Higher amount of uncontrollable variables	[37]
Experimental Evaluation	TM	×	✓	Endocrine dysfunctions	×	×	×	Limited samples were present.	[38]
Experimental Evaluation	TDT	✓	✓	Physical deformity, Growth retardation	✓	✓	✓	Higher treatment costs	[39]
Experimental Evaluation	TM	×	×	Nil	✓	×	×	No visible symptoms	[40]

✓: included and ×: not included

From the above table, it was found that the risks of IO were seen in the research studies [33], [34], [35], [37], [38], and [39]. This indicated that IO risk was associated with the BT treatment, and it was inevitable. Along with the IO risks, other side effects like Cardiac disorder [34], Endocrine dysfunctions [38], etc., were associated with the treatment. Apart from the treatment-related risks, social risks were also reported in some studies. The social risks, like economic burden, employment risks, and emotional burden, were also seen in the studies.

4. REVIEW SUMMARY

The existing studies on TM primarily focused on the clinical management techniques like regular BT and chelation therapy. These therapies significantly improved the life expectancy and survival of thalassemia patients over the decades. However, limited importance was given to the evaluation of blood transfused QoL in TM patients, particularly in the Indian Subcontinent. Most of the studies concentrated on the Hb maintenance and transfusion outcomes, while the long-term physiological, psychological, social, and economic impacts remained underexplored. Moreover, the uneven distribution of TM disease among the different endogenous populations in India and the lack of region-specific QoL data highlighted a major gap in understanding the patient-centred outcomes beyond the survival rate. From the analysis, it was found that TM was a severe chronic hereditary disorder that required lifelong management with regular BTs. This was found to be the foundation of the treatment for the TDT patients in India. Although BTs were essential and were an inevitable treatment for TM, significant adverse effects like IO, increased treatment cost, etc were existed. Moreover, poor compliance and risk of transfusion-transmitted infections might complicate the disease management. Thus, the patients experienced emotional stress, financial burden, and physiological challenges. This resulted in a gap between the improved survival rates and compromised QoL among the TM patients. In addition, the existing TM management framework in India remained survival-focused. This indicated the limited integration of QoL assessment and psychosocial care for the patients. Therefore, the public health highlighted the BT availability, while emotional support and long-term follow-up received comparatively less attention. Additionally, the absence of standardized QoL assessment tools and disparities in healthcare access across various populations limited the results. As previously explained in Section 2, research articles were extracted from the database between 2016 and 2025. Figure 2 shows a graphical representation of the selection results of the reviewed articles.

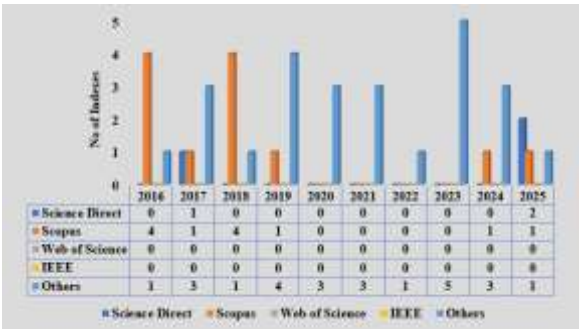

Figure 2: Graphical representation of the selection results of the reviewed articles.

5. CONCLUSION

This review examined the impact of QoL in blood-transfused thalassemia patients in India using clinical trials, experimental evaluations, etc. This review also highlighted clinical, psychosocial, and economic challenges associated with long-term disease management. These findings from the collected research studies indicated that the BTs in the TM patients improved the Hb levels and increased the life expectancy among the patients. However, the regular BTs resulted in severe impacts like IO, cardiac failure, bone deformities, etc., in the TM patients. Moreover, the blood transfused TM patients experienced reduced QoL due to the frequent hospital visits, increased financial, social, and economic burden, etc. Here, both paediatric and adult patients were affected. However, the important factors influencing the QoL were emotional stress and economic stress. The findings highlighted the gap between the survival-oriented treatment approaches and patient-related care in treating TM disease. Moreover, this review had some limitations, such as uneven data availability, limited studies, and varying healthcare access. Therefore, to overcome these limitations, future studies must focus on the large-scale, region-specific studies, standardized QoL assessment studies, and evaluation of the economic and social support, improving the QoL in TM patients.

REFERENCES

1. Bijit Biswas, Narendra Nath Naskar, Keya Basu, Aparajita Dasgupta, Rivu Basu and Bobby Paul, “Transfusion-transmitted infections, its risk factors and impact on quality of life: An epidemiological study among β-thalassemia major children”, Asian Journal of Transfusion Science, vol. 16, pp. 1-7, 2022.
2. Deeksha Choudhary , Ritu Rakholia and Pooja Agarwal, “A Cross Sectional Study for Growth and Quality of Life Assessment among Multitransfused Thalassemia Patients and Factors Affecting it in Kumaon Region of Uttarakhand, India”, International Journal of Pharmaceutical and Clinical Research, vol. 15, no. 6, pp. 944-950, 2023.
3. Ranjan Bhattacharyya, Kaustav Chakraborty, Arya Sen, Rajarshi Neogi and Sumita Bhattacharyya, “A comparative study of temperamental, behavioral, and cognitive changes in thalassemia major, thalassemia minor, and normal population”, Indian Journal of Psychiatry, vol. 6, pp. 618-622, 2019.
4. Abhilasha, Ankita Thakur, Deepika, Isha, Navjot Kaur, Pratibha, Karobi Das, Renu Sharma and Amita Trehan, “Health promotion practices and coping behaviors among caregivers of children suffering from thalassemia major”, IP International Journal of Medical Paediatrics and Oncology, vol. 7, no. 3, pp. 125-133, 2021.
5. Preetinanda M Dash, Praveen K Sahu, Siris Patel, Ranjeet S Mashon, Kiran R Kharat and Malay B Mukherjee, “Effect of Assorted Globin Haplotypes and αThalassemia on the Clinical Heterogeneity of Hb S-β-Thalassemia”, Hemoglobin International Journal for Hemoglobin Research, pp. 1-8, 2018. http://www.tandfonline.com/action/showCitFormats?doi=10.1080/03630269.2018.1536666
6. Hidangmayum Dwijaraj Sharma, Konsam Biona Devi, Pravin Kumar, Ksh Birendra Singh, Diamond Princy J and Rajesh Boini, “Pattern of hemoglobinopathies and thalassemia in Manipur, India”, International Journal of Advances in Medicine, vol. 7, no. 3, pp. 1-4, 2020.
7. Mendi P S S Singh, Rasik B Gupta, Rajiv Yadav, Ravendra K Sharma and Rajasubramaniam Shanmugam, “Prevalence of α + -Thalassemia in the Scheduled Tribe and Scheduled Caste Populations of Damoh District in Madhya Pradesh, Central India”, Hemoglobin International Journal for Hemoglobin Research, pp. 1-5, 2016. http://www.tandfonline.com/action/showCitFormats?doi=10.3109/03630269.2016.1170031
8. Warpe BM, Shrikhande AV and Poflee SV, “Can Trimodal Distribution of HbS Levels in Sickle Cell Traits Be Used To Predict the Associated Alpha-Thalassemia For Screening Cases in Central India?”, Iranian Journal of Pathology, vol. 11, no. 2, pp. 1-5, 2016.
9. Ashwin P Patel, Prakash H Parmar, Rupesh B Patel, Nikhil M Trivedi and Nileshkumar A Bhartiya, “Factors Influencing Beta-Thalassemia Awareness in Western India”, National Journal of Community Medicine, vol. 7, no. 3, pp. 1-5, 2016.
10. Nitu Nigam, Rashmi Kushwaha, Geeta Yadav, Prithvi K Singh, Nitin Gupta, Bhupendra Singh, Monica Agrawal, Pooran Chand, Shailedra K Saxena and Madan Lal Brahma Bhatt, “A demographic prevalence of β Thalassemia carrier and other hemoglobinopathies in adolescent of Tharu population”, Journal of Family Medicine and Primary Care, vol. 9, pp. 1-6, 2020.
11. Dhara Bipin Joshi and Uma Siddharth Nayak, “Nutritional Status of Children with Beta Thalassemia Major”, Lithuanian Sports University, vol. 2, no. 29, pp. 50–57, 2023.

12. Nupur Parakh, Jagdish Chandra, Sunita Sharma, Bhavna Dhingra, Rajesh Jain and DeoNath Mahto, "Efficacy and Safety of Combined Oral Chelation With Deferiprone and Deferasirox in Children With b-Thalassemia Major: An Experience From North India", Journal of Pediatric Hematology/Oncology, vol. 39, no. 3, pp. 1-5, 2017.
13. Maryam Sadat Mirlohi, Hamid Yaghooti, Saeed Shirali, Ali Aminasnafi and Samaneh Olapour, "Increased levels of advanced glycation end products positively correlate with iron overload and oxidative stress markers in patients with β-thalassemia major", Annals of Hematology, vol. 97, pp. 679–684, 2018.
14. Ashwini Kumar, Batra H S, Mithu Banerjee, Bandyopadhyay S, Saha T K, Pratibha Misra and Vivek Ambad, "PAI-1 Study in Thalassemia Major Patients Receiving Multiple Blood Transfusion", Indian Journal of Clinical Biochemistry, vol. 32, no. 3, pp. 1-4, 2017.
15. Arniat Christiani Telambanua and Desi Maryasari, "The Effect of Blood Transfusion on Hemoglobin, Hematocrit, and Ferritin Levels in Children with Thalassemia at RSUDZA Banda Aceh", International Journal of Midwifery and Health Sciences, vol. 2, no. 3, pp. 1-14, 2024.
16. Sarangapani Seetha, Aravind A, Kshithija Balaji Tandri, Balaji T S, Bhargavi K and Haritha C, "Analysis of transfusions records among thalassemia patients in Nellore, India", Bioinformation, vol. 21, no. 10, pp. 1-4, 2025.
17. Tarun Kumar Sarkar, Pulak Kumar Jana, Jasmine M, Timiresh Kumar Das, Mrinmoy Adhikary, Vinoth Gnana Chellaiyan, Harsh Aggarwal and Neha Taneja, "A cross sectional study on adequacy of blood transfusion and transfusion related infections in thalassemic patients attending a medical college hospital, West Bengal", International Journal of Community Medicine and Public Health, vol. 5, no. 8, pp. 1-4, 2018.
18. Nitin Joseph, Siddharth Pai, Shreejita Sengupta, Suchaita Bharadwaj, Saksham Dhawan and Kanishk Khare, "A Clinico-epidemiological Study of Thalassemia Cases in India", Journal of Natural Science, Biology and Medicine, vol. 9, pp. 1-6, 2018.
19. Manisha Shrivastava, Rashmi Bathri and Nirupama Chatterjee, "Mutational analysis of thalassemia in transfusion-dependent beta-thalassemia patients from central India", Asian Journal of Transfusion Science, vol. 13, pp. 1-5, 2019.
20. Liqaa Mohammed Al-Sharifi, J Murtadha, Shahad A, Mohammed Y, Sura J, Waleed Z, Raheeq M, Sura A, Ehab H, Shahad M and Abbas Q, "Prevalence of Hepatitis B and C in Thalassemic Patients and its Relation with Type of Thalassemia, Frequency of Blood Transfusion, and Spleen Status", Medical Journal of Babylon, vol. 16, pp. 1-4, 2019.
21. Kundan Mittal, Pankaj Abrol and Jaivinder Yadav, "Prevalence of transfusion transmitted infections amongst multiple blood transfused patients of β-thalassemia major in a tertiary care hospital", International Journal of Research in Medical Sciences, vol. 5, no. 1, pp. 181-185, 2017.
22. Sujay Bhowmik, Amit Kumar Biswas, Ajay Kumar Baranwal, Amit Ajay Pawar and Ujjwal Dimri, "The effect of blood transfusion on serum hepcidin levels in chronically transfused patients of β-thalassemia major: An observational study in a tertiary care centre in Western Maharashtra", Asian Journal of Transfusion Science, vol. 18, pp. 73-78, 2024.
23. Maria Domenica Cappellini, Antonis Kattamis, Vip Viprakasit, et al., "Quality of Life in Patients with β-Thalassemia: Transfusion Dependent Versus Non-Transfusion Dependent", American Society of Hematology, pp. 1-3, 2017. http://doi.org/10.1182/blood.V130.Suppl_1.751.751
24. Gulen Tuysuz and Funda Tayfun, "Health-related Quality of Life and its Predictors Among Transfusion-dependent Thalassemia Patients", Journal of Pediatr Hematol Oncol, vol. 39, no. 5, pp. 1-5, 2017.
25. Nurul Nazihah Mohd Nor, Fatmawati Kamal, Munirah Abdul Razak, Zulaiha Muda, Nurul Hidayah Musa, Mariam Mohamad and Ezalia Esa, "Genetic mutations of Transfusion Dependent Thalassaemia (TDT) in paediatric patients", The Malaysian journal of pathology, vol. 47, no. 3, pp. 457 – 465, 2025.
26. Madhu Bains and Kalpana Mandal, "A Study to Assess the Quality of Life among Children with Thalassemia and its Relationship with Selected Factors in Selected Hospitals of Delhi", Indian Journal of Youth and Adolescent Health, vol. 6, no. 3, pp. 1-7, 2019.
27. Sujata Sharma, Lekha Parikh and Prachi Pandhare, "Iron overload in non-transfusion-dependent thalassemia- experience at a tertiary care center in

India", Pediatric Hematology Oncology Journal, vol. 10, pp. 1-5, 2025.
28. Ipsita Jena, Sristi Ganguly and Narendranath Soren, "Quality of life in children aged 5- 14 years with beta thalessemia major", Panacea Journal of Medical Sciences, vol. 13, no. 3, pp. 635–640, 2023.
29. Zahra Rafii, Fazlollah Ahmadi, Sayed Mohamad Kazem Nourbakhsh and Ebrahim Hajizadeh, "The Effects of an Orientation Program on Quality of Life of Patients with Thalassemia: a Quasi-Experimental Study", Journal of Caring Sciences, vol. 5, no. 2, pp. 223-229, 2016.
30. Kapil Chordiya, Vikash Katewa, Pramod Sharma, Bindu Deopa and Suman Katewa, "Quality of Life (QoL) and the Factors Affecting it in Transfusion-dependent Thalassemic Children", The Indian Journal of Pediatrics, pp. 1-6, 2018. https://doi.org/10.1007/s12098-018-2697-x
31. Pahul Kaur, "Financial Burden on the Caregivers of Children living with Thalassemia Major in India: A Sociological Perspective", International Journal of All Research Education and Scientific Methods (IJARESM), vol. 11, no. 8, pp. 1-8, 2023.
32. Shruti Kakkar, Priyanka Dewan, Sukhmani Sidhu, Evani Jain, Anirudh Jain and Praveen C Sobti, "A survey of education and employment status of patients with transfusion-dependent thalassemia from a low-middle-income country", Pediatric Hematology Oncology Journal, vol. 10, pp. 1-5, 2025.
33. Vidya Puttagunta, "Health Related Quality of Life and Economic Burden in Children with Beta Thalassaemia Major Aged 2-18 years", International Journal of Academic Medicine and Pharmacy, vol. 5, no. 4, pp. 1237-1241, 2023.
34. Neha A Patel, Sumit V Unadkat, Jitesh P Mehta and Sudha B Yadav, "A study on transfusion transmitted infections (TTIs), transfusion-related complications, and quality of life among the beta-thalassemia major patients in Jamnagar district", International Journal of Medical Science and Public Health, vol. 5, no. 4, pp. 1-5, 2016.
35. Dolat Singh Shekhawat, Siyaram Didel, Abhishek Purohit, Tanuja Rajial, Charu Sharma, Pratibha Singh and Kuldeep Singh, "A Comprehensive Gap Analysis of Risk Factors for Transfusion Dependent Thalassemia in Siblings", Indian Journal of Hematology and Blood Transfusion, pp. 1-7, 2024. https://doi.org/10.1007/s12288-024-01848-1
36. Pooja Chowdhury and Lokajeet Baro, "Assessment of factors affecting health related quality of life in Thalassemic children in Assam, India", IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 19, no. 6, pp. 12-18, 2020.
37. Sajad Salehipour, Mahnaz Ghaljeh, Ali Navidian and Hamed Sarani, "Impact of Continuous Care Model on the Quality of Life of Patients with Thalassemia Major: A Clinical Trial Study", Evidence Based Care Journal, vol. 10, no. 4, pp. 59-66, 2021.
38. Amol Kumar, Preeti Doshi, Ramdas Dahiphale, Ansh Chaudhary and Bhupendra Chaudhary, "Investigating the prolongation of blood transfusion frequency in thalassemic children by omega 3 fatty acid and protein supplementations through milk", International Journal of Clinical Trials, vol. 8, no. 1, pp. 17-21, 2021.
39. Riya Kaur Kalra, Dania Kaur, Manmeet Sodhi and Jasleen Kaur, "Knowledge, attitude and practice in parents of chronically transfused thalassemic patients regarding thalassemia in thalassemia day care unit in government medical college, Amritsar, Punjab, India", International Journal of Contemporary Pediatrics, vol. 6, no.6, pp. 2469-2475, 2019.
40. Hirak Roy, Debabrata Das, Rajdeep Paul and Lisa Chakraborty, "A study to assess the effect of intervention on awareness regarding Thalassemia of Higher Secondary School Teachers of Alipurduar District, West Bengal", International Journal of Life Sciences, Biotechnology and Pharma Research, vol. 13, no. 3, pp. 1-11, 2024.