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Saja Hammadi Fahad
Diyala Health Directorate, Diyala Governorate, Iraq

Ghadeer Noori Salih
Diyala Health Directorate, Diyala Governorate, Iraq

Aliaa Ibrahem Khaleel
Diyala Health Directorate, Diyala Governorate, Iraq

Corresponding Author:
Saja Hammadi Fahad
Diyala Health Directorate, Diyala Governorate, Iraq

Premarital screening of haemoglobinopathies: Experience of the major centre of Diyala Governorate, Iraq

Saja Hammadi Fahad, Ghadeer Noori Salih and Aliaa Ibrahem Khaleel

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Abstract
Background: Thalassemia is the most common single genetic disorder. Being a preventable disease, the "premarital screening program" was established. The objective of the study was to determine the prevalence of Haemoglobinopathies among couples attending a center for premarital screening in Baquba center of Diyala governorate.
Materials and Method: During a period of 1 year, 7000 couples were screened for hemoglobinopathies. Screened subjects were categorized according to variant frequency among them. HPLC done for each subject and the result analyzed statistically.
Results: The prevalence of β-thalassemia trait was 2.45 (172/7000) with nearly equal proportions between male and female. HbD Punjab trait and sickle cell trait were less common.
Conclusion: A relatively lower prevalence rate of heterozygous β-thalassemia has been present among the studied sample in comparison to prevalence figures from reports in the other governorate.

Keywords: Premarital screening, beta thalassemia, sickle cell disorders, Diyala

Introduction
Haemoglobinopathies are a collection of genetic illnesses that may be roughly categorised as either quantitative or qualitative abnormalities. This condition is widely prevalent worldwide and is commonly hereditary [1, 2]. Thalassemia is a significant public health issue in specific parts of the world, including nations in the Mediterranean, Middle East, Southeast Asia, and India. The condition is a result of inadequate synthesis of α or β globin chains [3], leading to the two primary types of thalassemia: α and β thalassemia. The majority of thalassemias are inherited in a Mendelian recessive manner [5]. According to the World Health Organisation (WHO), around 7% of the global population are carriers of trait genes for haemoglobin opathies, namely sickle cell disease and thalassemia [5]. Various countries around the world have introduced preventive screening programmes, including premarital screening. These programmes are designed to identify individuals who carry haemoglobin disorders in order to evaluate the likelihood of having children with a severe form of the disease. The ultimate goal is to decrease the occurrence of β-thalassemia and SCD [6, 7]. The objective of this study is to identify the frequency of various hemoglobinopathies among couples attending the premarital screening programme at Ba'quba teaching hospital, which is the primary facility in Diyala governorate, Iraq.

Method
1. **Study design and time:** This descriptive study was conducted on 7000 samples from December 2022 to December 2023, subjects attending marriage centers in Ba'quba Teaching hospital and underwent routine mandatory tests.
2. **Sample and Method:** Whole blood was taken from attender subjects to perform blood group, automated Complete Blood Count (CBC) (by Sysmex Coulter automated cell counter) and Hb variant analysis by HPLC (Bio-Rad D 10), virology testing to exclude contagious viral diseases & VDRL for syphilis. Sickling test done when indicated in some cases.
3. **Study area:** Diyala province has six premarital screening program units, two of them in baquba and the others in its subsidiary districts. Our study done at the major unit

of those centers in baquba teaching hospital.

4. Statistical analysis

Data were collected, summarized, analyzed and presented using Statistical Package for Social Sciences (SPSS) version 22. Qualitative (categorical) variables were expressed as number and percentage, whereas, quantitative (numeric) variables were expressed as mean and median. The significance threshold was established at $p<0.05$

Ethical issues

The data taken from the files without Subjects' names and the privacy of the participants were protected. Moral consent requirements were done.

Results

This descriptive study done during 1 year from January 2023 till January 2024 and screened 7000 persons who attend the premarital screening program as a couple in Baquba teaching hospital/ Diyala. Their mean age was 27.54 year ranged between 17 and 55 years, the β-thalassemia trait was the commonest encountered type among the haemoglobinopathies (Table 1).

Table 1: The Frequency of Hb patterns among studied couples

Hb patterns	N (%) / Total (100)
B-thalassemia trait	172 (2.45)
Hemoglobin D trait	15 (0.21)
Hemoglobin C trait	7 (0.1)
Sickle cell trait	5 (0.071)
Hemoglobin C homozygous	1 (0.014)
Hemoglobin E trait	5 (0.071)
Hemoglobin E homozygous	1(0.014)
Normal	6794 (97.05)

Table 2: Distribution of the subjects regarding gender

Category	Male (%)	Female (%)	Total (%)	p-value
B-thalassemia trait	84 (1.2)	88 (1.25)	172 (2.45)	0.2
Sickle cell trait	4 (0.057)	1 (0.014)	5 (0.071)	0.02
Hb C trait	6 (0.085)	1 (0.014)	7 (0.1)	0.008
Hb C homozygous	1 (0.014)	0	1 (0.014)	0.1
Hb E trait	4 (0.057)	1 (0.014)	5 (0.071)	0.02
Hb E homozygous	1 (0.014)	0	1 (0.014)	0.1
Hb D trait	6 (0.085)	9 (0.12)	15 (0.21)	0.2
Normal	3397 (48.52)	3397 (48.52)	6794 (97.05)	<0.05
Total	3503 (50.03)	3497 (49.9)	7000 (100)	0.2

Table 3: Parameters of B- thalassemia trait cases

Parameter	B- thalassemia trait (Mean±SD)
RBC($x10^{12}$)	5.7±0.7
HB(g/dl)	11.99±1.57
MCV(fl)	65.11±5.3
MCH(pg)	20.44±2.40
HbA2	5.3±0.8
HbF	1.5±1.8

Table 4: The mean and SD of the variant Hb (HPLC) windows

Variant hemoglobin	Mean ±SD
HbC trait	32±3.7
HbS trait	31.20±3.25
HbD trait	32.62±4.9
HbE trait	16.6±0.5

Discussion

The program of premarital screening done in most of Iraqi provinces which is similar to many Arab countries like, the Kingdom of Bahrain [8] Saudi Arabia in which the screening become mandatory in 2004 [9]. In respect to the age mean, our results were comparable to those obtained by Hayawi, *et al*. in a study conducted in Al-Russafa, Baghdad [10]. Regarding frequency distribution according to gender, were statistically insignificant in β- thalassemia trait & HbD while significant in other variant and other reports like Salama RA, *et al*. [11]. This is merely one related to sample selection. Our study shows that β thalassemia frequency were the commonest, which is similar to the result of Adnan B *et al*. [12] Attiyah *et al*. [13] in Karbala province in which the commonest hemoglobinopathies were the β thalassemia, in the United Arab Emirates the frequency of β thalassemia was (2.98%). despite being the commonest in our studied group but statistically was lower frequent (2.45%) than comparable reports in other Iraqi provinces studies like Sulamani [14], Irbil [15], with frequency of 4.14% and 6.9% respectively, this may be explained by sample size differences. On the other hand, the frequency of HbD was the second most common followed by HbC trait unlike comparable studies in the same studies [14, 15] Nineveh [13] study, Hamadanyia [16] may be attributed to the single centre experience in the current study with attender attributed

mostly to Baquba city population.

Conclusion

β-thalassemia trait was the most common type of all hemoglobinopathies in our center attender with prevalence rate of 2.45%. Premarital screening programs are necessary for prevention of high-risk couples. Increasing education of the disease by education by medical counselling and public media and the provision of facilities for antenatal diagnosis are essential to decrease the homozygous thalassemia population.

Conflict of Interest

Not available

Financial Support

Not available

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