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Determinants of sleep disturbances in chronically-ill patients during the COVID-19 pandemic

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Abstract:

Rapid emergence and transmission of SARS-CoV-2 significantly impacted mental health. Restrictions, lockdowns and quarantines issued during the wait for vaccines resulted in additional psychological distress in most populations. We aim to describe the impact of perceived stress related to the pandemic and sociodemographic determinants on sleep disturbances in the population of patients with chronic medical conditions, such as psoriasis, kidney transplant recipients and undergoing dialysis. During the cross-sectional survey conducted between May and October 2020, we enrolled 270 patients with three different chronic medical conditions. Study sample was examined regarding the reported sleep complaints (Insomnia Severity Index), occurrence of psychopathological symptoms (General Health Questionnaire 28) and their perceived levels of stress related to pandemic (Perceived Stress Scale). We observed 25,2% prevalence of ISI scores indicative of clinical insomnia in the group of chronically-ill patients during the first phase of the pandemic. ISI scores were found to be strongly correlated with GHQ28 and moderately correlated with PSS-10 scores. The profiles of reported complaints varied significantly between groups. There are varied outcomes related to sleep disturbances measured with ISI in the general population depending on the country and phase of pandemic with most of them ranging from 11.5 to 20%. Findings of our study suggest that population of patients with chronic conditions, with special emphasis on those who have a simultaneous history of psychiatric or psychological treatment, requires additional attention in order to objectivize and maintain sleep disorders during occurrence of severe stress conditions such as the COVID-19 pandemic.

stress; sleep disturbances; chronic disease; COVID-19 pandemic

1. AIM OF THE STUDY

Rapid emergence and transmission of the novel coronavirus variant, SARS-CoV-2, significantly impacted mental health [1]. Psychopathological consequences of the COVID-19 pandemic are related not only to the direct influence of SARS-CoV-2 on human organism. Widely issued restrictions, lockdowns and quarantines during the wait for vaccination to become avail-

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able resulted in additional psychological distress in most populations. These changes lead to decreased social contacts and social support, while at the same time increased the stress levels and anxiety related to worries about health and future of individuals and their close ones [2,3] It stands to reason that the impact and profile of the resulting mental disorders will vary dependent on the population characteristics.

Significant global stress factor and associated changes to the daily life of the general population resulted in increased levels of anxiety and depressive symptoms, but also affected the sleep quality and quantity. Early reports from large groups of Chinese participants indicate that over 20% of them met criteria of clinical insomnia according to Insomnia Severity Index (ISI) and 18.2% were identified to have poor sleep quality with Pittsburgh Sleep Quality Index (PSQI) [4,5]. In another study by Gualano et al. 42.2% of Italian respondents reported to experience sleep disturbances and in 17.4% their ISI score indicated moderate or severe insomnia [6]. Among factors predisposing to pandemic-induced insomnia female sex, younger age or a diagnosis of a chronic disease were listed. Additionally, age, depressive symptoms and perceived stress level were identified as factors responsible for cognitive pre-sleep arousal, while female gender, depressive symptoms, increased stress levels and interruption of regular work were associated with somatic pre-sleep arousal, both leading to aggravation of sleep disturbances [7]. A large international survey study conducted in 13 countries, including Poland, identified 36.7% and 17.4% from a 22 300 group of respondents to manifest insomnia symptoms and probable clinical insomnia, respectively. Similarly, females, younger participants and Polish participants were identified as groups at greater risk of insomnia symptoms [8]. Other studies, including meta-analyses of multi-national studies, reported sleep complaints ranging from 29.7% up to 69.9% of participants from the general population confirming common occurrence of this phenomenon [9–12].

While sleep disturbances described in the general population remain a common complaint during the COVID-19 pandemic, their frequency and pandemic-related changes in patients with previously diagnosed chronic diseases remain underexplored. As it turns out, when a person is diagnosed with a somatic illness, treatment for sleep disorders is frequently inadequate, which lowers quality of life. However, some evidence links insomnia with an increased risk of morbidity and mortality, which has important ramifications for the fields of psychiatry and psychology [13–15]. Research shows that various chronic diseases, such as rheumatoid arthritis or multiple sclerosis, significantly impact sleep quality in several mechanisms both related to symptoms of a primary disease and psychological distress, including distress resulting from the primary diagnosis [16,17]. According to a systematic review by Henry et al., patients diagnosed with psoriasis complaining of sleep difficulties range from 0.05 up to even 85.4% depending on a study and research design indicating a need for further exploration and methods alignment [18]. In a study by Sahin et al., patients with psoriasis slept 1 hour less on average than the healthy control group and pruritus, anxiety or depressive symptoms significantly mediated the effect [19]. These findings lie in agreement with another systematic review, which additionally underscores the impact of alleviating symptoms of the primary disease on improving sleep length and quality [20]. On the other hand, evidence exists on aggravation of psoriasis in response to sleep disorders indicating more complex and bidirectional interactions of a chronic dermatological disease and sleep disorders [21].

Similarly, chronic kidney disease has also been linked to various sleep-related problems, including insomnia, obstructive sleep apnea, hypersomnia, parasomnias or restless legs syndrome [22,23]. A recent meta-analysis by Tan et al. reports that frequency of poor sleep quality or insomnia in patients with chronic kidney is associated with the method of treatment. There was a 48% prevalence of insomnia in patients who were not receiving kidney replacement therapy and only 26% in patients who received kidney transplant. Interestingly, undergoing both peritoneal dialysis and hemodialysis has been associated with worse sleep quality, while undergoing peritoneal dialysis is related to increased prevalence of insomnia [24]. Dialysis impacts sleep and circadian rhythm by depleting patients of melatonin but also elevated serum urea

nitrogen and phosphorus levels have been associated with worse outcomes [25].

Our previous research focused on describing psychological well-being and perceived stress level in patients diagnosed with several chronic conditions, such as psoriasis, multiple sclerosis, kidney transplant recipients and patients undergoing dialysis. [26]. In this study we analyze occurrence of self-reported sleep complaints in three groups of chronically-ill patients who were undergoing regular medical visits and treatment during the first phase of COVID-19 pandemic. We hypothesize that patients with chronic medical conditions will be characterized with significant sleep disturbances and that this effect will be associated with experienced stress related to the pandemic alongside the sociodemographic determinants. This research may contribute to future recommendations regarding organization of health care for chronically-ill patients during similar global health crisis.

2. MATERIAL AND METHODS

2.1. Study design

We have recruited chronically-ill patients with diagnoses of psoriasis, patients who had had a kidney transplant and patients with chronic kidney disease receiving dialyses, to participate in a cross-sectional survey carried out between May and October 2020, during the first phase of COVID-19 pandemic. The local Bioethical Committee at the Wroclaw Medical University accepted the study (KB-468/2020; KB-469/2020; KB-470/2020). The study has been conducted in accordance with the STROBE guidelines [27]. For detailed methods and procedures see Pawłowski et al, 2022 [26].

2.2. Settings

The participants took part in the survey voluntarily, with no financial reward. Participation was anonymous and data was secured at all stages of the study. Questionnaires were provided either online or in print, as a consequence of COVID-19 restrictions and patients safety. The printed forms were provided to all groups of patients at the University Clinical Hospital in Wroclaw, Poland. Additionally, we used Computer-Assisted Web Interviewing (CAWI) to conduct an online version of the survey and shared it via the website and the social media profile of Polish Association for Psoriasis patients. In the preliminary section of the survey respondents filled an informed consent, so participation and processing of data was possible. Participants were evaluated for occurrence and intensity of sleep disorders. Demographic variables, as well as pandemic-related data, such as previous quarantines, COVID-19 exposures or infections, were also included in the survey.

2.3. Participants

The inclusion criteria were as follows: 1) a previous diagnosis of psoriasis (P group), current dialysis therapy (D group) or being an adult kidney transplant recipient in the past (T group); 2) age over 18 and 3) informed consent to participate. Due to the online version of the survey no medical documents nor confirmations were required in order to preserve anonymity in P group. Participants from D and T groups were recruited only at the hospital. Hence, their medical data and documentation were available in order to confirm diagnoses. Exclusion criteria were: 1) age under 18; 2) inability to provide informed consent and 3) surveys with incomplete sections. Psychological and psychiatric history was collected but did not disqualify from participation.

2.4. Variables:

The psychometric tools used in the study were selected by a team of experts from different medical specialties (psychiatry, psychology, dermatology and nephrology) and were based on appropriate literature. The survey consisted of following sections:

Sociodemographic data.

Insomnia Severity Index (ISI) provides information on existing sleep disturbances, their character and impact on daily life. It consists of 7 items which are answered on a 5-point scale from 0 to 4, with higher scores corresponding with more aggravated sleep difficulties. The total score is

calculated by summing up each answer and according to the literature can be interpreted as: 0-7 – No clinically significant insomnia; 8-14 – Subthreshold insomnia; 15-21 – Clinical insomnia (moderate severity) and 22-28 – Clinical insomnia (severe). The questionnaire was validated with Cronbach's alpha ranging from 0,72 to 0,9 [28,29].

The General Health Questionnaire (GHQ-28) is a self-administered screening tool designed to detect and measure the presence of psychopathological symptoms. It consists of 28 items and its maximum score is 84 points. The questionnaire was validated in the Polish population and deemed satisfactory with validity scores (Cronbach's alpha) around 0.8. Based on the previous literature, the cut-off score was established at 24 points [30,31]. In order to correlate ISI with GHQ28 without the contribution of two questions directly evaluating sleep, we additionally distinguished sleep-excluded GHQ (seGHQ).

The Perceived Stress Scale 10 (PSS-10) assesses the level of experienced stress during last month. It contains 10 questions designed to measure the subjective level of stress. The general result reflects the intensity of perceived stress. Participants indicate their answers on a 5-point scale ranging from 0 (never) to 4 (very often). The PSS-10 score is calculated by summing up the item scores. The higher the score, the higher the level of stress experienced. The questionnaire was validated in the Polish population and deemed satisfactory with the validity scores (Cronbach's alpha) around 0.8 [32].

2.5. Statistical methods

The statistical analysis of obtained results was performed with the use of IBM SPSS Statistics v. 26 (SPSS INC., Chicago, USA) software. All data was assessed for parametric or non-parametric distribution. The minimum, maximum, mean and standard deviation were calculated, whereas for GHQ28, PSS-10 and ISI, parameters distrubution was also assessed for curtosis and skewness. Due to the relatively large sample, Kolmogorov-Smirnov test results were calculated. Analyzed variables were evaluated using the Mann–Whitney U test and the Spearman correlation. Differences between several groups were assessed by Kruskal-Wallis 1-way analysis of variance on ranks and Bonferroni-Dunn post-hoc test was performed. Additionally, ANCOVA and multivariate linear stepwise regression with backward elimination were conducted in order to increase sensitivity. In case of the variable "diagnosis" the renal transplant group was automatically set as a control group (as the subgroup with the highest quantitiy of participants) and other subgroups were compared to this group. The rho Spearmann matrix was performed to establish correlation between variables. A 2-sided p value ≤0.05 was considered to be statistically significant.

3. RESULTS:

3.1. Participants characteristics:

We recruited 270 participants aged from 18–89 into the study. According to their primary diagnosis they were divided into 3 groups: 95 patients with psoriasis (P group), 102 recipients of kidney transplants (T group) and 73 patients receiving dialyses (D group). The study groups had relatively dissimilar sociodemographic profiles in terms of age, marital status, psychiatric treatment, psychotherapy and duration of illness and similar gender distribution.

There was a slight predominance of women in the study group (n = 141; 52.2%). The mean age was 50.46 years (*SD* = 17,68). 13% of the participants had previously been treated by a psychiatrist and 16% had been subjected to psychotherapy. The detailed characteristics of the study group are summarized in Table 1.

Table 1. Detailed sociodemographic data.

group	Psoriasis (N=95)	Kidney Transplant recipients (N=102)	Dialyzed patients (N=73)	Total (N=270)
gender (female)	58 (61%)	49 (48%)	34 (47%)	141 (52.2%)

age	40.24 ± 16.9	51.59 ± 13.42	63.40 ± 15.49	50.46 ± 17.68
illness duration (years)	16.65 ± 13.76	7.77 ± 6.80	3.52 ± 3.62	9.75 ± 9.22
relationship status				
single	21	18	4	43
in relationship	20	10	6	36
married	42	62	48	152
separated	0	0	1	1
divorced	8	10	3	21
widow/widower	4	2	11	17
previous psychiatric treatment (yes)	19 (20%)	13 (12.75%)	3 (4.1%)	35 (13%)
previous psychotherapy (yes)	29 (30.5%)	11 (10.8%)	3 (4.1%)	43 (16%)

3.2. ISI, PSS-10 and GHQ-28 in the studied population.

The mean ISI score was 9.04 (with Cronbach's alpha at 0.932), whereas mean PSS-10 and GHQ-28 scores in the whole study group were 19.03 and 29.07, respectively. Considering the cut-off points of these psychometric tools, the mean scores corresponded with subthreshold insomnia, moderate level of perceived stress and indication of significant psychopathology.

Due to a relatively large sample size, we performed the Kolmogorov-Smirnov test in order to establish data distribution. All analyzed variables were significantly different than normal distribution. Additionally, PSS-10 scores had a leptokurtotic distribution indicating similar perception of currently experienced stress in the studied group. The detailed data is provided in Table 2.

Table 2. Mental well-being, perceived stress related to pandemic level and sleep disturbances in the studied population (N = 270).

	R	M	SD	Mdn	Sk	Kurt	D
GHQ28	0-84	29.07	18.73	23	0.93	0.37	0.13**
sleep-excluded GHQ28 (seGHQ)	0-78	27.25	17.74	22	0.94	0.34	0.13**
PSS-10	0-40	19.03	6.20	20	-0.66	1.17	0.13**
ISI	0-28	9.04	6.69	8	0.51	-0.74	0.12**
Difficulty falling asleep	0-4	1.03	1.18	1	0.81	-0.45	0.28**
Difficulty staying asleep	0-4	1.12	1.15	1	0.56	-0.83	0.26**
Problems waking up too early	0-4	1.01	1.17	1	0.89	-0.30	0.28**
Satisfaction with current sleep pattern	0-4	2.17	1.13	2	0.25	-0.38	0.17**
Interference of sleep problem with daily functioning	0-4	1.47	1.18	2	0.17	-1.04	0.19**
Noticeability of current sleep problem	0-4	1.29	0.99	1	0.51	-0.36	0.25**
Distress about current sleep problem	0-4	1.09	1.12	1	0.67	-0.58	0.24**

* $p < 0.05$;** $p < 0.01$; R – range; M – arithmetic mean; SD – standard deviation; Mdn – median; Sk – skewness; Kurt – kurtosis; D– Kolmogorov-Smirnov test result

3.3. Frequency of sleep-related complaints in the studied population.

Table 3 summarizes the frequency of each answer to specific ISI items. Less than half of the participants denied having difficulty falling asleep or waking up too early, whereas 13.1% and 13.9% of participants reported severe or very severe problems. The most frequently reported complaints according to the mean scores (Figure 1) involved dissatisfaction with current sleep quality, interference of reported sleep disorders with daily functioning of the participants and that experienced sleep problems were noticeable to others. On the other hand, problems with waking up too early and difficulty falling asleep were the least frequently reported by the chronically-ill patients.

Table 3. Answers to ISI items in the whole study group

%	difficulty falling asleep	difficulty staying asleep	problems waking up too early	satisfaction with current sleep pattern	interference of sleep problem with daily functioning	noticeability of current sleep problem	distress about current sleep problem	**total Insomnia Severity Index**
0	47.6%	42.5%	47.4%	4.5%	29.3%	22.3%	40.8%	-
1	18.4%	18.4%	21.8%	27.1%	18.8%	41.3%	24.5%	**47.8%**
2	21.0%	25.6%	16.9%	28.6%	31.2%	23.1%	21.5%	**27.0%**
3	9.7%	11.3%	10.5%	28.9%	17.3%	11.7%	10.9%	**21.1%**
4	3.4%	2.3%	3.4%	8.3%	3.4%	1.5%	2.3%	**4.1%**

0 – none/very satisfied; 1 – mild/satisfied; 2 – moderate; 3 – severe/dissatisfied; 4 – very severe/very dissatisfied

1 – no clinically significant insomnia; 2 – subthreshold insomnia; 3 – clinical insomnia (moderate) 4 – clinical insomnia (severe)

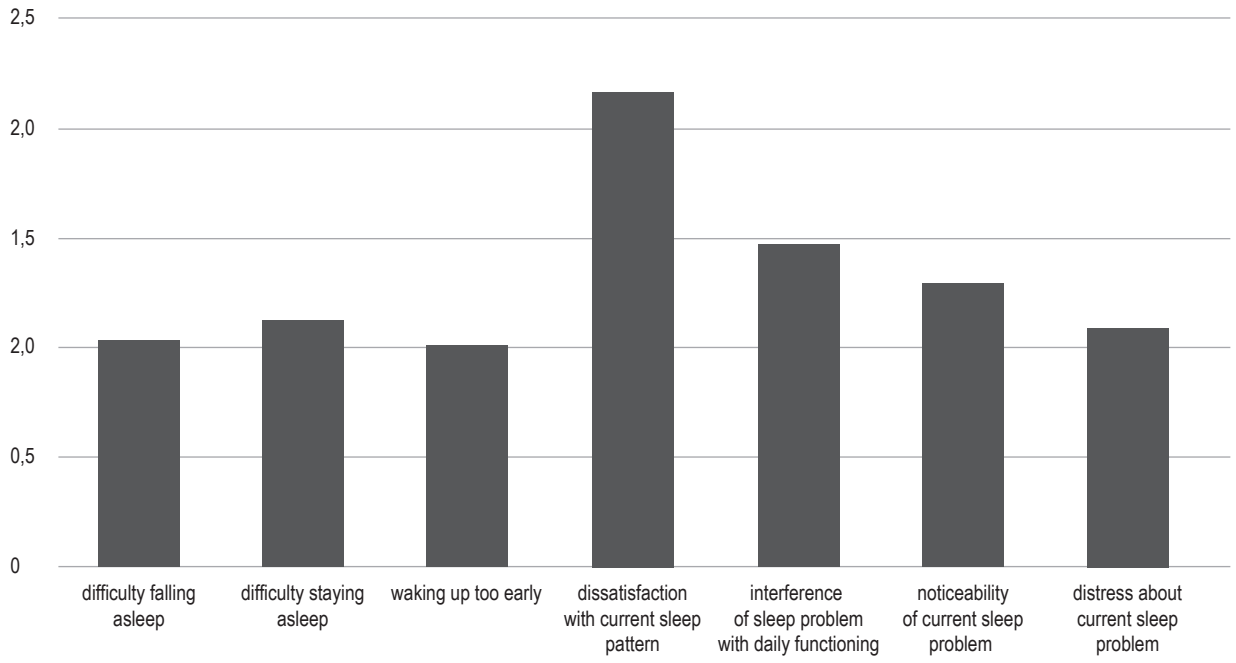

Figure 1. Mean profile of answers to Insomnia Severity Index in the whole study group.

Total ISI score indicative of moderate and severe clinical insomnia was observed in 25.2% of the participants, whereas 27% was categorized as subtreshold insomnia and 47.8% of the participants did not manifest symptoms indicative of sleep disorders.

3.4. ISI in relation to PSS-10, GHQ28 and sociodemographic data.

In order to assess the correlation between ISI and sociodemographic data or PSS-10 and GHQ28 we used the rho Spearman correlation matrix. U Mann-Whitney test was used in order to analyse qualitative sociodemographic data (sex, history of previous psychiatric treatment, history of previous psychotherapy).

In the rho Spearman analysis ISI scores in the whole group was found to be strongly correlated with GHQ28 scores and moderately correlated with PSS-10 score and seGHQ (GHQ28 after removal of questions directly assessing sleep). Additionally, we observed weak inverse correlation between ISI and duration of the chronic disease. The correlation between ISI scores and age was statistically insignificant. We observed a tendency of higher ISI scores in female participants (p=0.063). Interestingly, previous psychiatric treatment or psychotherapy correlated with higher ISI scores in chronically-ill patients during the COVID-19 pandemic (Tables 4, 5).

Table 4. The rho Spearmann correlation coefficients between ISI scores and age, duration off the primary disease, GHQ-28, sleep-excluded GHQ-28 and PSS-10 scores in the whole study group.

	ISI (total)
Age	-0.007
Duration of the primary disease	-0.234*
GHQ-28	0.504**
seGHQ28	0.466**
PSS-10	0.323**

* $p < 0.05$;** $p < 0.01$

Table 5. The U Mann-Whitney test result of correlation between sex, previous psychiatric treatment, previous psychotherapy and total ISI scores in the whole study group.

	Mdn	Mrang	Mdn	Mrang	U	p	rg
sex	female (n = 141)		male (n = 129)				
ISI	10	143.94	6	126.27	7904.00	0.063	0.13
previous psychiatric treatment	no (n = 235)		yes (n = 35)				
ISI	7	129.59	15	175.17	2724.00	0.001	0.34
previous psychotherapy	no (n = 226)		yes (n = 43)				
ISI	7	129.18	12	165.57	3544.50	0.005	0.27
	Mdn	Mrang	Mdn	Mrang	U	p	rg

Mdn – median; Mrang – mean range; *U* – U Mann-Whitneya test result; *p* – p-value; *rg* – Glass's estimator of effect size

3.5 Differences in psychometric scores between 3 groups.

We performed the Kruskal-Wallis test in order to compare the obtained outcomes between the three studied groups of patients. We did not detect any statistically significant differences in total ISI of P, T or D groups. However, we observed the lowest PSS-10 scores in the P group. Additionally, both T group and D group were shown to report lower GHQ28 scores and seGHQ scores than P group (Table 6).

Table 6. Psychometric scores in relation to the chronic medical condition.

		I: Psoriasis		II: Kidney transplant		III: Dialysis					
		Mdn	Mrang	Mdn	Mrang	Mdn	Mrang	H(2)	p	ε^2	Post-hoc
A	GHQ28	43.00	190.08	17.50	97.01	21.00	118.25	74.81	< 0.001	0.278	A.II < A.I** A.III < A.I**
B	seGHQ	42.00	192.08	15.50	96.29	20.00	116.65	79.89	< 0.001	0.297	B.II < B.I** B.III < B.I**
C	PSS-10	18.00	108.93	20.00	144.90	21.00	156.95	18.07	< 0.001	0.067	C.I < C.II** C.I < C.III**
D	ISI	10.00	138.16	6.00	129.11	10.00	140.96	1.16	0.561	0.004	n.i.

Mdn– median; Mrang– mean range; H– Kruskall-Wallis test result; *p*– p-value; *ε2*– effect size

After analysis of each ISI item, we observed several statistically significant differences. D group respondents were more likely to complain of difficulties with falling asleep than T group. They also more frequently reported having difficulties staying asleep or waking up too early. Additionally, the distress about their current sleep problem was reported more frequently than in T group. Despite this, dissatisfaction with current sleep pattern was higher in T group than D group. P group reported more complaints on interference of experienced sleep problem with their daily functioning than T group. They also more frequently reported distress related to the sleep problem. There were no statistically significant differences in noticeability of experienced sleep problem between the three groups (Table 7).

Table 7. Comparison of sleep complaints measured with ISI between participants wich different chronic medical conditions.

		I: Psoriasis		II: Kidney transplant		III: Dialysis					
		Mdn	Mrang	Mdn	Mrang	Mdn	Mrang	H(2)	p	ε^2	Post-hoc
A	Difficulty falling asleep	1.00	136.03	0.00	119.01	1.00	152.85	9.29	0.010	0.035	A.II < A.III**
B	Difficulty staying asleep	1.00	134.09	0.00	119.90	1.50	152.52	8.31	0.016	0.031	B.II < B.III*
C	Problems waking up too early	0.00	131.96	0.00	122.13	1.00	152.14	7.26	0.026	0.027	C.II < C.III*
D	Dissatisfaction with current sleep pattern	2.00	138.56	2.00	140.75	2.00	116.14	5.24	0.073	0.020	D.III < D.II
E	Interference of sleep problem with daily functioning	2.00	143.29	1.00	120.23	2.00	139.69	5.37	0.068	0.020	E.II < E.I
F	Noticeability of current sleep problem	1.00	124.00	1.00	136.71	1.00	137.94	2.01	0.366	0.008	n.i.
G	Distress about current sleep problem	1.00	140.69	0.00	113.27	1.00	151.68	13.02	0.001	0.049	G.II < G.I* G.II < G.III**

Mdn– median; Mrang– mean range; H– Kruskall-Wallis test result; *p*– p-value; *ε2*– effect size

3.6 ANCOVA and multivariate linear stepwise regression results.

After performing analysis of covariance, we observed total ISI score was mainly mediated by the GHQ-28, PSS-10 and to smaller extent, inversely by previous psychiatric treatment. Among three studied chronic conditions, diagnosis of psoriasis was a potential weak protective factor (compared to T group, which in case of this variable was a control group) in regard to occurrence of sleep disturbances measured with the total ISI score and all its items with exception of noticeability and distress related to the current sleep problem. Additionally, undergoing dialysis was a risk factor of more complaints on noticeability of current sleep problem compared to T group.

Multivariate linear stepwise regression models with backward elimination were built with the use of age, GHQ-28 and PSS-10 and were characterized with moderate predictive values ranging from 0,351 for the whole studied group up to 0,445 for the D group (Table 8). We hypothesize that missing information on current intensity of the symptoms related to the primary disease could further improve the accuracy of the models.

Table 8. Multivariate linear stepwise regression models with backward elimination, predictive of the total ISI for the whole study group (N=270), patients with psoriasis, kidney transplant recipients and patients undergoing dialysis. Variables eliminated from the final model are reported with the "p to eliminate" value.

total ISI score for the whole study group (N=270)					
	MS	F	p	β	R^2
Intercept	76.9422	2.62444	0.106481	-	0.351
Age	129.4704	4.41613	0.036594	0.107825	
GHQ28	876.4665	29.89557	0.000000	0.339196	
PSS-10	931.3144	31.76638	0.000000	0.346714	
total ISI score for the P group					
Intercept	16.7987	0,55357	0.458801	-	0.373
Age	Not included in the final model (p=0.66)				
GHQ	191.2090	6.30093	0.013854	0.264621	
PSS-10	485.2178	15.98944	0.000130	0.421540	
total ISI score for the T group					
Intercept	191.706	7.92851	0.005906	-	0.256
Age	Not included in the final model (p=0.45)				
GHQ	1434.340	59.32075	0.000000	0.618000	
PSS-10	Not included in the final model (p=0.17)				
total ISI score for the D group					
Intercept	31.550	1.14400	0.288891	-	0.445
Age	Not included in the final model (p=0.77)				
GHQ	1440.481	52.23169	0.000000	0.673257	
PSS-10	Not included in the final model (p=0.06)				

4. DISCUSSION:

In our study we analyze self-reported sleep disturbances in relation to perceived stress level related to the COVID-19 pandemic and psychological wellbeing in three groups of chronically-ill patients. In our previous research we have observed that almost half of the studied population of chronically-ill patients reported symptoms indicative of a depressive episode or anxiety [26]. Previous studies conducted in the general population, students or medical professionals associate diagnosis of a chronic disease with more aggravated sleep disturbances, reporting increased severity of insomnia symptoms in participants who reported a diagnosis of chronic condition [33–36]. In a study by Wankowicz et al. patients with a diagnosis of lupus erythematosus were shown to score twice higher in ISI than control group [37]. Additionally, multimorbidity has been linked to both increased number of missed medical appointments and worse sleep-related outcomes during the COVID-19 pandemic [38].

In a study by Alhadi and Alhuwaydi the mean ISI score of the university students was 12.9, whereas we recorded a lower mean score of 9.04 [39]. We hypothesize that, alongside to the older age of our participants, this difference may be related to the later phase of the pandemic during which we collected the data and in which partial habituation to the stressor could have been developed. On the other hand, we recorded lower percentage of clinical insomnia according to ISI than patients with fibromyalgia in a study by Aloush et al. [40].

It has been shown that while psychological distress measured with psychometric tools such as the Patient Health Questionnaire-9, the Generalized Anxiety Disorder-7 or the Impact of Event Scale-Revised correlates with the current stage of the chronic kidney disease, undergoing dialysis directly correlates with increased ISI score only [41]. This additional impact of regular medical procedures may be related to the necessity of frequent hospital visits and associated fear of infection in this group of patients prior to the SARS-CoV-2 vaccines development. In a study by Yu et al., patients with end-stage kidney disease undergoing hemodialysis were shown to exhibit higher ISI scores than the group receiving peritoneal dialysis during the COVID-19 pandemic [42]. This finding emphasizes the impact of regular medical procedures on the mental health of patients at risk of SARS-CoV-2 infection. In our study, we observed similar ISI scores in all three groups regardless of the primary diagnosis and associated therapeutic plan. However, these results were obtained in the presence of different GHQ-28 and PSS-10 scores, with P group patients reporting significantly higher GHQ-28 and significantly lower PSS-10, which may suggest a moderating impact of mental wellbeing and perceived stress on sleep complaints. Compared to the study by Yu et al., we obtained similar mean ISI scores, despite the fact that we recorded more participants reporting symptoms indicative of moderate and severe clinical insomnia. This difference may also be related to the slightly earlier phase of the pandemic during our study and lesser time for adaptation to the new stress factor in our study group.

Another study conducted during the early phase of the COVID-19 pandemic revealed that prevalence of insomnia measured with ISI in a group of 305 Chinese organ recipients was 11.8% [43]. There are varied outcomes related to sleep disturbances measured with ISI in the general population depending on the country and phase of pandemic with most of them ranging from 11.5 to 20% [44–47]. In our study group of chronically-ill patients, we recorded 25.2% of the participants above the cut-off point (scores 15 and more) with no significant differences between kidney transplant recipients and other groups. We hypothesize that in addition to a primary chronic condition the higher prevalence of moderate and severe clinical insomnia may be mediated by sociocultural differences. Moreover, our results show resemblance to 30-32% prevalence of insomnia obtained in the meta-analyses of the studies conducted at the early phase of the pandemic with inclusion of medical professionals who were even more frequently exposed to potential SARS-CoV-2 infection at their place of work [48,49]. However, further research on larger groups is required in order to establish the mechanism of increased sleep complaints in the patients with chronic conditions during the pandemic conditions.

We observed a high frequency of complaints regarding satisfaction with current sleep pattern,

which stands out in relation to relatively fewer complaints regarding difficulties with falling or staying asleep. Moreover, main complaints reported by the study participants concerned interference of the sleep problem with their daily functioning and noticeability of their decreased sleep quality to others. It seems that in circumstances of a global stress factor presence, satisfaction with current sleep pattern may be a sensitive indicator of experienced stress even without acknowledging it during daily life. We believe that this profile of answers to ISI, with less substantiation by the more objective sleep indicators may indicate the underlying anxiety in the chronically-ill patients during the uncertain pandemic conditions. Previous research links sleep satisfaction to individual health status but also to frequency of healthcare seeking behaviors [50]. While the participants of our study are at risk of dissatisfaction with current sleep quality due to their primary diagnosis, objectivization of their symptoms is recommended in order to reduce unnecessary self-medicating behavior.

Prior to the COVID-19 pandemic, patients with a diagnosis of psoriasis have been shown to manifest increased psychological distress measured with a 12-item General Health Questionnaire [51]. In our study we used a 28-item version of this tool and observed significantly increased GHQ-28 scores in P group compared to T and D groups. Interestingly, these outcomes could not be fully explained by correlation with PSS-10 or ISI scores indicating initially increased psychological distress related to a psoriasis diagnosis and potentially to the associated significantly higher duration of the disease. Additionally, potential bias resulting from online version of the questionnaire could contribute to these results. What is more, we observed higher interference of reported sleep problem with daily functioning and higher distress directly associated with sleep in P group, whereas the same group also reported lower level of dissatisfaction with current sleep pattern. It is our understanding that the perceived distress and daily functioning were not fully related to the sleep quality linking these findings with the increased GHQ-28 scores.

The core ISI complaints related to difficulties with falling and staying asleep or waking up too early were found to be significantly more frequently reported in the D group. The necessity of undergoing long and regular medical procedures, such as hemodialysis, at varied time of a day has been shown to impact the sleep of patients regardless of the COVID-19 pandemic. Hence, this finding is consistent with existing knowledge [24,25].

After correlating ISI scores with GHQ28 and seGHQ scores we obtained similar results of 0.504 and 0.466 respectively indicating a small contribution of two questions used for assessment of sleep in GHQ28 to this association. More importantly, our research confirms previous finding on the correlations of female sex and perceived stress with ISI [6,12]. However, we did not observe a significant correlation with younger age [8], which may indicate that its effect size is decreased in the presence of a chronic disease in comparison to the general population. Previous psychiatric treatment and psychotherapy corresponded with significantly increased ISI scores which suggests that the population of people with previous mental disorders may be at risk for sleep disturbances in the circumstances of the pandemic. Our findings are consistent with a meta-analysis of polysomnographic research conducted by Baglioni et al. in patients with mental disorders who were shown to have significantly altered sleep profiles [52].

Although sleep disturbances during the COVID-19 pandemic may have a transient character, research shows that they have a large impact on the health-related quality of life [53]. Therefore, additional focus is required in order to screen for and reduce sleep complaints. So far, most non-pharmacological interventions aimed at improving sleep are characterized as low certainty in existing studies and require further prospective studies [54]. However, several reports shed light onto interventions especially relevant during the COVID-19 pandemic. Research shows that cognitive behavioral therapy is effective in reducing ISI scores in patients with SARS-CoV-2 infection [55]. Psychoeducational interventions aimed at sufficient exercise and good sleep hygiene remain especially important in circumstances of reorganized daily life with less time spent outside and working from home. Similarly, beneficial impact of social support has been highlighted in the recent findings on sleep quality during the COVID-19 pandemic [12,56,57]. In a study by

Grey et al., participants with high social support were 52% less likely to report poor sleep quality. These findings remain especially relevant in the population of patients diagnosed with chronic conditions who were advised to refrain from social contacts and therefore are at risk of worsened social support.

Our study reports findings on occurrence and intensity of insomnia in chronically-ill patients during the first wave of the COVID-19 pandemic. We were able to recruit a relatively large group of participants with diagnoses of psoriasis, recipients of kidney transplant and patients undergoing regular dialysis. However, our results are limited by several factors: 1) The studied groups were not matched in terms of sociodemographic characteristics, such as sex or education; 2) The clinical symptoms of each disease were not measured leading to a lack of control over the influence of these variables on the sleep disturbances and potentially decreasing the adjustment of the obtained regression models and 3) Due to the global character of COVID-19 pandemic we were unable to recruit control group. At the time of our study, only few participants were already individually affected by COVID-19 or quarantines. Hence, we were not able to analyze the impact of infections and individual restrictions on the outcomes of the study.

5. CONCLUSIONS

We observed 25.2% prevalence of results indicative of clinical insomnia in the group of chronically-ill patients during the first wave of pandemic. We hypothesize that a relatively large portion of the participants reporting sleep-related complaints may be associated with the necessity of frequent hospital visits during the COVID-19 pandemic, like in patients after renal transplant or dialysis patients, or to the pre-existent psychological distress, as in case of psoriasis patients who also scored higher in GHQ-28. Our research confirms association of female sex and chronic disease with more aggravated sleep disturbances. However, we did not confirm a correlation of younger age with insomnia symptoms. Findings of our study suggest that population of patients with chronic medical conditions, with special emphasis on those who have a simultaneous history of psychiatric or psychological treatment, requires additional attention in order to objectivize and maintain sleep disorders, especially during stressful conditions such as pandemic. Wide-targeted screening and interventions focused on psychoeducation should be implemented alongside non-pharmacological and pharmacological methods of treatment in order to improve sleep patterns and significantly increase health-related quality of life of patients with chronic medical conditions.

REFERENCES

1. Chen PJ, Pusica Y, Sohaei D, Prassas I, Diamandis EP. An overview of mental health during the COVID-19 pandemic. Diagnosis. 2021;8(4):403–12.
2. Banerjee D, Rai M. Social isolation in Covid-19: The impact of loneliness. Int J Soc Psychiatry. 2020;66(6):525–7.
3. Brown LA, Hamlett GE, Zhu Y, Wiley JF, Moore TM, DiDomenico GE, et al. Worry about COVID-19 as a predictor of future insomnia. J Sleep Res. 2022;31(5):1–11.
4. Lin L yu, Wang J, Ou-yang X yong, Miao Q, Chen R, Liang F xia, et al. The immediate impact of the 2019 novel coronavirus (COVID-19) outbreak on subjective sleep status. Sleep Med. 2021;77:348–54.
5. Huang Y, Zhao N. Generalized anxiety disorder, depressive symptoms and sleep quality during COVID-19 outbreak in China: a web-based cross-sectional survey. Psychiatry Res. 2020;288(March).
6. Gualano MR, Lo Moro G, Voglino G, Bert F, Siliquini R. Effects of Covid-19 Lockdown on Mental Health and Sleep Disturbances in Italy. Int J Environ Res Public Health [Internet]. 2020 Jul 2;17(13):4779. Available from: https://www.mdpi.com/1660-4601/17/13/4779
7. Gorgoni M, Scarpelli S, Mangiaruga A, Alfonsi V, Bonsignore MR, Fanfulla F, et al. Pre-sleep arousal and sleep quality during the COVID-19 lockdown in Italy. Sleep Med. 2021;88:46–57.
8. Morin CM, Bjorvatn B, Chung F, Holzinger B, Partinen M, Penzel T, et al. Insomnia, anxiety, and depression during the COVID-19 pandemic: an international collaborative study. Sleep Med. 2021;87:38–45.
9. Alharbi AS, Alshahrani SM, Alsaadi MM, AL-Jahdali HH, Wali SO, BaHammam AS. Sleep quality and insomnia during the covid-19 lockdown among the saudi public. Saudi Med J. 2021;42(4):384–90.
10. Pinto J, van Zeller M, Amorim P, Pimentel A, Dantas P, Eusébio E, et al. Sleep quality in times of Covid-19 pandemic. Sleep Med. 2020;74:81–5.
11. Zhang SX, Chen RZ, Xu W, Yin A, Dong RK, Chen BZ, et al. A Systematic Review and Meta-Analysis of Symptoms of

Anxiety, Depression, and Insomnia in Spain in the COVID-19 Crisis. Int J Environ Res Public Health. 2022;19(2):1–15.

12. Yuan K, Zheng YB, Wang YJ, Sun YK, Gong YM, Huang YT, et al. A systematic review and meta-analysis on prevalence of and risk factors associated with depression, anxiety and insomnia in infectious diseases, including COVID-19: a call to action. Mol Psychiatry. 2022;(May).
13. Halioua B, Chelli C, Misery L, Taieb J, Taieb C. Sleep Disorders and Psoriasis: An Update. Acta Derm Venereol. 2022;102(25):1–8.
14. Lindner A V., Novak M, Bohra M, Mucsi I. Insomnia in Patients With Chronic Kidney Disease. Semin Nephrol [Internet]. 2015;35(4):359–72. Available from: http://dx.doi.org/10.1016/j.semnephrol.2015.06.007
15. Pierratos A, Hanly PJ. Sleep disorders over the full range of chronic kidney disease. Blood Purif. 2011;31(1–3):146–50.
16. White CP, White MB. Sleep problems and fatigue in chronically ill women. Behav Sleep Med. 2011;9(3):144–61.
17. Kotronoulas G, Wengström Y, Kearney N. Sleep and sleep-wake disturbances in care recipient-caregiver dyads in the context of a chronic illness: A critical review of the literature. J Pain Symptom Manage. 2013;45(3):579–94.
18. Henry AL, Kyle SD, Bhandari S, Chisholm A, Griffiths CEM, Bundy C. Measurement, Classification and Evaluation of Sleep Disturbance in Psoriasis: A Systematic Review. PLoS One. 2016;11(6):1–18.
19. Sahin E, Hawro M, Weller K, Sabat R, Philipp S, Kokolakis G, et al. Prevalence and factors associated with sleep disturbance in adult patients with psoriasis. J Eur Acad Dermatology Venereol. 2022;36(5):688–97.
20. Gupta MA, Simpson FC, Gupta AK. Psoriasis and sleep disorders: A systematic review. Sleep Med Rev [Internet]. 2016;29:63–75. Available from: http://dx.doi.org/10.1016/j.smrv.2015.09.003
21. Controne I, Scoditti E, Buja A, Pacifico A, Kridin K, Fabbro M Del, et al. Do Sleep Disorders and Western Diet Influence Psoriasis? A Scoping Review. Nutrients. 2022;14(20):1–16.
22. Nigam G, Camacho M, Chang E, Riaz M. Exploring sleep disorders in patients with chronic kidney disease. Nat Sci Sleep [Internet]. 2018 Jan;Volume 10:35–43. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5797456/pdf/nss-10-035.pdf
23. Maung SC, Sara A El, Chapman C, Cohen D, Cukor D. Sleep disorders and chronic kidney disease. World J Nephrol [Internet]. 2016;5(3):224. Available from: http://www.wjgnet.com/2220-6124/full/v5/i3/224.htm
24. Tan LH, Chen PS, Chiang HY, King E, Yeh HC, Hsiao YL, et al. Insomnia and Poor Sleep in CKD: A Systematic Review and Meta-analysis. Kidney Med [Internet]. 2022;4(5):100458. Available from: https://doi.org/10.1016/j.xkme.2022.100458
25. Scherer JS, Combs SA, Brennan F. Sleep Disorders, Restless Legs Syndrome, and Uremic Pruritus: Diagnosis and Treatment of Common Symptoms in Dialysis Patients. Am J Kidney Dis [Internet]. 2017 Jan;69(1):117–28. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0272638616304188
26. Pawłowski M, Fila-Witecka K, Rymaszewska JE, Kamińska D, Poznański P, Augustyniak-Bartosik H, et al. Psychopathological Symptoms Among Chronically Ill Patients During SARS-CoV-2 Pandemic in Poland. Psychol Res Behav Manag. 2022;15:2659–69.
27. Cuschieri S. The STROBE guidelines. Saudi J Anaesth. 2019;13(5):S31–4.
28. Bastien CH, Vallières A, Morin CM. Validation of the insomnia severity index as an outcome measure for insomnia research. Sleep Med. 2001;2(4):297–307.
29. Morin CM, Belleville G, Bélanger L, Ivers H. The insomnia severity index: Psychometric indicators to detect insomnia cases and evaluate treatment response. Sleep. 2011;34(5):601–8.
30. Goldberg DP, Hillier VF. A scaled version of the General Health Questionnaire. Psychol Med. 1979;9(1):139–45.
31. Makowska Z, Merecz D, Mościcka A, Kolasa W. The validity of General Health Questionnaires, GHQ-12 and GHQ-28, in mental health studies of working people. Int J Occup Med Environ Health. 2002;15(4):353–62.
32. Cohen S, Kamarck T, Mermelstein R. A Global Measure of Perceived Stress. J Health Soc Behav [Internet]. 1983 Dec;24(4):385. Available from: https://www.jstor.org/stable/2136404
33. Özçelik N, Kesin HV, Telatar G, Özyurt S, Yılmaz Kara B, Gümüş A, et al. "COVID-Somnia" in healthcare workers during the pandemic. Hosp Pract (1995) [Internet]. 2022;50(4):273–81. Available from: https://doi.org/10.1080/21548331.2022.2102777
34. Alkahtani RF, Alomar AA, Alkanhal AF, Alhinti MF, Alatoui SE, Alrashidi RR, et al. Prevalence of Anxiety, Depression, and Sleep Disturbances Associated With the COVID-19 Outbreak in Riyadh, Saudi Arabia. Cureus. 2022;14(5).
35. Wańkowicz P, Szylińska A, Rotter I. Insomnia, anxiety, and depression symptoms during the COVID-19 pandemic may depend on the pre-existent health status rather than the profession. Brain Sci. 2021;11(8).
36. Wańkowicz P, Szylińska A, Rotter I. The impact of the covid-19 pandemic on psychological health and insomnia among people with chronic diseases. J Clin Med. 2021;10(6):1–8.
37. Wańkowicz P, Szylińska A, Rotter I. Evaluation of mental health factors among people with systemic lupus erythematosus during the sars-cov-2 pandemic. J Clin Med. 2020;9(9):1–8.
38. Shan Wong SY, Zhang D, Shan Sit RW, Kei Yip BH, Chung RY, Man Wong CK, et al. Impact of COVID-19 on loneliness, mental health, and health service utilisation: A prospective cohort study of older adults with multimorbidity in primary care. Br J Gen Pract. 2020;70(700):E817–24.

39. Alhadi AN, Alhuwaydi AM. Insomnia Prevalence and Associated Factors Among University Students in Saudi Arabia During the COVID-19 Pandemic and Lockdown: A Large-Scale Survey. Nat Sci Sleep. 2022;14(September):1651–63.
40. Aloush V, Gurfinkel A, Shachar N, Ablin JN, Elkana O. Physical and mental impact of COVID-19 outbreak on fibromyalgia patients. Clin Exp Rheumatol [Internet]. 2021 Jun 21;39(3):108–14. Available from: https://www.clinexprheumatol.org/abstract.asp?a=16897
41. Lee KM, Kim JS, Hwang S, Cho NJ, Park S, Gil HW, et al. The Higher the CKD Stage, the Higher the Psychological Stress in Patients with CKD during COVID-19 Pandemic. J Clin Med. 2022;11(16).
42. Yu JY, Kim JS, Hong CM, Lee KY, Cho NJ, Park S, et al. Psychological distress of patients with endstage kidney disease undergoing dialysis during the 2019 coronavirus disease pandemic: A cross-sectional study in a University Hospital. PLoS One [Internet]. 2021;16(12 December):1–14. Available from: http://dx.doi.org/10.1371/journal.pone.0260929
43. Cai Z, Cai X, Song Y, Wang D, Zhang Y, Ma S, et al. Psychological Distress and Its Association With Quality of Life in Organ Transplant Recipients During COVID-19 Pandemic. Front Psychiatry. 2021;12(June).
44. Habbash F, Salah A Ben, Almarabheh A, Jahrami H. Insomnia and Related Factors During the Delta Wave of the COVID-19 Pandemic in the Kingdom of Bahrain: A Cross-Sectional Study. Nat Sci Sleep. 2022;14(October):1963–75.
45. Kokou-Kpolou CK, Megalakaki O, Laimou D, Kousouri M. Insomnia during COVID-19 pandemic and lockdown: Prevalence, severity, and associated risk factors in French population. Psychiatry Res [Internet]. 2020;290:113128. Available from: https://doi.org/10.1016/j.psychres.2020.113128
46. Pieh C, Budimir S, Probst T. The effect of age, gender, income, work, and physical activity on mental health during coronavirus disease (COVID-19) lockdown in Austria. J Psychosom Res [Internet]. 2020;136(May):110186. Available from: https://doi.org/10.1016/j.jpsychores.2020.110186
47. Alqahtani JS, Alrabeeah SM, Aldhahir AM, Siraj R, Aldabayan YS, Alghamdi SM, et al. Sleep Quality, Insomnia, Anxiety, Fatigue, Stress, Memory and Active Coping during the COVID-19 Pandemic. Int J Environ Res Public Health. 2022;19(9):1–11.
48. Pappa S, Ntella V, Giannakas T, Giannakoulis VG, Papoutsi E, Katsaounou P. Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: A systematic review and meta-analysis. Brain Behav Immun [Internet]. 2020 Aug;88(1):901–7. Available from: https://linkinghub.elsevier.com/retrieve/pii/S088915912030845X
49. Krishnamoorthy Y, Nagarajan R, Saya GK, Menon V. Prevalence of psychological morbidities among general population, healthcare workers and COVID-19 patients amidst the COVID-19 pandemic: A systematic review and meta-analysis. Psychiatry Res. 2020;293(May).
50. Abraham O, Pu J, Schleiden LJ, Albert SM. Factors contributing to poor satisfaction with sleep and healthcare seeking behavior in older adults. Sleep Heal [Internet]. 2017;3(1):43–8. Available from: http://dx.doi.org/10.1016/j.sleh.2016.11.004
51. Finzi A, Colombo D, Caputo A, Andreassi L, Chimenti S, Vena G, et al. Psychological distress and coping strategies in patients with psoriasis: The PSYCHAE Study. J Eur Acad Dermatology Venereol. 2007;21(9):1161–9.
52. Baglioni C, Nanovska S, Regen W, Spiegelhalder K, Feige B, Nissen C, et al. Sleep and mental disorders: A meta-analysis of polysomnographic research. Psychol Bull [Internet]. 2016 Sep;142(9):969–90. Available from: https://pubmed.ncbi.nlm.nih.gov/27165699%0Ahttps://www.ncbi.nlm.nih.gov/pmc/articles/PMC5664198/%0Afile:///C:/Users/Carla Carolina/Desktop/Artigos para acrescentar na qualificação/The impact of birth weight on cardiovascular disease risk in the.pdf
53. Soh HS, Cho BL. Long COVID-19 and Health-Related Quality of Life of Mild Cases in Korea: 3-Months Follow-up of a Single Community Treatment Center. J Korean Med Sci. 2022;37(46):1–14.
54. Natale P, Ruospo M, Saglimbene VM, Palmer SC, Strippoli GF. Interventions for improving sleep quality in people with chronic kidney disease. Cochrane Database Syst Rev [Internet]. 2019 May 26; Available from: https://doi.wiley.com/10.1002/14651858.CD012625.pub2
55. He J, Yang L, Pang J, Dai L, Zhu J, Deng Y, et al. Efficacy of simplified-cognitive behavioral therapy for insomnia (S-CBTI) among female COVID-19 patients with insomnia symptom in Wuhan mobile cabin hospital. Sleep Breath. 2021;25(4):2213–9.
56. Grey I, Arora T, Thomas J, Saneh A, Tomhe P, Abi-Habib R. The role of perceived social support on depression and sleep during the COVID-19 pandemic. Psychiatry Res. 2020;293(May).
57. Xiao H, Zhang Y, Kong D, Li S, Yang N. The effects of social support on sleep quality of medical staff treating patients with coronavirus disease 2019(COVID-19) in January and February 2020 in China. Med Sci Monit. 2020;26:1–8.