

Psychological burden of healthcare professionals in Germany during the acute phase of the COVID-19 pandemic: differences and similarities in the international context

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ABSTRACT

Background Healthcare professionals (HPs) are the key figures to keep up the healthcare system during the COVID-19 pandemic and thus are one of the most vulnerable groups in this. To this point, the extent of this psychological burden, especially in Europe and Germany, remains unclear. This is the first study investigating German HPs after the COVID-19 outbreak.

Methods We performed an online-based cross-sectional study after the COVID-19 outbreak in Germany (10–31 March 2020). In total, 2224 HPs (physicians $n = 492$, nursing staff $n = 1511$, paramedics $n = 221$) and 10 639 non-healthcare professionals (nHPs) were assessed including generalized anxiety (Generalized Anxiety Disorder-7), depression (Patient Health Questionnaire-2), current health status (EQ-5D-3L), COVID-19-related fear, subjective level of information regarding COVID-19.

Results HPs showed less generalized anxiety, depression and COVID-19-related fear and higher health status and subjective level of information regarding COVID-19 than the nHPs. Within the HP groups, nursing staff were the most psychologically burdened. Subjective levels of information regarding COVID-19 correlated negatively with generalized anxiety levels across all groups. Among HPs, nursing staff showed the highest and paramedics the lowest generalized anxiety levels.

Conclusions In the context of COVID-19, German HPs seem to be less psychological burdened than nHPs, and also less burdened compared with existing international data.

Keywords COVID-19, generalized anxiety, healthcare professionals, information, psychological burden

Introduction

The COVID 19 pandemic reached Germany in late February 2020. It brought not only objective medical challenges for healthcare professionals (HPs), but also reports and findings from other more affected countries. Due to exponentially increasing case numbers and large numbers of patients requiring intensive care, those more affected countries are facing unexpected challenges. Countries such as China, Italy, Spain, Brasil and the USA were and are currently reaching the limits of their healthcare systems in the context of this pandemic: something that was previously unimaginable in industrialized countries.¹ Such a development seems to have been avoided in Germany but is not completely ruled out for the future.

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In the face of an ever-renewing European and a further worldwide escalation, there is no shortage of uncertainty and concern among HPs. It is already known from countries other than Germany that HPs are under elevated psychological stress during the COVID-19 pandemic and show increased levels of various psychometric values, including anxiety and depression.^{2–5} Existing evidence, e.g. from China, already shows the extent of the psychological burden on HPs. Front-line healthcare workers were identified as bearing a particularly heavy psychological burden.^{2,6} However, these studies were conducted during the extreme stress phase of the COVID-19 epidemic in China. Only few data in the context of other studies suggest that, e.g. in the UK, a heightened psychological burden for the HPs may exist.⁷ There is, as yet no comparable data, especially from a time when the health system is still mainly coping normally, alongside already population-wide uncertainty, particularly in Europe.

The German situation to this point is 2-fold: Continuing and past restrictions in public life, contact restrictions, empty supermarket shelves and daily updated increasing case numbers are still coupled with a hospital system that is and was largely still able to cope normally. This is combined with mortality rates, which are, for the moment, low when compared internationally.^{8,9} Though, the German population shows itself already burdened in terms of generalized anxiety, depression and distress, which is in line with evidence from other countries,^{10,11} customized low-threshold interventions, offline as well as online, are needed and already implemented.^{12–14} The aim of this study was to close the research gap and provide initial findings on psychological burden of German HPs after the COVID-19 outbreak.

It is hypothesized that the group of HP in Germany will mirror the existing, population-wide elevated psychological burden¹⁵ to an even greater extent by being in the ‘front line’, as already could be observed in previous studies in other countries.^{2,3}

Methods

Study design, setting and participants

A nationwide, online-supported cross-sectional survey was conducted. Participants were recruited via online channels and official channels e.g. websites of clinics. The survey period was from the 10–31 March 2020. It was during this period that the first increased numbers of COVID-19 cases in Germany, increasingly restrictive government regulations, the closure of European borders and the restriction of individual freedoms occurred. In total, 12 863 people completed the questionnaire,

of which we identified 2224 people in the medical sector as HPs and 10 639 as non-healthcare professionals (nHPs). HPs were from three different groups: physicians, nursing staff and paramedics. The sample description can be seen in Table 1. All participants gave their written consent to participate in the survey and the evaluation of the collected data. The study was conducted in accordance with the ethical guidelines from the Declaration of Helsinki and was approved by the local ethics committee of the faculty of medicine.

Instruments

Details of general socio-demographic variables were asked. Validated psychometric instruments were used to assess psychological burden. The Generalized Anxiety Disorder-7 (GAD-7) to measure generalized anxiety symptoms over the course of the last 2 weeks (GAD-7, 7 items, 4-point Likert Scale meaning 0 = never to 3 = nearly every day),¹⁶ the Patient Health Questionnaire-2 (PHQ-2) to screen for depression symptoms over the course of the last 4 weeks (PHQ-2, 2 items, 4-point Likert Scale meaning 0 = never to 3 = nearly every day)¹⁷ and the visual analogue scale of the EuroQol EQ-5D-3L scale to assess current health status (ranging from 0 [worst imaginable health status] to 100 [best imaginable health status]).¹⁸ Additionally, based on scientific and media reports, multiple items and item scales were formed in expert consensus with regard to ‘COVID-19-related fear’ (one item, 7-point Likert scale meaning 1 = very low to 7 = extremely high), ‘the subjective level of information regarding COVID-19’ (3 items: I feel informed about COVID-19; I feel informed about measures to avoid an infection with COVID-19; I understand the health authorities’ advice regarding COVID-19. Seven-point Likert scale, meaning 1 = complete disagreement to 7 = complete agreement). Scale reliability for was tested using Cronbach’s α for internal consistency. ‘The subjective level of information regarding COVID-19’ showed high internal consistency (Cronbach’s $\alpha = 0.801$).

Data analysis

The descriptive and inferential statistics were performed with R3.6.1 (R Core Team, 2019). Sum scores for the GAD-7 and PHQ-2 and mean scores for all other scales were calculated.

To assess the hypotheses, the 95% confidence of the association measures are reported; for each difference between the groups after having assessed the global mean difference in the respective scale. Hence, the assumptions were assessed based on their precision.^{19–21} Generally, test statistics and *P* values are not reported given that at this sample size even the slightest deviation from equivalence results in extremely low *P* values. When the confidence interval (CI) of the effect

Table 1 Sample description

		Physicians (n = 492)		Nursing staff (n = 1511)		Paramedics (n = 221)		nHPs (n = 10 639)	
		n	%	n	%	n	%	n	%
Gender	Female	323	65.65	1312	86.83	55	24.89	7474	70.25
	Male	168	34.15	197	13.04	164	74.21	3131	29.43
	Divers	1	0.20	2	0.13	2	0.90	34	0.32
Residence	City	337	68.50	758	50.17	79	35.75	6247	58.71
	Medium-sized city	98	19.92	382	25.28	67	30.32	2404	22.59
	Small town	31	6.30	180	11.91	42	19.00	1059	9.95
	County	26	5.28	191	12.64	33	14.93	931	8.75
Risk group	Yes	84	17.07	365	24.16	50	22.62	2395	22.51
	No	408	82.93	1146	75.84	171	77.38	8244	77.49
Mental illness	Yes	19	3.84	159	10.52	14	6.33	1430	13.44
	No	476	96.16	1352	89.48	207	93.67	9209	86.56
Place of work (physician)	Clinic	312	63.41						
	Outpatient	142	28.86						
	Other	38	7.72						

Note: Risk group indicates whether the participant belonged to one of the risk groups for a severe course of COVID-19 (cardiovascular disease, diabetes mellitus, chronic respiratory disease, cancer).

size covers 0, we assume there is no effect. As soon as this is the case, we use the guidelines by Sawilowsky²² to evaluate the importance of the effect; a Cohen's $d \sim 0.2$ is considered a small, a $d \sim 0.5$ is considered medium-sized and $d \sim 0.8$ is regarded as large effects.

Due to the large sample size and the intuitive and common interpretation of the effect sizes, parametric methods were also used for violation of the normality assumption.²³ For mean comparisons Welch's t -test with the Cohen's d association measure was used, for multiple mean comparisons and between-subject analysis of variance with the association measure η^2 with subsequent t -tests for post hoc comparisons with Tukey error correction. A complete summary of all post hoc group comparisons after calculation of the variance analyses and post hoc tests can be assessed in the supplementary materials.

To clear the association of subjective level of information regarding COVID-19 and other variables, Spearman correlations between variables were performed. To subsequently test the interdependence of variables a robust linear M-estimator regression was performed (rlm from the R package MASS, 2002). All Spearman correlations including confidence between the measures are provided in the supplemental material.

Following the results of the correlation analyses, prevalence ratios for the amount of participants with moderate

generalized anxiety in relation to the subjective level of information regarding COVID-19 were explored. Levels of generalized anxiety were divided by using the GAD-7 sum score of ≥ 10 ²⁴ as a split into low levels of generalized anxiety (< 10) and moderate to high levels of generalized anxiety (≥ 10). This was compared with a pre-COVID-19 standard population, where 5.9% of the population scored above ≥ 10 .²⁵ The subjective level of information regarding COVID-19 was split by the median into high (\geq median) and low ($<$ median) levels. Prevalence ratios were calculated using unconditional maximum likelihood. CIs were calculated using normal approximation (via the R-packages epitools, 2020).

Results

Concerning generalized anxiety measured by the GAD-7, differences between the different HP groups and between the HPs and the nHPs could be found ($\eta^2 = 0.009$, CI = [0.006–0.013]) see fig. 1. Physicians show less generalized anxiety than nursing staff and the nHPs (physicians versus nursing staff: $d = -0.213$, CI = [–0.315 to –0.111] physicians versus nHPs: $d = -0.342$, CI = [–0.432 to –0.251]). Nursing staff show the highest generalized anxiety of all HPs. They also trend toward lower anxiety scores than the nHPs, effect sizes are relatively small (nursing staff versus nHPs: $d = 0.129$, CI = [0.075–0.182]). Descriptively

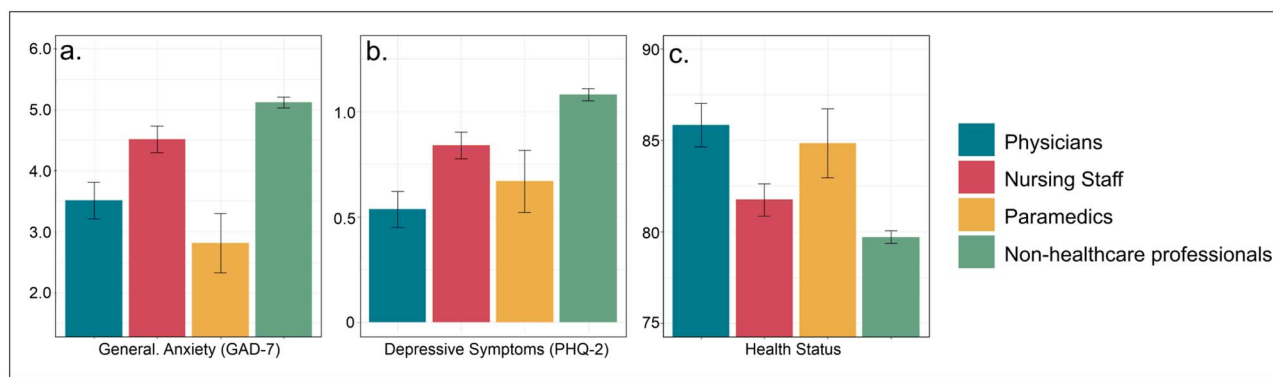


Fig. 1. Representation of the different manifestations of generalized anxiety (GAD-7) (a), depression (PHQ-2) (b), health status (c). Bars represent mean individual sum scores for GAD-7 and PHQ-2 and means for health status. Error bars represent 95% CIs. Note: GAD-7: 4-point Likert scale from 0 = never to 3 = nearly every day; PHQ-2: 4-point Likert scale from 0 = never to 3 = nearly every day; health status (EQ-5D-3L): visual analogous scale from 0 (worst imaginable health status) to 100 (best imaginable health status).

paramedics show the lowest generalized anxiety, although they do not differ from physicians in the direct comparison (paramedics versus physicians: $d = 0.148$, $CI = [-0.011$ to $0.306]$).

Depression, measured by the PHQ-2, also shows differences between the different HP groups and between the HPs and the nHPs ($\eta^2 = 0.009$, $CI = [0.006-0.012]$) **fig. 1**. Physicians show lower depression scores than nursing staff and the nHPs (physicians versus nursing staff: $d = -0.21$, $CI = [-0.312$ to $-0.108]$; physicians versus nHPs: $d = -0.377$, $CI = [-0.468$ to $-0.287]$). Nursing staff and paramedics show lower depression scores than the nHPs, although the paramedics differ in a more pronounced manner (nursing staff versus nHPs: $d = 0.167$, $CI = [0.113-0.221]$, paramedics versus nHPs: $d = 0.285$, $CI = [0.152-0.418]$). There are neither differences between paramedics and physicians, nor between paramedics and nursing staff (all CIs covering 0).

Physicians and paramedics show, comparatively to nursing staff and the nHPs, the best health status. Both differ from the nHPs ($\eta^2 = 0.007$, $CI = [0.00039-0.0094]$; physicians versus nHPs: $d = 0.345$, $CI = [0.254-0.435]$, paramedics versus nHPs: $d = -0.289$, $CI = [-0.423$ to $-0.156]$). Nursing staff slightly differ from paramedics ($d = -0.174$, $CI = [-0.315$ to $-0.033]$), whereas the difference between nursing staff and physicians is relatively more pronounced ($d = 0.23$, $CI = [0.128-0.332]$). Physicians do not differ from paramedics ($d = 0.056$, $CI = [-0.103$ to $0.214]$). Nursing staff, thus, show a lower health status than physicians and paramedics, but the health status of nursing staff is rated hardly better than that of the nHPs ($d = -0.115$, $CI = [-0.169$ to $-0.061]$) **fig. 1**.

COVID-19-related fear could be found among HPs and the nHPs. HPs show less COVID-19-related fear than the

nHPs (all $ds > 0.2$ with CIs not including 0). Physicians and nursing staff show a similar level ($\eta^2 = 0.01$, $CI = [0.008-0.015]$; $d = -0.003$, $CI = [-0.105$ to $0.10]$) Paramedics in particular show a lower level of COVID-19-related fear than physicians and nursing staff (paramedics versus physicians: $d = 0.414$, $CI = [0.255-0.573]$; paramedics versus nursing staff: $d = 0.417$, $CI = [0.276-0.558]$) see **fig. 2**.

Overall, the participants report a high level of subjective level of information regarding COVID-19, the mean values of all groups (HPs and nHPs) were >5.5 . Existing differences between nursing staff and physicians, as well as nursing staff and the nHPs, of which the CIs deviate from 0, remain negligible (nursing staff versus physicians: $d = 0.07$, $CI = [0.011-0.129]$, nursing staff versus nHPs: $d = 0.046$, $CI = [0.015-0.077]$) **fig. 2**.

Subjective level of information regarding COVID-19 correlates with generalized anxiety. The association of high or low subjective levels of information regarding COVID-19 and low or moderate to high generalized anxiety (cutoff of ≥ 10) is shown in **Table 2**. The proportion of moderately anxious participants regardless of level of information is 15.99% in the nHPs, 4.25% in physicians, 11.41% in nursing staff and 4.55% in paramedics.

The probability of reaching the pathological GAD-7 cutoff score of ≥ 10 thus diminishes across almost all HP groups and the nHPs with the degree of subjective level of information regarding COVID-19 (**Fig. 3**). For physicians, nursing staff and others, the prevalence of having generalized anxiety when sufficiently informed is critically reduced (with CIs of the prevalence ratio deviating significantly from 1). However, reduced moderate generalized anxiety in participants with high subjective levels of information can also be observed when the sample is analyzed as a whole.

Table 2 Generalized anxiety and subjective level of information regarding COVID-19 across the different groups

Profession		Generalized anxiety below cutoff (GAD-7 < 10)	Generalized anxiety above cutoff (GAD-7 ≥ 10)	% above cutoff	Prevalence ratio
Physicians	Low level of information	170	16	8.60	0.494
	High level of information	293	13	4.25	95% CI [0.243–1.00]
	Total	463	29	5.89	
Nursing staff	Low level of information	569	98	14.69	0.599
	High level of information	767	74	8.80	95% CI [0.451–0.80]
	Total	1336	172	11.41	
Paramedics	Low level of information	95	5	5.00	0.833
	High level of information	115	5	4.16	95% CI [0.238–2.80]
	Total	210	10	4.55	
nHPs	Low level of information	3556	771	17.82	0.835
	High level of information	5373	929	14.88	95% CI [0.766–0.911]
	Total	8929	1700	15.99	
In total	Low level of information	4390	891	16.87	0.807
	High level of information	6550	1032	13.61	95% CI [0.743–0.876]
	Total	10 940	1923	14.95	

Note: Prevalence ratio presented for the presence of at least moderate generalized anxiety symptoms (≥ 10) as a function of the subjective feeling of information regarding COVID-19. Subjective level of information is split across the median in high (≥ 6) and low (≤ 6) levels. GAD-7, sum scores of ≥ 5 , ≥ 10 and ≥ 15 indicate mild, moderate and severe generalized anxiety symptoms.

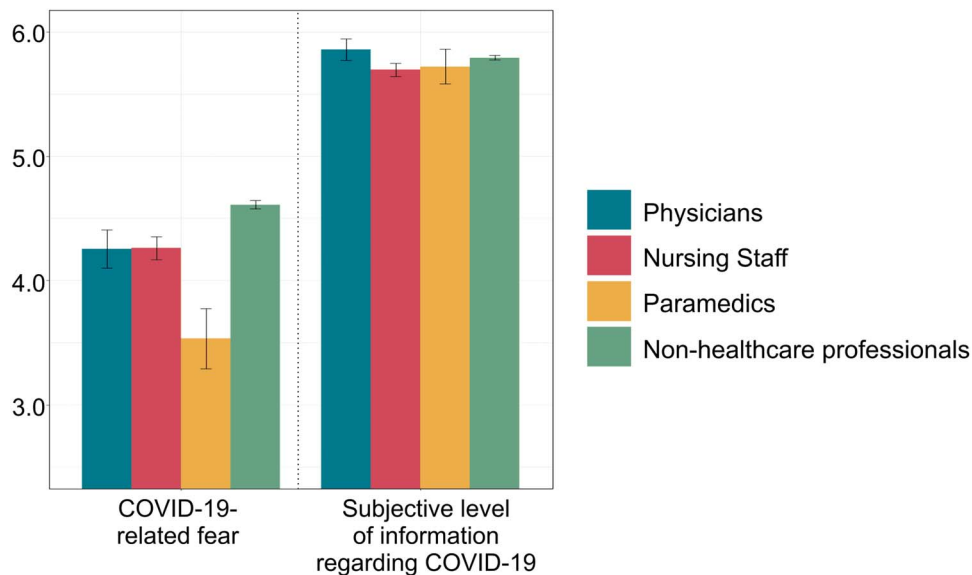


Fig. 2. Representation of the different characteristics of COVID-19-related fear and subjective level of information regarding COVID-19. Bars represent mean values of COVID-19-related fear and the means of the individual sum scores of the subjective level of information regarding COVID-19. Error bars represent 95% CIs. Note: COVID-19-related fear: one item, 7-point Likert scale meaning 1 = very low to 7 = extremely high; subjective level of information regarding COVID-19 (three items: I feel informed about COVID-19; I feel informed about measures to avoid an infection with COVID-19; I understand the health authorities' advice regarding COVID-19. Seven-point Likert scale, meaning 1 = complete disagreement to 7 = complete agreement).

Discussion

Main findings of the study

Assessing the psychological burden and COVID-19-related concerns of people working in the healthcare system is of high relevance in the light of the COVID-19 pandemic events.

To this point, this study is the first to assess those points in the German healthcare system.

In this study, nHPs reported overall higher levels of psychological burden than the HPs, which is particularly pronounced in generalized anxiety and depression scores. Within

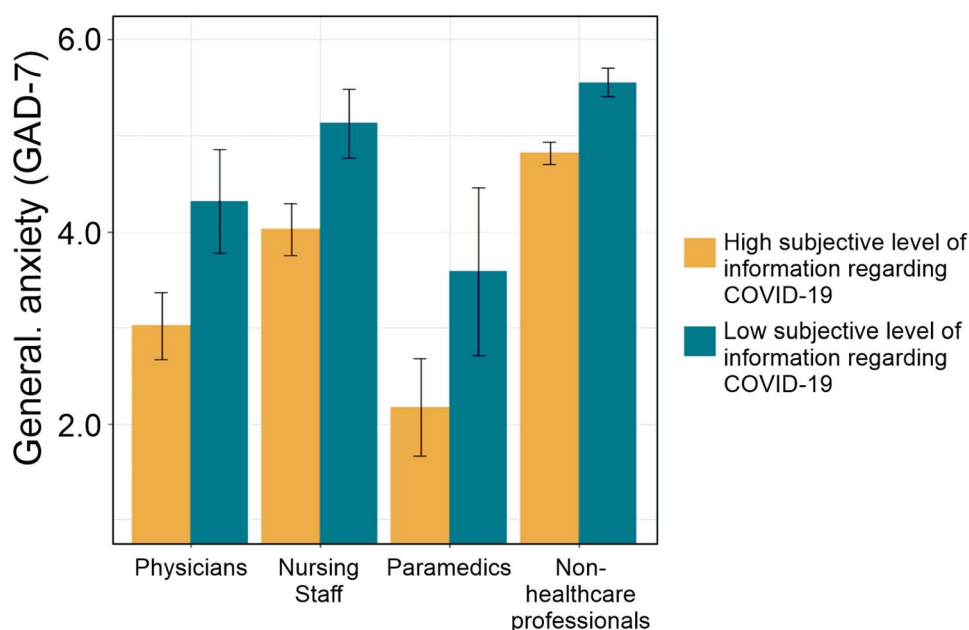


Fig. 3. Generalized anxiety (GAD-7) as a function of subjective level information regarding COVID-19 split by the median into high level (\geq median) and low level ($<$ median) of subjective level of information. Bars represent means of the sum scores of the GAD-7. Error bars represent 95% CIs. Note: GAD-7: 4-point Likert scale from 0 = never to 3 = nearly every day; subjective level of information regarding COVID-19 (three items: I feel informed about COVID-19; I feel informed about measures to avoid an infection with COVID-19; I understand the health authorities' advice regarding COVID-19. Seven-point Likert scale, meaning 1 = complete disagreement to 7 = complete agreement).

the HP groups there was, in relative terms, less psychological burden on physicians and paramedics than on nursing staff. Health status was better in the HP groups and within those, physicians reported the best health status, followed by paramedics. HPs also showed less COVID-19-related fear than nHPs, paramedics showing the least fear. Subjective levels information regarding COVID-19 was high overall HPs and nHPs. High levels of subjective levels of information regarding COVID-19 correlated negatively with high levels of generalized anxiety symptoms globally. In the group of individuals with low subjective levels of information regarding COVID-19, 17.88% of the nHPs, 8.60% of the physicians, 14.69% of the nursing staff and 5.00% of the paramedics scored above the cutoff of ≥ 10 , indicating the presence of GAD symptoms. Even without the division in subjective levels of information regarding COVID-19, still 15.99% of the nHPs, 5.89% of the physicians, 11.41% of the nursing staff and 4.55% of the paramedics scored above this cutoff. Especially concerning the nHPs and the nursing staff, this is a massive elevation of prevalence in comparison to a pre-COVID-19 sample, where only 5.9% of the population scored above this cutoff.²⁵

What is already known on this topic

The psychological burden of HPs during the COVID-19 pandemic has already been investigated in the early hotspots

of the pandemic, especially in China and Southeast Asia. High psychological burden of front-line workers could be found in China^{4–6,26} and other countries (e.g. Tan *et al.*³). In detail, at the height of the crisis in China, 50.7% of healthcare workers showed symptoms of depression, 44.7% those of generalized anxiety and 73.4% showed increased stress symptoms.²⁷ The psychological response of HPs during epidemics has already been investigated during other virus outbreaks, e.g. SARS and H1N1, drawing similar pictures.^{28,29} A clear picture concerning the HPs in Europe, especially in the beginning of the virus outbreak still does not exist.

What this study adds

In the present study, it was possible to show a rare picture of a healthcare system in the early outbreak stages of a pandemic in the western world. During this phase of the outbreak in Germany, in which uncertainty and anxiety prevailed but COVID-19 cases and death rates were still moderate and low, HPs were less psychologically burdened than the nHPs and less psychologically burdened than comparable HP groups in other countries.^{3–6,26} This poses the question why the German HPs coped and cope so well in the light of the current pandemic and in comparison to the nHPs. The finding that physicians in the current situation are among the least burdened by generalized anxiety and depression can maybe be understood by the fact that generalized anxiety was most

correlated with the subjective level of information regarding COVID-19. This may explain why physicians and HPs show lower overall levels of generalized anxiety and COVID-19-related fear, which also is in line with findings from Tan *et al.*³ where nonmedical healthcare workers had higher prevalence of anxiety than medical healthcare workers. This, in a second step, points to the inevitable need for the population to be informed transparently and evidence based in order to experience the COVID-19 pandemic with a low level of fear as possible.^{15,30} The present findings of this study also urge especially western countries to conduct still more research concerning the psychological burden of their HPs. Existing literature is majorly consisting of studies from Southeast Asia and during the early, dramatic scenes of the pandemic. To meet the needs of the HPs, especially as soon as the situation worsens again or a much feared 'second wave' hits Europe, the mental health of HPs will have to be given high priority in supporting measures.³¹

Limitations of this study

Limitations need to be considered. Data were obtained via an anonymous online, self-reported questionnaire in a cross-sectional study design. A potential selection bias may exist. During the short survey period, a series of various governmental restrictions were put into place, which may represent different manifestations of psychological states at different points in time. Data were acquired during a rather early period of the outbreak, which poses the risk of an under- or even overestimation of psychological burden. On the other hand, this exceptional early assessment period might be a major strength of posed study—a thus large sample as the present on the beginning of the current outbreak is scarce and adds a piece to the COVID-19 puzzle in order to gain a clearer picture of the unprecedented COVID-19 pandemic.

Conclusion

In conclusion, HPs in Germany show less psychological burden compared with HPs in other countries and compared with the general population in Germany after the outbreak of COVID-19. In the investigated sample, nursing staff seems to be the most vulnerable group for mental health burden during the COVID-19 pandemic, whereas a high subjective level of information seems to be associated with less psychological burden.

Supplementary data

Supplementary data mentioned in the text are available to subscribers in *PUBMED* online.

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Declaration of competing interest

The authors declare that they have no competing interests.

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