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COVID-19

Chronic migraine in the first COVID-19 lockdown: the impact of sleep, remote working, and other life/psychological changes

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Abstract

Aims The objective of this study was to evaluate the impact of the first Italian COVID-19 lockdown on patients with chronic migraine (CM).

Material and methods The study was based on an e-mail survey addressed to CM patients of our headache center. The survey evaluated demographic, life style, sleep, psychological, and migraine features during the COVID-19 lockdown period and the month before. The outcomes were migraine impact on daily life and variation in attack frequency, attack duration, migraine pain intensity, migraine symptomatic drugs use per week, and efficacy.

Results Ninety-two patients completed the survey. During the lockdown period, attack frequency was stable in 40,2%, increased in 33,7%, and reduced in 26,1% of patients; attack duration was stable in 55,4%, increased in 23,9%, and reduced in 20,7%. Migraine pain was stable or reduced in 65,2% and increased in 34,8%; number of symptomatic drugs per week was stable in 50%, reduced in 29,3%, and increased in 20,7%; migraine drug efficacy was stable in 73,9%, reduced in 17,4%, and increased in 8,7%. Patients had a HIT-6 score of 64,63 ± 8,81. Significant associations were found with remote working, smoke, education, discontinuation of the therapy performed within headache center, migraine familiarity, sleep, anxiety, perceived stress, concern about future, and COVID-19.

Conclusion During the lockdown, approximately half of the patients had a clinical stability, a quarter an improvement, and another quarter a worsening. We identified different migraine-influencing elements; in particular, the remote working could represent an easy way to ameliorate migraineurs' life.

Keywords Chronic migraine · Headache · COVID-19 · Lockdown · Life style · Remote working

Introduction

Migraine represents a social problem with an enormous disability burden, especially in chronic migraine (CM) [1, 2]. It is influenced by life style and habits such as coffee consumption [3, 4], smoke [5], computer, smartphone, and television use [6]. Sleep quality (SQ) [7, 8], depression, anxiety, and stress [4] have also a significant impact.

The COVID-19 pandemic led the governments to introduce a series of restrictive measures referred as "lockdown." Lockdown represented a revolution for life of many people, it was a stressful condition which forced Italians to stay at home limiting human contact, changing the way to live relations and to work in the context of a pandemic which threatened public health and devastated economy.

The aim of the present study was to evaluate the influence of the first COVID-19 lockdown in Italy on CM patients. We investigated the impact of CM on daily life during the lockdown and changes in frequency, attack duration, pain intensity, and drugs between this period and the previous month.

Using COVID-19 lockdown as a unique occasion to acquire new insights into this disease, the study evaluated the influence of social habit, family life, work life, mood, SQ, perceived stress, and future concern on CM patients.

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Methods

The present observational cross-sectional study was based on an e-mail survey addressed to patients suffering from CM followed at our headache center. The survey was an editable file that every patient completed and re-sent to our headache center e-mail. The questionnaire is available on supplementary materials. We also verified and added some migraine information using our headache center archive. The study investigated migraine, sleep, life, and psychological features during the previous month and the Italian COVID-19 lockdown period which went from March 9th, 2020, to May 3rd, 2020. The survey started on April 24th, 2020, and closed on May 3rd, 2020.

Inclusion criteria

Patients were selected according to the following criteria:

- CM diagnosis based on International Classification of Headache Disorders, third edition criteria [9]
- Age ≥ 18 years
- Written informed consent to participate to the study

Survey

The survey consisted of:

- Demographic and life-style module
- Sleep features module
- Psychological module
- Migraine module

Demographic and life-style module consisted of age, gender, educational qualifications, number of son/daughters, age of sons/daughters, COVID-19 province prevalence, size of the house, rent or mortgage to pay, number of people in house, ratio of house size/number of people, living with parents, quality of home-inhabitant relationship, unemployment, work/study stop, remote working (RW), job loss during COVID-19 pandemic, hours of computer use, variation of computer time use, hours of smartphone use, variation of time smartphone use, hours of Internet use, variation of time internet use, hours of television viewing, variation of time television viewing, number of coffee cups, variation of coffee cups, quality variation of nutrition, variation of meal regularity, smoke, variation of smoking habit, times a day to research information about on COVID-19, perceived reduction of noise pollution, and COVID-19 infection.

Sleep features module included the Pittsburgh Sleep Quality Index (PSQI, used to evaluate sleep quality, the score ranges from 0 to 21, a higher score is associated with a worst condition), variation of sleep time duration, perceived variation of SQ, and variation of sleep latency.

Psychological module was composed by Beck Depression Inventory (BDI, measures the severity of depression, score ranges from 0 to 63, a higher score is associated with a worst condition), State-Trait Anxiety Inventory (STAI, evaluates anxiety through two different score, one for the trait anxiety, one for the state anxiety, each one ranges from 20 to 80, and a higher score is associated with a higher anxiety level), variation in perceived anxiety/depression, Perceived Stress scale (PSS, assesses perceived stress, it ranges from 0 to 40, and a higher score is associated with higher stress perception), variation in perceived stress, concern for the future in lockdown, variation of concern for the future, times a day to go outside, and concern for COVID-19.

Migraine module evaluated migraine familiarity, anti-migraine drug overuse story, migraine with aura, age of onset, age of migraine chronification, variation of migraine frequency (increased, reduced, or a stable number of migraine days per month compared to pre-lockdown period), variation of migraine attack duration (increase, reduction, or no change compared to pre-lockdown period), increased migraine pain intensity during lockdown, variation of migraine symptomatic drugs use per week (increase, reduction, unchanged in comparison with previous period), variation of migraine drug efficacy (increase, reduction, unchanged compared to previous period), the six-item headache impact test (HIT-6, provides a global measure of adverse headache impact, the score ranges from 36 to 78, a higher score is associated with a worst condition).

Every patient had an own migraine diary and was asked to respond to frequency, duration, intensity, and symptomatic drug use questions according to it.

Using our headache center archive, we also verified history of anti-migraine drug overuse and evaluated the discontinuation of the therapy performed within the headache center (botulinum toxin or monoclonal antibodies) due to lockdown. It should be noted that only headache centers were authorized to provide monoclonal antibodies acting on the CGRP pathway until the end of July 2020 and our center could not do it during the lockdown period.

Study outcomes

Every collected variable was referred to the following outcomes:

- Migraine impact on daily life (HIT-6)
- Variation of migraine frequency (number of migraine days per month)
- Variation of migraine attack duration
- Increased migraine pain intensity

- Variation of migraine symptomatic drugs use per week
- Variation of migraine drug efficacy

Ethics

The research was conducted ethically in accordance with the World Medical Association Declaration of Helsinki. The study protocol has been approved by the local research institute's committee on human research. All the patients have given their written informed consent.

Statistical analysis

All statistical analyses were performed using R software. Continuous variables were expressed as mean ± standard deviation; categorical variables were expressed as absolute frequencies and percentages. Continuous variables were analyzed by Shapiro–Wilk test to evaluate normal distribution. Mann–Whitney *U* or Student's *t* test for independent samples was used for comparison between categorical variables with two levels and continuous variables as appropriate. ANOVA test or Kruskal–Wallis test was used for comparison between categorical variables with > 2 levels and continuous variables on the basis of normal distribution. The chi-square test was used for comparison between categorical variables. The method of partitioning the degrees of freedom was applied to refuse H_0 hypothesis as appropriate. Spearman's rank or Pearson's correlation coefficient was used for comparison between continuous variables as appropriate.

The multivariate analysis was performed using the multiple logistic regression model. Regarding outcomes with three levels (variation of migraine frequency, variation of migraine attack duration, variation of migraine symptomatic drug use, and variation of migraine drug efficacy), we built two different models. In the first model, "improved" and "no change" categories were unified; in the second model, "worsened" and "no change" categories were unified in order to perform multivariate analysis. A value of $P < 0.05$ was considered significant.

Results

Among 150 chronic migraineurs followed in our headache center, 92 patients accepted to participate in the study.

A migraine familial history was present in 80,4% of respondents. Age of migraine onset was ≤ 18 years in 66,3%. Migraine became chronic at an age ≤ 18 years in 27,2%, between 18 and 30 years in 41,3%, and at an age ≥ 31 years in 31,5%. Aura was present in 8,7% of patients. An anti-migraine drug overuse story was present in 80,4%. Patients had a HIT-6 score of 64,63 ± 8,81.

Migraine attack frequency was stable in 40,2%, increased 33,7%, and reduced in 26,1%; migraine attack duration was stable in 55,4%, increased in 23,9%, and reduced in 20,7% (Fig. 1). Migraine pain was stable or reduced in 65,2% and increased in 34,8%; number of migraine symptomatic drugs per week was stable in 50%, reduced in 29,3%, and increased in 20,7%; migraine drug efficacy was stable in 73,9%, reduced in 17,4%, and increased in 8,7%. Migraine data are reported in Table 1.

Demographic, life style, sleep, and psychological data are reported in Tables 2 and 3.

Influences of demographics, life style, sleep, psychological, and migraine features on migraine outcome

HIT-6

A higher HIT-6 score was associated with low educational qualifications, unemployment, more hours of television viewing, a reduction in meal regularity, worsening in SQ, a

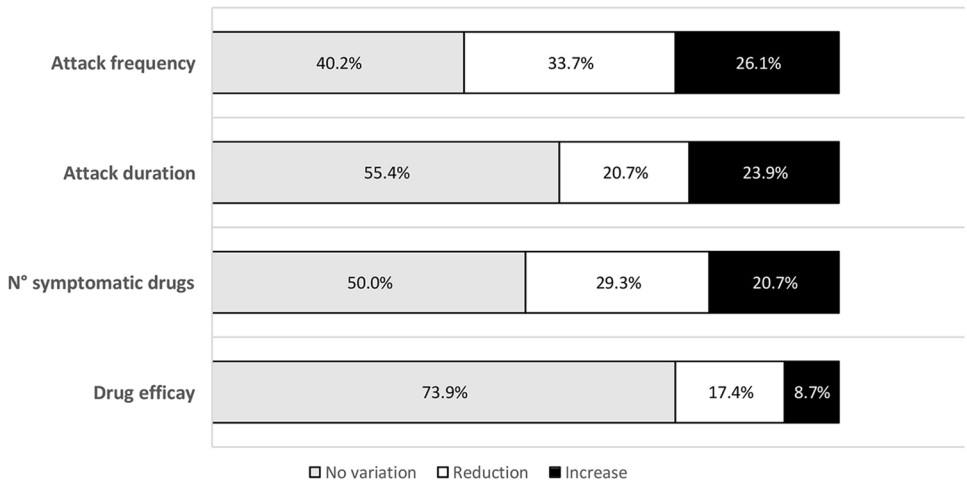

Fig. 1 Chronic migraine changes during lockdown

Table 1 Migraine related data

	N (%)
Familiarity	74 (80,4%)
Age of onset ≤ 18 years	61 (66,3%)
Age of chronification	
≤ 18 years	25 (27,2%)
18–30 years	38 (41,3%)
≥ 31 years	29 (31,5%)
Aura	8 (8,7%)
Migraine drug overuse	74 (80,4%)
Discontinuation of therapy performed within center	13 (14,1%)
	Mean ± DS
HIT-6	64,63 ± 8,81
	N (%)
Attack frequency variation	
No variation	37 (40,2%)
Decrease	24 (26,1%)
Increase	31 (33,7%)
Attack duration change	
No change	51 (55,4%)
Decrease	19 (20,7%)
Increase	22 (23,9%)
Increased pain	32 (34,8%)
Symptomatic drugs per week variation	
No change	46 (50,0%)
Decrease	27 (29,3%)
Increase	19 (20,7%)
Migraine drug efficacy variation	
No change	68 (73,9%)
Decrease	16 (17,4%)
Increase	8 (8,7%)

HIT-6, six-item headache impact test

higher BDI score, worsening in perceived depression/anxiety, a higher State-Trait Anxiety Inventory-State (STAI-S) score, a higher State-Trait Anxiety Inventory-Trait (STAI-T) score and a higher PSS score (Table S1).

On multivariate analysis, only low educational qualification and a higher STAI-T remained significant.

Variation of the number of migraine days per month

An increased migraine attack frequency was associated with smoke, reduced sleep time duration, reduced quality of sleep, increased sleep latency, higher PSQI, higher BDI, worsening in perceived depression/anxiety, increased perceived stress, STAI-S, and STAI-T (Table 4). On multivariate analysis, only smoke and a high STAI-S were associated with increased frequency.

Variation of migraine attack duration

An increased migraine attack duration was associated with a reduction in meal regularity, reduced sleep time duration, reduced quality of sleep, increased sleep latency, worsening in perceived depression/anxiety, a higher PSS score, and increased perceived stress. A reduced migraine attack duration was associated with RW. Both increase and reduction of migraine attack duration were associated with longer internet use time. See Table 4. Multivariate analysis confirmed that the decrease was related with RW and the increment was associated with reduced sleep duration and a higher PSS score.

Variation of migraine pain intensity

An increased migraine pain intensity was associated with lower ratio of house size/number of people, longer smartphone use time, longer internet use time, worsening in meal quality, a reduction in meal regularity, concern for the future, reduced sleep time duration, reduced quality of sleep, higher PSQI score, no migraine familiarity, worsening in perceived depression/anxiety, increased perceived stress, higher BDI score, higher STAI-S score, higher STAI-T score, and higher PSS score (Table 4). Concern for the future, reduced sleep time duration, no migraine familiarity, increased perceived stress, and higher STAI-T score remained significant on multivariate analysis.

Variation of migraine symptomatic drug use per week

An increased migraine symptomatic drugs use per week was associated with discontinuation of the therapy performed within headache center, reduced quality of sleep, worsening in perceived depression/anxiety, increased perceived stress, and higher STAI-S score (Table 5). Only discontinuation of the therapy performed within headache center and STAI-S was confirmed on multivariate analysis.

Variation of migraine drug efficacy

A reduction of migraine drug efficacy was associated with smoke, increased sleep latency, worsening in perceived depression/anxiety, increased perceived stress, higher STAI-S score, and concern for COVID-19. An increased migraine drug efficacy was associated with RW and an improved quality of sleep. Both increase and reduction in migraine drug efficacy were associated with an increase in cigarette consumption. See Table 5. Multivariate analysis showed that the efficacy reduction was associated with smoke, STAI-S, and concern for COVID-19 and that the improvement was related with remote working and improved quality of sleep.

Table 2 Demographic and lifestyle data

	N	(%)
Gender: Female	79	(85,9%)
Age: ≤ 40 years old	39	(42,24%)
Educational qualification		
Primary/secondary school graduation	25	(27,2%)
High school graduation	46	(50%)
Degree/post graduate education	21	(22,8%)
Unemployment		
Yes	32	(34,8%)
No	60	(65,2%)
Stop to work/study	19	(20,7%)
Remote working	20	(21,7%)
Job loss	8	(8,7%)
Home size ≤ 100 sqm	42	(45,7%)
Living with other people	83	(90,2%)
Ratio of house size/number of people ≤ 40 sqm per person	58	(63,0%)
Computer Hours ≥ 5	28	(30,4%)
Variation computer hours		
No variation	43	(46,7%)
Fewer	13	(14,1%)
More	36	(39,1%)
Smartphone hours ≥ 5	23	(25,0%)
Variation smartphone hours		
No variation	29	(31,5%)
Fewer	6	(6,5%)
More	57	(62,0%)
Internet hours ≥ 5	22	(23,9%)
Variation internet hours		
No variation/fewer	44	(47,8%)
More	48	(52,2%)
Television hours ≥ 5	13	(14,1%)
Variation television hours		
No variation /fewer	47	(51,1%)
More	45	(48,9%)
Meal quality		
Same	46	(50,0%)
Worsening	26	(28,3%)
Improvement	20	(21,7%)
Meal regularity		
Same	54	(58,7%)
Worsening	21	(22,8%)
Improvement	17	(18,5%)
Smoker	22	(23,9%)
Smoke variation		
No variation/reduction	77	(83,7%)
Increase	15	(16,3%)
Coffee cups per day		
No	23	(25,0%)
≤ 2	39	(42,4%)
> 3	30	(32,6%)
Coffee consume variation		
No variation	67	(72,8%)

Table 2 (continued)

	N	(%)
Less	11	(12,0%)
More	14	(15,0%)
Sons/daughters		
No sons/daughters	45	(48,9%)
Sons/daughters < 18 years	20	(21,7%)
Rent/mortgage	30	(32,6%)
Home-inhabitant relationship		
Good	41	(44,6%)
Very good	39	(42,4%)
No good	12	(13,0%)
Living with parents	25	(27,2%)
Time to focus on the news about COVID-19 > 2 times a day	35	(38,0%)
COVID-19 province prevalence > 0,0632 cases per population (%)	58	(63,0%)
COVID-19 infection	0	(00,0%)
Going out during the lockdown		
Never	26	(28,3%)
1–2 times a day	52	(56,5%)
3 or more times a day	14	(15,2%)
Reduction in noise pollution	82	(89,1%)

Discussion

During lockdown, our patients responded in a different manner: approximately half had a clinical stability, a quarter had a migraine improvement, and the other quarter a worsening compared to the pre-lockdown month. In detail, the migraine frequency was stable in 40,2%, increased in 26,1%, and reduced in 33,7%; the attack duration was unchanged in 55,4%, increased in 23,9%, and reduced in 20,7%; migraine pain was stable or reduced in 65,2% and intensified in 34,8%. Number of migraine symptomatic drugs per week was the same in 50%, reduced in 29,3%, and increased in 20,7%; migraine drug efficacy was stable in 73,9%, reduced in 17,4%, and increased in 8,7%. Patients had a HIT-6 score of 64,63 ± 8,81.

In the present study, migraine severity and changes in lockdown were associated with several elements: some classical migraine-related factors and others that were never reported in literature.

Low educational qualification (LEQ), a well-known risk factor for CM [9], was associated with higher HIT-6 score suggesting which part of our migraineurs are more vulnerable. Around life style, our smoker patients showed an increased migraine attack frequency and a reduction of migraine drug efficacy. Smoke is, indeed, related in different studies with migraine and constitutes an important headache trigger [5, 10].

Anxiety, perceived stress, and sleep have a significant influence in our patients. High level of anxiety was linked with all examined outcomes. Anxiety disorders are, indeed, very common in migraine, two to five times more prevalent than in the general population, and they are much more common in patients with CM than episodic migraine [11] and were also associated with more severe migraine [12]. The perceived stress in our patients was linked with attack duration and pain intensity. Stress during lockdown, in line with the literature, certainly had a determinant role in our patients' worsening. Stress is a prevalent migraine trigger and it is also considered to exacerbate and maintain migraine [11, 13]. Major life events are related with headache chronification [14] and perceived stress was related with CM in Moon et al. study [15]. Anxiety and perceived stress in migraineurs are important signs of fragility to take into consideration to avoid migraine worsening. We specifically investigated concerns about future and COVID-19: they were associated with pain intensity and reduced drug efficacy, respectively. This was in line with anxiety and stressful status. Regarding sleep, the present study showed that a reduced sleep time duration was related with an increment in migraine attack duration and pain. A sleep quality improvement was also associated with an increased drug efficacy. Sleep is, indeed, another important factor which influences CM: high attack frequency had been related with poor SQ and poor sleepers; CM had been associated with non-restorative sleep, poor sleep habits, short sleep time, and longer sleep latency [16]. Our results reaffirm as sleep has a key role in this disease and is influenced by life changes. The sleep problems, together with anxiety and stress, should be always investigated in migraineurs and treated in collaboration with other professional figures

Table 3 Psychological and sleep related data

	N	(%)
State Anxiety (STAI-S)		
Average anxiety (41–60)	50	(54,3%)
Above average anxiety (61–100)	23	(25,0%)
Below average anxiety (0–40)	19	(20,7%)
Trait Anxiety (STAI-T)		
Average anxiety (41–60)	46	(50%)
Above average anxiety (61–100)	17	(18,5%)
Below average anxiety (0–40)	29	(31,5%)
Depression (BDI)		
Average (0–13)	59	(64,1%)
Moderate (14–28)	24	(26,1%)
Severe (29–63)	9	(9,8%)
Anxiety/depression variation		
No variation	51	(55,4%)
Reduction	9	(9,8%)
Increase	32	(34,8%)
Future concern		
No or low	14	(15,2%)
Medium	45	(48,9%)
High	33	(35,9%)
Future concern increase	54	(58,7%)
COVID-19 concern	76	(82,6%)
Perceived stress (PSS)		
Low	14	(15,2%)
Moderate	57	(62,0%)
High	21	(22,8%)
Stress variation		
No variation	34	(37,0%)
Reduction	13	(14,1%)
Increase	45	(48,9%)
Sleep time variation		
No variation	32	(34,8%)
Reduction	27	(29,3%)
Increase	33	(35,9%)
Sleep quality variation		
No variation	44	(47,8%)
Worsening	35	(38,0%)
Improvement	13	(14,1%)
Sleep latency		
No variation	43	(46,7%)
Reduction	5	(5,4%)
Increase	44	(47,8%)
	Mean ± SD	
PSQI	11,96 ± 5,85	

STAI-S, State-Trait Anxiety Inventory-State; *STAI-T*, State-Trait Anxiety Inventory-Trait; *BDI*, Beck Depression Inventory; *PSS*, Perceived Stress scale; *PSQI*, Pittsburgh Sleep Quality Index

such as sleep specialists, psychologists, and psychiatrists in order to improve patients' quality of life.

A controversial point is the association between no migraine family history and increased pain intensity. Familial predisposition plays an important role in migraine: it was linked with an increased migraine risk and a higher attack frequency in other studies [17]. A possible explanation of our findings could be that no-familial forms are more influenced by external elements and life changes than familial forms. Regarding treatment with botulinum toxin and monoclonal antibodies, it was stopped during the lockdown and our study showed that the discontinuation led to an increase in migraine symptomatic drug consumption. The therapy discontinuation led also a worsening in other outcomes but the small size of the population examined probably did not permit to obtain a statistical significance.

An interesting finding is that RW was associated with reduced migraine attack duration and increased drug efficacy. RW has progressively spread in recent years, but its use is enormously increased during the lockdown due to COVID-19, allowing to maintain different service ensuring the worker safety. No other studies reported a link between RW and migraine, probably because they evaluated mainly migraine frequency. We hypothesize that this improvement could be attributed to the distance from workplace and its stressor, and the possibility to manage time in a different manner. Previous studies indicated time flexibility as a main strong point of RW, and it allows the people to shape the work on the basis of their needs [18]. This is particularly relevant for migraineur who could avoid exposure to factors that could favor, worse, and prolong the migraine attack. RW was associated with better performance, more satisfaction, reduced stress, less absenteeism, and more motivation in several studies [18]. It should be taken in consideration in order to ameliorate the condition of subjects afflicted by chronic migraine that represent a frail class of workers. RW and time flexibility could also increase level of employment in these patients that often give up working because of their condition. Specific studies are needed to evaluate the effect of RW in migraineurs workers and in particular outside of pandemic and lockdown context to verify our findings in normal everyday life.

Several studies evaluated migraine in the COVID-19 period. However, the present investigation is the only one focused on CM patients. The other studies associated migraine changes with sleep disturbance, depression, anxiety, emotional reaction, pandemic risk perception, computer use, eating habits, and physical activity during lockdown [19–27]. It is interesting to observe the different trends in these studies: the majority of Al Hashel et al. patients had a worsening [19]; most patients were stable in Smith et al. study [25]; Delussi et al., Parodi et al., and Verhagen et al. migraineurs had an improvement [20, 21, 26]; and the majority of Dallavalle et al. patients improved or were stable on the basis of pre-lockdown condition [22]. Gentile

Table 4 Analysis of factors associated with attack frequency, duration, and pain variation

		Attack frequency				Attack duration				Migraine pain		
		Same *n* (%)	Decrease *n* (%)	Increase *n* (%)	*P*	Same *n* (%)	Decrease *n* (%)	Increase *n* (%)	*P*	No increase *n* (%)	Increase *n* (%)	*P*
Age (years)	≤40	16 (17,4)	13 (14,1)	10 (10,9)	0,262	19 (20,7)	9 (9,8)	11 (12,0)	0,531	25 (27,2)	14 (15,2)	0,847
	>40	21 (22,8)	11 (12,0)	21 (22,8)		32 (34,8)	10 (10,9)	11 (12,0)		35 (38,0)	18 (19,6)	
Gender	Female	33 (35,9)	20 (21,7)	26 (28,2)	0,754	44 (47,8)	17 (18,5)	18 (19,6)	0,776	50 (54,3)	29 (31,5)	0,339
	Male	4 (4,3)	4 (4,3)	5 (5,4)		7 (7,6)	2 (2,2)	4 (4,3)		10 (10,9)	3 (3,3)	
Educational qualification	Primary/Secondary school	10 (10,9)	4 (4,3)	11 (12,0)	0,073	15 (16,3)	3 (3,3)	7 (7,6)	0,145	15 (16,3)	10 (10,9)	0,080
	High school	17 (18,4)	11 (12,0)	18 (19,6)		22 (23,9)	10 (10,9)	14 (15,2)		27 (29,3)	19 (20,7)	
	Degree/Post graduate	10 (10,9)	9 (9,8)	2 (2,2)		14 (15,2)	6 (6,5)	1 (1,1)		18 (19,6)	3 (3,3)	
Sons	None	20 (21,7)	11 (12,0)	14 (15,2)	0,720	25 (27,2)	8 (8,7)	12 (13,0)	0,729	32 (34,8)	13 (14,1)	0,245
	1 or more	17 (18,5)	13 (14,1)	17 (18,5)		26 (28,2)	11 (12,0)	10 (10,9)		28 (30,4)	19 (20,7)	
Son age	No sons	20 (21,7)	11 (12,0)	14 (15,2)	0,491	25 (27,2)	8 (8,7)	12 (13,0)	0,692	32 (34,8)	12 (13,0)	0,434
	At least 1 son ≤ 18	6 (6,5)	8 (8,7)	6 (6,5)		9 (9,8)	6 (6,5)	5 (5,4)		11 (12,0)	9 (9,8)	
	Only son ≥ 18	11 (12,0)	5 (5,4)	11 (12,0)		17 (18,5)	5 (5,4)	5 (5,4)		17 (18,5)	10 (10,9)	
COVID-19 province prevalence*	<0,0632%	16 (17,4)	7 (7,6)	11 (12,0)	0,527	21 (22,8)	5 (5,4)	8 (8,7)	0,518	21 (22,8)	13 (14,1)	0,594
	≥0,0632%	21 (22,8)	17 (18,5)	20 (21,7)		30 (32,6)	14 (15,2)	14 (15,2)		39 (42,4)	19 (20,7)	
House size (square meters)	≤100	18 (19,6)	9 (9,8)	15 (16,3)	0,647	22 (23,9)	9 (9,8)	11 (12,0)	0,852	24 (26,1)	18 (19,6)	0,136
	>100	19 (20,7)	15 (16,3)	16 (17,4)		29 (31,5)	10 (10,9)	11 (12,0)		36 (39,1)	14 (15,2)	
Rent/mortgage	No	27 (29,3)	16 (17,4)	19 (20,7)	0,590	33 (35,9)	16 (17,4)	13 (14,1)	0,192	44 (47,8)	18 (19,6)	0,096
	Yes	10 (10,9)	8 (8,7)	12 (13,0)		18 (19,6)	3 (3,3)	9 (9,8)		16 (17,4)	14 (15,2)	
Living with other people	No	3 (3,3)	2 (2,2)	4 (4,3)	0,772	6 (6,5)	2 (2,2)	1 (1,1)	0,630	8 (8,7)	1 (1,1)	0,116
	Yes	34 (37,0)	22 (23,9)	27 (29,3)		45 (48,9)	17 (18,5)	21 (22,8)		52 (56,5)	31 (33,7)	
Ratio of house size/ number of people£	≤40	24 (26,1)	13 (14,1)	21 (22,8)	0,560	30 (32,6)	12 (13,0)	16 (17,4)	0,529	33 (35,9)	25 (27,2)	<0,029
	>40	13 (14,1)	11 (12,0)	10 (10,9)		21 (22,8)	7 (7,6)	6 (6,5)		27 (29,3)	7 (7,6)	
Living with parents	No	23 (25,0)	19 (20,7)	25 (27,2)	0,168	40 (43,5)	14 (15,2)	13 (14,1)	0,233	44 (47,8)	23 (25,0)	0,881
	Yes	14 (15,2)	5 (5,4)	6 (6,5)		11 (12,0)	5 (5,4)	9 (9,8)		16 (17,4)	9 (9,8)	
Home-inhabitant relationship	No good	5 (5,4)	2 (2,2)	5 (5,4)	0,715	7 (7,6)	3 (3,3)	2 (2,2)	0,556	8 (8,7)	4 (4,3)	0,458
	Good	18 (19,6)	9 (9,8)	14 (15,2)		19 (20,7)	10 (10,9)	12 (13,0)		24 (26,1)	17 (18,5)	
	Very good	14 (15,2)	13 (14,1)	12 (13,0)		25 (27,2)	6 (6,5)	8 (8,7)		28 (30,4)	11 (12,0)	
Unemployment	No	25 (27,2)	17 (18,5)	18 (19,6)	0,570	34 (37,0)	13 (14,1)	13 (14,1)	0,780	42 (45,7)	18 (19,6)	0,187
	Yes	12 (13,0)	7 (7,6)	13 (14,1)		17 (18,5)	6 (6,5)	9 (9,8)		18 (19,6)	14 (15,2)	
Stop to work/study	No	32 (34,8)	17 (18,5)	24 (26,1)	0,319	38 (41,3)	18 (19,6)	17 (18,5)	0,171	49 (53,3)	24 (26,1)	0,452
	Yes	5 (5,4)	7 (7,6)	7 (7,6)		13 (14,1)	1 (1,1)	5 (5,4)		11 (12,0)	8 (8,7)	
Remote working	No	28 (30,4)	18 (19,6)	25 (27,2)	0,648	44 (47,8)	10 (10,9)	18 (19,6)	<0,009	44 (47,8)	28 (30,4)	0,117
	Yes	9 (9,8)	6 (6,5)	5 (5,4)		7 (7,6)	9 (9,8)	4 (4,3)		16 (17,4)	4 (4,3)	

Table 4 (continued)

		Attack frequency				Attack duration				Migraine pain		
		Same *n* (%)	Decrease *n* (%)	Increase *n* (%)	*P*	Same *n* (%)	Decrease *n* (%)	Increase *n* (%)	*P*	No increase *n* (%)	Increase *n* (%)	*P*
Job loss	No	35 (38,0)	20 (21,7)	29 (31,5)	0,270	47 (51,1)	18 (19,6)	19 (20,7)	0,503	55 (59,8)	29 (31,5)	0,866
	Yes	2 (2,2)	4 (4,3)	2 (2,2)		4 (4,3)	1 (1,1)	3 (3,3)		5 (5,4)	3 (3,3)	
Computer hours	< 5	27 (29,3)	18 (19,6)	19 (20,7)	0,463	39 (42,4)	12 (13,0)	13 (14,1)	0,265	45 (48,9)	19 (20,7)	0,121
	≥ 5	10 (10,9)	6 (6,5)	12 (13,0)		12 (13,0)	7 (7,6)	9 (9,8)		15 (16,3)	13 (14,1)	
Computer hours variation	No variation	19 (20,7)	10 (10,9)	14 (15,2)	0,311	30 (32,6)	5 (5,4)	16 (17,4)	0,086	28 (30,4)	15 (16,3)	0,239
	Fewer	2 (2,2)	6 (6,5)	5 (5,4)		5 (5,4)	3 (3,3)	5 (5,4)		6 (6,5)	7 (7,6)	
	More	16 (17,4)	8 (8,7)	12 (13,0)		16 (17,4)	11 (12,0)	9 (9,8)		26 (28,3)	10 (10,9)	
Smartphone hours	< 5	28 (30,4)	19 (20,7)	22 (23,9)	0,779	41 (44,6)	14 (15,2)	14 (15,2)	0,313	49 (53,3)	20 (21,7)	< 0,043
	≥ 5	9 (9,8)	5 (5,4)	9 (9,8)		10 (10,9)	5 (5,4)	8 (8,7)		11 (12,0)	12 (13,0)	
Smartphone hours variation	No variation	14 (15,2)	6 (6,5)	9 (9,8)	0,688	17 (18,5)	6 (6,5)	6 (6,5)	0,536	19 (20,7)	10 (10,9)	0,614
	Fewer	3 (3,3)	2 (2,2)	1 (1,1)		5 (5,4)	1 (1,1)	0 (0,0)		5 (5,4)	1 (1,1)	
	More	20 (21,7)	16 (17,4)	21 (22,8)		29 (31,5)	12 (13,0)	16 (17,4)		36 (39,1)	21 (22,8)	
Internet hours	< 5	30 (32,6)	17 (18,5)	23 (25,0)	0,627	44 (47,8)	12 (13,0)	14 (15,2)	< 0,038	51 (55,4)	19 (20,7)	< 0,006
	≥ 5	7 (7,6)	7 (7,6)	8 (8,7)		7 (7,6)	7 (7,6)	8 (8,7)		9 (9,8)	13 (14,1)	
Internet hours variation	No variation or fewer	18 (19,6)	13 (14,1)	13 (14,1)	0,661	26 (28,3)	10 (10,9)	8 (8,7)	0,464	31 (33,7)	13 (14,1)	0,313
	More	19 (20,7)	11 (12,0)	18 (19,6)		25 (27,2)	9 (9,8)	14 (15,2)		29 (31,5)	19 (20,7)	
Television hours	< 5	31 (33,7)	20 (21,7)	28 (30,4)	0,682	44 (47,8)	17 (18,5)	18 (19,6)	0,779	53 (57,6)	26 (28,3)	0,353
	≥ 5	6 (6,5)	4 (4,3)	3 (3,3)		7 (7,6)	2 (2,2)	4 (4,3)		7 (7,6)	6 (6,5)	
Television hours variation	No variation or fewer	19 (20,7)	13 (14,1)	15 (16,3)	0,913	27 (29,3)	11 (12,0)	9 (9,8)	0,513	33 (35,9)	14 (15,2)	0,304
	More	18 (19,6)	11 (12,0)	16 (17,4)		24 (26,1)	8 (8,7)	13 (14,1)		27 (29,3)	18 (19,6)	
Coffee (cups per day)	No	8 (8,7)	7 (7,6)	8 (8,7)	0,400	11 (12,0)	4 (4,3)	8 (8,7)	0,467	13 (14,1)	10 (10,9)	0,459
	≤ 2	15 (16,3)	13 (14,1)	11 (12,0)		23 (25,0)	10 (10,9)	6 (6,5)		28 (30,4)	11 (12,0)	
	> 2	14 (15,2)	4 (4,3)	12 (13,0)		17 (18,5)	5 (5,4)	8 (8,7)		19 (20,7)	11 (12,0)	
Coffee consume variation	No variation	26 (28,3)	18 (19,6)	23 (25,0)	0,953	41 (44,6)	13 (14,1)	13 (14,1)	0,419	47 (51,1)	20 (21,7)	0,221
	Less	4 (4,3)	3 (3,3)	4 (4,3)		4 (4,3)	3 (3,3)	4 (4,3)		5 (5,4)	6 (6,5)	
	More	7 (7,6)	3 (3,3)	4 (4,3)		6 (6,5)	3 (3,3)	5 (5,4)		8 (8,7)	6 (6,5)	
Meal quality	Same	19 (20,7)	14 (15,2)	13 (14,1)	0,297	29 (31,5)	10 (10,9)	7 (7,6)	0,130	42 (45,7)	12 (13,0)	< 0,002
	Worsening	11 (12,0)	3 (3,3)	12 (13,0)		11 (12,0)	4 (4,3)	11 (12,0)		8 (8,7)	13 (14,1)	
	Improvement	7 (7,6)	7 (7,6)	6 (6,5)		11 (12,0)	5 (5,4)	4 (4,3)		10 (10,9)	7 (7,6)	
Meal regularity	Same	22 (23,9)	17 (18,5)	15 (16,3)	0,466	34 (37,0)	12 (13,0)	8 (8,7)	< 0,052	42 (45,7)	12 (13,0)	< 0,004
	Worsening	8 (8,7)	3 (3,3)	10 (10,9)		7 (7,6)	4 (4,3)	10 (10,9)		8 (8,7)	13 (14,1)	
	Improvement	7 (7,6)	4 (4,3)	6 (6,5)		10 (10,9)	3 (3,3)	4 (4,3)		10 (10,9)	7 (7,6)	

Table 4 (continued)

		Attack frequency				Attack duration				Migraine pain		
		Same *n* (%)	Decrease *n* (%)	Increase *n* (%)	*P*	Same *n* (%)	Decrease *n* (%)	Increase *n* (%)	*P*	No increase *n* (%)	Increase *n* (%)	*P*
Smoke	No	33 (35,9)	18 (19,6)	19 (20,7)	<0,027	40 (43,5)	15 (16,3)	15 (16,3)	0,608	47 (51,1)	23 (25,0)	0,489
	Yes	4 (4,3)	6 (6,5)	12 (13,0)		11 (12,0)	4 (4,3)	7 (7,6)		13 (14,1)	9 (9,8)	
Smoke variation	No variation or reduction	35 (38,0)	18 (19,6)	24 (26,1)	0,066	43 (46,7)	15 (16,3)	19 (20,7)	0,801	51 (55,4)	28 (30,4)	0,643
	More	2 (2,2)	6 (6,5)	7 (7,6)		8 (8,7)	4 (4,3)	3 (3,3)		9 (9,8)	8 (8,7)	
Time to focus on COVID-19 news	≤2 a day	24 (26,1)	18 (19,6)	15 (16,3)	0,117	33 (35,9)	11 (12,0)	13 (14,1)	0,830	40 (43,5)	17 (18,5)	0,203
	>2 a day	13 (14,1)	6 (6,5)	16 (17,4)		18 (19,6)	8 (8,7)	9 (9,8)		20 (21,7)	15 (16,3)	
Going out during quarantine	Never	10 (10,9)	6 (6,5)	10 (10,9)	0,364	12 (13,0)	7 (7,6)	7 (7,7)	0,382	15 (16,3)	11 (12,0)	0,599
	≤2 times a day	19 (20,7)	17 (18,5)	16 (17,4)		28 (30,4)	11 (12,0)	13 (14,1)		36 (39,1)	16 (17,4)	
	>2 times a day	8 (8,7)	1 (1,1)	5 (5,4)		11 (12,0)	1 (1,1)	2 (2,2)		9 (9,8)	5 (5,4)	
Noise pollution reduction	No	4 (4,3)	2 (2,2)	4 (4,3)	0,864	3 (3,3)	3 (3,3)	4 (4,3)	0,223	5 (5,4)	5 (5,4)	0,285
	Yes	33 (35,9)	22 (23,9)	27 (29,3)		48 (52,2)	16 (17,4)	18 (19,6)		55 (59,8)	27 (29,3)	
Sleep time variation	No variation	19 (20,7)	7 (7,6)	6 (6,5)	<0,001	25 (27,2)	6 (6,5)	1 (1,1)	<0,001	27 (30,4)	5 (5,4)	<0,002
	Reduction	7 (7,6)	2 (2,2)	18 (20,7)		10 (10,9)	2 (2,2)	15 (16,3)		11 (12,0)	16 (17,4)	
	Increase	11 (12,0)	15 (16,3)	7 (7,6)		16 (17,4)	11 (12,0)	6 (6,5)		22 (23,9)	11 (12,0)	
Sleep quality variation	No variation	23 (25,0)	12 (13,0)	9 (9,8)	<0,001	28 (30,4)	10 (10,9)	6 (6,5)	<0,001	35 (38,0)	9 (9,8)	<0,001
	Worsening	10 (10,9)	4 (4,3)	21 (22,8)		17 (18,5)	2 (2,2)	16 (17,4)		14 (15,2)	21 (22,8)	
	Improvement	4 (4,3)	8 (8,7)	1 (1,1)		6 (6,5)	7 (7,6)	0 (0,0)		11 (12,0)	2 (2,2)	
Sleep latency	No variation	23 (25,0)	8 (8,7)	12 (13,0)	<0,001	26 (28,3)	8 (8,7)	9 (9,8)	<0,015	30 (31,5)	13 (14,1)	0,449
	Reduction	0 (0,0)	5 (5,4)	0 (0,0)		1 (1,1)	4 (4,3)	0 (0,0)		4 (4,3)	1 (1,1)	
	Increase	14 (15,2)	11 (12,0)	19 (20,7)		24 (26,1)	7 (7,6)	13 (14,1)		26 (28,3)	18 (19,6)	
Migraine family history	No	4 (4,3)	5 (5,4)	9 (9,8)	0,166	8 (8,7)	2 (2,2)	8 (8,7)	0,067	8 (8,7)	10 (10,9)	<0,039
	Yes	33 (35,9)	19 (20,7)	22 (23,9)		43 (46,7)	17 (18,5)	14 (15,2)		52 (56,5)	22 (23,9)	
Migraine drug overuse	No	9 (9,8)	7 (7,6)	2 (2,2)	0,070	9 (9,8)	4 (4,3)	5 (5,4)	0,867	12 (13,0)	6 (6,5)	0.886
	Yes	28 (30,4)	17 (18,5)	29 (31,5)		42 (45,7)	15 (16,3)	17 (18,5)		48 (52,2)	26 (28,3)	
Aura	No	33 (35,9)	23 (25,0)	28 (30,4)	0,649	47 (51,1)	16 (17,4)	21 (22,8)	0,421	54 (58,7)	30 (32,6)	0,543
	Yes	4 (4,3)	1 (1,1)	3 (3,3)		4 (4,3)	3 (3,3)	1 (1,1)		6 (6,5)	2 (2,2)	
Age of migraine onset (years)	≤18	25 (27,2)	16 (17,4)	20 (21,7)	0,966	36 (39,1)	12 (13,0)	13 (14,1)	0,602	40 (43,5)	21 (22,8)	0,920
	>18	12 (13,0)	8 (8,7)	11 (12,0)		15 (16,3)	7 (7,6)	9 (9,8)		20 (21,7)	11 (12,0)	
Age of migraine chronification (years)	≤18	12 (13,0)	8 (8,7)	5 (5,4)	0,191	15 (16,3)	7 (7,6)	3 (3,3)	0,508	18 (19,6)	7 (7,6)	0,243
	19–30	15 (16,3)	6 (6,5)	17 (18,5)		21 (22,8)	6 (6,5)	11 (12,0)		21 (22,8)	17 (18,5)	
	≥31	10 (10,9)	10 (10,9)	9 (9,8)		15 (16,3)	6 (6,5)	8 (8,7)		21 (22,8)	8 (8,7)	

Table 4 (continued)

		Attack frequency				Attack duration				Migraine pain		
		Same *n* (%)	Decrease *n* (%)	Increase *n* (%)	*P*	Same *n* (%)	Decrease *n* (%)	Increase *n* (%)	*P*	No increase *n* (%)	Increase *n* (%)	*P*
Discontinuation of therapy performed within center	No	34 (37,0)	21 (22,8)	24 (26,1)	0,225	45 (48,9)	17 (18,5)	17 (18,5)	0,411	53 (57,6)	26 (28,3)	0,353
	Yes	3 (3,3)	3 (3,3)	7 (7,6)		6 (6,5)	2 (2,2)	5 (5,4)		7 (7,6)	6 (6,5)	
Depression (BDI)	Average (0–13)	23 (25,0)	21 (22,8)	15 (16,3)	< 0,029	35 (38,0)	13 (14,1)	11 (12,0)	0,355	46 (50,0)	13 (14,1)	< 0,003
	Moderate (14–28)	10 (10,9)	1 (1,1)	13 (14,1)		13 (14,1)	3 (3,3)	8 (8,7)		10 (10,9)	14 (15,2)	
	Severe (29–63)	4 (4,3)	2 (2,2)	3 (3,3)		3 (3,3)	3 (3,3)	3 (3,3)		4 (4,3)	5 (5,4)	
Stata Anxiety (STAI-S)	Below average (0–39)	9 (9,8)	9 (9,8)	1 (1,1)	< 0,003	13 (14,1)	4 (4,3)	2 (2,2)	0,150	18 (19,6)	1 (1,1)	< 0,001
	Average (40–60)	19 (20,7)	14 (15,2)	17 (18,5)		26 (28,3)	13 (14,1)	11 (12,0)		34 (37,0)	16 (17,4)	
	Above average (61–100)	9 (9,8)	1 (1,1)	13 (14,1)		12 (13,0)	2 (2,2)	9 (9,8)		8 (8,7)	15 (16,3)	
Trait Anxiety (STAI-T)	Below average (0–39)	12 (13,0)	13 (14,1)	4 (4,3)	< 0,012	18 (19,6)	7 (7,6)	4 (4,3)	0,584	26 (28,3)	3 (3,3)	< 0,002
	Average (40–60)	16 (17,4)	10 (10,9)	20 (21,7)		23 (25,0)	9 (9,8)	14 (15,2)		27 (29,3)	19 (20,7)	
	Above average (61–100)	9 (9,8)	1 (1,1)	7 (7,6)		10 (10,9)	3 (3,3)	4 (4,3)		7 (7,6)	10 (10,9)	
Anxiety/depression variation	No variation	24 (26,1)	14 (15,2)	13 (14,1)	< 0,006	35 (38,0)	7 (7,6)	9 (9,8)	< 0,001	40 (43,5)	11 (12,0)	< 0,001
	Reduction	1 (1,1)	6 (6,5)	2 (2,2)		1 (1,1)	7 (7,6)	1 (1,1)		7 (7,6)	2 (2,2)	
	Increase	12 (13,0)	4 (4,3)	16 (17,4)		15 (16,3)	5 (5,4)	12 (13,0)		13 (14,1)	19 (20,7)	
Perceived stress (PSS)	Low	7 (7,6)	4 (4,3)	3 (3,3)	0,077	9 (9,8)	3 (3,3)	2 (2,2)	< 0,009	13 (14,1)	1 (1,1)	< 0,001
	Moderate	21 (22,8)	19 (20,7)	17 (18,5)		33 (35,9)	15 (16,3)	9 (9,8)		41 (44,6)	16 (17,4)	
	High	9 (9,8)	1 (1,1)	11 (12,0)		9 (9,8)	1 (1,1)	11 (12,0)		6 (6,5)	15 (16,3)	
Perceived stress variation	No variation	17 (18,5)	10 (10,9)	7 (7,6)	< 0.002	24 (26,1)	6 (6,5)	4 (4,3)	< 0,001	32 (34,8)	2 (2,2)	< 0,001
	Reduction	1 (1,1)	8 (8,7)	4 (4,3)		4 (4,3)	7 (7,6)	2 (2,2)		9 (9,8)	4 (4,3)	
	Increase	19 (20,7)	6 (6,5)	20 (21,7)		23 (25,0)	6 (6,5)	16 (17,4)		19 (20,7)	26 (28,3)	
Future concern	No or low	7 (7,6)	5 (5,4)	2 (2,2)	0,333	10 (10,9)	2 (2,2)	2 (2,2)	0,209	13 (14,1)	1 (1,1)	< 0,001
	Medium	19 (20,7)	12 (13,0)	14 (15,2)		25 (27,2)	12 (13,0)	8 (8,7)		33 (35,9)	12 (13,0)	
	High	11 (12,0)	7 (7,6)	15 (16,3)		16 (17,4)	5 (5,4)	12 (13,0)		14 (15,2)	19 (20,7)	
Future concern variation	No variation or reduction	17 (18,5)	12 (13,0)	9 (9,8)	0,223	23 (25)	8 (8,7)	7 (7,6)	0,570	29 (31,5)	9 (9,8)	0,061
	Increase	20 (21,7)	12 (13,0)	22 (23,9)		28 (30,4)	11 (12,0)	15 (16,3)		31 (33,7)	23 (25,0)	
COVID-19 concern	No	5 (5,4)	4 (4,3)	7 (7,6)	0,614	7 (7,6)	3 (3,3)	6 (6,5)	0,367	56 (60,9)	32 (34,8)	0,135
	Yes	32 (34,8)	20 (21,7)	24 (26,1)		44 (47,8)	16 (17,4)	16 (17,4)		4 (4,3)	0 (0,0)	
PSQI	Means ± standard deviation	11,95 ± 5,75	9,79 ± 5,31	13,70 ± 5,98	0,049	11,78 ± 5,68	12,11 ± 6,29	12,24 ± 6,12	0,950	11,03 ± 5,40	13,74 ± 6,35	0,036

*Cases per population; £ square meters per person, *STAI-S*, State-Trait Anxiety Inventory-State; *STAI-T*, State-Trait Anxiety Inventory-Trait; *BDI*, Beck Depression Inventory; *PSS*, Perceived Stress scale; *PSQI*, Pittsburgh Sleep Quality Index

Table 5 Symptomatic drugs per week and efficacy variation between previous month and lockdown

		Symptomatic drugs per week				Migraine drug efficacy			
		No change *n* (%)	Decrease *n* (%)	Increase *n* (%)	*P*	No change *n* (%)	Decrease *n* (%)	Increase *n* (%)	*P*
Age (years)	≤ 40	18 (19,6)	15 (16,3)	6 (6,5)	0,220	29 (31,5)	7 (7,6)	3 (3,3)	0,955
	> 40	28 (30,4)	12 (13,0)	13 (14,1)		39 (42,4)	9 (9,8)	5 (5,4)	
Gender	Female	37 (40,2)	25 (27,2)	17 (18,5)	0,312	58 (63,0)	14 (15,2)	7 (7,6)	0,965
	Male	9 (9,8)	2 (2,2)	2 (2,2)		10 (10,9)	2 (2,2)	1 (1,1)	
Educational qualification	Primary/Secondary school	16 (17,4)	3 (3,3)	6 (6,5)	0,201	20 (21,7)	4 (4,3)	1 (1,1)	0,146
	High School	21 (22,8)	15 (16,3)	10 (10,9)		32 (34,8)	11 (12,0)	3 (3,3)	
	Degree/Post Graduate	9 (9,8)	9 (9,8)	3 (3,3)		16 (17,4)	1 (1,1)	4 (4,3)	
Sons	None	26 (28,3)	14 (15,2)	5 (5,4)	0,080	35 (38,0)	7 (7,6)	3 (3,3)	0,682
	1 or more	20 (21,7)	13 (14,1)	14 (15,2)		33 (35,9)	9 (9,8)	5 (5,4)	
Son age	No sons	26 (28,3)	14 (15,2)	5 (5,4)	0,193	35 (38,0)	7 (7,6)	3 (3,3)	0,290
	At least 1 son ≤ 18	7 (7,6)	7 (7,6)	6 (6,5)		11 (12,0)	6 (6,5)	3 (3,3)	
	Only son ≥ 18	13 (14,1)	6 (6,5)	8 (8,7)		22 (23,9)	3 (3,3)	2 (2,2)	
COVID-19 province prevalence*	< 0,0632%	19 (20,7)	9 (9,8)	6 (6,5)	0,683	26 (28,3)	6 (6,5)	2 (2,2)	0,763
	≥ 0,0632%	27 (29,3)	18 (19,6)	13 (14,1)		42 (45,7)	10 (10,9)	6 (6,5)	
House size (square meters)	≤ 100	20 (21,7)	15 (16,3)	7 (7,6)	0,417	31 (33,7)	8 (8,7)	3 (3,3)	0,854
	> 100	26 (28,3)	12 (13,0)	12 (13,0)		37 (40,2)	8 (8,7)	5 (5,4)	
Rent/mortgage	No	34 (37,0)	17 (18,5)	11 (12,0)	0,385	48 (52,2)	8 (8,7)	6 (6,5)	0,255
	Yes	12 (13,0)	10 (10,9)	8 (8,7)		20 (21,7)	8 (8,7)	2 (2,2)	
Living with other people	No	5 (5,4)	3 (3,3)	1 (1,1)	0,758	7 (7,6)	2 (2,2)	0 (0,0)	0,600
	Yes	41 (44,6)	24 (26,1)	18 (19,6)		61 (66,3)	14 (15,2)	8 (8,7)	
Ratio of house size/number of people[£]	≤ 40	28 (30,4)	17 (18,5)	13 (14,1)	0,848	44 (47,8)	11 (12,0)	3 (3,3)	0,280
	> 40	18 (19,6)	10 (10,9)	6 (6,5)		24 (26,1)	5 (5,4)	5 (5,4)	
Living with parents	No	30 (32,6)	22 (23,9)	15 (16,3)	0,256	46 (50,0)	13 (14,1)	8 (8,7)	0,106
	Yes	16 (17,4)	5 (5,4)	4 (4,3)		22 (23,9)	3 (3,3)	0 (0,0)	
Home-inhabitant relationship	No good	6 (6,5)	3 (3,3)	3 (3,3)	0,730	10 (10,9)	2 (2,2)	0 (0,0)	0,757
	Good	19 (20,7)	15 (16,3)	7 (7,6)		31 (33,7)	6 (6,5)	4 (4,3)	
	Very good	21 (22,8)	9 (9,8)	9 (9,8)		27 (29,3)	8 (8,7)	4 (4,3)	
Unemployment	No	29 (31,5)	19 (20,7)	12 (13,0)	0,800	45 (48,9)	8 (8,7)	7 (7,6)	0,182
	Yes	17 (18,5)	8 (8,7)	7 (7,6)		23 (25,0)	8 (8,7)	1 (1,1)	
Stop to work/study	No	35 (38,0)	21 (22,8)	17 (18,5)	0,466	52 (56,5)	14 (15,2)	7 (7,6)	0,518
	Yes	11 (12,0)	6 (6,5)	2 (2,2)		16 (17,4)	2 (2,2)	1 (1,1)	
Remote working	No	38 (41,3)	19 (20,7)	15 (16,3)	0,471	55 (59,8)	14 (15,2)	3 (3,3)	< 0,012
	Yes	8 (8,7)	8 (8,7)	4 (4,3)		13 (14,1)	2 (2,2)	5 (5,4)	
Job loss	No	43 (46,7)	23 (25,0)	18 (19,6)	0,401	61 (66,3)	15 (16,3)	8 (8,7)	0,577
	Yes	3 (3,3)	4 (4,3)	1 (1,1)		7 (7,6)	1 (1,1)	0 (0,0)	
Computer hours	< 5	35 (38,0)	18 (19,6)	11 (12,0)	0,324	46 (50,0)	13 (14,1)	5 (5,4)	0,512
	≥ 5	11 (12,0)	9 (9,8)	8 (8,7)		22 (23,9)	3 (3,3)	3 (3,3)	
Computer hours variation	No variation	22 (23,9)	9 (9,8)	12 (13,0)	0,270	33 (35,9)	9 (9,8)	1 (1,1)	0,086
	Fewer	8 (8,7)	4 (4,3)	1 (1,1)		10 (10,9)	0 (0,0)	3 (3,3)	
	More	16 (17,4)	14 (15,2)	6 (6,5)		25 (27,2)	7 (7,6)	4 (4,3)	
Smartphone hours	< 5	38 (41,3)	18 (19,6)	13 (14,1)	0,239	52 (56,5)	11 (12,0)	6 (6,5)	0,814
	≥ 5	8 (8,7)	9 (9,8)	6 (6,5)		16 (17,4)	5 (5,4)	2 (2,2)	
Smartphone hours variation	No variation	12 (13,0)	11 (12,0)	6 (6,5)	0,712	22 (23,9)	6 (6,5)	1 (1,1)	0,754
	Fewer	4 (4,3)	1 (1,1)	1 (1,1)		4 (4,3)	1 (1,1)	1 (1,1)	
	More	30 (32,6)	15 (16,3)	12 (13,0)		42 (45,7)	9 (9,8)	6 (6,5)	

Table 5 (continued)

		Symptomatic drugs per week				Migraine drug efficacy			
		No change *n* (%)	Decrease *n* (%)	Increase *n* (%)	*P*	No change *n* (%)	Decrease *n* (%)	Increase *n* (%)	*P*
Internet hours	< 5	39 (42,4)	18 (19,6)	13 (14,1)	0,146	53 (57,6)	12 (13,0)	5 (5,4)	0,622
	≥ 5	7 (7,6)	9 (9,8)	6 (6,5)		15 (16,3)	4 (4,3)	3 (3,3)	
Internet hours variation	No variation or fewer	19 (20,7)	16 (17,4)	9 (9,8)	0,333	31 (33,7)	7 (7,6)	6 (6,5)	0,271
	More	27 (29,3)	11 (12,0)	10 (10,9)		37 (40,2)	9 (9,8)	2 (2,2)	
Television hours	< 5	38 (41,3)	24 (26,1)	17 (18,5)	0,667	58 (63,0)	13 (14,1)	8 (8,7)	0,446
	≥ 5	8 (8,7)	3 (3,3)	2 (2,2)		10 (10,9)	3 (3,3)	0 (0,0)	
Television hours variation	No variation or fewer	21 (22,8)	17 (18,5)	9 (9,8)	0,337	36 (39,1)	6 (6,5)	5 (5,4)	0,429
	More	25 (27,2)	10 (10,9)	10 (10,9)		32 (34,8)	10 (10,9)	3 (3,3)	
Coffee (cups per day)	No	13 (14,1)	6 (6,5)	4 (4,3)	0,714	17 (18,5)	6 (6,5)	0 (0,0)	0,171
	≤ 2	18 (19,6)	14 (15,2)	7 (7,6)		29 (31,5)	4 (4,3)	6 (6,5)	
	> 2	15 (16,3)	7 (7,6)	8 (8,7)		22 (23,9)	6 (6,5)	2 (2,2)	
Coffee consume variation	No variation	34 (37,0)	18 (19,6)	15 (16,3)	0,721	52 (56,5)	11 (12,0)	4 (4,3)	0,457
	Less	4 (4,3)	5 (5,4)	2 (2,2)		6 (6,5)	3 (3,3)	2 (2,2)	
	More	8 (8,7)	4 (4,3)	2 (2,2)		10 (10,9)	2 (2,2)	2 (2,2)	
Meal quality	Same	23 (25,0)	14 (15,2)	9 (9,8)	0,897	35 (38,0)	7 (7,6)	4 (4,3)	0,428
	Worsening	12 (13,0)	7 (7,6)	7 (7,6)		18 (19,6)	7 (7,6)	1 (1,1)	
	Improvement	11 (12,0)	6 (6,5)	3 (3,3)		15 (16,3)	2 (2,2)	3 (3,3)	
Meal regularity	Same	27 (29,3)	17 (18,5)	10 (10,9)	0,533	42 (45,7)	6 (6,5)	6 (6,5)	0,370
	Worsening	8 (8,7)	7 (7,6)	6 (6,5)		14 (15,2)	6 (6,5)	1 (1,1)	
	Improvement	11 (12,0)	3 (3,3)	3 (3,3)		12 (13,02)	4 (4,3)	1 (1,1)	
Smoke	No	38 (41,3)	21 (22,8)	11 (12,0)	0,102	57 (62,0)	8 (8,7)	5 (5,4)	< 0,011
	Yes	8 (8,7)	6 (6,5)	8 (8,7)		11 (12,0)	8 (8,7)	3 (3,3)	
Smoke variation	No variation or reduction	41 (44,6)	22 (23,9)	14 (15,2)	0,208	62 (67,4)	10 (10,9)	5 (5,4)	< 0,005
	More	5 (5,4)	5 (5,4)	5 (5,4)		6 (6,5)	6 (6,5)	3 (3,3)	
Time to focus on COVID-19 news	≤ 2 a day	31 (33,7)	18 (19,6)	8 (8,7)	0,135	43 (46,7)	8 (8,7)	6 (6,5)	0,450
	> 2 a day	15 (16,3)	9 (9,8)	11 (12,0)		25 (27,2)	8 (8,7)	2 (2,2)	
Going out during quarantine	Never	9 (9,8)	11 (12,0)	6 (6,5)	0,149	18 (19,6)	5 (5,4)	3 (3,3)	0,739
	≤ 2 times a day	31 (33,7)	13 (14,1)	8 (8,7)		38 (41,3)	9 (9,8)	5 (5,4)	
	> 2 times a day	6 (6,5)	3 (3,3)	5 (5,4)		17 (18,5)	2 (2,2)	0 (0,0)	
Noise pollution reduction	No	5 (5,4)	3 (3,3)	2 (2,2)	0,988	9 (9,8)	1 (1,1)	0 (0,0)	0,423
	Yes	41 (44,6)	24 (26,1)	17 (18,5)		59 (64,1)	15 (16,3)	8 (8,7)	
Sleep time variation	No variation	19 (20,7)	7 (7,6)	6 (6,5)	0,111	25 (27,2)	5 (5,4)	2 (2,2)	0,352
	Reduction	14 (15,2)	5 (5,4)	8 (8,7)		19 (20,7)	7 (7,6)	1 (1,1)	
	Increase	13 (14,1)	15 (16,3)	5 (5,4)		24 (26,1)	4 (4,3)	5 (5,4)	
Sleep quality variation	No variation	23 (25,0)	14 (15,2)	7 (7,6)	< 0,017	36 (39,1)	6 (6,5)	2 (2,2)	< 0,001
	Worsening	19 (20,7)	5 (5,4)	11 (12,0)		24 (26,1)	10 (10,9)	1 (1,1)	
	Improvement	4 (4,3)	8 (8,7)	1 (1,1)		8 (8,7)	0 (0,0)	5 (5,4)	
Sleep latency	No variation	22 (23,9)	12 (13,0)	9 (9,8)	0,117	36 (39,1)	6 (6,5)	1 (1,1)	< 0,001
	Reduction	0 (0,0)	4 (4,3)	1 (1,1)		2 (2,2)	0 (0,0)	3 (3,3)	
	Increase	24 (26,1)	11 (12,0)	9 (9,8)		30 (32,6)	10 (10,9)	4 (4,3)	
Migraine family history	No	9 (9,8)	3 (3,3)	6 (6,5)	0,227	12 (13,0)	5 (5,4)	1 (1,1)	0,406
	Yes	37 (40,2)	24 (26,1)	13 (14,1)		56 (60,9)	11 (12,0)	7 (7,6)	
Migraine drug overuse	No	12 (13,0)	4 (4,3)	2 (2,2)	0,270	16 (17,4)	1 (1,1)	1 (1,1)	0,255
	Yes	34 (37,0)	23 (25,0)	17 (18,5)		52 (56,5)	15 (16,3)	7 (7,6)	

Table 5 (continued)

		Symptomatic drugs per week				Migraine drug efficacy			
		No change *n* (%)	Decrease *n* (%)	Increase *n* (%)	*P*	No change *n* (%)	Decrease *n* (%)	Increase *n* (%)	*P*
Aura	No	42 (45,7)	25 (27,2)	17 (18,5)	0,934	61 (66,3)	15 (16,3)	8 (8,7)	0,577
	Yes	4 (4,3)	2 (2,2)	2 (2,2)		7 (7,6)	1 (1,1)	0 (0,0)	
Age of migraine onset (years)	≤ 18	29 (31,5)	19 (20,7)	13 (14,1)	0,796	46 (50,0)	10 (10,9)	5 (5,4)	0,900
	> 18	17 (18,5)	8 (8,7)	6 (6,5)		22 (23,9)	6 (6,5)	3 (3,3)	
Age of migraine chronification (years)	≤ 18	10 (10,9)	12 (13,0)	3 (3,3)	0,108	20 (21,7)	3 (3,3)	2 (2,2)	0,676
	19–30	20 (21,7)	7 (7,6)	11 (12,0)		28 (30,4)	8 (8,7)	2 (2,2)	
	≥ 31	16 (17,4)	8 (8,7)	5 (5,4)		20 (21,7)	5 (5,4)	4 (4,3)	
Discontinuation of therapy performed within center	No	42 (45,7)	25 (27,2)	12 (13,0)	0,006	60 (65,2)	12 (13,0)	7 (7,6)	0,389
	Yes	4 (4,3)	2 (2,2)	7 (7,6)		8 (8,7)	4 (4,3)	1 (1,1)	
Depression (BDI)	Average (0–13)	31 (33,7)	19 (20,7)	9 (9,8)	0,243	46 (50,0)	6 (6,5)	7 (7,6)	0,078
	Moderate (14–28)	12 (13,0)	4 (4,3)	8 (8,7)		17 (18,5)	7 (7,6)	0 (0,0)	
	Severe (29–63)	3 (3,3)	4 (4,3)	2 (2,2)		5 (5,4)	3 (3,3)	1 (1,1)	
Stata Anxiety (STAI-S)	Below average (0–39)	13 (14,1)	6 (6,5)	0 (0,0)	< 0,012	16 (17,4)	0 (0,0)	3 (3,3)	< 0,044
	Average (40–60)	25 (27,2)	26 (28,3)	9 (9,8)		38 (41,3)	8 (8,7)	4 (4,3)	
	Above average (61–100)	8 (8,7)	5 (5,4)	10 (10,9)		14 (15,2)	8 (8,7)	1 (1,1)	
Trait Anxiety (STAI-T)	Below average (0–39)	18 (19,6)	10 (10,9)	1 (1,1)	0,100	22 (23,9)	2 (2,2)	5 (5,4)	0,126
	Average (40–60)	21 (22,8)	12 (13,0)	13 (14,1)		35 (38,0)	9 (9,8)	2 (2,2)	
	Above average (61–100)	7 (7,6)	5 (5,4)	5 (5,4)		11 (12,0)	5 (5,4)	1 (1,1)	
Anxiety/depression variation	No variation	32 (34,8)	12 (13,0)	7 (7,6)	< 0.009	40 (43,5)	7 (7,6)	4 (4,4)	< 0,018
	Reduction	2 (2,2)	6 (6,5)	1 (1,1)		6 (6,5)	0 (0,0)	3 (3,3)	
	Increase	12 (13,0)	9 (9,8)	11 (12,0)		22 (23,9)	9 (9,8)	1 (1,1)	
Perceived stress (PSS)	Low	8 (8,7)	4 (4,3)	2 (2,2)	0,490	9 (9,8)	2 (2,2)	3 (3,3)	0,062
	Moderate	28 (30,4)	19 (20,7)	10 (10,9)		45 (48,9)	7 (7,6)	5 (5,4)	
	High	10 (10,9)	4 (4,3)	7 (7,6)		14 (15,2)	7 (7,6)	0 (0,0)	
Perceived stress variation	No variation	22 (23,9)	9 (9,8)	3 (3,3)	< 0.030	28 (30,4)	4 (4,3)	2 (2,2)	< 0,001
	Reduction	4 (4,3)	7 (7,6)	2 (2,2)		8 (8,7)	0 (0,0)	5 (5,4)	
	Increase	20 (21,7)	11 (12,0)	14 (15,2)		32 (34,8)	12 (13,0)	1 (1,1)	
Future concern	No or low	10 (10,9)	3 (3,3)	1 (1,1)	0,124	12 (13,0)	1 (1,1)	1 (1,1)	0,406
	Medium	22 (23,9)	16 (17,4)	7 (7,6)		35 (38,0)	6 (6,5)	4 (4,3)	
	High	14 (15,2)	8 (8,7)	11 (12,0)		21 (22,8)	9 (9,8)	3 (3,3)	
Future concern variation	No variation or reduction	21 (22,8)	11 (12,0)	6 (6,5)	0,576	29 (31,5)	6 (6,5)	3 (3,3)	0,908
	Increase	25 (27,2)	16 (17,4)	13 (14,1)		39 (42,4)	10 (10,9)	5 (5,4)	
COVID-19 concern	No	8 (8,7)	3 (3,3)	5 (5,4)	0,408	10 (10,9)	6 (6,5)	0 (0,0)	< 0,038
	Yes	38 (41,3)	24 (26,1)	14 (15,2)		58 (63,0)	10 (10,9)	8 (8,7)	
PSQI	Means ± standard deviation	11,50 ± 5,78	11,41 ± 5,91	13,94 ± 5,84	0,276	11,61 ± 5,67	14,19 ± 5,94	10,38 ± 6,74	0,209

*Cases per population; £ square meters per person; *STAI-S*, State-Trait Anxiety Inventory-State; *STAI-T*, State-Trait Anxiety Inventory-Trait; *BDI*, Beck Depression Inventory; *SS*, Perceived Stress scale; *PSQI*, Pittsburgh Sleep Quality Index

et al. showed a migraine worsening during the second lockdown [23]. Di Stefano et al. reported that one-third of the patients were stable, one-third had a worsening, and the remaining an improvement [27]. Focusing on the Italian first lockdown and on adult patients with CM, our study did not show the improvement that was present in Altamura

et al. and Delussi et al. chronic migraineurs. Altamura et al. patients' improvement was most probably due to monoclonal antibody administration. The differences with Delussi et al. could be explained through the different interview time: our survey was started on April 24th and was closed on May 3rd, and theirs between March 27th and April 18th. Delussi et al. attributed the improvement to patients' resilience [21] that could have been eroded by time, justifying the different results.

There are several limitations in our study. The first limitation is the small number of patients. Second, non-response from the web-based survey may result in selection bias.

Third, we do not have standardized data in the pre-lockdown period, and we are based on patients' report, migraine diary, and perception. Fourth, many outcomes and variables taken in consideration have subjective characteristics and are prone to recall bias that are common in these types of studies. Fifth, the study in a single institution may have affected the selection of patients.

Conclusion

During lockdown, our patients responded in a different manner: approximately half had a clinical stability, a quarter had a migraine improvement, and the remaining a worsening. Our study represented a unique prospective to observe and evaluate CM in different conditions from daily routine. Differently than other studies, we focused on CM patients, the migraineurs who are frailest and the most difficult to treat. We found some elements which represented vulnerability points that must be evaluated in migraine. Anxiety, stress, and sleep problems represent an enormous burden for CM that negatively influence their life and would be always investigated and treated in collaboration with different professional figures.

The most relevant study finding is the improvement due to the remote working; it could represent an easy way to ameliorate the condition of chronic migraineurs, increasing both their well-being and work performance.

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Author contribution CCT, ESV, and AC contributed to the study design; CCT, AC, and CV performed the data collection; TG performed the statistical analysis; AT, MA, GV, and RS supervised the research; CCT, AC, CV, RS, and MA wrote the article.

Availability of data and material Derived data supporting the findings of this study are available from the corresponding author on request.

Declarations

Conflict of interest The authors declare no competing interests.

Ethical approval The research was conducted ethically in accordance with the World Medical Association Declaration of Helsinki. The study protocol has been approved by the research institute's committee on human research.

Consent to participate and for publication All the patients have given their written informed consent.

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