

## RESEARCH ARTICLE

# The underestimation of depression in primary health care in Greece during the post-COVID-19 pandemic: A simulation study

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## ABSTRACT

Depression is the primary cause of psychological distress, particularly in a crisis like the SARS-CoV-2 pandemic. Primary healthcare structures don't seem to be able to identify and treat a sizable percentage of depressed individuals. This study aimed to examine the prevalence of undiagnosed depression in primary healthcare settings during the post-COVID-19 pandemic and its correlation with demographics and alcoholism. This cross-sectional study used the PHQ-9 (Patient Health Questionnaire-9) to measure depression levels and the FAST (Fast Alcohol Screening Test) to assess alcoholism. A total of 212 individuals (86 males, aged  $51.22 \pm 6.11$ , and 126 females, aged  $49.75 \pm 6.22$ ) who visited a Primary Health Center in Western Greece between May 2022 and September 2022 were included in the study. Findings revealed the occurrence of undetected depression in a percentage of 63.2% of cases. More specifically, 36.8% of the sample showed no depressive symptoms at all, 28.3% had mild depression, 18.4% had moderate depression, and 16.5% had severe depression. However, gender and alcoholism did not seem to influence the occurrence of depressive symptoms somehow. The results offer significant evidence regarding the prevalence of depression and its inadequate diagnosis in primary healthcare settings throughout the post-COVID-19 era. Based on the findings, general practitioners, mental health professionals, and the personnel of a Primary Health structure can use these questionnaires as screening tools for depression and alcoholism problems during patients' visits. Future longitudinal studies might be conducted to examine the enduring psychological impacts of the pandemic and develop a depression awareness campaign within the context of primary healthcare.

**Keywords:** depression; underestimation; primary health care; post-COVID-19; Greece

## 1. Introduction

Depression is a prevalent mental health condition in the 21st century, leading to psychological issues. It

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is estimated that at least 5% of the general population worldwide shows depressive symptoms<sup>[1]</sup>. According to WHO, it is expected that by 2030, it will be the leading cause of disability worldwide<sup>[1]</sup>. Furthermore, depression is more common in women than men, and the age and cultural context<sup>[2]</sup> impact on gender variations in the prevalence of depression<sup>[3,4]</sup>.

However, in addition to women, the elderly, patients with chronic diseases, the immunocompromised, people of low socioeconomic status, and people who abuse substances also present a high risk of a depressive episode<sup>[5-7]</sup>.

Despite the seriousness of depression, many people do not seek medical help, mainly if they belong to vulnerable social groups. For this reason, the most effective assessment of risk factors and detection of depressive symptoms must occur in the community<sup>[8]</sup>. After all, research proves that in this way, the severe effects of depression are treated more effectively, and early deaths from suicide are prevented<sup>[9]</sup>. In addition to suicide, depressed patients are at risk of other destructive habits. More specifically, people with depression appear to be more likely to develop problems with alcohol use at some point in their lives, at a rate of about 30%<sup>[10,11]</sup>. More often, men consider the use of alcohol as self-medication, as it causes a temporary loss of consciousness and reduces the discomfort and feelings of depression<sup>[12,13]</sup>. Therefore, it is considered crucial to investigate the existence of problems with alcohol in depressed patients by mental health specialists because their comorbidity affects the development of depression.

Nevertheless, from 2019 onwards, the rates of psychological problems multiplied with the emergence of the Covid-19 pandemic and how to deal with it<sup>[14,15]</sup>. Pandemics are sudden diseases that appear worldwide and negatively affect citizens' public health. Data from previous pandemics (SARS, MERS, HIV) show increased psychological problems with long-term effects on people's lives<sup>[9]</sup>.

In this case, SARS-CoV-2 resulted in a lower quality of life for residents of various countries such as Portugal, Saudi Arabia, Greece, Austria and Italy<sup>[16-20]</sup>. More specifically, the inability to control the situation, the high transmissibility of the virus, fear of infection, confinement, insecurity, economic hardship, tracking the number of deaths, strict public health measures, and loss of social interaction probably caused many psychological effects on residents, which are beginning to be investigated the current period<sup>[21]</sup>.

Detecting mental disorders during the acute period of the pandemic was challenging<sup>[22,23]</sup>. Primary healthcare facilities were in an emergency as they dealt with many COVID-19 patients and discouraged citizens from regular medical visits<sup>[24,25]</sup>. The focus on physical health, directives to reduce hospital visits, increased workloads, high numbers of COVID-19 patients, shortages of medical and nursing staff, illness of healthcare workers, and psychological burnout of PHC workers and across the health system seem to have led to a focus on the physical health of patients<sup>[26]</sup>. During the COVID-19 pandemic, there was a brief yet significant decline in the number of individuals with pre-existing mental illnesses seeking primary care after an incident of self-harm<sup>[27]</sup>. In the Greek area, it seems that the consequences are more intense since even before the pandemic, the PHY services were understaffed, and the doctors, in the few minutes they had per incident, focused on the investigation of physical diseases<sup>[28]</sup>. That significant decline in primary care-recorded mental illness during the spring of 2020, coupled with the heightened mental health burden from the pandemic, suggests untreated mental illnesses<sup>[27]</sup>.

Also, vulnerable social groups (e.g., the elderly, immunocompromised, institutionalized, chronically ill, psychiatric patients) presented a higher risk of developing psychological problems during the quarantine period<sup>[29]</sup>. Furthermore, COVID-19 patients showed higher than normal levels of anxiety, sadness, post-traumatic stress symptoms, cognitive impairment, and sleep disturbances. These long-lasting effects remain present six months after the disease in 23% of individuals<sup>[30,31]</sup>. Depressive symptoms and health anxiety

appear to have been prompted by their confinement, worry for their survival, and the deprivation of their loved ones during the sickness<sup>[30,31]</sup>. The reasons for causing emotional problems in adults during the COVID-19 pandemic have multiplied. The decrease in economic income, unemployment, the 24-hour cohabitation of the whole family in one house, distance learning, and teleworking, in combination with the loss of support networks, brought about a change in both family functionality and the psychological state of individuals<sup>[32]</sup>.

Finally, studies conducted in primary health care revealed a significant increase and underdiagnosis of depression at a rate of approximately 50%<sup>[33-35]</sup>. The reason for this is that all the medical staff concentrated on treating COVID-19's physical issues while ignoring the patients' mental health<sup>[36,37]</sup>.

### **1.1. Research Gap**

However, some studies conducted to investigate the mental effects of the pandemic seem to have focused only on the chronically ill, students, and elderly, leaving aside the middle-aged (40-60 years old), who were vulnerable and faced with economic insecurity, family management at home, and job insecurity<sup>[38,39]</sup>.

To our knowledge, this is the first study in Western Greece that investigated the prevalence of undetected depression and alcoholism in individuals 40-60 years old post-COVID-19 in Primary Healthcare. In addition, the existing literature in Greece in the post-COVID era is conducted only on primary health workers, younger adults, students, chronically ill patients, and the elderly<sup>[6,7,40-46]</sup>. We hope our findings will be valuable for general practitioners, mental health professionals, nurses, and the personnel of a Primary Health structure. They can use the study questionnaires during patients' visits to quickly screen for depression and alcoholism problems and immediately provide the appropriate care.

### **1.2. Aim of Study**

This study aims to thoroughly investigate the prevalence of depression in individuals aged 40-60 within the community using primary health care, as well as the coexistence of drinking as a comorbidity during the post-COVID-19 period. According to the literature review, our research questions for conducting this study were: (1) what the prevalence of undiagnosed depression in primary health care during the post-Covid period is; (2) whether comorbidity between depression and alcoholism will occur; (3) which demographic factors will influence the occurrence of depression.

## **2. Methods and Materials**

### **2.1. Setting, inclusion, and exclusion criteria.**

The study's participants were selected among general practitioners working at a public Primary Health Care Center in Western Greece and private general practitioners in the same region, following an open call. Moreover, the study's sample collection process started in May 2022 and ended in September 2022. Participants provided written agreement to participate, and the questionnaire was delivered in accordance with the Law on the Protection of Personal Data of the Participants.

The participants were 212 individuals who visited for regular medical check-ups by their general practitioners. Their participation was voluntary, and there was no reward. Their personal motivation for participation was their interest in their health. Out of the 220 cases that satisfied the criterion for inclusion, eight cases were not considered in the study due to incomplete data. Regarding this sample, 59.4% were females and 40.6% were males. The participants' ages ranged from 40 to 60 years, with a mean age of  $50.36 \pm 6.20$  years. The inclusion criteria of the participants were the following: a) to be 40-60 years old, b) to have

the ability to read and write in Greek language, and c) to be able to visit a structure of primary health care. In addition, participants filled out a form with their demographic data. The exclusion criteria were: a) not to be involved in psychological intervention or be followed by a psychiatrist since the Covid period, and b) not to be Greek citizens.

In this way, data, such as gender, age, educational and economic level, place of residence, professional status, history of hospitalization in the past, and physical and mental illnesses, were collected from the participants. The study was carried out in accordance with the standards outlined in the Declaration of Helsinki and received approval from the Institutional Review Board of the University of Patras (13081, 9 June).

## **2.2. Instruments of the Study**

Two questionnaires and a demographic data form were provided for the study. The first measured depression and its severity, and the second concerned alcohol consumption.

The **Patient Health Questionnaire (PHQ-9)** was administered to evaluate depression, which assesses the presence of depression according to the DSM-IV, the severity of the depression, and the effectiveness of the intervention. It includes the evaluation of the existence of 9 criteria of DSM-5 depression during the last two weeks. It is rated from 0 (no) to 3 (almost every day) to collect a final score ranging from 0 to 27 and provides results for the severity of any existing depression. This questionnaire is a short tool with high sensitivity for the detection of depression in the elderly (0.90), reliability (0.99), and predictive validity (0.92)<sup>[47]</sup>. The scale demonstrates high reliability, as evidenced by a Cronbach's  $\alpha$  coefficient of 0.89 in the PHQ Primary Care Study and 0.86 in the PHQ Ob-Gyn Study<sup>[48]</sup>. It was also used in several studies conducted to investigate the effects of the COVID-19 pandemic<sup>[49-51]</sup>. The Greek version of the instrument was used for the study<sup>[52]</sup>, and it also had high reliability, as proved by the Cronbach alpha coefficient in our research, which is 0.887.

The **Fast Alcohol Screening Test (FAST)** was then used to detect alcoholism and the risk of developing alcoholism. The FAST consists of 10 questions that assess alcohol consumption during the current period and one year prior. On a Likert scale, responses are ranked from 0 (never) to 4 (every day). The sum of the responses provides results for the existence of an alcohol problem and the risk of developing one in the future. The scale shows reliability ( $\alpha = 0.77$ )<sup>[53]</sup>, and the study used a validated version in the Greek language<sup>[54]</sup>. The questionnaire in this research indicates high internal consistency with a Cronbach alpha coefficient of 0.857. Studies conducted around the same period to investigate Covid's effects appear to have used the same questionnaire<sup>[55,56]</sup>.

## **2.3. Statistical analysis**

Descriptive analysis was conducted on the sociodemographic characteristics of the participants. Mean values and standard deviations are reported for continuous variables and frequencies for categorical variables. Eta was used to determine associations between categorical variables and the PHQ-9 dimensions as part of a one-way analysis of variance. Associations between the dimensions of the FAST Alcohol and PHQ-9 domains were examined using Pearson's correlation coefficient. All statistical analyses were performed using SPSS version 25.

### 3. Results

#### 3.1. Characteristics of the sample

In total, 212 individuals were included in the study's sample. Out of the total, 86 were male, and 126 were female. The average ages of men and women were  $51.22 \pm 6.11$  years and of women  $49.75 \pm 6.22$ , with an age range of 40-60 years for both sexes. Most participants were married (52.4%), and 67.5% had children. Regarding their educational level, 34.4% graduated from high school, and 32.5% completed university studies. Regarding professional status, 26.9% were public employees and 24.5% were private employees. Of the 212 participants, 76 (35.8 %) declared that their monthly family income ranged from 501 to 999 euros, while only 35 (16.5%) declared a relatively high family income, over 1,500 euros. Regarding place of residence, 89 participants (42%) lived in a semi-urban area, while 43 (20.3%) declared a rural area. Regarding medical family history, 58 participants (27.4%) of the total sample had a history of hospitalization. Regarding the type of disease, only one participant answered that he had a mental illness, specifically bipolar disorder. **Table 1** displays the demographic features of the sample.

**Table 1.** Demographic characteristics of the sample.

<b>Age of men</b> (years) M. $\pm$ S.D. (range)	51.22 $\pm$ 6.11 (40-60)
<b>Age of women</b> (years) M. $\pm$ S.D. (range)	49.75 $\pm$ 6.22 (40-60)
<b>Marital status</b>	<b>(N, %)</b>
Married	111 (52.4)
Divorced	35 (16.5)
Unmarried	57 (26.9)
Widowers	9 (4.2)
<b>Children</b>	
Yes	67.5
No	32.5
<b>Educational level</b>	
Primary school	18 (8.5)
Middle school	27 (12.7)
Senior High School	73 (34.4)
University/Technical Degree	69 (32.5)
Postgraduate studies	17 (8.0)
Doctoral studies	8 (3.8)
<b>Professional situation</b>	
Unemployed	4 (7.5)
Farmer	20 (9.4)
Private employee	54 (25.5)
Civil servant	57 (26.9)
Freelancer	38 (17.9)
Retired	9 (4.2)

Table 1. (Continued)

<b>Monthly Income (Euros)</b>	
0 - 500	43 (20.3)
501-999	76 (35.8)
1.000-1.500	58 (27.4)
1.500+	35 (16.5)
<b>Residence</b>	
Urban area	80 (37.7)
Semi-urban area	89 (42.0)
Rural area	43 (20.3)
<b>Hospitalization</b>	
Yes	58 (27.4)
No	154 (72.6)
<b>Physical disease</b>	
Yes	33 (15.6)
No	179 (84.4)
<b>Mental illness</b>	
Yes	1 (0.5)
No	211 (99.5)
<b>Kind of Mental Illness</b>	
Bipolar Disorder	1 (0.5)
None	211 (99.5)

S.D: Standard Deviation; M: Mean.

### 3.2. Questionnaires

The mean total score for the PHQ-9 depression questionnaire was  $7.79 \pm 5.82$ . The results showed that the majority of the sample had scored mild depressive disorder. For the alcohol scale, the FAST alcohol scale was completed by 197 people, with an average of  $0.87 \pm 1.68$ , while the Risk Alcohol scale was completed by seven people, with an average of  $11.43 \pm 3.73$ . These results are presented in more detail in **Table 2**.

Table 2. Total Score of questionnaires PHQ-9 (Patient Health Questionnaire-9) and FAST (Fast Alcohol Screening Test).

	(N)	M	SD	Min	Max
<b>PHQ – 9 Total Score</b>		7.79	5.82	0	24
<b>Fast Alcohol Screening Test (FAST)</b>					
Fast Alcohol	197	0.87	1.68	0	9
Risk Alcohol	7	11.43	3.73	6	17

In total, data were obtained from the depression scale on both the incidence rate of depression and its severity. Among the participants, 63.2% experienced depressive symptoms. More specifically, of the participants in the sample, 36.8% showed no depressive symptoms at all, 28.3% had mild depression, 18.4% had moderate depression, and 16.5% had severe depression—more detail in **Table 3**.

Table 3. Depression Severity of the sample as determined using the PHQ -9.

	N	%	
<b>PHQ-9</b>	No depressive symptoms	78	36.8
	Mild	60	28.3
	Moderate	39	18.4
	Severe	35	16.5
	Total	212	100

### 3.3. Correlations

Significant negative correlations between demographics and the PHQ-9 scale were revealed by linear correlation analysis through Pearson's and Eta Coefficient test. Specifically, marital status and physical illness were positively correlated with the PHQ-9 depression scale ( $\eta^2 = 0.057$ ,  $p < 0.001$ ) and ( $\eta^2 = 0.089$ ,  $p < 0.001$ ). More details about correlations are in **Table 4**.

**Table 4** Correlations between demographics and the FAST Alcohol and RISK Alcohol questionnaires with the PHQ-9 questionnaire.

Covariate	Level	PHQ-9
		Total score N: mean (SD)
Hospitalization <sup>a</sup>	Yes	58: 9.47 (6.45)
	No	154: 7.16 (5.46)
	<b>F(1, 210)</b>	6.806
	<b>P value</b>	<b>0.010</b>
	<b><math>\eta_p^2</math></b>	<b>0.031*</b>
Educational Level <sup>a</sup>	Primary School	18: 9.50 (7.14)
	Middle School	27: 8.19 (5.084)
	Senior High school	73: 6.85 (6.13)
	University Degree	69: 7.57 (5.39)
	Postgraduate Studies	17: 8.41 (5.44)
	Doctoral Studies	8: 11.75 (4.33)
	<b>F(5, 206)</b>	1.53
	<b><math>\eta_p^2</math></b>	0.036
<b>P value</b>	0.181	
Professional Status <sup>a</sup>	Unemployed	21: 3.53 (0.58)
	Farmer	20: 10.25 (6.79)
	Freelancer	38: 8.82 (6.22)
	Private employee	54: 7.15 (5.94)
	Civil Servant	57: 6.39 (4.86)
	Retired	9: 11.22 (4.96)
	<b>F(5, 206)</b>	2.453
	<b><math>\eta_p^2</math></b>	<b>0.056</b>
<b>P value</b>	<b>0.035</b>	
Marital status <sup>a</sup>	Married	111: 6.48 (5.51)
	Divorced	35: 8.91 (5.25)
	Unmarried	57: 9.47 (6.49)
	Widowers	9: 8.89 (3.69)
	<b>F(3, 208)</b>	4.19
	<b><math>\eta_p^2</math></b>	<b>0.057</b>
<b>P-value</b>	<b>0.007</b>	
Residence <sup>a</sup>	Urban area	80: 8.14 (6.39)
	Semi-urban area	89: 6.81 (4.97)
	Rural area	43: 9.16 (6.14)
	<b>F(2, 209)</b>	2.64
	<b><math>\eta_p^2</math></b>	0.025
<b>P value</b>	0.074	

Table 4. (Continued)

		PHQ-9
Gender <sup>a</sup>	Male	86: 8.66 (6.28)
	Female	126: 7.19 (5.44)
	<b>F(1, 210)</b>	3.301
	<b><math>\eta_p^2</math></b>	0.015
	<b>P value</b>	0.07
Physical Illness <sup>a</sup>	Yes	33: 12.03 (6.15)
	No	179: 7.01 (5.52)
	<b>F(1, 210)</b>	22.88
	<b><math>\eta_p^2</math></b>	<b>0,098</b>
	<b>P-value</b>	<b>0.000</b>
Other Mental Illnesses <sup>a</sup>	Yes	1: 0.00
	No	211: 7.82 (5.81)
	<b>F(1, 210)</b>	1.803
	<b><math>\eta_p^2</math></b>	0.009
	<b>P-value</b>	0.181
Children <sup>a</sup>	Yes	143: 7.24 (5.52)
	No	69: 8.91 (6.30)
	<b>F(1, 210)</b>	3.87
	<b><math>\eta_p^2</math></b>	<b>0.18</b>
	<b>P-value</b>	<b>0.05</b>
Income <sup>a</sup>	0-500€	43: 7.95 (6.02)
	501-999€	76: 7.36 (5.08)
	1000-1500€	58: 6.07 (5.84)
	>1500€	35:11.37 (5.73)
	<b>F(3, 208)</b>	6.76
	<b><math>\eta_p^2</math></b>	0.089
	<b>P-value</b>	0.059
<b>Instruments</b>		
FAST Alcohol <sup>b</sup>	<b>r (195)</b>	0.21
	<b>P-value</b>	0.76
RISK Alcohol <sup>b</sup>	<b>r (5)</b>	0.70
	<b>P-value</b>	0.08

<sup>a</sup> Eta Coefficient test ( $\eta^2$ ); <sup>b</sup> Pearson Correlation;  $\eta_p^2$  : Eta Squared;

## 4. Discussion

This study aims to thoroughly investigate the prevalence of depression in individuals aged 40-60 within the community using primary health care, as well as the coexistence of drinking as a comorbidity. In this study, the relationship between gender and alcoholism and the appearance of depressive symptoms was also investigated. Finally, an attempt was made to interpret the cumulative role of alcoholism and socioeconomic factors in the depression of individuals.

Findings revealed that participants experienced moderate, mild levels of depression during the COVID-19 pandemic period. According to existing study results<sup>[57,58]</sup>, the prevalence of depression is reported to be 45%, which indicates a higher occurrence compared to the period without a pandemic. Populations exhibit

varying degrees of concern with COVID-19, irrespective of their infection status, and many contributing factors influence the extent of this concern<sup>[57,58]</sup>.

Moreover, our study revealed that gender did not correlate with the PHQ-9 total score. There are conflicting findings regarding gender differences. Two studies conducted in Korea and China found similar results to our research<sup>[59,60]</sup>. On the other hand, many studies in various countries (Spain, Germany, Latin America and the Caribbean Countries, Republic of Ireland) have found sex differences in depression during the COVID-19 pandemic<sup>[4,61-64]</sup>. Nevertheless, it is essential to note that in the existing literature before the COVID-19 pandemic, the gender differences in the occurrence of depression are significantly influenced by age<sup>[3,60]</sup>. More specifically, a study that occurred in 2020 showed that being older would decrease the severity of depression<sup>[60]</sup>.

Findings in the present study indicated that marital status, the existence of children, professional status, chronic disease, or history of hospitalization show a statistically significant correlation with depression. Furthermore, other socioeconomic factors play an essential role in depressive symptoms. More specifically, people who live alone without family, have a low income and/or are unemployed, live in rural areas, and suffer from some chronic physical illnesses have been shown to experience depression more often<sup>[8]</sup>. This happens because they lack a strong support network and access to health structures; therefore, they delay the diagnosis and treatment of the disorder, increasing the severity of the disease and frequent relapses<sup>[8]</sup>.

More specifically, during the pandemic period, several studies have indicated a higher prevalence of depression among those who are married compared to those who are single<sup>[58,65-68]</sup>. However, a study revealed a higher vulnerability to depression and anxiety among individuals who are not married<sup>[69]</sup>. Additionally, studies have indicated that divorce or the loss of a spouse through widowhood has been identified as a significant factor in determining the severity of depression and anxiety<sup>[58,70]</sup>. This association may be attributed to heightened feelings of loneliness and a lack of emotional support<sup>[58,70]</sup>.

The literature suggests that depressive symptoms may be positively associated with household size with the presence of school-age children during the COVID-19 pandemic<sup>[71,72]</sup>. The above statement partially follows our study's findings, as our research focused only on a specific population of parents (aged 40-60 years old) and cannot be compared with studies that included younger participants. However, our findings reveal new evidence in this specific population with specific characteristics. In addition, additional household members were identified as a potential source of stress. Extended periods of adhering to a stay-at-home mandate may lead to heightened irritability or decreased tolerance among individuals, diminishing the possible advantages of social support and companionship offered by other people residing in the same family<sup>[72]</sup>.

Regarding professional status, the loss of employment or being unemployed affects depression<sup>[73,74]</sup>. Specifically, the findings of our study are in line with the findings of a survey that indicated that individuals who maintained their employment during the COVID-19 lockdown had notably reduced levels of depression compared to those who were unemployed or lost their jobs<sup>[75]</sup>.

Furthermore, the presence of chronic diseases concurrently has emerged as an additional risk factor contributing to the occurrence of mental health issues during the COVID-19 pandemic<sup>[58,76]</sup>. A study revealed that healthcare workers with comorbid chronic diseases were more susceptible to psychological disorders than those without any comorbidities<sup>[77]</sup>. The heightened challenges in obtaining medical services during the epidemic constitute a significant factor contributing to the rise in depression among individuals with chronic illnesses<sup>[58,78]</sup>.

Regarding alcohol and depression, the literature shows a positive correlation between alcoholism and depression. Findings in other studies indicated that depressive disorders appear to significantly influence the occurrence of alcohol problems at some point in a person's life to cope with psychological distress<sup>[10,79-82]</sup>. More specifically, according to Shield et al., people with mild to moderate depression had greater odds of increased drinking<sup>[81]</sup>. Contrary to the literature findings, most participants in the present study did not report problems with alcohol use, and thus, no statistically significant association with depression was found. On the other hand, one study with younger participants than ours found a decrease in alcohol consumption during and after the post-COVID period and that those with depressive symptoms were more resistant to decreasing their drinking quantity and frequency after the COVID-19 outbreak<sup>[83]</sup>.

Therefore, our findings partially confirmed the current literature. More specifically, a high rate of undiagnosed depression was found during the post-Covid-19 period. A study with individuals who have a chronic disease found the underestimation of depression during COVID-19<sup>[84]</sup> and in another study during the initial year of the COVID-19 pandemic, there was a significant decrease in the follow-up for their new diagnosis of depression within 30 days<sup>[85]</sup>. In contrast, concerning gender, based on the existing data, we expected to detect differences in the occurrence of depression between men and women, a hypothesis which, in our case, did not confirm. Also, the hypothesis of the existence of a correlation between alcoholism and depression was not established despite the international literature, which shows higher rates of alcohol consumption by depressed patients in the present study.

Finally, it is essential to consider the limitations of this study. Firstly, the study's results cannot be generalized, as the sample of participants a) has specific characteristics (40-60 age range), and b) the sample's size was limited as the study was exploratory. Also, the data comes only from the visitors of specific Primary Health Care Centers and regional clinics in Western Greece. Extending the research to more primary healthcare structures in Greece is appropriate. Another limitation of this study is its cross-sectional nature, which limits the inclusion of data from both before and after the data collection period, leading to more comprehensive findings. Also, the study was not able to investigate whether the cause of depression was solely COVID-19 or if there were also personal problems of the participants that deteriorated during the pandemic.

After a literature review, the present study appears to be the first to detect underdiagnosed depression in 40-60-year-old visitors to primary care in Western Greece post-COVID-19. As the literature review mentioned, the existing research in Greece in the post-COVID era is conducted only on primary health workers, younger adults, students, chronically ill patients, and the elderly.

So, the main strength point of this study is that the findings revealed a depression rate of 63.2% in the research participants in a typical short-patient visit, which had not yet been detected in the context of primary health care in Greece. Also, the general practitioners of a Primary Health Center used the study's questionnaire to screen for depression and alcoholism. Moreover, an essential role in depressed patients seems to be played by the family situation, the existence of children, the profession, some previous hospitalization, and a chronic physical disease. As a result of the underdiagnosis of depression, there is also delayed treatment. Therefore, it would be essential to conduct longitudinal studies post-COVID-19 pandemic to investigate further the pandemic's mental imprint and the evolution of patients with depression over time in more age groups.

Furthermore, the need to train primary health care general practitioners in mental health matters is considered crucial. Specifically, the study findings show the need for medical staff to focus on brief psychometric screening tools such as PHQ-9 and FAST to screen depression symptoms immediately and

have the opportunity to offer the appropriate treatment choice for patients with depression, as they are the person's first contact with the health care system. Also, according to our findings, general practitioners should pay more attention to the demographic characteristics of the patients because family situation, the existence of children, the profession, some previous hospitalizations, and chronic physical diseases appear to influence the occurrence of depression. Only in this way could primary health care address the problem of depression underdiagnosis, and this screening should also be delivered in other primary health care units. It is thoroughly recommended to arrange educational programs for primary health workers on mental health issues, community awareness programs about the clinical symptoms of depression, and a mobile mental health unit for regular depression detection in rural areas. In this way, individuals can perceive any depressive symptoms and a reduction in their physical and psychological quality of life. Therefore, they will be able to seek medical help if needed. Finally, the vigilance and information of the individuals will lead to the destigmatization of depression and the provision of valuable instructions for the support of patients in the relevant social context.

## **Author Contributions**

Author Contributions: Conceptualization: A.T. P.P. and E.J.; Methodology: P.P. P.G. and E.J.; Data Collection: A.T. A.K. A.G. and P.P.; Analysis: P.P. A.K. A.T.; Writing—Original Data Preparation: A. T., P.P.; Writing—Review and Editing: A. T, P.P., N.T. P.G., and E.J.; Supervision: P.P., N.T. P.G. and E.J.

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## **Institutional Review Board Statement**

Institutional Review Board Statement: The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Institutional Review Board of the University of Patras (13081/ 9 June).

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## **Informed Consent Statement**

Informed consent was obtained from all subjects involved in the study.

## **Data Availability Statement**

Data will be available after a request in the corresponding author.

## **Conflict of interest**

The author declares no conflict of interest.

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