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Original article

Psychological impact of the SARS-CoV-2 outbreak on the staff of a French hospital



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ABSTRACT

Background: The outbreak of SARS-CoV-2 has resulted in anxiety, depression and post-traumatic stress disorder (PTSD) among hospital staff. The factors associated with this psychological impact remain to be determined.

Methods: A cross-sectional study using an online questionnaire completed by the staff of a French hospital, two months after the SARS-CoV-2 outbreak.

Results: Among the 353 participants (of whom 67% were healthcare professionals), 32% had symptoms of anxiety, 16% of depression and 16% of PTSD. Eleven per cent had initiated or increased treatment with sleeping pills, and 6% with anxiolytics. In a multivariate analysis, factors independently associated with anxiety were: change of professional team, having a relative infected by SARS-CoV-2 and a new/increased treatment with sleeping pills or anxiolytics. The only factor associated with depression was the feeling of risk during professional practice. The factors associated with PTSD were: having a relative infected by SARS-CoV-2, the feeling of risk during professional practice, the increase in smoking and treatment with sleeping pills. The observance of transmission preventive measures (TPM) was not associated with the psychological impact of SARS-CoV-2. A personal history of SARS-CoV-2 infection and age < 36 years were associated with insufficient use of protective equipment. Age < 36 years, and being a healthcare professional were associated with the non-observance of social distancing.

Conclusion: The hospital staff displayed psychological consequences, resulting in the use of anxiolytics and sleeping pills. Belonging to a group with low-risk of severe disease was associated with lower observance of TPM.

1. Introduction

A SARS-CoV-2 coronavirus epidemic started in China in December 2019 and has led to more than 85 million cases and 1.8 million deaths worldwide up to January 2021. France has been affected by 2.6 million cases and 65,000 deaths. In March and April 2020, during the first outbreak, hospitals were forced to reorganise urgently to accommodate patients presenting with severe SARS-CoV-2 infections, especially in the Île-de-France and Grand-Est regions. Institutional reorganisation encountered several challenges, notably related to uncertainties about the natural history of the disease, efficient preventive measures, and tensions related to supply of medical protective material/equipment and drugs. The outbreak also had an impact on the personal life of medical staff, due to reorganisation of family life and the

reduction of sleeping and rest times. Several studies conducted in China during the SARS-CoV-2 outbreak and previous studies conducted during the Severe Acute Respiratory Syndrome (SARS) et Middle East Respiratory Syndrome (MERS) epidemics revealed high levels of anxiety, depression and post-traumatic stress disorders (PTSD) among healthcare professionals [1,2]. In France, studies have evaluated the psychological impact of the SARS-CoV-2 epidemic on specific populations, such as intensive care unit (ICU) healthcare professionals [3–5], radiologists [4], residents in oncology, radiotherapy, urology and surgery [7–9], community pharmacists [10] and professionals working in acute care geriatric facilities [11]. However, global data on the psychological impact of the SARS-CoV-2 epidemic on hospital staff are lacking.

Our primary objective was to assess/evaluate the psychological impact of the SARS-CoV-2 epidemic on the staff of a hospital in the Île-de-France region, two months after the first outbreak. Our secondary objectives were to identify personal and professional risk factors for anxiety, depression and PTSD, to evaluate the impact of psychological symptoms on the consumption of tobacco,

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alcohol and psychotropic drugs and on the observance of measures to prevent transmission, i.e. the use of personal protective equipment (PPE) and social distancing at work.

2. Material and methods

2.1. Population

The *Groupe Hospitalier Sud Île-de-France* (GHSIF) includes the hospitals of Melun (350 beds) and Brie Comte-Robert consisting of 66 geriatric beds and 197 places of housing for dependent elderly people (EHPAD). During March and April 2020, the GHSIF received 830 patients infected by SARS-CoV-2. The GHSIF employs 1788 “full-time equivalent” professionals. A psychological support unit (PSU) for the hospital staff was put into place on March 23, 2020 to prevent psychological risks. From its creation until June 26 2020 (start of our study), this support unit performed 369 consultations, i.e. individual conversations and support groups, in all departments (medical and administrative), referral units and EHPADs. PSUs also offered relaxation, hypnosis and sophrology sessions, implemented by trained volunteers.

2.2. Psychological questionnaire for staff

In the overall context of outbreak feedback, the hospital staff was invited by mail and by the managers to answer a self-completed, anonymous questionnaire, available on the internal hospital website from June 15 until June 26, 2020. The questionnaire included socio-demographic data, evaluated the personal and professional organisational changes induced by the outbreak, the psychological impact, the evolution in alcohol, tobacco and psychotropic drugs consumption, the use of PPE during health care and the respect of social distancing with colleagues during meals. After answering questions regarding transmission preventive measures (TPM), participants were invited to choose one or several reasons for their attitude of compliance or non-compliance from a predetermined list.

Anxio-depressive disorders were assessed by the Hospital Anxiety and Depression Scale (HAD). This scale, developed by Zigmond and Snaith [12], detects anxio-depressive disorders, excluding somatic symptoms that might skew evaluation. It has been translated and validated in many countries, notably on a population of professionals in France [13]. It comprises of 14 items, rated from 0 to 3 points. Seven questions refer to anxiety (total A) and seven to depression (total D), allowing the calculation of two scores. For each score (A and D), the interpretation is as follows: score ≤ 7 , absence of symptoms, score 8–10, possible symptoms, score ≥ 11 , certain symptoms. PTSD was assessed by the Impact of Event Scale – Revised (IES-R). This auto-questionnaire was developed by Horowitz et al. [14] and completed by Weiss and Marmar [15]. It investigates the main symptoms of PTSD listed in the DSM-IV, and includes 22 items distributed in 3 scales evaluating avoidance, intrusive thoughts and hypervigilance. The respondents are asked to describe the occurrence of different behaviour patterns during the 7 previous days, on a frequency scale ranging from 0 to 4 points. A total score of 40 to 55 indicates moderate PTSD symptoms, and a score above 56 severe symptoms.

2.3. Statistical analysis

Statistical analysis was performed with Epi-Info™, version 7.2.3.1. The descriptive analysis of discontinuous variables comprised frequencies and percentages, and analysis of continuous variables comprised medians and interquartile ranges. The factors associated with a psychological impact of the SARS-CoV-2 outbreak and inobservance of TPM were sought out in univariate analysis by

Table 1
Characteristics of the 353 participants^a.

Characteristics	n (%)
Socio-demographic data	
Sex	
Female	312 (89)
Male	38 (11)
Age	
< 25 years	15 (4)
25 to 35 years	90 (21)
36 to 45 years	109 (31)
46 to 55 years	108 (31)
> 55 years	31 (9)
Marital life	
Schoolchildren	253 (72)
Individual vulnerability to SARS-CoV-2	196 (56)
Family member vulnerable to SARS-CoV-2	66 (19)
109 (31)	
Professional data	
Healthcare professional	
Nurse	238 (67)
Caregiver	95 (9)
Physician	38 (6)
Health manager	33 (6)
24 (2)	
Professional experience	
Student	2 (<1)
< 5 years	75 (21)
5 to 10 years	80 (23)
> 10 years	196 (56)
Location	
Hospital	326 (92)
EHPAD	27 (8)
Department	
Emergency unit	25 (7)
Intensive care unit	23 (7)
Medical department	63 (18)
Others	242 (69)
Personal impact of SARS-CoV-2	
Change of residency	11 (3)
Separation from family	71 (20)
Personal infection by SARS-CoV-2	33 (9)
Family member infected by SARS-CoV-2	82 (23)
Professional impact of SARS-CoV-2	
Feeling of taking risk	
No	48 (14)
Rarely	118 (34)
Often	181 (52)
Working while being ill	49 (14)
Change of professional team	94 (27)
Acquisition of new professional competences	155 (45)
Acquisition of new professional relations	213 (62)
Dynamism of scientific research	134 (41)
Disappearance of hierarchical barriers	71 (21)

^a Total < 353 for some variables, as the questionnaire offered the opportunity to not respond.

Fisher's exact test. Significant variables ($P < 0.05$) were included in multivariate analysis in a logistic regression model.

3. Results

3.1. Description of the population

The response rate was 20% of the hospital personnel having been invited to respond ($n = 353$), 89% of the participants were women. The description of the population is shown in Table 1. Two-thirds of the participants ($n = 238$, 67%) were healthcare professionals, with a high proportion of nurses, caregivers and physicians. Half of them had more than 10 years of professional experience.

During the outbreak, 20% had been temporarily separated from their family, 23% had had a family member infected by SARS-CoV-2, and 9% had been infected themselves.

Table 2
Results of the psychological scales and psycho-active substance consumption^a.

Psychological status	n (%)
HAD scale – Anxiety	
No anxiety symptomatology (≤ 7)	240 (70)
Possible anxiety symptomatology (8–10)	65 (18)
Certain anxiety symptomatology (≥ 11)	48 (14)
HAD scale – Depression	
No depression symptomatology (≤ 7)	299 (85)
Possible depression symptomatology (8–10)	34 (10)
Certain depression symptomatology (≥ 11)	20 (6)
IES-R total score	
Mild symptoms (0–39)	295 (84)
Moderate symptoms (40–55)	36 (10)
Severe symptoms (≥ 56)	22 (6)
Smoking	
No	273 (77)
Yes, stable	40 (11)
Yes, increased	31 (9)
Yes, decreased	7 (2)
Daily alcohol consumption	
No	300 (85)
Yes, stable	24 (7)
Yes, increased	21 (6)
Yes, decreased	3 (<1)
Daily cannabis consumption	4 (1)
Initiation / increased treatment for anxiety	22 (6)
Initiation / increased treatment for insomnia	37 (11)

^a Total < 353 for some variables, as the questionnaire offered the opportunity to not respond

3.2. Impact of the outbreak on professional organisation

During the outbreak, 27% of participants changed their professional team and 14% worked while being ill. More than half reported a feeling of taking risks in their professional activity. However, they also said they had developed new professional relations (62%), acquired skills (45%) and observed dynamism in scientific research (41%) and the disappearance of hierarchical barriers (21%).

3.3. Psychological impact of the outbreak, consumption of tobacco, alcohol and psychotropic drugs

The medians and interquartile ranges of psychological scales were as follows: HAD-anxiety, 6 [4–8]; HAD-depression, 3 [1–6]; IES-R-avoidance, 6 [2–11]; IES-R-hypervigilance, 4 [1–8]; IES-R-intrusive thoughts 8 [3–15]; IES-R-total 19 [8–33]. The psychological scores and tobacco, alcohol and psychotropic drug consumption are detailed in Table 2. In summary, 32% of participants had symptoms of anxiety (severe 14%), 16% of depression (severe 6%) and 16% of PTSD (severe 6%). During the outbreak, 11% of participants had initiated or increased treatment for insomnia, and 6% treatment for anxiety. The treatment was allopathic medicine requiring medical prescription for 27 out of 37 patients (insomnia) and 18 out of 22 patients (anxiety); and homeopathic treatments or phytotherapy in other cases.

3.4. Use of personal protective equipment and respect of social distancing

Among 316 professionals who evaluated their use of PPE, 258 (73%) reported compliance with local guidelines, 33 (9%) insufficient use and 25 (7%) excessive use. Regarding social distancing during meals, evaluated from 340 responses, this was respected in 187 cases (53%), not respected in 138 cases (39%), and not applicable in 15 cases (4%). The main motivations of professionals who reported a correct use of PPE were the concern to protect their family and relatives ($n=214$, 83%). Additional scores were: awareness of the severity of the disease ($n=211$, 82%), sense of responsi-

bility towards their patients ($n=176$, 68%), duty of exemplarity ($n=118$, 46%), confidence in the local recommendations ($n=105$, 41%), feeling of being well-informed ($n=105$, 41%) and feeling of being well-protected ($n=80$, 31%). The main justifications for insufficient use of PPE were lack of PPE availability ($n=16$), discomfort ($n=13$), the feeling that ‘we do too much’ ($n=11$) and waste of time ($n=8$).

Non-compliance with social distancing during meals was mainly the result of organisational constraints ($n=92$) and the need for relaxation and proximity with colleagues ($n=68$).

Fifty-eight participants declared that they had changed their attitude towards preventive measures since the beginning of the epidemic. The trigger factors for change were: death of a patient infected by SARS-CoV-2 ($n=20$), infection of a family-member by SARS-CoV-2 ($n=20$) and personal infection by SARS-CoV-2 ($n=17$).

3.5. Factors associated with the psychological impact of the SARS-CoV-2 outbreak and non-compliance with transmission preventive measures (TPM)

Factors associated with the psychological impact of the SARS-CoV-2 outbreak and the non-compliance with TPM in univariate analysis are summarised in Tables 3 and 4. In multivariate analysis (Table 5), the factors independently associated with anxiety were treatment with anxiolytics or sleeping pills, change of professional team, and having a family-member infected with SARS-CoV-2, while the only factor associated with depression was the feeling of taking risks in the exercise of one’s professional duty. The factors associated with PTSD were treatment with sleeping pills, increased smoking, the feeling of taking risks in the exercise of professional activity, and having a family member infected with SARS-CoV-2.

Personal history of SARS-CoV-2 infection and age younger than 36 years were significantly associated with insufficient use of PPE, while risk-factors for severe SARS-CoV-2 infection and a HAD-Anxiety score = 8 were associated with excessive use of PPE. Lastly, belonging to health-care personnel or being younger than 36 years old were associated with non-compliance to social-distancing during meals. Unlike univariate analysis, being a nurse and working in intensive-care unit were not associated with non-compliance to social-distancing.

4. Discussion

4.1. The main results

This study evaluating the psychological impact of the SARS-CoV-2 epidemic on hospital staff in France presents two specificities compared with previous studies: analysis of the consumption of tobacco, alcohol and psychotropic drugs, and compliance with measures to prevent transmission.

Our study, performed two months after the first SARS-CoV-2 outbreak in the Île-de-France region, shows 32% anxiety and 16% depression within the hospital staff. These percentages are much lower than the 45 to 55% anxiety and 25 to 60% depression observed in previous international reports involving the HAD scale, which were performed at the peak of the epidemic in China and Brazil [16–18]; it bears mentioning that these reports were based on a lower HAD scale cut-off value (8 points) and included “suspected” anxiety or depressive disorders. When compared to the 2 French studies using the same HAD scale cut-off value as ours (11 points), which disclosed 14.6% and 19% anxiety, and 12% and 9% depression among radiologists and ICU healthcare workers respectively [5,6], the psychological impact in our population is slightly higher than expected. Other French studies used a lower HAD scale cut-off value (8 points) [3,7], but did not mention their cut-off [4] or apply

Table 3
Factors associated with psychological status (symptoms of anxiety, depression, and post-traumatic stress disorder) in univariate analysis^a.

	HAD-A ≥ 8 (n = 113)	HAD-A < 8 (n = 240)	P	HAD-D ≥ 8 (n = 54)	HAD-D < 8 (n = 199)	P	IES-R ≥ 40 (n = 58)	IES-R < 40 (n = 295)	P
Socio-demographic data									
Female sex	105 (94)	207 (87)	0.039	50 (93)	262 (89)	0.267	54 (93)	258 (88)	0.207
Age < 36 years	35 (31)	77 (29)	0.410	15 (28)	90 (30)	0.434	12 (21)	93 (32)	0.065
Marital life	80 (75)	173 (77)	0.411	39 (75)	214 (76)	0.490	37 (70)	216 (77)	0.166
Schoolchildren	56 (51)	140 (60)	0.082	27 (51)	169 (57)	0.239	32 (56)	164 (56)	0.544
Individual vulnerability to SARS-CoV-2	25 (22)	41 (17)	0.175	13 (24)	53 (18)	0.189	13 (22)	53 (18)	0.277
Family member vulnerable to SARS-CoV-2	42 (37)	67 (28)	0.058	24 (44)	85 (29)	0.017	24 (41)	85 (29)	0.046
Personal impact of SARS-CoV-2									
Family member infected by SARS-CoV-2	38 (34)	44 (19)	0.002	18 (34)	64 (22)	0.043	22 (39)	60 (21)	0.004
Change of residency	4 (4)	7 (3)	0.490	4 (7)	7 (2)	0.071	4 (7)	7 (2)	0.088
Separation from family	28 (25)	43 (18)	0.088	13 (24)	58 (19)	0.268	16 (28)	55 (19)	0.087
Working while being ill	17 (15)	32 (13)	0.388	10 (19)	39 (13)	0.183	11 (19)	38 (13)	0.147
Personal infection by SARS-CoV-2	16 (14)	17 (7)	0.029	8 (15)	25 (8)	0.105	9 (16)	24 (8)	0.073
Professional data and impact									
Healthcare professional	73 (65)	166 (69)	0.231	37 (69)	202 (68)	0.513	38 (66)	201 (68)	0.402
Nurse	28 (25)	67 (28)	0.314	16 (30)	79 (26)	0.368	19 (33)	76 (26)	0.174
Physician	7 (6)	26 (11)	0.113	4 (7)	29 (10)	0.408	3 (5)	30 (10)	0.172
Intensive care unit	7 (6)	16 (7)	0.535	1 (2)	22 (7)	0.105	5 (9)	18 (6)	0.321
Professional experience > 10 years	63 (56)	133 (55)	0.523	31 (57)	165 (55)	0.440	34 (59)	162 (55)	0.355
Change of professional group	39 (35)	55 (23)	0.016	20 (37)	74 (25)	0.052	20 (35)	74 (25)	0.090
Sensation of taking risk in professional activity	71 (64)	110 (47)	0.002	37 (70)	144 (49)	0.004	47 (82)	134 (46)	< 0.001
Psychoactive substances consumption									
Increased smoking	15 (13)	16 (7)	0.034	8 (15)	23 (8)	0.083	12 (21)	19 (6)	0.002
Increased alcohol consumption	12 (11)	10 (4)	0.020	5 (9)	17 (6)	0.243	5 (9)	17 (6)	0.296
Introduction / increase in anxiolytic treatment	17 (15)	5 (2)	< 0.001	9 (17)	13 (4)	0.002	13 (23)	9 (3)	< 0.001
Introduction / increase in sleeping pill treatment	25 (68)	12 (32)	< 0.001	13 (25)	24 (8)	< 0.001	18 (32)	19 (7)	< 0.001

^a Total < 353 for some variables, as the questionnaire offered the opportunity to not respond; in bold: statistically significant results.

other evaluation scales [9], which precluded comparisons with our results.

We found 16% PTSD in our population, which is higher than in the previous international studies using the IES-R questionnaire, with the exception of a Chinese study which found 35% incidence of PTSD in healthcare workers [19]. Studies in Singapore and India found rates of 7 and 8%, respectively [20,21]. The difference between our findings and those of other previously published studies is all the more significant because we used a threshold of = 40 IES-R points, as recommended in France, instead of the threshold of = 24 or 26 points employed in the previous studies. However, our results are consistent with the 16% to 27% incidence of PTSD obtained with various evaluation scales (IES-R, Post-traumatic Stress Disorder Checklist for DSM-5) among French ICU professionals and pharmacists [4,5,10].

Our questionnaire included questions on treatment with psychotropic drugs, to objectively support conclusions on the psychological impact of the epidemic on the hospital staff. If the percentage of participants who initiated or increased treatment with anxiolytics or sleeping pills was low (6 and 11%, respectively), the requirement of medical prescriptions for their delivery, and significant association with the HAD scale and the IES-R, undoubtedly reveals a major impact in a small fraction of the hospital staff.

We also searched for an association between psychological condition and an increase in smoking and alcohol consumption. In the general population, Stanton et al. showed that a modification in alcohol consumption and smoking habits was correlated with anxiety and depression levels [22]. In France, a national survey involving 222 residents in oncology and radiotherapy revealed an increase in consumption of tobacco in 31% of participants, alcohol in 29% and

psychostimulants in 24% during the first peak of the SARS-CoV-2 epidemic [7]. Moreover, increased consumption of alcohol and tobacco was concomitantly associated with anxiety, depression and insomnia in 1001 residents and fellows of surgery [9]. We did not find such a correlation, even though PTSD symptoms were associated with an increase in smoking in our population. Although this observation is less worrisome than an initiation or increase of psychotropic treatment, it demonstrates a tangible impact of altered psychological condition on lifestyle.

We aimed to identify risk factors for anxiety, depression and PTSD in relation to the SARS-CoV-2 epidemic. We did not find some of the risk factors previously reported in the literature, such as female sex, young age, being a nurse or a “frontline worker” or belonging to non-medical staff [1–3,6,16,19,20,23–28]. This finding might be explained, with regards to age and sex, by the proportion of males and people younger than 25 years in our population. By contrast, we identified for the first time a change of professional team as contributing to the emergence of anxiety, and the feeling of taking risks in the practice of professional activity as promoting depression and PTSD. The identification of these new risk factors should facilitate the proposal of practical measures to limit the psychological impact of the epidemic on hospital staff. If changes in professional team and medical department are required, intensive support by the managers is necessary. In addition, providing sufficient PPE and improving the employees’ training on their proper use could reduce the sense of insecurity and limit the risk of subsequent depression and PTSD symptoms. The suitability of these measures has been confirmed by a French survey, in which sufficient PPE supply decreased the risk of anxiety and depression by 31% and 25%, respectively, among young surgeons [9]. Lastly,

Table 4
Factors associated with non-compliance with transmission preventive measures in univariate analysis^a.

	Personal protective equipment use						Social distancing		
	Insufficient (n = 33)	Other situations (n = 264)	P	Excessive (n = 25)	Other situations (n = 244)	P	Compliance (n = 138)	Non- compliance (n = 202)	P
Socio-demographic data									
Female sex	25 (78)	233 (89)	0.086	23 (92)	211 (87)	0.377	121 (88)	179 (89)	0.483
Age < 36 years	17 (52)	82 (31)	0.017	9 (36)	84 (34)	0.518	58 (42)	44 (22)	0.015
Marital life	23 (72)	193 (77)	0.319	13 (59)	185 (79)	0.036	105 (79)	142 (75)	0.229
Schoolchildren	16 (48)	144 (55)	0.285	13 (52)	128 (53)	0.532	83 (60)	104 (53)	0.111
Individual vulnerability to SARS-CoV-2	3 (9)	50 (19)	0.117	9 (36)	37 (15)	0.014	20 (15)	44 (22)	0.058
Family member vulnerable to SARS-CoV-2	10 (30)	80 (30)	0.577	13 (52)	69 (28)	0.016	40 (29)	64 (32)	0.320
Personal impact of SARS-CoV-2									
Family member infected by SARS-CoV-2	8 (25)	62 (24)	0.518	4 (16)	58 (24)	0.186	35 (26)	45 (23)	0.320
Separation from family	7 (21)	56 (21)	0.576	5 (20)	50 (20)	0.596	33 (24)	34 (17)	0.071
Working while being ill	8 (24)	32 (12)	0.058	2 (8)	35 (14)	0.297	23 (17)	24 (12)	0.145
Personal infection by SARS-CoV-2	7 (21)	20 (8)	0.020	3 (12)	25 (10)	0.500	17 (12)	15 (8)	0.094
Professional data and impact									
Healthcare professional	29 (88)	193 (73)	0.045	22 (88)	189 (77)	0.168	110 (80)	121 (60)	< 0.001
Nurse	13 (39)	77 (29)	0.157	7 (28)	81 (33)	0.389	47 (34)	46 (23)	0.015
Physician	4 (12)	28 (11)	0.488	4 (16)	28 (11)	0.144	13 (9)	19 (9)	0.569
Intensive care unit	4 (12)	16 (6)	0.169	3 (12)	16 (7)	0.253	15 (11)	8 (4)	0.012
Professional experience > 10 years	15 (46)	149 (56)	0.156	13 (52)	135 (55)	0.455	64 (46)	127 (63)	0.002
Change of professional group	7 (22)	80 (31)	0.212	12 (48)	63 (26)	0.021			
Sensation of taking risk in professional activity	19 (59)	130 (50)	0.202	19 (76)	120 (50)	0.010	75 (56)	101 (51)	0.226
Psychological status									
HAD-A ≥ 8	11 (33)	83 (31)	0.484	17 (68)	70 (29)	< 0.001	43 (31)	67 (33)	0.394
HAD-D ≥ 8	5 (15)	41 (16)	0.596	8 (32)	38 (16)	0.043	17 (12)	36 (18)	0.110
IES-R ≥ 40	2 (6)	46 (17)	0.069	10 (40)	34 (14)	0.003	19 (14)	37 (18)	0.168

^a Total < 353 for some variables, as the questionnaire offered the opportunity to not respond. in bold: statistically significant results.

Table 5
Factors associated with psychological status and non-compliance with transmission preventive measures in multivariate analysis.

	Odds ratio	95% confidence interval	P
HAD-Anxiety score ≥ 8			
Anxiolytic treatment	4.94	1.41 – 17.34	0.013
Sleeping pills	3.48	1.47 – 8.24	0.005
Family member infected by SARS-CoV-2	1.96	1.10 – 3.51	0.023
Change of professional group	2.09	1.21 – 3.62	0.009
HAD-Depression score ≥ 8			
Sensation of taking risk in professional activity	2.00	1.02 – 3.91	0.042
IES-R score ≥ 40			
Sleeping pills	3.24	1.16 – 9.03	0.025
Increased smoking	3.33	1.25 – 8.90	0.02
Sensation of taking risk in professional activity	4.49	2.06 – 9.80	< 0.001
Family member infected by SARS-CoV-2	2.14	1.06 – 4.33	0.034
Insufficient PPE* use			
Age < 36 years	2.31	1.10 – 4.83	0.027
Personal infection by SARS-CoV-2	3.18	1.19 – 8.19	0.021
Excessive PPE* use			
HAD-Anxiety score ≥ 8	3.54	1.33 – 9.41	0.011
Individual vulnerability to SARS-CoV-2	2.91	1.06 – 7.97	0.038
Non-compliance with social distancing			
Age < 36 years	2.17	1.33 – 3.56	0.002
Healthcare professional	1.94	1.10 – 3.42	0.021

* PPE: personal protective equipment.

the impact of the SARS-CoV-2 infection of a family member had not been previously studied in healthcare professionals. Although this risk factor is neither controllable nor related to professional activity, it might be a criterion to propose remedial psychological support to affected professionals.

As our objective was not to evaluate the efficacy of psychological support units (PSU), we were unable to determine if they had an impact on the percentages of anxiety, depression and PTSD. In contrast, our results confirm the relevance of extended

support of hospital staff, of which PSU might be one modality. Long-term follow-up is all the more important because, in the case of SARS-CoV-1, PTSD symptoms have been described in healthcare providers several years after the epidemic in China, Hong Kong and Canada [29–31].

We initially hypothesised that the psychological impact of the SARS-CoV-2 outbreak and non-compliance to PTM might be interdependent. We supposed that anxio-depressive symptoms and/or PTSD would result either in an excess in PPE use, or, on the

contrary, to hopelessness and negligence. In a study involving 1642 participants from the general population in Cyprus, compliance with precautionary measures was associated with low scores of depression and high levels of anxiety [32]. Finally, in cases of anxiety, we did find an excessive use of PPE. Compliance with PPE was adequate, as only 9% of the professionals reported insufficient use. Altruistic motivations (protecting one's patients and family members), predominated over individual considerations; i.e. confidence in local recommendations, and feelings of being properly informed and protected.

Good compliance with PPE contrasted with the non-compliance with social distancing during meals in 39% of participants. This type of non-compliance results from two factors: logistical constraints, unsuitable premises and the obligation for some professionals to stay in the care unit; and the need for human contact with colleagues, to relax and consolidate team-spirit. Considering the deleterious impact of grouped SARS-CoV-2 infection cases in a professional team, ensuring respect of social distancing without compromising inter-personal relations and collective dynamics is a major internal organisation issue for hospitals and health-care structures.

4.2. Limitations of the study

The monocentric design of the study did not allow us to transpose its conclusions to all types of hospital staff. However, as the GHSIF belongs to hospitals which were in the forefront of the SARS-CoV-2 outbreak, it is unlikely that the psychological impact of this epidemic has been underestimated.

Voluntary participation in the study could have constituted a selection bias, as there was a risk that only personnel strongly affected by the outbreak would participate. Heightened recognition of the positive aspects of reorganisation (development of new professional relations and new skills, scientific interest, etc.) suggests that the questionnaire was completed by a representative sample of the hospital staff.

In addition, all previous studies on the mental health of hospital staff during the SARS-CoV-2 epidemic used the same methodology, which legitimates comparison of our results with data from the literature. The responses to some HAD scale such as 'I still enjoy the things I used to enjoy' or 'I look forward with enjoyment to things' might have been affected by the practical impossibility to practice many social or recreational activities. However, this methodological limit was also common to previous studies.

Whether the psychological impact of the SARS-CoV-2 epidemic on healthcare professionals differs from that on the general population is a matter of debate. A meta-analysis of 55 studies (including 45 in China and 41 in the general population) concluded that only the incidence of insomnia, but not depression, anxiety or PTSD, differed between healthcare professionals and the general population [33]. In our study, as in most previous work on the topic, the absence of a control group in the general population prevented us from unquestionably ascribing the psychological impact of the SARS-CoV-2 outbreak to professional activity. Other factors, such as containment, probably also contributed to mental health alteration. We believe, however, that this does not diminish the relevance of our results. We aimed to identify modifiable risk factors in the professional environment, to contribute to the reconsideration of efficient actions designed to reduce psycho-social risks of hospital staff. As extra-professional factors are not accessible to preventive strategies at workplace, the difficulty of quantifying them does not deeply impact our pragmatic reflection on the improvement of hospital organisation.

The absence of an internal control group (as we did not have data on the mental health status of hospital professionals before the SARS-CoV-2 outbreak) did not allow us to formally attribute the

participants' psychological condition to the outbreak. Some of these troubles might have pre-existed; however, their association with increased tobacco, alcohol and psychotropic drug consumption strongly suggests a real impact of the SARS-CoV-2 epidemic. Previous comparable studies suffer from the same bias. The study by Caillet et al. constitutes an exception: the authors showed a higher incidence of anxiety, depression and PTSD in ICU healthcare professionals during the first peak of the SARS-CoV-2 epidemic compared to data from the literature on ICU professionals' mental health [4]. Unfortunately, there exist no global reference data about mental health status of hospital staff in France before the SARS-CoV-2 epidemic. Georger et al., in a survey involving the whole hospital staff of 2 French hospitals during the same period, observed that 34% of respondents presented increased moral exhaustion compared to baseline [34]. Therefore, despite the absence of internal control, our presumption that the SARS-CoV-2 outbreak has had a significant psychological impact is consistent with previous studies.

Evaluating the prevalence of burn-out would have been interesting. It was not possible for practical reasons (the length of the questionnaire would have been considerably increased); this element should nonetheless be considered in subsequent studies. Lastly, considering the resurgence of the SARS-CoV-2 epidemic, a re-evaluation of the parameters of this study on a regular basis (for example, after 6 and 12 months) is needed, in order to detect long-term psychological consequences.

5. Conclusion

Two months after the first SARS-CoV-2 outbreak, the professionals of a first-line hospital significantly suffered from anxiety-depressive and PTSD symptoms. The psychological impact of the epidemic had concrete consequences, as it was associated with the prescription of psychotropic drugs (anxiolytics and sleeping pills) and with increased smoking in cases of PTSD.

Several risk factors for psychological impacts were identified: change in professional team, feeling of taking risks in professional activity, and having a family member infected with SARS-CoV-2. These factors can be prevented, or their impact attenuated, by institutional organisation measures.

Finally, we observed that PPE use was adequate, mostly for altruistic reasons, while compliance with social distancing during meals was compromised by logistical constraints and by strengthened relations between colleagues. This last point is a major improvement target. Indeed, in the perspective of an extended epidemic, supporting of team-spirit under adequate sanitary conditions is of paramount importance.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the 1964 Helsinki declaration and its later amendments.

Human and animal rights

The authors declare that the work described has not involved experimentation on humans or animals.

Informed consent and patient details

The authors declare that this report does not contain any personal information that could lead to the identification of the patient(s) and/or volunteers.

Disclosure of interest

The authors declare that they have no competing interest.

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Authors' contributions

Clara Flateau, Coralie Noël, Aurélie Bonnafoux, Elodie Fuentes contributed to the study design; the statistical analysis was undertaken by Clara Flateau and Coralie Noël; and the article writing by Clara Flateau, Coralie Noël, Aurélie Bonnafoux, Elodie Fuentes, Astrid de Pontfarcy, and Sylvain Diamantis.

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References

- [1] Carmassi C, Foghi C, Dell'Oste V, Cordone A, Bertelloni CA, Bui E, et al. PTSD symptoms in healthcare workers facing the three coronavirus outbreaks: what can we expect after the COVID-19 pandemic? *Psychiatry Res* 2020;292:113312.
- [2] Luo M, Guo L, Yu M, Jiang W, Wang H. The psychological and mental impact of coronavirus disease 2019 (COVID-19) on medical staff and general public – A systematic review and meta-analysis. *Psychiatry Res* 2020;291:113190.
- [3] Azoulay E, De Waele J, Ferrer R, Staudinger T, Borkowska M, Povoia P, et al. Symptoms of burnout in intensive care unit specialists facing the COVID-19 outbreak. *Ann Intensive Care* 2020;10(1):110.
- [4] Caillet A, Coste C, Sanchez R, Allaouchiche B. Psychological impact of COVID-19 on ICU caregivers. *Anaesth Crit Care Pain Med* 2020;39(6):717–22.
- [5] Altmayer V, Weiss N, Cao A, Marois C, Demeret S, Rohaut B, et al. Coronavirus disease 2019 crisis in Paris: a differential psychological impact between regular intensive care unit staff members and reinforcement workers. *Aust Crit Care* 2020 [S1036-7314(20)30346-5].
- [6] Florin M, Pinar U, Chavigny E, Bouaboula M, Jarbouli L, Coulibaly A, et al. Socio-economic and psychological impact of the COVID-19 outbreak on private practice and public hospital radiologists. *Eur J Radiol* 2020;132:109285.
- [7] Hilmi M, Boilève A, Ducouso A, Michalet M, Turpin A, Neuzillet C, et al. Professional and psychological impacts of the COVID-19 pandemic on oncology residents: a national survey. *JCO Glob Oncol* 2020;6:1674–83.
- [8] Abdessater M, Rouprêt M, Misrai V, Matillon X, Gondran-Tellier B, Fretton L, et al. COVID-19 pandemic impacts on anxiety of French urologist in training: outcomes from a national survey. *World J Urol* 2020:1–2.
- [9] Vallée M, Kutchukian S, Pradère B, Verdier E, Durbant È, Ramlugun D, et al. Prospective and observational study of COVID-19's impact on mental health and training of young surgeons in France. *Br J Surg* 2020;107(11):e486–8.
- [10] Lange M, Joo S, Couette PA, de Jaegher S, Joly F, Humbert X. Impact on mental health of the COVID-19 outbreak among community pharmacists during the sanitary lockdown period. *Ann Pharm Fr* 2020;78(6):459–63.
- [11] El Haj M, Allain P, Annweiler C, Boutoleau-Brettonnière C, Chapelet G, Gallouj K, et al. Burnout of healthcare workers in acute care geriatric facilities during the COVID-19 crisis: an online-based study. *J Alzheimers Dis* 2020;78(2):847–52.
- [12] Zigmond AS, Snaith RP. The hospital anxiety and depression scale. *Acta Psychiatr Scand* 1983;67(6):361–70.
- [13] Bocéréan C, Dupret E. A validation study of the Hospital Anxiety and Depression Scale (HADS) in a large sample of French employees. *BMC Psychiatry* 2014;14:354.
- [14] Horowitz M, Wilner N, Alvarez W, Horowitz M, et al. Impact of event scale: a measure of subjective stress. *Psychosom Med* 1979;41(3):209–18.
- [15] Weiss DS, Marmar CR. The impact of event scale – revised. In: Wilson JP, Keane TM, editors. *Assessing psychological trauma and PTSD*. New York: Guilford Press; 1997. p. 399–411.
- [16] Xiao X, Zhu X, Fu S, Hu Y, Li X, Xiao J. Psychological impact of healthcare workers in China during COVID-19 pneumonia epidemic: a multi-centre cross-sectional survey investigation. *J Affect Disord* 2020;274:405–10.
- [17] Wang H, Huang D, Huang H, Zhang J, Guo L, Liu Y, et al. The psychological impact of COVID-19 pandemic on medical staff in Guangdong, China: a cross-sectional study. *Psychol Med* 2020:1–9, <http://dx.doi.org/10.1017/S0033291720002561>.
- [18] Dal'Bosco EB, Floriano LSM, Skupien SV, Arcaro G, Martins AR, Anselmo ACC. Mental health of nursing in coping with COVID-19 at a regional university hospital. *Rev Bras Enferm* 2020;73(Suppl 2) [e20200434].
- [19] Lai J, Ma S, Wang Y, Cai Z, Hu J, Wei N, et al. Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019. *JAMA Netw Open* 2020;3(3):e203976.
- [20] Tan BYQ, Chew NWS, Lee GKH, Jing M, Goh Y, Yeo LLL, et al. Psychological impact of the COVID-19 pandemic on health care workers in Singapore. *Ann Intern Med* 2020;173(4):317–20.
- [21] Chew NWS, Lee GKH, Tan BYQ, Jing M, Goh Y, Ngiam NJH, et al. A multinational, multicentre study on the psychological outcomes and associated physical symptoms amongst healthcare workers during COVID-19 outbreak. *Brain Behav Immun* 2020;88:559–65.
- [22] Stanton R, To QG, Khalesi S, Williams SL, Alley SJ, Thwaite TL, et al. Depression, anxiety and stress during COVID-19: associations with changes in physical activity, sleep, tobacco and alcohol use in Australian adults. *Int J Environ Res Public Health* 2020;17(11):4065.
- [23] Barello S, Palamenghi L, Graffigna G. Burnout and somatic symptoms among frontline healthcare professionals at the peak of the Italian COVID-19 pandemic. *Psychiatry Res* 2020;290:113129.
- [24] Elbay RY, Kurtulmu A, Arpacýođlu S, Karadere E. Depression, anxiety, stress levels of physicians and associated factors in COVID-19 pandemics. *Psychiatry Res* 2020;290:113130.
- [25] Civantos AM, Byrnes Y, Chang C, Prasad A, Chorath K, Poonia SK. Mental health among otolaryngology resident and attending physicians during the COVID-19 pandemic: national study. *Head Neck* 2020;42(7):1597–609.
- [26] Badahdah A, Khamis F, Al Mahyijari N, Al Balushi M, Al Hatmi H, Al Salmi I, et al. The mental health of health care workers in Oman during the COVID-19 pandemic. *Int J Soc Psychiatry* 2020 [20764020939596].
- [27] Que J, Shi L, Deng J, Liu J, Zhang L, Wu S, et al. Psychological impact of the COVID-19 pandemic on healthcare workers: a cross-sectional study in China. *Gen Psychiatry* 2020;33:e100259.
- [28] Nwachukwu I, Nkire N, Shalaby R, Hrabok M, Vuong W, Gusnowski A, et al. COVID-19 pandemic: age-related differences in measures of stress, anxiety and depression in Canada. *Int J Environ Res Public Health* 2020;17(17):6366.
- [29] Fu XW, Wu LN, Shan L. Review of possible psychological impacts of COVID-19 on frontline medical staff and reduction strategies. *World J Clin Cases* 2020;8(15):3188–96.
- [30] Lancee WJ, Maunder RG, Goldbloom DS. Prevalence of psychiatric disorders among Toronto hospital workers one to two years after the SARS outbreak. *Psychiatr Serv* 2008;59(1):91–5.
- [31] Maunder RG, Lancee WJ, Balderson KE, Bennett JP, Borgundvaag B, Evans S, et al. Long-term psychological and occupational effects of providing hospital healthcare during SARS outbreak. *Emerg Infect Dis* 2006;12(12):1924–32.
- [32] Solomou I, Constantinidou F. Prevalence and predictors of anxiety and depression symptoms during the COVID-19 pandemic and compliance with precautionary measures: age and sex matter. *Int J Environ Res Public Health* 2020;17(14):4924.
- [33] Cénat JM, Blais-Rochette C, Kokou-Kpolou CK, Noorishad PG, Mukunzi JN, McIntee SE, et al. Prevalence of symptoms of depression, anxiety, insomnia, post-traumatic stress disorder, and psychological distress among populations affected by the COVID-19 pandemic: a systematic review and meta-analysis. *Psychiatry Res* 2021;295:113599.
- [34] Georger F, Dos Santos E, Gazagne L, Berdagué P, Saib A, Nahon S, et al. COV IMPACT: stress exposure analysis among hospital staff in 2 hospitals in France during the COVID-19 pandemic. *Ann Cardiol Angeiol* 2020;69(5):227–32.