

# History of contact with the SARS-COV-2 virus and the sense of coherence in the development of psychological distress in the occupational health professionals in Spain

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## Abstract

The COVID-19 pandemic has affected the psychological well-being of healthcare professionals, among them, on medical and nursing occupational specialists. This study describes the psychological distress that this group has suffered, analyzing the effect that the sense of coherence related with the history of contact with infected people has generated in their mental health. Cross-sectional descriptive study using online questionnaires. Data were collected on a sample of 499 subjects, representing 42.0% and 38.8% of the associations of specialists in Occupational Medicine and Nursing, respectively. A univariate data analysis, independence test, and the CHAID multivariate method were carried out. The percentage of workers with high psychological distress was higher among women than among men; this was also higher in public sector workers than in the

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private sector. No differences have been observed regarding psychological distress and educational level, coexistence, having children, working away from home, having a pet, or between being a physician or nurse. The most efficient measure to prevent psychological distress was acting regarding the comprehensibility dimension of the sense of coherence. Sex, contact with any infected person, age, living as a couple, working in public or private centers, the availability of diagnostic tests, and the correlation with the manageability dimension were modulating factors. Sense of coherence is an effective measure to prevent psychological distress due to contact with people affected by COVID-19 in Occupational Health professionals.

### **Keywords**

Occupational practice, COVID-19, psychological distress, sense of coherence, occupational health professionals

### **Background**

Healthcare professionals who were subjected to quarantine because of COVID-19, those who worked in COVID-19 intensive care units, or those who had family or friends infected with the SARS-CoV-2 virus developed considerably more anxiety, depression, frustration, and fear than those who had not experienced these conditions,<sup>1-3</sup> also causing the appearance of panic crisis and various psychic disorders.<sup>1,4</sup> To these we must add insomnia,<sup>5,6</sup> post-traumatic stress,<sup>7</sup> physical and mental exhaustion, or emotional disorders,<sup>8</sup> which generate frequent feelings of not being able to cope with the situation.

Along the COVID-19 pandemic, different public health interventions have been implemented in the search for effective results on workers' physical and mental health.<sup>9</sup> In the European Union, these regulations have reinforced the need for collaboration between the occupational and preventive health services of private companies and the occupational services of the National Health Systems for the diagnosis, treatment, and rehabilitation of work-related diseases.<sup>10,11</sup> However, these regulations have been limited to a scarce collaboration and procedures that have been issued to protect the rights of workers in periods of isolation during the pandemic.<sup>11</sup>

The current lack of interventions has led researchers both in epidemiology and preventive medicine to require the occupational health research community to submit papers on workers' health risks regarding the COVID-19 pandemic.<sup>12</sup> Although some studies have analyzed the mental health effects of COVID-19 on non-health workers,<sup>13</sup> there are not many publications focused on specific healthcare professionals, such as specialists in Occupational Medicine and Nursing, which are the subject of this study.

It is known that Occupational Medicine and Nursing specialists have had to work longer hours and with limited human resources, with the subsequent effects on their mental health.<sup>14</sup> On the other hand, maintaining the psycho-emotional well-being of frontline healthcare workers and building their resilience is crucial in addressing and containing the COVID-19 disease,<sup>15,16</sup> as these negative effects on psychological health are often broader and longer-term than the effects on physical

health.<sup>17</sup> In this way, psychological distress (PD) is a widely used indicator of mental health status and the sense of coherence (SOC) is a competence that can help professionals cope with the work-related PD and may contribute to their well-being and health.<sup>18</sup>

SOC was described as an ability to understand a situation, perceiving it as manageable, and provides a way to find meaning that motivates and allows the person to mobilize their resources and develop an effective coping response.<sup>19,20</sup> Several studies have shown that personality traits such as lower neuroticism and higher extraversion, open-mindedness to new experiences, and conscientiousness influence the SOC by promoting its development.<sup>21,22</sup> The SOC is acquired through training; health professionals with higher academic levels will have higher rates of SOC.<sup>23</sup>

This study aims to know the influence that the history of contact with the SARS-COV-2 virus and the Sense of Coherence have had in the development of Psychological Distress in the collective of Occupational Physicians and Nurses in Spain during the first months of the pandemic.

## Methods

### *Design*

Cross-sectional descriptive study using online questionnaires.

### *Participants*

A non-probabilistic sampling was used. An invitation to participate in the study was sent to all members of the Spanish Association of Specialists in Occupational Medicine and of the Association of Specialists in Occupational Nursing. Professionals who did not have their residence in Spain at the time of the study or were not active (medical leave, jobless, or retired) were excluded. Data collection took place between 23 April and 24 June 2020.

### *Instruments*

An ad hoc questionnaire was prepared based on published scientific evidence. For sociodemographic and work-related variables, age, sex, marital status, employment status, level of study, public or private nature of the workplace, years of experience in the specialty, level of care of the working activity, and variables related to working conditions were assessed. For the study of the “contact history” variable, history of contacts with possible positive cases of COVID-19, or suspected of being positive was also collected, as well as having performed sampling for COVID-19 diagnosis.

In relation to the psychological distress variable, the Goldberg General Health Questionnaire<sup>24</sup> was used. This questionnaire consists of 12 items and 4 answer options, and an overall score in a range between 0 and 12 points. The scale achieved

a Cronbach's  $\alpha$  reliability value of 0.97, and the internal consistency indexes presented by the dimensions ranged from  $\alpha = 0.91$  to  $\alpha = 0.93$ .<sup>25</sup>

The sense of coherence was measured through the Sense of Coherence-13 (SOC) scale in its Spanish version.<sup>26</sup> It is a self-administered questionnaire composed of 13 items with seven points. It assesses how often the participant lives certain experiences such as believing they are treated unfairly or whether they have very confusing feelings or ideas. The scale has a range of 13–91 points in its overall rating. It has three dimensions: (1) Meaningfulness, which measures the value that the person gives to experiences and motivation to fight against the adversities and challenges of life; (2) Comprehensibility, which measures the cognitive ability to understand and deal with difficult-to-solve situations; and (3) Manageability, which measures the ability to make effective use of the resources available to the person. The instrument as a whole obtained a Cronbach's  $\alpha$  index of 0.824. The internal consistency indexes presented by the dimensions were  $\alpha = 0.591$  for meaningfulness,  $\alpha = 0.690$  for comprehensibility, and  $\alpha = 0.611$  for manageability. The scores obtained in each dimension of the SOC were categorized, distinguishing between low, medium, or high, where low grouped scores between the minimum and the 25th percentile; medium, central 50% of cases; and high, between the 75th percentile and the maximum value.

## Procedure

A first draft of the questionnaire was analyzed by 10 experts consisting of specialists in clinical psychology, public health, epidemiologists, and Occupational physicians and nurses. Piloting was subsequently performed with the aim to identify the level of understanding and reliability of the questionnaire. Fifty-seven healthcare workers chosen through a sampling for convenience with approximately similar characteristics to the final target population were selected and accepted to participate. 50.90% were men and 49.10% were women, and the mean age was 41.87 years ( $SD = 11.86$ ). Most of these participants were married (56.10%) and had postgraduate studies, either Master's or Doctorate (57.90%). All of them completed the survey from different electronic devices (Tablet, laptop, and mobile). The questionnaire was accepted and no difficulty in the development, completion, or understanding of the items was found. Also, our scales achieved a Cronbach's  $\alpha$  reliability value of 0.867 in the GHQ and 0.831 in the SOC.

Data were collected through an online questionnaire using the Qualtrics® survey and storage platform. The online questionnaire was distributed among the physicians of the Spanish Association of Specialists in Occupational Medicine and the nurses of the Spanish Association of Specialists in Occupational Nursing, who had agreed to be contacted for research purposes. To this end, both associations were contacted and collaborated with the dissemination of the link to the online questionnaire. From the presidency of both Associations, information on the study was sent to their associates and their participation was requested. By clicking a link, the participants could access the survey. Prior to starting the questionnaire, an

introductory page was displayed to inform about the study and its objectives, and the written consent for participation was requested at the end of it.

### *Data analysis*

A descriptive statistical analysis was performed, with determination of absolute frequencies and percentages of variables that collect socio-labor information, contact history, and sense of coherence. To assess whether there was an association between these variables and the presence of psychological distress, the independence  $\chi^2$  test was used, and the CHAID method determined which variables were most significant. The chosen predictors were those with lower adjusted  $p$ , as long as that value was less than or equal to the significance level set to 0.05. The analyses were carried out with the statistical software SPSS 26.0© (IBM, Armonk, NY, US) and R version 4.0.0©.<sup>27</sup>

### *Ethical aspects*

This study had the favorable report of the Research Ethics Committee of Huelva, belonging to the Ministry of Health of Andalusia (PI 036/20) and complied with all the ethical principles contained in the Helsinki Declaration. All participants gave their permission to participate voluntarily and anonymously through the mandatory written informed consent before starting the online survey.

## **Results**

### *Descriptive analysis*

The final sample was composed of 499 Occupational Health professionals, of which 402 were specialist physicians and 97 were nursing specialists. In absolute terms, 42% of physicians and 38.8% of nurses of both professional Associations answered the questionnaire. 65.73% of the total were women, 50% of them were over 51 years of age, and 55.51% had master's or doctoral studies. 78.16% were married or living together as a couple, 79.56% had children, and 33.67% had a pet. All of them were actively working during the first months of the COVID-19 pandemic in Spain, and 69.96% were working away from home. Similarly, 36.67% worked in a public center. Of the total sample, 80.56% were Occupational Medicine specialists and 19.44% were Occupational Nursing specialists.

The percentage of workers with high psychological distress (PD) was higher in women (72.87%) than in men (51.46%); it was also higher in those aged 51 or younger (70.28%) than in those over the age of 51 (60.46%), and higher in public sector workers (72.68%) than those in the private sector (61.39%). No statistically significant difference has been observed between PD and educational level, living as a couple, having children, working away from home, having a pet, or between being a physician or a nurse (Table 1).

**Table 1.** Socio-labor variables of the studied collective and psychological distress.

	Total		GHQ < 3		GHQ ≥ 3		Statistical $\chi^2$	p-Value
	No. cases	% of total	No. cases	% line	No. cases	% line		
Sex	499	100	172	34.47	327	65.53		
Male	171	34.27	83	48.54	88	51.46	22.797	<0.001
Female	328	65.73	89	27.13	239	72.87		
Age*								
51 or younger	249	50.00	74	29.72	175	70.28	5.116	0.024
Older than 51	249	50.00	98	39.36	151	60.64		
Educational level								
Degree/ University degree	222	44.49	69	31.08	153	68.92	2.032	0.154
Postgraduate MSc or PhD	277	55.51	103	37.18	174	62.82		
Marital status								
With a partner	390	78.16	142	36.41	248	63.59	2.979	0.084
Without a partner	109	21.84	30	27.52	79	72.48		
Children								
No	102	20.44	32	31.37	70	68.63	.544	0.461
Yes	397	79.56	140	35.26	257	64.74		
Having a pet								
No	331	66.33	111	33.53	220	66.47	.380	0.538
Yes	168	33.67	61	36.31	107	63.69		
Working*								
From home	117	26.23	85	72.65	32	27.35	5.140	0.077
Away from home	312	69.96	191	61.22	121	38.78		
Both from and away from home	17	3.81	12	70.59	5	29.41		
Work center								
Public	183	36.67	50	27.32	133	72.68	6.534	0.011
Private or associated	316	63.33	122	38.61	194	61.39		
Profile								
Occupational Health nurse	97	19.44	34	35.05	63	64.95	.018	0.893
Occupational Health physician	402	80.56	138	34.33	264	65.67		

\*Total cases do not correspond because information was not collected in all subjects.

### *Multivariate analysis*

Figure 1 shows the psychological distress (PD) segmentation tree obtained from the socio-labor variables listed in Table 1. The sex variable was profiled as the most significant, with a lower percentage of cases with PD among men. In women, the type of workplace was a mediating variable, with higher levels of PD among those working for a public company. Among those who did so in a private company, working from home in telework mode generated higher levels of PD.

In relation to contacts that may lead to the disease, that was having been in contact for more than 15 min and with less than 2-m distance with an infected person, 61.3% claimed not to have experienced this situation. This percentage dropped to 45.9% when the participant had not been in casual contact with an infected person. Even lower was the percentage of those who claimed not to have had any contact with any person or material suspected of being infected (35.9%). 76.4% replied that no family member had been infected. In none of these contact situations, a statistically significant difference was found for generating higher percentages of PD (Table 2).

The total mean score of the SOC-13 scale was 62.8 (SD = 12.02). Table 2 shows how, regarding the overall value of the sense of coherence (SOC), 88.5% of those who give a low value have PD, a percentage which was lower among those with intermediate SOC (67.2%), and even lower among those with a high SOC (38.0%).

The same trend was seen in the three dimensions that make up the SOC. 90.5% of those with low comprehensibility have PD, lowering this percentage (63.7%) for those who have intermediate SOC levels and decreasing to 34.3% for those professionals with high levels of comprehensibility. Low manageability was also associated with a higher percentage of professionals showing PD (84.0%), while the lowest percentage was found among those with higher manageability levels (35.8%). Similarly, 80.7% of those with low meaningfulness levels have PD, lowering this percentage for those with intermediate levels of meaningfulness (67.2%), and even more (42.6%) for those with high meaningfulness levels.

Sex distinction was presented as the most significant variable when studying sociodemographic variables and contact history together, with higher risk found among women than among men. For women who work in public centers, 80.4% have psychological distress (PD), this percentage decreases for those who work in private centers; when they do so in associated centers, PD was reduced to 79.7% when working from home and to 62.3% if they worked away from home or combining both ways. In men, having had a diagnostic test was presented as a mediating variable, and for those who had undergone the test, the percentage of PD reduced to 18.8% if they had a pet, and to 52.2% if they did not. Among men who had not been diagnosed, PD was higher (69%) in those with university studies than in those with postgraduate studies, being age the mediating variable in the latter case and decreasing the percentage to 64.5% in individuals aged 51 or younger, or to 52.4% in those over 51 years of age if they were working in a public center, and to 11.1% for those in private or associated centers (Figure 2).

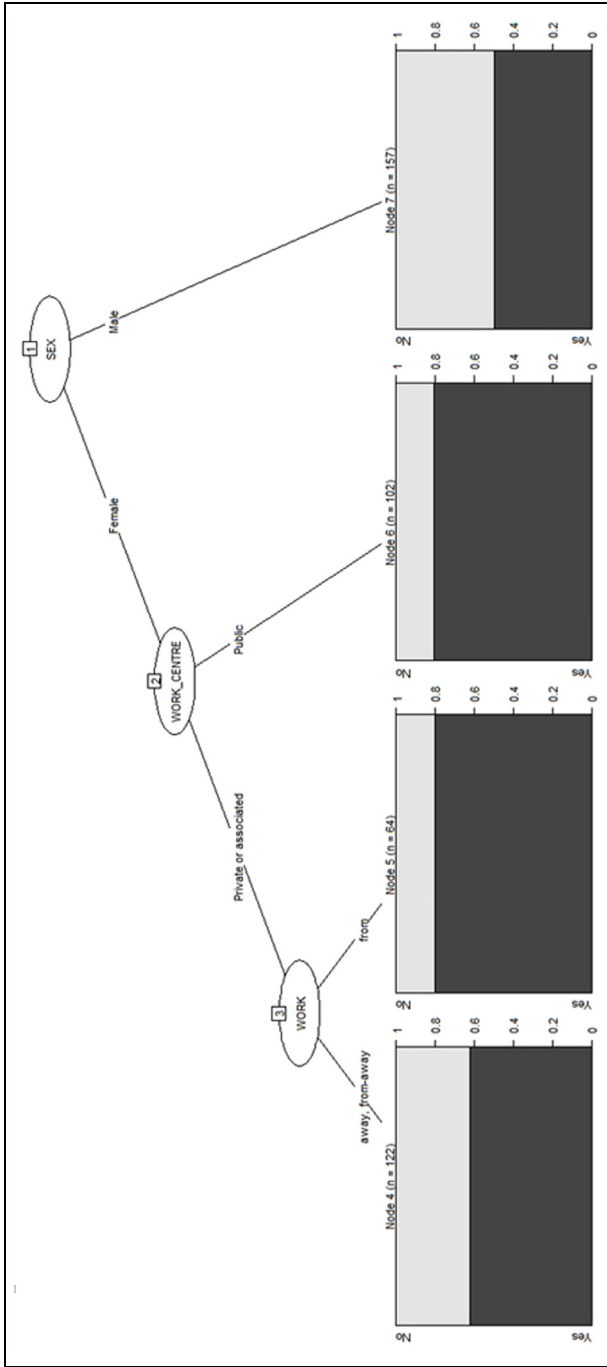


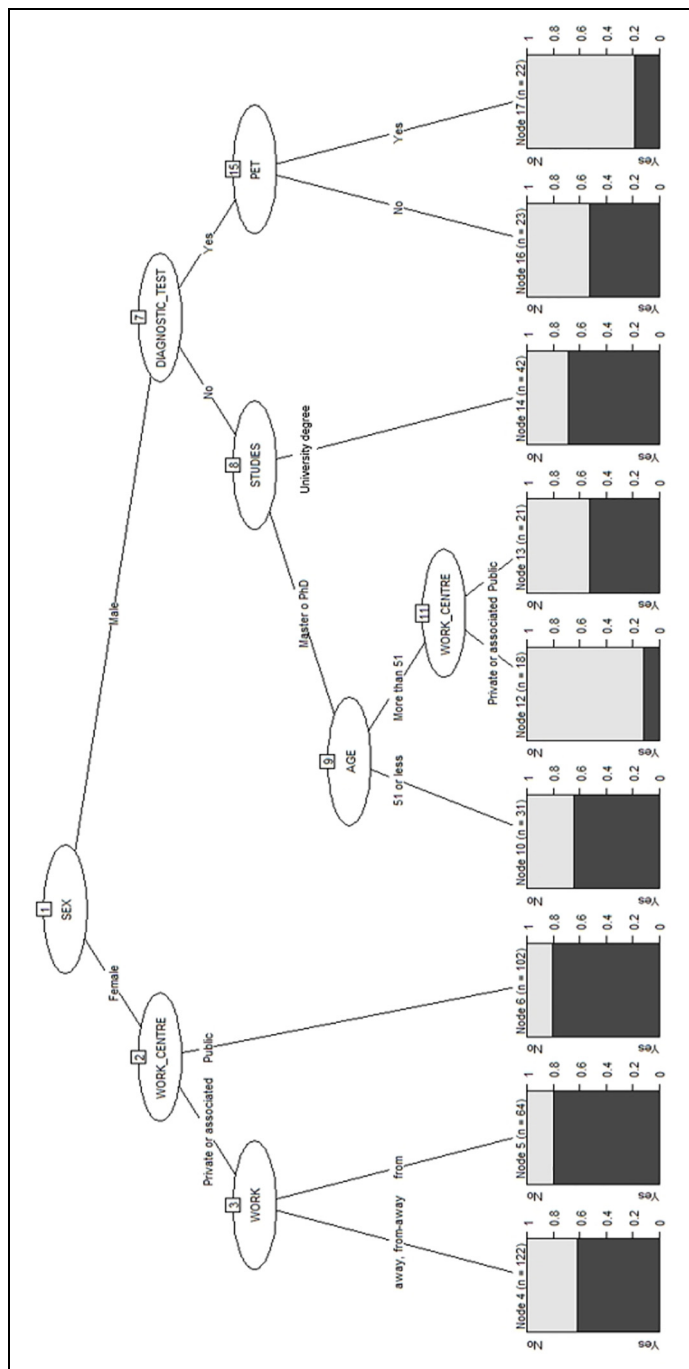
Figure 1. Socio-labor variables in the genesis of psychological distress.



**Table 2.** Association of the history of contact and sense of coherence with the development of psychological distress.

	Total		GHQ < 3		GHQ ≥ 3		Statistical $\chi^2$	p-Value
	No. cases	% of total	No. cases	% line	No. cases	% line		
	495	100	170	34.3	325	65.7		
	499	1.00	172	34.47	327	65.53		
Contact record								
Contact upper to 15 min and <2 m with infected person								
No	306	61.3	106	34.6	200	65.4	.010	0.910
Yes/doesn't know	193	38.7	66	34.2	127	65.8		
Casual contact with infected person								
No	229	45.9	75	32.8	154	67.2	.553	0.457
Yes/doesn't know	270	54.1	97	35.9	173	64.1		
Any contact with a person or material suspected of being infected								
No	179	35.9	63	35.2	116	64.8	.065	0.798
Yes/doesn't know	320	64.1	109	34.1	211	65.9		
Infected family member								
No	380	76.4	135	35.5	245	64.5	.789	0.374
Yes/doesn't know	119	23.8	37	31.1	82	68.9		
Infected peer*								
No	137	30.7	46	33.6	91	66.4	.296	0.587
Yes/doesn't know	309	69.3	112	36.2	197	63.8		
Quarantined for having symptoms or having had risk contact*								
No	454	96.4	161	35.5	293	64.5	1.036	0.309
Yes	17	3.6	4	23.5	13	76.5		
Diagnostic tests performed								
No	335	67.13	113	33.7	222	66.3	.246	0.620
Yes/doesn't know	164	32.87	59	36.0	105	64.0		
Sense of coherence								
Comprehensibility (SOC_C)								
Low	148	29.90	14	9.5	134	90.5	85.508	<.001
Intermediate	245	49.49	89	36.3	156	63.7		
High	102	20.61	67	65.7	35	34.3		
Manageability (SOC_M)								
Low	156	31.52	25	16.0	131	84.0	60.797	<.001
Intermediate	244	49.29	84	34.4	160	65.6		
High	95	19.19	61	64.2	34	35.8		
Meaningfulness (SOC_S)								
Low	140	28.28	27	19.3	113	80.7	39.819	<.001
Intermediate	247	49.90	81	32.8	166	67.2		
High	108	21.82	62	57.4	46	42.6		
SOC								
Low	130	26.26	15	11.5	115	88.5	71.241	<.001
Intermediate	244	49.29	80	32.8	164	67.2		
High	121	24.44	75	62.0	46	38.0		

\*Total cases do not correspond because information is not collected in all subjects.



**Figure 2.** Association between history of contact and development of psychological distress.

In Figure 3, between the different dimensions of the SOC and the sociodemographic variables, the first node of the segmentation tree was part of the Comprehensibility dimension, distinguishing different criteria of division in its construction, among which the manageability and meaningfulness dimensions do not appear. High comprehensibility generates psychological distress in 34.7% of professionals. However, intermediate and low levels of comprehensibility will be mediated by a second node, the marital status. The fact of having an intermediate level of comprehensibility and a partner registers psychological distress in 49.5% of professionals working in private or associated centers, amounting this percentage to 71.2% in public centers. Without a partner, the highest proportion of psychological distress corresponds to women, with 85.4% of cases, as compared to men, with 61.1%. If the comprehensibility level was low and they do not have a partner, 77.8% of professionals have psychological distress, and this percentage increases to 83.3% for men and 96.2% for women by having a partner.

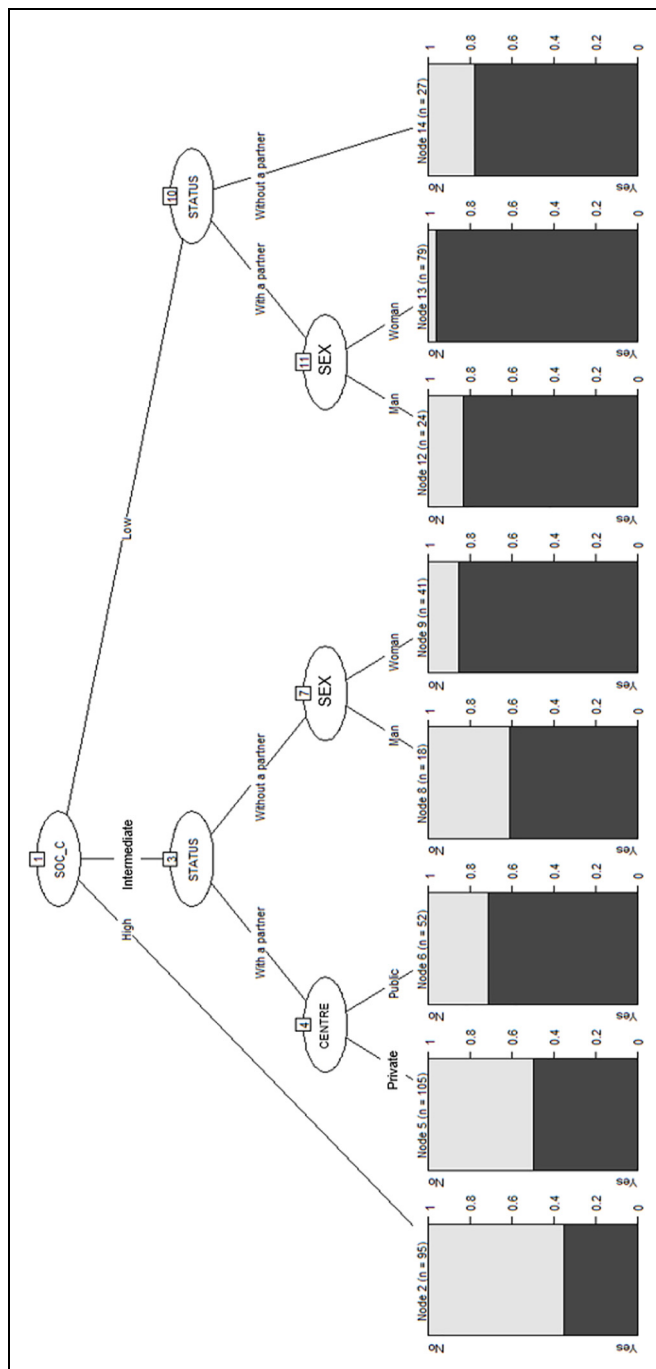
From the variables studied, Figure 4 allows us to observe how the compressibility dimension of the SOC test (SOC\_C) was presented as the most significant variable by determining the percentage of presence of psychological distress (PD). From it, three groups were formed that apply different criteria to create a tree with fourteen terminal nodes.

High comprehensibility and the fact that they have been, or not knowing whether they have been, in casual contact with a confirmed infected person results in a percentage of PD of 25%, while being sure that no casual contact has been had was mediated by the manageability dimension of the SOC test (SOC\_M). Intermediate manageability with some suspected contact increases the percentage of PD to 90.9%, decreasing to 41.7% in the absence of suspicion. Also, with high or low manageability there is no PD in those over 51 years, and 46.2% otherwise.

Intermediate comprehensibility was also mediated by marital status; not having a partner results in 77.8% of cases with PD, and having a partner varies between 71.2% in those working in public centers and 49.5% in those working for private or associated centers. However, with low comprehensibility, the fact of having a partner leads to a higher percentage of PD, 96.2% in women and 83.3% in men, than not having a partner, with 77.8% of cases.

## Discussion

COVID-19 pandemic has been an important challenge for healthcare professionals worldwide and we need tools that provide information about both the physical and mental status of this population. This study has made it possible to know personal factors regarding having contact with COVID-19 patients or related to the sense of coherence, that were associated with high levels of psychological distress among healthcare professionals in the area of occupational health. This could allow preventive actions to be established to reduce PD in occupational medicine or occupational nursing. This group of healthcare professionals has differentiated



**Figure 3.** Association between sense of coherence and development of psychological distress.

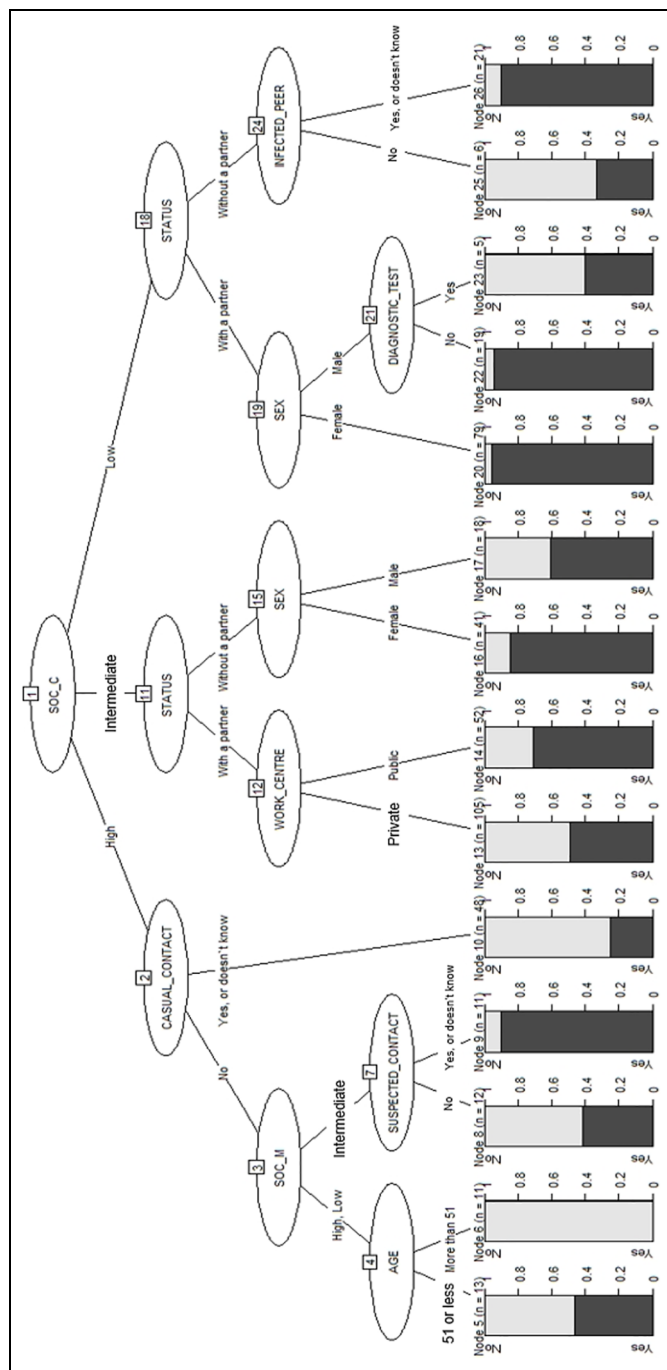


Figure 4. History of contact, sense of coherence, and development of psychological distress.

work activities, as well as different effects on their mental health than those published in previous studies which were carried out on all healthcare professionals.

The percentage of workers with high psychological distress was higher among women than among men; this was also higher in public sector workers than in the private sector. Marital status, age, and type of center (public or private) were also related with distress. As COVID-related modulating factors, we can find having a diagnostic test, casual/suspected contact, and infected peer.

Overall, COVID-19 case-fatality ratio is about 2.4 times higher among men than among women, although no apparent sex differences exist in the number of confirmed cases.<sup>28</sup> On the contrary, the results of this study reveal a percentage of women with psychological distress, like most studies have shown previously,<sup>2,29</sup> although there were precedents of opposite results in previous epidemics.<sup>30</sup> In our study, greater PD has not been found among nurses than among physicians, contrary to the observations of other studies.<sup>31</sup> This difference found in the literature may be explained by comparing different professional activities of other specialists, such as those in the frontline of healthcare attention.<sup>2,8,12,15</sup>

The perception of possible contact with infected people has not been found to condition PD levels, although other health studies have identified this conditioning factor.<sup>31</sup> This was justifiable because of the type of work activity these professionals perform and the lower percentage that claims to have been in contact with people or material suspected of being infected. Sex was the most significant variable when studying sociodemographic variables and contact history together, as increased risk has been seen in women. In this sense, in women working in a public center or working from home, the percentage of PD levels increases. It seems that, in this case, the PD that teleworking generates<sup>32</sup> was greater than that produced by working away from home, although in the latter case the possibility of contact with contaminated people or material exists.<sup>33</sup> Given the high percentage of telework that has been found in the group of study, compared to the lower percentage of health professionals who telework in hospitals, it could be of interest to further analyze the influence of the high percentage of jobs that have been transformed into telework and, consequently, with less exposure or contact with people affected by COVID-19, in the development of psychological distress.

We found greater PD values in subjects who work in a public center. This may be due either to the fact that they carry out a bigger scope of activities than those of private centers and the ability to organize their work and their own preventive measures. In men, regarding the development of PD, we found factors already described in the occupational medicine specialist collective, such as whether or not they had been performed the diagnostic test<sup>34</sup> and others less described such as having a pet, although its protective effect has been considered.

Likewise, by promoting high values of the sense of coherence, both in its overall value and in its three dimensions, the development of PD would be prevented, corroborating previous studies.<sup>35</sup> Similarly, the level of work engagement or a higher level of health has also been linked to lower levels of work or family conflicts.<sup>20</sup> In our study, the mean overall value of the SOC was 62.25 (SD = 12.01), a very

similar figure to those found in previous studies on nurses<sup>36</sup> or healthcare professionals.<sup>31</sup> The higher SOC value was 24.44%, being much lower than that observed among non-health workers during the pandemic period (47.7%).<sup>37</sup>

The results confirm the need to not only be concerned about protecting the physical health of healthcare professionals, but also about the effects on their mental health, something that has been confirmed by a high number of studies.<sup>5,38</sup> Many have criticized the delay of governments in enabling healthcare workers to have sufficient preventive measures against contagion, and the high number of these professionals who were infected at the beginning of the pandemic in Spain has been seen, 14.9% in March 2020, with a higher percentage among women.<sup>31</sup> We are also in time to prevent the effect of COVID-19 on the mental health of these occupational healthcare professionals, as we know that these effects occur soon,<sup>39</sup> but that they also remain in the long term, even more than the effects on biological health.<sup>17</sup> There have been studies, such as the present one, that identified factors on which it is efficient to act upon to promote and protect the mental health of healthcare professionals. Between these strategies it could be useful adopting a healthy diet (specifically including vitamins and minerals), having an active lifestyle, having rest properly between work shifts, maintaining of social networks, expressing feelings/emotions, and dedicating shorter time to the watching, reading, or listening about information on COVID-19.<sup>40-42</sup> For team leaders or managers in health facilities, keeping all staff protected from chronic stress and poor mental health, ensuring quality communication, and ensuring that staff are aware of where and how they can access mental health and psychosocial support services is essential.<sup>42</sup>

One of the limitations of the study is inherent in the used methodology, since the non-probabilistic sampling and the wilfulness in participating prevents from knowing the representativeness. We know that the percentage of participation was significant, 42.00% of occupational health physicians and 38.8% of occupational health nurses, although we cannot know if the characteristics of those who participated were similar to the ones of those who did not. Likewise, the level of training was quite homogeneous in the studied group and no differences have been appreciated regarding the level of participation according to age and sex. The absence of differences between social variables, the collaboration of the two associations of professionals specialized in occupational health in Spain, and the high percentage of participation could support the extrapolation of the results to the whole collective, albeit with some caution.

## **Implications for Occupational Health Practice**

This study releases that the Occupational Medicine and Nursing collective has suffered mental health effects similar to those of all healthcare professionals, but also other differing ones, possibly justified by lower working activity in hospitals and higher in companies that monitor the health of workers in general, which sets them apart from clinical healthcare, which mostly serve sick people. In addition, physicians and nurses at work care for theoretically healthy people, although they may

be asymptomatic carriers of COVID-19 or even with symptoms in their first state. In this way, sense of coherence is an effective measure to prevent psychological distress due to contact with people affected by Covid-19.

## Conclusions

The results of this study were consistent with previous studies, such as higher PD in women or young people. But there were also different ones, such as not having found more PD in nurses than in practitioners. Likewise, nurses have been able to adapt better to teleworking than other health professionals, largely due to the low hospital percentage of teleworkers, and maybe because of the less exposure or contact with people affected by COVID-19. Comprehensibility and manageability are dimensions of the Sense of Coherence that have been related with the regulation of psychological distress in Occupational medical and nursing specialists.

This study may lead to the convenience of segmenting studies on the effects of COVID-19 into subgroups of healthcare professionals. We believe that future studies should be carried out to analyze these differentiating group characteristics, which may justify a different development of PD level, and thereby could lead to identify measures for its prevention.

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