



Awareness of β -Thalassemia Among Non-Medical Students in UAE

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DECLARATION

We declare that this Community Medicine Project, “Awareness of β -Thalassemia among non-medical students in UAE - A Cross Sectional Study” is an original research work conducted and submitted in partial fulfilment of the requirement of our Project Course in the MD program.

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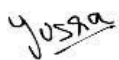
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CERTIFICATE OF COMPLETION

I, Dr.Nermine Nosseir, certify that this Project Report on “Awareness of β -Thalassemia among non-medical students in UAE” is research carried out by Samreen Khan (2022MD08), Yusra Parveen (2022MD26), Sabrina Mamtaz (2022MD19), Abdulla Patel (2022MD18) under my supervision and guidance.

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BONAFIDE CERTIFICATE

I, Prof. Shatha Al Sharbatti, do hereby certify that this Project Report on “Awareness of β -Thalassemia among non-medical students in UAE” is a bonafide work submitted by Samreen Khan (2022MD08), Yusra Parveen (2022MD26), Sabrina Mamtaz (2022MD19), Abdulla Patel (2022MD18) in partial fulfillment of the requirements of the Project Course in the MBBS program, and it is accepted.

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ABSTRACT

➤ **Title:**

To Assess the knowledge, attitude and perception of Beta Thalassemia among non-medical university students in UAE.

➤ **Objectives:**

- To determine the extent of knowledge that non-medical students have about thalassemia, including its causes, symptoms, and prevention methods.
- To evaluate non-medical students' awareness of the relationship between consanguineous marriages (marriage between relatives) and the increased risk of thalassemia in offspring, and their perceptions of this risk within the context of cultural practices in the UAE.

➤ **Methods:**

A descriptive cross-sectional study was conducted among 430 non-medical students from 33 UAE universities between December 2024 and September 2025. Data were collected using a structured self-administered online questionnaire assessing socio-demographic characteristics, knowledge, attitudes, and perceptions. Statistical analysis was performed using SPSS version 28 with chi-square tests to identify associations ($p < 0.05$).

➤ **Results:**

Only 35.6% of participants had prior awareness of Beta-thalassemia, mainly through social media, while 64.4% had never heard of the disorder. Knowledge about its genetic cause, symptoms, and preventive measures was limited. Although 54.2% trusted genetic testing, many were uncertain about its reliability. Cultural and social barriers—particularly stigma, family influence, and lack of awareness were key obstacles to premarital screening. Over half (58.6%) recognized consanguineous marriage risks, and 67.2% expressed interest in learning more.

➤ **Conclusion:**

Findings highlight a considerable knowledge gap regarding Beta-thalassemia among non-medical students in the UAE. Targeted educational interventions, awareness campaigns, and integration of genetic health topics into university curricula are recommended to improve awareness and promote preventive practices aligned with national thalassemia control efforts.

Keywords: Beta-Thalassemia, Genetic Screening, Consanguinous Marriages, Perception, Knowledge, Attitude.

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LIST OF SYMBOLS, ABBREVIATIONS AND NOMENCLATURE

UAE: United Arab Emirates

IRB: Institutional Review Board

P-value: Probability Value

GMU: Gulf Medical University

RBC: Red Blood Cell

CHAPTER ONE

INTRODUCTION

Beta-thalassemia major (commonly known as "Cooley's Anemia" or "Mediterranean Anemia") is a severe hereditary blood disorder caused by a reduction or absence of beta-globin chain synthesis, leading to decreased hemoglobin levels, reduced red blood cell (RBC) production, and chronic anemia. This condition is inherited in an autosomal recessive pattern, typically affecting individuals who are homozygous or compound heterozygous for beta-thalassemia mutations.⁽¹⁾ The clinical presentation of thalassemia major occurs between 6 and 24 months of age, with affected children displaying failure to thrive, pallor, hepatosplenomegaly, skeletal deformities, and craniofacial abnormalities. In untreated cases, complications such as stunted growth, poor musculature, jaundice, and leg ulcers can also arise.

Globally, the prevalence of beta-thalassemia is highest in regions with a historical presence of *Plasmodium falciparum* malaria, including Mediterranean countries, the Middle East, Central Asia, Southern China, and parts of Southeast Asia. Population migration and intermarriage have contributed to the global spread of thalassemia, making it a worldwide health issue, including in the United Arab Emirates (UAE).⁽¹⁾ Current estimates indicate that approximately 1.5% of the global population are carriers of beta-thalassemia, with 60,000 symptomatic individuals born annually. However, there is a disparity between the number of carriers and those receiving treatment, with only about 200,000 registered patients receiving regular care worldwide. ^(2,3,4)

Thalassemia places a substantial burden on healthcare systems due to the need for lifelong blood transfusions and iron chelation therapy, which are required for survival. Given the significant health and economic impacts, early diagnosis and effective management are essential. Public awareness and understanding are key to reducing the burden of beta-thalassemia through measures such as premarital screening, genetic counseling, and education.⁽²⁾

In the UAE, a growing, diverse population presents unique challenges in managing thalassemia. National strategies like premarital screening programs aim to reduce the incidence, but success depends largely on public awareness and attitudes toward the disease. While studies have assessed the awareness of thalassemia among medical professionals, limited research exists on the knowledge, attitude, and perception of non-medical students—an important group that can influence public opinion and behavior.⁽²⁾ Moreover, they are of marital age and should be aware that any hereditary disorders their future partner may have such as β -Thalassemia major may lead to severe physical, emotional and economic burdens with their future children.⁽⁵⁾

Premarital screening involves genetic testing to determine whether prospective couples are carriers of thalassemia or other hereditary conditions.⁽³⁾ While such programs are effective in reducing the incidence of the disease, they also raise complex social and cultural questions, particularly around marriage decisions, partner selection, and societal attitudes toward genetic compatibility. In some communities, carrier couples may face social pressure to reconsider marriage plans, which can influence how individuals perceive the importance of genetic testing in personal and family life. These attitudes are shaped by cultural, religious, and personal beliefs, and they are critical in determining the effectiveness of public health programs.⁽⁶⁾

Non-medical university students, as part of the young population, represent a crucial group whose attitudes and behaviors can influence broader public health trends. Understanding how they perceive genetic testing, premarital screening, and its impact on marriage decisions is important for designing effective awareness campaigns and shaping future health policies.⁽⁷⁾

Since marriage remains a significant cultural milestone in the UAE, it is vital to explore whether students view genetic testing as a helpful tool or as a potential barrier in choosing their life partners.⁽³⁾

This research will assess the attitudes of non-medical students in UAE universities toward the role of genetic testing for thalassemia in marriage decisions, including their perceptions of premarital screening. It will also examine whether students are willing to consider genetic compatibility in their partner selection and how screening programs influence their views on marriage.⁽³⁾

➤ *Rationale*

This study aims to assess the knowledge, attitude, and perception of beta-thalassemia among non-medical university students in the UAE. As the future leaders, advocates, and influencers within society, understanding their level of awareness is critical to identifying gaps that could hinder public health efforts.

By identifying knowledge gaps, this research can help provide information and awareness about β -Thalassemia to empower individuals to make informed decisions about their health and relationships, ultimately contributing to the reduction of thalassemia cases in the UAE. ⁽⁸⁾ Additionally, the study will explore potential barriers that students may face when considering genetic test results in their marriage decisions.

➤ *Objectives*

- *Primary Objective:*

- ✓ To determine the extent of knowledge that non-medical students have about thalassemia, including its causes, symptoms, and prevention methods.

- *Secondary Objectives:*

- ✓ To examine non-medical students' attitudes toward the role of genetic testing for thalassemia in marriage decisions, including their views on premarital screening and how it influences their thoughts on partner selection and marriage within the UAE.
- ✓ To explore any cultural or social barriers that may affect students' awareness and attitudes toward thalassemia screening and prevention.
- ✓ To evaluate non-medical students' awareness of the relationship between consanguineous marriages (marriage between relatives) and the increased risk of thalassemia in offspring, and their perceptions of this risk within the context of cultural practices in the UAE.

CHAPTER TWO

LITERATURE REVIEW

Beta-thalassemia is a severe hereditary blood disorder caused by the reduced or absent synthesis of the beta-globin chains of hemoglobin, resulting in chronic anemia, ineffective erythropoiesis, and multi-organ complications. Given its autosomal recessive inheritance, the condition is particularly significant in populations with high carrier prevalence, where consanguineous marriages are common. Premarital and carrier screening programs have been globally recognized as effective preventive strategies. However, the awareness, knowledge, and attitudes of university students toward thalassemia screening vary across cultural and social contexts. (1,2)

Several studies in South and Southeast Asia have highlighted substantial gaps in knowledge and misconceptions about beta-thalassemia. Hossain et al. reported that in Bangladesh, university students exhibited limited understanding of thalassemia's genetic transmission, complications, and preventive measures, often influenced by cultural myths and misperceptions. Similarly, Hasan et al. emphasized that even high-risk indigenous students lacked sufficient awareness, underlining the persistent need for targeted educational interventions. These findings suggest that knowledge gaps are not solely confined to the general population but are evident among educated young adults who are potential future parents. (15,20)

The social and cultural environment also plays a critical role in shaping attitudes toward thalassemia prevention. In Thailand, Xu et al. identified barriers to screening in migrant populations, including language difficulties, low health literacy, fear of social stigma, and limited access to health services. These social constraints hinder participation in screening programs despite their proven efficacy. Comparable trends were observed in the UAE and Malaysia, where Abd El-Kader and Saleh and Ko Latt et al. noted that although students recognized the importance of premarital screening, cultural norms and familial influence often dictated decisions, sometimes discouraging proactive engagement. (16-18,19)

Knowledge and attitudes toward genetic testing further influence preventive practices. Likhanov et al. found that students' genetic literacy correlated with acceptance of screening and counseling, indicating that educational interventions addressing the genetic basis of thalassemia could improve preventive behaviors. In Pakistan, Rehman et al. demonstrated that awareness among parents of thalassemia patients did not always translate into consistent preventive practices, reflecting the complex interplay of knowledge, cultural expectations, and social pressures. Hossain MJ et al. similarly emphasized that despite awareness of safe marriage practices for thalassemia prevention, social norms around marriage choices often limited the application of this knowledge. (21-23)

Cross-country comparisons reveal that while awareness levels vary, common barriers persist, including misconceptions about inheritance, low perceived susceptibility, social stigma, and insufficient integration of screening programs into the educational and healthcare systems.

Knowledge, attitude, and practice studies in Pakistan and Bangladesh indicate that targeted awareness campaigns, combined with culturally sensitive counseling, can significantly improve the willingness of university students to undergo screening and influence future reproductive choices. Notably, Xu et al. suggested that optimal screening strategies must account for local sociocultural contexts, language barriers, and accessibility to ensure effective implementation. (17,24)

Overall, the literature indicates that improving awareness and attitudes toward beta-thalassemia among university students requires a multi-faceted approach. Educational programs tailored to non-medical students, leveraging media campaigns and peer education, are crucial to correcting misconceptions. Cultural sensitivity is paramount, as familial and societal norms strongly influence marriage and reproductive decisions. Additionally, integrating genetic literacy into university curricula and promoting premarital screening as a normative preventive measure could bridge the gap between knowledge and practice. By addressing both informational deficits and socio-cultural barriers, public health initiatives can empower young adults to make informed reproductive choices, ultimately reducing the incidence of beta-thalassemia in high-risk populations. (15,17,24)

In conclusion, while there is increasing recognition of the importance of thalassemia awareness among university students, persistent knowledge gaps, cultural constraints, and social pressures impede effective preventive practices. Strategic interventions that combine education, counseling, and culturally sensitive awareness campaigns are essential to foster informed decision-making, mitigate hereditary risks, and support the broader public health goal of thalassemia prevention in regions with high carrier prevalence.

CHAPTER THREE

MATERIAL AND METHODS

➤ *Study Design:*

This study is a cross-sectional quantitative descriptive investigation conducted across 33 universities in the UAE. The data collection took place between December 2024 and September 2025, covering a wide range of students from different non medical universities across UAE within this period. Following completion of data collection, data analysis commenced on 12th October 2025.

➤ *Subject: Study Population sample*

The study population consisted of non-medical university students residing in the UAE who were 18 years and above. From this population, a sample of 430 students was selected on a random basis to participate in the study, providing a representative snapshot of awareness levels within this group.

➤ *Inclusion/ Exclusion Criteria*

The study included non-medical university students residing in the UAE who were above the age of 18, representing the marital age group. Both males and females from all ethnic backgrounds were eligible to participate. Students were excluded if they were enrolled in medical colleges or were below 18 years of age.

➤ *Sampling Strategy*

A non-probability convenience sampling strategy was used to recruit participants. Students aged 18 years and above from various non-medical universities in the United Arab Emirates (UAE) were invited to participate. We visited multiple university campuses and approached students in common areas to complete the questionnaire. Participation was voluntary, and inclusion was based on accessibility and willingness to participate.

➤ *Sample Size Determination*

$$N = \frac{z^2 \times p(1-p)}{e^2}$$

- N is the sample size,
- z is the z-score corresponding to a 95% confidence level (1.96),
- p is the estimated proportion of the population with awareness of Beta-Thalassemia in UAE (25% or 0.25)
- e is the margin of error. (4% or 0.04) $N = 3.84 \times [0.25 - 0.0625] / 0.0016 = 450$

Sample size: 450 non-medical university students

➤ *Study Duration and Setting*

Study will be conducted in non medical universities in UAE, shopping malls and other public places. Permission will be taken from the respected authorities for conducting the research in those particular areas.

The study will span nine months, encompassing participant recruitment, data collection, data processing, and analysis.

➤ *Variable: Predictor(Dependent), Outcome (Independent), Co-founder*

The study included both independent and dependent variables relevant to the objectives.

The independent variables were age, gender, nationality, year of study, family history of thalassemia, and exposure to health education programs. These factors were considered potential predictors of awareness and attitudes toward β -thalassemia.

The dependent variables included the participants' knowledge and awareness about thalassemia, attitudes toward premarital screening and genetic testing, and perceptions regarding consanguineous marriage and cultural barriers.

Potential confounding variables such as educational background, previous exposure to awareness campaigns, and socioeconomic status were identified, as they could influence awareness levels and attitudes independently of the main predictors.

➤ *Tool/Instrument for Data Collection/ Type*

The primary data collection tool will be a self-administered questionnaire. This questionnaire is designed to capture essential information about participants' knowledge, attitudes, and perceptions of beta thalassemia. It will be developed based on existing literature and adapted to the local context. Validation will be performed by reviewing online research articles and journals to ensure accuracy and relevance.

➤ *Preparation/ Choosing/ Translation*

Before starting data collection, the research team identified the target population as non-medical university students aged 18 years and above in the United Arab Emirates (UAE). Ethical approval was obtained from the relevant institutional review board. The questionnaire was finalized after reviewing relevant literature and ensuring that the questions were clear, concise, and aligned with the study objectives. The team organized visits to different universities to facilitate data collection and ensured that participants were informed about the purpose of the study and their rights before participation.

A non-probability convenience sampling method was used to select participants. The researchers approached students in various non-medical universities across the UAE, inviting those who met the inclusion criteria (aged 18 and above, enrolled in a non-medical program) to voluntarily complete the questionnaire. This method was chosen due to its practicality and accessibility, allowing researchers to gather data efficiently from a diverse student population.

The questionnaire was administered in English, as it is widely used as the medium of instruction in most UAE universities. Therefore, no translation was required.

➤ *Data collection method/ Operational Plan/ Budget*

Data were collected using a self-administered structured questionnaire. The questionnaire was distributed to students from various non-medical universities in the United Arab Emirates (UAE). Researchers visited campuses in person and approached students in common areas such as cafeterias, libraries, and study halls. After explaining the study purpose and obtaining verbal consent, participants who met the inclusion criteria (aged 18 years and above, enrolled in a non-medical program) were invited to complete the questionnaire voluntarily. Responses were collected anonymously to ensure confidentiality and encourage honest participation. Completed questionnaires were reviewed for completeness before data entry.

The research went through a validated operational plan that included the ethical approval of the study, then the recruitment of the participants and data collection, and analysis. Since the survey was done online, the study did not incur many expenses, limited to software access and printing needs, which were covered by institutional resources.

ITEMS	AMOUNTS (DHS)
Report printing and transportation	500
Publication	1500
total	2000

Ethical Consideration and Human Subject Protection Ethical guidelines will be strictly adhered to:

- **Informed Consent:** Participants will be fully informed about the study objectives, and written consent will be obtained before they complete the questionnaire.
- **Anonymity and Confidentiality:** Participants' responses will remain anonymous, and only authorized team members will have access to the data.
- **Data Confidentiality:** All collected data will be kept confidential and will be used solely for research purposes.
- **Participant Welfare:** The study will not involve any form of physical, emotional, or social harm, nor will it include drug administration.

➤ *Analytical Approach*

The data stored in the excel sheet will be added to an online programme used for statistical analysis. The programme used will be a statistical package of social science software (SPSS), version 30.

Categorical variables will be summarized using frequencies and percentages, while continuous variables will be presented with means and standard deviations. Pearson's chi-square test will assess associations between categorical variables, the t-test will compare mean differences in continuous variables, and logistic regression will identify predictors of knowledge, attitudes, and perceptions among the public.

CHAPTER FOUR

RESULTS

➤ Table 1 — Sociodemographic Characteristics

- *Gender*

The sample consisted of slightly more males (53.7%) than females (46.3%), showing a fairly balanced gender distribution. This balance strengthens the generalizability of the findings across both genders. The slight male predominance may reflect university enrollment trends in the UAE or sampling characteristics. Since gender was later found *not significantly associated* with knowledge or attitudes about thalassemia, this distribution suggests that awareness gaps are widespread across both male and female non-medical students rather than gender-specific.

- *Age Group*

Most participants were between 20–21 years (39.8%), followed by 18–19 years (32.6%), showing that the sample primarily consisted of early university-level individuals. Smaller groups included those aged 22–23 (17.0%) and 24+ (10.7%). The age spread is important because later analyses revealed a significant association between age and knowledge ($p = 0.018$), with older students demonstrating better awareness. This suggests that accumulated exposure to academic, social, or community settings contributes to increased understanding about thalassemia as students progress in age.

- *Year of Study*

A large proportion of participants were in their 1st year (33.3%), followed by 2nd year (29.1%) and 3rd year (24.2%), with very few from higher years. This creates a highly representative picture of younger students early in their academic journey. Since year of study showed no direct significant association with attitude but did show a *positive linear trend*, these results imply that additional years in university gradually contribute to improved perceptions toward genetic screening. This may reflect increased maturity, exposure to health-related content, or participation in awareness campaigns over time.

- *Field of Study*

Students came from a wide variety of majors, with the largest groups from Business & Management (31.2%) and Computer & IT (24.4%). Since none of the fields of study showed a significant association with knowledge or attitude, this suggests that gaps in thalassemia awareness exist universally across non-medical academic tracks. The finding also highlights the need for integrating genetic literacy or health awareness content across diverse university majors, rather than limiting education to healthcare-related disciplines.

- *University Location*

Most participants studied in Dubai (71.2%), while others were distributed across Ajman (18.8%), Sharjah (6.5%), and smaller numbers in other emirates. This heavy concentration in Dubai reflects either the geographic location of the research team or greater university density in that emirate. The imbalance suggests that knowledge and attitudes captured may be more reflective of Dubai-based non-medical youth. Underrepresentation of other emirates indicates the need for wider sampling in future studies to ensure national representativeness.

- *Ethnicity*

The two largest ethnic groups were South-East Asian (46%) and Eastern Mediterranean (45.1%), reflecting the multicultural landscape of UAE universities. The ethnic diversity enhances the relevance of findings across expatriate populations. Since ethnicity did not significantly influence knowledge or attitudes, this indicates that poor awareness of thalassemia transcends cultural backgrounds. This is especially relevant because thalassemia prevalence varies widely across ethnicities, suggesting that even high-risk groups may lack adequate understanding.

- *Marital Status*

Almost all participants were single (95.3%), which aligns with the young age profile of the sample. While marital status did not show a significant relationship with knowledge or attitudes, married participants tended to show more positive attitudes toward screening, possibly due to increased personal relevance. However, their small sample size limits generalizability. Overall, the high number of single participants means their preferences and attitudes are particularly relevant for premarital screening campaigns aimed at youth. (Table 1)

Table 1 Sociodemographic Characteristics of Participants (n = 430)

Variable	Category	Frequency (n)	Percent (%)
Gender	Male	231	53.7
	Female	199	46.3
Age Group (years)	18–19	140	32.6
	20–21	171	39.8
	22–23	73	17.0
	24+	46	10.7
Year of Study	1st Year	143	33.3
	2nd Year	125	29.1
	3rd Year	104	24.2
	4th Year	53	12.3
	5th Year	2	0.5
	6th Year	3	0.7
Field of Study (Major)	Business and Management	134	31.2
	Accounting and Finance	59	13.7
	Engineering and Architecture	55	12.8
	Psychology and Social Sciences	47	10.9
	Media, Arts and Communication	30	7.0
	Computer and IT	105	24.4
University Locations	Abu Dhabi	4	0.9
	Dubai	306	71.2
	Sharjah	28	6.5
	Ajman	81	18.8
	RAK	9	2.1
	UAQ	1	0.2
	Fujairah	1	0.2
Ethnicity	African Region	15	3.5
	Americas Region	6	1.4
	South-East Asia Region	198	46.0
	European Region	10	2.3
	Eastern Mediterranean Region	194	45.1
	Western Pacific Region	7	1.6
Marital Status	Married	20	4.7
	Single	410	95.3
Total Participants		430	100.0

➤ Table 2 — Knowledge & Awareness About Beta Thalassemia

• *Heard of Beta Thalassemia*

Only 35.6% had heard of beta thalassemia, showing a major awareness deficit. The lack of exposure is significant because thalassemia is one of the most common genetic disorders in the region. The low awareness suggests limited coverage of genetic disorders in general education settings, highlighting the need for targeted awareness strategies in schools and universities.

• *Perceived Cause*

While 57.7% correctly identified it as a genetic disorder, 42.3% incorrectly attributed it to bacterial, autoimmune, or nutritional causes. This reveals substantial confusion regarding basic disease etiology. Misconceptions pose a barrier to effective prevention, as individuals who misunderstand the hereditary nature may underestimate the importance of premarital screening.

• *Perceived Risk Groups*

The majority (72.1%) correctly recognized that individuals with a family history or everyone equally are at risk. This indicates some general understanding of hereditary transmission.

However, 27.9% believed only certain ethnic groups are at risk, which may reflect partial knowledge influenced by cultural beliefs rather than scientific understanding.

• *Preventive Measures*

Only 41.6% recognized genetic testing before marriage as a preventive method, highlighting a crucial knowledge gap. Since premarital screening is a national strategy in the UAE, the lack of awareness of such a fundamental prevention measure underscores insufficient dissemination of genetic education.

- *Attendance at Educational Sessions*

A large majority (83.3%) had never attended an educational session about thalassemia. This directly explains low awareness levels. Without structured exposure to genetic literacy, misconceptions and indifference toward screening may persist.

- *Interest in Learning More*

Despite low awareness, 67.2% expressed interest in learning more. This indicates openness to educational interventions and an unmet need for accessible information. The strong willingness to learn suggests that awareness campaigns may be highly effective if implemented. (Table 2) Fig. 1

The bar graph shows that social media (16.5%) is the most common source of information about beta thalassemia among participants, highlighting the strong influence of digital platforms on students' health awareness. High school education contributed only 9.5%, indicating limited curricular coverage of genetic disorders. Other sources—such as family, friends, healthcare professionals, and community programs—played minimal roles, suggesting that formal and interpersonal channels are underutilized. Overall, the figure reflects significant reliance on informal digital sources and limited structured health education, contributing to widespread knowledge gaps. Strengthening school curricula and university-based awareness initiatives is essential to improve accurate understanding.

Table 2 Participants' Knowledge and Awareness of Beta Thalassemia (n = 430)

Variable	Category	Frequency (n)	Percent (%)
Heard of Beta Thalassemia	Yes	153	35.6
	No	277	64.4
Perceived Cause of Beta Thalassemia	Genetic disorder	248	57.7
	Bacterial/autoimmune/nutritional causes	182	42.3
Perceived Risk Group	Individuals with family history / everyone equally	310	72.1
	Certain ethnic groups or regions	120	27.9
Preventive Measures	Genetic testing before marriage	179	41.6
	Not aware / regular checkups / vaccines / healthy lifestyle	251	58.4
Attended Educational Session	Yes	72	16.7
	No	358	83.3
Interested in Learning More	Yes	289	67.2
	No	141	32.8

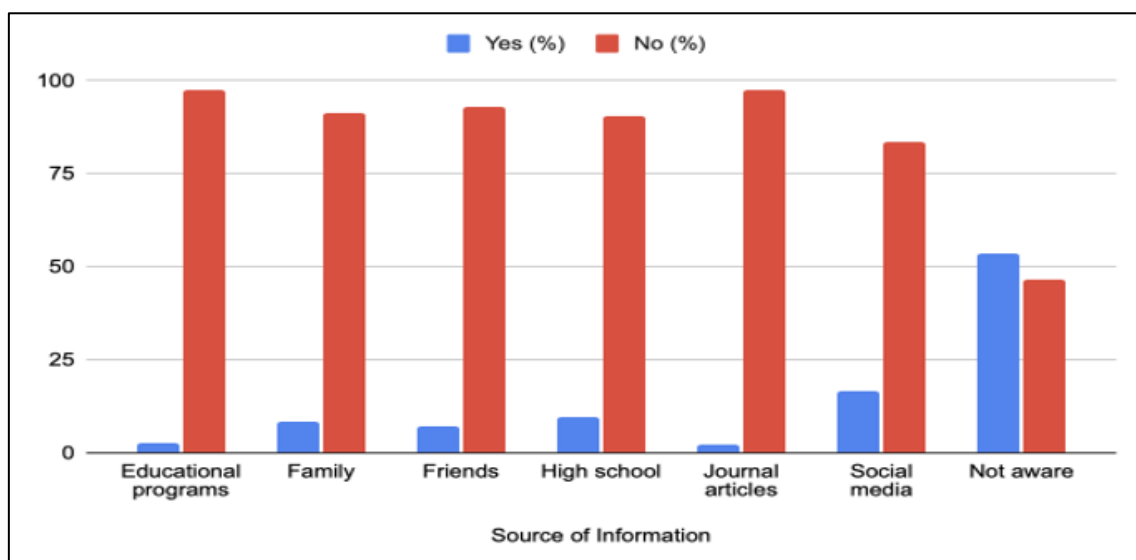


Fig 1 Sources of Information About Beta Thalassemia Among the Participants

➤ *Table 3 — Knowledge of Beta Thalassemia Symptoms*

- *Bone Deformities*

A total of 47.7% correctly identified bone deformities as a symptom of beta thalassemia, while 52.3% were unaware. Bone deformities are characteristic of untreated thalassemia major due to bone marrow expansion, so recognition of this sign reflects moderately accurate understanding. However, the fact that half the sample did not know this suggests limited exposure to clinical features of the condition. This gap may influence early recognition and may diminish the perceived seriousness of the disorder among students.

- *Jaundice*

Only 37.4% recognized jaundice, whereas 62.6% did not. Jaundice is a common manifestation due to hemolysis in thalassemia. This low recognition rate indicates insufficient awareness of common hematological signs among students. Limited understanding of jaundice may reflect a broader lack of exposure to clinical pathology or basic medical knowledge among non-medical students.

- *Delayed Growth in Children*

Just 36.7% correctly identified growth delay as a symptom. The majority (63.3%) lacked this knowledge, indicating poor understanding of how chronic anemia affects childhood development. Since delayed growth has major long-term consequences, lack of awareness may reduce concern about the disease's impact on future offspring.

- *Frequent Infections*

Only 17.4% identified frequent infections as a symptom — the lowest recognition among all items. This highlights a major gap in understanding immunological complications of thalassemia, especially in patients requiring repeated transfusions or those with iron overload. The very low awareness may prevent individuals from appreciating the severity and lifelong clinical burden of the disease.

- *Fatigue and Weakness*

Fatigue and weakness were the most recognized symptoms, correctly identified by 59.3%. While this is relatively high compared to other symptoms, over 40% still did not identify fatigue, despite it being a hallmark of chronic anemia. This suggests that even common and intuitive symptoms of anemia are not universally understood.

- *High Blood Pressure*

Notably, 35.3% incorrectly believed high blood pressure is a symptom of thalassemia. This high rate of misconception is concerning and indicates confusion between general medical conditions and specific genetic disorders. Misidentifying unrelated symptoms demonstrates limited health literacy and underscores the need for awareness campaigns emphasizing accurate symptom recognition.

- *Pale Skin*

Only 37.0% correctly identified pale skin as a sign of anemia related to thalassemia. This relatively low recognition of a classic, easily observable symptom reflects insufficient understanding of basic hematologic concepts. Since pale skin is often one of the first signs noticed by families, low awareness may impact early suspicion and timely diagnosis. (Table 3) Fig. 2

Figure 2 illustrates participants' recognition of key symptoms of beta thalassemia and highlights substantial variability in awareness. The most frequently identified symptom was fatigue and weakness, selected by 59.3% of respondents, reflecting moderate understanding of anemia-related manifestations. Bone deformities were recognized by 47.7%, indicating partial awareness of severe, long-term complications. However, recognition of other important symptoms was notably lower: only 37–38% identified jaundice, pale skin, or delayed growth, suggesting limited understanding of typical hematologic and pediatric features of thalassemia. Awareness was lowest for frequent infections (17.4%), despite its clinical relevance in thalassemia major. Additionally, 35.3% incorrectly identified high blood pressure as a symptom, reflecting misconceptions and poor health literacy. Overall, the figure demonstrates that while some hallmark symptoms are known, significant gaps and inaccuracies persist, underscoring the need for improved educational initiatives focusing on accurate symptom recognition.

Table 3 Participants' Knowledge of Beta Thalassemia Symptoms (n = 430)

Symptom	Yes (n)	Yes (%)	No (n)	No (%)
Bone deformities	205	47.7	225	52.3
Jaundice	161	37.4	269	62.6
Delayed growth in children	158	36.7	272	63.3
Frequent infections	75	17.4	355	82.6
Fatigue and weakness	255	59.3	175	40.7
High blood pressure	152	35.3	278	64.7
Pale skin	159	37.0	271	63.0

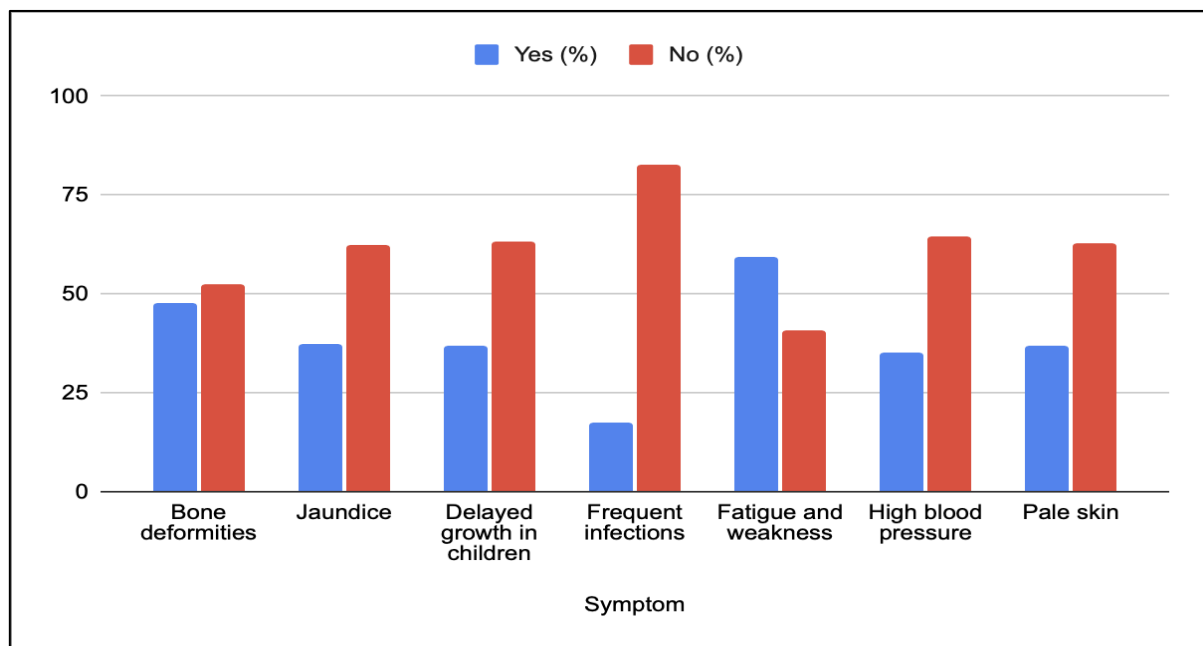


Fig 2 Participants' Knowledge of Beta Thalassemia Symptoms

Note: Participants could Select Multiple Symptoms; Percentages are Based on Total Sample (n = 430).

- **Objective 1: Knowledge About Thalassemia**

“To determine the extent of knowledge non-medical students have about thalassemia, including its causes, symptoms, and prevention.”

The mean knowledge score among non-medical students is 6.40 ± 3.43 , suggesting moderate knowledge about thalassemia. Scores range from 1 to 16, indicating wide variability in understanding among participants.

Table 3a Association Between Knowledge About Thalassemia and Demographic Variables (n = 430)

Variable	Category	Inadequate Knowledge n (%)	Adequate Knowledge n (%)	p-value
Gender	Male (n=231)	150 (64.9%)	81 (35.1%)	0.932
	Female (n=199)	130 (65.3%)	69 (34.7%)	
Age Group	18–19 (n=140)	100 (71.4%)	40 (28.6%)	0.018
	20–21 (n=171)	115 (67.3%)	56 (32.7%)	
	22–23 (n=73)	43 (58.9%)	30 (41.1%)	
	24+ (n=46)	22 (47.8%)	24 (52.2%)	
Field of Study (Major)	Business & Management	91 (67.9%)	43 (32.1%)	0.156
	Accounting & Finance	34 (57.6%)	25 (42.4%)	
	Engineering & Architecture	37 (67.3%)	18 (32.7%)	
	Psychology & Social Sciences	24 (51.1%)	23 (48.9%)	
	Media, Arts & Communication	19 (63.3%)	11 (36.7%)	
	Computer & IT	75 (71.4%)	30 (28.6%)	
Ethnicity	African	10 (66.7%)	5 (33.3%)	0.738
	Americas	4 (66.7%)	2 (33.3%)	
	South-East Asia	130 (65.7%)	68 (34.3%)	
	European	8 (80.0%)	2 (20.0%)	
	Eastern Mediterranean	122 (62.9%)	72 (37.1%)	
Marital Status	Western Pacific	6 (85.7%)	1 (14.3%)	0.146
	Married (n=20)	10 (50.0%)	10 (50.0%)	
	Single (n=410)	270 (65.9%)	140 (34.1%)	

• *Table 3a — Association Between Knowledge and Demographic Variables*

✓ *Gender*

There was no significant association between gender and knowledge ($p = 0.932$). Both males and females showed similarly low levels of adequate knowledge. This indicates that misconceptions and awareness gaps cut across both genders, suggesting neither group is more informed than the other.

✓ *Age Group*

Age was significantly associated with knowledge ($p = 0.018$). Younger students (18–19 years) had the lowest adequate knowledge (28.6%), while older students (24+) had the highest (52.2%). This trend suggests that knowledge improves with maturity, academic exposure, and possibly increased contact with health-related information over time.

✓ *Field of Study*

The field of study showed no significant relationship ($p = 0.156$). Regardless of major—business, engineering, psychology, media, or IT—students demonstrated similar levels of limited knowledge. This indicates that thalassemia-related content is not integrated across non-medical curricula.

✓ *Ethnicity*

No significant association was found ($p = 0.738$). Even ethnic groups from regions where thalassemia is more prevalent did not demonstrate higher awareness. This implies that cultural background alone does not guarantee better knowledge.

✓ *Marital Status*

Marital status also showed no significant effect ($p = 0.146$). Knowledge remained consistently low among both married and single participants.

✓ *Overall Interpretation for Objective 1*

Most students (65.1%) had inadequate knowledge. Only age demonstrated a significant influence on knowledge, indicating that awareness improves with time rather than academic program or background. These findings highlight the need for targeted education, especially among first-year students and younger age groups.

➤ *Table 4 — Attitudes Toward Genetic Testing*

• *Awareness of Premarital Screening*

A moderate 51.6% had heard of premarital genetic screening in the UAE. Despite being a legally established program, nearly half of participants were unaware of its existence. This is concerning because premarital screening is a cornerstone of thalassemia prevention. The lack of awareness points to gaps in national communication strategies, especially among university-aged youth.

• *Belief in Reliability of Genetic Testing*

Just 54.2% believed genetic testing is reliable, while 45.8% expressed doubt. This indicates uncertainty or mistrust toward genetic tools. Such skepticism can reduce motivation to undergo testing and reflects the need for public health campaigns that clarify the accuracy, purpose, and benefits of genetic screening.

• *Comfort Discussing Genetic Screening with a Partner*

Although 34.7% were very comfortable and 27.9% somewhat comfortable, a significant portion remained neutral (30.2%). Only a small minority were uncomfortable (7.2% combined).

Neutrality suggests hesitancy or lack of awareness rather than opposition. Comfort levels are important because partner communication is essential for informed premarital decision-making.

• *Reactions if Found to Be a Carrier*

A mix of responses was seen:

- ✓ 32.6% would seek advice from a healthcare professional
- ✓ 29.1% were uncertain and would seek more information
- ✓ 27.4% would be concerned but open to options
- ✓ 10.9% would consider not having biological children

These findings show that most students desire professional guidance and more information when facing carrier status. The low proportion willing to avoid biological pregnancy suggests reliance on alternative options (e.g., IVF with genetic testing) is still unfamiliar among youth.

- *Belief that Genetic Counseling Should Be Promoted*

A strong 85.1% believed counseling should be promoted among young adults. This indicates receptiveness to educational interventions and supports integrating genetic literacy programs into universities. The strong support reflects recognition that genetic counseling contributes to informed decision-making.

- *Likelihood of Encouraging Family/Friends to Test*

Responses were mixed:

- ✓ 21.4% very likely
- ✓ 22.1% likely
- ✓ 31.9% neutral
- ✓ 24.7% unlikely/very unlikely

The high neutrality reflects uncertainty rather than resistance. Many students support screening personally but lack confidence to promote it to others. This underscores a gap between attitude and advocacy, likely influenced by inadequate knowledge or cultural sensitivities. (Table 4)

Table 4 Participants' Attitudes Towards Genetic Testing for Beta Thalassemia (n = 430)

Variable	Category	Frequency (n)	Percent (%)
Heard of premarital screening for genetic disorders in the UAE	Yes	222	51.6
	No	208	48.4
Believe genetic testing is reliable to prevent Beta Thalassemia	Yes	233	54.2
	No	197	45.8
Comfort discussing genetic screening with a potential partner	Very Uncomfortable	7	1.6
	Somewhat Uncomfortable	24	5.6
	Neutral	130	30.2
	Somewhat Comfortable	120	27.9
	Very Comfortable	149	34.7
Feeling if found out self/partner carries gene	Concerned but open to options	118	27.4
	Uncertain, would seek further information	125	29.1
	Would consider not having biological children	47	10.9
	Would seek advice from healthcare professional	140	32.6
Believe genetic counseling should be promoted among young adults	Yes	366	85.1
	No	64	14.9
Likelihood of encouraging friends/family to get genetic testing	Very Unlikely	45	10.5
	Unlikely	61	14.2
	Neutral	137	31.9
	Likely	95	22.1
	Very Likely	92	21.4

➤ *Table 5 — Factors Influencing Decision to Undergo Genetic Screening*

- *Family Expectations*

About 34.7% reported family expectations influenced their decision. Family remains an important social unit in UAE culture, and parental guidance significantly shapes marriage choices. However, two-thirds stated that family expectations would not influence them, reflecting increasing autonomy among young adults and possibly shifting cultural norms regarding marriage decision-making.

- *Personal Choice*

A large majority (75.1%) identified personal choice as a major factor. This highlights a strong emphasis on individual autonomy among university students. From a public health perspective, this is encouraging because young people may independently opt for screening even without external pressure from family or regulations.

- *Government Regulations*

Only 19.3% felt government regulations influence their decision. Although premarital screening is mandatory for couples planning to marry, this finding suggests limited awareness of legal frameworks or underestimation of regulatory influence. This reflects the need for better communication of national health policies.

- **Religious Beliefs**

Religious beliefs played a role for 22.6%, indicating that faith influences screening decision-making for a minority. While religion is culturally significant in the UAE, most participants appear to view genetic screening as a medical rather than religious issue. (Table 5) Fig. 3

Figure 3 illustrates the factors influencing participants' decisions to undergo genetic screening before marriage, highlighting the varying degrees of personal, social, and cultural influence. The most prominent factor was personal choice, endorsed by 75.1% of participants, indicating that individual autonomy plays the central role in health-related decision-making among young adults. In contrast, family expectations influenced only 34.7%, reflecting a shift toward independent decision-making despite the cultural importance of family in the region. Religious beliefs (22.6%) and government regulations (19.3%) were less influential, suggesting that participants view genetic screening primarily through a personal lens rather than as a religious or legal obligation. The distribution emphasizes that most students are willing to make screening decisions based on personal values rather than social pressure. Overall, Figure 3 demonstrates that autonomy is the dominant driver, while familial, cultural, and regulatory factors exert comparatively lower influence on screening intentions.

Table 5 Factors Influencing Participants' Decision to Undergo Genetic Screening Before Marriage (n = 430)

Factor	Yes (n)	Yes (%)	No (n)	No (%)
Family expectations	149	34.7	281	65.3
Personal choice	323	75.1	107	24.9
Government regulations	83	19.3	347	80.7
Religious beliefs	97	22.6	333	77.4

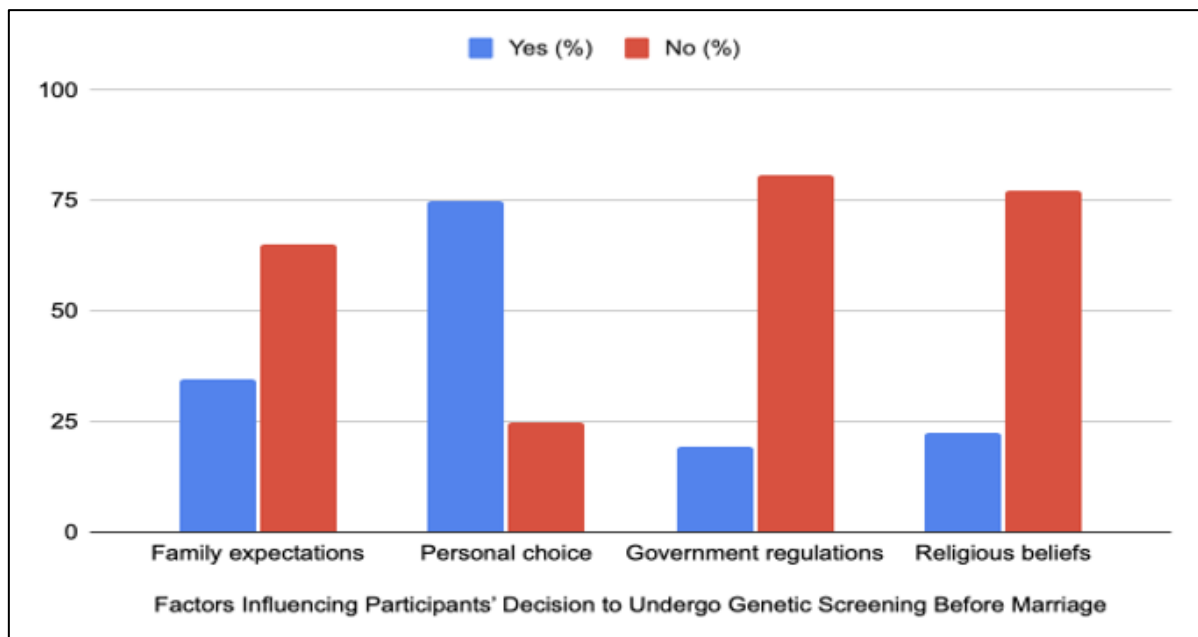


Fig 3 Factors Influencing Participants' Decision to Undergo Genetic Screening Before Marriage
Note: Participants could Select Multiple Factors; Percentages are Based on Total Sample (n = 430).

- **Objective 2: Attitudes Toward Genetic Testing**

“To assess attitudes toward the role of genetic testing and premarital screening in marriage-related decision-making.”

The mean attitude score among participants is 12.25 ± 2.47 , suggesting a moderate attitude toward the subject. Scores range from 5 to 18, indicating some variability in attitudes among the participants.

Table 5a Association of Sociodemographic Factors with Attitude (Negative vs Positive)

Variable	Category	Negative Attitude n (%)	Positive Attitude n (%)	p-value
Gender	Male	98 (42.4%)	133 (57.6%)	0.125
	Female	70 (35.2%)	129 (64.8%)	
Age Group	18–19	59 (42.1%)	81 (57.9%)	0.135
	20–21	71 (41.5%)	100 (58.5%)	
	22–23	27 (37.0%)	46 (63.0%)	
	24+	11 (23.9%)	35 (76.1%)	

Year of Study	1	65 (45.5%)	78 (54.5%)	0.176
	2	50 (40.0%)	75 (60.0%)	
	3	38 (36.5%)	66 (63.5%)	
	4	14 (26.4%)	39 (73.6%)	
	5	0 (0.0%)	2 (100.0%)	
	6	1 (33.3%)	2 (66.7%)	
Field of Study (Major)	Business & Management	49 (36.6%)	85 (63.4%)	0.138
	Accounting & Finance	21 (35.6%)	38 (64.4%)	
	Engineering & Architecture	22 (40.0%)	33 (60.0%)	
	Psychology & Social Sciences	12 (25.5%)	35 (74.5%)	
	Media, Arts & Communication	15 (50.0%)	15 (50.0%)	
	Computer & IT	49 (46.7%)	56 (53.3%)	
Ethnicity	African Region	7 (46.7%)	8 (53.3%)	0.407
	Americas Region	0 (0.0%)	6 (100.0%)	
	South-East Asia Region	77 (38.9%)	121 (61.1%)	
	European Region	5 (50.0%)	5 (50.0%)	
	Eastern Mediterranean Region	77 (39.7%)	117 (60.3%)	
	Western Pacific Region	2 (28.6%)	5 (71.4%)	
Marital Status	Married	4 (20.0%)	16 (80.0%)	0.073
	Single	164 (40.0%)	246 (60.0%)	

• Table 5a — Sociodemographic Factors and Attitude

✓ *Gender*

No significant association ($p = 0.125$) was found. Both males and females had similar distributions of positive and negative attitudes, suggesting that attitudes toward genetic testing are not gender-influenced.

✓ *Age Group*

While not statistically significant ($p = 0.135$), older participants (24+) showed a trend toward higher positive attitudes (76.1%). Younger students were slightly less positive, potentially due to limited awareness.

✓ *Year of Study*

Attitudes improved gradually with the academic year, though results were not statistically significant ($p = 0.176$). However, linear trend analysis showed that senior students tend to be more supportive of genetic screening, possibly due to increased maturity and exposure.

✓ *Field of Study*

No significant associations ($p = 0.138$). Students across all majors expressed generally positive attitudes, indicating broad acceptance of genetic screening regardless of academic background.

✓ *Ethnicity*

No significant influence ($p = 0.407$). Support for genetic testing appears culturally universal within the sample.

✓ *Marital Status*

Although not statistically significant ($p = 0.073$), married participants showed higher positive attitudes. Marriage increases personal relevance, which may explain greater openness.

Table 5b: Association between Factors Influencing Genetic Screening and Attitude ($n = 430$)

Variable	Category	Negative Attitude n (%)	Positive Attitude n (%)	p-value
Family Expectations	No	124 (44.1%)	157 (55.9%)	0.003*
	Yes	44 (29.5%)	105 (70.5%)	
Religious Beliefs	No	129 (38.7%)	204 (61.3%)	0.794
	Yes	39 (40.2%)	58 (59.8%)	
Personal Choice	No	35 (32.7%)	72 (67.3%)	0.120
	Yes	133 (41.2%)	190 (58.8%)	
Government Regulations	No	131 (37.8%)	216 (62.2%)	0.252
	Yes	37 (44.6%)	46 (55.4%)	

* $p < 0.05$ Indicates Statistical Significance.

- *Table 5b — Factors Influencing Genetic Screening and Attitude*

- ✓ *Family Expectations*

A significant association ($p = 0.003$) indicated that participants influenced by family expectations were more likely to hold positive attitudes. This highlights the strong role of family authority in health decisions in the region.

- ✓ *Religious Beliefs*

No significant association ($p = 0.794$). Most students did not rely on religion to guide decisions about genetic testing.

- ✓ *Personal Choice*

Not significant ($p = 0.120$). Although personal choice was important for most participants, it did not strongly differentiate attitude groups.

- ✓ *Government Regulations*

Not significant ($p = 0.252$). Awareness of regulations did not significantly impact attitudes.

- ✓ *Overall Interpretation for Objective 2*

Most students showed positive attitudes, and demographic variables were not major determinants. Family expectations significantly improved positive attitudes, indicating that interventions involving parents and families could enhance screening acceptance. However, attitudes may reflect social desirability rather than deep understanding, emphasizing the need to pair education with screening programs.

- *Table 6 — Cultural & Social Barriers*

- *Culture Affects Marriage Choices*

A substantial 66.5% agreed culture affects marriage decisions, confirming that cultural norms and traditional expectations still guide partner selection. This is important because cultures that encourage consanguineous marriage may influence thalassemia prevalence.

- *Cultural Beliefs Impact Willingness for Genetic Testing*

A larger 76% believed cultural beliefs affect willingness for genetic testing. This indicates that cultural expectations can both encourage and discourage testing. Cultural sensitivity is therefore critical in designing awareness campaigns.

- *Main Reasons People Avoid Premarital Screening*

- ✓ Lack of awareness (47.7%) was the top barrier
- ✓ Fear of stigma (33.7%) was the second
- ✓ Religious beliefs (12.6%) and cost (6%) were less impactful

The dominance of awareness-related barriers underscores the need for educational outreach. Stigma remains a major social barrier, reflecting fear of being labeled as a carrier or facing marriage rejection.

- *Reaction if Family Advises Against Marriage*

Most participants (60.9%) would consider family advice but decide for themselves. This suggests a balance between respect for family opinions and individual independence.

- *Social Stigma as a Barrier*

Responses were mixed:

- ✓ 30.9% said yes
- ✓ 20.7% said no
- ✓ 48.4% were unsure

The high uncertainty indicates limited understanding of how stigma operates socially. Uncertainty can itself hinder proactive testing.

- *Encouragement Methods for Screening*

- ✓ 48.1% favored community awareness campaigns
- ✓ 23.3% supported mandatory screening

✓ 20.2% supported financial incentives

Community education was the top choice, showing students prefer awareness-driven strategies over coercive or financial approaches. (Table 6)

Table 6 Cultural and Social Barriers Affecting Genetic Testing for Beta Thalassemia (n = 430)

Variable	Category	Frequency (n)	Percent (%)
Culture affects marriage choices	Yes	286	66.5
	No	144	33.5
Cultural beliefs impact willingness for genetic testing	Yes	327	76.0
	No	103	24.0
Main reason people avoid premarital screening	Lack of awareness	205	47.7
	Fear of stigma	145	33.7
	Religious beliefs	54	12.6
	Cost of testing	26	6.0
Reaction if family advises against marriage due to Beta Thalassemia risk	Prioritize own decision	45	10.5
	Consider but still decide for self	262	60.9
	Take family advice seriously	123	28.6
Social stigma as a barrier	Yes	133	30.9
	No	89	20.7
	Not sure	208	48.4
Encouragement for young people to participate in screening	Community awareness campaigns	207	48.1
	Making screening mandatory	100	23.3
	Financial incentives	87	20.2
	None of the above	36	8.4

Note: Participants could Select Multiple Responses for Some Questions; Percentages are Based on Total Sample (n = 430).

• Objective 3: Cultural And Social Barriers

“To identify cultural and social factors that influence awareness, knowledge, and attitudes related to thalassemia and screening.”

Table 6a Association between Cultural/Social Barriers and Knowledge about Beta Thalassemia among Young Adults (n = 430)

Variable	Category	Inadequate Knowledge (n, %)	Adequate Knowledge (n, %)	p-value
Culture affects marriage choices	No	94 (65.3%)	50 (34.7%)	0.960
	Yes	186 (65.0%)	100 (35.0%)	
Cultural beliefs affect willingness for genetic testing	No	74 (71.8%)	29 (28.2%)	0.100
	Yes	206 (63.0%)	121 (37.0%)	
Main reason to avoid premarital screening	Cost of testing	21 (80.8%)	5 (19.2%)	0.104
	Fear of stigma	86 (59.3%)	59 (40.7%)	
	Lack of awareness	134 (65.4%)	71 (34.6%)	
	Religious beliefs	39 (72.2%)	15 (27.8%)	
Social stigma as barrier	No	56 (62.9%)	33 (37.1%)	0.006
	Yes	101 (75.9%)	32 (24.1%)	
	Not sure	123 (59.1%)	85 (40.9%)	
Family advice against marriage	Prioritize own decision	25 (55.6%)	20 (44.4%)	0.215
	Consider but decide own	178 (67.9%)	84 (32.1%)	
	Take advice seriously	77 (62.6%)	46 (37.4%)	
Encourage participation in Thalassemia screening	None of the above	31 (86.1%)	5 (13.9%)	0.002
	Community awareness	118 (57.0%)	89 (43.0%)	
	Financial incentives	62 (71.3%)	25 (28.7%)	
	Mandatory screening	69 (69.0%)	31 (31.0%)	

• **Table 6a — Cultural/Social Barriers and Knowledge Culture Affecting Marriage Choices**

No significant association ($p = 0.960$). Whether culture influences marriage choices did not affect knowledge levels.

✓ **Cultural Beliefs Impact Testing Willingness**

Not significant ($p = 0.100$). Cultural influence did not explain differences in knowledge.

✓ **Reasons for Avoiding Premarital Screening**

No significant association ($p = 0.104$). Cost, stigma, lack of awareness, and religion did not explain knowledge levels.

✓ **Social Stigma as a Barrier**

A significant association was found ($p = 0.006$):

Participants who perceived stigma as a barrier were more likely to have inadequate knowledge. Lack of knowledge may intensify fear of stigma, preventing engagement with genetic services.

✓ **Advice Against Marriage**

No significant relationship ($p = 0.215$).

✓ **Encouragement for Screening**

A significant association ($p = 0.002$).

Students with adequate knowledge favored awareness campaigns, incentives, and mandatory screening. Those with inadequate knowledge were more likely to respond “none of the above,” reflecting apathy or misunderstanding.

Table 6b Association Between Culture and Attitude Toward Genetic Screening

Variable	Category	Negative Attitude (n, %)	Positive Attitude (n, %)	p-value
Does your culture affect your marriage choices?	No	69 (47.9%)	75 (52.1%)	0.008
	Yes	99 (34.6%)	187 (65.4%)	—
Do you think cultural beliefs impact willingness to undergo genetic testing?	No	50 (48.5%)	53 (51.5%)	0.024
	Yes	118 (36.1%)	209 (63.9%)	—
Main reason people avoid premarital screening	Cost of testing	14 (53.8%)	12 (46.2%)	0.011
	Fear of stigma	42 (29.0%)	103 (71.0%)	—
	Lack of awareness	86 (42.0%)	119 (58.0%)	—
	Religious beliefs	26 (48.1%)	28 (51.9%)	—
Social stigma as barrier	No	43 (48.3%)	46 (51.7%)	<0.001
	Yes	67 (50.4%)	66 (49.6%)	—
	Not sure	58 (27.9%)	150 (72.1%)	—
Family advice against marriage due to Beta Thalassemia	Prioritize own decision	21 (46.7%)	24 (53.3%)	0.494
	Consider but decide own	102 (38.9%)	160 (61.1%)	—
	Take advice seriously	45 (36.6%)	78 (63.4%)	—
Encouragement for young people to participate in screening	None of the above	24 (66.7%)	12 (33.3%)	<0.001
	Community awareness campaigns	55 (26.6%)	152 (73.4%)	—
	Financial incentives	45 (51.7%)	42 (48.3%)	—
	Making screening mandatory	44 (44.0%)	56 (56.0%)	—

• **Table 6b — Cultural Factors and Attitude Culture Affects Marriage Choices (Yes/No)**

Participants who reported that culture affects their marriage choices demonstrated a higher proportion of positive attitudes toward genetic screening (65.4%) compared to those who reported no cultural influence (52.1%). The association was statistically significant ($\chi^2 = 7.118$, $p = 0.008$), indicating that cultural norms and expectations may play an important role in shaping individuals' openness to screening. Cultural influence may create a sense of responsibility or social expectation to ensure healthy offspring, which could motivate more favorable attitudes. However, this positive attitude may not necessarily represent true understanding—it may reflect culturally driven conformity rather than informed decision-making.

- *Cultural Beliefs Impact Willingness to Undergo Genetic Testing*

Students who acknowledged that cultural beliefs influence willingness to undergo genetic testing showed a significantly higher rate of positive attitudes (63.9%) compared to those who did not believe culture played a role (51.5%). The association was statistically significant ($\chi^2 = 5.107$, $p = 0.024$). This pattern suggests that cultural awareness — whether supportive or discouraging — impacts individuals' perceptions of screening. Importantly, this influence may not stem from increased knowledge but from social pressure or cultural expectations, again highlighting that positive attitudes do not always reflect adequate understanding.

- *Main Reason for Avoiding Premarital Screening*

When analyzing reasons for avoiding screening, participants with positive attitudes most commonly cited fear of stigma (71.0%) and lack of awareness (58.0%). This association was statistically significant ($\chi^2 = 11.188$, $p = 0.011$). The dominance of stigma and lack of awareness suggests that even those who support screening may still lack accurate information about the process. It also indicates that fear of negative perceptions within families or communities remains a major barrier. This demonstrates a paradox: students may support screening but still avoid participating due to fear, uncertainty, or misinformation.

- *Social Stigma as a Barrier (Yes / No / Not Sure)*

A strong association was observed between social stigma and attitude ($\chi^2 = 21.268$, $p < 0.001$). Interestingly, participants who answered “Not sure” showed the highest rate of positive attitudes (72.1%). This indicates that uncertainty about stigma—not confidence—may drive acceptance. Those who selected “Yes” or “No” exhibited lower positive attitudes. The pattern suggests that unclear or shallow understanding of stigma contributes to seemingly positive attitudes, which may not be grounded in real knowledge or experience. Uncertainty itself reflects low awareness and may artificially inflate positive attitude scores.

- *Family Advice Against Marriage (Prioritize Own Decision / Consider but Decide / Take Advice Seriously)*

No significant association was found between family advice and attitude ($\chi^2 = 1.412$, $p = 0.494$). Positive attitudes toward genetic screening did not differ meaningfully whether participants relied on their own decisions, balanced family input, or took family advice seriously. This result suggests that—at least theoretically—attitudes toward genetic screening are formed independently of potential family pressure. However, it is possible that responses reflect hypothetical situations rather than real decision-making dynamics, which may be more complex in actual marriage contexts.

- *Encouragement for Participating in Screening (None / Awareness Campaigns / Financial Incentives / Mandatory Screening)*

The association between encouragement factors and attitude was highly significant ($\chi^2 = 31.977$, $p < 0.001$). Participants with positive attitudes most strongly supported community awareness campaigns and mandatory screening, while some unexpectedly selected “none of the above.” This divergence shows that even those who support genetic screening differ in what they perceive as effective motivators. The presence of “none of the above” among positive-attitude participants suggests a gap between theoretical support and practical behavior—meaning positive attitudes do not always translate to action.

- *Overall Interpretation for Objective 3*

Cultural factors significantly shape attitudes, but not knowledge. Stigma emerged as an important barrier influencing both knowledge and attitude patterns. Awareness campaigns must therefore carefully address cultural sensitivity and stigma reduction.

➤ *Table 7 — Awareness of Consanguineous Marriages*

- *Knowing Someone in a Consanguineous Marriage*

58.6% knew someone in a cousin marriage, indicating that the practice remains common in various cultural communities. This personal exposure may influence perceptions of genetic risk.

- *Ways to Improve Awareness*

Participants favored:

- ✓ School education programs (39.1%)
- ✓ Religious/community discussions (27.4%)
- ✓ Social media campaigns (21.6%)

✓ The preference for structured educational programs suggests that early intervention during adolescence is viewed as highly effective.

- ✓ *Perceived Impact of Cousin Marriage*

- ✓ 54% believed risk significantly increases
- ✓ 27.2% thought risk slightly increases
- ✓ 19% were unsure or believed there was no risk

Over half recognized the elevated genetic risk, but the remaining group indicates incomplete understanding. Clearer communication of genetic inheritance patterns is needed.

- *Comfort Discussing Risks with Family*

Only 44% felt comfortable discussing genetic risks. The remaining majority showed hesitancy or refusal, reflecting the cultural sensitivity of marriage decisions and genetic disorders.

- *Importance of Educating Communities*

The majority considered education either important (21.9%) or very important (41.2%), indicating strong support for public health initiatives. However, the presence of neutral and negative responses suggests gaps in engagement or awareness. (Table 7)

Table 7 Awareness of Consanguineous Marriages and Their Impact on Genetic Disorders (n = 430)

Variable	Category	Frequency (n)	Percent (%)
Know anyone in consanguineous marriages	Yes	252	58.6
	No	178	41.4
What would help improve awareness about risks	School education programs	168	39.1
	Religious or community discussions	118	27.4
	Social media campaigns	93	21.6
	None of the above	51	11.9
Perceived impact of cousin marriages on genetic disorders	Significantly increases risk	232	54.0
	Slightly increases risk	117	27.2
	Not sure	41	9.5
	Does not impact risk	40	9.3
Comfort discussing risks with family	Yes	189	44.0
	Maybe	162	37.7
	No	79	18.4
Importance of educating communities about genetic risks	Very important	177	41.2
	Important	94	21.9
	Neutral	88	20.5
	Unimportant	29	6.7
	Very unimportant	42	9.8

Note: Participants could Select Multiple Responses for Some Questions; Percentages are Based on Total Sample (n = 430).

➤ Table 8 — Reasons For Preference for Consanguineous Marriages

- *Cultural Traditions*

A high 61.2% believed culture drives consanguineous marriage. This reinforces the importance of approaching the topic with cultural sensitivity when advocating genetic screening.

- *Strengthening Family Bonds*

49.1% believed it strengthens family ties, showing that emotional and social cohesion are key motivations. Addressing thalassemia risk must therefore acknowledge family values to avoid resistance.

- *Financial Benefits*

One-third (33.5%) cited financial advantages, indicating that economic considerations shape marital decisions in some communities.

- *Lack of Awareness of Genetic Risks*

The most commonly identified reason (64.2%) was limited genetic risk awareness. This aligns with earlier findings and confirms that misinformation is a central factor sustaining cousin marriage acceptance. (Table 8)

Table 8 Reasons for Preference of Consanguineous Marriages (n = 430)

Reason	Yes (n)	Yes (%)	No (n)	No (%)
Cultural traditions	263	61.2	167	38.8
Strengthening family bonds	211	49.1	219	50.9
Financial benefits	144	33.5	286	66.5
Lack of awareness about genetic risks	276	64.2	154	35.8

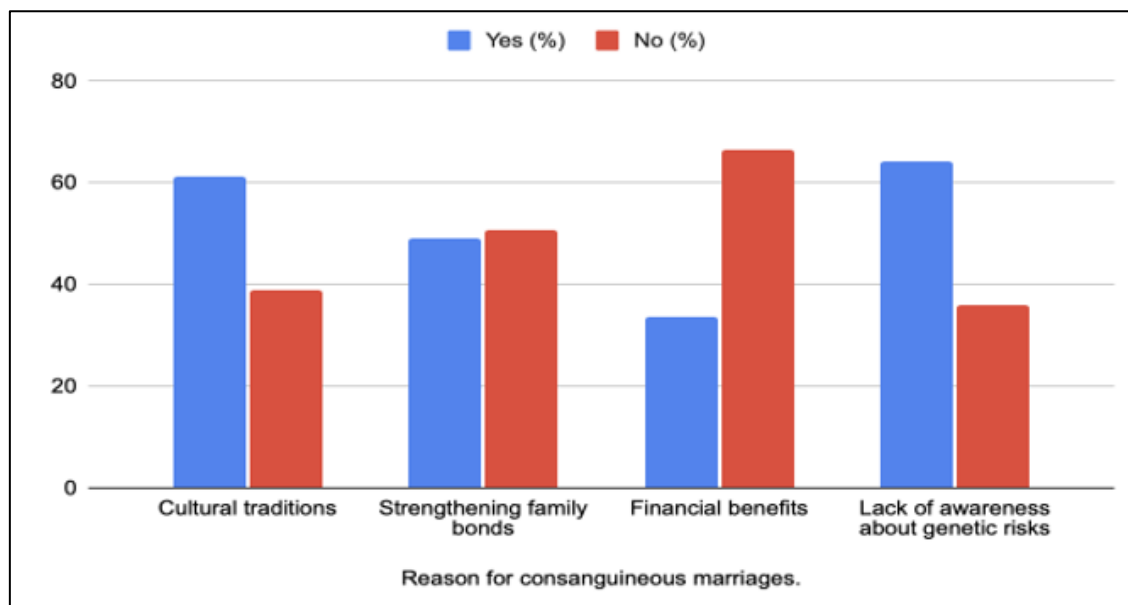


Fig 4 Participant's Reasons for Preference of Consanguineous Marriages

Note: Participants could Select Multiple Reasons; Percentages are Based on Total Sample (n = 430).

- Objective 4: Awareness Of Consanguineous Marriages

“To assess students’ awareness of genetic risks associated with consanguineous marriage and its influence on attitudes.”

Table 8a Association between Reasons for Consanguineous Marriages and Attitude (n = 430)

Factor	Category	Negative Attitude n (%)	Positive Attitude n (%)	p-value
Cultural Traditions	No	75 (44.9%)	92 (55.1%)	0.048*
	Yes	93 (35.4%)	170 (64.6%)	
Financial Benefits	No	105 (36.7%)	181 (63.3%)	0.158
	Yes	63 (43.8%)	81 (56.3%)	
Lack of Awareness about Genetic Risks	No	67 (43.5%)	87 (56.5%)	0.159
	Yes	101 (36.6%)	175 (63.4%)	
Strengthening Family Bonds	No	92 (42.0%)	127 (58.0%)	0.203
	Yes	76 (36.0%)	135 (64.0%)	

*p < 0.05 Indicates Statistical Significance.

- Table 8a —Factors Related to Consanguineous Marriage and Attitude Toward Genetic Screening

- ✓ Cultural Traditions

A statistically significant association was found between “cultural traditions” as a reason for consanguineous marriage and attitude toward genetic screening ($\chi^2 = 3.919$, $p = 0.048$).

Participants who identified cultural traditions as a major reason for consanguineous marriage were more likely to hold a positive attitude toward genetic screening compared to those who did not select this reason. This indicates that individuals who are aware of cultural practices may also be more receptive to screening as a preventive tool. Their positive attitude may reflect a desire to preserve tradition while also protecting future generations from genetic disorders. However, this attitude does not necessarily imply deep understanding — it may be influenced by cultural expectations rather than knowledge-based decisions.

- ✓ Strengthening Family Bonds

The association between “strengthening family bonds” and attitude toward genetic screening was not statistically significant ($\chi^2 = 1.618$, $p = 0.203$). Participants who believed cousin marriage strengthens familial relationships did not differ meaningfully in their attitudes toward screening compared to those who did not endorse this belief. This suggests that emotional or relational reasons for consanguinity exist independently of participants’ perceptions of genetic risks or preventive testing. The neutrality indicates that valuing family unity does not automatically lead to increased or decreased support for genetic screening.

- ✓ Financial Benefits

“Financial benefits” showed no significant association with attitude ($\chi^2 = 1.994$, $p = 0.158$). Participants who viewed cousin marriage as financially advantageous did not show significantly higher or lower positive attitudes toward genetic screening. This

suggests that economic motivations for marrying within the family do not influence health-related attitude formation.

Financial reasoning and views on genetic health appear to be separate cognitive domains for the participants.

✓ *Lack of Awareness of Genetic Risks*

The association between “lack of awareness” and attitude was not statistically significant ($\chi^2 = 1.982$, $p = 0.159$). Although lack of awareness is a widely recognized reason for consanguineous marriage in many cultures, participants who endorsed this explanation did not demonstrate more positive attitudes toward screening. This is important because it reveals that understanding that *others* lack awareness does not necessarily translate into participants themselves having better attitudes, greater concern, or stronger motivation to undergo testing. It further highlights that recognizing a gap in knowledge does not automatically lead to proactive health behavior.

Table 8b Association between Reasons for Consanguineous Marriages and Knowledge (n = 430)

Factor	Category	Inadequate Knowledge n (%)	Adequate Knowledge n (%)	p-value
Cultural Traditions	No	113 (67.7%)	54 (32.3%)	0.377
	Yes	167 (63.5%)	96 (36.5%)	
Financial Benefits	No	185 (64.7%)	101 (35.3%)	0.792
	Yes	95 (66.0%)	49 (34.0%)	
Lack of Awareness about Genetic Risks	No	100 (64.9%)	54 (35.1%)	0.953
	Yes	180 (65.2%)	96 (34.8%)	
Strengthening Family Bonds	No	146 (66.7%)	73 (33.3%)	0.492
	Yes	134 (63.5%)	77 (36.5%)	

• *Table 8b — Reasons for Consanguinity and Knowledge Cultural Traditions*

The association between “cultural traditions” as a reason for consanguineous marriage and participants’ knowledge level was not statistically significant ($p > 0.05$). Students who endorsed cultural traditions were not more or less likely to have adequate knowledge. This suggests that cultural practices related to cousin marriage persist independently of genetic risk awareness.

Even participants who recognized the cultural roots of the practice did not have a better understanding of thalassemia or inheritance patterns. This indicates a separation between cultural reasoning and medical knowledge within this population.

✓ *Strengthening Family Bonds*

This factor also showed no significant association with knowledge ($p > 0.05$). Students who believed consanguinity strengthens family unity did not differ in knowledge scores compared to those who did not endorse this reason. This shows that emotional or social motivations for consanguinity exist regardless of participants’ genetic literacy. Knowledge about hereditary diseases does not appear to influence whether individuals view consanguineous marriage as a way to keep families close.

✓ *Financial Benefits*

The relationship between financial motivations and knowledge was likewise not statistically significant ($p > 0.05$). Participants who believed cousin marriage provides economic advantages (e.g., preserving property, reducing dowry or wedding costs) did not demonstrate different knowledge levels about thalassemia. This further reinforces that economic reasoning and genetic knowledge operate independently. Students may understand economic benefits but remain unaware of genetic risks—or vice versa.

✓ *Lack of Awareness of Genetic Risks*

Even this factor, which might be expected to correlate with knowledge, showed no significant association ($p > 0.05$). Participants who cited “lack of awareness” as a reason for consanguinity did not have lower or higher knowledge levels. This means that recognizing that society lacks awareness does not necessarily mean the individual has good knowledge, nor does it guarantee low knowledge. This finding highlights a deeper issue: acknowledgment of general ignorance does not translate into personal understanding.

✓ *Overall Interpretation for Objective 4*

Attitudes toward consanguinity are primarily shaped by cultural norms, not knowledge. Regardless of awareness levels, cultural motivations remain strong drivers. This suggests that educational interventions alone may not change attitudes unless accompanied by culturally sensitive community engagement.

CHAPTER FIVE

DISCUSSION AND LIMITATIONS

➤ *Discussion:*

The findings of this study show that knowledge and attitudes toward beta-thalassemia among non-medical university students are shaped by age, educational exposure, cultural norms, and persistent misconceptions. Although the sample was balanced by gender (53.7% males, 46.3% females), gender showed no significant association with knowledge, indicating that awareness gaps are systemic rather than demographic—consistent with university cohorts in Bangladesh where both males and females demonstrated similar misconceptions⁽²⁵⁾. Age, however, was significantly associated with knowledge ($p = 0.018$), and the predominance of younger students aged 18–21 years (72.4%) and early-year undergraduates (86.6%) likely contributed to the modest mean knowledge score (6.40 ± 3.43). A comparable pattern was seen in Thailand, where younger first-year students misunderstood hereditary transmission until later academic training⁽²⁶⁾.

Awareness levels were low, with only 35.6% having heard of beta-thalassemia. A case study in Bangladesh similarly showed that 38% of students relied on social media and believed thalassemia was “contagious,” demonstrating the impact of informal information sources⁽²⁹⁾. In this study, social media (16.5%) and high school (9.5%) were the leading sources, which helps explain why 42.3% incorrectly attributed thalassemia to infection or nutritional deficiency. Such misconceptions highlight the vulnerability of students to unregulated digital health messages.⁽²⁵⁾

Knowledge of clinical symptoms was fragmented. Fatigue/weakness was recognized by 59.3%, but fewer identified bone deformities (47.7%), jaundice (37.4%), delayed growth (36.7%), or infection susceptibility (17.4%). A case from Pakistan illustrates the consequence of such gaps: parents of a thalassemia-major child repeatedly misinterpreted recurrent infections as “seasonal flu,” delaying urgent clinical care⁽³¹⁾. Similar misunderstandings among students may reduce perceived disease severity and weaken motivation for screening⁽³²⁾.

Attitudes toward genetic testing were generally positive. Over half (51.6%) were aware of the UAE premarital screening program, and 54.2% believed genetic testing could prevent disease. Furthermore, 62.6% were comfortable discussing screening with partners, and 85.1% supported promoting genetic counseling. However, only 43.5% were willing to recommend testing to others, indicating a gap between theoretical acceptance and behavioral intent. This mirrors a UAE case study where couples complied with mandatory testing but could not explain how screening prevents disease—a phenomenon described as “acceptance without understanding”⁽²⁷⁾.

Cultural and social barriers were prominent. Although 76% agreed culture influences testing, 33.7% cited stigma as a barrier, and stigma showed a significant association with knowledge ($p = 0.006$). A Bangladesh case documented students avoiding testing due to fear of being labeled a carrier and jeopardizing marriage prospects, reflecting similar fears among our respondents.

Family influence also played a key role: although 75.1% cited personal choice as central, family expectations (34.7%) significantly enhanced positive attitudes ($p = 0.003$), consistent with Malaysian findings where parental encouragement improved screening uptake^(28,30).

Consanguinity also shaped perceptions. While 54% acknowledged genetic risk, many underestimated its severity (27.2% “slight risk,” 9.3% “no risk”). Students’ preference for consanguineous marriage—driven by familiarity (45.6%), family ties (28.1%), and trust (14.2%)—mirrors a Bangladeshi case in which a couple proceeded with cousin marriage despite counseling because of strong family expectations. Notably, knowledge did not significantly influence preference ($p = 0.234$), suggesting cultural motivations outweigh biomedical reasoning⁽²⁸⁻³⁰⁾.

➤ *Limitations:*

Although this study aimed to include a diverse and representative sample of non-medical university students across the UAE, several limitations must be acknowledged. Despite efforts to collect data through both in-person visits and online dissemination of the questionnaire, most responses were concentrated among students from universities in Dubai and Ajman, resulting in underrepresentation of students from other emirates such as Abu Dhabi, Fujairah, Ras Al Khaimah, and Umm Al Quwain. Consequently, the sample may not fully reflect the diversity of non-medical students nationwide. Participation was voluntary, and not all students who were invited completed the survey, creating a potential non-response bias whereby students with greater awareness or personal interest in health-related issues may have been more likely to participate. Additionally, convenience sampling and unequal distribution of participants across institutions increased the risk of selection bias. Another important limitation is that the study did not include a pilot test, nor was the questionnaire formally validated prior to data collection, which may have affected the reliability and overall quality of the responses. Without established validity, there is a risk that the survey may not have accurately measured the constructs it intended to assess, potentially limiting the strength and generalizability of the study’s conclusions.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

➤ *Conclusion:*

This study set out to evaluate the awareness, perceptions, and attitudes toward beta-thalassemia among non-medical university students in the UAE, a demographic of significant future public health relevance. The findings clearly demonstrate a low level of baseline awareness, with only 35.6% of participants reporting prior knowledge of the disorder despite its high carrier frequency in the country. This gap persists even in a region with long-standing governmental preventive strategies such as premarital screening and expanded genetic testing programs. The results suggest that while structural prevention exists, the population's engagement with it remains limited, primarily due to insufficient awareness and limited exposure to educational initiatives.

The comparison of our findings with similar studies conducted in Bangladesh, Pakistan, Indonesia, and Malaysia reveals a shared trend among young non-medical populations: awareness of thalassemia remains low unless individuals have direct medical exposure or familial risk. Research from Bangladesh and Pakistan similarly reported low recognition levels of genetic transmission, prevention strategies, and implications of consanguineous marriages. These parallels highlight that lack of awareness among youth in thalassemia-endemic regions is not a localized phenomenon but a broader public health pattern.

Interestingly, this study found that social media served as the most common information source, yet only 16.7% had participated in a structured awareness session. Despite this, participants expressed high willingness to learn more, which demonstrates a promising public health opportunity. The absence of statistically significant gender differences reinforces the finding that lack of awareness is uniform rather than subgroup-specific. Cultural and social influences, including stigma, prioritization of familial expectations, and sensitivity around marriage-related genetic discussions, emerged as additional barriers. These findings align with UAE-based studies showing hesitation toward openly discussing genetic risk factors despite supportive attitudes toward the concept of screening.

Overall, the study demonstrates that while preventative frameworks and genetic screening policies exist in the UAE, there is a critical disconnect between implementation and public comprehension. Increasing awareness among young adults is essential because they represent future prospective carriers, parents, and decision-makers. This research contributes novel insight by examining a non-medical student population—an audience often overlooked despite being highly influential due to their age and social connectivity. Strengthening genetic literacy among this demographic can significantly contribute to reducing beta-thalassemia incidence, decreasing healthcare burden, and supporting the UAE's long-term vision of advancing genetic health awareness and prevention.

➤ *Recommendations:*

Based on the findings of this research, it is evident that systematic, culturally informed, and sustained awareness strategies are essential to effectively address the knowledge gap regarding beta-thalassemia among non-medical university students. The recommendations proposed aim to bridge existing gaps and support national health goals while remaining sensitive to the UAE's cultural landscape.

The first priority should be the integration of genetic health education into university-level general education subjects. As demonstrated in studies from Malaysia and India, incorporating genetic literacy into coursework significantly improves long-term awareness and screening uptake. Since knowledge was strongly associated with educational exposure in our findings, embedding basic genetic and public health concepts across disciplines would normalize genetic health discussions and reduce stigma.

Universities should collaborate with governmental and healthcare institutions to host structured programs such as seminars, screening drives, expert lectures, and peer-led campaigns.

Considering that most students cited social media and informal sources of information, combining traditional educational strategies with digital outreach can expand accessibility. Targeted awareness videos, culturally sensitive infographics, and multilingual content could help overcome both cultural and linguistic barriers.

Premarital screening programs should also be more visibly promoted within university environments. Awareness campaigns must highlight the real-world implications of genetic risk, including inheritance probability, available prevention strategies, and the importance of early screening. Further, creating accessible pathways for students to receive confidential genetic testing and counseling may encourage proactive engagement.

Since cultural beliefs and consanguineous marriage practices were identified as major influences, collaboration with community leaders, religious scholars, and family influencers is essential.

Studies from Thailand and the Middle East show that health promotion campaigns that respectfully integrate cultural values

result in greater acceptance and behavioral change. Religious-based discussions emphasizing prevention rather than restriction may normalize thalassemia dialogue while reducing perceived stigma.

Lastly, future research should expand to include comparative groups such as medical students, high school students, and married adults to understand evolving attitudes over time. Longitudinal studies could also assess whether awareness interventions lead to improved screening participation and informed marital decision-making.

In conclusion, effective prevention of beta-thalassemia requires more than policy; it demands awareness, accessibility, and attitudinal change. Implementing sustained, culturally informed educational interventions—particularly within universities—has the potential to significantly reduce disease burden and contribute to a healthier, more informed future population in the UAE.

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ANNEXURE

➤ Letters of Permission

	جامعة الخليج الطبية GULF MEDICAL UNIVERSITY ACADEMIC HEALTH CENTER	
31st January 2025		Ref. no. IRB-COM-STD-55-Jan-2025
To,		
Samreen Khan - 2022MD08 Abdulla Patel - 2022MD18 Sabrina Mamtaz - 2022MD19 Yusra Parveen - 2022MD26 College of Medicine Gulf Medical University Ajman, UAE		
Subject: <u>Institutional Review Board Approval</u>		
Dear Student/s		
Greetings from Gulf Medical University, Ajman.		
This is to inform you that the Institutional Review Board has reviewed your research project titled " Awareness of B-Thalassemia in UAE ". Dr. Nermine Nosseir, Associate Professor of Anatomy, College of Medicine.		
The data collected by you shall be used only for the purpose of conducting the research study. Any information obtained in connection with the study should be treated as confidential. Any violation of these terms and conditions will be treated as personal/ academic misconduct that may warrant further action in this regard.		
Best Regards		
		
Prof. Salem Chouaib Chairperson, Institutional Review Board		
P.O Box: 4184, Ajman - United Arab Emirates • Tel.: +971 6 7431333 Fax: +971 6 7431222 Email: admissions@gnu.ac.ae • Web: www.gnu.ac.ae , www.thumbay.com		

➤ Questionnaire:

Questionnaire Title: Awareness of Beta-Thalassemia among non-medical students in UAE Investigators: Samreen Khan, Abdulla Patel, Sabrina Mamtaz, Yusra Parveen Supervisor: Dr. Nermine Nosseir Site(s): Gulf Medical University, Ajman, UAE Study-Related Phone Number(S): 06-7431333 Introduction: We are students in 3rd year Medicine Program, GMU, Ajman You are being invited to participate in the research entitled "Awareness of Beta-Thalassemia among non-medical students in UAE" This Consent Form gives you information about the study we wish to conduct. You will get to know the benefits you may get if you agree to participate, how we hope to use the information that we will get from study, and who else will share the information. This will help you to make an informed decision whether to participate or not. You may choose not to participate, or you may withdraw your decision to participate in the study at any time. In either case, you will not lose any benefits to which you are otherwise entitled. Purpose of the research This research explores the attitudes of non-medical university students in the UAE toward genetic testing for beta-thalassemia and premarital screening's role in marriage decisions. It aims to assess students' perceptions of genetic compatibility, its influence on partner selection, and the potential cultural and social implications of premarital screening in managing thalassemia in the UAE. For that we intended to do this research with the following objectives: • To determine the extent of knowledge that non-medical students have about thalassemia, including its causes, symptoms, and prevention methods. • To examine non-medical students' attitudes toward the role of genetic testing for thalassemia in marriage decisions, including their views on premarital screening and how it influences their thoughts on partner selection and marriage within the UAE. • To explore any cultural or social barriers that may affect students' awareness and attitudes toward thalassemia screening and prevention.	• To evaluate non-medical students' awareness of the relationship between consanguineous marriages (marriage between relatives) and the increased risk of thalassemia in offspring, and their perceptions of this risk within the context of cultural practices in the UAE. Participant selection and number of participants The study will include non-medical university students, between the ages of 18-30, (marital age group), males and females who will be selected from different non-medical universities. Approximately 450 individuals will take part in this research. Why am I being asked to participate in this study? You are asked to participate in this research because you fulfill the inclusion criteria. How long will I be in this study? You will be in this study for 10-15 minutes that are needed for filling a questionnaire. What will I be asked to do? You will be asked to fill a questionnaire that include; socio-demography, information about the Knowledge about B-thalassemia, Attitude towards the role of genetic testing, Culture and social barriers, Awareness about consanguineous relationships and its effect on genetic disorders. What benefit can I expect from participating in the study? The possible benefit you may get in this study is that you will have increased knowledge about genetic diseases, specifically beta-thalassemia, access to resources and support (brochures), improved healthcare outcome by the prevention and management strategies, contribution to scientific research for understanding public awareness levels, community building. Confidentiality, Anonymity and storage of data We assure you that the study is anonymous. The information you provide will be analyzed by group, and there will be no link between you as a person and the results. Confidentiality of the information will be respected, and only the research team and Ethics Committee member may have access to the data. The data will be stored in the Community Medicine Department for three years as per the GMU policy. Provision of feedback to the participant The results of this study will be published/ presented at national/international conferences. Provision made for distribution of a copy of the consent form to all participants If you accept to participate in this study, you will be provided with a copy of this informed consent.
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Can I participate in this study if I do not sign this consent form? To participate in this research, you have to sign this informed consent; then you will be provided with a copy of the same. Signature of Consent I have read this Consent Form, and all my questions have been answered. I volunteer to take part in this study. I authorize the use and disclosure of my questionnaire's responses to the parties listed in the authorization section of this consent for the purposes described above. Signature of Subject with Date: Signature of the interviewer with name and date: * Indicates required question	1. Age * ⌵ Dropdown Mark only one oval. ☐ 17 ☐ 18 ☐ 19 ☐ 20 ☐ 21 ☐ 22 ☐ 23 ☐ 24 ☐ 25 ☐ 26 ☐ 27 ☐ 28 ☐ 29 ☐ 30 ☐ 31 ☐ 32 ☐ 33 ☐ 34 ☐ 35 ☐ +35 2. Gender * Mark only one oval. ☐ Male ☐ Female
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3. Year of Study * ⌵ Dropdown <i>Mark only one oval.</i> ☐ 1st ☐ 2nd ☐ 3rd ☐ 4th ☐ 5th ☐ 6th ☐ not applicable 4. Field of Study (Major) * _____ 5. University Name * _____ 6. Ethnicity * _____ 7. Marital Status * <i>Mark only one oval.</i> ☐ Married ☐ Single KNOWLEDGE ABOUT BETA THALASSEMIA	8. Have you ever heard of Beta thalassemia? * <i>Mark only one oval.</i> ☐ Yes ☐ No 9. If yes, where did you first hear about <i>Check all that apply.</i> ☐ Social Media ☐ High-school / University ☐ Family ☐ Friends ☐ Journal Articles ☐ Educational Programs ☐ Other: _____ 10. Which of the following do you think are symptoms of Beta Thalassemia? * (Select all that apply) <i>Check all that apply.</i> ☐ Fatigue and weakness ☐ Delayed growth in children ☐ Yellowing of the skin and eyes (Jaundice) ☐ Bone deformities ☐ Frequent infections ☐ High blood pressure ☐ Pale skin ☐ Other: _____
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11. What do you think causes Beta Thalassemia (Select all that apply) * <i>Check all that apply.</i> ☐ A bacterial infection ☐ A genetic disorder ☐ A nutritional deficiency ☐ An autoimmune disease 12. In your opinion, who is most at risk for Beta thalassemia? * <i>Mark only one oval.</i> ☐ Everyone equally ☐ certain ethnic groups or regions ☐ only individual with family history 13. What preventive measures do you believe can reduce the risk of Beta Thalassemia? * <i>Mark only one oval.</i> ☐ Genetic testing before marriage ☐ Maintaining healthy lifestyle ☐ Vaccinations ☐ Regular health checkups ☐ Other: _____ 14. Have you ever attended or participated in an educational session on genetic disorders or Beta Thalassemia? * <i>Mark only one oval.</i> ☐ Yes ☐ No	15. Would you be interested in learning more about Beta thalassemia if resources were available on campus? * <i>Mark only one oval.</i> ☐ Yes ☐ No ATTITUDE TOWARDS THE ROLE OF GENETIC TESTING 16. Have you heard of premarital screening for genetic disorders in the UAE? * <i>Mark only one oval.</i> ☐ Yes ☐ No 17. Do you think genetic testing for Beta Thalassemia is a reliable way to prevent the condition in future generations? * <i>Mark only one oval.</i> ☐ Yes ☐ No ☐ Not sure
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18. How comfortable would you be discussing genetic screening with a potential partner? * <i>Mark only one oval.</i> ☐ Very comfortable ☐ Somewhat comfortable ☐ Neutral ☐ Somewhat uncomfortable ☐ Very uncomfortable 19. How would you feel if you found out that you or your partner carried the gene for Beta Thalassemia? * <i>Mark only one oval.</i> ☐ Concerned but open to options ☐ Uncertain, would seek further information ☐ Would consider not having biological children ☐ Would seek advice from healthcare professional ☐ Other: _____ 20. What factors influence your decision to undergo genetic screening before marriage? (Select all that apply) * <i>Check all that apply.</i> ☐ Family expectations ☐ Religious beliefs ☐ Personal choice ☐ Government regulations ☐ Other: _____	21. Do you think genetic counseling for Beta thalassemia should be promoted among young adults? * <i>Mark only one oval.</i> ☐ Yes ☐ No 22. How likely are you to encourage friends or family members to get genetic testing for Beta Thalassemia if they are planning to marry? * <i>Mark only one oval.</i> 1 2 3 4 5 Very ☐ ☐ ☐ ☐ ☐ Very unlikely CULTURE AND SOCIAL BARRIERS 23. Does your culture affect your marriage choices? * <i>Mark only one oval.</i> ☐ Yes ☐ No 24. Do you think cultural beliefs impact people's willingness to undergo genetic testing? * <i>Mark only one oval.</i> ☐ Yes ☐ No
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25. In your opinion, what is the main reason some people avoid premarital screening? * <i>Mark only one oval.</i> ☐ Fear of stigma ☐ Lack of awareness ☐ Religious beliefs ☐ Cost of testing ☐ Other: _____ 26. How would you react if your family advised against a marriage due to the risk of passing on Beta Thalassemia? * <i>Mark only one oval.</i> ☐ I would take their advice seriously ☐ I would consider it but still make my own decision ☐ I would prioritize my own decision over their concerns 27. Do you think social stigma is a barrier for genetic testing and counseling in your community? * <i>Mark only one oval.</i> ☐ Yes ☐ No ☐ Not sure	28. What would encourage more young people to participate in Thalassemia screening programs? * <i>Mark only one oval.</i> ☐ Community awareness campaigns ☐ Financial incentives ☐ Making screening mandatory ☐ None of the above ☐ Other: _____ AWARENESS ABOUT CONSANGUINEOUS MARRIAGES AND ITS EFFECT ON GENETIC DISORDER 29. Do you know anyone in consanguineous marriages (marriage among relatives) ? * <i>Mark only one oval.</i> ☐ Yes ☐ No 30. What would help improve awareness about the risks of consanguineous marriages? * <i>Mark only one oval.</i> ☐ School education programs ☐ Religious or community discussions ☐ Social media campaigns ☐ None of the above
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31. In your opinion, why do some families prefer consanguineous marriages? (Select all that apply) * <i>Check all that apply.</i> ☐ Cultural traditions ☐ Strengthening family bonds ☐ Financial benefits ☐ Lack of awareness about genetic risks ☐ Other: _____ 32. In your opinion, how does marriage between relatives (cousins, for example) impact the likelihood of genetic disorders? * <i>Mark only one oval.</i> ☐ Significantly increases the risk ☐ Slightly increases the risk ☐ Does not impact the risk ☐ Not sure 33. Would you feel comfortable discussing the health risks of consanguineous marriages with family members? * <i>Mark only one oval.</i> ☐ Yes ☐ No ☐ Maybe, depending on the context	34. How important do you think it is to educate communities about the genetic risks associated with consanguineous marriages? * <i>Mark only one oval.</i> 1 2 3 4 5 Very ☐ ☐ ☐ ☐ ☐ Very Unimportant This content is neither created nor endorsed by Google. Google Forms
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➤ *Plan/ Project as Contribution to Community*

The most meaningful starting point is education, because lack of awareness was clearly the strongest barrier highlighted in the research. The project would focus on developing an annual university-based awareness campaign in collaboration with healthcare providers, student councils, and genetic counseling services.

The program would include short interactive workshops, awareness booths, and optional free or subsidized carrier screening for students who are interested. Since most students reported learning through social media, a parallel digital campaign would be created using short videos, infographics, and real patient stories to make the topic relatable rather than purely academic.

Including bilingual content (Arabic and English) would help ensure cultural inclusivity.

An important component of this plan would be integrating trained peer ambassadors, because students tend to respond better to people within their age group rather than authority figures. Finally, feedback tools would be built into the program to assess changes in knowledge and attitudes over time. If successful, this model could be repeated yearly and expanded to other universities, gradually creating a more informed and health-conscious future population.

