

Original Paper

The Relationship Between Psychosocial Status and Adherence to Treatment Regimen in Adolescents With Thalassemia



Maryam Ghorbanpoor¹ , Mahshid Mirzaie^{2*} , Seyedeh Noshaz Mirhaghjou³, Zahra Atrkar Roshan⁴ 

1. Pediatric Nursing (MSN), 17 Shahrivar Hospital, Guilan University of Medical Sciences, Rasht, Iran.
2. Instructor, Department of Nursing, Ph.D Candidate, School of Nursing and Midwifery, Guilan University of Medical Sciences, Rasht, Iran.
3. Instructor, Department of Midwifery, School of Nursing and Midwifery, Guilan University of Medical Sciences, Rasht, Iran.
4. Assistant Professor, Department of Bio-Statistics, School of Medicine, Guilan University of Medical Sciences, Rasht, Iran.

Use your device to scan and read the article online



Citation Ghorbanpoor M, Mirzaie M, Mirhaghjou SN, Atrkar Roshan Z. The Relationship Between Psychosocial Status and Adherence to Treatment Regimen in Adolescents With Thalassemia. *J Holist Nurs Midwifery*. 2020; 30(2):78-85. <https://doi.org/10.32598/jhnm.30.2.78>

Running Title Psychosocial Status and Adherence to Treatment in Adolescents With Thalassemia

 <https://doi.org/10.32598/jhnm.30.2.78>



Article info:

Received: 01/11/2020

Accepted: 02/12/2020

Available Online: 01/04/2020

Keywords:

Thalassemia,
Psychosocial status, Treatment regimen, Adolescents

ABSTRACT

Introduction: Adherence to the treatment regimen is among the key principles in chronic diseases, like thalassemia. The difficult treatment of these patients and the significant biopsychosocial changes that occur during adolescence may lead to numerous psychosocial changes. Such issues may affect their adherence to the treatment regimen.

Objective: The current study aimed to determine the relationship between psychosocial status and adherence to the treatment regimen in adolescents with thalassemia referring to hospitals in Rasht City, Iran.

Materials and Methods: Cross-sectional study was conducted on 66 adolescents with thalassemia. The study samples included patients aged 11-21 years, referring to two hospitals in Rasht City, Iran, in 2017. They were selected using the census methods. Data collection tools included a demographic form and Pediatric Symptom Checklist-Youth Report (PSC-Y). The compliance rate was measured by evaluating their adherence to follow-up visits, average results of the last three ferritin tests, and iron chelator use. The collected data were analyzed using descriptive statistics and the Chi-squared test, Fisher's exact test, and regression analysis.

Results: Fifty percent of patients reported psychosocial problems and most of them had good adherence to follow-up visits (74.2%); however, their adherence to ferritin tests (47%) and iron chelator use (45.5%) was poor. Regression analysis results suggested that the effect of psychosocial status on adherence to follow-up visits ($P < 0.05$, $OR = 0.8$, 95% CI: 0.628-1), ferritin test ($P < 0.05$, $OR = 0.213$, 95% CI: 0.044-1), and iron chelator use ($P < 0.001$, $OR = 0.852$, 95% CI: 0.772-0.94) was significant.

Conclusion: Adolescents with thalassemia fail to adhere to treatment regimen fully; therefore, appropriate interventions are required to improve their psychosocial status.

* Corresponding Author:

Mahshid Mirzaie, PhD.

Address: Department of Nursing, Ph.D Candidate, School of Nursing and Midwifery, Guilan University of Medical Sciences, Rasht, Iran.

Tel: +98 (13) 33555056

E-mail: mirzaie@gums.ac.ir

Highlights

- Adherence to the treatment regimen is among the key principles in chronic diseases, like thalassemia.
- The chronicity of disease, treatment tolerance, and early death could lead to psychosocial problems in thalassemia patients. These issues are exacerbated in adolescence due to significant biopsychosocial alternations.
- Poor psychosocial status can dramatically decrease adherence to the treatment regimen in thalassemia patients.

Plain Language Summary

Patients with thalassemia major suffer from many biopsychological symptoms during treatment; this may impair their psychosocial status, negatively affect their quality of life, and cause problems for successful treatment and treatment adherence. This study examined the relationship between psychosocial status and adherence to the treatment regimen in thalassemia patients. The collected results revealed a statistically significant relationship between them. Patients with good psychosocial status showed better treatment adherence, more regular visits for follow-up and blood transfusion, as well as iron-lowering medication use; i.e., very important for the prevention of iron poisoning and its dangerous side effects and prolongs the life span of patients. However, it is a very difficult treatment for these patients and requires 8-10 hours of overnight infusion for 6-5 days. It is suggested that similar studies be conducted to improve the quality of life and psychosocial status of these patients. Accordingly, their adherence to treatment increases, leading to fewer complications and a prolonged life span.

Introduction

Thalassemia is hemoglobinopathy caused by a defect in the globin chain synthesis inherited from parent to offspring's auto autosomal genome [1]. Thalassemia syndromes are the most prevalent genetic diseases worldwide. In Iran, there are about 20000 people with these syndromes, and 888 patients have been identified in Guilan Province, Iran [2]. Thalassemia manifestations encompass various serious clinical challenges and could lead to hypersplenism, liver enlargement, hemochromatosis, heart failure, growth retardation, pancreatic disorders, and hepatitis B, C, D, E, and G [3]. The treatment basis for these patients is a repeated blood transfusion that can treat anemia [4]. However, it causes iron overload in vital organs, including the heart and pancreas liver, which disrupts the function of these tissues [5].

To minimize its effect, deferoxamine is used as an iron-chelating agent. Its slow subcutaneous injection by a pump is recommended over 8-10 hours (usually bed-time) for 5-7 days a week. This process can reduce the liver iron burden and the incidence of functional disorders of the heart, pancreas, and other organs. Besides, it improves growth and sexual maturation and extends the patients' life span [6]. Before and after the deferoxamine initiation, it is necessary to regularly measure the patient's serum ferritin level (every 6 months) [7].

Despite the importance of adherence to treatment, patient adherence level is low in this area [8]. Adherence to the treatment regimen is defined as the extent to which people's behavior complies with health or medical recommendations [9]. It is affected by various factors, such as pain, scratches, and burns in the injection area [10, 11], high drug costs, drug adverse effects [12] smoking, problems with pump use, illness awareness, depression, psychosocial characteristics [13], and age; where adolescents demonstrated less adherence than children [11].

Thalassemia patients, like some other chronic patients, experience some biopsychosocial problems [14]. Numerous factors, such as the chronicity of disease, treatment tolerance, disability, and early death, could lead to psychosocial problems in these patients. Besides, they profoundly affect patient performance that can be exacerbated by the characteristics of adolescence [15]. These patients suffer from various pressures, including the feelings of humiliation, despair, anxiety, depression, and worry about school/employment/treatment problems or welfare, cultural, or familial issues [16]. Anxiety and depression are present in 47% of these patients, which could cause problems in their self-care and psychological status [17].

Psychosocial aspects can influence adherence to treatment regimen more than other factors [18]. Nurses who

comprise >70% of the healthcare team have a valuable role to play in supporting these patients. They have more frequent access to patients and spend more time in their care; therefore, they have extensive opportunities to communicate with them [14] effectively. They could also increase their adherence through clear explanations, encouragement, support, and reassurance [19].

Promoting compliance in thalassemia patients is a major principle in reducing their complications and increasing their life expectancy. Various factors can affect these patients' adherence to the treatment regimen, including puberty and psychosocial characteristics. Therefore, identifying these factors is the first essential step for determining patients at risk of non-adherence. Such a measure could help health professionals to design programs that improve compliance. Some studies have also suggested that psychosocial status influences the adherence to the treatment regimen of Acquired Immunodeficiency Syndrome (AIDS), asthma, and muscular dystrophy in patients; however, few studies have explored the relationship between psychosocial status and adherence to thalassemia treatment and provided contradictory results.

Materials and Methods

This analytical cross-sectional study was conducted on 66 adolescents with thalassemia aged 11-21 years, referring to two hospitals in Rasht City, Iran, in 2017. The study subjects were selected using the census method. The study inclusion criteria were as follows: regular referral for receiving blood, having a medical record, approved diagnosis of thalassemia, receiving transfusion-dependent treatment, and not using medications that affect the neurological system.

Data collection tools included a demographic data form (surveying age, gender, parents' education, and job, family income, the number of blood transfusions, & the number of deferoxamine infusion) and Pediatric Symptom Checklist-Youth Report (PSC-Y) used for measuring the psychosocial status of patients. It is a standard tool for screening children and adolescents and diagnosing psychosocial problems. Moreover, it is widely used for preventive care. It has 35 items rated on a 3-point Likert-type scale (0=never, 1=sometimes, 2=often). The total obtainable score is 35. For children aged 11-16 years, the cutoff point is 28, and for adolescents aged >16 years old, it is 30 [11, 20].

The questionnaire was translated to Persian by two English language translators using the back-translation

method. The Content Validity Index (CVI) as well as the opinions of experts (2 assistant professors, 6 faculty members, and one psychologist), were used to assess the scale's validity. The Content Validity Ratio (CVR) for the items was also determined using the Lawshe table. After confirmation, it was tested on 10 adolescents with thalassemia to examine the simplicity and clarity of questions. For its reliability, a Cronbach's alpha coefficient of 0.79 was obtained. After obtaining consent from the study participants, the questionnaire was completed by them (if their literacy was insufficient, the questionnaire was completed through an interview).

The study participants' adherence to treatment regimen was measured by: a. calculating the average of the last 3 blood ferritin tests (average <2500 µg/L defined as good compliance); b. assessing the adherence to follow-up visits in the last 10 visits (scored 1-10; scores >7 represent good compliance and scores ≤7 indicate poor compliance) [3, 7, 11]; and c. patient report of adherence to daily iron chelator use in the past 4 weeks (≥5 injection times a week was considered as good compliance) [3, 7, 10]. Eventually, all the patients were informed on the benefits of compliance, how to take the medication, the adverse effects of not consuming the drug, and all information a thalassemia patient must know. The obtained data were analyzed in SPSS v. 21 using descriptive statistics and statistical tests of the Chi-squared test, Fisher's exact test, and regression analysis.

Results

Table 1 presents the demographic characteristics of the study patients. Most of them underwent blood transfusion once a month (83.3%); most of them reported a change in their face (48.5%), skin complications (39.4%), liver problems (34.8%), cardiovascular diseases (6.1%), diabetes (10.6%), and puberty disorders (25.8%). Furthermore, a majority of patients had hemoglobin levels of >8 g/dL at the time of blood transfusion (69.7%).

Mean±SD score of the study subjects' psychosocial status was 24.73±9.69 (range: 4-43). Thirty-three (50%) and 33 (50%) of these patients reported undesirable and poor psychosocial status, respectively. Moreover, 74.2% of the samples had good adherence to follow-up visits, and the adherence to the ferritin test was good for 53% and poor for 47% of them. Twenty-six subjects were treated with an injectable iron chelator, 34 with an oral chelator, and 6 with a combined form (oral and injectable). Adherence to injectable chelator was good in 23.1% of them, and to an oral chelator, it was good for 79.4%. For adherence to the combined form of chela-

Table 1. Demographic characteristics of participants

Variables		NO. (%)
Gender	Female	37(56.1)
	Male	29(43.9)
Age (y)	<16	17(25.8)
	>16	49(74.2)
Educational level	Junior high school	28(43.1)
	High school diploma	32(49.2)
	Academic degree	5(7.7)
Birth order	1 th	39(59.1)
	2 th	18(27.3)
	3 rd and higher	9(13.6)
Mother's educational level	Illiterate	8(12.1)
	Junior high school	31(47)
	High school diploma	20(30.3)
	Academic degree	7(10.6)
Father's educational level	Illiterate	3(4)
	Junior high school	37(56)
	High school diploma	18(27)
	Academic degree	9(13)
Mother's job	Housekeeper	60(90.1)
	Employed	6(90)
Father's job	Employed	17(25.8)
	Worker	12(18.2)
	business	27(40.9)
	Farmer	8(12.1)
	Unemployed	2(3)
Family income (\$)	<250	20(30.3)
	250-499	26(39.4)
	500-1000	14(21.2)
	>1000	6(9.1)
Father's age	<50	50(75.8)
	>50	16(24.2)
Mother's age	<40	25(37.9)
	41-50	33(50)
	>50	8(12.1)
The siblings of thalassemia major	No	56(84.6)
	Yes	10(15.4)
The parents with kinship relationship	No	49(74.2)
	Yes	17(25.8)

Table 2. Regression analysis results of the relationship between psychosocial status and adherence to chelator use

Variables	OR	Sig.	SE	Regression Coefficient (B)	95% CI	
					Upper	Lower
Gender	4.850	0.04	0.77	1.579	21.918	1.073
Psychosocial status	4.850	0.001	0.80	-1.61	0.940	0.772

Table 3. Regression analysis results of the relationship between psychosocial status and adherence to the ferritin test

Variable	OR	Sig.	SE	Regression Coefficient (B)	95% CI	
					Upper	Lower
Psychosocial status	0.213	0.053	0.8	-1.546	1.022	0.044

Table 4. Regression analysis results of the relationship between psychosocial status and adherence to follow-up visits

Variables	OR	Sig.	SE	Regression Coefficient (B)	95% CI	
					Upper	Lower
Hemoglobin level	0.021	0.003	1.297	-3.895	0.268	0.002
Psychosocial status	0.8	0.05	0.124	-0.223	0.1	0.28

tor, 50% of the study participants were at a good level. Overall, 54.5% had good adherence to iron chelator use.

The study results indicated a significant difference in psychosocial status between the two groups of patients with good and poor adherence ($P=0.001$); the psychosocial status level in patients with good adherence to follow-up visits was 67.3%. Moreover, there was a significant difference in psychosocial status between the two groups of patients with good and poor adherence to the ferritin test ($P=0.001$); the psychosocial status level in patients with good adherence was 94.3%. Furthermore, there was no significant difference in psychosocial status between the two groups of patients with good and poor adherence to using combined form of iron chelator ($P=0.5$); however, in terms of oral chelator ($P=0.001$), injectable chelator ($P=0.028$), and overall chelator use ($P=0.001$), the difference between two groups was significant. This indicates that the good psychosocial status level in patients with good adherence to medication use was higher than in those with poor adherence.

A logistic regression model was used to investigate the relationship between psychosocial status and adherence to medication (iron chelator) by controlling individual and disease-related factors. The relevant results indicated that, by controlling the effect of these factors, good psychosocial status significantly affected adherence to

medication use ($P=0.001$). Gender was also a predictor of adherence to medication, where good adherence in women was 4.8-fold higher than that in men (Table 2).

Regarding the relationship between psychosocial status and adherence to the ferritin test by controlling individual and disease-related factors, regression analysis results reported that psychosocial status level was the only predictor of adherence ($P=0.05$); any increase in psychosocial status decreases the odds ratio of good adherence to the ferritin test (Table 3).

The relationship between psychosocial status and adherence to follow-up visits by controlling individual and disease-related factors was assessed by applying the regression analysis method. The related results reported the significant effect of good psychosocial status on the adherence. Any increase in psychosocial status decreased the odds of good adherence to follow-up visits. Hemoglobin level was another factor influencing adherence to follow-up visits, where those with hemoglobin levels <8 g/dL were less likely to adhere properly (Table 4).

Discussion

Beta-thalassemia is a common genetic disorder in Iran. Iran ranks first globally in terms of the prevalence of thalassemia [20]. Beta-thalassemia causes serious

symptoms in children, often manifested as psychosocial problems [21]. The need for blood transfusion, medical care, and early death anxiety can lead to feelings of anger, despair, loneliness, and stress. Physical development in children with thalassemia is less than their peers. Accordingly, it creates feelings, such as humility, conflict, differentiation, or incompetence, to perform tasks [22]. It is necessary to identify psychosocial problems in patients with thalassemia to increase awareness and planning in this area. Thus, this study aimed to investigate the relationship between psychosocial problems and adherence to treatment in adolescents with thalassemia.

The majority of study samples performed blood transfusion once a month, i.e., consistent with Kumaravel et al.'s study of psychosocial problems in blood transfusion-dependent thalassemia patients; they revealed that most patients did blood transfusions once a month [23]. According to Noorsalehi et al., blood transfusion in most patients was <42 days [24]. Moreover, the hemoglobin level of most samples was >8 g/dL, i.e., consistent with other similar studies [24, 25]. The favorable referral for blood transfusion and a hemoglobin level of >8 g/dL can be due to the rapid and observable incidence of non-transfusion complications; its effects on the general health of patients is quite evident. As a result, these patients have a more regular referral to reduce these complications.

In addition, facial deformity, skin and liver complications, cardiovascular diseases, diabetes, and puberty disorders were observed in patients. In the study of Khamoushi et al. [26], cardiac disease was also observed in thalassemia patients. Complications can be the failure to adhere to the strict and stressful treatment regime fully. In our study, half of the patients reported a poor psychosocial status, i.e., consistent with the results of some studies [23, 27, 28]. Arab et al. [20] found that most of the patients with thalassemia enjoyed an acceptable mental health condition. This discrepancy may be due to the cultural and geographical differences of the studied samples.

Regarding adherence to follow-up visits, most adolescents with thalassemia had good adherence, i.e., consistent with Al-Kloub et al.'s study [11] and against the findings of Shaker [29] who reported good adherence in a small number of patients. In the present study, good adherence to follow-up visits was due to monthly blood transfusion. Such data indicate that adolescents' physiological need for blood transfusion to reduce hypoxia and disruption of daily living activities makes them regularly

refer to health centers. It can also be due to health system-related factors, like providing comprehensive care or demographic variables including education, parent education, patient knowledge, satisfaction with treatment, family social support, and culture.

Regarding adherence to the ferritin test, our results revealed that most patients with thalassemia had a mean ferritin level of less than 2500 µg/L. This result is inconsistent with Al-Kloub et al.'s study [11] and against those of Riaz et al. [30] who reported good adherence in a small number of patients. High ferritin levels in patients indicated poor adherence to the iron chelator use and led to increased blood ferritin levels in them. Adherence to oral chelator use was observed in the majority of samples, while their adherence to the injectable form of chelator was very poor, i.e., consistent with the findings of some studies [31, 32]. This finding might be due to the ease of oral administration and the difficulty of injection as well as mood changes during puberty.

The obtained results suggested a significant difference in psychosocial status between groups with good and poor adherence to follow-up visits. This finding is in line with that of Al-Kloub et al. [11], who studied the effect of psychosocial status and disease knowledge on chelator adherence. Moreover, our results revealed a significant difference in psychosocial status between groups with good and poor adherence to the ferritin test, i.e., consistent with some studies [11, 33]. However, these data were inconsistent with those of Cakaloz et al. [34]. This data discrepancy may be due to the failure of medication therapy and reduced ferritin levels despite medication adherence in different patients.

Adherence to the treatment with iron chelators is a turning point in the survival of patients with thalassemia. Serum ferritin levels >2500 µg/L indicate a dangerous level of iron in the body. In patients with chronic disease, adherence to treatment decreases over time after diagnosis; challenges in adolescence may exacerbate it. The present study also suggested that the psychosocial status of adolescents with thalassemia was poor, and its effect was significant on adherence to the treatment regimen, i.e., a decline in psychosocial status decreased the compliance level. This indicates the need to provide them with education about the importance of adherence. Therefore, interventions to improve the psychosocial status of these patients and treatment adherence are recommended. It is suggested that the treatment staff evaluate the compliance of these patients according to the blood infusion chart; accordingly, enhance compliance by encouraging regular follow-up.

This study had some limitations ,including restricting the results to a specific group and geographical area (people with thalassemia in Rasht City, north of Iran) and not using a random sampling technique due to the small sample size. Therefore, it is suggested that studies be conducted in other populations and geographical regions using a random sampling method to empower the generalizability of findings.

Adolescents with thalassemia fail to adhere to treatment regimen completely; therefore, appropriate interventions are required to improve their psychosocial status.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the Research Ethics Committee of Guilan University of Medical Sciences (Code: IR.GUMS.REC.1395.370).

Funding

This study received financial support from the Social Determinants of Health Research Center (SDHRC) of Guilan University of Medical Sciences.

Authors contributions

Conceptualization: Maryam Ghorbanpour, Mahshid-Mirzaie, SeyedehNoshaz Mirhaghjou and Zahra Atrkar Roshan; Drafting and data analysis: Mahshid Mirzaie; Investigation and data Analysis: Maryam Ghorbanpour and Zahra Atrkar Roshan; Editing and review: All authors.

Conflict of interest

The authors declared no conflicts of interest.

Acknowledgements

This study was extracted from a Master's thesis approved by Guilan University of Medical Sciences. The authors would like to thank the Deputy for Research and Technology, Social Determinants of Health Research Center, the hospitals and all patients for their cooperation and support.

References

- [1] Razzazan N, Ravanipour M, Gharibi T. [Effect of self-management empowering model on the quality of life in adolescents and youths with major thalassemia (Persian)]. *Journal of Nursing Education*. 2014; 3(2):48-59.
- [2] Firouzbakhtk S, Ghasemi K, Motamed N, Sarrikhani M. [The Evaluation of chelator therapy in reducing serum ferritin and improving ejection fraction (EF%) in thalassemic patients (Persian)]. *Iranian South Medical Journal*. 2015; 18(2):280-7.
- [3] Mojtahedzadeh F. [Thethalassaemia diseases (Persian)]. Tehran: Adiban; 2011. 115-35.
- [4] Kliegman RM, Stanton B, Geme J, Schor N. *Nelson textbook of pediatrics*. Philadelphia: Elsevier; 2016.
- [5] Azami M, Tardeh Z, Abangah GH, Sayemiri K. [The prevalence of impaired glucose tolerance in patients with thalassemia major in Iran: A systematic review and meta-analysis (Persian)]. *Journal of Shahid Sadoughi University of Medical Sciences and Health Services*. 2016; 23(10):912-22.
- [6] Ganzella M, Fontao Zago MM. The experience of thalassemic adults with their treatment. *SciELO Analytics*. 2011; 19(4):968-76. [DOI:10.1590/S0104-11692011000400016] [PMID]
- [7] Abolghasemi H, Eshghi P. [Textbook of Thalassemia (Persian)]. Tehran: Baqiyatallah University of Medical Science; 2005.
- [8] Pooladfar GH, Moaiedfar M. [The effect of education on improving tolerance of subcutaneous deferoxamine iron deficiency diet in severe thalassemia patients (Persian)]. *Iranian South Medical Journal*. 2006; 8(2):134-42.
- [9] Shirazi N, Oraki M, Zare H. [The effect of cognitive behavioral anger management training on general health of patient with type 2 diabetes (Persian)]. *The Journal of Urmia University of Medical Sciences*. 2014; 24(12):966-76.
- [10] Hockenberry M, Rodgers C, Wilson D. *Wong's nursing care of infants and children*. 10th Ed. Canada: Elsevier; 2015.
- [11] Al-klob MI, Salameh TN, Froelicher ES. Impact of psychosocial status and disease knowledge on deferoxamine adherence among thalassaemia major adolescents. *International Journal of Practice* 2014; 20(3):265-74. [DOI:10.1111/ijn.12143] [PMID]
- [12] Rashid M, Karimi M. Compliance of deferoxamine injection in beta - thalassaemia major patients in Iran. *Transfusion Medicine*. 2012; 22(2):104-7. [DOI:10.1111/j.1365-3148.2011.01130.x] [PMID]
- [13] Porter JB, Evangeli M, El-Beshlawy A. The challenges of adherence and persistence with iron chelation therapy. *International Journal of Hematol*. 2011; 94(5):453-60. [DOI:10.1007/s12185-011-0927-3] [PMID]
- [14] Razzazan N, Ravanipour M, Jahanpour F, Zarei AR, Motamed N, Hosseini S. Investigating challenges facing self-management empowerment education in adolescents and youths with major thalassemia. *Jundishapur Journal of Chronic Disease Care*. 2014; 3(4):e23366. [DOI:10.17795/jjcdc-23366]
- [15] Pouraboli B, Azizzadeh Forouzi M, Arab M. [Mental health of adolescents with thalassemia major visiting Kerman specific diseases center (Persian)]. *Journal of Health & Development*. 2015; (4)1:20-2.
- [16] Shahnavazi A, Behnammoghadam M, Abdi N, Rigi KH, Allahyari E, Bakhshi F, et al. [Effectiveness of eye movement desensitization and reprocessing on anxiety in adolescents with thalassemia in the

- 12-month follow-up (Persian)]. *Armaghane-danesh, Yasouj University of Medical Sciences Journal (YUMSJ)*. 2016; 20(11):962-71.
- [17] Hooshmandi R, Akabarian Sh, Bahreini M, Mirzaei K. [The relationship between social support and depression in patients with thalassemia major in Bushehr, Iran (Persian)]. *Nursing Journal of Vulnerable*. 2015; 2(4):1-14.
- [18] Bane C, Hughes CM, McElnay JC. The impact of depressive symptoms and psychosocial factors on medication adherence in cardiovascular disease. *Patient Education and Counseling*. 2006; 60(2): 187-93. [DOI:10.1016/j.pec.2005.01.003] [PMID]
- [19] Gauchet A, Tarquinio C, Fischer G. Psychosocial predictors of medication adherence among persons living with HIV. *International Journal of Behavioral Medicine*. 2007; 14(3):141-50. [DOI:10.1007/BF03000185] [PMID]
- [20] Arab M, Abaszadeh A, Ranjbar H, Pouraboli B, Rayani M. Survey of psychosocial problems in thalassemic children and their siblings. (Persian)]. *Iranian Journal of Nursing Research*. 2012; 7(24):53-61.
- [21] Louthrenoo O, Sittipreechacharn S, Thanarattanakorn P, Sanguanersmri T. Psychosocial problems in children with thalassemia and their siblings. *Journal of Medicine Association Thailand*. 2002; 85(8):881-5.
- [22] Malekshahi F, Tolabi T, Ravanshad F. A survey about behavioral and emotional problems in thalassemic patients referred to Khorramabad Shahid Madani Hospital thalassemia center. *The Quarterly Journal of Fundamentals of Mental Health*. 2001; 3(11-12):115-21.
- [23] Kumaravel SK, Jagannathan S, Balaji J, Karthick NR, Pugalandhiraja KV. Psychosocial problems associated with transfusion dependent thalassemia in a tribal population. *Pediatric Oncall Journals*. 2016; 13(4):90-102. [DOI:10.7199/ped.oncall.2016.45]
- [24] Noorsalehi E, Mojtabaii S, Bolookimoghadam K, Orangpour R, Frouhari A. [Evaluation of blood transfusion and splenectomy in thalassemic patients (Persian)]. *Journal of Guilan University of Medical Sciences*. 2006; 14(56):61-6.
- [25] Kooshki A, Tofighian T, AkbarzadehR. [Nutritional status and blood indices in patients with β -thalassemia major (Persian)]. *Journal of Mazandaran University of Medical Sciences*. 2014; 24(115):93-100.
- [26] Khamoushi F, Ahmadi SM, Karami-Matin B, Ahmadi-Jouybari T, Mirzaei-Alavijeh M, Ataee M, et al. [Prevalence and socio-demographic characteristics related to stress, anxiety, and depression among patients with major thalassemia in the Kermanshah county (Persian)]. *Journal of Biology and Today's World*. 2015; 4(3):79-84. [DOI:10.15412/J.JBTW.01040304]
- [27] Majdeteimoori Z, Sedghisabet M, Hasavari F, Rezapuor M. [The study of bodily, mental, social, and economical problems of major thalassemia infected patient that referred to Somesara Imam Khomeini Hospital (Persian)]. *Journal of Holistic Nursing And Midwifery*. 2008; 18(1):31-7.
- [28] Naderi M, Hormozi MR, Ashrafi M, Emamdadi A. Evaluation of mental health and related factors among patients with beta-thalassemia major in south east of Iran. *Iranian Journal of Psychiatry*. 2012; 7(1):47-51.
- [29] Shaker WH. Factors affecting adolescents' adherence to therapeutic recommendations after thalassemia. *International Journal of Scientific and Research Publications*. 2015; 5(12):23-6.
- [30] 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 Research Notes*. 2011; 11(4):287. [DOI:10.1186/1756-0500-4-287] [PMID] [PMCID]
- [31] Al-Kloub M, Abed M, Al-Khawaldeh O, Al-Tawarah Y, Froelicher E. Predictors of non-adherence to follow-up visits and deferasirox chelation therapy among Jordanian adolescents with thalassemia major. *Pediatric Hematology and Oncology*. 2014; 31(7):624-37. [DOI:10.3109/08880018.2014.939792] [PMID]
- [32] Trachtenberg FL, Gerstenberger E, Xu Y, Mednick L, Sobota A, Ware H, et al. Relationship among chelator adherence, change in chelators, and quality of life in thalassemia. *Quality of Life Research*. 2014; 23(8):2277-88. [DOI:10.1007/s11136-014-0671-2] [PMID] [PMCID]
- [33] Aydinok Y, Eremis S, Bukusoglu N, Yilmaz D, Solak U. Psychosocial implications of thalassemia major. *Pediatrics International*. 2005; 47(1): 84-9. [DOI:10.1111/j.1442-200x.2004.02009.x] [PMID]
- [34] Cakaloz B, Cakaloz I, Polat A, Inan M, Oguzhanoglu NK. Psychopathology in thalassemia major. *Pediatrics International*. 2009; 51(6):825-8. [DOI:10.1111/j.1442-200x.2009.02865.x] [PMID]