Investigation of the Relationship between Thalassemia and Depression to Predict a Base for Rehabilitation Measures

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ABSTRACT
This study examines the relationship between thalassemia, an inherited blood disorder, and depression, a psychologically debilitating illness. Thalassemia, which is characterized by insufficient hemoglobin production, significantly affects the quality of life and well-being of patients. As more effective treatment and even a cure for thalassemia have become possible, attention is being drawn to the assessment of depression, which is common among those affected. In addition to investigating the relationship between depression and thalassemia, this research also aims to provide a basis for patient rehabilitation. The study is conducted with a sample of 60 subjects consisting of thalassemia and non-thalassemia children aged 4 to 14 years from different areas of the province. The Beck Depression Inventory scale’s second revision has been used for this purpose. The results confirmed the hypothesis that there is a positive correlation between thalassemia and depression. Statistical analysis was performed using SPSS t-test and revealed a significant level of comorbidity with a calculated coefficient alpha of 0.768, mean of 41.40, standard deviation (SD) of 2.009, Cohen’s d of 0.188, and significance of 0.50. These results are consistent with the previous research conducted by the Iranshahr Institute (2014-2015) indicating a marked occurrence of depression in thalassemia patients. This research is needed overall to understand the relationship between mental health problems and thalassemia. However, the scope of the study is limited to a local hospital with challenges such as language barriers and cultural stigma. Despite these limitations, this study highlights the need for further research on depression in thalassemia patients and suggests avenues for future research and therapeutic rehabilitation interventions. In addition, this topic can be further researched, as diseases such as thalassemia pose great challenges in dealing with those affected. It can also help parents support the suffering child in coping with the psychological burden of the physical illness.

KEYWORDS
thalassemia, depression, rehabilitation

INTRODUCTION
Thalassemia is an inherited blood disorder characterized by the production of abnormal hemoglobin. Hemoglobin is a protein in red blood cells that is responsible for the transportation of oxygen. In this disease, a large number of red blood cells are destroyed, resulting in anemia (NHLBI, 2012). Thalassemia can lead to abnormal formation of hemoglobin. People with thalassemia are unable to make enough hemoglobin, leading to severe anemia. Hemoglobin is contained in red blood cells and transports oxygen to all parts of the body. If there is not enough hemoglobin in the red blood cells, oxygen cannot reach all parts of the body. The organs then suffer from a lack of oxygen and can no longer function properly. In addition to low oxygen-carrying capacity, this abnormal form of hemoglobin also makes red blood cells more susceptible to destruction, decreasing the amount of healthy red blood cells and causing anemia (Cecil et al., 2012).

Complications from thalassemia are common. Thalassemia can lead to disability, mainly due to its impact on physical health, quality of life, and the ability of affected individuals to perform daily activities. Chronic and severe forms of thalassemia, especially thalassemia major, can lead to several complications that contribute to disability (Abu Shosha and Al Kalaldeh, 2018). These complications can include:
• Chronic fatigue: Individuals with thalassemia often experience chronic fatigue due to the reduced oxygen-carrying
capacity of their blood, leading to weakness and a decreased ability to perform regular activities.
• Iron overload and organ damage: Regular blood transfusions, a common treatment for thalassemia, can lead to iron overload in the body, causing damage to organs such as the heart, liver, and endocrine glands. Organ damage can significantly impact overall health and functioning.
• Bone deformities: Thalassemia can lead to bone deformities, particularly in the face and skull, due to the expansion of the bone marrow in an attempt to compensate for ineffective blood production.
• Delayed growth and development: Thalassemia, especially in its severe forms, can interfere with normal growth and development in children, resulting in physical disabilities.
• Emotional and psychological impact: Living with a chronic condition like thalassemia can have a significant emotional and psychological impact, potentially leading to mental health challenges such as anxiety and depression. The emotional toll can contribute to a sense of disability in terms of overall well-being.

In thalassemia, which is also recognized as an inherited blood disorder, the disorder is transmitted from parents to children through genetic inheritance. The severity of thalassemia can vary and ranges from mild to severe. Therefore, people with thalassemia must strictly adhere to their treatment plans to mitigate potential disability. The normal composition of the hemoglobin molecule requires two alpha and two beta protein chains. In thalassemia, this balance is disturbed by a defective chain, resulting in two primary types: alpha- and beta-thalassemia (Shafique et al., 2021; Yenigil et al., 2014). Normally, four genes are involved in the synthesis of alpha-globulin, two of which are inherited from each parent. However, in thalassemia, mutations affecting one, two, three, or all four genes can lead to a malfunction in the synthesis of alpha-globulin protein chains (Kwafie et al., 2020). This disruption of the normal genetic process can contribute to a range of disabilities associated with thalassemia.

Alpha major is a disease in which severe anemia begins before birth. Pregnant women carrying affected fetuses are themselves at risk for severe pregnancy and birth complications. The most severe form of alpha-thalassemia major leads to stillbirth. Normally, the synthesis of the beta-globulin protein chain is regulated by two genes, one of which is inherited from each parent. Beta-thalassemia occurs when the synthesis of the beta protein chain is impaired as a result of an inherited mutation in one or both genes (Unissa et al., 2018). Beta-thalassemia patients are born normal but develop severe anemia in the first year of life. Beta-thalassemia is also known as Cooley’s anemia. Most people born with thalassemia have problems within a few months of birth. Less severe cases may not be detected until later in childhood or even in adulthood.

This study aims to determine the relationship between depression and thalassemia in patients and to provide a basis for rehabilitation intervention. The scale used in this study is valid, reliable, and applicable, suggesting that it is a useful tool for assessing the level of depression in individuals with thalassemia. The results undeniably show that mental health problems exist in this group, emphasizing the need for a holistic approach to healthcare. The fact that thalassemia and depression co-occur highlights the importance of treating mental health problems in addition to medical therapies. Mental health professionals can rely on this scale as a useful tool to assess and understand the complex experience of depression in patients with thalassemia, which will ultimately lead to more thorough and individualized therapeutic rehabilitation interventions for this susceptible group.

Symptoms of thalassemia

Thalassemia is a hereditary blood disorder that often leads to symptoms such as anemia, a condition in which the blood cannot carry enough oxygen throughout the body. Anemia is a common manifestation of thalassemia that leads to various problems. These include colds, dizziness, irritability, shortness of breath, and headaches. In severe cases, it can also lead to symptoms such as pronounced deformities of the facial bones, stunted growth, yellow skin (jaundice), iron overload, susceptibility to infections, an enlarged spleen, and heart problems. These multifaceted symptoms of thalassemia can significantly affect a person’s physical health and overall well-being, potentially leading to disability. In addition, the chronic nature of thalassemia and its potential complications can contribute to emotional distress, potentially culminating in conditions such as depression. In severe cases, thalassemia can further exacerbate symptoms such as an enlarged liver or heart, dark urine, pale skin, and poor appetite, highlighting the complicated relationship between thalassemia, disability, and mental health issues (Iqbal and Sajjad, 2021).

If we look at the psychosocial aspect of these patients’ lives, we can also identify disorders in this area. Symptoms such as poor self-image due to physical problems, stunted growth, pale skin, and frequent illnesses make them feel inferior to their peers, sometimes leading to bullying, which in turn leads to isolation, few friends, and avoidance of social interaction. These children and young people have a negative attitude toward their environment and toward life itself. One of the main problems is low self-esteem and the feeling of being worthless (Tarım and Öz, 2022).

Causes

According to the UK’s National Health Services website (Thalassaemia, n.d.), thalassemia is primarily caused by inheriting faulty genes from parents. It is not influenced by parental actions before or during pregnancy, nor is it contagious. Thalassemia inheritance involves receiving one set of genes from each parent. For a child to be born with beta-thalassemia, they must inherit the faulty beta-thalassemia gene from both parents, who are carriers of the gene trait.

Treatment

Treatment for thalassemia depends on the type and severity of the disorder. Treatments include blood transfusion, iron
Depression

According to the World Health Organization, depressive disorder, commonly referred to as depression, is a common mental illness characterized by persistent feelings of sadness or disinterest in activities (Salman, 1997; World Health Organization, n.d.). It deviates markedly from typical mood swings and can affect all aspects of life, including relationships with family, friends, and the community, as well as performance at school and work. Depression, which is categorized as a mental health disability, can occur in anyone, although individuals who have experienced abuse, severe loss, or other stressful events are at higher risk. Women are more prone to depression compared to men. The average duration of episodes of this depressive disorder, which is recognized as a mental disability, is 6-8 months (Mehdi et al., 2023). According to the Institute of Health Metrics and Evaluation’s (n.d.) Global Health Data Exchange website, an estimated 3.8% of the population suffers from depression, including 5% of adults (4% of men and 6% of women) and 5.7% of adults over the age of 60. It is estimated that around 280 million people worldwide suffer from depression. According to another study by Woody et al. (2017), the prevalence of depression in women is about 50% higher than that in men. Worldwide, over 10% of pregnant women and women who have recently given birth suffer from depression. In addition, more than 700,000 people die by committing suicide every year. This makes suicide the fourth most common cause of death among 15- to 29-year olds.

DSM5 depressive disorder category

According to DSM5, depressive disorders include a wide variety of disorders which include disruptive mood dysregulation disorder, persistent depressive disorder, substance\ medication-induced depression disorder, depressive disorder due to another medical condition, other specified depressive disorders, unspecified depressive disorder, etc.

Causes

The causes of depression are not fully understood and may not be attributed to a single source. Depression is likely to be due to a complex combination of factors that includes genetic, biological, environmental, psychological, and social or psychosocial factors. Other factors may include stressful life events, personality (as having less successful coping strategies), genetic factors (first-degree relatives of depressed patients are at high risk), or any childhood traumatic event. Depressed mood or low mood, reduced interest or pleasure in daily life activities, unintentional weight loss or low appetite, insomnia or hypersomnia, psych motor agitation, fatigue, feeling of worthlessness or guilt, difficulty in concentration, recurrent thoughts of death or suicide, or attempt at suicide are the features that may be seen as the symptoms of depression (Adams et al., 2023; Chae et al., 2023).

Theoretical background

Thalassemia consists of one of the most common chronic and genetic hematologic disorders, globally. There are approximately 240 billion people worldwide who are heterozygous for beta-thalassemia while approximately 200,000 affected homozygotes are born annually (Shrestha, 2023). Thalassemia is a major health problem not only for the patients and their families but also for the Public Health System of each country due to the cost of treatment involving regular transfusions, iron chelation, frequent hospitalization, and general medical follow-up. As more effective management and even cure of thalassemia have become possible, attention is drawn to the evaluation of psychiatric disorder such as depression that frequently accompanies these individuals (Angastiniotis, 2024). Depression is a chronic disease that needs medical treatment and poses several limitations to patients’ lives given the disabilities that provoke it, thus exerting a negative influence on their quality of life.

Although the etiology of depression in children and adolescents is not well understood compared to that in adults, it is considered as a result of interactions between different factors. The factors involved in the onset of depression are stressful events (chronic illness), family-related factors (death in a family, divorce, physical abuse, inter-family conflicts, or economic difficulties that undermine the quality of the relation within the family), or social factors (peer group or school when children experience it as pressure). Relatively, hereditary factors seem to be responsible for the onset of depression, such as mental illness in the family that significantly increases the risk for the child to develop depression; however, it is not fully clear whether inheritance is responsible for the development of depression. Furthermore, depression in children has demonstrated disturbances in the metabolism of neurotransmitters and endocrine disorders mainly cortisol as an adult. Finally, and most strikingly, the way a person seems to be responsible for depression onset, according to cognitive theory (Dowds, 2021).

Depression and thalassemia in children

The concept of depression during childhood has been a matter of controversy as this period is widely accepted as a time full of joy without symptoms of despair. Following this line of view, it becomes apparent that depression in children remains undiagnosed and consequently untreated. Additionally, failure of diagnosis is attributed to differences in clinical presentations across developmental stages that often raise the question of whether childhood-onset depressive disorder is a different illness from that in adults. Moreover, an equally important issue is whether depressive disorders in childhood consist of an increased risk for psychiatric diagnosis in adulthood. However, during the last 20 years, it has been slowly acknowledged that children may
Children more frequently develop social withdrawal and complain of psychosomatic symptoms, such as headache, abdominal pain, irritability, poor school performance, social isolation, and inability to handle frustration (Rey and Hazell, 2009). During the first years of life, children are unable to understand the real extent of the disease; however, they feel the general climate of disorganization that follows the disease. As they mature, they become more aware of the nature of thalassemia, thus developing denial and psychological distress. The impact of the disease in many dimensions of life becomes increasingly evident during preschool and school age when children seek independence. Another significant area in this period is related to comparisons between children and their peer group. Given the often unpredictable and fluctuating course of thalassemia, it is apparent that the disease is related to frequent re-hospitalizations and repeated absences from school and therefore low school performance. Numerous other factors are responsible for low school performance, such as impaired abstract reasoning, deficits of language, attention, memory or visual-spatial skills, and executive functions which are more prominent in hemosiderotic patients (Koutelekos and Haliasos, 2013).

Children should be evaluated to have early intervention, special education, and psychological support. Controversy exists over the possibility of quitting school. The chronicity of the disease affects children’s social life negatively, because it reveals the disease and triggers comments or questions in their environment, mainly the school. Usually, thalassemia children refuse to discuss their health with friends and are dependent on their parents. However, children feel psychological distress when caregivers put less emphasis on the importance of providing information or explanations to children about the nature of the disease. All the above factors have effects on children’s self-esteem, personality development, and emotional health. Usually, children develop negative thoughts about their lives and experience feelings of loneliness, isolation, and psychiatric morbidity that make their integration into a social environment. Teacher’s role has a beneficial impact on minimizing the emotional burden of thalassemia disease as they are often able to change the negative attitudes or perceptions of classmates, thus offering precious help for their integration into society (Afzal et al., 2023; Allayar et al., 2014).

**Depression and thalassemia in adolescents**

Adolescence is an intermediate phase between childhood and adulthood, when a permanent change in the body takes place. Furthermore, adolescence is accompanied by many challenges, such as social, personal, and career. At the same time, it is a period when significant changes in mood take place for various reasons. For example, teenagers wish to go through new circles in their lives, experience grief for prior joys of childhood, and face emotional conflicts due to the release from their parents and the uncertainty of finding other sources of support. On the contrary, thalassemia adolescents, being already affected by the chronic illness and having realized the impact of its chronicity, are more vigilant of their illness progression and potential health hazards. Accordingly, they face significant problems in all facets of life that contribute to the onset of depression. The main factors involved in psychiatric disorders are family (overprotection, negligent, or hostile parents), social (uncompassionate peers), and the burden of disease (complications, blood transfusion, iron chelation). Furthermore, thalassemia adolescents experience feelings of shame or denial, uncertainty about the outcome of the disease, and fear of stigmatization or the imminent death that imposes restrictions on social life. At this stage, thalassemia individuals are more self-conscious of their adversely affected physical appearance and consider that the illness has negatively affected their academic performance and their heterosexual relationships. Regarding the opposite sex, they feel different due to their delayed sexual development, awkward physical appearance including changes in body image. Health professionals and the supportive net of adolescents (family, social) play a crucial role in making them feel confident, build self-esteem, and eventually become self-sufficient individuals (Beirão et al., 2020).

One aspect in need of a closer notice is recognizing the clinical presentation of depression in adolescence which includes loss of appetite or excessive eating, sleeping difficulties, restriction of activities, somatic complaints, replacing the subjective complaints, and poor concern for physical appearance and mental health. Frequent manifestations are antisocial behavior and suicidal tendencies.

**Depression and thalassemia in adults**

Initially, the disease was less common in adults, and in the early days of treatment, thalassemia was regarded as a condition of the young mainly treated by pediatric teams. Since the 1960s, with advances in hematologic-oncology, median survival in thalassemia major has increased from 16 to 30 years. As an increasing number of young people reach adulthood, thalassemia has become a chronic disease having significant ongoing healthcare needs that must be delivered in adult, rather than in pediatric, settings, a process known as “transition.” Indeed, adults being at risk for many complications, such as osteoporosis, cardiac diseases, and organ failure, require treatment in a nonpediatric setting. The problem has two options: on the one hand, healthcare professionals are less prepared for this transition or are unfamiliar with adult-specific issues and on the other hand many centers remain (Sawh, 2023) focused on the care of pediatric patients including unavailability of necessary equipment. Interestingly, adult patients moving from thalassemia centers to adult healthcare facilities face the risk of not receiving proper treatment, mainly attributed to the lack of specialists and centers. Management of any chronic illness needs ways to ease this important transition and ensure effective communication between health care professionals in children and adult settings. Nowadays, patients move from the pediatric age group to adulthood, and maturing adults experience different goals and challenges; this distress has come to the forefront of clinical practice. It is noteworthy
that the causes of distress disorders appear to vary over the years and the improvement of treatments. For example, in the previous decade’s high prevalence of psychosocial health disorders derived from their accommodation with hard life conditions and expectation of death. However, in contemporary times, psychosocial health disorders are attributed to poor socio-economic status, uncertainty about the future, or concern about being a burden to the family. Other factors that held responsible for the onset of psychosocial distress are chronic disease, fertility issues, and limited family, educational, and career opportunities. Significant concerns are raised about its treatment as it has been shown to exert a negative influence on the therapeutic regimen (Maryam et al., 2018).

Routine hospitalization also exposes individuals to the huge risk of having to reveal their disease to colleagues and employers, thus facing potential bias and discrimination. Enhancing public awareness after considering socio-cultural and religious factors is important to dispel any misconceptions and avoid being stigmatized by society. Regarding sex, there are observed differences with women in assessing the psychosocial aspects of the disease as important factors affecting quality of life. A possible explanation is that women live longer, withstand chelation therapy, and have lower rates of cardiovascular events. In developing countries where there is an observed lack of public awareness or the cost of therapy is either too expensive or not available, helpless thalassemia adults in their effort to cope with the disease may experience severe emotional difficulties, such as frustration, sadness, hostility, depression, anxiety, fear of death, lack of confidence, isolation, and anger (Böge et al., 2018).

Providing information to patients in understandable and accurate terms about the nature of the disease, the need for treatment, and the new medical protocols, has beneficial effects both on the outcome of thalassemia and depression. Knowledge deficits may result in unnecessary depression. The provision of information should be individualized and appropriate to the age, development stages, psychological maturity, personality, and family environment (Tabussam et al., 2022).

Thalassemia patients require lifelong psychological support for the prevention of mental health issues. The ultimate goal of implementing psychological programs for thalassemia patients is to combat depression by enhancing their integration into the social mainstream, minimizing knowledge deficits, and providing help to plan and actualize their educational, personal, and career goals, thus leading fulfilling lives (Mardhiyah et al., 2023). To prove that thalassemia can cause great damage to the psychological health of an individual, a study was held in Iranshahr in the year 2014. It was strived to check the amount of depression in beta-thalassemia patients; 57 patients were enrolled (mean age 17 years). For assessment, Beck Depression Inventory (BDI) was used. Based on the results, it was concluded that a noticeable rate of depression was found in patients.

In another research study conducted by the same institute in the year 2015, 60 patients were enrolled. For this purpose, the demographical questionnaire, BDI, and Becks Anxiety Inventory were used. For depression, it was found that the mean for depression was 27.73 + 3.5 showing a high rate of depression in patients. In another study conducted in Jordan, it was stated that not only do patients with thalassemia suffer from a wide variety of psychological problems but the mothers of the sufferers also experience psychological symptoms such as depression (Mirbehbani et al., 2014). In this regard, 65 mothers of patients with thalassemia and 65 mothers of normal children were enrolled. For assessment, BDI was used. This showed a significant prevalence of depression in the case group than that of the control group (values were 84.6% vs. 56.9%; <0.05). Keeping in view the following results, it was concluded that mothers of children with major thalassemia are vulnerable to depression and they need psychosocial support to promote their health.

**Techniques for medical specialists dealing with patients**

Medical specialists who are dealing with thalassemia patients can to some extent manage the distressed child going through depression by practicing the following:

- Providing them with a comfortable treatment environment.
- Listening to their concerns regarding their health and treatment.
- Pretending medical play for children showing signs of hypersensitivity to desensitize them to the treatment.

**Rationale**

Thalassemia is an inherited blood disorder that causes severe damage to the quality of life. This physiological disease is accompanied by several psychological disorders as well, including depression. This investigation is a trial to explain the psychological factors contributing to the disturbance of the mental health of such individuals. It aims to find out the prevalence of depression in thalassemia patients and also to provide such people with possible psychological help, which will not only facilitate them in coping with their disease and its damaging consequences but also help them adjust to society and the environment around them and have better survival skills.

**METHODOLOGY**

The aim of this study is to find out the relationship between thalassemia and depression and to analyze the effects of psychological stress on the quality of life of thalassemia patients. This study uses a correlational and cross-sectional approach to investigate the relationship between thalassemia and depression. Quantitative methods were used to analyze the data collected from the sample population.

**Hypothesis**

There will be a significant comorbidity rate among thalassemia disease and psychological distress such as depression.
Sampling

A purposeful sample of 60 individuals is taken to assess the hypothesis. Half of the sample, i.e. purposefully selected, is collected from Fatimid Foundation, Hayatabad, Peshawar. It consists of 30 individuals (n = 30) including children and adolescents. The other half contains normal individuals with no thalassemia history, enrolled randomly from different places.

Instrument

The instrument used in this research is the BDI (BDI, BDI-IA, BDI-2) created by Aaron T. Beck. This is a 21-question multiple-choice self-report inventory of the most widely used psychometric test for measuring the severity of depression and its developmental marked shift among mental health professionals, who had until then, viewed depression from a psychodynamic perspective, instead of it being rooted in the patient’s thoughts.

The current version of BDI-2 is designed for individuals aged 13 and over and is composed of items related to the symptoms of depression, such as hopelessness and irritability, cognitions, such as guilt or feelings of being punished, and physical symptoms, such as fatigue, weight loss, and lack of interest in sex. There are three versions of the BDI—the original BDI, first published in 1961, the later one revised in 1978: BDI-IA, and BDI-2, published in 1996. The BDI is widely used as an assessment tool by healthcare professionals and researchers in a variety of settings. The BDI was used as a model for the development of children’s depression inventory, first published in 1979 by clinical psychologist Maria Kovacs.

Procedure

The study was conducted on a sample of 60 people aged 14 to 25 years from the population of thalassemia patients at the Fatimid Foundation and other educational institutions to determine their level of depression as shown in Figure 1. The subjects had given their consent to complete the scale. All subjects were interviewed individually face to face and the report was prepared. All subjects were assured that their responses would be treated confidentially. All subjects were given verbal instructions. After the test was completed, it was ensured that the subjects were satisfied with their answers. Subsequently, the subjects were thanked and rewarded for their time and effort. Finally, the researcher applied the statistical $t$-test for independent samples to the collected data and the results were interpreted accordingly.

RESULTS AND DISCUSSION

Table 1 shows the descriptive statistics and reliability measures for the BDI scale. The BDI scale has 21 items, with a mean (M) score of 41.40 and a standard deviation (SD) of 2.009. The skewness of the BDI scores is 0.721, indicating a slightly right-skewed distribution. Kurtosis, which measures the peakedness of the distribution, is -1.02, suggesting

<table>
<thead>
<tr>
<th>Scales</th>
<th>No. of items</th>
<th>M</th>
<th>SD</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>Coefficient alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDI</td>
<td>21</td>
<td>41.40</td>
<td>2.009</td>
<td>0.721</td>
<td>-1.02</td>
<td>0.768</td>
</tr>
</tbody>
</table>

Abbreviations: BDI; M, mean; SD, standard deviation.
a relatively flat distribution with lighter tails compared to a normal distribution. The coefficient alpha (Cronbach’s alpha) for the BDI scale is 0.768, indicating good internal consistency reliability. This means that the items in the BDI scale are correlated with each other and the same suggest that the scale is measuring a consistent construct.

Table 2 shows the demographic characteristics of the sample in relation to the Beck Depression Inventory (BDI) scale. Specifically, it displays the gender distribution of the sample, with 34 males (56.66%) and 26 females (43.33%) participating in the study. This indicates that slightly more than half of the participants were male, while approximately 43% were female.

Table 3 shows a significant correlation between thalassemia patients and depression, as indicated by the reliability analysis of the Beck Depression Inventory Scale (BDIS). The coefficient alpha of 0.768 for the BDIS suggests strong internal consistency among its 21 items which reflects a reliable measurement of depressive symptoms.

Table 4 shows the comparison of depression levels between male and female thalassemia patients using the Beck Depression Inventory (BDI) scores.

For males, the mean BDI score is 39.7 with a standard deviation of 20.8, while for females, the mean BDI score is 43.5 with a Standard Deviation of 19.2. The t-value of 5 indicates a statistically significant difference in depression levels between males and females. Cohen’s D of 0.188 indicates a small effect size which suggests that the difference in depression levels between males and females, while statistically significant, may not be practically significant.

The study conducted showed a significant correlation between thalassemia and depression as shown in Table 3. Reliability was determined by calculating the coefficient alpha, which was 0.768. The calculated results show that the scale used is reliable and that there is significant comorbidity between thalassemia and depression in the two different groups. This indicates a high level of depression in thalassemia patients. This was also found in a previous study by the Iranshahr Institute (2014-15), in which they concluded that high levels of depression were found in thalassemia patients. The high level of depression could be treated with both therapeutic rehabilitation interventions. The study was conducted on a sample from a local hospital, so the results cannot be generalized globally. As English is a third national language, many people had difficulty in understanding the questionnaire and interpreting the simple terms used in the questions; so, some of the subjects may have given incorrect answers, which might slightly affect the results. Participants’ responses could have been influenced by social desirability or bias. They are also confronted with stereotypical rituals and attitudes of society and are ostracized. They are seen as a burden on society and are either overprotected or neglected. They also have to undergo painful treatment therapies to survive this disease. All these unfortunate factors contribute to the high rates of depression in these patients. In the future, the research could be applied to children, adolescents, and adults. The field could be expanded to consider differences and differentiate depression in male and female patients. In this context, the comorbidity of other mental disorders besides depression can also be investigated. In addition, this topic can be further researched as diseases such as thalassemia pose great challenges in dealing with those affected. It can also help parents to support the suffering child in coping with the psychological burden of the physical illness. Furthermore, the study could be conducted on skilled and unskilled individuals, differentiating between them according to the presence of depression. Future research can also incorporate essential therapeutic techniques that prove helpful in reducing the level of depression.

CONCLUSION

The scale has good applicability, reliability, and validity to measure the level of depression in thalassemia patients. The researcher can easily find out whether these patients have mental health problems. Using the scale, a professional can easily determine the comorbidity between two variables. It can be concluded that professionals can rely on the scale to assess the level of depression in thalassemia patients. The study highlights the need for further research on depression in thalassemia patients and suggests avenues for future research and therapeutic rehabilitation interventions. In addition, this topic can be further researched as diseases such as thalassemia pose great challenges in dealing with those affected. It can also help parents to support the suffering child in coping with the psychological burden of the physical illness.

### Table 2: Demographic characteristics of sample BDI scale.

<table>
<thead>
<tr>
<th>Gender variable</th>
<th>F</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>34</td>
<td>56.66%</td>
</tr>
<tr>
<td>Female</td>
<td>26</td>
<td>43.33%</td>
</tr>
</tbody>
</table>

Abbreviation: BDI, Beck Depression Inventory.

### Table 3: Coefficient alpha of BDI scale.

<table>
<thead>
<tr>
<th>Scale</th>
<th>No. of Items</th>
<th>M</th>
<th>SD</th>
<th>Coefficient alpha</th>
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</thead>
<tbody>
<tr>
<td>BDI scale</td>
<td>21</td>
<td>41.40</td>
<td>2.009</td>
<td>0.768</td>
</tr>
</tbody>
</table>

Abbreviations: BDI, Beck Depression Inventory; M, mean; SD, standard deviation.

### Table 4: T value showing differences in thalassemia patient’s level of depression.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Male (n = 34)</th>
<th>Females (n = 26)</th>
<th>t</th>
<th>P</th>
<th>95% class interval</th>
<th>Cohen’s d</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td></td>
<td>LL</td>
</tr>
<tr>
<td>BDI</td>
<td>39.76</td>
<td>20.88</td>
<td>43.53</td>
<td>19.20</td>
<td>58</td>
<td>0.50</td>
</tr>
</tbody>
</table>

Abbreviations: BDI, Beck Depression Inventory; LL, lower limit; M, mean; SD, standard deviation; UL, upper limit.
COMPETING INTERESTS

No competing interest was declared by the authors. All the authors agreed to the submission of the manuscript. None of the material in this paper was published or under consideration for publishing elsewhere.

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