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Chronic Medical Disorders during COVID-19: Differences in Morbidities, Work, Habits and Attitudes

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ABSTRACT

***Background**: Chronic medical disorders (CMD) are highly prevalent and are often associated with multiple mental and physical comorbidities, which amplify health risks and pose significant challenges for long-term treatment, contributing to their substantial burden on individuals and healthcare systems. During the pandemic CMD were particularly affected. Portugal besides having a higher prevalence of CMD is among the countries which used more strict protective pandemic measures with subsequent negative impacts.*

***Objectives:** The paper aims to identify different dysfunctional patterns in 14 CMD: diabetes, hypertension, cardiovascular (CVD), fibromyalgia, rheumatologic, respiratory, allergic, autoimmune, gastrointestinal and dermatologic disorders, chronic pain, fatigue, tinnitus and dizziness.*

***Methods:** Online surveys were used for data collection gathering 5479 individuals, mean age 48.5 years, ranging from 18 to 90 years, 67.7% were females. Demographics, work before COVID, health status, confinement, attitudes and behaviors, mental health, sleep, physical activity, multimedia use, nutrition, toxics and additions. ANOVA and linear discriminant analysis (LDA) were used for data analysis and significance was set at $p<0.05$.*

***Results:** The most important features to differentiate CMD were comorbidities, work stress before COVID, Sleep, Mental Health and Attitudes. The disorders with higher canonical correlations with the discriminant function in LDA were: Chronic Pain, Fibromyalgia, Autoimmune, CVD, Fatigue, Diabetes, Dermatologic, Dizziness. Correct classification of the original group varied between 79.2 and 92.0%. Correct classification for "Not having" a specific CMD varied between 79.7 and 92.5%. Correct classification for "Having" a specific CMD provided lower values and varied between 60.0 and 82.4%.*

***Conclusions:** The CMD studied exhibited distinct characteristics both among themselves and compared to individuals without the disease. LDA achieved high accuracy in classifying each CMD. These findings provide valuable insights for guiding strategies to manage CMD's during future public heath disasters.*

Keywords
Chronic medical disorders, Comorbidities, COVID19, Sleep, Work Stress.

Abbreviations
AID: Auto Immune Disorders, BMI: Body Mass Index, CMD: Chronic Medical Disorders, CVD: Cardiovascular disorders, EU: European Union, GDP: Gross Domestic Product, GID: Gastro-Intestinal Disorders, LDA: Linear Discriminant Analysis, WHO: World Health Organization.

Introduction
COVID was a societal and a health care marker. Despite the main symptoms being similar to a common flue (dry cough, shortness of breath, headaches, muscle aches, fever or chills) other symptoms pointed to upper airway and digestive tract involvement (loss of taste or smell, fatigue, upset stomach, vomiting, diarrhea) and threatening complications occurred, such as severe pneumonia and death.

A death rate around 1% was devastating and urged efficient measures worldwide [1]. Death and serious complications varied among countries and regions [2], but globally they increased with age, affecting particularly the elderly. Multiple morbidities were associated with severe COVID-19 illness; obesity, diabetes with complications, and anxiety and fear-related disorders had the strongest association with death [3,4].

Long-term consequences and immunologic dysfunction were further serious consequences which health care services are still handling. In Scotland older age, higher BMI, severe COVID-19 infection, female sex, social deprivation and comorbidities were predictors of long COVID, while vaccination against COVID-19 and testing positive, while Delta or Omicron variants were dominant, predicted reduced risk [5]. In a Chinese study significant predictors of long-term fatigue were length of hospitalization, non-use of antiviral drug, immune-related serum markers of IL-6 and $CD16+CD56^{+}$ NK cell levels, neurologic diseases and a lack of vaccination [6]. However, the variability of symptoms included in long COVID is quite high together with the presence of preexisting morbidities [7].

In Portugal the predictors of long COVID after discharge from a specialized centre were fatigue and persistent cough at 3 months and pain and cognitive disturbances at 6 months; symptoms had significant negative impact upon quality of life. Concerning long COVID risk factors this study provided somewhat different results since neither age, nor gender, nor previous morbidities were significant risks [8]. Symptoms cluster analysis of long COVID Portuguese patients was performed, and four clusters were found: Cluster 1 had older patients, 90% females and minor symptoms; Cluster 2 had a high female percentage and joint pain, myalgia, fatigue, insomnia, headache and palpitations; Cluster 3 symptoms had the highest prevalence of pre-existing health conditions, fatigue affected 100%, headache 86% of the patients, joint pain and tobacco consumption were frequent; in Cluster 4 memory loss and concentration issues were the most frequent symptoms and the patients had a high prevalence of alcohol use [7].

According to the EU-SILC survey 41 % of Portuguese people aged 16 and over reported having at least one chronic condition – a higher proportion than in the EU (36 %). One third (30 %) of all deaths in Portugal in 2019 can be attributed to behavioural risk factors (smoking, dietary risks, alcohol and low physical activity); this share is however lower than the EU average (39%) [9]. Taking this data into consideration it is important to evaluate behavioural, environmental and health factors associated with chronic disorders during the COVID pandemic to get relevant knowledge, which can be potentially helpful in future pandemics, namely in preventing negative short- and long-term consequences of Chronic Medical Disorders (CMD). The aim of the present paper was to obtain differential behavioural and environmental factors of CMD during the first COVID outbreak, which can be integrated in future recommendations of more personalized health care strategies.

Methods
Online surveys were conducted with 5479 participants (mean age: 48.6±14.3 years; range: 18-90 years), of whom 67.7% were female. The study included data collected from the Portuguese mainland and the Islands of Madeira and the Azores [10]. The overall project was approved by CENC´s Ethical Committee 1/2020. There was no funding, public or private, and no conflict of interests.

The Survey Legend platform was utilized to conduct anonymous surveys targeting adults (aged >18 years). Participants provide their consent for data collection allowing data analysis and statistical use. Data were collected online during the first wave of COVID-19, spanning from April to August 2020. The surveys addressed the following topics: Demographics, Work before COVID; Health Status; Confinement/Lockdown Attitudes and behaviors; Mental health; Sleep; Physical activity; Multimedia use; Nutrition; Toxics and Additions. Health Status included yes/no questions: being healthy (subjective) or suffering from the following diseases: Sleep, Psychiatric, Neurologic, Cardiovascular, Respiratory, Allergies, Gastrointestinal, Rheumatologic, Endocrinologic/metabolic, Autoimmune, Orthopedic, Cancer, Renal, Dermatologic, Hematologic, Gynecologic, Urologic, Ear-Nose-Throat (ENT), Ophthalmologic, Chronic pain, Fatigue, Tinnitus and Dizziness.

The Morbidities Index (MI) represents the total number of reported morbidities at baseline. During the COVID-19 pandemic, participants indicated whether their morbidities had worsened or improved. Based on this, two additional indices were calculated: the COVID-19 Worsening (Morbidities Worsening Index (MWI)) and improvement (Morbidities Improvement Index (MII)).

Confinement attitudes and behaviors were evaluated by yes/no answers [10]. The average and number of both, positive and negative attitudes and behaviors were computed per subject.

Calamity mood data were obtained by 1 to 10 visual analogue scales (VAS). The Calamity Experience Check List was computed

by averaging the scales of depression, anxiety, irritability, worries [11]. Sleep data included data relative to weekdays and weekends during COVID-19: Sleep schedules, Subjective Sleep duration in hours, sleep latency in minutes, number of awakenings and Sleep Quality (SQ) and Awakening quality (AQ) obtained in a 1-10 VAS. Physical activity: intensity (null, mild, moderate, intense) and hours/week. TV, Social Networks, Mobile Phone, Gaming use were quantified in hours/day. Nutrition included: meals/day. Scores for the recommended frequencies were calculated [12]. Smoking: yes/no; cigarettes/day. Alcoholic intake: Alcohol-free: Yes/No; glasses/day of beer, wine, aperitive wine, brandy. Drugs: no; occasionally; sometimes; regularly. The prevalence of chronic disorders and complaints among survey responders was calculated; only disorders with prevalences higher than 1.6% (86 subjects were used).

Quantitative variables were calculated by the mean and its confidence interval. Normality was tested by Kolmogorov-Smirnov test. Most continuous variables had a normal distribution except calamity scale, get up time for weekdays and weekends, cigarettes per/day. ANOVA (unidirectional analysis of variance) with Post-hoc Bonferroni tests was used comparing each chronic disease with the remaining population.

Linear Discriminant Analysis (LDA) was used in order to find a linear combination of features characterizing the different sub samples associated with chronic disorders or complaints (n=14) using the continuous variables with gaussian distribution as predictors: age, Body Mass Index (BMI), work stress variables before COVID, lockdown days, number of morbidities, and its evolution during COVID, variables related with daily living in confinement (attitudes and behaviors either positive or negative), humor VAS (depression, anxiety, irritability, worries), economic problems, sleep variables, screen time (TV, Mobile, Social networks, gaming), nutrition, physical activity. Discriminant functions, Structure Correlation Coefficients, Functions at Group Centroids, Eigen values and Canonical correlations, Wilks Lambda, Box M and Classifier (computed for cases without missing values (n=900) and for the total samples) were calculated.

All tests were performed using the SPSSv29. Statistical significance was assessed with an alpha level of 0.05.

Results

The number of patients and corresponding percentage in the total population are shown in table 1. Allergies, Hypertension, Fatigue and Respiratory disorders were the most prevalent. The prevalence of conditions showed some variation by sex. Males were more prevalent in certain groups, such as Diabetes and Hypertension. In Cardiovascular disorders (CVD) no significant sex differences were observed, while females predominated in the remaining groups.

Table 2 presents data on demographics, before COVID work stress, morbidities and confinement characteristics.

Patients with diabetes, hypertension, CVD, fibromyalgia, rheumatologic disorders, and tinnitus were older; in respiratory, allergies, autoimmune, and dermatologic disorders were younger; there were no age differences in gastrointestinal disorders (GID), chronic pain, fatigue and dizziness. Regarding work conditions before COVID, patients with hypertension reported higher levels of stress and greater responsibilities. Similarly, patients with respiratory disorders reported higher stress levels, increased responsibilities, more frequent conflicts, greater exposure to moral or sexual harassment, and intellectually demanding work. Patients with allergies reported significantly higher stress levels, more interruptions, multitasking, conflicts, responsibilities, and work that was both intellectually and physically demanding. Those with gastrointestinal disorders (GID) reported increased conflicts. Fibromyalgia patients experienced higher levels of conflicts and moral/sexual harassment, while patients with rheumatic disorders reported more interruptions and moral/sexual harassment. Patients with autoimmune disorders (AID) faced more interruptions, multitasking, responsibilities, conflicts and work that was both intellectually and physically demanding. Patients suffering from chronic pain and fatigue reported the highest levels across all work-related factors including stress, interruptions, multitasking, conflicts, responsibilities, moral/sexual harassment, and both intellectually and physically demanding work. Those with

Table 1

	Total		Males		Females		
Disease	**No n (%)**	**Yes n (%)**	**No n (%)**	**Yes n (%)**	**No n (%)**	**Yes n (%)**	**p-value**
Diabetes	5266 (98.1%)	104 (1.9%)	1678 (96.8	56 (3.2)	3608 (98.7)	49 (1.3)	**<0.001**
Hypertension	4856 (90.4%)	514 (9.6%)	1513 (87.3)	221 (12.7)	3363 (92.0)	294 (8.0)	**<0.001**
Cardiovascular	5224 (97.3%)	146 (2.7%)	1678 (96.8)	56 (3.2)	3566 (97.5)	91 (2.5)	0.119
Respiratory	5048 (94.0%)	322 (6.0%)	1669 (96.3)	65 (3.7)	3400 (93.0)	257 (7.0)	**<0.001**
Allergy	4659 (86.8%)	711 (13.2%)	1620 (93.4)	114 (6.6)	3059 (83.6)	598 (16.4)	**<0.001**
Gastrointestinal	5202 (96.9%)	168 (3.1%)	1694 (97.7)	40 (2.3)	3529 (96.5)	128 (3.5)	**0.019**
Fibromyalgia	5284 (98.4%)	86 (1.6%)	1727 (99.6)	7 (0.4)	3574 (97.7)	93 (2.5)	**<0.001**
Rheumatic	5250 (97.8%)	120 (2.2%)	1707 (98.4)	27 (1.6)	3564 (97.5)	93 (2.5)	**0.022**
Autoimmune	5162 (96.1%)	208 (3.9%)	1713 (98.8)	21 (1.2)	3470 (94.9)	187 (5.1)	**<0.001**
Chronic Pain	5205 (98.9%)	166 (3.1%)	1716 (99.0)	18 (1.0)	3508 (95.9)	150 (4.1)	**<0.001**
Fatigue	4980 (92.7%)	391 (7.3%)	1681 (96.9)	53 (3.1)	3320 (90.8)	338 (9.2)	**<0.001**
Dermatologic	5256 (97.9%)	114 (2.1)	1714 (98.8)	29 (1.2)	3563 (97.4)	94 (2.6)	**<0.001**
Tinnitus	5224 (97.3%)	147 (2.7%)	1699 (98.0)	35 (2.0)	3546 (96.9)	112 (3.1)	**0.028**
Dizziness	5192 (96.7%)	179 (3.3%)	1710 (98.6)	24 (1.4)	3502 (95.7)	156 (4.3)	**<0.001**

Table 2

			Diabetes	Hypertension	CVD	Respiratory	Allergies	GID	Fibromyalgia	Rheumatic	AID	Chronic Pain	Fatigue	Dermatologic	Tinnitus	Dizziness
Age and BMI	Age	**No**	48.3	47.5	48.3	48.6	49.4	48.5	48.4	48.4	48.6	48.4	48.5	48.6	48.4	48.5
		Yes	58.8	57.9	56.0	46.9	42.7	48.8	54.1	52.4	46.5	50.5	48.1	44.5	51.2	49.3
	ANOVA	**Sig**	**.000**	**.000**	**.000**	**.038**	**.000**	**.819**	**.000**	**.003**	**.040**	**.067**	**.591**	**.002**	**.018**	**.428**
	BMI	**No**	25.7	25.5	25.7	25.8	25.9	25.8	25.7	25.7	25.8	25.8	25.7	25.8	25.7	25.7
		Yes	27.7	27.9	27.3	25.5	24.8	24.9	27.1	26.5	25.3	25.4	25.7	25.1	25.8	25.8
	ANOVA	**Sig**	**.000**	**.000**	**.000**	**.329**	**.000**	**.030**	**.011**	**.418**	**.172**	**.418**	**.329**	**.805**	**.866**	**.875**
	Weight diff	**No**	0.20	0.17	0.18	0.15	0.11	0.18	0.16	0.16	0.16	0.15	0.12	0.17	0.17	0.16
		Yes	-0.92	0.23	0.03	0.57	0.57	0.15	0.76	0.77	0.54	0.92	0.93	0.31	0.39	0.56
	ANOVA	**Sig**	**.001**	**.699**	**.587**	**.030**	**.001**	**.917**	**.097**	**.047**	**.111**	**.004**	**.000**	**.672**	**.441**	**.115**
WORK before COVID	W stress B Covid	**No**	2.83	2.82	2.83	2.82	2.80	2.83	2.83	2.83	2.83	2.82	2.80	2.83	2.83	2.82
		Yes	2.99	2.94	2.99	3.06	3.06	3.01	3.09	3.04	2.96	3.06	3.26	3.11	3.05	3.18
	ANOVA	**Sig**	**0.193**	**0.041**	**0.112**	**.001**	**.000**	**0.067**	**0.066**	**0.064**	**0.134**	**0.017**	**.000**	**0.018**	**0.035**	**0.000**
	W interruptions B Covid	**No**	2.24	2.24	2.24	2.23	2.21	2.24	2.24	2.23	2.23	2.23	2.22	2.24	2.24	2.24
		Yes	2.36	2.21	2.13	2.36	2.41	2.36	2.54	2.57	2.47	2.47	2.47	2.43	2.27	2.31
	ANOVA	**Sig**	**0.333**	**0.535**	**0.314**	**0.091**	**.000**	**0.224**	**0.051**	**0.005**	**0.010**	**0.027**	**.000**	**0.128**	**0.751**	**0.482**
	W multitask B Covid	**No**	3.04	3.05	3.04	3.03	3.00	3.03	3.04	3.04	3.03	3.03	3.01	3.04	3.03	3.03
		Yes	2.89	2.97	3.06	3.17	3.28	3.13	3.22	3.16	3.28	3.28	3.39	3.12	3.14	3.24
	ANOVA	**Sig**	**0.278**	**0.217**	**0.874**	**0.078**	**.000**	**0.396**	**0.256**	**0.342**	**0.010**	**0.021**	**.000**	**0.536**	**0.352**	**0.056**
	W conflicts B Covid	**No**	2.10	2.10	2.10	2.08	2.06	2.09	2.10	2.10	2.09	2.09	2.07	2.09	2.09	2.08
		Yes	2.21	2.12	2.17	2.34	2.34	2.31	2.46	2.21	2.33	2.47	2.49	2.41	2.46	2.57
	ANOVA	**Sig**	**0.369**	**0.675**	**0.508**	**.001**	**.000**	**0.029**	**0.013**	**0.356**	**0.009**	**.000**	**.000**	**0.008**	**0.001**	**0.000**
	Responsibilities B Covid	**No**	3.39	3.38	3.38	3.38	3.36	3.39	3.39	3.39	3.38	3.38	3.37	3.39	3.38	3.38
		Yes	3.42	3.51	3.58	3.60	3.57	3.41	3.46	3.41	3.65	3.66	3.68	3.53	3.58	3.75
	ANOVA	**Sig**	**0.846**	**0.042**	**0.087**	**0.005**	**.000**	**0.830**	**0.665**	**0.891**	**0.005**	**0.012**	**.000**	**0.267**	**0.101**	**0.001**
	W harassment B Covid	**No**	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.07	1.08	1.08	1.08
		Yes	1.10	1.08	1.09	1.13	1.10	1.07	1.16	1.14	1.09	1.16	1.16	1.13	1.14	1.14
	ANOVA	**Sig**	**0.549**	**0.829**	**0.703**	**0.002**	**0.068**	**0.687**	**0.009**	**0.019**	**0.521**	**.000**	**.000**	**0.038**	**0.005**	**0.002**
	W intelect heavy	**No**	3.21	3.22	3.22	3.20	3.18	3.21	3.21	3.21	3.21	3.21	3.19	3.21	3.21	3.21
		Yes	3.29	3.22	3.23	3.41	3.46	3.32	3.38	3.35	3.46	3.46	3.54	3.47	3.47	3.38
	ANOVA	**Sig**	**0.566**	**0.986**	**0.908**	**0.009**	**.000**	**0.335**	**0.310**	**0.268**	**0.009**	**0.018**	**.000**	**0.042**	**0.022**	**0.117**
	W physicaly heavy	**No**	2.33	2.32	2.33	2.32	2.32	2.33	2.33	2.33	2.32	2.32	2.30	2.33	2.33	2.32
		Yes	2.38	2.40	2.47	2.44	2.42	2.43	2.55	2.36	2.63	2.60	2.67	2.40	2.43	2.57
	ANOVA	**Sig**	**0.681**	**0.242**	**0.197**	**0.127**	**0.045**	**0.324**	**0.164**	**0.796**	**0.001**	**0.008**	**0.000**	**0.615**	**0.385**	**0.016**
Morbidities	N morbidities	**No**	1.63	1.50	1.60	1.55	1.42	1.58	1.60	1.61	1.58	1.54	1.42	1.61	1.58	1.56
		Yes	3.48	3.19	3.69	3.44	3.27	4.14	5.12	4.07	3.74	5.29	4.71	3.90	4.51	4.66
	ANOVA	**Sig**	**.000**	**.000**	**.000**	**.000**	**.000**	**.000**	**.000**	**.000**	**.000**	**.000**	**.000**	**.000**	**.000**	**.000**
	Morbidities Worse	**No**	1.73	1.71	1.72	1.71	1.69	1.72	1.72	1.72	1.71	1.70	1.66	1.72	1.71	1.70
		Yes	1.88	1.87	1.93	2.06	2.00	2.10	2.50	2.21	2.08	2.59	2.56	2.22	2.31	2.42
	ANOVA	**Sig**	**0.423**	**0.103**	**0.215**	**0.003**	**0.000**	**.012**	**.000**	**0.007**	**0.008**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
	Morbidities Better	**No**	0.42	0.44	0.43	0.43	0.45	0.43	0.41	0.42	0.43	0.42	0.43	0.42	0.42	0.42
		Yes	0.32	0.23	0.21	0.30	0.23	0.19	0.76	0.34	0.26	0.28	0.25	0.18	0.27	0.27
	ANOVA	**Sig**	**0.344**	**0.000**	**0.023**	**0.052**	**0.000**	**.007**	**0.007**	**0.424**	**0.044**	**0.099**	**0.002**	**0.000**	**0.097**	**0.078**
Confinement	Number of days in lockdown	**No**	47.04	47.27	47.03	47.04	47.32	46.91	46.99	46.82	46.88	47.00	47.05	47.14	47.01	46.94
		Yes	43.59	44.22	44.86	45.95	44.52	49.35	46.34	53.14	49.36	46.12	45.97	37.08	45.56	48.15
	ANOVA	**Sig**	**0.758**	**0.065**	**0.477**	**0.608**	**0.062**	**0.420**	**0.857**	**0.048**	**0.338**	**0.758**	**0.577**	**0.010**	**0.638**	**0.678**
	Living in confinement	**No**	6.58	6.58	6.58	6.59	6.60	6.58	6.58	6.58	6.59	6.59	6.61	6.58	6.59	6.59
		Yes	6.55	6.51	6.44	6.32	6.42	6.30	6.25	6.51	6.24	6.27	6.15	6.47	6.01	6.08
	ANOVA	**Sig**	**0.031**	**0.390**	**0.377**	**0.013**	**0.017**	**0.060**	**0.098**	**0.716**	**0.008**	**0.031**	**.000**	**0.530**	**.000**	**.000**
	Your economic problems	**No**	2,98	2,99	2,99	2,99	3,00	2,99	2,97	2,98	2,99	2,96	2,94	3,00	2,98	2,96
		Yes	3,53	3,05	3,12	3,02	2,97	3,25	4,14	3,48	3,09	3,91	3,70	2,78	3,51	3,88
	ANOVA	**Sig**	**0,000**	0,516	0,492	0,847	0,788	0,127	**0,000**	**0,015**	0,535	**0,000**	**0,000**	0,295	**0,004**	**0,000**

Table 3

			Diabetes	Hypertension	CVD	Respiratory	Allergies	GID	Fibromyalgia	Rheumatic	AID	Chronic Pain	Fatigue	Derma-tologic	Tinnitus	Dizziness
Mental Health	How is your depression	No	3.77	3.77	3.77	3.75	3.76	3.76	3.76	3.77	3.76	3.74	3.66	3.76	3.75	3.75
		Yes	3.96	3.83	3.90	4.22	3.89	4.24	4.64	4.19	4.26	4.81	5.21	4.39	4.57	4.65
	ANOVA	**Sig**	**0.000**	0.607	0.543	**0.001**	0.183	**0.014**	**0.001**	0.059	**0.003**	**0.000**	**0.000**	**0.006**	**0.000**	**0.000**
	How is your anxiety	No	4.72	4.73	4.71	4.68	4.66	4.70	4.71	4.71	4.69	4.68	4.60	4.70	4.69	4.68
		Yes	4.62	4.60	4.81	5.22	5.11	5.31	5.25	5.09	5.31	5.86	6.15	5.48	5.71	5.79
	ANOVA	**Sig**	**0.000**	0.293	0.649	**0.000**	**0.000**	**0.003**	0.055	0.112	**0.001**	**0.000**	**0.000**	**0.001**	**0.000**	**0.000**
	How is your irritability	No	4.68	4.71	4.67	4.65	4.63	4.66	4.67	4.67	4.65	4.65	4.58	4.66	4.66	4.64
		Yes	4.45	4.32	4.72	5.12	4.94	5.11	5.11	4.81	5.15	5.33	5.84	5.13	5.21	5.55
	ANOVA	**Sig**	**0.001**	**0.001**	0.811	**0.002**	**0.003**	**0.028**	0.114	0.576	**0.007**	**0.001**	**0.000**	0.057	**0.011**	**0.000**
	Worries towards uncertainty	No	6.05	6.05	6.05	6.02	6.00	6.04	6.05	6.05	6.04	6.02	5.99	6.05	6.04	6.02
		Yes	6.12	6.07	6.39	6.57	6.40	6.41	6.57	6.15	6.50	7.01	6.93	6.37	6.70	7.02
	ANOVA	**Sig**	**0.000**	0.920	0.099	**0.000**	**0.000**	0.067	0.052	0.668	**0.009**	**0.000**	**0.000**	0.168	**0.002**	**0.000**
	How is frequency your sexual activity	No	3.99	4.03	3.99	3.99	3.99	3.99	3.98	3.98	3.99	4.00	4.02	3.99	4.00	3.99
		Yes	3.70	3.51	3.59	3.78	3.94	3.68	3.76	3.95	3.74	3.38	3.46	3.82	3.49	3.77
	ANOVA	**Sig**	**0.001**	**0.000**	0.056	0.144	0.673	0.112	0.415	0.874	0.148	**0.001**	**0.000**	0.463	**0.013**	0.238
	Time out of bed weekdays	No	7.89	7.89	7.89	7.90	7.91	7.89	7.89	7.89	7.88	7.88	7.88	7.89	7.89	7.88
		Yes	7.84	7.84	7.96	7.71	7.74	7.77	8.08	7.98	8.02	8.01	8.04	7.67	7.98	8.15
	ANOVA	**Sig**	.745	.494	.563	**.043**	**.010**	.335	.250	.544	.223	.332	**.049**	.136	.482	**.025**
Sleep	Time out of bed weekends	No	8.93	8.92	8.92	8.93	8.93	8.93	8.92	8.92	8.92	8.92	8.92	8.92	8.92	8.92
		Yes	8.88	8.98	9.21	8.84	8.88	8.92	9.08	9.20	8.99	9.18	8.96	9.08	9.12	9.07
	ANOVA	**Sig**	**0.042**	0.470	**0.038**	0.324	0.431	0.954	0.391	0.068	0.584	**0.042**	0.665	0.313	0.162	0.247
	Time into bed weekdays	No	-0.06	-0.06	-0.07	-0.05	-0.06	-0.06	-0.06	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07
		Yes	-0.06	-0.11	-0.03	-0.28	-0.11	-0.17	-0.13	0.17	0.07	0.07	-0.02	0.11	-0.05	0.01
	ANOVA	**Sig**	0.306	0.560	0.828	**0.021**	0.454	0.420	0.704	0.129	0.252	0.306	0.574	0.257	0.934	0.542
	Time into bed weekends	No	0.27	0.26	0.26	0.28	0.26	0.27	0.27	0.26	0.26	0.26	0.26	0.26	0.26	0.26
		Yes	0.22	0.28	0.38	0.09	0.28	0.16	0.18	0.41	0.44	0.37	0.27	0.48	0.45	0.44
	ANOVA	**Sig**	0.424	0.791	0.435	0.077	0.804	0.447	0.637	0.381	0.148	0.424	0.949	0.184	0.220	0.196
	Sleep duration weekdays	No	6.67	6.68	6.67	6.67	6.71	6.68	6.67	6.67	6.68	6.68	6.68	6.68	6.68	6.67
		Yes	6.93	6.64	6.75	6.69	6.43	6.67	6.90	6.68	6.44	6.65	6.59	6.67	6.62	6.84
	ANOVA	**Sig**	0.874	0.661	0.615	0.891	**0.000**	0.964	0.248	0.972	0.065	0.874	0.336	0.985	0.700	0.210
	Sleep duration weekends	No	7.46	7.44	7.45	7.46	7.48	7.46	7.45	7.45	7.47	7.46	7.47	7.45	7.46	7.46
		Yes	7.59	7.59	7.61	7.44	7.30	7.36	7.88	7.74	7.20	7.40	7.33	7.66	7.41	7.46
	ANOVA	**Sig**	0.723	0.150	0.398	0.863	**0.041**	0.546	0.073	0.149	0.087	0.723	0.240	0.304	0.811	0.998
	Sleep latency weekdays	No	32.25	32.28	32.21	32.31	32.07	32.16	32.09	32.34	32.27	32.12	31.74	32.18	32.18	32.04
		Yes	29.21	31.29	31.50	30.32	32.92	33.03	38.00	25.79	30.17	34.05	37.82	32.46	32.33	36.52
	ANOVA	**Sig**	0.514	0.575	0.823	0.370	0.586	0.772	0.161	0.059	0.452	0.514	**0.003**	0.940	0.963	0.129
	Sleep latency weekends	No	31.72	31.82	31.71	31.81	31.47	31.57	31.54	31.77	31.77	31.56	31.25	31.63	31.63	31.50
		Yes	28.65	30.17	29.74	29.30	32.88	34.24	38.80	27.05	28.73	34.47	36.84	32.72	32.75	36.24
	ANOVA	**Sig**	0.335	0.362	0.547	0.270	0.373	0.387	0.089	0.183	0.285	0.335	**0.007**	0.771	0.738	0.114
	Awakenings weekdays	No	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
		Yes	2.3	2.9	3.2	3.0	2.9	2.6	3.0	2.9	3.0	3.4	3.0	2.5	3.0	2.3
	ANOVA	**Sig**	**0.018**	0.557	0.161	0.174	0.182	0.482	0.639	0.724	0.350	**0.018**	0.172	0.319	0.532	0.067
	Awakenings weekends	No	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
		Yes	2.1	2.5	2.4	2.6	2.5	2.4	2.8	2.4	2.5	2.6	2.6	2.2	2.4	2.2
	ANOVA	**Sig**	0.258	0.462	0.820	0.118	0.547	0.926	0.113	0.977	0.435	0.258	0.064	0.281	0.826	0.192
	SleepQuality	No	5.68	5.70	5.69	5.71	5.75	5.71	5.71	5.70	5.71	5.73	5.79	5.69	5.71	5.71
		Yes	5.73	5.58	5.37	5.28	5.30	5.02	4.32	5.04	5.20	4.40	4.41	5.28	4.90	4.87
	ANOVA	**Sig**	**0.000**	0.291	0.108	**0.002**	**0.000**	**0.000**	**0.000**	**0.003**	**0.003**	**0.000**	**0.000**	0.080	**0.000**	**0.000**
	Sleep Waking Quality	No	5.79	5.79	5.80	5.83	5.86	5.82	5.82	5.81	5.82	5.84	5.89	5.80	5.82	5.82
		Yes	6.16	5.81	5.58	5.27	5.39	5.05	4.47	5.35	5.17	4.58	4.56	5.42	4.96	4.94
	ANOVA	**Sig**	**0.000**	0.878	0.273	**0.000**	**0.000**	**0.000**	**0.000**	**0.036**	**0.000**	**0.000**	**0.000**	0.093	**0.000**	**0.000**
	Hours physical activity	No	2.75	2.77	2.75	2.75	2.76	2.75	2.74	2.76	2.77	2.75	2.78	2.75	2.74	2.74
		Yes	2.60	2.53	2.46	2.71	2.68	2.58	3.00	2.35	2.19	2.52	2.21	2.66	2.78	3.08
	ANOVA	**Sig**	0.563	0.321	0.495	0.914	0.706	0.672	0.674	0.378	0.104	0.563	0.052	0.863	0.934	0.415

Nutrition and Physical Activity	Meal's day	No	3.84	3.86	3.84	3.84	3.82	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84
		Yes	3.74	3.68	3.73	3.91	3.97	3.84	3.99	3.88	3.94	3.89	3.83	3.82	3.75	3.81
	ANOVA	**Sig**	0.494	**0.000**	0.168	0.217	**0.000**	0.990	0.181	0.677	0.144	0.494	0.834	0.819	0.278	0.666
	Food Recommended	No	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
		Yes	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
	ANOVA	**Sig**	0.640	0.097	0.727	0.065	**0.000**	0.296	0.574	0.106	0.613	0.640	0.051	0.164	0.079	0.080
	Food REC YES	No	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
		Yes	5.4	5.4	5.4	5.1	5.0	5.5	5.3	5.6	5.0	5.4	5.0	4.9	5.6	5.6
	ANOVA	**Sig**	0.446	0.144	0.742	0.130	**0.004**	0.344	0.955	0.118	0.077	0.446	0.054	0.150	0.079	0.076
	Food REC NO	No	11.6	11.6	11.6	11.6	11.5	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6
		Yes	11.6	11.4	11.6	11.8	11.9	11.4	11.2	11.3	11.7	11.4	11.7	12.0	11.3	11.3
	ANOVA	**Sig**	0.384	0.062	0.985	0.147	**0.003**	0.335	0.226	0.161	0.430	0.384	0.274	0.096	0.187	0.140
	Food YES NO proportion	No	0.52	0.52	0.52	0.52	0.53	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52
		Yes	0.52	0.55	0.56	0.49	0.48	0.55	0.51	0.58	0.48	0.53	0.49	0.47	0.56	0.58
	ANOVA	**Sig**	0.735	0.156	0.238	0.132	**0.007**	0.325	0.731	0.132	0.166	0.735	0.127	0.148	0.263	0.089
	Hours physical activity	No	2.75	2.77	2.75	2.75	2.76	2.75	2.74	2.76	2.77	2.75	2.78	2.75	2.74	2.74
		Yes	2.60	2.53	2.46	2.71	2.68	2.58	3.00	2.35	2.19	2.52	2.21	2.66	2.78	3.08
	ANOVA	**Sig**	0.563	0.321	0.495	0.914	0.706	0.672	0.674	0.378	0.104	0.563	0.052	0.863	0.934	0.415

dermatologic disorders and with tinnitus experienced elevated levels of work stress, conflicts, moral/sexual harassment and intellectually demanding work. Individuals with dizziness complaints reported increased work stress, conflicts, responsibilities, moral/sexual harassment and physically demanding work. In contrast, no significant work-related issues were observed among patients with diabetes or CVD.

The number of comorbidities was significantly higher in all subgroups. Comorbidities worsening during COVID were reported by patients with respiratory disorders, allergies, GID, fibromyalgia, rheumatic disorders, AID, chronic pain, fatigue, dermatologic, tinnitus and dizziness. Comorbidities improvement during COVID was reported only for patients with fibromyalgia. The remaining disorder groups either had not significant differences or significant differences with lower improvements levels than the participants without disorders (control population). Patients with rheumatic disorders were more days in lockdown, while those with dermatologic disorders were the ones with less days in lockdown, for the remaining groups no differences were observed. The following groups were feeling less well during lockdown when compared to controls: respiratory, allergic, AID, chronic pain, fatigue, tinnitus and dizziness. Economic problems were more prevalent among individuals with diabetes, fibromyalgia, rheumatic disorders, chronic pain, fatigue, tinnitus, and dizziness. Additionally, lower sexual frequency was reported by patients with hypertension, chronic pain, fatigue and tinnitus.

Data from Mental Health and the health pillars (Sleep, Nutrition and Physical activity) are shown in Table 3. Higher depression levels were reported by patients with respiratory disorders, GID, fibromyalgia, AID, chronic pain, fatigue, dermatologic, tinnitus, dizziness. Higher anxiety levels were reported by patients with respiratory disorders, allergies, GID, AID, chronic pain, fatigue, dermatologic, tinnitus, and dizziness. Higher levels of irritability were reported by patients with hypertension, respiratory disorders, allergies, GID, AID, chronic pain, fatigue, tinnitus, and dizziness. Worries towards uncertainty were higher in respiratory, allergies, AID, chronic pain, fatigue, tinnitus, and dizziness.

Patients with respiratory and allergic diseases get out of bed earlier during weekdays while those with fatigue and dizziness get out of bed later. During weekends the patients' groups getting latter out of bed were the ones with CVD and chronic pain. There were no relevant differences in bedtime during weekdays and weekends. Patients with allergies had reduced sleep duration for both weekdays and weekends. Patients with fatigue had longer sleep latency for both weekdays and weekends. Patients with chronic pain report more frequent awakenings during weekdays. Patients with respiratory disorders, allergies, GID, fibromyalgia, rheumatic, AID, chronic pain, fatigue, tinnitus and dizziness reported worse Sleep Quality during the COVID. Patients with allergies, respiratory disorders, GID, fibromyalgia, rheumatic and autoimmune disorders, chronic pain, tinnitus and dizziness reported worse Awakening Quality. The number of meals per day were similar in patients with diabetes, cardiovascular, respiratory, GID, fibromyalgia, rheumatologic, chronic pain, fatigue, tinnitus and dizziness. However, the number of meals per day was lower in patients with hypertension, on the other hand the number of meals in patients with allergies was higher. Patients with allergies ate less recommended food and more non recommended foods.

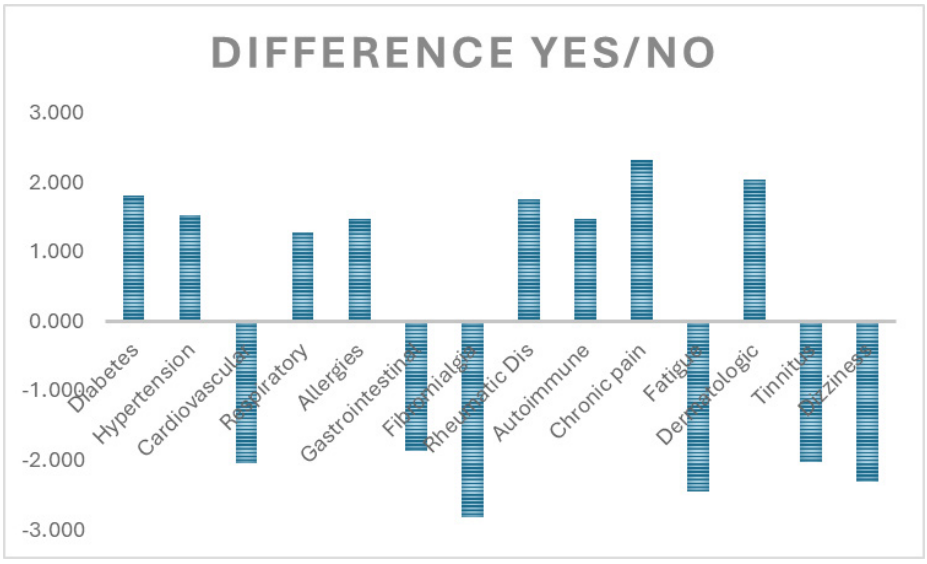
In diabetes, hypertension, CVD, respiratory, allergies, GID, fibromyalgia, rheumatic, AID, chronic pain, dermatologic, tinnitus, and dizziness there were no differences in Physical Activity during COVID.

Data from toxics' use: screen time, dependences and attitudes are shown in table 4. Patients with diabetes, hypertension and CVD drink more beer per day, while patients complaining of dizziness drink less. patients with hypertension, respiratory, allergic, GID, chronic pain, AID, fatigue and dizziness drink less wine per day and patients with allergies drink significantly less aperitives and brandies per day.

Patients with fibromyalgia and chronic pain saw more TV. Patients with fibromyalgia, chronic pain, fatigue and dizziness were the ones spending more time in social networks, and the ones with allergies spent more time in the mobile phone. GID had lower levels

Table 4

			Diabetes	Hypertension	CVD	Respiratory	Allergies	GID	Fibro-myalgia	Rheumatic	Autoimmune	Chronic Pain	Fatigue	Dermatologic	Tinnitus	Dizziness
Toxics	How many cigarettes	No	12.36	12.01	12.28	12.21	12.53	12.30	12.37	12.40	12.39	12.34	12.37	12.48	12.41	12.34
		Yes	14.54	16.40	16.39	15.41	11.47	15.42	14.78	12.75	12.95	14.23	12.87	5.00	12.44	15.75
	ANOVA	**Sig**	0.319	**0.001**	**0.049**	**0.038**	0.374	0.125	0.412	0.892	0.772	0.319	0.710	0.056	0.987	0.180
	Beer per day	No	0.49	0.46	0.50	0.50	0.51	0.50	0.51	0.50	0.51	0.51	0.51	0.51	0.50	0.52
		Yes	1.10	0.90	0.87	0.64	0.48	0.56	0.23	0.62	0.36	0.51	0.40	0.33	0.56	0.25
	ANOVA	**Sig**	0.964	**0.000**	**0.004**	0.144	0.689	0.693	0.072	0.413	0.175	0.964	0.191	0.313	0.681	**0.027**
	Wine per day	No	0.23	0.24	0.23	0.23	0.25	0.23	0.22	0.23	0.23	0.23	0.24	0.23	0.23	0.23
		Yes	0.09	0.08	0.08	0.07	0.03	0.04	0.26	0.03	0.02	0.03	0.04	0.03	0.08	0.02
	ANOVA	**Sig**	**0.026**	**0.004**	0.123	**0.019**	**0.000**	**0.042**	0.719	0.053	**0.009**	**0.026**	**0.001**	0.132	0.123	**0.019**
	Aperitive Wine per day	No	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
		Yes	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	ANOVA	**Sig**	0.286	0.127	0.314	0.410	**0.034**	0.301	0.406	0.341	0.230	0.286	0.101	0.471	0.314	0.269
	Brandy per day	No	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
		Yes	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	ANOVA	**Sig**	0.288	0.120	0.316	0.386	**0.035**	0.303	0.408	0.343	0.232	0.288	0.102	0.473	0.316	0.272
	Alcohol	No	9.19	8.99	9.23	9.33	9.71	9.36	9.36	9.34	9.50	9.39	9.62	9.37	9.34	9.51
		Yes	14.36	11.93	11.42	8.66	6.16	7.12	6.06	7.77	4.58	6.46	5.30	4.24	7.68	3.27
	ANOVA	**Sig**	0.189	**0.023**	0.353	0.697	**0.004**	0.329	0.243	0.529	**0.014**	0.189	**0.004**	0.113	0.478	**0.004**
	Drugs	No	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
		Yes	1.00	1.00	1.04	1.04	1.02	1.00	1.06	1.02	1.01	1.02	1.02	1.00	1.00	1.00
	ANOVA	**Sig**	0.958	0.118	0.264	0.062	0.431	0.296	**0.046**	0.817	0.793	0.958	0.681	0.394	0.319	0.298
Screens	TV h Day	No	3.07	3.06	3.08	3.08	3.10	3.08	3.06	3.07	3.06	3.06	3.07	3.08	3.07	3.07
		Yes	3.58	3.29	3.08	3.08	2.95	3.08	4.30	3.45	3.46	3.57	3.19	2.95	3.46	3.34
	ANOVA	**Sig**	**0.026**	0.078	0.988	1.000	0.221	0.997	**0.000**	0.139	0.052	**0.026**	0.449	0.633	0.092	0.223
	Social Networks h Day	No	2.43	2.42	2.44	2.44	2.41	2.44	2.43	2.43	2.43	2.42	2.41	2.45	2.44	2.42
		Yes	2.81	2.65	2.54	2.44	2.61	2.38	3.20	2.68	2.76	3.03	2.81	2.11	2.40	3.03
	ANOVA	**Sig**	**0.009**	0.103	0.676	0.993	0.090	0.795	**0.015**	0.329	0.101	**0.009**	**0.009**	0.204	0.851	**0.005**
	Mobile h Day	No	2.57	2.59	2.56	2.55	2.51	2.55	2.57	2.56	2.55	2.55	2.56	2.56	2.57	2.56
		Yes	2.33	2.33	2.66	2.89	2.90	2.99	2.51	2.77	2.93	3.03	2.71	2.75	2.58	2.74
	ANOVA	**Sig**	0.054	0.084	0.705	0.056	**0.002**	0.067	0.873	0.456	0.089	0.054	0.350	0.514	0.968	0.468
	Games h Day	No	1.91	1.93	1.90	1.87	1.91	1.90	1.90	1.90	1.90	1.90	1.88	1.91	1.91	1.89
		Yes	1.31	1.66	1.63	2.25	1.86	2.02	2.03	1.99	1.94	1.96	2.12	1.64	1.70	2.09
	ANOVA	**Sig**	0.826	0.174	0.540	0.122	0.764	0.735	0.765	0.802	0.886	0.826	0.300	0.467	0.532	0.535
Dependences	TV dependence	No	3.31	3.31	3.32	3.31	3.30	3.33	3.31	3.32	3.32	3.31	3.32	3.32	3.32	3.33
		Yes	3.57	3.40	3.14	3.50	3.45	2.95	3.68	3.31	3.32	3.46	3.35	3.38	3.39	3.08
	ANOVA	**Sig**	0.453	0.426	0.369	0.169	0.115	**0.043**	0.171	0.949	0.993	0.453	0.810	0.798	0.718	0.180
	Social Networks dependence	No	3.66	3.69	3.66	3.64	3.58	3.66	3.65	3.65	3.64	3.65	3.64	3.65	3.66	3.65
		Yes	3.31	3.33	3.29	3.86	4.12	3.52	3.56	3.77	3.87	3.60	3.80	3.94	3.56	3.77
	ANOVA	**Sig**	0.813	**0.005**	0.098	0.170	**0.000**	0.518	0.744	0.630	0.246	0.813	0.265	0.246	0.677	0.569
	Games dependence	No	1.67	1.67	1.67	1.66	1.66	1.67	1.66	1.67	1.65	1.66	1.66	1.67	1.66	1.66
		Yes	1.43	1.66	1.43	1.77	1.71	1.57	1.95	1.72	2.04	1.87	1.73	1.74	1.75	1.90
	ANOVA	**Sig**	0.140	0.902	0.094	0.295	0.451	0.446	0.140	0.753	**0.002**	0.140	0.453	0.657	0.541	0.082
	Alcohol dependence	No	1.47	1.45	1.46	1.47	1.49	1.47	1.47	1.48	1.47	1.47	1.48	1.47	1.47	1.48
		Yes	1.26	1.66	1.66	1.45	1.36	1.47	1.40	1.24	1.41	1.39	1.36	1.25	1.45	1.27
	ANOVA	**Sig**	0.429	**0.001**	0.084	0.815	**0.020**	0.964	0.617	0.054	0.485	0.429	0.115	0.079	0.817	**0.046**
Attitudes	Number Positive Attitudes	No	0.56	0.56	0.56	0.56	0.57	0.56	0.56	0.56	0.56	0.56	0.57	0.56	0.56	0.56
		Yes	0.51	0.53	0.61	0.47	0.49	0.38	0.43	0.40	0.50	0.43	0.42	0.52	0.50	0.45
	ANOVA	**Sig**	**0.020**	0.312	0.380	**0.025**	**0.007**	**0.001**	0.089	**0.020**	0.291	**0.020**	**0.000**	0.557	0.332	**0.050**
	N. Negative Attitudes	No	1.15	1.16	1.15	1.13	1.12	1.14	1.15	1.14	1.14	1.14	1.12	1.14	1.14	1.13
		Yes	1.08	1.05	0.98	1.38	1.33	1.40	1.29	1.34	1.37	1.40	1.52	1.43	1.47	1.52
	ANOVA	**Sig**	**0.001**	**0.027**	0.052	**0.000**	**0.000**	**0.002**	0.215	**0.045**	**0.002**	**0.001**	**0.000**	**0.005**	**0.000**	**0.000**
	Number Trauma Violence	No	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
		Yes	0.04	0.01	0.03	0.04	0.02	0.02	0.01	0.02	0.03	0.02	0.03	0.04	0.04	0.04
	ANOVA	**Sig**	0.686	0.399	0.167	**0.000**	0.292	0.273	0.833	0.790	0.064	0.686	**0.004**	0.055	**0.006**	**0.005**
	Number positive doings	No	1.94	1.94	1.95	1.94	1.94	1.95	1.94	1.95	1.94	1.95	1.96	1.95	1.95	1.95
		Yes	1.93	1.94	1.90	1.93	1.95	1.79	2.15	1.87	1.95	1.86	1.73	1.80	1.74	1.70
	ANOVA	**Sig**	0.451	0.909	0.699	0.893	0.914	0.197	0.203	0.602	0.947	0.451	**0.004**	0.322	0.099	**0.031**
	Number negative doings	No	0.60	0.60	0.60	0.59	0.59	0.60	0.60	0.60	0.60	0.60	0.59	0.60	0.60	0.60
		Yes	0.71	0.59	0.56	0.71	0.69	0.58	0.64	0.70	0.74	0.71	0.74	0.79	0.77	0.75
	ANOVA	**Sig**	0.071	0.708	0.492	**0.014**	**0.002**	0.749	0.632	0.187	**0.014**	0.071	**0.001**	**0.012**	**0.010**	**0.015**



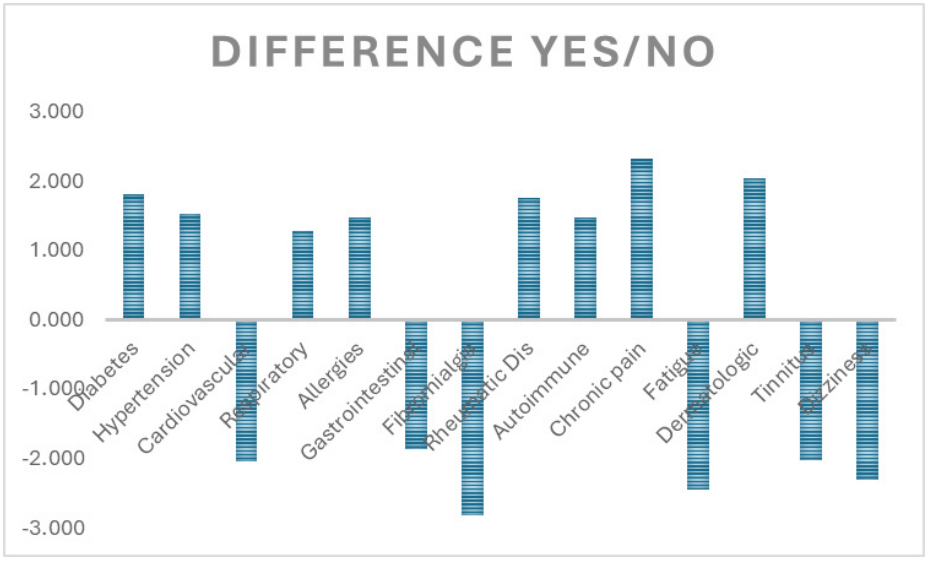


Table 5

	EIGEN VALUES		Wilks Lambda (31 df)			CENTROID		Test Results		Classification		
	Eigen value	Canonical Correlation	Wilks Lambda	Chi-Square	Sig	Centroid No	Centroid Yes	Box M	Sig	% Correct No	% Correct Yes	% Correct original group
Diabetes	.68	**.261**	**.937**	58.044	**.002**	**-.038**	**1.773**	.059	.810	**82.7**	**78.9**	**82.6**
Hypertension	.227	**.430**	**.815**	181.457	**<.001**	**-.166**	**1.365**	5.184	**.023**	**79.7**	**74.5**	**79.2**
CVD	.125	**.333**	**.889**	104.759	**<.001**	**.063**	**-1.979**	6.673	**.010**	**87.6**	**75.0**	**87.2**
Respiratory	.100	**.302**	**.909**	84.921	**<.001**	**-.083**	**1.199**	7.551	**.006**	**82.4**	**66.1**	**81.4**
Allergies	.258	**.453**	**.795**	204.273	**<.001**	**-.205**	**1.258**	4.111	**.043**	**82.4**	**71.7**	**80.9**
GID	.120	**.327**	**.893**	100.553	**<.001**	**.066**	**-1.807**	3.736	.055	**86.1**	**71.9**	**85.6**
Fibromyalgia	.155	**.366**	**.866**	127.903	**<.001**	**.056**	**-2.761**	55.530	**<.001**	**92.5**	**66.7**	**92.0**
Rheumatic Dis	.120	**.327**	**.893**	100.340	**<.001**	**-.071**	**1.674**	11.967	**<.001**	**87.5**	**62.2**	**86.4**
Autoimmune	.113	**.318**	**.899**	94.911	**<.001**	**-.081**	**1.388**	14.545	**<.001**	**84.4**	**60.0**	**83.0**
Chronic pain	.180	**.391**	**.847**	147.345	**<.001**	**-.080**	**2.245**	20.585	**<.001**	**87.9**	**71.0**	**87.3**
Fatigue	.444	**.554**	**.693**	326.231	**<.001**	**.197**	**-2.247**	44.696	**<.001**	**87.9**	**77.0**	**87.0**
Dermatologic	.077	**.267**	**.929**	65.847	**<.001**	**-.038**	**2.003**	.471	.497	**84.9**	**82.4**	**84.9**
Tinnitus	.129	**.338**	**.886**	107.481	**<.001**	**.065**	**-1.970**	31.237	**<.001**	**89.3**	**72.4**	**88.8**
Dizziness	.177	**.388**	**0.849**	145.050	**<.001**	**.079**	**-2.235**	56.313	**<.001**	**90.4**	**67.7**	**89.6**

Table 6

Chronic Pain	Fibromyalgia	AID	CVD	Fatigue	Diabetes	Dermatologic	Dizziness	Hypertension	Respiratory	Tinnitus	Allergies	GID	Rheumatic
N morbidities .867	N morbidities -.821	N morbidities .787	N morbidities -.612	N morbidities -.916	Age .441	N morbidities .518	N morbidities -.721	N morbidities .627	N morbidities .777	N morbidities -.726	N morbidities .698	N morbidities -.732	N morbidities .748
Sleep Quality -.334	Sleep Quality -.352	Work conflicts B Covid .248	Age -.454	Sleep Waking Quality .285	N morbidities .385	Work conflicts B Covid .382	Worries vs uncertainty -.280	Age .583	Number negative doings .276	Number negative doings -.301	Age -.304	Sleep Waking Quality .222	
Sleep Waking Quality -.268	Sleep Waking Quality .330	Work physically heavy .248	Beer per Day -.280	Morbidities worse -.231	BMI .328	N days of lockdown -.366	Number negative doings -.255	BMI .368	Sleep Quality -.244	Sleep Waking Quality .229	Sleep Quality -.224		
How is your depression .244	Social Networks h/ day -.282	Morbidities worse .244	Work multitask B Covid .242	How is your depression -.226	Sleep Waking Quality .312	Work harassment B Covid .340	Work conflicts B Covid -.249	Beer per Day .328	Sleep Waking Quality -.227	Work responsibilities B Covid .222			
Social Networks h/ day .240	Morbidities worse -.250	How is your anxiety .244	BMI -.228	Sleep Quality .221	How is your irritability -.261	Number Negative Attitudes .215	How are your economic problems -.238	How is frequency your sexual activity -.205	Number Negative Attitudes .209				
Morbidities Worse .237	TV h/day -.225	N days of lockdown .243	How is your anxiety .216	How is your anxiety -.219	Work multitask B Covid -.259	Work physically heavy .205	How is your anxiety -.213						
How are your economic problems .236	Work stress B Covid -.208	Work stress interruptions B Covid .239	Work stress interruptions B Covid .215	How are your economic problems -.203	Sleep Quality .254	Work multitask B Covid .202							
How is your anxiety .217	How are your economic problems -.207	Sleep Waking Quality -.200	Work conflicts B Covid .211										
N days of lockdown .214	Work physically heavy -.200												
How are your worries vs uncertainty .212													
Number Negative Attitudes .206													

of TV dependence, hypertension lower levels of social networks dependence, while allergies had higher social networks dependence levels, AID higher levels of game dependence, hypertension had higher levels of alcoholic dependence while allergies and dizziness lower levels of alcoholic dependence. Positive attitudes were less frequent in Respiratory patients, allergies, GID, rheumatic, chronic pain, fatigue, dizziness. Negative attitudes were more frequent in Respiratory patients, allergies, GID, rheumatologic, AID, chronic pain, fatigue, dermatologic, tinnitus and dizziness, and less frequent in hypertension. Positive doings were lower in fatigue and dizziness. Negative doings were higher in Respiratory patients, allergies, AID, fatigue, dermatologic, tinnitus and dizziness.

Discriminant analysis showed consistent and significant differences for the chronic disorders and complaints evaluated (see table 5). Wilks Lambda was highly significant for all of them, the centroids for having (yes) and not having a disorder/complaint are quite different; for some disorders the "yes" centroid is negative (CVD, GID, fibromyalgia, fatigue, tinnitus and dizziness). The centroids biggest differences are for fibromyalgia, fatigue, chronic pain, dizziness, CVD and tinnitus (see Figure 1).

The test results evaluated by the Box M are significant for all situations, except for diabetes, GID and dermatologic disorders. The classification correctness was high in general with higher results for the No (not having the disorder/complaint) than for the Yes (having the disorder/complaint).

The pooled within-groups correlations between discriminating variables and standardized canonical discriminant functions were computed for each disorder/complaint; since degrees of freedom (df) are higher than 900, correlations higher than .200 were ranked and are presented in table 6. Chronic pain, Fibromyalgia, AID, Fatigue and CVD have the highest number of features with significant correlations.

It is also clear that the number of morbidities and morbidities worsening is very relevant is most disorders. Sleep quality and/or sleep waking quality were quite significant in chronic pain, fibromyalgia, fatigue, AID, respiratory disorders, diabetes, tinnitus, allergies and GID. Items from concerning mental health (depression, anxiety, irritability and worries) were significant in all entities, except hypertension and allergies. Work stress before COVID was significant fibromyalgia, AID, CVD, diabetes, dermatologic, dizziness and tinnitus. Other factors such as economic problems, negative attitudes, screen time and beer consumption were specific of specific entities.

Discussion

The obtained results must be discussed in two different perspectives. One is the importance of a multidimensional approach and the associated relevance of specific features, which range from demographics to attitudes and from work characteristics before the pandemic to confinement and habits during the pandemic; the other relates to the differences between common chronic disorders in a stressful situation.

Age is a significant factor: in most chronic disorder's patients tend to be older, except for those with allergies, respiratory disorders, fatigue and dermatologic disorders. In the LDA analysis, older age showed a strong correlation with the discriminant function for CVD, diabetes and hypertension, while younger age was similarly correlated for patients with allergies. BMI varied significantly across several conditions, being higher in diabetes, hypertension, CVD, and fibromyalgia, and or lower in allergies and gastrointestinal disorders. However, in the LDA analysis, BMI was only a significant factor for diabetes, hypertension and CVD.

The evaluation of work stress before COVID is relevant since, the presence of significant effects during the pandemic is a putative indicator of its long-term effects. Indeed, the several parameters of work stress (the subjective evaluation, the presence of significant interruptions and multitasking, conflicts, responsibilities together with physical and intellectual load, were quite frequent in most disorders and confirmed its relevance in LDA for fibromyalgia, AID, CVD, diabetes, dermatologic disorders, dizziness and tinnitus. Particular attention must be addressed to CVD and Dermatologic disorders since they share multitasking and work conflicts associated either with interruptions or an increased physical load. Furthermore, in the dermatologic group harassment is also present.

Work stress is worldwide quite prevalent; in 2019 (prior to the COVID pandemic) 38% of workers globally reported experiencing high daily stress [13]. Psychosocial factors are a considerable source of stress at work while having significant associations with depression [14].

The chronic cortisol excess associated with work stress and mediated by the stress level, may precede the development of an allostatic load, while explaining multiple health effects [15]. Data from 27 cohort studies in Europe, the USA and Japan suggests that work stressors, such as job strain and long working hours, are associated with a moderately elevated risk of incident coronary heart disease and stroke [16]. Work stress can indeed increase the risk of cardiovascular disease by 50%; the effort-reward imbalance workplace stress model explains the increased risk of CVD by its association with organic factors, such as, increased hypertension, intima media thickness and fibrinogen [17]. Job strain is also a risk factor for diabetes [16,18]. Stress, namely work bullying, excessive workload and low decision latitude are possible contributing factors in the development of fibromyalgia [19]. For our knowledge information concerning the prevalence of autoimmune disorders, tinnitus and dizziness in relation with work stress is not available.

The average number of comorbidities in the observed CMD was in all sub-groups significantly higher than in controls, ranging between 3.19 and 5.29; in practice this means a high prevalence of comorbidities, and is in line with the concept that chronic disorders are not only co-morbid but also syndemic, especially when this term extends from synergistic epidemics to synergistic multilevel environments contributing to negative heath impacts [20].

The existence of comorbidities in chronic disorders and their bidirectional mutual influence with potential increased severity of both is well known. In LDA the correlation values for morbidities were quite high, ranging from .518 in dermatologic disorders to -.916 in fatigue. Furthermore, morbidities worsening during COVID, showed significant correlations with the discriminant function in chronic pain, fibromyalgia, AID and fatigue. These results obtained during the COVID pandemic are in line with comorbidities relevance. Chronic pain is rather prevalent worldwide (~ 20%) and its frequent comorbidities are anxiety, depression, cognitive impairments, sleep disorders, migraine, diabetes type II, hypertension, CVD, fatigue, etc. [21]. Fibromyalgia common morbidities are irritable bowel syndrome, headache, paraesthesia's, depression, anxiety, obesity and multiple skin disorders (psoriasis, chronic urticaria, contact allergy, acneiform disorders, hidradenitis suppurativa, and vitiligo) [22].

AID include an extensive spectrum of diseases, since from to brain to the blood and skin, auto immunity aggression might occur. Immunodeficiency comorbidities and complications include infection, chronic lung disease, granulomatous lymphocytic interstitial lung disease, and autoimmune disorders [23]; sleep disturbances and mental disorders are frequently comorbid manifestations. AID, despite the marked diversity share common haplotypes and gut dysbiosis is, among them, a common comorbidity, occurring long before autoimmunity even begins [24].

Low vision, diabetes mellitus, back/neck problems, osteoarthritis, chronic obstructive pulmonary disease (COPD), and cancer are the most prevalent comorbid conditions in the different CVDs [25,26]. In diabetes the most common comorbid disorders are dyslipidaemia, hypertension, Non Alcoholic Fatty Liver Disease, Obesity, Polycystic ovary syndrome and Sleep apnea [27]. Respiratory diseases have as frequent comorbidities obesity, gastroesophageal reflux disease, and allergic rhinitis, sleep disorders, cardiovascular disorders and cancer [28]. For tinnitus again sleep and mental disorders are frequently comorbid [29].

The number of days in lock down was quite similar in the several groups; differences occurred in Rheumatic disorders (loner days in lockdown) and in dermatologic patients (shorter lockdown). The number of days in lockdown had, however, low but significant, canonical correlations with the discriminant function in Chronic pain and AID and dermatologic disorders. The subjective way people was living in lockdown was always slightly worse in the chronic disorder's patients with significant differences in diabetes, respiratory and allergic subgroups, AID, chronic pain and fatigue, tinnitus and dizziness; despite these differences they did not emerge as relevant in discriminant analysis.

Depression, anxiety, irritability and worries were frequently higher in CMD patients. In some disorders all of them (diabetes, chronic pain, fatigue, tinnitus and dizziness), in some others, none of them, such as CVD. However, in discriminant analysis mental health components showed significant correlations with the discriminant function in chronic pain, AID, fatigue, CVD, diabetes and dizziness. These results are in line with two known aspects of mental health, especially in what concerns anxiety and depression: it deteriorates in chronic disorders, and it was negatively impacted during COVID; according to the WHO the COVID-19 pandemic triggered a 25% increase in prevalence of anxiety and depression worldwide [30].

Economic problems were relevant in most disorders and emerged with significant correlations in LDA in chronic pain, fibromyalgia, fatigue and dizziness. According to the World Bank the pandemic introduced "shock waves through the world economy and triggered the largest global economic crisis in more than a century. Studies based on precrisis data suggest, for example, that more than 50 percent of households in emerging and advanced economies were not able to sustain basic consumption for more than three months in the event of income losses. Similarly, the average business could cover fewer than 55 days of expenses with cash reserves" [31]. These negative impacts were strongly felt in Portugal with the EU commission stating that Portuguese GDP was estimated to have fallen by 7.6% in 2020 [32]. Therefore, citizens´ economic problems were expected, but it must be stressed that the most affected were those who complain with pain, fatigue and dizziness, often considered functional symptoms.

The average sleep latency was higher than 30 minutes in both groups and even slightly higher in non-patients; average number of awakenings was close to 3 per night and sleep duration in weekdays was around 6.5 h and a bit higher in weekends 7.5h. This may reflect the global sleep difficulties of the Portuguese adult population with high prevalence of poor sleep [33], short sleep [34], Insomnia [35,36], sleep inducing medication [37,38] and pain-related insomnia [39]. Despite the detailed information concerning sleep habits (into bed and out of bed during weekdays and weekends) and sleep parameters (latency, awakenings and duration) only the quality of both Sleep and Wakening provided significant differences.

COVID impact upon Sleep and Wakening quality of the general population has been described [10]. In all chronic disorders, with exception of CVD and hypertension, Sleep and Wakening quality deteriorated during COVID. One or both, have significant correlations with the discriminant function in Chronic pain, Fibromyalgia, AID, Fatigue, Diabetes, Respiratory diseases, Tinnitus, Allergies and GID.

In Brazil, during the pandemic, there was decreased physical activity, and an increase in symptoms of anxiety and depression and screen time [40]. In Canada avoiding excessive screen time and engaging in exercise, particularly outdoors, were important behaviours associated with better perceived mental and general health during the COVID-19 [41]. In Portugal data concerning physical activity during COVID showed some singularities; it was practised more by males than females, elderly practice more often and more outdoors than younger subjects, those that practise PA between 4 and 10h per week had better pandemic compliance; those with low PA levels had poorer nutrition habits and longer

screen time [42]. A systematic review and metanalysis confirmed an increase screen time during the pandemic in all ages, from children to adults; the associated correlates included adverse dietary behaviours, sleep, mental health, parental health, and eye health [43]. In Portugal identical results were observed in adults in what concerns nutrition, sleep and mental health [44]. Despite both Physical activity and Nutrition being considered, together with Sleep, the pillars of health, they did not differentiate the subgroups of CMD in our sample. Physical activity was not different in the subgroups evaluated. Nutrition was only different in Allergies. No correlations were found in LDA.

Patients with CVD, hypertension and respiratory disorders had a higher cigarette consumption; most patients with CMD had a lower consumption of wine and only beer per day emerged with significant correlations in LDA, negative in CVD and positive in Hypertension. Screen time, mainly for social networks, was higher in several CMD subgroups (Diabetes, Fibromyalgia, Chronic Pain, Fatigue and Dizziness) and they had significant correlations for Chronic Pain (+) and Fibromyalgia (-). The number of Positive attitudes was lower in several patients´ groups, and the number of negative attitudes was significantly lower in many subgroups with exception of diabetes and hypertension, in which it was lower and CVD with no differences. Trauma and violence were significant in respiratory diseases, fatigue, tinnitus and dizziness. Positive doings were lower in fatigue and dizziness, and negative doings were higher in respiratory, allergies, autoimmune, fatigue, dermatologic, tinnitus and dizziness. LDA confirmed in importance of negative attitudes and doings in respiratory, dermatologic, tinnitus. The study limitations concern the subjective not confirmed responses related to internet surveys, but this drawback is compensated by the high number of responses over the entire territory. Another limitation relates to the non-inclusion of gender in discriminant analysis since LDA requires gaussian distributions.

Conclusions

The high prevalence of chronic medical disorders, their association with multiple mental and physical comorbidities, and the consequent health risks and long-term treatment difficulties contribute to their high burden in multiple dimensions: individual, societal, healthcare and economic.

During the pandemic chronic medical disorders were particularly affected. Portugal besides having a higher prevalence of chronic medical disorders, is among the countries which used more strict protective pandemic measures with subsequent quite negative socioeconomic impacts. This country is therefore a good model for studying the differences and similarities of chronic disorders during negative environmental periods.

An ecologic multilevel model of health and disease was used both to collect and to analyse the data [45]. LDA was used to identify differences between 14 chronic disorders. Correct classification of the CMD was achieved for each of them, with percentages ranging from 79.2% in Hypertension to 92% in Fibromyalgia; in all subgroups Lamba Wilks was highly significant; Box M test results were only not significant for diabetes and GID. Comorbidities, Sleep, Mental Health, Work stress, and Attitudes emerged as the most relevant features in CMD. Two complaints´ subgroups, Tinnitus and Dizziness, often discarded due to their non-specificity, presented important relevance among the studied disorders. Future studies are still needed and Recommendations for detailed attention in Public Health services proposed. Two others, CVD and Hypertension, presented some specificities, with higher prevalence of toxics consumption, cigarettes, beer, wine, alcoholic beverages and alcohol dependence, no differences in sleep, in mental symptoms and less work stress before COVID. Taking in consideration the high associated health risks of both specific recommendations dealing with toxic habits is proposed in health literacy programs. Chronic Pain, Fibromyalgia, Autoimmune disorders, Fatigue and CVD had the highest numbers of significant correlations with the discriminant function. It must be stressed that the first four types of disorders are usually associated with subjective symptoms and/or complex clinical presentations. Consequently, these disorders deserve special care in environmental stressing situations. Altogether each CMD deserves a tailored attention, considering and caring the associated specificities.

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