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Evaluation of Quality of Life in Children and Adolescents with Thalassemia Major

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ABSTRACT

Background and Objective: Thalassemia is one of the most common genetic diseases that affect all aspects of quality of life (QOL). The present study was conducted to evaluate the QOL of children and adolescents with thalassemia major.

Methods: This descriptive-analytical-cohort study was performed on patients with thalassemia major referred to Ali Asghar Hospital in Zahedan in 2017-2018. A 26-item World Health Organization Quality of Life questionnaire (WHOQOL-Bref) was used to assess patients' QOL. The questionnaire of this study had two major components; 1- General information like age, sex, education, numbers of transfusions and heart disease and 2- Questions regarding physical and mental health. The result of the questionnaire yielded a score depending on the answers provided by the patients. Data were analyzed using the independent t-test and ANOVA.

Findings: Out of the 250 participants in the study, 123 and 127 ones were male and female, respectively. The mean QOL score was 262.735±13.785. There was no significant difference between boys and girls in the QOL score. But there was a significant difference in the QOL based on the education (P=0.000), heart disease (P=0.000) and number of blood transfusions (P=0.001).

Conclusion: This study revealed that patients with thalassemia major required special attention to various aspects of their lives as their lower QOL negatively impacted them. Providing more and better medical and rehabilitation services to this group seems to be necessary.

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Introduction

Thalassemia major is a genetic disorder that occurs due to a decrease in the production of globulin chains in hemoglobin resulting in a shorter lifespan of the erythrocytes [1-4]. The result of this mutation is a severe anemia that causes growth and developmental defects, disrupting the function of vital organs. The increased energy and calories required for hematopoiesis result in a weakened body which predisposes the patients to infections. Delays in starting the treatment with blood transfusions lead to death within the first decade of life [5-7].

The most important aspect of treatment in these patients is regularly scheduled blood transfusions to avoid the two following complications; 1-increased bone marrow activity leading to bone changes and 2-hepatosplenomegaly, both of which can lead to death [8].

Quality of life (QOL) is a dynamic concept meaning that it is dependent on time; changing with fluctuations in internal and external conditions. The QOL is a state of mind, judged best by the patients. But in situations where they might lack the proper judgment to do so, physicians and the nursing staff are qualified to evaluate their QOL in-their-stead [9, 10]. Kids with thalassemia generally have negative thoughts about their own lives; they feel guilt, anxiety and have low confidence. They also feel different from their peers. An indicator of the emotional toll the disease brings can be measured by evaluating psychological symptoms including the patients' issues with their physical symptoms and separation anxiety.

The pain, extent of the disease and QOL in these patients have an integrated relationship which in addition to the physical signs and symptoms affects all aspects of their lives, meaning one of the most important aims of the treatment plan is alleviating the burdens these patients live with [11].

Nowadays, with the existing treatments, many reports express an increased life expectancy of thalassemia major patients. In addition to the physical and mental health issues they face, social obstacles such as; starting families, getting higher education and jobs adds to the burdens these patients suffer. These issues will eventually lead to frustration and social avoidance, further reducing their QOL [12].

Knowing how the patients feel about their life and their different aspects helps us schedule a better plan to move towards alleviating their condition. The aim of this study was to evaluate the QOL of children and adolescents with thalassemia major, to pinpoint where we -and life in general- come a short, and better plan to improve and alleviate these shortcomings.

Methods

Design and participants

The aim of this descriptive-analytical-cohort study was to evaluate the QOL in children and adolescents with thalassemia major. The inclusion criteria for the study were: all thalassemia major patients >13 years old, who routinely visited Ali-Asghar Clinic in Zahedan in 2017-2018. The exclusion criteria were patients who did not have beta-thalassemia major and were <13 years old.

In this study, beta-thalassemia major patients who came to Ali-Asghar Clinic in Zahedan were asked to participate in the study. Totally, 123 male and 127 female patients agreed to participate in the study.

Data collection

The selected patients completed the World Health Organization Quality of Life Questionnaire (WHOQOL-Bref) and informed consent form. The questionnaire of the current study had two components: 1-General information like age, sex, education, transfusions, heart disease and 2-Questions about their QOL, physical and mental health with the aim of obtaining a subjective measure for the study. This allowed us to take a more individualized approach to each patient and gain better insight into their lives. The WHOQOL-Bref includes 26 questions and is a well-known evaluation of the QOL. To correctly calculate each patient's score based on the questionnaire, the scores of each item were added together and then converted into a scale from zero (worst condition)

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to one hundred (best condition). The questionnaire was created by the World Health Organization (WHO), originally from 1998, revised in 2012. Appendices 4, 7 and 8 of the questionnaire include a series of questions to which patients respond and which were then analyzed using a rating scheme (Appendix 9) to assess their overall satisfaction or dissatisfaction with their QOL. The questionnaire is freely available on the website WHO, regardless of nationality. Since the questionnaire is available only in English, we translated it into handouts that patients completed, and calculated their scores using the guides in Appendix 9. The questions are simple and to the point, with multiple-choice answers ranging from very dissatisfied to very satisfied (with slight variations in wording depending on the question). Patients were asked a variety of questions about different including their sleep patterns, pain perception, QOL, health, energy, general satisfaction and so on [13-16].

The short-term outcome until discharge included: infant's death due to IVH, inserting shunt, seizures, decreased IVH grade, and recovery.

Statistical analysis

The data were entered into SPSS 19 and analyzed using independent t-test and ANOVA. A P-value of less than 0.05 was considered statistically significant. Cronbach's intra-cluster and alpha correlation values were above 0.7 in all domains.

Results

This study examined 250 patients with thalassemia major out of whom, 127 (50.8%) and 123 (49.2%) cases were girls and boys, respectively. Categorizing our patients into age groups showed that ≤20% were 15 years, 37.2% were from 16 to 20 years, 29.6% were from 21 to 25 years and 13.2% were > 25 years old. Categorizing our patients based on their educational levels showed that 40.80% had primary or illiterate education, 22.4% had secondary education, 29.2% had high school or diploma and 7.6% had academic degrees. Evaluating our patients based on their history of cardiovascular diseases indicated that 40% had a history of cardiovascular disease and 60% did not. Finally, 46.3% of our patients had a transfusion routine of once every 10-21 days and 53.6% once every 22-30 days (Table 1).

The average score of QOL was 262.735±13.785 in which the mean of the physical subscale was 58.9, the mean of the psychological subscale was 68.01, the mean of the social subscale was 66.56 and the mean of the environmental subscale was 70.65. In Table 1, we compare the QOL of thalassemia major patients based on their age and gender. Hence, no significant difference existed between the psychological and social subcategories in different age groups and genders.

However, significant differences were found between the psychosocial and environmental categories based on the patients' education. In Table 2, we compare the QOL of thalassemia major patients based on their levels of education (P=0.000), history of heart disease (P=0.000) and numbers of transfusions received (P=0.001). In addition, under the physical category, no significant difference was found between levels of education and history of heart disease. However, there was a significant difference in the psychological, social and environmental aspects of their lives. According to the ANOVA analysis, the average QOL scores in different groups were as follows; 250.8±29.74 for illiterate patients and those with only primary educations, 276.5±33.35 for secondary education and 259.2±9.06 for high school and diploma degrees, indicating a significance difference between the QOL of patients depending on their educational levels. We used ANOVA analysis for education instead of the independent T-test, since education is not a quantifiable measure (it is a descriptive one) reported with different levels of descriptive patterns. ANOVA analysis studies a descriptive factor with ≥3 categories. Education is a descriptive measure where it either exists or not (yes or no) and is categorized into multiple categories (high-school, diploma, Bachelors', etc.) Patients with secondary and high school education and diplomas had the highest QOL scores and illiterate patients or those with primary education along with those who ranked above diplomas had

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the lowest QOL scores. Significant differences were observed in the physical, psychological, social and

environmental scales based on the presence or absence of heart disease. In all these subcategories the patients with heart disease achieved fewer scores than those without any heart diseases. QOL score with a mean of 248.95±30.67 in people with heart disease was significantly lower than people with no heart disease with a mean of 274.29±30.49. Physical and environmental categories showed a significant difference in terms of blood transfusion frequency; therefore, people with low blood transfusion (10 to 21 times) had a significantly higher score than people with high blood transfusion (22 to 30 times). There was no significant difference in the frequency of blood transfusions on the psychosocial scale. The QOL scores in people with fewer blood transfusions with an average of 271.58±36.038 were significantly higher than people with more blood transfusions with an average of 257.71±31.00.

Table 1. Comparing quality of life in Thalassemia major patients based on their age and gender

Category	Variance	Types	Number	Average	Standard Deviation	One way ANOVA		Independent T-test	
						F	Pvalue	T	Pvalue
Physical	Age	<15	50	57.56	10.31	0.40	0.76	-	-
		16-20	93	52.42	10.30				
		21-25	74	59.00	9.73				
		>25	33	59.30	10.71				
	Sex	Female	127	58.98	10.64	-	-	0.101	0.919
		Male	123	58.85	9.67				
Psychological	Age	<15	50	70.86	9.80	1.57	0.20	-	-
		16-20	93	67.76	9.08				
		21-25	74	67.54	11.54				
		>25	33	65.48	18.80				
	Sex	Female	127	67.97	12.75	-	-	-0.065	0.948
		Male	123	68.07	10.51				
Social	Age	<15	50	64.12	15.44	2.53	0.06	-	-
		16-20	93	69.00	9.18				
		21-25	74	66.15	11.72				
		>25	33	64.30	11.18				
	Sex	Female	127	67.69	11.57	-	-	1.540	0.125
		Male	123	65.40	11.91				
Environmental	Age	<15	50	78.16	12.40	7.66	0.00	-	-
		16-20	93	70.43	14.33				
		21-25	74	66.19	14.13				
		>25	33	69.94	12.72				
	Sex	Female	127	71.37	15.21	-	-	0.814	0.416
		Male	123	69.91	13.19				
Total	Age	<15	50	270.70	39.93	1.62	0.19	-	-
		16-20	93	266.61	29.72				
		21-25	74	258.88	32.16				
		>25	33	259.12	38.97				
	Sex	Female	127	266.02	36.62	-	-	0.878	0.381
		Male	123	262.23	31.26				

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Table 2. Comparing quality of life between thalassemia major patients based on their levels of education, history of heart disease, and numbers of transfusions

Category	Variance	Types	Number	Average	Standard Deviation	One way ANOVA		Independent T-test	
						F	P-value	T	P-value
Physical	Education	Illiterate/Primary	102	56.96	9.06	2.70	0.05	-	-
		Secondary	56	59.73	10.92				
		High school/Diploma	73	61.21	9.96				
		Above Diploma	19	58.26	12.61				
	Heart Disease	Yes	100	56.63	10.74	-	-	-2.956	0.003
		No	150	60.45	9.48				
	Transfusions	10-21	116	62.086	9.391	-	-	-	-
		22-30	134	56.179	10.024				
Psychological	Education	Illiterate/Primary	102	64.01	10.53	10.54	0.000	-	-
		Secondary	56	74.09	9.95				
		High-school/Diploma	73	69.33	10.19				
		Above Diploma	19	66.58	18.24				
	Heart Disease	Yes	100	64.31	11.77	-	-	-4.2	0.000
		No	150	70.49	10.98				
	Transfusions	10-21	116	68.793	12.866	-	-	0.979	0.329
		22-30	134	67.343	10.548				
Social	Education	Illiterate/Primary	102	64.60	12.45	5.69	0.001	-	-
		Secondary	56	64.77	12.62				
		High school/Diploma	73	71.22	9.36				
		Above Diploma	19	64.47	9.21				
	Heart Disease	Yes	100	62.23	12.55	-	-	-4.970	0.000
		No	150	69.45	10.29				
	Transfusions	10-21	116	67.319	11.777	-	-	0.949	0.344
		22-30	134	65.903	11.768				
Environmental	Education	Illiterate/Primary	102	65.25	14..03	11.7	0.000	-	-
		Secondary	56	77.93	10.74				
		High school/Diploma	73	72.84	14.10				
		Above Diploma	19	69.89	14.25				
	Heart Disease	Yes	100	65.78	13.79	-	-	-4.595	0.000
		No	150	73.91	13.64				
	Transfusions	10-21	116	73.388	15.477	-	-	-	-
		22-30	134	68.291	12.677				
Total	Education	Illiterate/Primary	102	250.81	29.74	11.34	0.000	-	-
		Secondary	56	276.52	33.35				
		High school/Diploma	73	274.59	30.49				
		Above Diploma	19	259.21	9.06				
	Heart Disease	Yes	100	248.95	30.67	-	-	-6.174	0.000
		No	150	274.29	32.51				
	Transfusions	10-21	116	271.586	36.038	-	-	3.217	0.001
		22-30	134	257.716	31.000				

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Discussion

The overall results of this study showed that adolescents with B-thalassemia major had a low QOL. Tables 1 and 2 compare the quality of lives of these patients according to their respective age groups, genders, education status, presence or absence of heart disease and the transfusions they undergo.

Well, it is necessary to mention that patients enduring chronic B-thalassemia major (or any chronic disease for that matter)- experienced a lower QOL, and as many other studies have already reached this conclusion, it is important to consider the statistical differences and lifestyle variations patients in different regions experience. In addition, most studies reinforce this correlation, the greater the public awareness is, the better the management is.

Mikelli hasfound that the QOL of these patients is low in the four aspects of physical, emotional, social and education [17]. The research done by Aydinok et al. shows that children with thalassemia major have a lower QOL than healthy children [18]. The study by Ismail et al. titled "QOL study in children and adolescents of thalassemia major 5 to 18 years" indicates that these patients have a lower QOL in four aspects compared to their control group [19]. The results are consistent with the results of our study. With all that said, in the following section we compare our findings with other studies and discuss the reasons as to why patients with B-thalassemia Major, experience a lower QOL.

The findings of Tahmasebi et al.'s study indicate that the number of blood transfusions, deferoxamine and the number of hospitalizations due to the problems caused by the disease has reduced the QOL in all affected children, especially in the social aspects, which is consistent with our results [20]. It seems that the fewer social interactions these kids have due to the deformities caused by the disease as well as the time they spend under facial treatment negatively impacts their QOL. In a study by Khani et al. in 2008, the status of various aspects of the QOL of patients with thalassemia major in Mazandaran province was examined over the course of over 15 years. The results show that patients with thalassemia are prone to various types of psychiatric disorders and are in need of psychiatric consults [21]. The results of this study are in tandem with ours. In a study by Kargar et al. in 2010 in Kerman, the QOL in school-age children with thalassemia was assessed. The average QOL of these patients in physical and emotional areas compared to other areas was lower, which in this regard, was consistent with our study [22]. Zare et al. (2012) examined the QOL of thalassemia patients in the thalassemia center of Shafa Hospital in Ahvaz. Their results show that the average overall QOL score is low regardless of age, sex, family income or level of education, all of which are consistent with our results [23]. A study by Seyedifar et al. showed that the QOL of beta thalassemia major patients depends on the type of iron-depleting treatment they received, their gender, and their socioeconomic status [24].

To compare the QOL of patients with different studies, we would first like to attract attention to a study by Pakbaz et al. from 2004. This study evaluated the QOL of B-thalassemia patients using The Dartmouth Care Cooperative Chart System (COOP) questionnaire. The scoring is ascribed from “excellent (1) to poor” (5). Scores 1 and 2 are normal. Score 3 indicates mild to moderate impairment, and scores 4 and 5 are severe abnormalities. In the current study, 50% of transfusion and non-transfusion-dependent thalassemia patients demonstrated some impairment in QOL. In the present study, it was found that increased transfusion was reversely correlated with the QOL. Though we did not go into making a dedicated comparison between the presence of transfusions and total absence of transfusions, it was easily deducible that the inconvenience caused by the activity negatively affected the patients’ QOL [25]. Another study by A.Alzaharni et al. specifically evaluates the QOL of the patients who are transfusion dependent. In this case-control study, the authors used the same WHOQOL questionnaire and reported no significant differences between their case and control groups, while stating a significance difference between the male and females with B-thalassemia Major [26]. A more local

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study from Iran by Ansari et al. (2014) used their own translated version of the WHOQOL questionnaire within 6 dimensions including overall QOL, health, physical, psychological, social, and environmental relationship. Their results show that age, higher education level, lower ferritin level and the use of oral iron chelator were associated with better QOL scores while, cardiac disease, hepatitis C and history of psychiatric disorders were associated with lower QOL scores. The results of this study closely resemble ours; though in our study, Hepatitis C and history of psychiatric disorders were not examined [27].

A study from 2020 by Maheri et al. introduced a modeling approach using the PRECEDE model to determine the predictors of QOL in Transfusion-Dependent Thalassemia patients. In their study, the authors report an association between the patients' quality of lives and transfusions with other factors such as, anxiety–depression, self-efficacy, perceived barriers, knowledge, enabling factors, and reinforcing factors; stating all as statistically significant [28]. A cross-sectional, nation-wide study by Etemad et al. from Iran assessed QOL in B-thalassemia patients and its related factors. The authors used General, Transfusion-dependent QoL (TranQol) Standard, and Multidimensional Scale of Perceived Social Support (MSPSS) questionnaires and they conclude that many factors affecting the QOL can be controlled, so social support, increased Hb levels, regular and timely blood transfusions and treatments can improve the patients' QOL [29].

Limitations of the study

One of our limitations compared to other studies was that we did not account for the presence or histories of other conditions such as psychiatric disorders and hepatitis C. Another limitation, which could be extended to other studies as well, is that single-origin questionnaires (like the WHOQOL) may not account for the regional and cultural differences that could contribute to the patients' QOL, thus calling for multiple studies which use the best parts of the existing questionnaires and modify them to best suit the cultural and societal aspects of the region, leading to a more realistic result with more applications.

Conclusion

Based on the findings of this study, patients with thalassemia were more exposed to physical, psychological, environmental and social problems. Therefore, to improve the QOL of these patients, medical treatment should be combined with emotional, psychological and social support to avoid the irreversible complications which these patients experience. Hence, treatments and management plans should be directed towards improving the QOL in thalassemia patients.

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Ethical approval

The Ethics Committee of Zahedan University of Medical Sciences certified this study under the ethics certificate number: IR.ZAUMS.REC.1393.1108.

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Conflict of interest

The authors declare no conflicting interests.

References

1. Dahlui M, Hishamshah MI, Rahman AJ, Aljunid SM. Quality of life in transfusion-dependent thalassaemia patients on desferrioxamine treatment. Singapore Med J 2009; 50(8): 794-9.
2. Sheth S, Thein SL. Thalassemia: A Disorder of Globin Synthesis. In: Kaushansky K, Prchal JT, Burns LJ, Lichtman MA, Levi M, Linch DC, editors. Williams Hematology, 10e. New York, NY: McGraw-Hill Education. 2021; pp: 785.
3. Andrews NC. Iron metabolism. Princ Mol Med 2th ed. Humana Press Inc. 2006; pp: 848-53.

[DOI: 10.22088/CJP.BUMS.9.1.8]

4. Samavat A, Modell B. Iranian national thalassaemia screening programme. Br Med J 2004; 329(7475): 1134–7.
5. Smith-Whitley K, Kwiatkowski JL. Hemoglobinopathies. Nelson Textbook of Pediatrics. 21 ed. Elsevier Inc. 2020; p: 2540-58.
6. Angastiniotis M. Lifestyle and Quality of Life. In: Porter J, Taher A, Specialties CMDDoMaM, Dimitrios F, editors. Guidelines For The Management of Transfusion Dependent Thalassemia (TDT). 2021; Pp: 228-43.
7. Saxon B. Handbook of Transfusion Medicine. 1st ed. Elsevier. 2002; p:327.
8. Thavorncharoensap M, Torcharus K, Nuchprayoon I, et al. Factors affecting health-related quality of life in Thai children with thalassemia. BMC Blood Disord 2010; 10(1): 1-0.
9. Van Dyne A, Moy J, Wash K, et al. Health, Psychological and Demographic Predictors of Depression in People with Fibromyalgia and Osteoarthritis. Int J Environ Res Public Health 2022; 19(6): 3413. doi: 10.3390/ijerph19063413. PMID: 35329109; PMCID: PMC8950397.
10. Velikova G, Brown JM, Smith AB, Selby P. Computer-based quality of life questionnaires may contribute to doctor-patient interactions in oncology. Br J Cancer 2002; 86(1): 51-9.
11. Heidari M, Alhani F, Kazemnejad A, Moezzi F. The effect of empowerment model on quality of life of Diabetic adolescents. Iran J Pediatr 2007; 17(s1): 87-94.
12. Shaligram D, Girimaji SC, Chaturvedi SK. Psychological problems and quality of life in children with thalassemia. Indian J Pediatr 2007; 74(8): 727-30.
13. Berlim MT, Pavanello DP, Caldieraro MAK, Fleck MPA. Reliability and validity of the WHOQOL BREF in a sample of Brazilian outpatients with major depression. Qual Life Res 2005; 14(2): 561-4.
14. Harper A, Power M, Orley J, et al. Development of the World Health Organization WHOQOL-BREF Quality of Life Assessment. Psychol Med 1998; 28(3): 551-8.
15. Skevington SM, Lotfy M, O'Connell KA. The World Health Organization's WHOQOL-BREF quality of life assessment: Psychometric properties and results of the international field trial a Report from the WHOQOL Group. Qual Life Res 2004; 13(2): 299-310.
16. WHO. The World Health Organization Quality of Life (WHOQOL). Organization WH, editor. https://www.who.int/publications/i/item/WHO-HIS-HSI-Rev.2012.03: World Health Organization; Available in 2012 June, 16th, 2022.
17. Mikelli A, Tsiantis J. Brief report: Depressive symptoms and quality of life in adolescents with b-thalassaemia. J Adolesc 2004; 27(2): 213-6.
18. Aydinok Y, Erermis S, Bukusoglu N, et al. Psychosocial implications of Thalassemia Major. Pediatr Int 2005; 47(1): 84-9.
19. Ismail A, Campbell MJ, Ibrahim HM, Jones GL. Health related quality of life in Malaysian children with thalassaemia. Health Qual Life Outcomes 2006; 4: 39.
20. Tahmasbi S, Aein F, Heravi karimuoe F. B-thalassemia children and quality of life: Does the present condition justify children's quality of life? J Holist Nurs Midwifery 2007; 17(1): 23-30.
21. Khani H, Majdi MR, Marzabadi EA, et al. Quality of life of Iranian β-thalassaemia major patients living on the southern coast of the Caspian Sea. East Mediterr Heal J 2012; 18(5): 539-45.
22. Kargarnajafi M, Borhani F. Quality of life in thalassemic school aged children of Kerman special diseases center in 2010. J Qual Res Heal Sci 2020; 10(2): 26-33.
23. Zarea K, Baraz Pordanjani S, Pedram M, Pakbaz Z. Quality of Life in Children With Thalassemia who Referred to Thalassemia Center of Shafa Hospital. Jundishapur J Chronic Dis Care 2012; 1(1): 32245.
24. Seyedifar M, Dorkoosh FA, Hamidieh AA, et al. Health-related quality of life and health utility values in beta thalassemia major patients receiving different types of iron chelators in Iran. Int J Hematol Stem Cell Res 2016; 10(4): 224-31.
25. Pakbaz Z, Treadwell M, Yamashita R, et al. Quality of Life in Patients with Thalassemia. Blood 2004; 16; 104(11): 3786.
26. Alzahrani RA, Almutairi OM, Alghoraibi MS, et al. Quality of life in transfusion-dependent thalassemia patients. J Taibah Univ Med Sci 2017; 12(5): 465-70.
27. Ansari S, Baghersalimi A, Azarkeivan A, et al. Quality of life in patients with thalassemia major. Iran J Pediatr Hematol Oncol 2014; 4(2): 57-63.

[DOI: 10.22088/CJP.BUMS.9.1.8]

28. Maheri M, Rohban A, Sadeghi R, Joveini H. Predictors of Quality of Life in Transfusion-dependent Thalassemia Patients Based on the PRECEDE Model: A Structural Equation Modeling Approach. J Epidemiol Glob Health 2020; 10(2): 157-63.

29. Etemad K, Mohseni P, Aghighi M, et al. Quality of Life and Related Factors in β-Thalassemia Patients. Hemoglobin 2021; 45(4): 245-9.

[DOI: 10.22088/CJP.BUMS.9.1.8]