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Depression symptoms and associated factors among thalassemia patients in the Palestinian Territories: a cross-sectional study

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Abstract

Background: Thalassemia is a condition that causes the human body to destroy red blood cells faster than they can be made. It causes physical symptomology as well as psychological distress. The current study aimed to identify the prevalence of depression symptoms among individuals with moderate to severe thalassemia. A quantitative descriptive cross-sectional design was applied utilizing the Beck Depression Inventory to assess the level of depression in the sample.

Results: Some significant relationships were demonstrated in the sample: males reporting severe depression symptoms than females by 6.0 times (95% CI 0.07–0.62, p 0.014), and reporting moderate depression symptoms (95% CI 0.00–0.47, p 0.05). Additionally, income was found to be a predictor of level of depression symptoms with low income reported higher incidence of severe depression symptoms than those whose monthly income was > 400\$ by 18.4 times (95% CI 0.38–1.03, $p \leq 0.001$), but not reporting a significant association between moderate depressive symptoms and monthly income (95% CI – 0.12–1.47, P 0.225). A significant association was found between the educational attainment and level of depression symptoms with lower levels of education predicting higher levels of severe depression symptoms (95% CI 0.069–0.89, p 0.022), but no significant association was reported between moderate depression symptoms and educational attainment (95% CI – 0.49–0.01, p 0.81).

Related to disease characteristics a relationship was confirmed between severe depressive symptoms and medication level such as the individual needing tablets or pumps (95% CI 0.189–1.05, p 0.005 and 95% CI 0.52–1.44, p 0.001) respectively. Other disease related variables showed no significant correlation with depressive symptom levels.

Additional significant relationships were found in environment whereas increased moderate depressive symptoms were experienced by individuals residing in rural areas as opposed to those living in IDP camps or cities by 4 times (95% CI – 0.30–0.01, p 0.04), but no significant association was found between severe depression and the place of residence. The other independent variables had no significant correlation with severe or moderate depressive symptoms.

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Conclusion: In light of these findings addressing symptoms of depression directly and supporting patients with thalassemia with basic life needs unrelated to their disease maybe mitigating depressive symptoms which may negatively affect recovery.

Keywords: Thalassemia, Depression, Palestine

Background

Thalassemia is a set of genetic diseases of hemoglobin synthesis characterized by reduced or absence of one or more of a person's hemoglobin [1]. Thalassemia is globally the most common genetic disease related to a chronic blood disorder. Characterized medically by decreased synthesis of one of the two types of polypeptide (chain B and A) that form the adult human hemoglobin molecule. It reduces the filling of the red blood cells with hemoglobin and leads to anemia [2].

There are two kinds of thalassemia; the first is alpha-thalassemia, commonly found in individuals from the Middle East, Southeast Asia, China, and Africa. There are an estimated 26 million alpha-thalassemia carriers of Southeast Asian origin, 5–15% of Alpha-thalassemia occurs in the Mediterranean area (Cyprus, Turkey, Greece, and Southern Italy) and approximately 1% in the Middle East [3].

The second strand designated as beta-thalassemia, is a complex disease most common in Africa, the Mediterranean region, China, the Middle East, the Indian Subcontinent, and Southeast Asia, stretching from Southern China down the Malaysian Peninsula to the Indonesian Islands [4]. In beta-thalassemia intermediate (TI) the deficiency of beta protein in the hemoglobin causes moderate to severe anemia, causing complications, including bone deformities and enlargement of the spleen [5].

Thalassemia major (TM) also known as Cooley's anemia or beta-thalassemia, occurs when the gene abnormalities affect the production of the beta-globin protein. It is the most common and dangerous type of beta-thalassemia as it damages beta protein in the hemoglobin chain, leading to life-threatening anemia. In the case of major thalassemia, the individual is likely to require recurrent blood transfusions and prolonged medical care. The treatments themselves often lead to iron overload, which is remediated with chelation therapy to prevent early complications that end with the loss of life due to organ failure [6].

Physical symptoms can differ significantly depending on the form of thalassemia and the seriousness of the condition that the individual suffers from. Individuals with thalassemia may complain of irritability, pale appearance, weakness and fatigue, facial bone deformities, discoloration of the skin, and shortness of breath [7].

The total number of thalassemia patients in Palestine is about 866, of whom are 557 in West Bank and 309 in Gaza Strip [8]. Depression is the most common psychological complication for individuals with thalassemia [9]. The prevalence of depression in patients with thalassemia has been estimated to be between 8–12% among adult men and 20–25% among adult women [10]. These findings are significantly higher than the general prevalence of depression which was estimated to be between 2 and 9% with the incidence of depression found to be higher among females than males: 2:1 in the general population [11].

Individuals with thalassemia are exposed to emotional higher levels of distress related to their symptoms that may affect self-esteem negatively across the life span as children, adolescents, and adults [5].

Yahia et al. (2013) conducted a study evaluated the prevalence of anxiety and depression among individuals affected by thalassemia in Egypt, the study indicated that 32.1% and 16.1%, of patients reported experiencing clinical and borderline levels of depression. The physical symptoms related to depression were heart failure, frequent hospitalization, diabetes mellitus, short stature, and delayed puberty [12].

Also, Maheri et al (2018) conducted a study in Iran using the hospital anxiety and depression scale to investigate anxiety and depression among patients with thalassemia, they found 19.8% had depression and 23.7% had an anxiety disorder [13].

A longitudinal study done by the American Clinical Research Network for thalassemia investigated the symptoms of depression and anxiety in patients with thalassemia, found that 11% of the patients had symptoms of depression [14].

The explanation of relative hypercholesterolemia in beta-thalassemia patients is the result of accelerated erythropoiesis and increased low-density lipoprotein (LDL) uptake by macrophages of reticuloendothelial system [15]. The hypercholesterolemia decreases the atherosclerosis but also has negative consequences especially major depression [16].

The current study investigating the level of depression symptoms among patients with thalassemia in the West Bank of Palestinian territories. This study is necessary to explore the psychological effect of such thalassemia trait among the Palestinian population.

Methods

Study design

A descriptive cross-sectional design was used to achieve the aims and the objectives of the current study. The study population were patients with thalassemia (moderate to severe) who were admitted for regular blood transfusion treatment.

Setting

The patients were recruited from five government hospitals in the West Bank of Palestine; Al-Watani in the city of Nablus, Darwish Nazal in the city of Qalqilia, Dr. Thabet Thabet Hospital in the city of Tulkarm, Jenin Hospital in the city of Jenin, and Tubas Hospital in the city of Tubas.

The sample size for this study was calculated based on 95% CI and 5% margin of error by using the Raosoft software sample size calculator and the recommended sample was 163 individuals aged (16–26) with moderate and severe thalassemia, and excluded more age categories because the life rate for thalassemia patients is 25–30 years. Any patient has thalassemia, from the mentioned districts, not diagnosed with psychiatric disorders; was included. Of these patients with thalassemia, 41 were from Tulkarm (29 TM and 12 TI), 30 from Qalqilia (20 TM and 10 TI), 40 from Nablus (30 TM and 10 TI), 48 from Jenin (40 TM and 8 TI), and four from Tubas (1 TM and 3 TI). The sample was conveniently chosen between 2018 and 2019. The sample size applied was based on and according to similar studies.

Data collection

All participants completed a recruitment survey in a closed area inside the hospital. Data was collected through face-to-face interviews with all the participants

who agreed and who met the inclusion criteria. Each interview lasted approximately 10 to 15 min.

Measures

Beck Depression Inventory (BDI): The BDI is self-reported instrument that consists of 21 questions on a Likert scale. Scores 1–13 indicate minimal depressive symptoms, 14–19 mild depressive symptoms, 20–28 having moderate depression, and 29–63 suggests that the individual has severe depression. The validity of the BDI has been applied in multiple cultural settings several researchers worldwide [17, 18].

Alansari (2006) examined the Arabic BDI version against validity and reliability of the tool in Arabic culture, was found to be valid, Cronbach alpha coefficient indicated high level of internal consistency ($\alpha = 0.85$) [19]. In the current study, we used Alansari validated, reliable, and Arabic version.

Statistical analysis

The data were analyzed using IBM SPSS software ver. 21.0 through descriptive statistics (mean, standard deviation, frequency, and percentage) and analytical statistics using generalized linear regression model. The results were considered to be significant at the conventional level of $P \leq 0.05$. The minimal to mild depression variable considered in this study as a referral factor when analyzed the regression, due to that all thalassemia patients had at least minimal to mild depression and there was no one free from depression symptoms.

Results

Results of demographic information in Table 1 shows that the female participants outnumbered the male participants: 55.2% versus 44.8%. 38.7% of participants were

Table 1 Distribution of the participants according to socio-demographic data

Variables	No%	Variable	No%		
Gender	Male	(73)44.8	Age at diagnosis	≤ 1 year	(105)65
	Female	(90)55.2		≥ 1 year	(58)35
Age	16–20	(43)26.3	Transfusion Frequency	Weekly	(45)27.6
	21–25	(63)38.7		Monthly or more	(118)72.4
	> 25	(57)35.0	Percentage of Ferritin	Low	(62)38.0
Residency	IDP camp	(27)16.5		High	(101)62.0
	Rural village	(95)58.3	Medication for the treatment of Ferritin	Tablet	(97)59.5
	City	(41)25.2		Pump machine	(48)29.5
Education levels	Primary	(22)13.5		No treatment	(18)11.0
	Secondary	(67)41.1	Complications	Change of face shape	(22)13.5
	Diploma and higher	(74)45.4		Splenomegaly and Hepatomegaly	(141)86.5

older than 20 years old. Most of the participants (58.3%) were from rural villages (as opposed to cities or internally displaced people's camps (IDP)). About 41% of the participants had completed high school. Sixty-five percent of the participants were diagnosed with thalassemia at the age of ≤ 1 , while 35% were diagnosed after 1 year of age.

Regarding transfusion frequency, the results showed that 72.4% of the sample received blood transfusion monthly and above, while 27.6% received blood transfusion weekly. About 62% of the sample had a high ferritin level; which reflects the vulnerability to develop iron overload related complication, close to 60% of participants used tablets to treat ferritin, while 29.5% used pump machines, and 11% did not need treatment. Also, 86.5% of the participants reported complications such as hepatomegaly, splenomegaly, and heart failure, 13.5% who said facial disfiguration.

As Table 2 shows, 55.8% of the sample reported severe level of depression, 22.8% experienced moderate depression, 15.3% had minimal depression, and 6.1% suffered from mild depression.

Results of Table 3 illustrates the significant correlation between level of depressive symptoms related to demographic and disease characteristics/effects in the sample. The results demonstrate a significant association between gender and depression symptoms with males reporting severe depression symptoms than females by 6.0 times (95% CI 0.07–0.62, p 0.014), and reporting moderate depression symptoms (95% CI 0.00–0.47, p 0.05). Additionally, income was found to be a predictor of level of depression symptoms with low income (individuals with monthly income of < 400 \$; the minimum wage in Palestine) reported higher incidence of severe depression symptoms than those whose monthly income was > 400 \$ by 18.4 times (95% CI 0.38–1.03, $p \leq 0.001$), but not reporting a significant association between moderate depressive symptoms and monthly income (95% CI – 0.12–1.47, P 0.225).

A significant association was found between the educational attainment and level of depression symptoms with lower levels of education predicting higher levels of severe depression (95% CI 0.069–0.89, p 0.022), but no

significant association was reported between moderate depression symptoms and educational attainment (95% CI – 0.49–0.01, p 0.81).

Related to disease characteristics a relationship was confirmed between severe depressive symptoms and medication level such as the individual needing tablets or pumps (95% CI 0.189–1.05, p 0.005 and 95% CI 0.52–1.44, p 0.001) respectively. Other disease-related variables showed no significant correlation with depressive symptom levels.

Additional significant relationships were found in environment whereas increased moderate depressive symptoms were experienced by individuals residing in rural areas as opposed to those living in IDP camps or cities by 4 times (95% CI – 0.30–0.01, p 0.04), but no significant association was found between severe depression and the place of residence. The other independent variables (age, marital status, work, age at DX, period for blood transfusion, level of ferritin, complications) had no significant correlation with severe or moderate depressive symptoms.

Discussion

This study aimed to identify the prevalence of depression symptoms and socio-demographic characteristics associated with it among patients with moderate to severe thalassemia in the West Bank of Palestine.

The current study demonstrated that a majority (78.5%) of the sample had moderate to severe depression per the Beck Depression Scale (55.8% of the participants had severe depression while 22.7% had moderate depression). There are a variety of factors that may influence this finding. This could be attributed to the political conditions in Palestine for all Palestinians but may also be related to the unemployment rate for those with thalassemia, the inability to adequately participate in educational programs, the inability to marry in some cases as well as individual factors not addressed in the data.

In a previous study, Sabry and Salama (2009) found no thalassemia patient free from depression symptoms and demonstrated that depressive levels were significantly higher among individuals affected by thalassemia than the non-affected population [20]. This result concurs with Khurana's work, who found that most individuals with thalassemia reported at least moderate depression symptoms and low self-esteem [21]. In a sample of thalassemia patients in India, it was found that 30.8% had clinical depression and indicated that depression was the most common mental disorder among individuals with thalassemia in India [22]. All of these findings concurred with the results of the current study.

Factors associated with depressive symptoms among moderate to severe thalassemia patients in the current sample was gender with males having more significant

Table 2 Distribution of the sample according to the depression level

Level	Frequency (%)
Minimal	25 (15.3)
Mild	10 (6.1)
Moderate	37 (22.8)
Severe	91 (55.8)
Total	163 (100)

Table 3 Generalized linear models for factors associated with minimal to mild compared with severe depression and for factors associated with minimal to mild compared with moderate depression among PWT

Minimal to mild compared with severe depression among PWT								Minimal to mild compared with moderate depression among PWT					
V	B	SE	Chi	95%CI		P	B	SE	Chi	95%CI		P	
				Lower	Upper					Lower	Upper		
Gender	Male	0.345	0.140	6.058	0.070	0.620	0.014	0.237	0.121	3.855	0.000	0.473	0.050
	Female	0a					0a						
Age (Y)	16–20	– 0.158	0.189	0.697	– 0.529	0.213	0.404	– 0.185	0.141	1.736	– 0.461	0.090	0.188
	21–25	0.186	0.162	1.312	– 0.132	0.504	0.252	– 0.207	0.144	2.063	– 0.490	0.076	0.151
	> 25	0a					0a						
Residency	City	0a					0a						
	Village	0.020	0.163	0.015	– 0.300	0.339	0.903	0.296	0.145	4.164	– 0.300	0.012	0.041
Education	IDP camp	0.069	0.214	0.103	– 0.351	0.488	0.748	0.172	0.207	0.690	– 0.351	– 0.234	0.406
	Primary	0.478	0.209	5.216	0.068	0.889	0.022	0.034	0.269	0.016	– 0.493	0.016	0.899
	Secondary	0.275	0.148	3.452	– 0.015	0.564	0.063	0.021	– 0.015	0.029	– 0.220	0.029	0.866
MS	Diploma and higher	0a					0a						
	Single	– 0.270	0.296	0.837	– 0.849	0.309	0.360	– 0.713	0.548	1.693	– 1.788	1.693	0.193
	Married	– 0.518	0.354	2.141	– 1.211	0.176	0.143	– 0.847	0.565	2.247	– 1.954	2.247	0.134
Work	Divorced	0a					0a						
	Employed	– 0.079	– 0.079	0.273	– 0.378	0.219	0.620	– 0.173	0.158	1.190	– 0.138	1.190	0.275
Monthly income US (\$)	unemployed	0a					0a						
	< 400	0.703	0.703	18.401	0.382	1.025	0.001	0.165	0.136	1.473	– 0.102	1.473	0.225
Age at DX	> 400	0a					0a						
	≤ 1 year	– 0.207	0.149	1.916	– 0.501	0.086	0.166	– 0.014	0.116	0.014	– 0.241	0.014	0.906
Period for BT	> 1 year	0a					0a						
	Weekly	0.191	0.163	1.373	– 0.128	0.510	0.241	0.092	0.134	0.470	0.355	0.470	0.493
Ferritin level	Monthly or more	0a					0a						
	Low	0.301	0.157	3.661	– 0.007	0.609	0.056	– 0.022	0.125	0.030	0.224	0.030	0.863
Medications	High	0a					0a						
	Tablet	0.621	0.221	7.917	0.188	1.054	0.005	0.190	0.158	1.453	0.500	1.453	0.228
	Pump	0.979	0.233	17.726	0.523	1.435	0.001	0.264	0.219	1.449	0.694	1.449	0.229
Complications	No need	0a					0a						
	Face changes	– 0.082	0.221	0.137	– 0.515	0.352	0.711	0.106	0.161	0.432	0.422	0.432	0.511
	Splenomegaly and hepatomegaly	0a					0a						

Y year, MS marital status, DX diagnose, BT blood transfusions, V variable, B coefficient, SE standard error, PWT patient with thalassemia, IDPC internally displaced people's camps

symptomatology (p 0.014). Males in Palestine carry a high social expectation for marriage, economic success, education, and responsibility for the family, especially in rural areas where women are not commonly working outside of the home. Unemployment, lack of education, and increased sense of responsibility may factor into the experience of depression in this population of male patients. These results are in accordance to a study in Iran where Ghaffari found that depression among males was more than in females with thalassemia [23]. Some studies in non-health affected populations found that males were more prone to depression [24]. However,

the study of Naderi and a study of Khodaei conducted in Iran, found no significant association between gender and mental health disorders such as depression [25, 26].

The currently study additionally revealed a significant association between severe depression symptoms and education level among individuals with thalassemia in the West Bank (p 0.022).

Adib-Hajbaghery found a statistically significant association between lower levels of education and depression symptoms in individuals with thalassemia. They maintained that the higher level of education including knowledge about thalassemia itself could assist individuals to

accept and adapt to their symptoms while lower levels of education lead to misunderstanding, self-blame and low self-esteem [27]. One consideration that must be further explored is the correlation between intelligence quotient (IQ), intellectual disabilities, specific learning disabilities in thalassemia, or as a mediating factor in the relationship between the lack of education and depression.

Biswas et al. (2016) found that challenging economic conditions of participants was a particular burden in India with the high costs of medical treatment and high levels of unemployment for individuals with thalassemia leading to psychological problems [28]. A study of Karaman showed that 31.6% of thalassemia participants were unemployed, and 59.1% had a monthly income below the countries standard. All these studies' findings concur with the results of this study which indicated that economic challenges (especially for the poorest) were related to depressive symptoms [29].

The current sample data demonstrated a significant correlation between depressive symptoms and the need for thalassemia medications in both tablets and pump form ($p < 0.005$, 0.001) respectively. This might be attributed to the additional level of physical complications, limitations or the pain and discomfort of economic burden that results from recurrent treatments. Moussa reported that frequent subcutaneous injections with the pump for patients of diabetes mellitus was associated with depression [30]. In addition, Trachtenberg reported that 63% of the thalassemia patients in his sample had used oral medication 11% had used a combination, and 6% had used a slow subcutaneous infusion or portable pump machine. In that study, taking oral chelation was significantly associated with depression ($p < 0.01$) [31]. In Palestine, the area of residence (city, rural, IDP camps) determines a wide variety of socio-economic factors including economic resources, employment opportunities, access to education, crowding, social acceptance, a psychological stress, etc. [32]. In the current investigation, it was found that there was a significant association between depression and participants' place of living whereas living in the village (as opposed to a city or IDP camp) was associated with increased level of depression ($p < 0.01$). Shaligram found that 75% of rural area thalassemia patients were vulnerable to depression [33]. This could be attributed to their access to medical care, difference in education level or ability to find employment as well as isolation from other's with similar disabilities and possibly increased level of discrimination in terms of social isolation, etc. Of further interest are the variables that did not predict depression in individuals affected by thalassemia which included marital status, employment status, period of blood transfusion, age, and disease complications.

The current study has several limitations which may provide the opportunity for future studies. The data in the study was based on self-report of thalassemia patients. Since many had limited education, it is unclear how well they understood the task or felt pressure to agree with interviewers' inquiries. Second, the demographic variables were limited and no other intellectual/psychological measures were administered. Comorbidity with other psychological disorders and or general/specific learning disabilities are unknown and unevaluated. The Beck Depression Inventory (BDI) alone was used with no other psychological measures included in our study such and limited social/economic information was included. Future studies that utilizing different mental health measures among patients with thalassemia in Palestine are needed. Additionally, only one study group of thalassemia patients was included in this study which limited the generalizability of the findings. Future studies examining the role of depression across demographic groups are needed. Lastly, calculation of the number of patients with chelators or deferoxamine was not added as it was not the main purpose of the study.

Conclusions

The prevalence of depression among individuals with thalassemia appears to be high and more prevalent than in non-affected individuals. Males, individuals with lower academic achievement, and lower levels of economic resources were found to be more vulnerable to depression. Individuals required to use medications such as tablet drugs and pump machines were also found to be of higher risk for developing depression symptoms.

These findings bring to light the need for screening, monitoring, and offering treatment interventions for individuals with thalassemia throughout the lifetime. Additionally, programs addressing obstacles and access to education, employment and psychological support for individuals affected by thalassemia may mitigate and alleviate the consequent depression over time.

Further studies of the chronology of symptoms across the lifespan would increase knowledge of critical factors (developmental and other) in the acquisition of depression symptoms. Lastly, investigation on the effects of depression on the course and outcome of thalassemia will be essential to support this potentially vulnerable population.

Abbreviations

CI: Confidential interval; IDP: Internally displaced people's camps; DX: Diagnose; TM: Thalassemia major; LDL: Low-density lipoprotein; TI: Thalassemia intermediate; BDI: Beck Depression Inventory; IQ: Intelligence quotient; PWT: Patient with thalassemia.

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Authors' contributions

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by SM, AS, FM, and DB. The first draft of the manuscript was written by AS and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

All procedures performed in this study involving human participants were in accordance with the ethical standards of An-Najah National University's Research Ethics Board (Reference number 20/AP/0019) and the American Psychological Association (APA, 2010) and with the 2013 Helsinki Declaration. Informed consent was obtained from all participants.

Consent for publication

Not applicable

Competing interests

The authors declare that they have no competing interests.

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