Risk Management and Healthcare Policy

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ORIGINAL RESEARCH

A Comparative Study of the Impact of the Covid-19 Pandemic on Mental Health, Healthcare Access, and Pain Levels of Patients with Chronic Pain from Spring 2020 to Spring 2021

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Purpose: The short-term impact of the Covid-19 pandemic on patients with chronic pain has been under the microscope since the beginning of the pandemic. This time-lag design study aimed to track changes in pain levels, access to care, mental health, and well-being of Greek chronic pain patients within the first year of the Covid-19 pandemic.

Patients and Methods: 101 and 100 chronic pain patients were contacted during the Spring of 2020 and 2021, respectively. A customized questionnaire was used to evaluate the perceived impact of the pandemic on pain levels and healthcare access. Psychological responses, personality characteristics, and overall well-being were evaluated using the Depression, Anxiety, and Stress Scale (DASS-42), the Ten-Item Personality Index (TIPI) and the Personal Wellbeing Index (PWI).

Results: The perceived effect of the pandemic and the Covid-related restrictions affected significantly access to healthcare, pain levels and quality of life. Differences were detected in the PWI sub-scales regarding Personal Safety, Sense of Community-Connectedness, Future Security, Spirituality-Religiousness, and General Life Satisfaction. Marital status, parenthood, education and place of residence were associated with differences in pain levels, emotional and psychological responses.

Conclusion: Changes in chronic pain levels, emotional responses, and overall well-being took place throughout the year. Also, an evident shift took place in the care delivery system. Both tendencies disclose an ongoing adaptation process of chronic pain patients and healthcare services that needs further monitoring.

Keywords: healthcare access, anxiety, stress, resilience, personality traits, emotional wellbeing

Introduction

Even though the Covid-19 pandemic may not eventuate as the most damaging pandemic in terms of mortality,[1] many challenges arise from the indirect effects on the global economy, societal and healthcare structures, technology, education, environment, culture,[2–7] psychosocial adjustment, gender inequalities,[8,9] mental health and quality of life.[2,10–12] The Covid-19 pandemic fulfils all criteria for a major adverse life event, experienced by a large number of people, that can result in serious cultural, societal, and economical shifts and cause collective trauma.[13,14]

The psychosocial impact of the Covid-19 pandemic is significant, especially in populations with chronic health conditions.[15–18] For over two years, people have been experiencing a disruption in healthcare access,[17–20] social isolation,[12,20–23] changes in daily routine including work, exercise and education,[22–24] changes in family dynamics including gender-based violence[8] and relationship dissatisfaction,[25] increased levels of stress, anxiety, anger and depression,[17,20,22] increased risk for post-traumatic stress disorder (PTSD)[20] and increased pain catastrophizing.[15,26,27] Patients with chronic pain have higher chances to report higher pain levels and poorer quality of life.[19,22,24,25,28–30]

Received: 21 February 2024
Accepted: 13 May 2024
Published: 18 May 2024

The pandemic and the subsequent disruption of all aspects of everyday life have lasted much longer than anyone hoped or anticipated. The Oxford Coronavirus Government Response Tracker Project introduced the Covid-19 Stringency Index (SI) to report and keep track of the strictness of government policies adopted globally.[31] SI has been linked with depression and distress.[11,31–33] Higher government stringency has also been linked with higher trust in the government and a higher sense of protection and security,[11,34] feelings which appear to be negatively associated with anxiety and mental well-being.[35,36] Older populations and people suffering from chronic conditions adjust better to more stringent government responses in terms of health-related quality of life and mental well-being.[11]

From Spring 2020 to Spring 2021, Greece endured three consecutive, strict lockdowns. The healthcare system had to conform to the new regulation requirements to contain the infection spread. The functions, capacity and resources of the Greek healthcare system were heavily challenged.[37,38] Patients suffering from non-Covid related conditions were denied easy access to the healthcare system and were forced to adjust to this new reality.[38–42] This study aimed to evaluate the Covid-19 pandemic sequelae on Greek chronic pain patients' pain experience and symptomatology, access to care, psychosocial and demographic profile across three pandemic waves. We wished to monitor the psychological and behavioral adaptation of patients and the Greek tertiary government healthcare system to the pandemic reality.

Material and Methods

This design was conducted with the approval of the Committee of Bioethics and Deontology in the University Hospital "Attikon" (232/11-05-2020), following the Declaration of Helsinki. We opted for a two-wave time-lagged methodology design because (a) we wished to examine the possible effects of the pandemic not only on perceived pain levels but on the functioning of the Greek National Healthcare System and (b) we wished to control for within-person fluctuations over time. The time lag between the two measurements was 12 months, to allow enough time for mechanisms of change to unveil and to control external variables such as weather and temperature, seasons and holidays, patient and carer availability, and reachability.[43,44]

In total, two hundred and one adult Pain Clinic outpatients followed up within the National Health Care System, suffering from malignant and non-malignant pain for more than 3 months, completed the following self-reported questionnaires: (a) a two-part customized, structured questionnaire designed by the pain management team. The first part of the questionnaire includes a demographic assessment and a Numeric Rating Scale (NRS) from 0 (=no pain at all) to 10 (=worst pain imaginable) to measure pain intensity. The second part consists of 26 questions developed to assess patients' perceptions on the impact of the Covid-19 pandemic and lockdown on pain experience, quality of life and access to treatment. Most items include three response options: (1) a lot, (2) moderately, and (3) not at all (Table 1). [19] (b) Depression, Anxiety and Stress Scale (DASS-42), a 42-item self-reported questionnaire with 4 response options varying from 0 (=did not apply to me at all – Never) to 3 (=applied to me very much, or most of the time – Almost always)[45] (c) Ten Item Personality Index (TIPI), a brief 10-item self-reported questionnaire that measures the Big-Five personality dimensions. Each item starts with the sentence "I see myself as…". Response options vary from 1(=disagree strongly) to 7(=agree strongly)[46] and (e) Personal Wellbeing Index (PWI), an 8-item self-reported questionnaire that evaluates standard of living, health, religiousness, sense of achievement, safety, security, connectedness, and life satisfaction. Each item starts with the sentence "How satisfied are you with…?". Response options vary from 0(=no satisfaction at all) to 10 (=completely satisfied).[47] Exclusion criteria included a co-existing Axis I mental disorder and the inability to understand and communicate in Greek. All patients provided informed consent. Anonymity was maintained.

The first part of the study was conducted during the first wave of the Covid −19 pandemic in Greece, from March to May 2020. During that first austere lockdown, all Pain Clinics around the country were shut down indefinitely and catered only to emergencies. All outpatients that had a cancelled appointment or visited the Pain Clinic as an emergency during that time were contacted via phone or on-site, when possible, and 101 agreed to participate in the study (77.2% response rate). Recruitment ended once the lockdown was over. The second part of the study took place one year later, from March to July 2021. The recruitment in the second stage ended once we reached the same number of participants as in the first cohort. All outpatients having an appointment at the same Pain Clinic since March 2021 were contacted either on-site or via phone, and 100 agreed to participate in the study (70.9% response rate). Data were collected (a) via Google Forms, (b) via phone interviews by one of the Psychologists of the pain management team, and (c) with self-completed questionnaires on-site (Table 2).

Table 1 The Changes in Patients' Responses Concerning the Perceived Effect of the Pandemic and Relevant Restrictive Measures on Access to Healthcare, Pain and Quality of Life for Years 2020 and 2021

	2020	2021	P-value*
	N (%)	N (%)	
Did your pain exist before the Covid-19 pandemic?			
Yes	93 (92.1)	81 (81.0)	0.399
No	8 (7.9)	18 (18.0)	0.047**
To what extent did the Covid-19 pandemic affect your pain levels?			
A lot	12 (11.9)	25 (25.0)	0.030**
Moderately	22 (21.8)	28 (28.0)	0.377
Not at all	67 (66.3)	47 (47.0)	0.069
To what extent did the restrictive measures (lockdown) affect your pain levels?			
A lot	16 (15.8)	27 (27.0)	0.087
Moderately	25 (24.8)	28 (28.0)	0.654
Not at all	60 (59.4)	45 (45.0)	0.158
How did the pandemic affect your treatment in general?			
Negatively	41 (40.6)	47 (47.0)	0.493
Not at all	53 (52.5)	47 (47.0)	0.582
Positively	7 (6.9)	6 (6.0)	0.795
Has the number of visits to the Pain Clinic increased or decreased? (either regular visits or phone contact)			
Decreased	61 (60.4)	36 (36.0)	0.013**
Increased	3 (3.0)	11 (11.0)	0.031**
Remained the same	37 (36.6)	53 (53.0)	0.083
If the number of visits has increased or decreased during the pandemic, how much did the pandemic affected this change of frequency?			
A lot	36 (35.6)	30 (30.0)	0.485
Moderately	19 (18.8)	22 (22.0)	0.617
Not at all	46 (45.5)	48 (48.0)	0.799
If the number of phone calls you made to the doctors of the Pain Clinic increased or decreased, how much did the pandemic affect this change of frequency?			
A lot	14 (13.9)	22 (22.0)	0.173
Moderately	17 (16.8)	21 (21.0)	0.497
Not at all	70 (69.3)	57 (57.0)	0.272
How many times per year did you visit the Pain Clinic, prior to the pandemic?			
>3	29 (28.7)	21 (21.0)	0.273
2–3	46 (45.5)	25 (25.0)	0.014**

(*Continued*)

Table 1 (Continued).

	2020	2021	P-value*
	N (%)	N (%)	
1	20 (19.8)	18 (18.0)	0.769
0	6 (5.9)	36 (36.0)	<0.001**
Have you reduced your visits to other health care services during the pandemic?			
A lot	52 (51.5)	35 (35.0)	0.076
Moderately	21 (20.8)	32 (32.0)	0.122
Not at all	28 (27.7)	33 (33.0)	0.497
Has your access to pain medication reduced during the pandemic?			
A lot	4 (4.0)	5 (5.0)	0.728
Moderately	12 (11.9)	12 (12.0)	0.981
Not at all	85 (84.2)	83 (83.0)	0.928
Have you used the application of remote prescribing?			
Yes	18 (17.8)	59 (59.0)	<0.001**
No	49 (48.5)	25 (25.0)	0.006**
I do not know what that is	34 (33.7)	16 (16.0)	0.012**
Did you have to increase your intake of analgesics, or switch to different medication, because your pain was not subsiding with your current treatment?			
Yes	33 (32.7)	46 (46.0)	0.132
No	68 (67.3)	54 (54.0)	0.225
Did you have any new pain symptoms during the pandemic?			
Yes	24 (23.8)	44 (44.0)	0.014**
No	77 (76.2)	56 (56.0)	0.078
To what extent did the pandemic affect your quality of life?			
A lot	36 (35.6)	46 (46.0)	0.250
Moderately	39 (38.6)	44 (44.0)	0.552
Not at all	26 (25.7)	10 (10.0)	0.008**
To what extent did the restrictive measures (lockdown) affect your quality of life?			
A lot	38 (37.6)	54 (54.0)	0.086
Moderately	43 (42.6)	34 (34.0)	0.326
Not at all	20 (19.8)	12 (12.0)	0.166
Do you think that the intensity and duration of your pain would have been different, if the pandemic had not occurred?			
They would be better	24 (23.8)	41 (41.0)	0.032**
They would be the same	71 (70.3)	58 (58.0)	0.277

(*Continued*)

Table 1 (Continued).

	2020	2021	P-value*
	N (%)	N (%)	
They would be worse	6 (5.9)	1 (1.0)	0.061
Do you think that the intensity and duration of your pain would have been different, if the lockdown had not been implemented?			
They would be better	26 (25.7)	42 (42.0)	0.048**
They would be the same	67 (66.3)	57 (57.0)	0.399
They would be worse	8 (7.9)	1 (1.0)	0.020**
Since the Covid-19 pandemic, my trust in the government mechanisms…			
…has ameliorated	41 (40.6)	16 (16.0)	<0.001**
…has remained the same	46 (45.5)	44 (44.0)	0.870
…has deteriorated	14 (13.9)	40 (40.0)	<0.001**

Notes: *Asymptotic normal z-test, **statistical significance at p-value<0.05.

Table 2 Comparison of Patients' Demographic Characteristics and Data Collection Methodology Between 2020 and 2021

	2020 N=101			2021 N=100			P-value*
	Mean (SD)	Min	Max	Mean (SD)	Min	Max	
Age	58.59 (16.16)	17.00	88.00	54.28 (17.04)	18.00	88.00	0.067
Number of children	1.50 (1.01)	0.00	4.00	1.31 (1.11)	0.00	5.00	0.206
Number of people staying at home	2.36 (1.41)	0.00	11.00	2.29 (1.09)	0.00	6.00	0.694
NRS (pain intensity)	4.59 (3.29)	0.00	10.00	4.78 (2.89)	0.00	10.00	0.668
	N(%)			N(%)			
Data Collection							
Phone interview	48 (47.5)			41 (41.0)			0.265
Google Forms	38 (37.6)			27 (27.0)			0.018**
Self-completed questionnaires	15 (14.9)			32 (32.0)			<0.001**
Response Rate	77.2%			70.9%			0.604
Sex							
Male	17 (16.8)			19 (19.0)			0.429
Female	84 (83.2)			81 (81.0)			0.796
Residence							
Urban	87 (86.1)			80 (80.0)			0.551
Semi-urban	10 (9.9)			12 (12.0)			0.199
Rural	4 (4.0)			8 (8.0)			<0.001**

(*Continued*)

Table 2 (Continued).

	2020 N=101			2021 N=100			P-value*
	Mean (SD)	Min	Max	Mean (SD)	Min	Max	
Education level							
Elementary	29 (28.7)			25 (25.0)			0.431
Secondary	40 (39.6)			38 (38.0)			0.715
Tertiary	32 (31.6)			37 (37.0)			0.304
Marital Status							
Single	9 (8.9)			24 (24.0)			<0.001**
In a relationship	9 (8.9)			7 (7.0)			0.080
Married	58 (57.4)			42 (42.0)			0.025**
Divorced	6 (5.9)			13 (13.0)			<0.001**
Widowed	19 (18.8)			14 (14.0)			0.034**

Notes: **T*-test, ***statistical significance at p-value<0.05.

Differences between both groups (2020 and 2021) were tested by the *t*-test. Changes in the percentages of patients' responses in the years 2020 and 2021 were assessed using the asymptotic z-test. Mann–Whitney test was used to identify possible changes in the questionnaires' scores. The Kruskal–Wallis test was applied when scores were compared among three or more groups. Significant associations were followed by post hoc tests with Bonferroni correction. A difference was marked as statistically significant or not at a 0.05 level. Stata v14 was used for the statistical analysis (StataCorp. 2015. Stata Statistical Software: Release 14. College Station, TX: StataCorp LP.)

Results

The demographic characteristics of the participants of the study are depicted in Table 2. Changes in the percentages of patients' responses between the two cohorts is depicted in Table 1. Statistically significant changes were observed in the patients' perceived effect of the pandemic and relevant restrictive measures on access to healthcare, perceived levels of pain, and quality of life between 2020 and 2021. There was a decrease in the participants' mean age from 58.59 (16.16) to 54.28 (17.04), however, it was not statistically significant. Regarding the patients' demographic profile, there were significant differences in marital status between the two cohorts (Table 2). Significant differences were also observed in data collection methodology (Table 2).

Pain Experience and New Pain Symptoms

In the total sample of 201 participants, 43.3% reported that their pain levels were affected by the pandemic "moderately" or "a lot" while 47.8% stated that their pain levels were affected by the lockdown "moderately" or "a lot". In the question "To what extent did the pandemic affect your pain levels?" the percentage that responded "very much" increased from 11.9% in 2020 to 25% in 2021 (p-value=0.030), while the percentage that responded "not at all" decreased from 66.3% to 47% (p-value=0.069) (Table 1).

Regarding pain intensity, there were no significant differences in the patients' NRS scores between 2020 and 2021. On the self-reported question "Do you think that the intensity and duration of your pain would have been different, if the pandemic hadn't occurred?" the percentage of the participants who believed that they would have been better compared to their current experience of pain increased from 23.8% in 2020 to 41% in 2021 (p-value= 0.032). Similarly, the percentage of participants who responded that they would have been better if the lockdown had not been implemented

increased from 25.7% in 2020 to 42% in 2021 (p-value= 0.048) and those who responded that they would have been worse were reduced from 7.9% to 1% (p-value=0.020). (Table 1).

Regarding the occurrence of new pain symptoms, 23.8% of the participants reported developing new pain symptoms during the pandemic in 2020 and the percentage increased to 44% in 2021 (p-value= 0.014). In the question "Did the pain you are currently seeking treatment for, exist before the pandemic?" the percentage that responded negatively increased from 7.9% to 18% within one year (p-value= 0.047).

Correlations of demographic characteristics and pain intensity revealed that NRS score was associated with having children (p=0.022) and with education level (p=0.025) in the first cohort, at the beginning of the pandemic. Specifically, the NRS score was significantly higher in the participants with elementary-level education compared to those with tertiary education (5.86 vs 3.50, p= 0.010). No associations were detected in 2021.

Access to Healthcare

When asked whether the number of walk-in visits or phone calls to the Pain Clinic was affected, the percentage of participants who reported a decrease was reduced from 60.4% in 2020 to 36% in 2021 (p-value= 0.013). Similarly, there was a reduction from 45.5% to 25% (p-value<0.001) in the percentage of the participants who responded "two–three times" to the question "How many times did you visit the Pain Clinic during the previous year" (p-value=0.014), while the participants who responded 'none' increased from 5.9% to 36% (p-value< 0.001). Regarding the participants' visits to other healthcare services, 69.7% reported that they reduced their visits to other healthcare services 'moderately' or 'a lot'. When asked whether they have used the application of remote prescribing, 59% of the participants responded affirmatively in 2021, compared to 17.8% in 2020 (p-value< 0.001) (Table 1).

Quality of Life, Stress, Depression, Anxiety, and Association with Demographic Characteristics

In the question "To what extent did the pandemic affect your quality of life?", there was a slight increase in the percentages of those who responded "a lot" and "moderately", while the number of participants who responded "not at all" decreased significantly from 25.7% in 2020 to 10% in 2021 (p-value= 0.008). In the question "Since the Covid-19 pandemic, my trust in the government mechanisms…", the number of participants who responded *…has ameliorated" decreased from 40.6% to 16% (p-value<0.001) while the number of participants who responded that it "…has deteriorated" increased from 13.9% to 40% within one year (p-value<0.001) (Table 1).

Significant differences were detected in the PWI Scale (p-value= 0.008). More specifically, the mean of personal safety decreased from 6.22 (2.43) in 2020 to 5.03 (2.92) in 2021 (p-value= 0.003). Sense of community-connectedness decreased from 6.93 (2.20) to 6.41 (2.01) (p-value=0.039). Regarding the level of future security, there was a significant decrease in the score from 5.23 (2.41) in 2020 to 4.12 (2.56) in 2021 (p-value= 0.003). Spirituality-religiousness also decreased from 7.67 (1.91) in 2020 to 6.87 (2.39) in 2021 (p-value= 0.020). Lastly, the general life satisfaction level decreased from 6.32 (2.39) to 5.39 (2.62) (p-value=0.006) (Table 3).

No significant differences were detected in personality items, levels of stress, anxiety, and depression. However, higher levels of anxiety (p=0.001) and depression (p=0.040), and lower overall scores in PWI (p=0.015) were found to be associated with increased analgesic intake or self-reported ineffectiveness of current treatment during 2021 (Table 4).

During 2020, marital status was found to be associated with the TIPI subscale "conscientiousness" (p=0.017) and personal well-being (p=0.007). No associations were detected in 2021 (Table 5). Having children was associated with higher levels of stress (p=0.022) in 2021, but not in 2020. Place of residence was associated with higher anxiety scores (p=0.048) in the 2021 sample (Table 6). Education level was associated with high levels of openness to experience (p<0.001), anxiety (p=0.012) and depression (p=0.025) in 2020, and with openness to experience (p<0.001), extraversion (p=0.004) and agreeableness (p=0.011) in 2021 (Table 7).

Table 3 Mean and Standard Deviation (SD) for TIPI, DASS-42, LOT-R and PWI Questionnaires for the First (2020) and the Second Year (2021) of the Pandemic

	2020	2021	P-value*
	Mean (SD)	Mean (SD)	
Pain Intensity (NRS)	4.59 (3.29)	4.78 (2.89)	0.687
Ten Item Personality Inventory (TIPI)			
Extraversion	3.87 (1.26)	3.61 (1.64)	0.202
Agreeableness	5.51 (1.13)	5.68 (1.14)	0.197
Conscientiousness	5.49 (1.32)	5.57 (1.39)	0.543
Emotional Stability	4.12 (1.33)	3.77 (1.36)	0.061
Openness to experience	4.33 (1.52)	4.63 (1.73)	0.153
Depression Anxiety Stress Scale 42 (DASS-42)			
Stress	17.82 (12.15)	19.22 (11.44)	0.373
Anxiety	10.83 (9.01)	11.98 (9.06)	0.303
Depression	13.45 (11.63)	13.72 (12.68)	0.954
Personal Wellbeing Inventory (PWI)	57.16 (15.55)	50.72 (16.71)	0.008**
Standard of Living	6.27 (2.41)	5.88 (2.46)	0.225
Personal Health	4.88 (2.67)	4.50 (2.68)	0.342
Achieving in Life	6.67 (2.27)	6.12 (2.65)	0.186
Personal Relationships	6.97 (2.44)	6.40 (2.60)	0.088
Personal Safety	6.22 (2.43)	5.03 (2.92)	0.003**
Community-Connectedness	6.93 (2.20)	6.41 (2.01)	0.039**
Future Security	5.23 (2.41)	4.12 (2.56)	0.003**
Spirituality/Religion	7.67 (1.91)	6.87 (2.39)	0.020**
General Life Satisfaction	6.32 (2.39)	5.39 (2.62)	0.006**

Notes: *Mann–Whitney Test, **statistical significance at p-value<0.05.

Discussion

The aim of this study was to examine the impact of the pandemic on pain and pain management and the interaction among psychological, demographic and pain-related variables across time in chronic pain patients. The perceived effect of the pandemic and the Covid-related restrictions affected significantly access to healthcare, pain levels, quality of life, life satisfaction, sense of security, and spirituality. The care delivery system was also severely affected.

Younger patients are experiencing more pain symptoms, thus reaching the pain clinic services more often than before. Also, patients in the older age groups may have been slipping outside the healthcare system.

The Covid-19 pandemic and the subsequent lockdowns are linked to somatization including the development of new pains, chronicity of pain symptoms and fatigue, by exacerbating risk factors such as sleep disturbances, lack of employment and physical activity, anxiety, depression, low quality of life, fear, and sense of threat.[48–51] Fear of infection, appointment delays and postponements, difficulty reaching healthcare services, social isolation, and poor socioeconomic and health status are a few of the variables that are linked with unmet healthcare needs among older adults during the pandemic.[52–56]

Table 4 Association Between Analgesic Intake and Psychological Evaluation Scores (TIPI, DASS-42 and PWI) During the Second Wave of the Pandemic (2021) via the Kruskal–Wallis Test (N=100)

	Did you have to increase your intake of analgesics, or switch to different medication, because your pain was not subsiding with your current treatment?		
	Yes	**No**	**p-value**
	Mean (SD)	**Mean (SD)**	
Ten Item Personality Index (TIPI)			
Extraversion	3.51 (1.49)	3.69 (1.77)	0.757
Agreeableness	5.73 (1.07)	5.65 (1.20)	0.944
Conscientiousness	5.58 (1.36)	5.56 (1.43)	0.966
Emotional Stability	3.68 (1.39)	3.84 (1.34)	0.464
Openness to experience	4.75 (1.56)	4.52 (1.86)	0.679
Depression Anxiety Stress Scale-42 (DASS-42)			
Stress	21.22 (11.65)	17.52 (11.09)	0.106
Anxiety	15.30 (10.38)	9.15 (6.63)	0.001*
Depression	17.30 (14.31)	10.67 (10.29)	0.040*
Personal Wellbeing Index (PWI)	45.26 (17.90)	55.37 (14.19)	0.015*

Note: *Statistical significance at p-value<0.05.

Table 5 Association Between Marital Status and Psychological Evaluation Scores (TIPI, DASS-42 and PWI) During the First and Second Wave of the Pandemic (2020 and 2021 Respectively) via the Kruskal–Wallis Test with Post Hoc Pairwise Comparisons

	Single (1)	**In a relationship (2)**	**Married (3)**	**Divorced (4)**	**Widowed (5)**	**p-value**	**Statistically significant pairwise comparisons p-value**
	Mean (SD)	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**		
2020 (N=101)							
Ten Item Personality Index (TIPI)							
Extraversion	3.78 (1.18)	4.11 (1.27)	3.79 (1.38)	3.58 (0.80)	4.13 (1.04)	0.686	
Agreeableness	4.83 (1.15)	5.44 (1.13)	5.68 (1.13)	5.67 (1.03)	5.29 (1.10)	0.259	
Conscientiousness	4.67 (0.79)	6.44 (0.58)	5.43 (1.37)	4.83 (1.72)	5.82 (1.18)	0.017*	1vs2: p=0.010
Emotional Stability	4.28 (1.52)	4.00 (1.64)	4.24 (1.24)	4.00 (1.95)	3.76 (1.23)	0.871	
Openness to experience	4.44 (1.57)	5.06 (1.63)	4.16 (1.56)	4.42 (1.16)	4.42 (1.46)	0.623	
Depression Anxiety Stress Scale-42 (DASS-42)							
Stress	16.89 (11.96)	15.78 (9.51)	17.66 (12.68)	24.67 (15.11)	17.58 (11.17)	0.816	
Anxiety	8.22 (4.63)	5.33 (3.87)	10.97 (9.53)	16.33 (13.94)	12.53 (7.83)	0.147	
Depression	16.67 (13.08)	6.89 (5.67)	12.86 (11.31)	23.67 (15.97)	13.58 (11.09)	0.213	
Personal Wellbeing Index (PWI)	52.44 (15.18)	66.89 (8.25)	57.69 (15.00)	37.83 (9.93)	59.26 (16.80)	0.007*	2vs4: p=0.002 3vs4: p=0.018 5vs4: p=0.026

(*Continued*)

Table 5 (Continued).

	Single (1)	In a relationship (2)	Married (3)	Divorced (4)	Widowed (5)	p-value	Statistically significant pairwise comparisons p-value
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)		
2021 (N=100)							
Ten Item Personality Index (TIPI)							
Extraversion	3.50 (1.45)	3.71 (1.38)	3.85 (1.71)	3.69 (1.64)	2.96 (1.90)	0.455	
Agreeableness	5.75 (1.22)	5.79 (0.91)	5.75 (1.14)	5.54 (0.99)	5.46 (1.31)	0.875	
Conscientiousness	5.38 (1.53)	5.64 (1.46)	5.80 (1.25)	5.65 (1.30)	5.07 (1.62)	0.532	
Emotional Stability	3.71 (1.44)	3.71 (1.19)	4.07 (1.27)	3.54 (1.46)	3.21 (1.40)	0.239	
Openness to experience	4.77 (1.74)	5.57 (1.06)	4.43 (1.74)	5.23 (1.42)	3.93 (1.95)	0.168	
Depression Anxiety Stress Scale-42 (DASS-42)							
Stress	19.75 (9.89)	29.71 (12.62)	15.90 (10.48)	21.23 (11.96)	21.14 (13.00)	0.053	
Anxiety	9.75 (5.60)	15.43 (7.00)	10.57 (9.74)	15.23 (11.68)	15.29 (8.79)	0.112	
Depression	14.50 (12.76)	12.29 (11.86)	10.57 (11.52)	17.23 (12.50)	19.29 (15.10)	0.146	
Personal Wellbeing Index (PWI)	49.17 (15.10)	47.71 (19.02)	55.31 (16.15)	46.38 (18.91)	45.14 (16.53)	0.187	

Note: *Statistical significance at p-value<0.05.

Table 6 Association Between Place of Residence and Psychological Evaluation Scores (TIPI, DASS-42 and PWI) During the First and Second Wave of the Pandemic (2020 and 2021 Respectively) via the Kruskal–Wallis Test with Post Hoc Pairwise Comparisons

	2020 (N=101)				
	Urban (1)	Semi urban (2)	Rural (3)	p-value	Statistically significant pairwise comparisons p-value
	Mean (SD)	Mean (SD)	Mean (SD)		
Ten Item Personality Index (TIPI)					
Extraversion	3.81 (1.27)	4.25 (1.18)	4.25 (1.19)	0.493	
Agreeableness	5.57 (1.11)	5.30 (1.34)	4.63 (0.63)	0.236	
Conscientiousness	5.45 (1.37)	5.55 (1.04)	6.25 (0.50)	0.487	
Emotional Stability	4.14 (1.36)	4.20 (1.14)	3.38 (1.31)	0.662	
Openness to experience	4.33 (1.47)	4.25 (2.06)	4.50 (1.68)	0.989	
Depression Anxiety Stress Scale-42 (DASS-42)					
Stress	17.33 (11.97)	18.80 (15.12)	26.00 (5.16)	0.279	
Anxiety	10.97 (9.15)	7.40 (7.66)	16.50 (6.61)	0.107	
Depression	13.49 (11.88)	10.60 (10.67)	19.50 (6.61)	0.329	

(*Continued*)

Table 6 (Continued).

	2020 (N=101)				
	Urban (1)	**Semi urban (2)**	**Rural (3)**	**p-value**	**Statistically significant pairwise comparisons p-value**
	Mean (SD)	**Mean (SD)**	**Mean (SD)**		
Personal Wellbeing Index (PWI)	56.77 (15.26)	59.60 (19.75)	59.50 (13.43)	0.456	
	2021 (N=100)				
Ten Item Personality Index (TIPI)					
Extraversion	3.59 (1.67)	3.46 (1.50)	4.06 (1.68)	0.779	
Agreeableness	5.73 (1.08)	5.42 (1.38)	5.63 (1.38)	0.819	
Conscientiousness	5.53 (1.41)	5.58 (1.52)	5.88 (1.06)	0.858	
Emotional Stability	3.74 (1.41)	3.92 (1.35)	3.81 (0.88)	0.714	
Openness to experience	4.73 (1.72)	4.00 (2.02)	4.50 (1.31)	0.433	
Depression Anxiety Stress Scale-42 (DASS-42)					
Stress	19.07 (11.57)	16.00 (9.46)	25.50 (11.70)	0.208	
Anxiety	11.95 (8.86)	8.33 (8.30)	17.75 (10.28)	0.048*	2vs3: p=0.021
Depression	13.68 (12.17)	9.17 (12.78)	21.00 (15.75)	0.094	
Personal Wellbeing Index (PWI)	50.35 (16.40)	55.42 (18.00)	47.38 (18.79)	0.523	

Note: *Statistical significance at p-level<0.05.

Furthermore, many patients that have been tested positive with Covid-19 experience post-viral musculoskeletal and neurological pain symptoms.[57–59]

Since all healthcare services resumed their functions in May 2020, it is not surprising that access to healthcare and pain clinic services increased from 2020 to 2021. It is noteworthy that recruitment in the second stage lasted two months longer. According to the outpatient logs, before the Pandemic the Pain Clinic would cater to 15(±5) patients per day. In the first cohort that had scheduled their appointments before the pandemic, nearly half of the outpatients would visit the Clinic 2–3 times per year for follow-up monitoring every 4–6 months. Almost one-third would visit more often, and only 5.9% of our sample consisted of new patients in 2020. Once the Pain Clinic re-opened after the first wave of the Pandemic, due to COVID-19 restrictions it catered to maximum 6 patients per day. Even though the frequency of interventional care remained the same, the frequency of follow-up visits decreased significantly. Our results echo what has been identified as the organizational impact of Covid-19, and it has been identified globally.[60–62] One additional care-provision change was the wider adoption of the remote prescribing application (Table 1). Patients did not have to visit the Clinic for a prescription renewal. Although helpful, this is not always ideal.[63] Many new symptoms or disease relapses may remain undetected and untreated.

The participants that attributed a worsening of their symptoms to the pandemic almost doubled. Higher self-reported pain levels after the pandemic outbreak seem to be a systematic finding across the pain literature. Higher self-perceived pain was linked with social isolation and movement restrictions.[16,18,22,27,29] The NRS scores of the participants remained the same over time, a result which seems to agree with the hypothesis that chronic pain is a stable disorder, even though patients' subjective experience of pain is significantly affected by external psycho-social stressors.[29,64,65]

Regarding the psychological impact of the pandemic, our results indicate stability on almost all psychopathological indices. Personality traits are considered to display relative stability in adulthood. However, there is ongoing research

Table 7 Association Between Education Level and Psychological Evaluation Scores (TIPI, DASS-42 and PWI) During the First and Second Wave of the Pandemic (2020 and 2021 Respectively) via the Kruskal–Wallis Test with Post Hoc Pairwise Comparisons

	2020 (N=101)				
	Elementary school (1)	**Highschool (2)**	**Graduate/ Post-graduate (3)**	**p-value**	**Statistically significant pairwise comparisons p-value**
	Mean (SD)	**Mean (SD)**	**Mean (SD)**		
Ten Item Personality Index (TIPI)					
Extraversion	3.41 (1.14)	4.10 (1.17)	4.00 (1.39)	0.054	
Agreeableness	5.22 (1.07)	5.81 (1.14)	5.39 (1.12)	0.091	
Conscientiousness	5.07 (1.25)	5.72 (1.31)	5.58 (1.34)	0.061	
Emotional Stability	3.90 (1.33)	4.10 (1.42)	4.34 (1.23)	0.371	
Openness to experience	3.50 (1.32)	4.50 (1.49)	4.88 (1.45)	0.001*	1vs2:p=0.009 1vs3: p=0.001
Depression Anxiety Stress Scale-42 (DASS-42)					
Stress	20.21 (10.64)	18.20 (13.40)	15.19 (11.63)	0.238	
Anxiety	14.00 (9.56)	11.15 (9.24)	7.56 (7.16)	0.012*	1vs3: p=0.005
Depression	18.48 (12.60)	12.65 (11.32)	9.88 (9.70)	0.025*	1vs3: p=0.011
Personal Wellbeing Index (PWI)	51.97 (18.19)	58.80 (15.56)	59.81 (11.86)	0.186	
	2021 (N=100)				
Ten Item Personality Index (TIPI)					
Extraversion	2.78 (1.59)	3.67 (1.54)	4.11 (1.59)	0.004*	1vs2:p=0.041 1vs3: p=0.002
Agreeableness	5.48 (1.15)	6.13 (1.00)	5.36 (1.15)	0.011*	2vs3: p=0.007
Conscientiousness	5.56 (1.34)	5.82 (1.42)	5.31 (1.39)	0.124	
Emotional Stability	3.60 (1.57)	3.95 (1.28)	3.70 (1.29)	0.450	
Openness to experience	3.34 (1.65)	4.79 (1.68)	5.32 (1.34)	<0.001*	1vs2:p=0.003 1vs3: p<0.001
Depression Anxiety Stress Scale-42 (DASS-42)					
Stress	20.16 (11.73)	18.00 (11.02)	19.84 (11.87)	0.733	
Anxiety	13.20 (10.38)	12.79 (9.50)	10.32 (7.52)	0.529	
Depression	18.48 (14.05)	13.37 (13.05)	10.86 (10.54)	0.136	
Personal Wellbeing Index (PWI)	43.80 (19.96)	52.39 (16.61)	53.68 (13.16)	0.062	

Note: *Statistical significance at p-level<0.05.

assessing the impact of critical life events on personality traits and how they evolve over time.[66–69] We believe that the observed slight changes in personality traits reflect a collective attempt to cope and adapt (decreased extraversion, increased conscientiousness), and a collective accumulation of grievances and fatigue (decreased emotional stability and optimism, increased openness to experience).

Chronic pain patients scored within the "mild" spectrum in all three domains of the DASS-42 scale in 2020. Stress and anxiety increased in 2021, and anxiety increased from "mild" to "moderate". However, depression decreased. The literature regarding stress, depression, and anxiety during the Covid pandemic is vast and disparate depending on sampling methods, targeted population, and the scope of each study. Higher stress levels are associated with pre-existing medical conditions, changes to healthcare access or fear of disruption of medical treatment, higher perceived levels of pain, and with the way public health measures are employed, communicated, and implemented.[70–73] These stressors, all present in our sample, explain the consistently high stress levels. Anxiety during the Covid era, on the other hand, is becoming an umbrella term to include, among others, fear, health anxiety, and death anxiety. Older age, female gender, pre-existing chronic conditions, isolation, higher frequency and stringency of protective measures and demographic characteristics such as higher education, being married, and having children are predictors of high anxiety.[74–78]

Stress resilience, a psychological coping process that is taking place across populations during the pandemic waves, could explain why stress remained consistent.[77] The lower depression levels of our sample could also be attributed to this ongoing coping process, as indicated by other studies that have used DASS-42 in patients with pre-existing conditions during the pandemic.[78] Kleinmann and colleagues[24] introduced the concept of protective stabilizing factors such as confidence in and satisfaction with the healthcare system. Stable or lower levels of depression and anxiety are also linked with positive coping strategies, personal control, and resilience.[26,77–80]

We observed a notable decline in overall well-being, especially in the indices concerning personal safety, future security, sense of connectedness, spirituality/religiousness, and overall satisfaction with life. There was also a significant shift in the participants' marital status. The prolonged lockdown seems to have taken a toll on how frail populations connect and interact with each other.[81,82] The pandemic and the forced co-existence has also taken a toll on relationships and marriage.[8,9,25] Patients' spiritual health has also declined. Spiritual health and care can be a source of comfort and strength.[83,84] Positive religious coping is associated with better mental health outcomes.[85] Higher religious and spiritual struggle during the pandemic was associated with higher psychological distress and worse self-reported pain perception.[86]

Perceived personal safety has been severely affected by the pandemic, especially in people suffering from chronic conditions. Sense of safety and stability during the pandemic is associated with maintaining continuity of care.[19,87] The fact that personal safety declined even though the healthcare system had been fully functioning since May 2020, combined with the significant decrease in the score distribution of future security, leads us to believe that this is an ongoing, inner process that is still happening. The impact of the pandemic on patients' personal safety and future security is dynamic and remains to be seen, as the effects of the pandemic are already spreading across the socioeconomic and political life of a country that emerged recently from a severe economic crisis.[19,39,41,88–90]

Conclusion

This is one of the few studies that evaluate the impact of the pandemic and the interaction of psychological, demographic, and pain-related variables across time. Its main limitations include the small number of participants, possible cohort effects, self-reported data, the fact that the sample comes from only one setting and the fact that only two cohorts were studied. Also, we only focused on self-reported levels and duration of pain and not on the type and etiology of pain, which could have provided more solid data regarding the observed increase of new pain patients.

Our results reveal a dramatic distrust of the participants in the governmental policies and the growing belief that participants would be experiencing less pain if the lockdown had not been implemented. Chronic pain patients seem to experience several conflicting inner processes, including relief, fear and uncertainty, resilience mechanisms and trust in the accessibility of healthcare, along with a growing fear for personal and future safety. At the same time, the organizational and structural shifts of the Greek National healthcare system are showing. Functioning, resources, sustainability, and accessibility have been disproportionate since the Covid-19 pandemic, a phenomenon that is expected to have an immense impact on patients in the future.[89,91] More research is required, to evaluate and update organizational functions and policies. As patients are adapting, so is the healthcare delivery system and the societal and psychological impact of this shift remains to be seen.

Disclosure

The authors report no conflicts of interest in this work.

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