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Evaluation of Factors influencing the birth of Thalassemia in Family Members with Thalassemia Major in Southeast Iran in 2021

Naderi Majid[1], Najafi Sahar[2], Ahmadi Mohammad Hossein[3], Ramezani Siakhulak Fariba[4], Yaghoubi Saeedeh[5]✉, Sadeghi Bojd Younes[6]✉

1. Non-Communicable Disease Research Center, Zahedan University of Medical Sciences, Zahedan, Iran
2. Department of Clinical Laboratory Sciences, School of Paramedical Sciences, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran
3. Department of Laboratory Sciences, School of Paramedical and Rehabilitation Sciences, Mashhad University of Medical Sciences, Mashhad, Iran
4. Department of Epidemiology, Health Promotion Research Center, Zahedan University of Medical Sciences, Zahedan, Iran
5. Zahedan University of Medical Sciences, Zahedan, Iran
6. Department of Laboratory Sciences, School of Allied Medical Sciences, Zahedan University of Medical Sciences, Zahedan, Iran

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Abstract

Background & Objectives: Beta-thalassemia is one of the complex diseases that causes many social and economic problems for the patient and his family. This study aimed to investigate factors influencing the birth of thalassemia (intermedia or major) in family members with thalassemia major in Sistan and Baluchistan province.

Materials & Methods: This descriptive-analytical study was conducted by census sampling on 48 families of thalassemia major patients with at least two children with thalassemia (intermedia or major) in their members. Data were collected through direct interviews and a review of patients' documents. The results were analyzed by SPSS (version 22) and Mann-Whitney U, Independent t-test, Wilcoxon, and Chi-square tests.

Results: In this study, statistical evaluations showed that the birth of thalassemia in family members with thalassemia major whose mothers are housewives was 100% and in families that had no premarital counseling was 91.7%. There was a significant relationship between variables related to mothers' awareness of thalassemia, including their place of residence and Sistani and Baluchestani ethnics, and the birth of thalassemia in family members with thalassemia major (in both cases, P-value = 0.05); However, there was no significant relationship between other variables related to mothers' awareness such as age groups and maternal education with the birth of thalassemia in family members with thalassemia major (P-Value = 0.98 and P-Value = 0.22, respectively).

Conclusion: Informing and educating before marriage for high-risk families with thalassemia children, as well as financial support for low-income families can inform parents, prevent the birth of thalassemia, and improve the quality of life of these patients.

Keywords: Beta-Thalassemia, Awareness, Prenatal diagnosis

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Introduction

Thalassemia is one of the most common blood disorders in Iran and the world whose most severe form is thalassemia major, which is caused by a defect in the synthesis of hemoglobin protein chains and causes severe anemia in a person (1, 2). Thalassemia can adversely affect the individual, family, and society. The families of these patients are exposed to many problems, including feelings of inferiority, hopelessness, anxiety, depression, worries about education, employment, medical, welfare, culture, and economic problems (3, 4).

✉**Corresponding Authors: 1. Yaghoubi Saeedeh,** Zahedan University of Medical Sciences, Zahedan, Iran
Email: Yaghoubimd@yahoo.com

2. Sadeghi Bojd Younes, Department of Laboratory Sciences, School of Allied Medical Sciences, Zahedan University of Medical Sciences, Zahedan, Iran
Email: younessadeghibojd@gmail.com.com

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Approximately 240 million people worldwide carry the gene for the disease, and about 100,000 thalassemia babies are born worldwide each year (5). Iran is located in the thalassemia belt, so this disease is the most common genetic disease in the country, and the number of patients with thalassemia major in Iran is about 25 thousand people, and every year about 800 new cases of thalassemia are added to this figure (6). Studies show that about 10% of Khuzestan, Bushehr, Hormozgan, Sistan and Baluchestan, Kerman, Gilan, Mazandaran, Isfahan, and Fars provinces carry the gene for this disease (7). The province of Sistan and Baluchistan has a population of about 2,775,014 people. This province has 1100 thalassemia major patients, with the most patients with this disease among the provinces of Iran.

Nowadays, carrier couples who are at risk of having a child with beta-thalassemia are advised not to get married; but if two healthy carriers get married, refraining from having children, choosing an adopted child, and using prenatal diagnosis (PND) services are available solutions (8, 9). Prenatal diagnosis services provide this opportunity for couples to know about the health or illness of their child during the fetal period. PND is done in two stages. In the first stage (PND 1), the genetic status of thalassemia carrier couples is checked in terms of the type of genetic defect in each of them before pregnancy and only once in their life, and in the second stage (PND 2), the genetic status has checked the fetus and definitive determination of whether the fetus is sick or healthy is done, which is necessary for every pregnancy (10).

To reduce costs and ensure the health of the community, the plan to prevent new cases of thalassemia major was implemented in 1991 in four provinces of Gilan, Mazandaran, Fars, and Khuzestan. It was reviewed in 1996, and from November 1997, it was notified to all medical universities of the country for implementation (11). PND of thalassemia centers was set up in high-prevalence provinces such as Sistan and Baluchistan. With the current approach, the birth of thalassemia in Iran has also decreased significantly; however, despite the PND of thalassemia, this decrease in Sistan and Baluchistan province has not been significant in parallel with other provinces (12, 13). Accordingly, the aim of the present study was to investigate the factors influencing the birth of thalassemia (intermedia or major) in family members with thalassemia major.

Materials and Methods

The present study was performed as a descriptive-analytical study with the census sampling method in Ali Asghar Children Hospital in Zahedan, Iran, in 2021. All families of thalassemia major patients in Sistan and Baluchistan province who experienced the birth of thalassemia (intermedia or major) in their members were included in the study. By designing a questionnaire, information was collected through direct interviews, and data from their documents were collected. The information included mother's age, mother's education, mother's job, father's education, father's job, mother's ethnicity, mother's nationality, marital status, parents' family relationship, place of residence, number of household members, monthly income level, health insurance, number of people with thalassemia in each family, type of thalassemia, thalassemia complications, death history due to thalassemia complications in the family, premarital counseling, reasons for not having premarital counseling, PND1 test, PND2 test, reasons for not having the first and second PND tests, abortion history, use of contraceptives, polygamy, and mothers' awareness of the disease. The inclusion criteria included the presence of at least two children with thalassemia (intermedia or major) in the families of patients with thalassemia major, and the exclusion criteria were having only one child with thalassemia (intermedia or major) in these families or incomplete document information. Before the interview, the necessary explanations about the current project were given to the parents, and if they expressed oral consent, the questionnaire was filled out for them. The results were analyzed by SPSS (version 22) and Mann-Whitney U, Independent t-test, Wilcoxon, and Chi-square tests.

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Results

In this study, 48 families who had at least two children with thalassemia major patients were selected and evaluated. All families had two thalassemia children, and 8 families had three thalassemia children. In this way, in the first and third birth, 100% of the children had thalassemia major, while in the second birth, 97.9% of the children had thalassemia major and 2.1% had thalassemia intermedia. The most common type of thalassemia in these patients was thalassemia major, and in Baluchestani ethnicity (93.8%), the frequency of thalassemia in family members with thalassemia major was higher than in Sistani ethnicity.

1. The birth of thalassemia based on parent's demographic characteristics

According to the parent's demographic characteristics of the studied patients (Table 1), the birth of thalassemia in family members with thalassemia major with housewife mothers was 100%. The birth of thalassemia in families with illiterate mothers and fathers was 50% and 34%, respectively. The lowest frequency of the birth of thalassemia was observed in families whose parents had at least a high school education level. The birth of thalassemia in families whose fathers' were workers and employees was 72.9% and 27.1%, respectively.

Table 1. Demographic characteristics of parents of patients with thalassemia major

Variable	Mode	Frequency	Percent
Mother nationality	Iranian	48	100%
	Non-iranian	0	0
Mother's age	< 35 years	20	41.7%
	≥ 35 years	28	58.3%
Mother's education	Unlettered	24	50%
	Elementary	21	43.8%
	Intermediate	0	0
	High school	3	6.2%

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Father's education	Unlettered	16	33.33%
	Elementary	15	31.25%
	Intermediate	9	18.75%
	High school	8	16.67%
Mother's job	Housekeeper	48	100%
	Employee	0	0
Father's job	Unemployed	8	16.7%
	Employee	1	2.1%
	Freelance	4	8.3%
	Worker	35	72.9%
Ethnicity	Baluchestani	45	93.8%
	Sistani	3	6.2%
	Others	0	0

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2. The birth of thalassemia based on the type of marriage and marital relationship

According to the information in Table 2, for parents who have a first-degree family relationship, the birth of thalassemia in family members with thalassemia major was 47.9%. Besides, 91.7% of the birth of thalassemia in family members with thalassemia major was where the parents did not have premarital counseling, and their marriage was informal. This amount was much higher than the parents whose counseling was received before the wedding, and the parent's marriage was formal and notarized. The most common reason for not having premarital counseling in these families was the lack of awareness of couples and marriage traditional concluders about premarital thalassemia screening's importance in preventing the birth of thalassemia (63.6% of cases).

In families where parents used contraceptives, especially LD™ (low-dose estrogen) pills, the birth of thalassemia in family members with thalassemia major was 87.5%.

Table 2. Information about marriage and marital relationships in parents of patients with thalassemia

Variable	Mode	Frequency	Percent
Formalization of a marriage	Notarized registration	4	8.3%
	Non-notarized registration	44	91.7%
Parental family relationship	First-class relative	23	47.9%
	Second-degree relative	0	0
	Far degree relative	7	14.6%
	Unrelated	18	37.5%
Premarital counseling	Yes	4	8.3%
	No	44	91.7%

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Reasons for not getting premarital counseling	Not knowing about marriage counseling	3	6.8%
	Lack of awareness of couples and traditional concluders about the importance of pre-marital thalassemia screening in preventing thalassemia	28	63.6%
	Lack of a marriage counseling center at the time of marriage	13	29.6%
Use of contraception	Yes	42	87.5%
	No	6	12.5%
Type of contraceptive	Quarterly ampoules	6	14.3%
	LD Tablet	26	61.9%
	Condom	1	2.4%
	Tubectomy	3	7.1%
	Other	6	14.3%

3. The birth of thalassemia based on the socio-economic status of the family

According to Table 3, the birth of thalassemia in urban families is 62.5% higher than in rural families. In families with more than or equal to 5 family members, the birth of thalassemia in family members with thalassemia major was 70.8%. In monogamous families, families with two thalassemia individuals, families with an income lower than the basic salary of the Ministry of Labor, and families with health insurance, the birth of thalassemia in family members with

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thalassemia major was higher. According to this study, heart disease was the most common cause of death due to thalassemia complications. Interestingly, in 91.7% of cases, the birth of thalassemia was present in families who did not have a history of death due to thalassemia complications (Table 3).

Table 3. Family information of patients with thalassemia major

Variable	Mode	Frequency	Percent
Dwelling	City	30	62.5%
	Village	18	37.5%
Number of family members	< 5	14	29.2%
	≥ 5	34	70.8%
Number of thalassemic individuals	2 people	40	83.3%
	3 people	8	16.7%
History of death due to thalassemia	Yes	4	8.3%
	No	44	91.7%
Reasons for death	Heart disease	2	50%
	Liver disease	1	25%
	Delay in treatment	1	25%

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Monthly income	lower than the basic salary of the Ministry of Labor	42	87.5%
	More than or equal to the basic salary of the Ministry of Labor	6	12.5%
Health insurance status	Yes	45	93.8%
	No	3	6.2%
Vehicle	Motorcycle	5	10.5%
	Car	6	12.5%
	without any vehicle	37	77%
Education about thalassemia in health centers	Yes	13	27.1%
	No	25	52.1%
	Lack of active health center	10	20.8%
Bigamy	Yes	8	16.7%
	No	40	83.3%

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4. The birth of thalassemia based on PND1 and 2 tests

The results showed that the birth of thalassemia was observed in families that did not perform the PND1 test (100%). In families who did not have a PND2 test in each pregnancy, the birth of thalassemia in family members with thalassemia major was 56.2%.

According to Table 4, one of the main reasons for not performing PND1 and 2 tests in the first and second births was the lack of knowledge about the need for PND tests, and in the third birth was the opposition of the spouse and relatives. Other reasons are briefly given in (Table 4).

Table 4. Frequency of Thalassemia in terms of reasons for not doing PND1 and 2 tests

Table 4. Frequency of Thalassemia in terms of reasons for not doing PND1 and 2 tests

Birth	First birth		Second birth		Third birth	
Reasons	Frequency	Percent	Frequency	Percent	Frequency	Percent
The opposition of spouse and relatives	3	6.2%	8	16.7%	3	37.5%
Genetic counseling weakness	0	0	0	0	0	0
Wrong in screening tests	0	0	1	2.1%	0	0
Economic causes	0	0	3	6.2%	1	12.5%
Delays in referrals to the genetics laboratory	1	2.1%	10	20.8%	2	25%
Lack of belief in the birth of thalassemia	0	0	3	6.2%	1	12.5%
religious beliefs	1	2.1%	2	4.2%	1	12.5%
Not knowing about the test	28	58.4%	15	31.2%	0	0
There was no test	15	31.2%	6	12.5%	0	0

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5. The birth of thalassemia based on mothers' awareness

Using Mann-Whitney U nonparametric test, it was found that there was a significant relationship between the birth of thalassemia in family members with thalassemia major and variables related to mothers' awareness of thalassemia such as ethnicity (Sistani and Baluchestani) and place of residence (city and village) (P-Value= 0.05 for both). But no significant relationship was found between the birth of thalassemia in family members with thalassemia major and other variables related to maternal awareness such as the mother's age and education, spouse's job and education, and family monthly income (Table 5).

Table 5. The level of mothers' awareness about thalassemia according to various factors and its relationship with the birth of thalassemia

Variable	Mode	P-Value
Mother's age	< 35	0.98
	≥ 35	
Mother's education	Illiterate	0.22
	Elementary	
	Middle	
	High school	
Spouse education	Illiterate	0.5
	Elementary	
	Middle	
	High school	
Spouse job	Employee	0.76
	Manual worker	
	Unemployed	
	Freelance	
Mother's ethnicity	Sistani	0.05
	Baluchestani	
Dwelling	City	0.05
	Village	
Monthly income	lower than the basic salary of the Ministry of Labor	0.5
	More than or equal to the basic salary of the Ministry of Labor	

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Discussion

Thalassemia major is a chronic and life-threatening disease that causes many social and economic problems for patients and their families (14). The psychological, mental, and family damage caused by this disease in a person with thalassemia has made recognizing this disease conditional on a deep and real understanding of the mentioned problems. For this reason, establishing close communication and adequate education to patients with thalassemia and their families can be very useful in recognizing this disease and preventing the birth of thalassemia (15).

This study deliberated the birth of thalassemia in family members with thalassemia major and determined its relationship with parental and family characteristics and showed that families in which parental marriage is familial (first-degree familial ratio) and traditional (non-notarized) and those who have not been counseled before the wedding are more likely to have the birth of thalassemia in family members. The most common reason for not having premarital counseling in these families was the lack of awareness of the importance of premarital thalassemia screening in couples and marriage traditional concluders. Therefore, it is suggested that clergymen who are involved in the marriage of the couple be given the necessary training on the significance of thalassemia prevention by experienced professors (trained clerics in the field of thalassemia) in the seminaries to get acquainted with the importance of premarital tests and preventive approaches such as the stages of prenatal diagnosis of thalassemia, and in the later stages, if the couple has religious questions about abortion, they will be confronted with more appropriate answers from the clergymen (12). Consistent with these results, Jafari et al. examined the effectiveness of the thalassemia prevention plan in increasing the level of awareness of couples and the withdrawal of carrier couples from marriage. They stated that despite the relatively good understanding, a high percentage of carriers still accept these high-risk marriages (16). It can be said that although education can increase the level of awareness in individuals, incomplete information and failure to recount the dangers and problems for carrier couples after marriage increases the number of births with thalassemia major.

Consistent with these results, Rezaie Keikha et al. also evaluated the knowledge and practice of thalassemia carrier couples in the Sistan region. They concluded that most subjects do not know about preventing thalassemia major, and it is better to prepare educational programs to improve their learning (17). According to these results, the weakness of education systems and health counseling services in many cities and the lack of awareness of couples about the direct relationship between the occurrence of these diseases and consanguineous marriages can be related to increasing the birth of thalassemia major and affects the quality of life of patients (18). Parents' low level of education in our study and the increase in the birth of thalassemia in family members with thalassemia major indicate the important role of the education system, especially in families with thalassemia. Therefore, due to mothers' and fathers' low literacy levels, educational methods appropriate to the literacy level and their repetition and continuity are essential, which can educate people on a large scale by making television or radio programs in the local dialect and broadcasting them through provincial channels. The results of this study showed that in Sistan and Baluchistan, the birth of thalassemia is more common in families with thalassemia children whose fathers are workers and earn lower than the basic salary of the Ministry of Labor. In the study of Joulai et al. in 2014 in Fars province, it was shown that one of the main reasons for the birth of thalassemia major (34%) is not receiving medical care due to financial problems, which is in line with the results of the present study (19). Studies show that increasing mothers' awareness and improving their attitude towards thalassemia enhance patients' living conditions (5, 20). In this regard, Kargar Najafi et al. by examining the knowledge and attitude of mothers with

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children with thalassemia, it was shown that after the implementation of the family empowerment plan, which affects the quality of life of patients and their families, the level of awareness and attitude about their children's disease had increased significantly (21). In continuation of the aforementioned study, in the present study, it was found that there is a significant relationship between the birth of thalassemia in family members with thalassemia major and variables related to maternal awareness such as ethnicity (Sistani and Baluchestani) and place of residence (city and village) (P-Value = 0.05 for both). However, there was no relationship between other variables related to mothers' awareness, such as mothers' age and education with the birth of thalassemia (P-Value = 0.98 and P-Value = 0.22, respectively). In our study, the birth of thalassemia in family members with thalassemia major was observed only in families who did not have PND1 and 2 tests. One of the main reasons for not having PND 1 and 2 tests in the first and second births was not knowing about the PND test, and in the third birth, the reason was the opposition of his wife and relatives to the tests. Similar to the present study, Miri Moghadam et al. examined 148 parents with thalassemia children and concluded that the main cause of the birth of thalassemia in the family is the lack of premarital tests (12). In the study of Abdul Wali Khan et al in 2020, it was shown that one of the reasons for not performing the PND test is the lack of awareness of the PND test (23%), which is consistent with the present study (9).

According to these results, the importance of education and information from health centers about premarital and pregnancy tests in Sistan and Baluchistan is evident. These bases are the first level of health care services. Educating and raising public awareness, mainly middle and high school students, and encouraging people about getting married to perform thalassemia screening tests, can prevent the birth of children with this disease. For the first time in Iran, in Sistan and Baluchistan province, factors influencing the birth of thalassemia (intermedia or major) in family members with thalassemia major were investigated, which is the most important advantage of the present study. Considering that in the present study, part of the information was collected through interviews with families with thalassemia major patients, it is possible that not all of them will provide the complete information correctly, however, it tried to get the information correctly and analyzed it in the present study. It is suggested that similar studies be conducted in other provinces of the country in order to better comprehend all aspects of this issue and prevent the incidence of thalassemia.

Conclusions

In the present study, lack of premarital tests and parental awareness was the most crucial cause of the birth of thalassemia in family members with thalassemia major. This may be due to the general ignorance and lack of justification of marriage concluders about the importance of preventing thalassemia in society and the ways in which it is transmitted from parents to children. Therefore, to acquaint the public with the importance of performing premarital tests and the possibility of diagnosing thalassemia before birth, it is possible to prepare educational programs appropriate to the community's needs in the local dialect and through the mass media. In this way, effective steps can be taken to make every effort to reduce this health, social and economic problem.

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Conflict of interests

The authors declare that they have no conflict of interest.

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