

ORIGINAL ARTICLE

Evaluation of Anxiety and Depression Using Hospital Anxiety and Depression Scale in Patients With Advanced Diabetic Eye Disease

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ABSTRACT

Introduction: Advanced diabetic eye disease (ADED) is the debilitating sequelae of diabetic retinopathy (DR). It is a chronic disease and requires life-long treatment. The mental health of patients with chronic disease is often affected. **Method:** A cross-sectional study was conducted involving ADED patients from Hospital Universiti Sains Malaysia (USM) and Hospital Sultanah Aminah from 1 May 2022 till December 2023. Diabetic patients with no DR were included as control group. Ocular examinations using slit lamp biomicroscopy were performed and HADS was used to assess patient's anxiety and depression. **Result:** A total of 108 diabetic patients were included in this study (54 ADED and 54 no DR). Percentage of ADED patients with anxiety and depression based on HADS score cut-off point of 8 or more were 64.8% and 61.1% respectively. The mean HADS for anxiety (HADS-A) score was significantly higher in ADED (8.15 SD 4.42) than in no DR (4.15 SD 3.02) ($p < 0.001$). The mean HADS for depression (HADS-D) score was significantly higher in ADED (7.69 SD 3.29) than in no DR (4.28 SD 3.45) ($p < 0.001$). Foot amputation and severe visual impairment were the factors that significantly associated with anxiety and depression. **Conclusion:** ADED is more susceptible to psychological stress due to visual impairment and chronic medical illness related to complication of DM. A holistic approach to the management of ADED patients should include a thorough evaluation of their mental health status and early referral for mental health care, which may aid in optimising patients' care and disease outcome.

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Introduction

The World Health Organization defines mental health as a state of overall well-being in which individuals are able to recognize their own abilities, cope with the normal stresses of life, and engage productively in work and daily activities (1). Depression is strongly linked to chronic illnesses and is more common among individuals with conditions such as diabetes mellitus (DM), heart disease, and stroke. The burden of managing these long-term diseases can contribute to the onset or worsening of depression (2). In Malaysia, the prevalence of anxiety and depression ranges from 8%

to 12%, respectively. However, a significant number of depression cases remain unreported due to fear of stigma within the community, as well as a lack of awareness and a tendency to seek alternative traditional treatments instead of professional care (3).

Diabetic retinopathy (DR) represents microvascular end-organ damage as a result of uncontrolled DM. It ranges from non-proliferative diabetic retinopathy (NPDR) to proliferative diabetic retinopathy (PDR) (4). The end spectrum of the disease is known as advanced diabetic eye disease (ADED) which is sight threatening conditions characterised by presence of traction retinal detachments (TRD), combined TRD with rhegmatogenous retinal detachments (RRD), rubeosis iridis and vitreous haemorrhages (5).

DM and its associated complications contribute to the

higher prevalence of mental disorders among diabetic patients. A study conducted on the Malaysian population found that individuals with systemic comorbidities tend to experience higher levels of anxiety and depression (6). Patients with DR are more vulnerable to anxiety and depression compared to diabetic patients without DR. The prevalence of anxiety and depression among DR patients is 41.1% and 34.3%, respectively (7). Poor vision often leads to psychological effects such as anxiety and depression, primarily due to the fear of blindness and the associated loss of independence and quality of life (8).

To the best of our knowledge, this is the first study to evaluate the mental health of patients with ADED in Malaysia. The study aims to examine the impact of ADED on anxiety and depression levels, using the Hospital Anxiety and Depression Scale (HADS) questionnaire.

Methods

1. Subjects

This is a comparative cross-sectional study conducted at two centers: Hospital Universiti Sains Malaysia (USM) and Hospital Sultanah Aminah, from May 2022 to May 2023. The study was approved by the USM Institutional Ethics Committee (USM/JEPeM/22050287) and the Medical Research and Ethics Committee (NMRR ID-22-01087-9UF) in accordance with the study protocol, the Helsinki Declaration, and the International Conference on Harmonisation (ICH) – Harmonised Tripartite Guideline for Good Clinical Practice (GCP).

The study population included all diabetic patients with ADED and diabetic patients without DR attending the two hospitals. Exclusion criteria comprised patients with ocular pathologies affecting visual acuity, a history of ocular surgery or trauma, and those taking antidepressants or mood stabilizers. The sample size was calculated using G Power and Sample Size software version 3.1.9.4 for the comparison of two means, based on standard deviations (SD 3.82 points for anxiety and SD 3.84 points for depression on the HADS score) among ADED patients. The study power, type 1 error, and the ratio between the intervention and control groups were set at 0.8, 0.05, and 1, respectively. Accounting for a 20% dropout rate, the required sample size was 54 patients. As a result, the recruitment target was set at twice the intended sample size, with a total of 108 patients.

2. Clinical Profiles of Patients

Comprehensive explanations were provided to the patients, and informed consent was obtained once they agreed to participate in the study. The recruited patients underwent detailed history-taking and a thorough eye examination. The severity of diabetic retinopathy (DR) was graded based on the Early Treatment Diabetic Retinopathy Study (ETDRS) design (9).

3. Anxiety and Depression Assessment Tools

Patients were assessed on the level of anxiety and depression symptoms as self-reported scale of negative emotional state using HADS questionnaire. It was done in a separate room to allow freedom to express their feelings. Family members were asked not to interfere with the patient's response.

All interviews were conducted in Malay language by principal investigator using the HADS questionnaire which consists of 14 item questionnaires, subdivided into 7 questions for anxiety (HADS-A) sub-scale and 7 questions for depression (HADS-D) sub-scale. Each of the item has a score of 0 to 3. The scoring for anxiety and depressive scores can range from 0 to 21. The level of anxiety and depression were further classified into mild anxiety or depression (score 8–10), moderate anxiety or depression (score 11–14), and severe anxiety or depression (score 15 and more). The translated Malay version of HADS has a Cronbach's alpha of 0.87. For anxiety, the sensitivity is 90%, specificity is 86.2% and positive predictive value of 94.6%. For depression, the sensitivity is 93.2%, specificity is 90.8% and positive predictive value of 97.5% (10). The best cut off point for Malay version HADS for both anxiety and depression are 8 or 9 points. In this study, the score of 8 and above was used as cut off point as it has sensitivity of 93.2% and specificity of 90.8% (10).

4. Statistical Analysis

Data were analysed using IBM SPSS Statistics ver. 27.0 (IBM Corp., Armonk, NY, USA). Linear models for continuous variables and crosstabs for categorical variables were used to compare clinical profiles. Data were presented as mean±standard error values for continuous variables and percentages for categorical variables. Descriptive statistics were used to summaries the demographic data of the subjects.

The mean HADS score for anxiety (HADS-A) and depression (HADS-D) were compared between DM patients with no DR and ADED using independent t-test. Factors associated with HADS-A and HADS-D scores in ADED patients using single and multiple linear regression. A p-value ≤0.05 was considered statistically significant.

Results

Socio-demographic data among diabetic patients with ADED and no diabetic retinopathy

A total of 108 patients were recruited in this study, consisting of 54 ADED patients and 54 DM patients with no DR. The mean age of ADED was 52.74 SD 10.37 years old. Most of the patients were female (37.0%) and Malay (57.4%). Majority of patients were married (88.9%) and living with family members (88.9%). The socio-demographic characteristic and clinical profiles of ADED patients were documented in Table I.

Table 1: Socio-demographic and clinical profiles among diabetic patients with ADED and no diabetic retinopathy

Variables	ADED (n=54) n (%)	No DR (n=54) n (%)
Age (y, mean $\pm$ SD)	52.74 (10.37)	53.04 (11.96)
Race	31 (57.4)	25 (46.3)
Malay	23 (42.6)	29 (53.7)
Chinese and Others		
Gender	20 (63.0)	19 (35.2)
Male	34 (37.0)	35 (64.8)
Female		
Marital status	48 (88.9)	42 (77.8)
Married	6 (11.1)	12 (22.2)
Others (single, widower, divorced)		
Education level		
Primary	25 (46.3)	26 (48.1)
Above Primary	29 (53.7)	28 (51.9)
Income (per month)		
$\leq$ RM 3000 (appx USD 640)	46 (85.2)	42 (77.8)
>RM 3000 (appx USD 640)	8 (14.8)	12 (22.2)
Living status		
Alone	6 (11.1)	11 (20.4)
Family	48 (88.9)	43 (79.6)
Transportation to hospital		
Drive own transport	14 (25.9)	29 (53.7)
Drive by family member or others transportation	40 (74.1)	25 (46.3)
Hypertension	47 (87.0)	38 (70.4)
Hyperlipidemia	22 (40.7)	20 (37.0)
Chronic Kidney Disease	17 (31.5)	1 (1.9)
Ischemic Heart Disease	14 (25.9)	1 (1.9)
Cerebrovascular Accident	5 (9.3)	3 (5.6)
Foot Amputation	17 (31.5)	5 (9.3)
Peripheral Neuropathy	6 (11.1)	2 (3.7)
Duration of Diabetes Mellitus (y, mean $\pm$ SD)	9.76 (4.75)	8.24 (4.37)
Duration of ADED (y, mean $\pm$ SD)	2.11 (2.37)	N/A
Eye Involvement for ADED		
Unilateral	25 (46.3)	N/A
Bilateral	29 (53.7)	
Visual Impairment Category		
Mild and Moderate	28 (51.9)	54(100)
Severe to Blindness	25 (48.1)	0

Abbreviation: ADED: Advanced diabetic eye disease;**y:** years**SD:** standard deviation**DR:** diabetic retinopathy

Anxiety and depression based on HADS

Percentage of ADED patients with anxiety and depression based on HADS score cut off point of 8 or more were

64.8% and 61.1% respectively (Table II).

Table II: Anxiety and depression based on HADS

HADS	ADED		No DR	
	n	%	n	%
HADS-A				
No anxiety (score ≤8)	19	(35.2%)	45	(83.3%)
Anxiety (score >8)	35	(64.8%)	9	(16.7%)
HADS-D				
No depression (score ≤8)	21	(38.9%)	44	(81.5%)
Depression (score >8)	33	(61.1%)	10	(18.5%)

Abbreviation: ADED: Advanced diabetic eye disease; DR: diabetic retinopathy; HADS: Hospital anxiety depression scale.

HADS-A: Hospital anxiety depression scale for anxiety; HADS-D: Hospital anxiety depression scale for depression

The mean HADS-A score and HADS-D score were significantly higher in the ADED group with a mean of 8.15 (SD 4.42) and 7.69 (SD 3.20) respectively

compared to no DR which had means of 4.15 (SD 3.02) and 4.28 (SD 3.45) ($p < 0.001$) (Table III).

Table III: Comparison of HADS-score for anxiety and depression between diabetic patients with ADED and no DR

Variables	ADED mean (SD)		No DR mean (SD)		p-value
HADS-A score	8.15	(4.42)	4.15	(3.02)	<0.001
HADS-D score	7.69	(3.20)	4.28	(3.45)	<0.001

***Independent T-test**

***Significant results (p-value < 0.05)**

Abbreviation. ADED: Advanced diabetic eye disease; HADS-A: hospital anxiety depression scale for anxiety; HADS-D: hospital anxiety depression scale for depression; DR: diabetic retinopathy

Factors associated with anxiety among diabetic patients with ADED

Simple linear regression analysis showed that the factors significantly associated with anxiety were foot amputation ($p < 0.001$), duration of ADED ($p = 0.042$) and severe visual impairment ($p = 0.004$). All these independent factors were included in multiple linear regression analysis as there were statistically significant variables ($p < 0.05$). Other factors that were included in

multiple linear regression analysis were demographic data, marital status, living status and systemic comorbidities due to clinical importance. Multiple linear regression analysis showed that the factors significantly associated with anxiety were living alone ($p < 0.050$), foot amputation ($p < 0.001$) and severe visual impairment ($p < 0.001$) (Table IV).

Table IV: Factors associated with anxiety based on HADS among diabetic patients with ADED

Predictor	Simple linear regression			Multiple linear regression	
	Crude b	(95% CI)	p-value	Adjusted b (95% CI)	p-value
Age (y, mean $\pm$ SD)	0.07	(-0.05, 0.18)	0.265		
Race					
Malay	1				
Chinese and Others	-0.41	(-2.87, 2.05)	0.740		
Gender					
Male	1				
Female	-0.32	(-2.84, 2.20)	0.800		
Marital status					
Married	1				
Others (single, widower, divorced)	3.20	(-0.56, 6.98)	0.094		
Education level					
Primary	1				
Above Primary	0.14	(-2.30, 2.58)	0.910		
Income (per month)					
$\leq$ RM 3000 (appx USD 640)	1				
> RM 3000 (appx USD 640)	0.41	(-3.02, 3.84)	0.810		
Living status					
Family	1				
Alone	3.21	(-0.57, 6.98)	0.090	3.05	(0.00, 6.10) 0.050*
Transportation to hospital					
Drive Own transport	1				
Drive by family member or others transportation	-0.88	(-3.65, 1.90)	0.530		
Hypertension	1.98	(-1.61, 5.56)	0.274		
Hyperlipidemia	0.90	(-1.57, 3.37)	0.467		
Chronic Kidney Disease	2.45	(-0.09, 4.98)	0.058		
Ischemic Heart Disease	0.67	(-2.11, 3.44)	0.631		
Cerebrovascular Accident	2.70	(-1.44, 6.84)	0.196		
Foot Amputation	4.33	(2.00, 6.67)	<0.001*	4.36	(2.30, 6.42) <0.001*
Peripheral Neuropathy	2.46	(-1.36, 6.28)	0.202		
Duration of Diabetes Mellitus (y, mean $\pm$ SD)	-0.00	(-0.26, 0.26)	1.000		
Duration of ADED (y, mean $\pm$ SD)	0.90	(0.03, 1.76)	0.042*		
Eye Involvement					
Unilateral	1				
Bilateral	1.57	(-0.83, 3.97)	0.200		
Visual impairment category					
Mild and Moderate	1				
Severe and Blindness	3.35	(1.09, 5.60)	0.004*	3.38	(1.47, 5.30) <0.001*

Note: b=regression coefficient.

***Significant results (p-value < 0.05)**

Forward and stepwise method applied. Assumption met (no multicollinearity (VIF<10) or interaction, expected mean error (residual) of the regression is zero, normal distribution and equal variance).

Abbreviation

ADED : Advanced diabetic eye disease

Factors associated with depression among diabetic patients with ADED

Simple linear regression analysis showed that the factors significantly associated with depression were transportation to hospital by family members or others ($p=0.020$), cerebrovascular accident ($p=0.045$), foot amputation ($p<0.001$), duration of ADED ($p=0.005$), bilateral eye involvement ($p=0.019$) and visual impairment in the category of severe ($p<0.001$). All these factors were included in multiple linear regression

analysis as they were statistically significant variables ($p<0.05$). Demographic data and systemic comorbidities included in multiple linear regression analysis due to clinical importance. Multiple linear regression analysis showed that the significant factors associated with depression were gender ($p=0.008$), cerebrovascular accident ($p=0.014$), foot amputation ($p<0.001$) and severe visual impairment ($p<0.001$) (Table V).

Table V: Factors associated with depression based on HADS among diabetic patients with ADED

Predictor	Simple linear regression			Multiple linear regression		
	Crude b	(95% CI)	p-value	Adjusted b (95% CI)		p-value
Age (y, mean $\pm$ SD)	0.06	(-0.03, 0.14)	0.167			
Race						
Malay	1					
Chinese and Others	-0.89	(-2.66, 0.87)	0.316			
Gender						
Male	1			1		
Female	-0.10	(-1.93, 1.72)	0.910	-1.92	(-3.32, -0.53)	0.008*
Marital status						
Married	1					
Others (single, widower, divorced)	1.10	(-1.68, 3.89)	0.430			
Education level						
Primary	1					
Above Primary	0.21	(-1.55, 1.97)	0.813			
Income (per month)						
$\leq$ RM 3000 (appx USD 640)	1					
> RM 3000 (appx USD 640)	0.37	(-2.11, 2.85)	0.766			
Living status						
Family	1					
Alone	1.10	(-1.68, 3.89)	0.430			
Transportation to hospital						
Drive own transport	1					
Drive by family member or others transportation	-2.28	(-4.18, -0.37)	0.020*			
Hypertension	1.61	(-0.98, 4.19)	0.218			
Hyperlipidemia	-0.24	(-2.03, 1.56)	0.793			
Chronic Kidney Disease	1.06	(-0.81, 2.94)	0.262			
Ischemic Heart Disease	-0.25	(-2.26, 1.76)	0.804			
Cerebrovascular Accident	2.99	(0.07, 5.92)	0.045*	2.72	(0.59, 4.86)	0.014*
Foot Amputation	3.64	(2.03, 5.24)	<0.001*	2.86	(1.53, 4.18)	<0.001*
Peripheral Neuropathy	2.42	(-0.31, 5.14)	0.081			
Duration of Diabetes Mellitus (y, mean $\pm$ SD)	0.04	(-0.15, 0.23)	0.662			
Duration of ADED (y, mean $\pm$ SD)	0.88	(0.27, 1.48)	0.005*			
Eye Involvement						
Unilateral	1					
Bilateral	2.02	(0.34, 3.69)	0.019*			
Visual Impairment Category						
Mild and Moderate	1					
Severe to Blindness	2.98	(1.42, 4.54)	<0.001*	4.25	(2.89, 5.61)	<0.001*

Note: b=regression coefficient.

***Significant results (p-value < 0.05)**

Forward and stepwise method applied. Assumption met (no multicollinearity (VIF<10) or interaction, expected mean error (residual) of the regression is zero, normal distribution and equal variance).

Abbreviation

ADED : Advanced diabetic eye disease

Discussion

ADED is a chronic sight threatening disease and often associated with psychological disturbance including anxiety and depression both in local population and western population. The aim of this study is to evaluate anxiety and depression using HADS among DM patients with ADED. We found that the mean score of HADS for anxiety and depression were significantly higher in ADED than in DM with no DR. In this study, anxiety and depression of ADED patients and control group were assessed using Malay version of HADS questionnaire. We found that despite no apparent DR, other diabetic related complication may contribute to anxiety and depression among patients.

Malaysia is a diverse nation, with its population consisting of 61.8% Malays, 21.4% Chinese, 6.4% Indians, and 0.9% from other ethnic backgrounds (11). Majority of the subjects in our study were Malay (57.4%) which correspond with the population distributions in Malaysia, followed by other races (42.6%). Study done to review the DM status in Malaysia showed that Malay ethnics consists of 58.2% of the population, followed by other races (44.9%) (12).

In this present study the mean anxiety score based on HADS was 8.15 (SD 4.42) for ADED and 4.15 (SD 3.02) for no DR. A study conducted in Greece using a different questionnaire showed that the mean anxiety score was worse with PDR. Patient with PDR in their study had severe anxiety whereas those diabetic patients with normal fundoscopy exhibited mild anxiety. In addition, the presence of concomitant comorbidities also affects overall health and social functioning (13).

The mean depression score based on HADS was 7.69 (SD 3.20) for ADED and 4.28 (SD 3.45) for no DR. Study done in Australia showed that the HADS score for depression was 3.54 with p value of 0.003, in contrast to diabetic patients with no DR, the mean HADS score for depression was 2.71 (14). This could be due to lower cut off point used and a different study population. Our study population consisted of population with a higher incidence of DM and diabetes related complications in Malaysia. Kelantan has registered the highest prevalence of diabetes cases compared to other states across Malaysia. Estimates suggest that approximately 20% of the population aged 19 and above are at risk of being diagnosed with DM (15). This could be due to the local delicacies as most of the food are sweet and contain high sugar levels.

Our analyses of HADS as self-reported scale of negative emotional state showed that 64.8% of ADED patients and 16.7% in the no DR group had anxiety symptom. For depression, 61% of ADED patients had depression symptoms, whereas 18.5% of patient with no DR had depressive symptoms. In China, the prevalence of

anxiety and depression was 13.5% and 25% among DR patients. In their study, the study population was done among DR patients regardless of the stages of DR. Our results differ due to the different sample population as we focused on patients with vision threatening PDR (16). A study was done in the US and affirmed 20.27% of DR patients had depression while 18.92% had anxiety (7). Both results were quite similar due to the possibility of both countries having a better healthcare system and higher Gross Domestic Product (GDP). There was a better treatment adherence and compliance thus reducing the incidence of vision threatening PDR.

In our study, we observed that male gender was associated with higher depression with a statistically significant p value of 0.008. Another study contrary to our findings, in which they found that female was associated with higher depression. Perimenopausal depression is a common phenomenon among women. The increase in systemic comorbidities further contributes to the higher rate of depression among women (17). The possible postulation from our findings include men are the breadwinner of the family. The loss of vision can affect the quality of life, social participation, independence, and mobility among the male respondent. This, in turn will increase the rate of depression among the respondents (18).

Our study found that cerebrovascular accidents (CVA) are correlated to the increased risk of depression. Patients with CVA had a depression score of 2.29 unit higher based on HADS-D. Our findings are consistent with the study by Thomas et al (19). They found that major depression episodes, without significant functional impairments, were associated with a relative risk of 2.67 (CI 1.08– 6.63) for stroke, after adjusting for vascular risk factors (19). Systemic review by Robinson found that the overall prevalence of major depression was 21.7%, while minor depression was 19.5%. The most significant factor associated with depression was the degree of limitation in daily activities (20,21). Therefore, optimizing the management of comorbidities such as stroke could help reduce the incidence of depression.

Our results showed that the risk of depression increased by 3.64 (95% CI: 2.03, 5.24), with a p-value of <0.001, among patients who had undergone foot amputation. A study conducted among amputees in South Korea affirmed that amputation is strongly associated with depression. In this cohort study, the risk of depression was notably higher following amputation, highlighting the importance of considering disability status and its severity when evaluating depression risk in amputees. Amputation leads to irreversible physical changes, which may result in feelings of loss of control and subsequently increase the risk of depression. Furthermore, individuals with mild disabilities after amputation showed a 46% higher risk of depression, while those with severe disabilities faced a 113% increase in risk. (22). We also found that foot amputation is associated with a high

prevalence of anxiety ($p < 0.001$). The prevalence of depressive and anxiety symptoms was 20% and 37%, respectively, which aligns with several prior studies reporting rates as high as 41% (23-24). Nearly 50% of respondents reported psychological distress due to amputation, which is consistent with our findings. A possible explanation for this is reduced mobility and lifelong dependence on others for daily activities, including travel.

Severity of visual impairment is statistically associated with an increased likelihood of depression. For every increase in the mean score on the HADS-D, there is a 3.64 unit (CI: 2.03, 5.24) increase in the risk of depression, with a p-value of < 0.001 . A study among Korean subjects found that the risk of depression significantly increased in both the non-blind visual impairment group and the blindness subgroup, with a higher hazard ratio observed in the blindness subgroup (25). Loss of vision is correlated to reduce functional mobility, loss of sense of security and dependency in performing daily activities such as getting dressed, having meals, and communicating with others. Approximately 8% of patients with mild dependency has moderate to severe depression (26). This conclusion suggests that legal blindness is correlated with depressive symptoms.

Our study identified that patients who were living alone had higher mean anxiety scores. The result was statistically significant ($p = 0.05$) for increased anxiety among ADED patients living alone. Additionally, patients with glaucoma who reside alone face an elevated risk of mental health issues. The primary contributors to mental illness in these individuals include feelings of loneliness, lack of support, and limited interaction with family members (27). Moreover, ADED patients who live alone often face difficulties in performing daily activities due to poor visual function. They also struggle with carrying out household chores independently.

In addition, severe visual impairment was associated with increased anxiety among ADED patients in our study. Our results were statistically significant ($p < 0.001$) for higher anxiety levels in the blindness group. Individuals with complete vision loss due to DR exhibited elevated levels of anxiety compared to those with partial visual impairment or those unaffected by DR (28). A study by Riazi et al. found that anxiety levels were lower among the blind population, possibly due to reduced involvement in the community and limited interaction with others (29). Their study contradicts our findings, which could be attributed to the fact that most of our study population were still in the denial stage and held hope for restored vision, unlike those with chronic blindness who have typically reached the acceptance stage.

There are several limitations to this study. As a cross-sectional study, we were unable to assess the causal

relationship between anxiety, depression, and ADED or other co-factors. Additionally, some important variables, such as whether patients live in urban or rural areas, their debt-to-income ratio (which could better assess their financial status), and the number of family members living with them or their living conditions, were not included. This study was conducted in Malaysia and is limited to Malaysian patients with DR. Lastly, a mental health assessment should be performed prior to recruiting subjects to identify neurodegenerative disorders, such as Alzheimer's disease, which should be excluded from the study.

We propose that all ADED patients undergo mental health screening, especially those with identified risk factors. Additionally, we recommend conducting this study across multiple centers throughout Malaysia. To the best of our knowledge, this is the first study to evaluate the mental health of ADED patients in Malaysia.

CONCLUSION

In conclusion, the mean HADS scores for anxiety and depression were significantly higher in the ADED group, and this was associated with factors such as a history of foot amputation, CVA, and visual impairment. We recommend that healthcare professionals consider the mental health status of patients with DR, particularly those with ADED.

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