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Predicting Anxiety and Depression Among Erectile Dysfunction Patients: A Cross-Sectional Study

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Abstract

In Vietnam, erectile dysfunction (ED) is prevalent and recognized to be associated with mental disorders; however, societal taboos impede a comprehensive understanding of this connection. Our study aims to investigate the factors related to higher levels of anxiety and/or depression (HAD) in individuals with ED. Between November 2022 and March 2023, a face-to-face survey was conducted at the Center for Andrology of Viet Duc University Hospital, involving 390 patients diagnosed with ED. The survey included 51 questions covering general patient information, the International Index of Erectile Function-15 (IIEF-15), the Patient Health Questionnaire-9 (PHQ-9), and the Generalized Anxiety Disorder-7 (GAD-7). The stepwise Akaike Information Criterion (AIC) method was used to identify factors associated with HAD. The study revealed an average age of 37.63 (11.84) years among participants, with a HAD prevalence of 17.69%. Several factors were associated with a higher likelihood of belonging to the HAD group in ED patients. These factors included non-office workers (OR: 1.11; 95% CI: [1.01, 1.21], $p = .025$), medium and high levels of work-related stress (OR: 1.23; [1.06, 1.44], $p = .008$; OR: 1.22; [1.04, 1.45], $p = .018$), multiple shameful experiences related to ED (OR: 1.16; [1.08, 1.25], $p < .001$), moderate and severe ED (OR: 1.17; [1.03, 1.32], $p = .013$; OR: 1.31; [1.14, 1.51], $p < .001$), and dissatisfaction with intercourse skills (OR: 1.09; [1.01, 1.17], $p = .028$). Our findings suggest a 16% higher likelihood of HAD status in individuals with multiple shameful experiences related to ED, while moderate and severe ED are associated with respective increases of 17% and 31% in the likelihood. These findings emphasize the importance of considering mental health in the care of individuals with ED.

Keywords

depression, anxiety, erectile dysfunction, multiple logistic regression

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Introduction

Erectile dysfunction (ED) is a commonly reported sexual disorder in men, and it holds significant clinical and public health implications (Minhas et al., 2021). Examining reviews on the global prevalence of ED from 15 studies with a total sample size of 19,434, employing either the International Index of Erectile Function-5 (IIEF-5) or other IIEF variants scoring system for diagnosis, reveals an overall global prevalence ranging from 13.1% to 71.2% and concurrently identifies a discernible linear correlation between age and the incidence of ED (Kessler et al., 2019). Among the Asian population, the prevalence of ED has shown notable variations, depending on the

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specific study populations, with rates ranging from as low as 2% to as high as 81.8%. Among males aged 40 years or older, the estimated ratio of individuals affected by ED is approximately 40.6% (Kim & Jeon, 2013).

Within the specific context of Vietnam, the incidence of ED among men in the community is reported to be 66.9% (Van Vo et al., 2017). It is important to recognize that while ED may not be a life-threatening condition, its impact on the quality of life and overall well-being of affected individuals cannot be understated (Guzman-Esquivel et al., 2021).

Academic studies have demonstrated a close association between ED and psychological disorders such as depression and anxiety, indicating a bidirectional relationship of cause and effect (Atlantis & Sullivan, 2012). Psychological disorders, specifically depression and anxiety, play a significant role as contributing factors to the development of ED (MacDonald & Burnett, 2021). It is evident that depression and anxiety increase the risk of ED, exacerbating the severity of the condition (Velurajah et al., 2022). ED has been identified to significantly diminish self-esteem and sexual satisfaction, potentially leading individuals to experience depression and anxiety, with a reported frequencies ranging from 60.9% to 78.6% (Yang et al., 2019). Research on intimate partner violence indicates that men with ED tend to experience diminished masculinity and an increased risk of violence with their partners, particularly sexual violence (Hill et al., 2023). However, the correlation between psychiatric disorders and the serverity of ED remains unclear (Waldinger, 2015).

In the context of a traditional Asian population, where discussions about sex remaintaboo and men are expected to conform to the societal perception of masculinity without any room for sexual failure, a significant number of Vietnamese men encounter difficulties in openly addressing issues related to their sexual lives (Irfan et al., 2020). Moreover, in Vietnamese culture, mental illnesses are often stigmatized and associated with madness or severe psychiatric disorders leading to a reluctance to openly discuss or learn about mental health concerns (Minas et al., 2017). Compounding these challenges, the current public medical insurance system in Vietnam does not cover sexual disorders, including ED, thereby exacerbating the lack of attention, research, diagnosis and treatment provided to individuals affected by both ED and psychiatric disorders such as depression and anxiety, particularly within primary care settings (Nguyen et al., 2019).

Our study is specifically designed to evaluate the extent of anxiety and depression experienced by patients who have been diagnosed with and are undergoing treatment for ED within health care settings. The primary objective of this research is to gain an understanding of the various factors that influence the levels of anxiety among patients with ED. By doing so, we aim to provide valuable insights into clinicians, enabling them to make diagnoses and develop effective treatment plans that can significantly enhance the patients' overall well-being. In addition, policymakers have also gathered further evidence on the impact of ED and its potential to promote health care insurance coverage for this condition.

Materials and Methods

Study Design and Participants

A cross-sectional study was carried out at the Center for Andrology of Viet Duc University Hospital, spanning from November 16, 2022, to March 16, 2023. The study involved male patients aged 18 years or older who actively sought a medical examination at the center for issues related to erectile function and had been diagnosed with moderate to severe ED based on the IIEF-5 classification. Prior to their participation in the study, the patients were provided with detailed information regarding the potential benefits and risks associated with their involvement. Informed consent was signed in written form from each patient who agreed to participate. Face-to-face interviews, conducted by trained researchers, were conducted in a private setting at the andrology clinic.

Questionnaire Design

The research survey employed in this study comprised a total of 51 questions, divided into three distinct parts. The first part focused on gathering general characteristics of the study participants and consisted of 25 questions. These questions aimed to gather information on demographic factors, medical history, lifestyle factors, and other relevant characteristics of the participants.

The second part of the survey assessed erectile function using the International Index of Erectile Function-15 (IIEF-15) questionnaire, which included 15 questions. Within this section, the erectile function was specifically evaluated using the IIEF-5, which allowed for the classification of ED into five categories: severe (scores 5–7), moderate (scores 8–11), mild to moderate (scores 12–16), mild (scores 17–21), and no ED (scores 22–25) (Rosen et al., 1997).

The final part of the survey included the General Anxiety Disorder-7 (GAD-7) scale, consisting of seven questions, and the Patient Health Questionnaire-9 (PHQ-9), which comprised nine questions. These scales were utilized to assess anxiety and depression levels among the participants. Based on the GAD-7 scale, patients were classified as having low anxiety (GAD-7 score ≤ 9) or high anxiety (GAD-7 score ≥ 10) (Spitzer et al., 2006).

Similarly, based on the PHQ-9 scale, patients were categorized as having none to mild depression (low depression—PHQ-9 score ≤9) or high depression (PHQ-9 score ≥10) (Kroenke et al., 2001).

Patients who exhibited low levels of anxiety and depression were classified into the low anxiety and depression (LAD) group, while those with high levels of anxiety and/or depression were classified into the high anxiety and/or depression (HAD) group.

Statistical Analysis

The comparisons of the anxiety and depression status (LDA and HDA) of study participants were conducted through Student's *t*-test for continuous variables, and through the chi-square test (if the expected value in a cell is greater than 5) or Fisher's exact test (if the expected value in a cell is less than or equal to 5) for categorical variables.

The main analysis was performed to evaluate the risk factors associated with the HDA status of study participants. The variables considered in the analysis encompassed age (year), body mass index (BMI; kg/m^2), accommodation, marital status, education, office work, stress level with work, main labor, religion, duration of ED (months), smoking, alcohol consumption, shameful experience with sex-related ED, weekly sports practice, weekly running practice, weekly other sports practice, practice psychological relaxation, penis size when fully erect, satisfaction with penis size at full erection, need to increase penis size, satisfaction with intercourse skills, and the classification of IIEF-5. The optimal model was determined using the stepwise Akaike Information Criterion (AIC) method from the MASS package. All hypotheses were tested with two-tailed tests, and a p value less than .05 was considered statistically significant. Statistical analysis was performed using R version 4.1.0 on Window 11.

Results

In this study, 390 ED patients participated with a response rate of 27.8% (390/1,402). The mean age was 37.63 (standard deviation = 11.84) years. In addition, 69 patients (17.69%) were classified into the HDA group.

Table 1 demonstrates statistically significant differences in the scores of various components as well as the total score of the IIEF-15 when comparing the anxiety and depression status of the participants. The erectile function score for the LDA group had a higher mean score of 16.99 (*SD* 6.00) than that for the HDA group, which had a mean score of 14.13 (*SD* 5.73) ($p < .001$). In addition, the orgasmic function score for the LDA group was higher, with a mean of 6.56 (*SD* 2.31), than that for the HDA group, which had a mean score of 5.81 (*SD* 2.46) ($p = .022$). Similarly, the sexual desire score for the LDA group was higher, with a mean of 6.97 (*SD* 2.13), than that for the HDA group, which had a mean score of 5.88 (*SD* 2.38) ($p = .001$). The intercourse satisfaction score for the LDA group was higher, with a mean of 4.63 (*SD* 1.39), than that for the HDA group, which had a mean score of 3.93 (*SD* 1.34) ($p < .001$).

The results of the study also indicate that the mean total score of the IIEF-5 in the LDA group (12.92 [4.23]) was significantly higher than the score in the HDA group (10.90 [4.00], $p < .001$). Similarly, the mean total score of the IIEF-15 in the LDA group (41.90 [12.43]) was significantly higher than that in the HDA group (35.54 [11.53], $p < .001$).

Regarding the classification of the IIEF-15, it was found that 90.97% (292/321) of the patients in the LDA group had no dysfunction, which was significantly higher than the HDA group (78.26%, $p = .008$). The classification of the IIEF-5 demonstrated that the rate of severe ED in the HDA group was 20.29%, which was twice as high as that in the LDA group ($p = .007$).

The classification based on the GAD-7 scale revealed that 39.13% of the patients had a low anxiety status but a high depression status, while 26.09% of the patients had a low depression status but a high anxiety status.

Finally, it was observed that the percentage of patients with a history of shameful experiences related to sex-related ED in the LDA group (42.68%) was significantly lower than that in the HDA group (68.12%, $p < .001$).

According to Table 2, the multivariable logistic model, consisting of seven variables, was determined to be the best fit for the data, explaining 12.3% of the variation in the outcome variable. The area under the receiver operating characteristic curve (ROC curve) was calculated to be 75.12%. Notably, no significant differences were observed between the odds ratios (ORs) of the variables in the univariable and multivariable models.

The study revealed that patients who were non-office workers had an 11% (95% CI: [1%, 21%], $p = .025$) higher likelihood of belonging to the HDA group than to the LAD group. Patients experiencing medium and high levels of work-related stress exhibited a 23% (95% CI: [6%, 44%], $p = .008$) and 22% (95% CI: [4%, 45%], $p = .018$) higher likelihood, respectively, of being classified into the HDA group. Patients reporting more than one shameful experience related to sex-related ED had a 16% (95% CI: [8%, 25%], $p < .001$) higher likelihood of being in the HDA group. Patients with moderate and severe ED demonstrated a 17% (95% CI: [3%, 32%], $p = .013$) and 31% (95% CI: [14%, 51%], $p < .001$) higher likelihood, respectively, of being categorized into the HDA group. Finally, patients expressing dissatisfaction with their intercourse skills exhibited a 9% (95% CI: [1%, 17%], $p = .028$) higher likelihood of belonging to the HDA group.

Table 1. Patient Characteristics According to Anxiety and Depression Status

Characteristics	Total $N = 390$	LAD $N = 390$	HAD $N = 390$	p Value
Erectile function score (points)	16.48 (6.04)	16.99 (6.00)	14.13 (5.73)	<.001
Orgasmic function score (points)	6.43 (2.36)	6.56 (2.31)	5.81 (2.46)	.022
Sexual desire score (points)	6.77 (2.21)	6.97 (2.13)	5.88 (2.38)	.001
Intercourse satisfaction score (points)	6.58 (2.63)	6.75 (2.66)	5.78 (2.34)	.003
Overall satisfaction score (points)	4.51 (1.41)	4.63 (1.39)	3.93 (1.34)	<.001
Total score of IIEF-15 (points)	40.77 (12.50)	41.90 (12.43)	35.54 (11.53)	<.001
Classification of IIEF-15				.008[a]
No dysfunction	346 (88.72%)	292 (90.97%)	54 (78.26%)	
Mid dysfunction	16 (4.10%)	8 (2.49%)	8 (11.59%)	
Mid to moderate dysfunction	10 (2.56%)	7 (2.18%)	3 (4.35%)	
Moderate dysfunction	8 (2.05%)	6 (1.87%)	2 (2.90%)	
Severe erectile dysfunction	10 (2.56%)	8 (2.49%)	2 (2.90%)	
Total score of IIEF-5	12.56 (4.25)	12.92 (4.23)	10.90 (4.00)	<.001
Classification of IIEF-5				.007
Mid erectile dysfunction	64 (16.41%)	59 (18.38%)	5 (7.25%)	
Mid to moderate erectile dysfunction	195 (50.00%)	165 (51.40%)	30 (43.48%)	
Moderate erectile dysfunction	85 (21.79%)	65 (20.25%)	20 (28.99%)	
Severe erectile dysfunction	46 (11.79%)	32 (9.97%)	14 (20.29%)	
Total score of GAD-7 (score)	4.33 (4.01)	3.00 (2.57)	10.55 (3.65)	<.001
Total score of PHQ-9 (score)	4.73 (4.59)	3.17 (2.65)	12.00 (4.73)	<.001
Classification of GAD-7				<.001[a]
Low anxiety status				
Minimal anxiety	231 (59.23%)	228 (71.03%)	3 (4.35%)	
Mid anxiety	117 (30.00%)	93 (28.97%)	24 (34.78%)	
High anxiety status				
Moderate anxiety	35 (8.97%)	0 (0.00%)	35 (50.72%)	
Severe anxiety	7 (1.79%)	0 (0.00%)	7 (10.14%)	
Classification of PHQ-9				<.001[a]
Low depression status				
None depression	228 (58.46%)	226 (70.40%)	2 (2.90%)	
Mid depression	111 (28.46%)	95 (29.60%)	16 (23.19%)	
High depression status				
Moderate depression	34 (8.72%)	0 (0.00%)	34 (49.28%)	
Moderate severe depression	11 (2.82%)	0 (0.00%)	11 (15.94%)	
Severe depression	6 (1.54%)	0 (0.00%)	6 (8.70%)	
Age (year)	37.63 (11.84)	37.47 (11.77)	38.33 (12.23)	.595
BMI (kg/m^2)	23.30 (2.66)	23.32 (2.68)	23.19 (2.59)	.700
Accommodation				.396
City	177 (45.38%)	142 (44.24%)	35 (50.72%)	
Countryside	213 (54.62%)	179 (55.76%)	34 (49.28%)	
Marital status				.225
Married	295 (75.64%)	239 (74.45%)	56 (81.16%)	
Alone	92 (23.59%)	80 (24.92%)	12 (17.39%)	
Separated	3 (0.77%)	2 (0.62%)	1 (1.45%)	
Education				.581
Bachelor and above	159 (40.77%)	134 (41.74%)	25 (36.23%)	
Vocational training	69 (17.69%)	54 (16.82%)	15 (21.74%)	
High school	112 (28.72%)	90 (28.04%)	22 (31.88%)	
Middle school and below	50 (12.82%)	43 (13.40%)	7 (10.14%)	
Office work				.662
Yes	113 (28.97%)	95 (29.60%)	18 (26.09%)	
No	277 (71.03%)	226 (70.40%)	51 (73.91%)	
Stress level with work				.106
No	26 (6.67%)	25 (7.79%)	1 (1.45%)	
Less stress	65 (16.67%)	57 (17.76%)	8 (11.59%)	
Medium stress	193 (49.49%)	155 (48.29%)	38 (55.07%)	
Lots of stress	106 (27.18%)	84 (26.17%)	22 (31.88%)	

(continued)

Table 1. (Continued)

Characteristics	Total *N* = 390	LAD *N* = 390	HAD *N* = 390	*p* Value
Main lobor				.612
No	52 (13.33%)	41 (12.77%)	11 (15.94%)	
Yes	338 (86.67%)	280 (87.23%)	58 (84.06%)	
Religion				.316[a]
No	369 (94.62%)	305 (95.02%)	64 (92.75%)	
Buddhism	17 (4.36%)	12 (3.74%)	5 (7.25%)	
Christianity	4 (1.03%)	4 (1.25%)	0 (0.00%)	
Duration of ED (months)	25.31 (43.55)	25.13 (45.72)	26.11 (31.80)	.831
Smoke				.506
Never	236 (60.51%)	199 (61.99%)	37 (53.62%)	
Sometimes	90 (23.08%)	72 (22.43%)	18 (26.09%)	
Regularly	27 (6.92%)	22 (6.85%)	5 (7.25%)	
Always	37 (9.49%)	28 (8.72%)	9 (13.04%)	
Alcohol				.275[a]
Never	38 (9.74%)	28 (8.72%)	10 (14.49%)	
Sometimes	302 (77.44%)	248 (77.26%)	54 (78.26%)	
Regularly	41 (10.51%)	37 (11.53%)	4 (5.80%)	
Always	9 (2.31%)	8 (2.49%)	1 (1.45%)	
Shameful experience with sex-related ED				<.001
Never	206 (52.82%)	184 (57.32%)	22 (31.88%)	
Experienced	184 (47.18%)	137 (42.68%)	47 (68.12%)	
Weekly gym practice				.255
No	346 (88.72%)	288 (89.72%)	58 (84.06%)	
Yes	44 (11.28%)	33 (10.28%)	11 (15.94%)	
Weekly running practice				1.000
No	302 (77.44%)	249 (77.57%)	53 (76.81%)	
Yes	88 (22.56%)	72 (22.43%)	16 (23.19%)	
Weekly other sports practice				.439
No	282 (72.31%)	229 (71.34%)	53 (76.81%)	
Yes	108 (27.69%)	92 (28.66%)	16 (23.19%)	
Practice psychological relaxation[b]				.068
No	79 (20.26%)	59 (18.38%)	20 (28.99%)	
Yes	311 (79.74%)	262 (81.62%)	49 (71.01%)	
Penis size when fully erect				.269[a]
<10 cm	11 (2.82%)	9 (2.80%)	2 (2.90%)	
10–12 cm	169 (43.33%)	136 (42.37%)	33 (47.83%)	
13–15 cm	202 (51.79%)	171 (53.27%)	31 (44.93%)	
>15 cm	8 (2.05%)	5 (1.56%)	3 (4.35%)	
Satisfaction with penis size at full erection				1.000
Unsatisfied	269 (68.97%)	221 (68.85%)	48 (69.57%)	
Satisfied	121 (31.03%)	100 (31.15%)	21 (30.43%)	
Need to increase penis size				.903
No	305 (79.22%)	252 (79.50%)	53 (77.94%)	
Yes	80 (20.78%)	65 (20.50%)	15 (22.06%)	
Satisfied with intercourse skills				.100
Unsatisfied	211 (54.10%)	167 (52.02%)	44 (63.77%)	
Satisfied	179 (45.90%)	154 (47.98%)	25 (36.23%)	

Note. LAD = low anxiety and depression; HAD = high anxiety and/or depression; IIEF-15 = International Index of Erectile Function-15; GAD-7 = Generalized Anxiety Disorder-7; PHQ-9 = Patient Health Questionnaire-9; BMI = body mass index; ED = erectile dysfunction. Quantitative variables are presented as Mean (SD), and categorical variables are presented as *N* (%).

[a]The chi-square test should be used when the expected value in a cell is greater than 5, whereas the Fisher exact test is appropriate when the expected value in a cell is less than 5.

[b]Practice Qigong; deep breathing; Yoga; meditation or other relaxation techniques.

Figure 1B shows almost no correlation between IIEF-15 scores and GAD-7 scores in the LAD group. However, in the HAD group, an inverse correlation exists between IIEF-15 scores and GAD-7 scores. This figure also does not indicate a significant difference in IIEF-15 and GAD-7 concerning the age of the study subjects.

Figure 1A reveals that the distribution of IIEF-15 scores in the LAD group peaks at approximately above

Table 2. Multivariable Model Predicting HAD Status

	Univariable			Multivariable		
Predictors	OR	95% CI	*p* Value	OR	95% CI	*p* Value
Intercept		—		0.83	[0.67, 1.02]	.078
Accommodation						
City		*Reference*			*Reference*	
Countryside	0.96	[0.89, 1.03]	.262	0.93	[0.86, 1.01]	.068
Office work						
Yes		*Reference*			*Reference*	
No	1.03	[0.95, 1.12]	.465	1.11	[1.01, 1.21]	.025
Stress level with work						
No		Reference			Reference	
Less stress	1.09	[0.92, 1.29]	.339	1.12	[0.95, 1.32]	.185
Medium stress	1.17	[1.00, 1.37]	.044	1.23	[1.06, 1.44]	.008
Lots of stress	1.18	[1.00, 1.39]	.046	1.22	[1.04, 1.45]	.018
Shameful experience with sex-related ED						
Never		Reference			Reference	
Experienced	1.16	[1.08, 1.25]	<.001	1.16	[1.08, 1.25]	<.001
Practice psychological relaxation[a]						
No		Reference			Reference	
Yes	0.90	[0.82, 0.99]	.034	0.92	[0.84, 1.01]	.094
Classification of IIEF-5						
Mid erectile dysfunction		Reference			Reference	
Mid to moderate erectile dysfunction	1.07	[0.96, 1.20]	.196	1.07	[0.97, 1.19]	.178
Moderate erectile dysfunction	1.18	[1.04, 1.33]	.010	1.17	[1.03, 1.32]	.013
Severe erectile dysfunction	1.25	[1.08, 1.45]	.002	1.31	[1.14, 1.51]	<.001
Satisfied with intercourse skills						
Satisfied		Reference			Reference	
Unsatisfied	1.07	[1.00, 1.16]	.068	1.09	[1.01, 1.17]	.028
Observations		—			384	
R^2		—			.123	
AUC		—			75.12%	

Note. HAD = high anxiety and/or depression; OR = odds ratio; CI = confidence interval; ED = erectile dysfunction; IIEF-5 = International Index of Erectile Function-5; AUC = area under the curve.
[a]Practice Qigong; deep breathing; Yoga; Meditation or other relaxation techniques.

50 points, whereas the HAD group peaks around 40 years of age. The distribution of the HAD group skews to the left, indicating lower IIEF-15 scores, while the LAD group skews to the right, indicating higher IIEF-15 scores.

Figure 1C shows that the majority of patients in the HAD group have GAD-7 scores above 10 points. However, there is still a small number of patients falling into the range of 5 to 10 points.

Figure 2B indicates a lack of significant correlation between IIEF-15 scores and PHQ-9 scores within the LAD group. In contrast, there is a clear inverse correlation between IIEF-15 scores and PHQ-9 scores within the HAD group. This figure also fails to identify a notable relationship between IIEF-15 and PHQ-9 scores and the age of the study participants. Figure 2A is analogous to Figure 1A, concerning the distribution of IIEF-15 scores.

Figure 2C demonstrates that the distribution of PHQ-9 scores in the LAD group peaks at approximately 3 points, whereas in the HAD group, the peak falls in the range above 10 points. The distribution difference between these two groups is quite pronounced.

Discussion

ED and anxiety/depression are intricately linked in a bidirectional relationship, whereby the presence of anxiety or depression increases the vulnerability to ED, and ED, in turn, intensifies symptoms of anxiety and depression, leading to a detrimental impact on the psychological well-being and overall quality of life for men. A cross-sectional study collected data from 390 ED Vietnamese patients, and the data were analyzed using a Stepwise method to determine the optimal model with the most

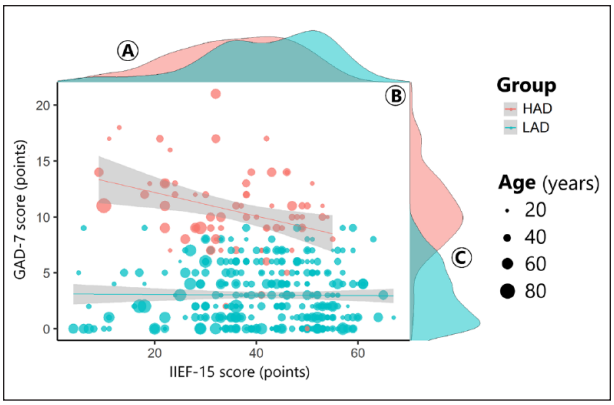

Figure 1. Relationship Between GAD-7 Scores and IIEF-15 Scores by HAD and LAD Groups

Note. Figure 1A represents the density distribution of IIEF-15 scores by HAD and LAD groups; Figure 1B is a scatter plot of IIEF-15 and GAD-7 with the size of each point related to age and separate regression lines for the HAD and LAD groups; Figure 1C is the density distribution plot for GAD-7 scores for HAD and LAD groups. GAD-7 = Generalized Anxiety Disorder-7; IIEF-15 = International Index of Erectile Function-15; HAD = high anxiety and/or depression; LAD = low anxiety and depression.

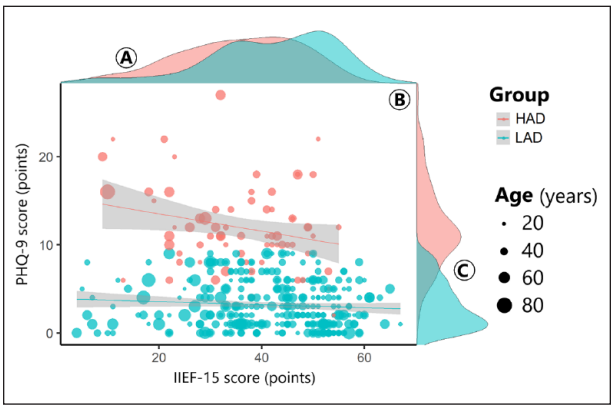

Figure 2. Relationship Between PHQ-9 Scores and IIEF-15 Scores by HAD and LAD Groups

Note. Figure 2A represents the density distribution of IIEF-15 scores by HAD and LAD groups; Figure 2B is a scatter plot of IIEF-15 and PHQ-9 with the size of each point related to age and separate regression lines for the HAD and LAD groups; Figure 2C is the density distribution plot for PHQ-9 scores for HAD and LAD groups. PHQ-9 = Patient Health Questionnaire-9; IIEF-15 = International Index of Erectile Function-15; HAD = high anxiety and/or depression; LAD = low anxiety and depression.

significant contributors to the HAD status. The findings of the analysis revealed that the optimal model derived from the collected data consists of seven variables, namely accommodation, occupation, stress level with work, shameful experience with sex-related ED, practice psychological relaxation, classification of IIEF-5, and satisfaction with intercourse skills. This model exhibited an area under the curve (AUC) score of 75.12%. A notable finding in our study was that having multiple shameful experiences related to ED (OR: 1.16; 95% CI: [1.08, 1.25], $p < .001$) was associated with a higher prevalence in the HAD group.

The study findings revealed a significant association between ED severity and higher levels of depression and anxiety. This finding of the study are consistent with the results of a recent study conducted by Yang Xiao et al., which revealed a statistically significant positive association between depression, anxiety, and the severity of ED (Yang et al., 2019). Previous studies have suggested a reciprocal relationship between ED and depression, as the prevalence of ED is almost five-fold higher in men with depression and vice versa, with men with ED often reporting higher rates of depression (Atlantis & Sullivan, 2012). In addition, previous research has confirmed the association of major depression disorder with decreased libido (Seidman, 2002), which aligns with the current findings, as the sexual desire score of the LDA group was higher than that of the HAD group.

Previous research has consistently demonstrated that ED has a significant psychological impact on men, leading to feelings of emasculation or demasculinization, which are associated with depression, shame, decreased self-worth, and a fear of social stigma (Takeuchi et al., 2021). In addition, studies have demonstrated that men with ED often experience heightened inhibition due to the fear of performance failure (Sarin et al., 2014), resulting in avoidance of sexual activity and the perpetuation or worsening of negative emotional states associated with sex (Giuri et al., 2017). Men with ED often attribute the erectile failures to personal incompetence (internal attribution) and perceive a lower sense of control or self-efficacy (Rowland et al., 2015). Nagative thoughts, such as feelings of inadequacy or the pressure to perform, as well as unrealistic and unattainable macho beliefs related to male sexual performance, contribute to this phenomenon. These beliefs may include the notion that a penile erection is essential for a woman's sexual satisfaction or that the failure to achieve an erection may result in a partner leaving, thereby contributing to the development of a vicious cycle of ED for men (Nobre, 2010). The aforementioned results are consistent with findings from our study, which showed a significant association between unsatisfied intercourse skills and shameful experience with sex-related ED and a higher prevalence of HAD status.

Prior research has consistently identified a significant negative association between the practice of psychological relaxation techniques, such as Qigong (Lin et al., 2022), deep breathing (Cheng et al., 2019), Yoga (Jonsson et al., 2020), Meditation (Saeed et al., 2019), and the occurrence of anxiety and depression. Our study also revealed a similar association between engaging in

relaxation techniques and the rates of anxiety and depression among patients with ED.

Previous studies have established a link between residing in urban areas and a higher prevalence of anxiety and depression (Van Vo et al., 2017). One possible explanation for this relationship is the exposure to air pollution in urban environments, particularly related to traffic, which has been reported to be positively associated with an increased prevalence of depression and anxiety disorders (Pelgrims et al., 2021). Despite consistent findings indicating a significant association between office jobs and higher rates of anxiety and depression when compared to other occupations (Kang et al., 2016), a study conducted among workers in Vietnam, a lower-middle-income country according to the World Bank classification, reported a notably higher prevalence of depression among individuals working in industrial zones than among the general population (Tran et al., 2019). Moreover, the relationship between mental health and work stress has been well-established, with higher levels of work-related stress being statistically linked to elevated rates of anxiety and depression (Kopp et al., 2008). The outcomes of our study align with prior research, revealing that the group of individuals employed in office jobs, which are perceived as stable and successful in Vietnam, exhibited lower levels of anxiety and depression than individuals in other professions.

The cross-sectional study conducted on Vietnamese patients with ED revealed that 17.69% of patients exhibited HAD. The study identified a relationship between seven variables, namely accommodation, occupation, stress level with work, shameful experience with sex-related ED, practice psychological relaxation, classification of IIEF-5, and satisfaction with intercourse skills and the presence of anxiety and depression in these patients. Specifically, the study results provide evidence for potential intervention strategies such as practice Qigong, deep breathing, Yoga, and meditation which may be beneficial in reducing anxiety and depression status among individuals with ED.

Limitations and Proposes

The major limitation in our study is that the sampling, conducted at the Center for Andrology of Viet Duc University Hospital in the northern region of Vietnam, may not fully represent Vietnamese male ED patients. In reality, there is considerable cultural variation between the northern and southern regions of Vietnam (Li et al., 2018). Considering the high prevalence of HAD at 17.69%, we believe that data collection involving multiple centers across Vietnam is necessary to foster closer collaboration between mental health experts and specialists in the field of andrology. This collaborative effort would contribute to improving the effectiveness of treating ED and other male reproductive disorders in general.

Author Contributions

Nguyen Quang: Conceptualization; Data curation; Methodology; Formal analysis; Project administration; Writing—original draft; Writing—review & editing. **Le Van Truong:** Conceptualization; Data curation; Methodology; Formal analysis; Writing—original draft; Writing—review & editing. **Nguyen Truong Nam:** Supervision; Conceptualization; Data curation; Methodology; Formal analysis; Writing—original draft; Writing—review & editing. **Eric Chung:** Data curation; Methodology; Writing—review & editing. **Bui Van Quang:** Conceptualization; Data curation. **Luu Quang Long:** Data curation; Methodology. **Nguyen Thanh Ngoc:** Conceptualization; Data curation. **Nguyen Thanh Minh:** Data curation; Methodology. **Do Mai Anh:** Conceptualization; Data curation, **Nguyen Dinh Thanh:** Data curation; Methodology.

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Ethical Approval

The protocol for this research project has been approved by a suitably constituted ethics committee of the institution, and it conforms to the provisions of the Declaration of Helsinki. Committee of the University of Medicine and Pharmacy, Vietnam National University, Hanoi, approval no. 1992/QĐ-ĐHYD.

Informed Consent

Approval for involvement and inclusion in publications was obtained from all patients.

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Data Availability

The raw data leading to the conclusion of this article would be made available by all the authors, without undue reservation.

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