A Survey on Mental Health Impact Caused by COVID-19 Pandemic in Italian Pediatric Healthcare Workers.

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Abstract

**Background:** Few studies investigated COVID-19 pandemic psychological effects on pediatric healthcare staff. The aim of this study was to evaluate sleep quality and psychological effects of pediatric healthcare workers during COVID-19 epidemic in Italy and to evaluate potential differences between Primary and Secondary Care operators.

**Methods:** Pediatric healthcare workers were involved in an online survey aimed to characterize responders and to define their clinical expertise in the management of suspected or confirmed COVID-19 patients during pandemic. Using validated scores, the online questionnaire assessed sleep quality, stress and anxiety level, self-efficacy and social support in pediatric healthcare workers.

**Results:** During COVID-19 outbreak, 67.43% of our population were suffering sleep disturbance, and we found a positive correlation between sleep disturbances with stress and anxiety. Furthermore, 19.42% of subjects were suffering anxiety and 53% were at risk of developing an acute stress disorder. Stress resulted inversely correlated with self-efficacy and social support.

Secondary care operators were more affected than family pediatricians by sleep disturbances, stress but especially by anxiety. Social support was considerably higher in secondary care operators compared to family pediatricians.

**Conclusions:** Despite the less exposure and the less infection probability, much of pediatric healthcare workers were suffered sleep disturbance, anxiety and potential stress disorder. In the Pediatric Units, these psychological effects could be related to other factors compared to frontline departments, such as the early confused situation, the difficulties in workplaces managing and in finding personal protective equipment, as well as the subsequent sense of helplessness and frustration.

Background

The outbreak of coronavirus disease 2019 (COVID-19) caused by SARS-CoV-2 infection in Wuhan City in China, has spread quickly around the world.\(^1\)

The first two cases of COVID-19 in Italy, a couple of Chinese tourists, were confirmed on January 30 by the Spallanzani Institute. The first case of secondary transmission occurred in Codogno, in Lombardy, on 18th February 2020. Successively, a series of ministerial decrees issued by the government imposed a national lockdown, closing schools, non-essential shops and businesses and limiting population movement except for necessity, work and health circumstances. The economic and psychological impact of the epidemic is huge.\(^2\)

During COVID-19 pandemic, health care workers have been facing enormous pressure, including a high risk of infection,\(^3\) isolation, patients with negative emotions, insufficient medical protective devices,
overwork and the fear of spread the virus to their families. The mental health of adult health care staff has received widespread attention during the COVID-19 outbreak given that this severe situation is causing several psychological consequences. Furthermore, in many workplaces where health care professionals treat patients with COVID-19, there is no specific mental health support for them. The physical health of medical staff is at risk as well because anxiety and stress can also adversely affect sleep quality. Chen et al. highlighted that the prevalence of self-reported depression and anxiety among pediatric medical staff members was significantly high during the COVID-19 outbreak, in particular in workers who had COVID-19 exposure experience.

The aim of this study was to evaluate sleep quality status and psychological effects of pediatric healthcare workers (HWs) during the fight against COVID-19 pandemic in Italy and to assess potential differences between Pediatric Primary and Secondary Care.

Methods

Study design, Survey sample and administration

We here report a pediatric HWs self-administered cross-sectional survey. Data were collected from May 15th to May 22nd 2020. The questionnaire (online supplementary appendix) included 94 questions. It was developed through item generation/reduction as recommended in the guidelines of clinicians’ self-administered surveys.

HWs included pediatricians, residents and nurses of Pediatrics Department in different Italian hospitals, and family pediatricians. In Italy, the “family pediatrician” is a medical professional of Pediatric Primary Care, who guarantees continuous healthcare assistance along child growth and development. To better understand the differences between primary and secondary pediatric care, the sample was divided into two groups: HWs working in hospital, including hospital pediatricians, pediatric residents and pediatric nurses (GROUP A), and HWs managing pediatric primary care, including family pediatricians (GROUP B). Noteworthy, according to the Health Ministry decree of 22nd February 2020, family pediatricians managed patients through telephonic contact and telemedicine.

HWs received an initial email that included a cover letter and the survey. The questionnaire was mainly distributed by email over an 8 days period. Non-respondents were contacted by email with one reminder after 72 hours to increase participation. Furthermore, the questionnaire was also distributed using a quicker mode of communications including Facebook and WhatsApp; we identified 450 HWs mostly by sending the link to local chat groups.

Study participants expressed their written consent and then voluntarily filled out the forms and completed the assessment scales. Anonymous responses were recorded and no ethical approval was required for this survey.
The questionnaire was composed of several sections (additional file 1): A) questions 1–14, aimed to characterize responders and to define their clinical expertise in the management of suspected or confirmed COVID-19 patients during pandemic; we defined as “contact” both physical contact (medical examination) and telephonic contact/telemedicine; B) questions 15–44 aimed to evaluate anxiety after traumatic events by using Stanford Acute Stress Reaction Index (SASR); C) questions 45–62 explored the participants’ sleep quality by using Pittsburgh Sleep Quality Index (PSQI); D) questions 63–72 aimed to measure anxiety levels by using Zung Self-Rating Anxiety Score (SAS); E) questions 73–82 tested the participants’ feelings of self-efficacy by using General Self-Efficacy Scale (GSES); F) questions 83–94 aimed to explore the participants’ social support using Multidimensional Scale of Perceived Social Support (PSS).

**Pittsburgh Sleep Quality Index**

PSQI is the gold standard questionnaire for assessing subjective sleep quality using a 18-item scale containing 7 components, each component scored between 0–3, with a total score ranging from 0–21; higher score indicating worse sleep quality. Zero to 5 points indicate *good sleep quality*, 6 to 10 points indicate *average sleep quality*, 11 to 15 points indicate *poor sleep quality*, and 16 to 21 points indicate *very poor sleep quality*.

**Stanford Acute Stress Reaction**

SASR is composed by 30-item evaluating anxiety after traumatic events. The level to which each symptom was experienced is rated on a 6-point scale, ranging from 0 (not experienced) and 5 (experienced very often). SASR can be scored summing all the scores obtained by the Likert-type scale (0–5) with a range 0–150 or dichotomously (0–2: 0, 3–5: 1) for the presence of a symptom. Higher score indicating higher levels of self-reported stress.

**Self-Rating Anxiety Scale**

Symptoms of anxiety were measured using Zung Self-Rating Anxiety Score (SAS). It contains 20 items rated on a 4-point scale (from never/rarely, to very often/all the time). The raw score can be from 20 to 80 points; a raw score-index score conversion table is provided by Zung. Higher scores indicate greater levels of anxiety. A score < 50 indicates *absence of anxiety*, 50–59 points indicate *mild anxiety*, 60–69 points indicate *moderate anxiety*, and > 70 points indicate *severe anxiety*.

**General Self-Efficacy Scale**

GSES was used to measure the feelings of self-efficacy, an important factor in achieving recovery from a stressing episode. The scale consists of 10 items, rated on a 4-point scale, where 1 corresponds to *not at all true*, 2 to *hardly true*, 3 to *moderately true*, and 4 to *exactly true*. The total score ranged from 10 to 40. There is no cut-off; higher scores indicated higher self-efficacy.

**Multidimensional Scale of Perceived Social Support**
PSS is a research tool designed to measure perceptions of support from 3 sources: Family, Friends and a Significant Other.\textsuperscript{18} It is a 12-item scale and each item is rated on a 7-point scale, with higher score indicating greater perceived social support. Mean scale score ranging from 1 to 2.9 could be considered \textit{low support}; a score from 3 to 5 could be considered \textit{moderate support}; a score from 5.1 to 7 could be considered \textit{high support}.\textsuperscript{19}

**Statistical analysis**

Descriptive analyses were conducted and the data were reported as media and standard deviation (SD) and counts and percentages. Unpaired t test for numerical variables and Pearson's Chi-squared test for categorical data were used to compare survey's answers in “Pediatrician Hospital staff” and “Family Pediatricians” and a post-hoc analysis based on Chi-squared residuals was performed according to Beasley and Schumacker (1995).\textsuperscript{20} Holm-Bonferroni was used for the post-hoc test. We analyzed the relationships of the several study scores with the socio-demographic and occupational data. Specifically, we used Pearson's correlation to evaluate the relationship among the several study scores, in particular we performed it for the correlation of the SASR with other study scores (PSQI, PSS, Zung index, GSES) and for the correlation between Zung index and PSQI as well.

The customary 0.05 type I error probability was chosen.

All analyses were run in R 3.6.2 [Language and Environment for Statistical Computing. R Core Team, R Foundation for Statistical Computing, Vienna, Austria, 2019; (https://www.R-project.org/)].

**Results**

All questionnaires were completed anonymously by 175 participants. The effective response rate was 38%. The survey included 175 pediatric HWs (mean age 41.47 ± 13.26; 76.57% women, 23.43% men): 58 pediatricians, 55 pediatric residents and 15 pediatric nurses working in different Italian Pediatric Departments and 47 family pediatricians.

HWs sociodemographic characteristics and clinical expertise in the management of suspected or confirmed COVID-19 patients during pandemic are shown in Table 1.
Table 1
Socio-demographic characteristics and occupational data of the responders.

|                                      | All Responders (N = 175) | Pediatric Hospital Staff (N = 128) | Family Pediatricians (N = 47) | p value |
|--------------------------------------|---------------------------|-----------------------------------|-----------------------------|---------|
| What is your age?                    |                           |                                   |                             | NS      |
|                                      | 41.5(13.3)                | 35.8(9.1)                         | 56.9(10.4)                  |         |
| Are you a male or a female?          |                           |                                   |                             | 0.016   |
| No                                   | 41(23.4)                  | 24(18.7)                          | 17(36.2)                    |         |
| Yes                                  | 134(76.6)                 | 104(81.3)                         | 30(63.8)                    |         |
| Do you have any son or daughter?     |                           |                                   |                             | <0.001  |
| No                                   | 97(55.4)                  | 91(71.1)                          | 6(12.8)                     |         |
| Yes                                  | 78(44.6)                  | 37(28.9)                          | 41(87.2)                    |         |
| In which macro-area of Italy do you work?  |                           |                                   |                             | NS      |
| North                                | 19(10.8)                  | 11(8.6)                           | 8(17.0)                     |         |
| Center                               | 141(80.6)                 | 106(82.8)                         | 35(74.5)                    |         |
| South                                | 12(6.9)                   | 8(6.3)                            | 4(8.5)                      |         |
| Islands                              | 3(1.7)                    | 3(2.3)                            | 0(0.0)                      |         |
| Do you have any flatmate older than 60 years? |                           |                                   |                             | <0.001  |
| No                                   | 132(75.4)                 | 108(84.4)                         | 24(51.1)                    |         |

Values are absolute numbers (percentages) for categorical data and media (standard deviation) for continuous variables. N: numbers; NS: not significant;

pediatric hospital staff consisted of hospital pediatricians, residents in Pediatrics and pediatric nurses; COVID-19: novel coronavirus 19 disease; SARS-Cov-2: Severe Acute Respiratory Syndrome - Coronavirus – 2; Ig: immunoglobulin

p value from Pearson’s Chi squared test

bold formatting to values where the p-value is < 0.05

*adjusted p value from post-hoc test (Bonferroni test) for pairwise Chi-squared test comparisons
| Choose your occupation among the following options? | All Responders (N = 175) | Pediatric Hospital Staff (N = 128) | Family Pediatricians (N = 47) | p value |
|---|---|---|---|---|
| Yes | 43(24.6) | 20(15.6) | 23(48.9) | |
| Choose your occupation among the following options? | Hospital pediatricians | Resident | Nurse | Family pediatricians |
| 58(33.1) | 55(31.4) | 15(8.6) | 47(28.9) | |
| How many patients with confirmed COVID-19 symptoms did you visit or manage by phone? | | | | NS |
| 0 | 76(43.4) | 59(46.1) | 17(36.2) | |
| 1–5 | 87(49.7) | 61(47.7) | 26(55.3) | |
| 6–15 | 8(4.6) | 4(3.1) | 4(8.5) | |
| >15 | 4(2.3) | 4(3.1) | 0(0.0) | |

Values are absolute numbers (percentages) for categorical data and media (standard deviation) for continuous variables. N: numbers; NS: not significant; pediatric hospital staff consisted of hospital pediatricians, residents in Pediatrics and pediatric nurses; COVID-19: novel coronavirus 19 disease; SARS-Cov-2: Severe Acute Respiratory Syndrome - Coronavirus – 2; Ig: immunoglobulin

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*adjusted p value from post-hoc test (Bonferroni test) for pairwise Chi-squared test comparisons
| How many patients with suspected COVID-19 symptoms did you visit or manage by phone? | All Responders (N = 175) | Pediatric Hospital Staff (N = 128) | Family Pediatricians (N = 47) | p value |
|---|---|---|---|---|
| 0 | 9 (5.1) | 8 (6.2) | 1 (2.1) | NS |
| <10 | 109 (61.6) | 76 (59.4) | 33 (70.2) | |
| 10–30 | 35 (19.8) | 23 (18.0) | 12 (25.6) | |
| 31–50 | 11 (6.2) | 11 (8.6) | 0 (0.0) | |
| 51–100 | 10 (5.7) | 9 (7.0) | 1 (2.1) | |
| >100 | 1 (0.6) | 1 (0.8) | 0 (0.0) | |

| How do you judge the adequacy of personal protective equipment in your workplace? | All Responders (N = 175) | Pediatric Hospital Staff (N = 128) | Family Pediatricians (N = 47) | p value |
|---|---|---|---|---|
| Absent | 19 (10.9) | 2 (1.6) | 17 (36.2) | *Abs-exc. 0.001 |
| Poor | 87 (49.7) | 7 (5.5) | 0 (0.0) | *Poor-suff. <0.001 |
| Sufficient | 62 (35.4) | 58 (45.3) | 29 (61.7) | |

Values are absolute numbers (percentages) for categorical data and media (standard deviation) for continuous variables. N: numbers; NS: not significant;

pediatric hospital staff consisted of hospital pediatricians, residents in Pediatrics and pediatric nurses; COVID-19: novel coronavirus 19 disease; SARS-Cov-2: Severe Acute Respiratory Syndrome - Coronavirus – 2; Ig: immunoglobulin

p value from Pearson's Chi squared test

bold formatting to values where the p-value is < 0.05

*adjusted p value from post-hoc test (Bonferroni test) for pairwise Chi-squared test comparisons
| All Responders (N = 175) | Pediatric Hospital Staff (N = 128) | Family Pediatricians (N = 47) | p value |
|-------------------------|-----------------------------------|-----------------------------|---------|
| **Excellent**           | 7(4.0)                            | 61(47.6)                    | 1(2.1)  |
| Did you perform rhino-pharyngeal swab for SARS-Cov-2? |                                   |                             | <0.001  |
| No                      | 79(45.1)                          | 46(35.9)                    | 33(70.2) |
| Yes                     | 96(54.9)                          | 82(64.1)                    | 14(29.8) |
| If Yes, which was the result? |                               |                             | NS      |
| Negative                | 95(98.9)                          | 81(98.8)                    | 14(100)  |
| Positive                | 1(1.1)                            | 1(1.2)                      | 0(0.0)  |
| Did you perform serologic test for SARS-Cov-2? |                                   |                             | 0.003   |
| No                      | 128(73.1)                         | 86(67.2)                    | 42(89.4) |
| Yes                     | 47(26.9)                          | 42(32.8)                    | 5(10.6)  |
| If Yes, which was the result? |                               |                             | 0.004   |
| Negative IgG and IgM    | 45(95.8)                          | 41(97.6)                    | 4(80.0)  |
| Negative IgG and positive IgM |                      |                             |         |
| Positive IgG and negative IgM |                         | 0(0.0)                      | 1(20.0)  |

Values are absolute numbers (percentages) for categorical data and media (standard deviation) for continuous variables. N: numbers; NS: not significant;

pediatric hospital staff consisted of hospital pediatricians, residents in Pediatrics and pediatric nurses; COVID-19: novel coronavirus 19 disease; SARS-Cov-2: Severe Acute Respiratory Syndrome - Coronavirus – 2; Ig: immunoglobulin

p value from Pearson's Chi squared test

*adjusted p value from post-hoc test (Bonferroni test) for pairwise Chi-squared test comparisons
| All Responders (N = 175) | Pediatric Hospital Staff (N = 128) | Family Pediatricians (N = 47) | p value |
|--------------------------|----------------------------------|-----------------------------|---------|
| Positive IgG and IgM     | 0(0.0)                           | 0(0.0)                      | 0(0.0)  |

Values are absolute numbers (percentages) for categorical data and media (standard deviation) for continuous variables. N: numbers; NS: not significant;

pediatric hospital staff consisted of hospital pediatricians, residents in Pediatrics and pediatric nurses; COVID-19: novel coronavirus 19 disease; SARS-Cov-2: Severe Acute Respiratory Syndrome - Coronavirus – 2; Ig: immunoglobulin

*p value from Pearson’s Chi squared test

bold formatting to values where the p-value is < 0.05

*adjusted p value from post-hoc test (Bonferroni test) for pairwise Chi-squared test comparisons

Mean PSQI value resulted 7.85 ± 3.52 (Table 2) and 67.43% of respondents had a score higher than 5, indicating sleep disturbance. The mean SASR score resulted 63.11 ± 30.11 (Table 2). According to the definition of acute stress disorder in DSM-IV, 53% of population was at risk of developing this disorder. Mean SAS value resulted 39.27 ± 12.48 (Table 2) and 19.43% of survey population had a score higher than 50, indicating anxiety. Furthermore, we found a positive correlation between sleep disturbances and stress (r = 0.678; p < 0.001), between sleep disturbances and anxiety (r = 0.627; p < 0.001) and between stress and anxiety (r = 0.648; p < 0.001) [figure1]. We found no correlation between the investigated aspects (sleep quality, stress and anxiety) and sociodemographic factors (having children or cohabitants over 60 years of age, infected relatives or friends) nor between the above aspects with SARS-CoV-2 exposure (suspected and confirmed cases).
Table 2
Evaluation of the psychological effects on the pediatric health-care workers caused by COVID-19 pandemic in Italy

|                     | All (N = 175) | Pediatric Hospital Staff (N = 128) | Family Pediatricians (N = 47) | p value |
|---------------------|--------------|-----------------------------------|------------------------------|---------|
| SASR                | 63.1(30.1)   | 65.5(29.4)                        | 62.0(32.3)                   | NS      |
| PSQI                | 7.8(3.5)     | 8.0(3.4)                          | 7.3(3.9)                     | NS      |
| Zung Index          | 39.3(12.5)   | 39.7(11.9)                        | 34.6(13.8)                   | 0.027   |
| GSES                | 29.5(5.7)    | 29.0(5.7)                         | 30.7(5.5)                    | NS      |
| PSS                 | 5.8(0.9)     | 5.9(0.9)                          | 5.6(0.2)                     | <0.001  |
| *Acute post-traumatic stress disorder |             |                                   |                              | NS      |
| No                  | 82(47.0)     | 59(46.1)                          | 23(49.9)                     |         |
| Yes                 | 93(53.0)     | 69(53.9)                          | 24(51.1)                     |         |

Values are absolute numbers (percentages) for categorical variables and media (standard deviation) for continuous variables. N: numbers; NS: not significant; pediatric hospital staff consisted of hospital pediatricians, residents in Pediatrics and pediatric nurses. COVID-19: novel coronavirus 19 disease; SASR: Stanford Acute Stress Reaction Index; PSQI: Pittsburgh Sleep Quality Index; GSES: General Self-Efficacy Scale; PSS: Perceived Social Support; Acute post-traumatic stress disorder is defined according to DSM-IV criteria.

*p value from Unpaired t test for continuous variables

#p value from Pearson's Chi squared test for categorical variables

bold formatting to values where the p-value is < 0.05

Mean GSES score resulted 29.48 ± 5.71 and mean PSS score was 5.8 ± 0.93 (Table 2). We found a negative correlation between SASR and GSES (r= -0.264; p < 0.001) and between SASR and PSS (r= -0.161; p = 0.033) [figure 1].

About differences between group A and group B, they presented no statistically significant differences in the number of COVID-19 suspected or confirmed contacts, but national dispositions imposed group B to have mostly telephonic contacts rather than actual medical examinations (Table 1). The supplying of personal protective equipment was significantly different between the two groups (absent: 1.56% vs 36.17%; poor 45.31% vs. 61.7%; sufficient 47.66% vs. 2.13%; excellent 5.47% vs. 0%; p < 0.001). The performance of rhino-pharyngeal swabs (64.06% vs. 29.79%, p < 0.001) and serology (32.81% vs. 10.64%, p < 0.001) for SARS-CoV-2 was significantly different between the two groups (Table 1).
Group A was slightly more affected than group B by sleep disturbances (PSQI: 8.03 ± 3.37 vs. 7.32 ± 3.87; p = 0.1547), stress (SASR: 65.50 ± 29.39 vs. 62.04 ± 32.30; p = 0.8662) and anxiety (SAS: 39.74 ± 11.97 vs 37.98 ± 13.83; p = 0.0276), but anxiety score was the only one to be statistically significant. Social support resulted considerably higher in group A (PSS: 5.88 ± 0.87 vs. 5.59 ± 1.08; p < 0.001).

Discussion

During COVID-19 epidemic, in addition to the psychological effects of the national state of emergency, HWs experienced specific critical issues and they were exposed to uncomfortable situations with limited possibilities of resolution. The psychological stress on frontline workers was incredible, compromising their sleep quality and mental health; more than 70% of HWs in China has reported psychological distress including insomnia, anxiety and depression.

To the best of our knowledge, this is the first study assessing sleep quality, stress and anxiety in Italian pediatric HWs and their relationship with self-efficacy and perceived social support.

We observed that during COVID-19 outbreak, in our population mean PSQI score resulted 7.85 ± 3.52 and 67.43% of pediatric HWs were suffering sleep disturbance (PSQI > 5). PSQI resulted slightly higher compared to HWs of a children's healthcare center in Wuhan (7.22 ± 2.62) and lower than 180 Chinese frontline HWs (8.58 ± 4.56) and 801 frontline medical workers in Hubei Province (9.3 ± 3.8).

Sleep quality is a key indicator of health; good sleep quality helps clinical staff to work better. We found a positive correlation between sleep disturbances and stress and between sleep disturbances and anxiety. Stress and anxiety were considered major causes of insomnia and their negative influence on sleep quality was previously demonstrated.

SASR score in our population resulted 63.11 ± 30.11, lower compared to frontline Chinese HWs (77.58 ± 29.52). According to the definition of DSM-IV, 53% of our population was at risk of developing an acute stress disorder. Mean SAS values in our population were 39.27 ± 12.48 and 19.42% of subjects reported a SAS ≥ 50. A similar SAS value was found in the Chinese study conducted on HWs at a children's healthcare center in Wuhan (34.44 ± 7.21), while higher values were found in frontline Chinese HWs (55.25 ± 14.18). These data may indicate a particular situation in Pediatric Departments, where stress and anxiety have not reached frontline departments levels, and they depend on different factors.

In the early days of COVID-19 outbreak, pediatric patients were relatively rare, and they were thought to be not susceptible to the infection. However, as the number of infected people increases, the disease has gradually been documented in children. In Italy, the pediatric confirmed cases are 1.8% of the total, similar to China (2%). Anyway, children are less commonly affected by SARS-CoV-2 and most of them presented with mild disease.
In Italy, on May 14, only 3.3% of pediatric COVID-19 cases needed hospitalization.\textsuperscript{33} Furthermore, closing schools and adopting the Italian government extraordinary measures led to a significant reduction of other respiratory infections in children\textsuperscript{36} and the fear to refer to the hospital (where probability of infection is high) have led to a substantial decrease (ranging from 73–88\%) in Pediatric Emergency Department visits compared with the same time period in 2019 and 2018.\textsuperscript{37} These factors created a unique condition in the Pediatric Departments, opposed to Adult Departments, where bed capacity was early saturated. This particular situation was confirmed in our population by the low exposure and infection rate detected by the swab and the serological test (Table 1). These data are reassuring compared to the infection rate found in Italian HWs in general (25.704 of HWs infected, equal to 11.6\% of total infection).\textsuperscript{33}

Despite less exposure and infection probability, most of our population resulted affected by sleep disturbance, stress and anxiety. While in the COVID-19 Units frontline workers (in particular in Intensive Care Units) stress could be related to the palpable infection exposure, the fear of infecting family members,\textsuperscript{4} prolonged shift times and prolonged use of protective equipment,\textsuperscript{38} in Pediatric Units stress and anxiety could be related to other factors.

First, as a child is usually susceptible to respiratory infections, to distinguish it from other common respiratory infections was particularly difficult.\textsuperscript{32}

Secondly, it has been suggested that asymptomatic or mildly symptomatic children might spread the infection.\textsuperscript{39} This probably represented an important cause of stress and anxiety in pediatric HWs, due to the fear of spreading the infection from asymptomatic subjects to HWs and other patients.\textsuperscript{40} To detect asymptomatic carriers, in a lot of Pediatric Departments, the swab for SARS-CoV-2 was also performed to hospitalized patients with non-suggestive COVID-19 symptoms\textsuperscript{40} and to the caregiver, whose presence is inevitable in Pediatric Departments.

About personal protective equipment, especially at the beginning of the pandemic, personal protective equipment was not always available in Pediatric Units; in fact, it was more readily available in high-risk specialty sectors.\textsuperscript{41}

Lastly, workplace reorganization was particularly difficult in Pediatric Department. The rapid evolution of the pandemic and the progressive updating of national and local indications led to a continuous reorganization of activities, procedures, but also to a workplace remodeling.\textsuperscript{42,43} For adult patients, entire departments were intended for COVID-19 and it was therefore easier to divide COVID-19 patients from non-COVID-19 patients. For Pediatric Departments, especially in medium-small hospitals, it was not so easy to find a solution to safely divide COVID-19 patients from non-COVID-19 patients in a unique department.

After the early confusion, when the lower children involvement was actually documented, someone experimented feelings of uselessness:\textsuperscript{42} together with the substantial decrease in Pediatric Emergency
Department visits, it was necessary to stop all routine and non-urgent outpatient activity. Concern for difficulties in accessing treatment of non-COVID patients were experimented too, because it was very difficult to protect other patients and healthcare staff. Lastly, the fear of being co-opted from other Operating Units, working in clinical areas requiring tasks beyond their own skills, was reported.

All these sudden changes caused an emotional overload with a significant increase in stress levels among pediatric HWs with negative effects on their well-being.

We found that self-efficacy was negatively associated to stress (Fig. 1); higher self-efficacy could maintain relatively stable emotions even under pressure. Self-efficacy results in increased confidence to do the job well, and higher values help to suffer less from loneliness and pessimism, improving coping mechanisms when under stress.

We also found that mean PSS value was indicative of high social support and that social support was negatively associated to stress (Fig. 1), helping medical staff to reduce stress by decreasing the perception of the threat of stressful events and the inappropriate behavior that can result from stress.

About differences between hospital HWs (group A) and family pediatricians (group B), we did not find statistically significant difference in having contact with suspected or confirmed COVID-19 patients, but group B mostly had telephonic contacts rather than actual medical examinations. Probably for this reason, the provision of personal protective equipment and the performance of rhino-pharyngeal swabs and serology were significantly lower in group B.

Group A resulted more affected by anxiety than group B (Fig. 2). This was probably caused by the greater exposure to COVID-19 patients compared to family pediatricians. The higher prevalence of women in group A, more predisposed to anxiety, must be considered.

Social support was considerably higher in group A (Fig. 2), probably because institutions support was higher in the hospitals, but also because of the particular working setting of the family pediatrician, who works alone in his own clinic without any cooperation with other professional figures.

**Conclusions**

There are some limitations in this study. Firstly, it is a self-administered survey, conducted over a few days during COVID-19 pandemic. Like all surveys, potential issues such as response bias and interpretation must be taken into account. The overall response rate was relatively low, thus limiting results generalizability; however, the response rate was similar to online surveys in general.

The survey was administered in Italy, that is particularly representative of the pandemic. But results cannot be generalized to all HWs because they are specific of Pediatric Care Units and they are representative especially of the Center of Italy, where the outbreak did not reach the same proportion as in the Northern Italy.
However, this is the first Italian survey investigating sleep quality and psychological status of pediatric HWs and differences between Pediatric Primary and Secondary Care operators.

In conclusion, despite the lower exposure and infection rate in Italian pediatric HWs, we observed that sleep disturbance was highly prevalent among them and it was associated with stress and anxiety. It is desirable that measures improving social support should be implemented and mental health service providers should be available for pediatric staff.

**Abbreviations**

Sars-CoV-2  
severe acute respiratory syndrome coronavirus 2

COVID-19  
Coronavirus Disease 2019

HWs  
Healthcare Workers

PSQI  
Pittsburgh Sleep Quality Index

SASR  
Stanford Acute Stress Reaction

SAS  
Self-Rating Anxiety Score

GSES  
General Self-Efficacy Scale

**Declarations**

**Ethics approval and consent to participate**

According to our Ethic Committee (Comitato Etico per la Ricerca Biomedica delle Province di Chieti e di Pescara e dell’Università degli Studi “G.d’Annunzio” di Chieti e Pescara) policy, no ethics approval was required.

Since we enrolled only competent adults, with no or minimal risks of harm, participants were informed that the survey questions are part of a research study and that answering the questions is voluntary. In fact, the informed individual provided their willingness to participate by choosing to complete the survey.

**Consent for publication**

All authors saw and agreed with the contents of the manuscript and approved the final version and its submission to the journal. All authors disclose no prior presentation of study data as an abstract or
Availability of data and material

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

All authors disclose no personal or financial support or author involvement with organizations with financial interest in the subject.

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Authors’ contributions

All authors contributed equally to this manuscript.

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Correlations among the scores used for evaluating COVID-19 pandemic psychological effects on pediatric healthcare workers. SASR: Stanford Acute Stress Reaction Index; PSQI: Pittsburgh Sleep Quality Index; GSES: General Self-Efficacy Scale; PSS: Perceived Social Support p value was from Pearson correlation
Figure 2

Mean difference of Anxiety and Social Support between pediatric hospital staff and family pediatricians. Pediatric Hospital staff consisted of hospital pediatricians, residents in Pediatrics and pediatric nurses. PSS: Perceived Social Support Values are expressed as media and standard deviation; p value was from Unpaired t test

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