COVID-19

Sense of Coherence (SOC) of Italian healthcare workers during the COVID-19 pandemic: analysis of associated factors

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Keywords

Summary

Introduction. *The COVID-19 pandemic has posed significant challenges for healthcare workers worldwide, potentially affecting their sense of coherence (SOC) and overall well-being. This study aimed to identify factors associated with different levels of SOC among healthcare workers, exploring demographic characteristics, work-related factors, changes in relationships and social habits, and the overall well-being.*

Methods. *A cross-sectional study was conducted among 628 healthcare workers. SOC scores were assessed using a standardized questionnaire. Statistical analyses were performed to identify associations between these factors and SOC.*

Results. *Healthcare workers had a lower average SOC score (mean: 57.1) compared to the national average in Italy (mean: 60.3). Younger age and shorter length of service were associated with a higher risk of low SOC (p < 0.0001). Healthcare workers*

in the northwestern regions of Italy had an increased risk of low SOC compared to their counterparts in the northeastern regions (p = 0.0336). Adverse pandemic-related experiences and worsening social relationships were also associated with a higher risk of low SOC (p < 0.0001).

Conclusions. *This study highlights the unique challenges and stressors faced by healthcare workers during the COVID-19 pandemic and their impact on SOC. Age, length of service, geographic location, and social status were significant factors influencing SOC levels. Targeted interventions are needed to enhance SOC and well-being, particularly for younger and newly employed healthcare workers. Strategies promoting social connections, work-life balance, and psychological support services are crucial to support healthcare workers' resilience and coping abilities.*

Introduction

The global COVID-19 pandemic has had a significant impact on people's daily lives and psychophysical well-being, leading to medical, social, and economic consequences [1].

In particular, healthcare workers have been shown to experience mental health issues at a higher rate compared to the general population. Indeed, the health care sector is already characterized by psychosocial risk factors closely related to workplace organization and worker safety, such as shifts, employment rates, emergency management, staff shortages, and daily exposure to extreme distress [2, 3].

However, the COVID-19 pandemic presented unprecedented challenges for the health care system and its workers. The world was unprepared for such an outbreak, resulting in the high transmissibility of the virus, inadequate provision of personal protective equipment, limited hospital capacity, staff shortages, increased workloads, and insufficient training for emergency healthcare workers [4]. These factors, combined with the limitations imposed by the pandemic, have significantly affected people's social lives, further deteriorating global well-being [5].

Scientific evidence has indicated that the negative stress experienced by healthcare workers can have long-term consequences on their overall well-being, attention, understanding, decision-making, and ability to provide effective care [6-8]. Therefore, it is crucial to invest in interventions aimed at improving the "Sense of Coherence" (SOC) levels among healthcare workers. SOC is a resource for managing stress, involving the identification and mobilization of external and internal resources to promote health and resolve tensions [9]. Introduced by Aaron Antonovsky in the 1970s, SOC refers to "the search for health causes, that is, factors that can generate health and well-being, individual resources and processes that promote health" [9].

According to Antonovsky, individuals with a strong SOC perceive the world as meaningful, understandable, and predictable. They view stressors as challenges and activate their own resistance resources to cope with them. Conversely, individuals with a weak SOC tend to perceive stress as burdensome. SOC represents an ongoing and dynamic sense of trust in the structured and predictable nature of life's stimuli, the availability of resources to address challenges, and the meaningfulness of these challenges, thus motivating commitment and

effort [10]. Antonovsky's SOC theory sheds light on the concept of "stress-resource interaction" and explains why people can experience improved health and well-being in stressful situations [11].

Several studies have demonstrated that individuals with high levels of SOC are aware of their resources and effectively utilize them during stressful situations. Consequently, they are less susceptible to burnout and generally enjoy better health [7, 12-15]. Therefore, SOC plays a significant role in maintaining mental health under stressful conditions, and different SOC levels influence a person's psychophysical state.

Moreover, previous research has shown that SOC levels correlate with psychological distress, with individuals possessing weak SOC being at a higher risk of mental health problems compared to those with moderate or strong SOC [16, 17]. For instance, a recent study on nurses working in Intensive Care Units found that a higher SOC level was associated with better mental health [18].

To date, there is limited scientific data on the factors influencing SOC levels among healthcare workers during the COVID-19 pandemic. Existing studies mainly focus on healthcare workers involved in the diagnosis, treatment, and care of COVID-19 patients, investigating factors related to psychological distress such as depression, anxiety, insomnia, and stress [19, 20]. Additionally, investigations into the impact of social relationships on SOC levels are often conducted in routine work situations rather than emergency contexts like the current pandemic [21, 22].

Examining the factors influencing or influenced by the global spread of emerging infectious diseases and other disasters that affect SOC levels will assist health systems in targeting preventive measures and health promotion initiatives for future pandemic phases. It is crucial to enhance healthcare workers' awareness of available resources and empower them to cope effectively with stressors [11, 23].

Protecting the well-being of medical and social health workers is a fundamental aspect of the public health response to the COVID-19 pandemic and empowering them is of utmost importance.

Therefore, the primary objective of the study was to evaluate the impact of the COVID-19 pandemic on SOC levels among healthcare workers. By identifying the specific factors associated with different SOC levels, the study aimed to provide insights for interventions and support programs that can enhance SOC and promote the well-being of healthcare workers during and beyond the pandemic.

Methods

STUDY DESIGN AND DATA COLLECTION PERIOD

This cross-sectional observational study encompassed sociodemographic characteristics, work-related factors, health status, as well as changes in relationships and social habits among healthcare workers during the COVID-19 pandemic. The data collection period for this study spanned from January 18 to May 24, 2022.

STUDY POPULATION

The study was addressed to all healthcare workers enrolled in their own Order as defined by the Italian Ministry of Health (National Federation of Orders of Medical Doctors, Surgeons, and Dentists, National Federation of Italian Veterinary Orders, National Federation of Italian Pharmacy Orders, National Federation of Nursing Professions Orders, National Federation of Midwifery Profession, National Federation of Orders of Medical Imaging and Health Professions, Technical, Rehabilitation, and Prevention, National Council of Psychologists Order, National Federation of Orders of Biologists, National Federation of Orders of Chemists and Physicists, National Federation of Physiotherapist Orders).

INCLUSION AND EXCLUSION CRITERIA

Inclusion criteria for this study consisted of healthcare professionals working in all areas of the healthcare system, who were duly registered with their respective professional orders, and operated in either the public or private sector, or both. On the other hand, individuals who were not currently practicing as healthcare professionals, and who did not work in the public or private sector, or in both, were excluded from the study.

DATA COLLECTION TOOLS

The study employed a structured questionnaire, developed using Google Forms, which consisted of some validated sections. The questionnaire was disseminated through major social networks, including popular social media platforms and messaging apps. The specific names of the social networks were not disclosed due to copyright and intellectual property considerations. The questionnaire comprised four sections: (i) socio-demographic, anthropometric, and work-related information; (ii) the WHO Well-Being Questionnaire (WHO-5); (iii) social relationships; and (iv) impact on personal life satisfaction.

The impact on personal life satisfaction was assessed using the Sense of Coherence (SOC) questionnaire. This questionnaire examined individuals' awareness of their position in life in relation to their goals, expectations, standards, and concerns within the context of their culture and values.

To measure SOC, the 13-item Sense of Coherence Scale (SOC-13), developed by Antonovsky [24] and translated into Italian by Sardu et al. [25], was utilized. The national SOC mean score was 60.3 (SD: 13.6, 95% CI 59.1-61.8). The scale consisted of 13 items rated on a 7-point Likert scale (1: very often, 7: almost never, not at all), with total scores ranging from 13 to 91. Higher scores indicated a stronger SOC. The Cronbach's alpha coefficient for the SOC-13 scale in this study was 0.78.

To enhance the generalizability of the study's findings and following suggestions from previous authors the SOC scores were divided into "low SOC" and "high SOC" categories [26, 27]. This categorization facilitated the comparison of variables between the two groups based on scores above and below the sample mean, respectively.

The section on socio-demographic, anthropometric, and work-related information aimed to describe and characterize the study sample. It included variables such as gender, age, marital status, country of birth, area of residence, number of people residing together, presence of minors, presence of elderly individuals, presence of disabled individuals, availability of open space at home, education, occupation, work experience, working conditions, type of employment (full-time or part-time), type of contract, occupation, and the impact of the pandemic on work.

The psychological impact questionnaire used the WHO Well-Being Questionnaire (WHO-5), which provides a simple measure of current psychological well-being [28]. A cut-off score of ≤ 50 was used accordingly to the scientific literature [29].

The section on social relationships encompassed information about family, friends, and co-worker relationships. It examined how the pandemic affected living arrangements with household members, as well as face-to-face and long-distance social relationships. It also explored visiting public places and self-care practices. Participants were asked to indicate whether their social relationships had worsened, improved, or remained unchanged since the start of the pandemic, and to what extent.

STATISTICAL ANALYSIS

A descriptive analysis was conducted on the study population, presenting socio-demographic and occupational information, psychological well-being, and changes in social relationships categorized based on SOC levels (high/low).

The results were reported as means and standard deviations or medians and interquartile ranges for quantitative variables, and frequencies for categorical variables.

To compare qualitative and quantitative variables, the χ^2 test and Mann-Whitney U test were employed, respectively. Statistical significance was defined as a p-value < 0.05. Logistic regression models were used to calculate odds ratios and 95% confidence intervals, assessing the association between socio-demographic and occupational variables, psychological well-being, and changes in social relationships for each SOC category.

The analyses were performed using JMP PRO® software, version 14 (SAS Institute, Cary, NC, USA).

RESOURCES

This research did not require any external resources. The questionnaires were administered through a free online platform.

Results

Overall, data were collected for 628 healthcare workers, of whom 318 (50.64%) were classified as having a weak SOC, and 310 (49.36%) were classified as having a high SOC. In this study, healthcare workers had a lower average SOC score compared to the national level in Italy (our study, average: 57.1; national study, average: 60.3) [25]. The median age of the participants included in the analysis was 38 years (interquartile range IQR 30-53), and the majority of the subjects were women (86.15%) and of Italian nationality (96.66%). The marital status was single in 46.82% of the cases. The province of residence belonged to the northeastern regions of Italy in 45.38% of the cases, northwestern in 23.57%, central in 12.74%, islands in 9.39%, and southern in 8.92%. In terms of educational attainment, the majority of the sample had a bachelor's degree (59.55%), followed by a master's degree (26.91%), a diploma (11.78%), and a Ph.D. (1.75%). The most represented job tasks were healthcare professions (86.94%), followed by medical professions (8.44%), and other professions such as psychologist, chemist, and physicist (4.62%).

The participating healthcare workers were mostly employed in the public sector, accounting for 72.45% of the sample, with a full-time contract (86.94%), and the majority had a length of service between 1-9 years (39.01%). 65.13% of the sample performed their main job in the prevention sector (55.37%). From the analysis there were no statistically significant difference by gender, birthplace, job task and SOC level (Tab. I).

Among the total respondents (n = 628), individuals aged 20-29 years showed a 6-fold higher risk (OR 5.97, 95% CI 2.66-13.45, p < 0.0001) of having a low SOC compared to those aged ≥ 60 years. Healthcare workers in other age groups showed a similar risk: specifically, individuals aged 30-39 years, 40-49 years, and 50-59 years had a three to four times higher risk of having a low SOC compared to those aged ≥ 60 years (OR 4.11, 95% CI 1.87-9.05, p = 0.0004; OR 3.01, 95% CI 1.28-7.09, p = 0.0115; OR 3.46, 95% CI 1.56-7.66, p = 0.0023, respectively).

A similar risk (OR 5.50, 95% CI 1.70-17.77, p = 0.0044) was found among individuals with a length of service of less than one year compared to healthcare workers with over 40 years of service, as well as in individuals with a length of service between 1 and 9 years (OR 5.70, 95% CI 2.07-15.70, p = 0.0008), and, to a lesser extent, in those with a length of service between 10 and 19 years (OR 3.58, 95% CI 1.26-10.13, p = 0.0164), 20-29 years (OR 3.53, 95% CI 1.21-10.33, p = 0.0211), and 30-39 years (OR 3.13, 95% CI 1.09-8.91, p = 0.033).

The northwestern regions showed an increased risk of low SOC compared to the northeastern regions (OR 1.54, 95% CI 1.03-2.30, p = 0.0336).

Being married, living with other people, having dependents under one's responsibility, and having open spaces in one's home were found to be protective factors against low SOC among healthcare workers (OR 0.54, 95% CI 0.39-0.76, p = 0.0003; OR 0.6, 95% CI 0.44-0.84, p = 0.0024; OR 0.55, 95% CI 0.39-0.78, p = 0.0009; OR 0.56, 95% CI 0.33-0.94, p = 0.0294) (Tab. I).

Based on the WHO-5 and SOC scores, female healthcare workers exhibited lower well-being and SOC scores compared to male healthcare workers (p = < 0.0006 and

Tab. I. Socio-demographic characteristics stratified by SOC level.

Socio-demographic characteristics	Low SOC ≤ 57 (n.,%)	High SOC > 57 (n.,%)	OR (95% CI)	p-Value*
Gender				
Male	37 (42.53)	50 (57.47)	Reference	
Female	281 (51.94)	260 (48.06)	1.46 (0.92-2.31)	0.1045
Age groups				
20-29	88 (61.97)	54 (38.03)	5.97 (2.66-13.44)	< 0.0001
30-39	102 (52.85)	91 (47.15)	4.11 (1.87-9.05)	0.0004
40-49	37 (45.12)	45 (54.88)	3.01 (1.28-7.09)	0.0115
50-59	82 (48.52)	87 (51.48)	3.46 (1.56-7.66)	0.0023
≥ 60	9 (21.43)	33 (78.57)	Reference	
Marital status				
Single	171 (58.16)	123 (41.84)	Reference	
Married	120 (43.01)	159 (56.99)	0.54 (0.39-0.76)	0.0003
Separated	12 (44.44)	15 (55.56)	0.57 (0.26-1.27)	0.1723
Divorced	15 (53.57)	13 (46.43)	0.83 (0.38-1.81)	0.2859
Birthplace				
Italy	306 (50.41)	301 (49.59)	Reference	
Foreign Country	12 (57.14)	9 (42.86)	1.31 (0.54-3.16)	0.5453
Region of residence				
Northeast	131 (45.96)	154 (54.24)	Reference	
Central	43 (53.75)	37 (46.25)	1.36 (0.83-2.24)	0.2189
Northwest	84 (56.76)	64 (43.24)	1.54 (1.03-2.30)	0.0336
Islands	29 (49.15)	30 (50.85)	1.14 (0.65-1.99)	0.6551
South	31 (55.36)	25 (44.64)	1.46 (0.82-2.59)	0.1998
Number of co-habitants in the same household				
1-2	161 (56.49)	124 (43.51)	Reference	
3-4	134 (43.93)	171 (56.07)	0.6 (0.44-0.84)	0.0024
≥5	23 (60.53)	15 (39.47)	1.18 (0.59-2.36)	0.6373
Minors under own responsibility				
Yes	75 (40.32)	111 (59.68)	0.55 (0.39-0.78)	0.0009
No	243 (54.98)	199 (45.02)	Reference	
Elderly under own responsibility				
Yes	67 (53.60)	58 (46.40)	1.16 (0.78-1.72)	0.4593
No	251 (49.90)	252 (50.10)	Reference	
Persons with disabilities under own responsibility				
Yes	30 (49.18)	31 (50.82)	0.94 (0.55-1.59)	0.8108
No	288 (50.79)	279 (49.21)	Reference	
Presence of open spaces in the home				
Yes	190 (48.72)	200 (51.28)	0.56 (0.33-0.94)	0.0294
No	128 (53.78)	110 (46.22)	Reference	
Educational Attainment				
Bachelor's degree	201 (53.74)	173 (46.26)	Reference	
Master's degree	77 (45.56)	92 (54.44)	0.72 (0.50-1.04)	0.0779
High School Diploma	35 (47.30)	39 (52.70)	0.77 (0.47-1.27)	0.311
PhD	5 (45.45)	6 (54.55)	0.72 (0.22-2.39)	0.5885
Job tasks				
Medical professions	29 (54.72)	24 (45.28)	Reference	
Healthcare professions	278 (50.92)	268 (49.08)	0.86 (0.49-1.51)	0.5974
Other professions**	11 (37.93)	18 (62.07)	0.51 (0.20-1.28)	0.1773
Years of service				
Less than a year	22 (57.89)	16 (42.11)	5.5 (1.70-17.77)	0.0044
1-9	144 (58.78)	101 (41.22)	5.70 (2.07-15.70)	0.0008
10-19	59 (47.20)	66 (52.80)	3.58 (1.26-10.13)	0.0164
20-29	38 (46.91)	43 (53.09)	3.53 (1.21-10.33)	0.0211
30-39	50 (43.86)	64 (56.14)	3.13 (1.09-8.91)	0.033
≥ 40	5 (20.00)	20 (80.00)	Reference	

▶

Tab. I. *continues.*

Socio-demographic characteristics	Low SOC ≤ 57 (n.,%)	High SOC > 57 (n.,%)	OR (95% CI)	p-Value*
Work setting				
Public	224 (49.23)	231 (50.77)	0.80 (0.55-1.18)	0.2582
Private	75 (54.74)	62 (45.26)	Reference	
Non-profit or third sector	19 (52.78)	17 (47.22)	0.92 (0.44-1.93)	0.8331
Work status				
Full-time	278 (50.92)	268 (49.08)	1.09 (0.68-1.73)	0.7184
Part-time	40 (48.78)	42 (51.22)	Reference	
Type of contract				
Employee contract	264 (50.32)	247 (49.68)	Reference	
Freelance	40 (64.58)	50 (35.42)	0.75 (0.48-1.17)	0.2075
Other***	14 (50.00)	13 (50.00)	1.01 (0.46-2.19)	0.9848
Work sector				
Hospital	119 (54.34)	100 (45.66)	1.26 (0.90-1.75)	0.1749
Territory	199 (48.66)	210 (51.34)	Reference	
Commuter				
Yes	82 (54.34)	68 (45.33)	1.24 (0.86-1.79)	0.2583
No	236 (49.37)	242 (50.63)	Reference	

* Chi-square test. **Psychologist; Chemist; Physicist. *** Work without a contract (verbal agreement); coordinated and continuous collaboration agreement; intermittent or on-call work; contract for work performance, professional consultancy; autonomous and occasional collaboration contract; temporary employment contract; apprenticeship contract

Tab. II. Well-being status (WHO-5 questionnaire) and SOC stratified by gender and job task.

	WHO-5	p-Value	SOC	p-Value
Mean, standard deviation (SD)	46.69 (21.49)	-	57.11 (11.21)	-
Gender				
Male	54.02 (19.47)	Reference	59.65 (11.30)	Reference
Female	45.52 (21.59)	0.0006*	56.71 (11.15)	0.0228*
Job tasks				
Medical professions	46.26 (22.33)	0.2159**	57.34 (13.13)	0.3173**
Healthcare professions	46.43 (24.45)	0.1447**	56.95 (11.02)	0.1629**
Other professions***	52.41 (20.71)	Reference	59.93 (11.09)	Reference

* T-test; ** Anova test; ***Psychologist; Chemist; Physicist.

p = 0.0228, respectively). Furthermore, there were no statistically significant differences between job tasks and well-being status and SOC (Tab. II).

Based on the WHO-5 score, 79.87% of the 318 healthcare workers with low SOC exhibited poor well-being, with a risk 7.8 times higher compared to the rest of the sample (OR 7.86, 95% CI 5.48-11.29, p = < 0.0001) (Tab. III).

Subjects whose relationships with family, friends, and colleagues worsened due to the pandemic showed a risk of approximately 2 times higher of having a low SOC, respectively (OR 2.62, 95% CI 1.81-3.79, p < 0.0001; OR 2.13, 95% CI 1.45-3.12, p = 0.0001; OR 2.11, 95% CI 1.47-3.05, p < 0.0001).

Furthermore, a statistically significant difference was found between the two SOC subgroups regarding the perception of danger regarding their work for themselves and their cohabitants. In particular, healthcare workers with low SOC had a higher perception that their work was a source of danger for themselves and their cohabitants compared to the subgroup with high SOC (p = 0.0214).

Healthcare workers who reported rarely or never visiting public places following the pandemic had a 2 times higher risk of having a low SOC (OR 2.30, 95% CI 1.33-3.99, p = 0.0030).

Additionally, taking care of oneself rarely or never compared to before the pandemic was found to be an

Tab. III. Well-being status (WHO-5 questionnaire) stratified by SOC level.

WHO-5 questionnaire	Poor well-being (≤ 50)	High well-being (> 50)	OR (95% CI)	p-Value *
Low SOC ≤ 57	254 (79.87)	64 (20.13)	7.86 (5.48-11.29)	< 0.0001
High SOC > 57	104 (33.55)	206 (66.45)	Reference	

* Chi-square test

Tab. IV. Changes in relationships and social habits following the pandemic, divided by SOC level.

Relationships and social habits	Low SOC ≤ 57 (n.,%)	High SOC > 57 (n.,%)	OR (95% CI)	p-Value
How has your relationship with family changed?				
It has worsened a little/moderately/greatly	141 (66.51)	71 (33.49)	2.62 (1.81-3.79)	< 0.0001*
It has improved a little/moderately/greatly	52 (41.27)	74 (58.73)	0.93 (0.61-1.42)	0.7282*
It has remained the same	125 (43.10)	165 (56.90)	Reference	
How has your relationship with friends changed?				
It has worsened a little/moderately/greatly	245 (56.45)	189 (43.55)	2.13 (1.45-3.12)	0.0001*
It has improved a little/moderately/greatly	17 (36.96)	29 (63.04)	0.96 (0.48-1.91)	0.9142*
It has remained the same	56 (37.84)	92 (62.16)	Reference	
How has your relationship with work colleagues changed?				
It has worsened a little/moderately/greatly	157 (61.33)	99 (38.67)	2.11 (1.47-3.05)	< 0.0001*
It has improved a little/moderately/greatly	65 (43.92)	83 (56.08)	1.04 (0.69-1.59)	0.8397
It has remained the same	96 (42.86)	128 (57.14)	Reference	
Do you believe that, during the pandemic, your work has put you and the people you live with in a dangerous situation? (median, IQR)	5 (4-6)	5 (3-6)	-	0.0214**
Since the beginning of the pandemic, have you had to change your place of residence out of fear of infecting those around you?				
Yes	55 (56.70)	42 (43.30)	1.33 (0.86-2.06)	0.1948*
No	263 (49.53)	268 (50.47)	Reference	
Since the beginning of the pandemic, how often do you visit public places (restaurants, shopping malls, clubs, etc.)?				
Very rarely or never/rarely/very rarely	288 (53.53)	250 (46.47)	2.30 (1.33-3.99)	0.0030*
Quite often/very often/very frequently	9 (33.33)	18 (66.67)	1 (0.38-2.60)	1.0000*
The same as before	21 (33.33)	42 (66.67)	Reference	
Since the beginning of the pandemic, has the opportunity to see friends and relatives been reduced?				
Very rarely or never/rarely/very rarely	59 (47.20)	66 (52.80)	1.34 (0.51-3.51)	0.5497*
Quite often/very often/very frequently	251 (51.97)	232 (48.03)	1.62 (0.65-4.04)	0.2982*
The same as before	8 (40.00)	12 (60.00)	Reference	
Since the beginning of the pandemic, have you reduced direct "face-to-face" contact with family, friends, neighbors, etc.?				
Very rarely or never/rarely/very rarely	56 (44.44)	70 (55.56)	1.35 (0.63-2.93)	0.4409*
Quite often/very often/very frequently	249 (53.32)	218 (46.68)	1.93 (0.95-3.93)	0.0686*
The same as before	13 (37.14)	22 (62.86)	Reference	
Since the beginning of the pandemic, have you had time to take care of yourself?				
Very rarely or never/rarely/very rarely	240 (58.54)	170 (41.46)	3.19 (2.04-5.01)	< 0.0001*
Quite often/very often/very frequently	44 (41.12)	63 (58.88)	1.58 (0.91-2.76)	0.1072
The same as before	34 (30.63)	77 (69.37)	Reference	
Since the beginning of the pandemic, have you increased social contacts with friends and family through social networks?	4 (3-5)	4 (3-5)	-	0.3963**
Since the beginning of the pandemic, have you reduced physical contact with people who do not live with you?	6 (4-2)	5 (4-6)	-	0.0748**

* Chi-square test. ** Mann Whitney test.

additional risk factor for low SOC (OR 3.19, 95% CI 2.04-5.01, p < 0.0001) (Tab. IV).

Discussion

The COVID-19 pandemic has been a significant challenge for healthcare workers worldwide, with social and psychological repercussions. The study results have allowed us to identify some factors that influence and are influenced by different levels of SOC among healthcare workers. In this study, healthcare workers had a lower average SOC score compared to the national average in Italy (our study, mean: 57.1; national study, mean: 60.3) [25]. This suggests that healthcare workers face unique challenges and stressors in their work environment that may impact their ability to perceive and manage stress effectively and thus tend to have a weaker SOC compared to the general population or it may suggest that the SOC of this population has weakened during the COVID-19 pandemic [27].

One notable finding was the association between age and SOC. Younger healthcare workers exhibited a significantly higher risk of having a low SOC compared to their older counterparts. This finding may be attributed to various factors, such as less professional experience,

lower job security, and limited coping mechanisms developed over time. It is crucial to recognize this vulnerability among younger healthcare workers and implement targeted interventions to enhance their SOC and overall well-being.

Another significant factor associated with low SOC was the length of service. Healthcare workers with shorter lengths of service demonstrated a higher risk of having a weak SOC. This finding suggests that the experience and tenure of healthcare workers may play a crucial role in building resilience and a strong SOC. It is important for organizations to provide support and resources to newly employed healthcare workers to help them navigate the challenges and stressors inherent in their roles.

This data can be explained by the numerous new hires made in emergency situations to cope with the pandemic, which did not provide adequate support and assistance during the initial training period for newly hired workers. Some studies have shown that people with less work experience, often younger individuals, exhibited worse results in terms of mental health, resilience, and social support, likely due to anxiety arising from the perception of unfamiliarity and uncontrollability of the associated risks [30-32]. High levels of education and professional experience, resilience, and social support are necessary for healthcare professionals involved in public health emergencies.

Geographic location was also found to be a contributing factor to SOC among healthcare workers. The study revealed that healthcare workers in the northwestern regions of Italy had an increased risk of having a low SOC compared to their counterparts in the northeastern regions. Consistent with previous literature studies, frontline work in an epicenter region of the epidemic is associated with high levels of depression, anxiety, insomnia, and distress, exposing healthcare workers to the risk of developing mental health problems [31, 33].

The study identified several protective factors associated with a higher SOC among healthcare workers. Being married, living with other people, having dependents, and having open spaces in one's home were found to be protective against low SOC. These factors may provide social support, stability, and a sense of belonging, which can buffer the impact of stressors on healthcare workers' well-being. Organizations can consider implementing initiatives that promote social connections and work-life balance to support healthcare workers in cultivating a strong SOC.

The study revealed that female healthcare workers scored lower in well-being and SOC than male counterparts. Surprisingly, job tasks did not significantly impact well-being or SOC, indicating that the observed gender differences were not directly tied to work responsibilities. These findings underscored the importance of addressing gender-specific stressors and promoting support for female healthcare workers to improve their overall well-being and coping mechanisms in the profession.

Importantly, healthcare workers with low SOC demonstrated a significantly higher risk of poor well-being. This finding highlights the interplay between SOC and overall mental health.

These results are consistent with other studies that have reported that individuals with weak SOC had a higher risk of mental health problems, both during and before the pandemic [23, 34, 35]. It is believed that individuals with a stronger SOC perceive less stress associated with daily life [36] and that SOC can moderate stress factors [37, 38]. During the COVID-19 pandemic, which introduced significant stress factors in both daily life and healthcare workplaces, healthcare workers with weak SOC should pay particular attention to their mental health. Strengthening healthcare workers' SOC can potentially improve their overall well-being and resilience, enabling them to cope more effectively with the demands of their profession.

Pandemic-related factors also played a role in healthcare workers' SOC. Worsening relationships with family, friends, and colleagues due to the pandemic were associated with a higher risk of low SOC.

In fact, a higher risk of low SOC was found in individuals whose social relationships had worsened compared to those whose social relationships remained the same or improved.

The unprecedented challenges posed by the pandemic, including increased workloads, fear of infection, and social isolation, likely contributed to the strain on healthcare workers' SOC.

Consistent with previously published studies, our results emphasize a worsening of SOC in subjects with low social support. In particular, living alone, lack of social interaction with relatives and friends, and weak social ties were the main motivations for the detrimental effects of low social support on SOC [39].

Therefore, social support is a protective factor for the psychological well-being of healthcare workers during the pandemic. Social support is a psychosocial coping resource that can attenuate the negative effects of stress [39] and positively influence individuals' emotional health [40, 41], especially during periods of social distancing. Social support also leads to reciprocal benefits for members of social groups, helping them cope with daily challenges and contributing to the maintenance of their physical and psychological health [42, 43]. Organizations and policymakers should recognize the impact of these factors and implement strategies to provide support, foster social connections, and promote work-life balance during challenging times.

On the other hand, being married, living with others, having fewer dependents, having open spaces in one's home, and taking care of oneself equally or better than before the pandemic were protective factors against low SOC among healthcare workers.

The results of this study suggest the need to plan and provide timely psychological support services for healthcare workers, such as psychosocial support and support groups, to strengthen SOC and improve social support. Additionally, targeted interventions focusing on coping strategies, with multidisciplinary interventions to support healthcare personnel, are of fundamental importance.

Dedicated psychological counseling can help healthcare personnel stimulate, maintain, and improve positive emotions and free themselves from negative emotions and stress, thereby increasing behavioral flexibility, building personal resources, and eliminating the physiological effects of negative emotions [43].

Interventions aimed at promoting mental well-being in healthcare workers exposed to COVID-19 should be immediately implemented, with particular attention to newly hired workers without experience in public health emergencies and healthcare workers on the front lines in high-risk areas.

Some authors have suggested actions to mitigate the impacts of the pandemic on the mental health of professionals, protecting and promoting their psychological well-being during and after the epidemic, including remote psychotherapy [44, 45].

For team leaders or managers in healthcare facilities, it is essential to protect all staff from chronic stress and poor mental health, ensure quality communication, and ensure that staff are aware of where and how they can access mental health and psychosocial support services [46].

This study has some limitations that should be considered during the data interpretation phase. For example, the results can provide data on the association between changes in social relationships and the mental health of healthcare workers divided by SOC level, but these results cannot be exclusively attributed to the impact of the pandemic; the causal relationship cannot be determined. The study utilized a cross-sectional design, limiting causal interpretations of the associations observed. Future longitudinal studies could provide a better understanding of how SOC evolves over time in healthcare workers. Furthermore, the study focused on healthcare workers in Italy, limiting the generalizability of the findings to other contexts. Further research involving diverse healthcare settings and populations is necessary to validate and extend these findings.

Furthermore, it was considered that conducting research through electronic means risks excluding people who do not have internet access, an email account, access to a computer, tablet, or other devices, or who are not familiar with digital technologies. However, given the restrictions imposed due to this pandemic (social isolation, population quarantine, etc.), it was impossible to conduct in-person assessments. Although the survey mode may be considered a potential limitation of the study, it is estimated that in the target population of the research (working-age individuals), the total number of people excluded for this reason represents a very low percentage of potential participants.

Another limitation of the study is that the management of pathological pre-existing conditions was not explicitly addressed as an objective or a factor in the analysis. This could have implications for the interpretation of the study findings, as pre-existing conditions could potentially confound or modify the relationships between the variables studied. Future research should consider incorporating measures or adjustments to account for the influence of pathological pre-existing conditions on the outcomes of interest. Addressing this limitation would provide a more comprehensive understanding of the factors influencing SOC and well-being in healthcare workers.

Furthermore, the questions reported in the section on social relationships focused on participants' perceptions of how their social relationships were affected by the pandemic, including whether they worsened, improved, or remained unchanged, as well as the extent of these changes. While this provides insights into participants' subjective experiences, it is important to consider potential limitations in the validity of self-reported measures. To assess the validity of this section of the questionnaire, it would be beneficial to consider conducting additional analyses to evaluate the psychometric properties of the items used. This could include examining the internal consistency, test-retest reliability, and construct validity of the social relationships section. Additionally, comparing the findings with established measures of social relationships or conducting qualitative interviews to gather more in-depth insights could help further validate the questionnaire's content.

Another limitation is that we were not able to estimate the non-response rate and the potential differences between respondents and non-respondents. This highlights the need for caution when generalizing the findings and suggests areas for further research to address this limitation.

On the other hand, this study has provided valuable insights into the Sense of Coherence (SOC) among healthcare workers and identified various factors associated with SOC levels.

However, it is important to interpret the results cautiously and avoid making causal claims based solely on the associations found. The identified associations provide valuable insights into the relationships between different factors and SOC levels among healthcare workers. However, further longitudinal or experimental studies are necessary to establish the direction of these relationships and determine if there is a cause-and-effect relationship.

Thus, it is essential to emphasize the observational nature of the study design and the need for future research to confirm and expand upon these findings.

The strengths of the study lie in its robust sample size, diverse participant characteristics, comprehensive analysis, and potential implications for interventions.

One of the key strengths of this study is the inclusion of a substantial sample size of 628 healthcare workers. A larger sample size enhances the generalizability of the findings and provides greater statistical power to detect significant associations. The diverse composition of the sample, including participants from different age groups, educational backgrounds, and professional roles, further strengthens the study's representativeness and allows for a comprehensive understanding of SOC among healthcare workers.

To note, in the context of SOC and well-being in healthcare workers, common intrinsic confounding factors to consider may include socioeconomic status, work-related factors, and personal resilience. Socioeconomic status, such as income, education level, and employment

status, can influence both SOC and well-being. Work-related factors, including job demands, satisfaction, and support, can also impact SOC and well-being. Personal resilience, coping styles, and personality traits may interact with stressors and affect SOC and well-being. To manage confounding factors, researchers employ study design strategies like randomization, matching, or stratification [47, 48].

Comparing the SOC of healthcare workers in this study to the national average in Italy adds an important dimension to the findings. This national comparison provides valuable context and highlights the unique challenges faced by healthcare professionals in their work environment. The lower average SOC score among healthcare workers in this study compared to the national average indicates that healthcare workers experience specific stressors and demands that may affect their ability to perceive and manage stress effectively.

The multifaceted analysis conducted in this study contributes to a nuanced understanding of the factors associated with SOC among healthcare workers. The examination of various factors, including age, length of service, geographic region, marital status, living arrangements, and pandemic-related experiences, allows for a comprehensive exploration of the complex interplay between these factors and SOC. By considering multiple factors simultaneously, this study provides a more holistic understanding of the determinants of SOC among healthcare workers.

The findings of this study have important implications for interventions and support programs aimed at enhancing SOC and promoting the well-being of healthcare workers. The identification of risk factors, such as younger age, shorter length of service, and adverse pandemic-related experiences, provides valuable insights for targeted interventions. Additionally, the identification of protective factors, such as being married, living with others, and having open spaces at home, can inform strategies to foster a supportive environment for healthcare workers.

In conclusion, this study contributes to the growing body of literature on SOC among healthcare workers. The results of this study can provide useful information for designing and promoting healthy and safe work environments through an empowerment program for healthcare workers, facilitating better emotional management and changes in habits and relationships caused by increased social fragmentation and self-protective behaviors, as well as better management of the long-term risk of psychological disorders among healthcare workers.

Specific support programs dedicated to healthcare workers can be planned by promoting information and training interventions on the latest prevention and coping strategies, creating supportive materials through periodic webinars to update on the latest available evidence on COVID-19.

The use of digital devices can be encouraged and implemented to provide support and promote psychological well-being through counseling activities (telephone-based and internet-based counseling services and platforms), with the aim of strengthening one's SOC and consequently improving well-being and quality of life.

In this context, a multidisciplinary approach appears crucial for proper management of the consequences on public health during the pandemic, by studying the biological effects and changes in behavioral and social habits.

Conclusions

The study findings demonstrate that younger healthcare workers, specifically those hired for less than a year, have experienced a greater impact during the pandemic. This can be attributed to the surge in emergency hires, which resulted in inadequate support and training for these individuals. Additionally, the decline or absence of family and social relationships since the onset of the pandemic contributes to lower levels of Sense of Coherence (SOC) and has significant implications for well-being. These outcomes hold particular relevance within the healthcare field, which has endured substantial pandemic-related challenges and faces potential long-term effects on the psychological and physical health of individuals and the practice of the profession. These findings lay the groundwork for further investigation and guide future prevention and health promotion interventions tailored to newly hired personnel. By addressing these issues, healthcare organizations can bolster well-being and SOC, fostering resilience among their workforce.

Ethical aspects

After providing comprehensive information about the nature and purposes of the study, participants were informed that their participation was voluntary, their responses were anonymous, and they could withdraw from the study at any time without providing any justification. It was also explained that any information collected during the study would be treated as strictly confidential and would be handled in aggregated form only by the healthcare personnel involved in the study in an entirely anonymous manner and solely for the purposes of scientific research or presentation at scientific conferences. The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki.

Acknowledgments

Conflict of interest statement

The authors declare no conflicts of interest.

Authors' contributions

MFP, CR: Conceptualization. MFP, LM, CR: Methodology. MFP, LM, CR: Validation. MFP: Formal analysis. MFP, LM: Data curation. MFP, LM, DA, GB, AV, FS, MM, and CR: Writing-original draft preparation. MFP, LM, DA, GB, AV, FS, MM, and CR: Writing-review and editing. CR: Supervision. All authors have read and agreed to the published version of the manuscript.

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