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Depressive and Anxiety Symptoms Among People Living with HIV in Turkey: A Cross-sectional Study

HIV ile Yaşayan İnsanlarda Depresyon ve Anksiyete Semptomları: Kesitsel Bir Çalışma

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Abstract

Objective: This study was undertaken to determine the prevalence of depression and anxiety, to assess sociodemographic and clinical determinants of depression and anxiety symptoms, and to identify factors that impact antiretroviral therapy (ART) adherence in people living with HIV (PLWH).

Methods: The study was conducted at a third-level hospital. Many assessment tools have been used to collect data among PLWH, including the Sociodemographic and Clinical Data Form, Mini-Mental Test, Hospital Anxiety and Depression Scale (HADS), and Center for Epidemiologic Studies Depression Scale (CES-D).

Results: 56% of HIV-positive individuals were diagnosed with depression and 37% with anxiety disorder. Differences in terms of monthly income (HAD-depression scale, $\chi^2=6.037$, $p=0.028$), smoking status (HAD-anxiety scale, $\chi^2=8.104$, $p=0.009$), and substance abuse (both HAD-depression and HAD-anxiety scales; $\chi^2=14.367$, $p<0.000$, and $\chi^2=18.641$, $p<0.001$, respectively) were found. There were significant associations between anxiety and current smoking [Odds ratio (OR)=5.46-95% confidence interval (CI): 1.77-16.88; $p=0.03$], as well as between depression and low monthly income [OR=3.77, (95% CI: 1.26-11.26; $p=0.018$)] and having a single-status [OR=2.68; 95% CI: 1.05-6.86; $p=0.04$]. Individuals with an HIV positivity duration of less than 3 years, the adherence to therapy was lower (OR=9.71; 95% CI: 1.14-82.99; $p=0.038$).

Conclusion: This is the first study from Turkey using HADS and CES-D scales to assess depressive and anxiety symptoms among PLWH. Significant differences were noted between HAD-D and CES-D scales in terms of a diagnosis of depression. Regression analysis showed associations between current smoking and anxiety, between depression and low income and single-status, and between low ART adherence and HIV positivity duration of less than 3 years. Regular follow-up of HIV-positive individuals, especially in terms of depression diagnoses, is of great importance.

Keywords: HIV, depression, anxiety

Öz

Amaç: Bu çalışmadaki amaç HIV ile yaşayan insanlarda depresyon ve anksiyete bozukluğu prevalansını tespit etmek, depresyon ve anksiyete belirtilerini etkileyen sosyo-demografik ve klinik değişkenleri belirlemek ve antiretroviral tedaviye (ART) uyumu etkileyen etmenleri saptayabilmektir.



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Öz

Yöntem: Çalışma üçüncü düzey bir hastanede yürütüldü. HIV ile yaşayan insanlardan veri toplamak için sosyo-demografik ve klinik veri formu, Mini-Mental Test, Hastane Anksiyete ve Depresyon Ölçeği (HADS) ve Epidemiyolojik Çalışmalar Merkezi Depresyon Ölçeği (CES-D) dahil olmak üzere bir dizi değerlendirme aracı kullanılmıştır.

Bulgular: HIV pozitif bireylerde %56 oranında depresyon, %37 oranında anksiyete bozukluğu tanısı saptanmıştır. Aylık gelir (HAD-depresyon ölçeği, $\chi^2=6,037$, $p=0,028$), sigara içme durumu (HAD-anksiyete ölçeği, $\chi^2=8,104$, $p=0,009$) ve madde kullanımı (hem HAD-depresyon hem de HAD-anksiyete ölçekleri sırasıyla; $\chi^2=14,367$, $p<0,000$ ve $\chi^2=18,641$, $p<0,001$) yönünden anlamlı farklılık bulunmuştur. Anksiyete bozukluğu ile mevcut sigara kullanımı arasında [Odds oranı (OR)=5,46, %95 güven aralığı (CI): 1,77-16,88; $p=0,03$], depresyon tanısı ile düşük aylık gelir arasında (OR=3,77, %95 CI: 1,26-11,26; $p=0,018$) ve depresyon tanısı ile bekar olma arasında (OR=2,68; %95 CI: 1,05-6,86; $p=0,04$) anlamlı ilişki saptanmıştır. HIV pozitiflik süresi 3 yıldan az olan bireylerde ise daha az tedaviye uyum saptanmıştır (OR=9,71; %95 CI: 1,14-82,99; $p=0,038$).

Sonuç: Bu çalışma, Türkiye'de HIV ile yaşayan insanların depresyon ve anksiyete tanılarını HADS ve CES-D ölçeklerini kullanarak değerlendiren ilk çalışmadır. Depresyon tanısı açısından HAD-D ve CES-D ölçekleri arasında önemli farklılıklar saptanmıştır. Regresyon analizi sonucu, mevcut sigara içme ve anksiyete bozukluğu arasında, depresyon tanısı ile düşük gelir ve bekar olma arasında, 3 yıldan daha kısa HIV pozitifliği süresi ile daha az tedavi uyumu arasında ilişki olduğunu gösterilmiştir. HIV pozitif bireylerin özellikle ve depresyon tanıları yönünden düzenli takibi büyük önem arz etmektedir.

Anahtar Kelimeler: HIV, depresyon, anksiyete

Introduction

Recent estimations suggest that depressive disorder and HIV-positivity will be associated with the highest disease burden by 2030⁽¹⁾.

Depression is the most common neuropsychiatric disorder in PLWH that has a very negative impact on the quality of life of these individuals⁽²⁾.

The prevalence of depressive disorder has been reported to be 3-fold higher among people living with HIV (PLWH) compared to the general population⁽³⁾. The reported prevalence of depression in these subjects varies between 20% and 79%, depending on the population studied, characteristics of control subjects, study period, and diagnostic tools used to identify depression⁽⁴⁾.

The link between depression and HIV infection is not straightforward, in which depression may represent a risk factor for HIV infection through augmentation of viral transmission⁽⁵⁾ or it may result in HIV infection itself. Development of depression among PLWH is associated with many factors including the presence of HIV in the central nervous system, social stigmatization, difficulties in combatting the disease, adverse effect of anti-retroviral agents, secondary complications, and problems of sexuality⁽⁶⁾.

Approximately 16% to 44.4% of PLWH cases have also been reported to suffer from any form of anxiety⁽⁷⁾.

Currently, PLWH is not adequately and systematically screened for depression in many countries, adversely

affecting the response to treatment, ART use, as well as the quality of life⁽⁸⁾. Identification of PLWH with depression not only improves the quality of life and adherence to ART but reduces mortality and morbidity⁽⁹⁾. Studies showing correlations between depression severity and low CD4+ count and high viral load support these observations⁽¹⁰⁾.

The objectives of our study were to determine the prevalence of depression and anxiety, to assess sociodemographic and clinical determinants of depression and anxiety symptoms, and to identify factors that impact ART adherence in PLWH who have been followed up and treated in a third-level Turkish hospital. The severity of depression was assessed with two tools, i.e. Center for Epidemiologic Studies Depression Scale (CES-D), and HAD, that are commonly used in studies involving PLWH. Also, the prevalence rates determined by these two different tools were compared.

Materials and Methods

Study Design and Panels

This study was conducted with the participation of PLWH treated and followed up in a 3rd level hospital in Turkey. Of the overall 250 patients followed up at the Department of Infectious Diseases, 82 agreed to participate. The research team consisted of a psychiatrist and infectious specialists treating disease. All participants were aged 18 years or older, and provided written informed consent. The study protocol was approved by the Ethics Committee of İzmir Tepecik Education and Training Hospital (decision no: 2019/12-17, date: 25th July 2019).

Sociodemographic and Clinical Data Form, Mini-Mental Test, Hospital Anxiety and Depression Scale (HADS), and CES-D administered to subjects who agreed to participate.

Also, data on CD4+ and HIV RNA counts were collected.

Patients who completed all surveys and measurement tools were included in the study.

Study Assessments

Sociodemographic and Clinic Data Form collects information on the following areas: gender, age, marital status, education level, birthplace, monthly income level, smoking status, alcohol use, substance use, duration of HIV positivity, HIV transmission route, CD4+ T cell count/mm³, viral load copies/mL, anti-retroviral therapy status, duration of antiretroviral treatment, presence/absence of secondary complications due to HIV positivity, previous diagnosis of psychiatric disorders, and history of psychiatric disorders in first-degree relatives.

The HADS is used to determine the risk of anxiety and depression as well as to measure the severity and change in the severity of anxiety and depression in a particular patient. It has two sub-scales, one for depression and one for anxiety. The reliability and validity studies of the Turkish version have been completed. The cutoff values for the anxiety and depression subscales of the Turkish version have been set at 10 and 7 points, respectively. The Cronbach's alpha value for the 14 items was 0.841.

Also, the validity and reliability studies for the CES-depression scale have been reported previously. Although the CES-D scale is not recommended to establish a diagnosis of depression, it is commonly used as a screening tool for depressive symptoms. It is a four-point Likert type scale consisting of 20 items. The total score ranges between 0 and 60, with different cutoff values for different cultural settings. Based on the US norms, the cutoff value was 16 points. Similarly, a cutoff value of 16 was also adopted for the Turkish version, based on the ROC analysis results in the validity and reliability study. In that study, a good level of internal consistency was found for CES-D, with a Cronbach's alpha value of 0.889.

Statistical Analysis

Study data were entered into the Statistical Package for the Social Sciences 22.0 software. The mean, standard deviation, median, and minimum-maximum were presented for the

numerical variables. For categorical variables, frequencies and percentages are presented. Reliability analyses were performed with Cronbach's alpha coefficients for HADS and CES-D. Cutoff groups for HADS and CES-D were stratified and cross-tables were prepared with independent variables in these groups. The differences in distributions between the groups were compared with chi-square and Fisher's exact tests. When a p value of less than 0.2 was determined in these tests, a logistic regression analysis was also performed. A backward-stepwise method was used with Wald statistics. The normal distribution of numerical variables was tested. For this purpose, both skewness and kurtosis coefficients and conformity to a normal distribution were evaluated. The association between these variables was examined using non-parametric correlation. For all comparisons, type 1 error was tested at $\alpha=0.05$. The difference between groups was considered significant when the p value was <0.05 .

Results

PLWH Demographics and Clinical Characteristics

Overall, there were 82 participants, 91.4% of whom were male. The mean age was 41.28 ± 12.90 years, with a mean HIV positivity duration of 4.80 ± 3.36 years.

The average scores for the Mini-Mental Test, HAD-depression scale, HAD-anxiety scale, and CES-D were 25.61 ± 3.53 , 6.87 ± 4.05 , 7.83 ± 4.23 , and 22.60 ± 12.60 , respectively. Other sociodemographic and clinical data are summarized in Table 1.

Distribution of Sociodemographic and Clinical Data According to Cutoff of HAD, CES-D and Mini-Mental Test Scores

Significant differences between the groups were found when the overall study participants were assessed according to HAD-depression cutoff score ($t=-13,757$; $p<0.000$), HAD-anxiety cutoff score ($t=-12,346$; $p<0.000$), and CES-D cutoff score ($t=-13,623$; $p<0.000$). A significant difference in terms of HAD-depression cutoff score was found between those with a monthly income level of <300 USD and ≥ 300 USD ($\chi^2=6.037$, $p=0.028$). Current smokers and non-smokers differed significantly concerning HAD-anxiety scale cutoff score ($\chi^2=8.104$, $p=0.009$). Also, there were significant differences in both HAD-depression ($\chi^2=14.367$, $p<0.000$) and HAD-anxiety ($\chi^2=18.641$, $p<0.000$) cutoff scores between those with or without substance abuse. However, the groups did not differ significantly in terms of viral load and CD4+ T helper cell count (Table 2).

Table 1. Sociodemographic and clinical characteristics of the patients

	Mean	SD
Age (mean±SD)	41.28	12.90
Period since being diagnosed (year)	4.80 Minimum: 1, Maximum: 17	3.36
CD4+ T helper	658	397
Minimental test score	25.61	3.53
HAD-depression score	6.87	4.05
HAD-anxiety score	7.83	4.23
CES-D	22.60	12.60
	n	%
Gender		
Male	75	91.4
Female	7	8.6
Education level		
Primary school	48	58.5
High school	15	18.3
Bachelor's degree	19	23.2
Marital status		
Single	41	50
Married	41	50
Individual monthly income		
300 USD≥	63	76.8
300 USD<	19	23.2
Smoking status		
Yes	50	61
No	32	39
Alcohol use		
Yes	41	50
No	41	50
Substance abuse		
Yes	15	18.3
No	67	81.7
Currently receiving ART		
Yes	74	90.2
No	8	9.8
Secondary complication		
Yes	45	45.1
No	37	54.9
First degree relatives who have psychiatric disease		
Yes	14	17.1
No	68	82.9
Viral load copy/mL		
<50	63	76.8
≥50	19	23.2

CD4+ T helper		
<200	3	3.7
200-350	9	11.0
>350	70	85.4
HAD-depression		
<7	36	43.9
≥7	46	56.1
HAD-anxiety		
<10	51	62.2
≥10	31	37.8
CES-D		
<16	29	35.4
≥16	53	64.6

SD: Standard deviation, HAD: Hospital Anxiety and Depression Scale, CES-D: Center for Epidemiologic Studies Depression Scale, ART: Antiretroviral therapy

Furthermore, when the study group was analyzed on the basis of HAD and CES-D cutoff values for depression, significant differences were found between those diagnosed with depression and those without a diagnosis of depression ($\chi^2=8,511, p=0.004$).

Distribution of Sociodemographic and Clinical Data According to ART Adherence

Significant differences in ART adherence were found in those with a HIV positivity history of less than 3 years and those with a HIV positivity history of greater than or equal to 3 years ($\chi^2=6.039, p=0.022$). There were no other significant differences with respect to other data (Table 3).

Correlations Between Significant Variables for HIV Infection

Significant correlations were noted between CES-D and HAD-depression ($r=0.423, p=0.01$), CES-D and HAD-anxiety ($r=0.621, p=0.01$), and HAD-depression and HAD-anxiety scores ($r=0.605, p=0.01$). Other correlation data are presented in Table 4.

Logistic Regression Analysis for Sociodemographic and Clinical Data Associated with Depression and Anxiety

A logistic regression analysis was applied to variables with a p value of less than 0.2. Marital status, smoking status, and ART were included in the analysis for HAD-anxiety, that showed a higher burden of anxiety symptoms among smokers [Odds ratio (OR)=5.46; 95% confidence interval (CI): 1.77-16.88, $p=0.03$]. When smoking and monthly income were included in the logistic regression analysis for HAD-depression scores, a monthly income level of <300 USD was associated with increased risk of depression (OR=3.77;

Table 2. Distribution of sociodemographic and clinical data according to cutoff of HAD, CES-D and Mini-Mental Test scores

	HAD-depression		HAD-anxiety		CES-D		Minimental Test	
	<7	7≤	<10	10≤	<16	16≤	<23	23≤
Gender								
Male	33 (44%)	42 (46%)	47 (62.6%)	28 (37.4%)	25 (33.3%)	50 (66.7%)	14 (18.6%)	61 (81.4%)
Female	3 (42.6%)	4 (57.1%)	4 (57.1%)	3 (42.6%)	4 (57.1%)	3 (42.6%)	2 (28.5%)	5 (71.5%)
Marital status								
Married	18 (43.9%)	23 (56.1%)	29 (70.7%)	12 (29.3%)	19 (43.3%)	22 (53.7%)	9 (22%)	32 (78%)
Single	18 (43.9%)	23 (56.1%)	22 (53.7)	19 (46.3%)	10 (24.4%)	31 (75.6%)	7 (17.1%)	34 (82.9)
Education attainment								
Primary school	18 (37.5%)	30 (62.5%)	28 (58.3%)	20 (41.7%)	16 (33.3%)	32 (66.7%)	10 (20.8%)	38 (79.2%)
High school	8 (53.3)	7 (46.7%)	11 (73.3%)	4 (26.7%)	4 (26.7%)	11 (73.3%)	3 (20%)	12 (80%)
Bachelor's degree	10 (52.6%)	9 (47.4)	12 (63.2%)	7 (36.8%)	9 (47.4%)	10 (52.6%)	3 (15.8%)	16 (84.2)
Monthly income								
≤300 USD	23* (36.5%)	40* (63.5%)	36 (57.1%)	27 (42.9%)	21 (33.3%)	42 (66.7%)	12 (19%)	51 (81%)
>300 USD	13* (68.4%)	6* (31.6%)	15 (78.9%)	4 (21.1%)	8 (42.1%)	11 (57.9%)	4 (21%)	15 (79%)
Smoking								
Yes	18 (36%)	32 (64%)	25** (50%)	25** (50%)	14 (28%)	36 (72%)	9 (18%)	41 (82%)
No	18 (56.3%)	14 (43.8)	26** (81%)	6** (19%)	15 (46.9%)	17 (53.1%)	7 (21.9%)	25 (78.1%)
Alcohol use								
Yes	20 (48.8%)	21 (51.2%)	25 (61%)	16 (39%)	14 (34.1%)	27 (65.9%)	9 (22%)	32 (78%)
No	16 (39%)	25 (61%)	26 (63.4%)	15 (36.6%)	15 (36.6%)	26 (63.4%)	7 (17.1%)	34 (82.9)
Substance abuse								
Yes	0^ψ	15^ψ (100%)	2^φ (13.3%)	13^φ (86.7%)	1 (6.7%)	14 (93.3%)	2 (13.3%)	13 (86.7%)
No	36^ψ (53.7%)	31^ψ (46.3%)	49^φ (73.1%)	18^φ (26.9%)	28 (41.8%)	39 (58.2%)	14 (20.9%)	53 (79.1%)
Secondary complication								
Yes	19 (42.2%)	26 (57.8%)	28 (62.2%)	17 (37.8%)	17 (37.8%)	28 (62.2%)	10 (22.2%)	35 (77.8%)
No	17 (45.9%)	20 (54.1%)	23 (62.2%)	14 (37.8%)	12 (32.4%)	25 (67.6%)	6 (16.2%)	31 (83.8%)
Viral load copy/mL								
>50	8 (42.1%)	11 (57.9%)	11 (57.9%)	8 (42.1%)	4 (21.1%)	15 (78.9)	3 (15.8%)	16 (84.2%)
<50	28 (44.4%)	35 (55.6%)	40 (63.5%)	23 (36.5%)	25 (39.7%)	38 (60.3%)	13 (20.6%)	50 (79.4%)
CD4+ T helper								
200+	34 (43%)	45 (57%)	48 (60.8%)	31 (39.2%)	28 (35.4%)	51 (64.6%)	16 (20.3%)	63 (79.7%)
<200	2 (66.7%)	1 (33.3%)	3 (100%)	0	1 (33.3%)	2 (66.7%)	0	3 (100%)

* $\chi^2=6.037$, $p=0.028$; ** $\chi^2=8.104$, $p=0.009$; ^ψ $\chi^2=14.367$, $p<0.000$; ^φ $\chi^2=18.641$, $p<0.000$.

HAD: Hospital Anxiety and Depression Scale, CES-D: Center for Epidemiologic Studies Depression Scale

95% CI: 1.26–11.26, $p=0.018$). Smoking status, marital status, and a HIV positivity history of <3 or greater than or equal to 3 years were subjected to a logistic regression analysis for CES-D. Accordingly, a single-status was associated with an increased occurrence of depression (OR=2.68; 95% CI: 1.05–6.86, $p=0.04$). For ART adherence, HAD-anxiety and duration of HIV positivity were included in the logistic regression, showing lower adherence to ART in those with a

HIV positivity duration of less than 3 years (OR=9.71; 95% CI: 1.14–82.99, $p=0.038$) (Table 5).

Discussion

In this study, the prevalence of depression among PLWH was 56.1% and 64.6% based on HAD-D and CES-D scales, respectively. In a 2011 review by Sherr et al.⁽¹¹⁾ involving 90 studies, the reported prevalence of depression in

Table 3. Distribution of sociodemographic and clinical data according to ART adherence				
	ART		χ^2	p
	No	Yes		
Gender				
Male	8 (10.7%)	67 (89.3%)	0.827	1.000
Female	0	7 (100%)		
Age				
<=40	6 (14%)	37 (86%)	1.809	0.269
40+	2 (5.1%)	37 (94.9%)		
Marital status				
Single	5 (12.2%)	36 (87.8%)	0.554	0.712
Married	3 (7.3%)	38 (92.7%)		
Monthly income				
>300 USD	2 (10.5%)	17 (89.5%)	0.017	1.000
≤300 USD	6 (9.5%)	57 (91.5%)		
Smoking				
No	2 (6.3%)	30 (93.8%)	0.733	0.473
Yes	6 (12%)	44 (88%)		
Alcohol use				
No	3 (7.3%)	38 (92.7%)	0.554	0.712
Yes	5 (12.2%)	36 (87.8%)		
HIV+ duration of year				
>3	1 (2.3%)	43 (97.7%)	6.039	0.022
≤3	7 (18.4%)	31 (81.6%)		
CD4+				
<200	0	3 (100%)	0.455	1.000
200≤	8 (10.1%)	71 (89.9%)		
Mini-Mental Test				
23≤	6 (9.1%)	60 (90.9%)	0.170	0.650
23>	2 (12.5%)	14 (87.5%)		
HAD-depression				
<7	2 (5.6%)	34 (94.4%)	1.286	0.456
≥7	6 (13%)	40 (87%)		
HAD-anxiety				
<10	3 (5.9%)	48 (94.1%)	2.299	0.147
≥10	5 (16.1%)	26 (83.9%)		
CES-D				
<16	1 (3.4%)	28 (96.6%)	2.028	0.249
≥16	7 (13.2%)	46 (86.8%)		

CES-D: Center for Epidemiologic Studies Depression Scale, ART: Antiretroviral therapy

these subjects varied significantly between 11% and 80%, depending on the tools used to identify depression, sample groups, and cutoff values used. In that same review, the prevalence based on CES-D was between 35% and 42.8%.

In another study where a HAD cutoff value of 11 points used to diagnose depression among PLWH, the prevalence of anxiety and depression were 4.8% and 3.1%, respectively⁽¹²⁾. However, in another study with a large sample size, where

Table 4. Correlations between significant variables for HIV Infection

Variables	1	2	3	4	5	6	7
1. CES-D							
2. HAD-anxiety	0.621**						
3. HAD-depression	0.423**	0.605**					
4. Mini-Mental Test	-0.007	-0.006	0.021				
5. CD4+ T helper	0.149	0.061	-0.006	-0.129			
6. Viral Load	0.182	0.180	0.130	0.082	-0.177		
7. HIV+ duration	-0.169	-0.056	-0.019	-0.106	0.128	-0.310**	
8. Age	-0.249*	-0.183	-0.105	-0.100	-0.031	-0.074	0.389**

*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).

HAD: Hospital Anxiety and Depression Scale, CES-D: Center for Epidemiologic Studies Depression Scale

Table 5. Logistic regression analysis for sociodemographic and clinical data associated with depression, anxiety and ART

HAD-A							
	B	S.E.	Wald	p	Exp (B)	95% CI for exp (B)	
						Lower	Upper
Constant	-2.130	0.568	14.057	0.000	0.12		
Smoking	1.698	0.576	8.689	0.003	5.46	1.77	16.88
HAD-D							
	B	S.E.	Wald	p	Exp (B)	95% CI for exp (B)	
						Lower	Upper
Constant	-.773	0.494	2.454	0.117	0.462		
Monthlyincome	1.327	0.559	5.639	0.018	3.77	1.26	11.26
CES-D							
	B	S.E.	Wald	p	Exp (B)	95% CI for exp (B)	
						Lower	Upper
Constant	0.147	0.313	0.219	0.640	1.16		
Marital status	0.985	0.480	4.210	0.040	2.68	1.05	6.86
ART							
	B	S.E.	Wald	p	Exp (B)	95% CI for exp (B)	
						Lower	Upper
Constant	-3.761	1.012	13.825	0.000	0.023		
HIV+duration	2.273	1.095	4.312	0.038	9.71	1.14	82.99

HAD: Hospital Anxiety and Depression Scale, CES-D: Center for Epidemiologic Studies Depression Scale, ART: Antiretroviral therapy, CI: Confidence interval

a cutoff value of 8 was used for HAD, anxiety was found in 27.4% and depression found in 32.9% of the patients⁽¹³⁾. In a systematic global review, the reported prevalence of anxiety and depression in countries with low to middle income were 33.92% and 41.36%, respectively⁽¹⁴⁾. In this study, the observed prevalence of depression for a CES-D cutoff value of 16 points was 35%, consistent with the above-described observations. However, the prevalence of anxiety and depression based on HAD scores were 62.2% and 43.9%, respectively, which were

higher than the previously published figures. We believe that this difference may be accounted for by the HAD cutoff values used in different communities and the variations in sample characteristics. The significant difference in depression prevalence as identified by CES-D and HAD-D may be related to the fact that some of the items of HAD-D may be difficult to comprehend, define serious depression and excludes any items assessing the somatic symptoms, while CES-D has an item that assesses the somatic aspects of the disease⁽¹⁵⁾.

There were significant differences in HAD scores between current smokers and non-smokers as well as between drug users and non-users. Compared to HIV-negative individuals, PLWH has been reported to have a higher prevalence of alcohol and drug use⁽¹⁶⁾.

In a study by Shuter et al.⁽¹⁷⁾, depression, and anxiety were reported in 73.3% and 67.3% of the smoker PLWH, respectively; in that study, most participants reported cigarette use for tackling anxiety and depression.

A high incidence of substance/drug use has been reported among PLWH. In a study, approximately 50% of PLWH have been reported to be active drug users⁽²⁾. Drug use is associated with adverse effects among PLWH due to many reasons. For instance, HIV transmission may occur directly via injectable substances and indirectly via non-injectable substances due to risky sexual behavior⁽¹⁸⁾. Furthermore, drug use may reduce the adherence to ART and may lead to disease progression⁽¹⁹⁾. Additionally, drug use has negative impacts on the response to therapy⁽²⁰⁾. An association between depression and substance use has been reported for PLWH⁽²¹⁾. It has been proposed that the main motivation behind substance use in these individuals may be related to the need to avoid negative mood or stress. Therefore, interventions directed at substance use among PLWH carry major clinical significance.

It has been well established that among PLWH, adherence to ART is the second most important factor for disease progression and death after CD4+ count. In our study, ART adherence was significantly different among those with a HIV positivity history of less than 3 years and greater than or equal to 3 years. These observations were also confirmed in our logistic regression analysis, similar to some other previous studies⁽²²⁾. It is possible that patients with a HIV positivity duration of more than 3 years may have more acceptance and insights of their condition. However, when individuals with HIV positivity of <3 or greater than or equal to 3 years compared concerning cut off points for depression and anxiety, no significant correlations were found, which may indicate that depression and anxiety do not present an obstacle for the continuation of ART. Also, the negative correlation between HIV positivity duration and the viral load supports this observation. As shown in the table, no effect of other sociodemographic and clinical variables on ART use was found.

Significant correlations were identified between tools used to evaluate depression and anxiety, which is an important

finding in terms of the consistency of our study findings. Studies assessing the mental health in PLWH in Turkey are scarce in number, and none of the previous studies used CES-D and HADS. Therefore, our study has shown that these two tools may be used to assess depression and anxiety in Turkish PLWH.

As expected, a significant correlation between the duration of HIV positivity and age was observed. Effective ART known to prolong lifespan in PLWH. Even in patients advancing into AIDS, the reported 10-year survival rate with HAART is 61%⁽²³⁾.

As shown by our regression analysis, an association between smoking and increased HAD-anxiety scores was present, with PLWH having a 3-fold increased prevalence of smoking⁽²⁴⁾. One possible explanation for the anxiety symptoms in these subjects involves the disruption of the biological stress pathways (e.g., hypothalamic-pituitary-adrenal axis and sympathetic-adrenal-medullary axis) by HIV⁽²⁵⁾. Similarly, HIV/AIDS may be related to behavioral practices such as smoking, substance use, and alcohol use that may aggravate or cause persistence of anxiety symptoms⁽²⁴⁾. In fact, based on a heuristic integrative model, a mutual relationship exists between smoking and anxiety⁽²⁶⁾. This explains the multitude of interventions aimed at the cessation of smoking among PLWH, along with relevant studies.

There was a statistically significant difference in HAD-D scores in subjects with a monthly income level of <300 USD and \geq 300 USD. The association between low income level and HAD-D score was also maintained in the logistic regression analysis. In another study where Beck Depression Inventory was used, similar associations between low income and increased severity of depression were reported among PLWH⁽²⁷⁾. Conversely, no such relationships could be observed in another study, using the same measurement tool⁽²⁸⁾. It appears that the cutoff value used for defining low-income level may have a significant impact on the association between depression and income level. Again, in a comprehensive meta-analysis, depressive PHWL were more likely to have low adherence to ART compared to those without depression⁽²⁹⁾. It may be assumed that low income level may predispose the individuals to depression, with a consequent decrease in ART adherence.

An association between single-status and CES-D scores was found in our group of PLWH. Several previous studies also reported links between single-status and increased depression severity⁽³⁰⁾. Similarly, 13-fold increased mortality

was reported among single PLWH compared to married PLWH (marital status and HIV/AIDS mortality: evidence from the US National Longitudinal Mortality Study). These data suggest that social support is an important determinant of the mental health among PLWH, and may even have a protective role against depression.

Study Limitations

The limitations of the study include the selection of the sample group from a single center and most it being male.

Conclusion

This is the first study in Turkey where HAD and CES-D scales were used to assess depression and anxiety among PLWH. Significant differences in terms of the diagnostic yield of HAD-D and CES-D scales were observed. Significant differences in the occurrence of depression and anxiety were found based on smoking and substance use status, while monthly income level had a significant impact on depression incidence. However, CD4+ count and viral load did not appear to affect the results. Also, an HIV positivity history of longer than 3 years increased ART adherence. The results of the regression analyses showed associations between anxiety and smoking; between depression and low income level and single-status; and low ART adherence and HIV positivity duration of less than 3 years.

Ethics

Ethics Committee Approval: The study protocol was approved by the Ethics Committee of İzmir Tepecik Education and Research Hospital (decision no: 2019/12-17, date: 25th July 2019).

Informed Consent: Consent form was filled out by all participants.

Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: K.A., H.A.U., S.A., U.S., Concept: K.A., H.A.U., S.A., U.S., Design: K.A., H.A.U., S.A., U.S., Data Collection or Processing: K.A., H.A.U., S.A., U.S., Analysis or Interpretation: K.A., H.A.U., S.A., U.S., Literature Search: K.A., H.A.U., S.A., U.S., Writing: K.A., H.A.U., S.A., U.S.

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