Research Article

Prevalence of Burnout in Portuguese Public Health Medical Residents amid the Response to the COVID-19 Pandemic

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Keywords
Burnout · COVID-19 · SARS-CoV-2 · Public health · Medical residency

Abstract
Introduction: Burnout is a psychological syndrome characterized by a state of emotional exhaustion, depersonalization, and a lack of personal accomplishment at the workplace. We aimed to evaluate the prevalence of burnout among Portuguese Public Health Medical Residents during the SARS-CoV-2 virus pandemic. ***Methods:*** Burnout was assessed with the Maslach Burnout Inventory – Human Services Survey, using a zero (never) to six (always) ordinal scale. Sociodemographic and workplace setting data were also collected. Categorical variables were presented as frequencies and percentages, and continuous variables as means and standard deviations (SDs). Chi-squared and independent sample *t* tests were used to evaluate the distributions of these variables, with a *p* value of 0.05. ***Results:*** Eighty-three people participated. The average age was 30.46 (±3.91), and 57.8% were female. We found that 77.11% had high levels of emotional exhaustion, 61.4% had high levels of depersonalization, and 44.6% had low levels of personal accomplishment. 32.5% of the participants were ex-periencing burnout, 30.5% were at high risk, 25.3% were at moderate risk, and 12% were at low risk. Burned-out participants had higher levels of emotional exhaustion (40.63 ± 7.36; mean ± SD) and depersonalization (15.63 ± 5.94; mean ± SD), and lower levels of personal achievement (29.42 ± 7.30; mean ± SD) than their peers. Regarding sociodemographic and work setting-related data, no statistically significant differences were found between professionals with and with no burnout. ***Conclusion:*** The present study shows high scores on all components of burnout and its prevalence among the population studied. Further studies are needed to determine whether this phenomenon was specific to this period.

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Prevalência de burnout nos médicos internos de saúde pública Portugueses durante a resposta à pandemia de COVID-19

Palavras Chave
Burnout · COVID-19 · SARS-CoV-2 · Saúde pública · Internato médico

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Resumo

Introdução: O *burnout* é uma síndrome psicológica caracterizada por um estado de exaustão emocional, despersonalização e baixa realização profissional. Propusemo-nos aferir a prevalência de *burnout* nos médicos internos de Saúde Pública portugueses durante a pandemia de SARS-CoV-2. *Métodos:* Os níveis de *burnout* foram medidos pelo *Maslach Burnout Inventory – Human Services Survey*, usando uma escala ordinal de zero (nunca) a seis (sempre). Foram também recolhidos dados sociodemográficos. As variáveis categóricas foram apresentadas como frequências e percentagens, e as variáveis contínuas como médias e desvios-padrão. Foram feitos testes t para amostras independentes e qui-quadrado de *Pearson* para avaliar a distribuição destas variáveis, com um valor *p* de 0,05. *Resultados:* Oitenta e três pessoas participaram. A idade média foi 30,46 (±3,91) e 57,8% eram mulheres. 77,11% tinham níveis elevados de exaustão emocional, 61,4% níveis elevados de despersonalização, e 44,6% níveis baixos de realização profissional. 32,5% dos participantes sofriam de *burnout*, 30,5% apresentavam risco elevado, 25,3% risco moderado, e 12% risco baixo. Os participantes em *burnout* tinham níveis mais elevados de exaustão emocional (40,63 ± 7,36; média ± DP) e despersonalização (15,63 ± 5,94; média ± DP), e níveis mais baixos de realização profissional (29,42 ± 7,30; média ± DP). Não foram encontradas quaisquer diferenças estatisticamente significativas no que toca a fatores sociodemográficos e relacionados com o trabalho, nos profissionais com e sem *burnout*. *Discussão e Conclusão:* O presente estudo demonstra níveis elevados em todos os componentes do *burnout* e na sua prevalência na população estudada. São necessários mais estudos para aferir se este é um fenómeno específico do período estudado.

Introduction

The COVID-19 global pandemic caused by the virus SARS-CoV-2 has been ravaging the world since it was first identified in Hubei, China, in December 2019 [1]. Since then, it has, at the time of writing (December 2021), infected over 265 million people and caused more than 5.2 million deaths worldwide [2].

The virus can be transmitted directly in a person-to-person fashion through droplets or aerosols expelled by the infected person or indirectly through the contact of susceptible individuals with objects that have been con-taminated by those particles [3]. Thus, the context in which the contact occurs ends up being pivotal for the spreading capacity of the virus. Physical proximity, especially when under 1.5–2 m, is a preponderant factor for the transmission, as well as when it occurs in small, closed, and poorly ventilated spaces. The duration of the contact is another important factor. The longer the contact lasts, the higher the risk of transmission. Conversely, restricting the duration of contact between individuals, their occurrence in large, well-ventilated spaces, the maintenance of distances greater than 2 m, the promotion of mask usage, and frequent hand washing are associated with a mitigated spreading of the virus [4, 5].

From a public health perspective, interventions need to be focused on reducing factors known to be associated with higher virus transmission and promoting those that restrain it. Thus, it is of pivotal importance to have an epidemiological surveillance system in place, to perform epidemiological inquiries into all positive cases, isolate them, as well as identify and isolate their high-risk contacts [4]. Measures taken at the international and national levels, like travel restrictions and general lockdowns, also help curb virus spread. Furthermore, it has been shown that, as far as the impact of the pandemic on economies goes, countries with higher yearly investments in healthcare, of about 7.6% of GDP or about USD 2,300 per capita, have lower average COVID-19 fatality rates, allowing for a shorter duration of lockdowns, and consequently less GDP shrinkage [6, 7]. The countries that have had better performances in dealing with the pandemic as measured by indexes of resilience, preparedness, and prevention were also those with higher levels of health expenditures, averaging 8.6% of GDP, and higher indexes of public governance [8]. Alternatively, certain environmental factors, along with suboptimal investments in healthcare, have shown to be important contributing factors to COVID-19 morbidity and mortality. Cities with more than 100 days exceeding the limits set for PM_{10} or ozone, little wind, and lower average temperatures have seen a greater number of infected individuals and a higher death toll [9]. On the other hand, cities with lower exposure of the population to days exceeding safe levels of $PM_{2.5}$ have shown a lower average fatality rate [7].

The pandemic has exerted tremendous pressure on most countries' national health systems, and Portugal was no exception. With more than 1 million confirmed cases and over 18,000 reported deaths since the beginning of the pandemic [10], Portuguese healthcare professionals found themselves in a situation where they had to work extended shifts, with no weekend breaks or days off for

weeks on end, so the high demand of health services caused by the COVID-19 crisis could be met. This was also the case with Public Health Medical Residents (PHMR). According to the World Health Organization, burnout is a syndrome resulting from prolonged exposure to work-related stress and is mainly characterized by feelings of depletion or exhaustion, increased mental and emotional distance from one's job, feelings of negativism or cynicism related to one's job, and reduced professional efficacy. It refers specifically to phenomena in the occupational context [11]. A 2019 meta-analysis by Koutsimani et al. [12] states that, although burnout and depression are different constructs, they correlate by 0.75. Despite not being a recognized mental illness in the 5th edition of the Diagnostic Statistical Manual of Mental Disorders [13], burnout can affect the global health of the individual and be responsible for an increased demand for health services [11].

Burnout is a concept firstly described in 1974 by Freudenberger [14] as comprising a series of unspecified physical and psychological symptoms, produced by an excessive energy requirement at work, and usually occurring among professions involving a helping relationship. Burned-out individuals were described as beset by physical symptoms such as headache and daytime sleepiness, and as demonstrating irritability and a rigid thought pattern. Burned-out workers looked and acted as if they were depressed [14]. Maslach and Leiter [15] expanded the concept of burnout and redefined it as a crisis in relationships with work and not necessarily a crisis with work people. According to these authors, burnout is defined as a syndrome with three dimensions: emotional exhaustion (EE), depersonalization (DP), and a lack of personal accomplishment (PA) at the workplace, which arise when functional coping strategies fail [16].

According to Maslach et al. [17], the risk factors for burnout can be divided into 7 categories: workload, control, reward, community, fairness, values, and job-person incongruity [18, 19]. Workload pertains to the overload felt by professionals when job demands exceed human limits. This risk factor is more closely related to the exhaustion dimension [20, 21] that mediates the relationship between workload with DP and lack of PA [22, 23]. Overload contributes to exhaustion by depleting the capacity of people to meet the demands of the job and gets to a critical point when there is no opportunity to recover during restful periods at either work or home [24]. Conversely, a sustainable workload allows for the effective use and improvement of existing skills, and for the worker to become proficient in new areas of activity [25].

Lack of control in the work setting has also been linked to the development of burnout. Patient noncompliance, inability to manage scheduled work hours, and not being allowed to participate in organizational decisions are examples of lack of control in healthcare [26]. Another important factor in this realm is the lack of job resources, which has been found to contribute to workers' disengagement [22]. Role ambiguity and role conflicts are also associated with greater burnout, as well as the absence of direction in the workplace [17, 20]. Conversely, active participation in organizational decision-making, and clearly defined roles and expectations from organizational leadership are associated with better levels of efficacy and lower levels of exhaustion and burnout [27, 28].

Insufficient reward, be it financial, institutional, or social, when compared to expectations has been shown to increase people's vulnerability to burnout [29, 30]. Lack of recognition from service recipients, colleagues, managers, and external stakeholders undermines both the work and the workers, and is associated with feelings of inefficacy [17, 20]. On the other hand, when consistency between the person and the job in the reward dimension is present, the likelihood of there being intrinsic satisfaction is higher [31].

Community refers to the overall quality of social interactions at work, and this includes themes such as conflict, mutual support, closeness, and the ability to work as a team. Burnout is less likely to occur within a positive and supportive work environment [32].

Fairness is the extent to which decisions at work are regarded as being fair and equitable [18]. Employees who perceive their supervisors as being both fair and supportive are less susceptible to burnout and are more accepting of major organizational change [33].

Values refer to the emotional and cognitive power of job goals and expectations. They are the ideals and motivations that attracted people to their jobs and are the motivating connection between the worker and the workplace, going beyond the mere exchange of time for money [18]. Conflict in values is related to all three dimensions of burnout [34].

Lastly, job-person incongruity refers to the problematic relationship between the person and the environment, which is frequently referred to as imbalance, misalignment, or misfit. This incongruity can be observed when the demands of the job exceed the capacity of the individual to cope effectively, or the person's efforts are not reciprocated with equitable rewards [18]. According to Maslach and Leiter's [15] burnout model, the greater the perceived incongruity, or mismatch, between the per-

son and the job, the greater the likelihood of burnout. Conversely, the greater this congruity is, the greater the likelihood of engagement with work.

Burnout has been linked to a variety of consequences, either physical, psychological, or occupational. A 2017 meta-analysis of 36 articles by Salvagioni et al. [35] found that the burnout syndrome is associated with coronary heart disease [36] and hospitalization for cardiovascular diseases [37], and their risk factors such as obesity, hyperlipidemia, type 2 diabetes, large waist circumference, high body mass index, metabolic syndrome, hypertension, high triglycerides, low HDL cholesterol, high LDL cholesterol [38], and fasting hyperglycemia [39]. In terms of physical symptoms, it has also been associated with musculoskeletal pain [40], changes in pain experience [41], prolonged fatigue [42], gastrointestinal issues, respiratory problems [43], severe injuries [44], and increased mortality below 45 years of age [45].

Regarding psychological issues, burnout is associated with increased insomnia [46] and sleep disturbances [43] and is a predictor of depressive symptoms [47], higher risk of initiating antidepressant treatment among men [48], and hospital admissions due to mental disorders [37]. Burnout also affects the quality of work. EE and DP are predictors of job dissatisfaction [49], and burnout is associated with increased sickness absence days (21%) and sickness absence spells (9%) [50]. Burnout is also a risk factor for leaves due to musculoskeletal disorders, and disorders of the circulatory and respiratory systems [51]. It has been found to predict new disability pensions during a 4-year follow-up in a Finnish study [44].

During the pandemic, PHMR's main functions were, among other things, interviewing confirmed cases and collecting information on the clinical history and possible contacts, performing contact tracing, and classifying them as high-risk exposure (close) contacts or low-risk exposure contacts. This was made to test and quarantine those contacts at high risk of having contracted the virus and, hopefully, break the transmission chain of infection [52]. PHMR also had to manage outbreaks at institutions such as schools and long-term care facilities. The high demand for health services during the pandemic has increased the workload placed upon these professionals. Some of them had to work 12–16 h every day for several months, with virtually no time left for themselves or their families. The increasing wave of new COVID notifications might have left some of them with an acute sense of lack of control regarding the amount of work that would be expected of them on any given day, as well as the fact that their interventions seemed to have little or no impact

Table 1. Burnout dimensions and *cut-off* points of the *Maslach Burnout Inventory**

Levels	EE	DP	PA
High	≥25	≥10	≥40
Medium	15–24	4–9	33–39
Low	≤14	≤3	≤32

NB: The scores are obtained by adding the numbered results obtained on each question. * *Cut-off* points as defined in Benevides-Pereira, 2010, p. 282.

on the incidence of the disease – due to a lack of human resources, during high incidence periods most new cases and their contacts were isolated only several days after the onset of symptoms or diagnosis. This fact may also have led to an internal conflict of values, leading some of them to believe that part of that hard work was futile and to wonder whether, instead of merely acting by protocol, their time should be allocated to other tasks for better effectivity in dealing with the pandemic.

All these factors could have contributed to the emergence of burnout among PHMR, and, if that is the case, measures such as hiring more medical personnel or optimizing the process of epidemiological surveillance must be taken. These actions should mitigate the effects of burnout on these professionals and protect their mental health, as well as better prepare public health services to better deal with future pandemics. One must first assess, however, the levels of burnout in this population. With this study, thus, we aimed to evaluate the prevalence of burnout among PHMR.

Materials and Methods

Sample and Data
Public health doctors' interventions are usually of a populational scope, unlike other medical specialities, whose focus is the individual patient. These include population health status assessment, health planning and management for health promotion, protection, and disease prevention, health authority functions, and surveillance and monitoring of transmittable and nontransmittable diseases. During the pandemic, their main functions were team management, data collecting and processing, epidemiological surveillance, and isolation of COVID-19-positive cases and their contacts. Due to understaffing problems among Public Health Units, PHMRs have to take on most of these activities, with very little support from their superiors, who were also overwhelmed. All the Portuguese PHMRs (out of around 200) were invited to participate, and the Portuguese edition of the Maslach Burnout Inventory – Human Services Survey (MBI-HSS) was applied, from

Table 2. Mean, absolute, and relative frequencies obtained on the different dimensions of burnout

	EE		DP		PA	
Mean (±SD)	34.39	12.63	12.47	6.95	32.27	7.27
Mean (±SD) per question	3.82	0.58	2.49	0.89	4.03	0.74
	n	%	*n*	%	*n*	%
High	64	77.11	51	61.4	11	13.3
Medium	12	14.46	22	26.5	35	42.2
Low	7	8.43	10	12	37	44.6

SD, standard deviation.

March 25, 2021, to May 17, 2021. In terms of sociodemographic and workplace setting data, the participants were asked about their age, gender, marital status, the existence of dependent children, their workplace region (North, Centre, Lisbon and Tagus Valley, Alentejo, or Algarve), whether they had worked locally at the Public Health Unit of their primary healthcare clusters, or if they had been recruited to work at their Regional Health Departments or at the National Directorate-General of Health, where they would mainly serve functions regarding data processing, publication, and communication. We also asked whether the residents had worked at the office in the Public Health Units, or Regional and/or National Departments, or if they had worked from home (the National Epidemiological Surveillance System is one hundred per cent computerized and can be accessed anywhere on the Internet via authentication). Lastly, the participants were inquired about the periods of the pandemic peaks of COVID-19 incidence that had happened to date during which they had worked: the 1st peak in March/April 2020, the 2nd peak in October/November 2020, and/or the 3rd peak, during January/February 2021. Due to the small size of our sample and privacy concerns, we did not ask about the residents' year of residency.

A total of 83 PHMRs participated. The majority were female (57.8%), had an average age of 30.46 (±3.91) years, and 66.3% were single. Most of the participants worked in the northern region (47%), at the local level (90.4%), and at the office (75.9%).

Informed consent was obtained by the Helsinki Declaration, and the data were anonymized via the *Microsoft Forms®* software. The confidentiality and anonymity of the participants were preserved.

Measures of Variables

The Portuguese version [53] of the MBI-HSS [17] – a burnout psychological assessment instrument that has been used in over 95% of research regarding this syndrome [54] – was used in our study. This version of the MBI-HSS includes 22 ordinal items reflecting three dimensions of burnout: EE, DP, and lack of PA. A seven-point ordinal response format was used, ranging from "0 – never" to "6 – everyday." The points obtained on each question are added to obtain the final score on each dimension. Cronbach's alpha coefficients obtained in the original study were 0.90 for EE, 0.79 for DP, and 0.71 for PA [17]. Cronbach's alpha coefficients obtained with our sample were 0.843 for EE, 0.755 for DP, and 0.761 for PA.

A person is said to be experiencing burnout if they simultaneously present high levels for the dimensions of EE and DP and low

levels for the PA dimension [55]. Regarding the cut-off points, we applied those suggested by Benevides-Pereira, 2008 [56] (Table 1), also used in other studies with Portuguese health professionals [57], which are considered a valid alternative in countries with no validated cut-off points to extrapolate burnout levels from the frequency of symptoms (Table 1).

Models and Data Analysis Procedure

The collected data were processed using *Microsoft Office Excel® 2017* and *Statistical Package for Social Sciences (SPSS®), version 17.0*. Categorical variables were presented as frequencies and percentages, and continuous variables as means and standard deviation (SD) for variables with skewed distributions. Pearson's χ^2 and independent samples *t* tests were used to evaluate the distributions of categorical and continuous variables, respectively, between the burnout and nonburnout groups, with a *p* value of 0.05 indicating statistical significance.

Results

We considered high levels of EE and DP, and low levels of PA [56] (≥25 on EE, ≥10 on DP, and ≤32 on PA) as being altered levels of these dimensions [58]. The maximum score for EE, DP, and PA is, respectively, 54, 30, and 48. Using the cut-off criteria defined by Benevides-Pereira [56] (see Table 1), we found that 77.11% of the participants had high levels of EE, 61.4% had high levels of DP, and 44.6% had low levels of PA (Table 2). The mean for the EE dimension was 34.39, with an SD of 12.63, the mean for the DP dimension was 12.47, with an SD of 6.95, and the mean for the PA dimension was 32.27, with an SD of 7.27. All these results can be consulted in Table 2.

In what concerns burnout as a multidimensional construct it was defined, following Ebisui [58], as affecting an individual who was experiencing three altered dimensions. High risk for burnout was considered if the individual had two altered dimensions, moderate risk if they had one altered dimension, and low risk if they had no

Table 3. Participants and the risk of burnout

	Burnout	
	n	%
Low risk	10	12
Moderate risk	21	25.3
High risk	25	30.1
Burnout	27	32.5

Table 4. Differences in the burnout dimension scores between participants with and with no burnout

	Burnout			
	no		yes	
	n = 31; 37.35%		n = 52; 62.65%	
	mean	SD	mean	SD
EE	23.90	12.76	40.63	7.36
DP	7.16	5.07	15.63	5.94
PA	37.03	4.05	29.42	7.30

altered dimensions. Twenty-seven of the participants had altered levels in all three dimensions, twenty-five of them had altered levels in two dimensions, twenty-one had one altered dimension, and ten had no altered dimensions. Thus, 32.5% of the participants were burned out, 30.1% were at a high risk of developing burnout, 25.3% were at moderate risk, and 12% were at low risk (Table 3).

Following Pereira et al. [57], all burned-out professionals as well as those who had a high risk for developing this syndrome were considered to be experiencing burnout. Thus, comparing the participants with and with no burnout (Table 4), it was found that the professionals who were experiencing burnout (fifty-two of them, resulting from the addition of the twenty-seven that were burned out and the twenty-five that were at high risk) had high levels of EE (40.63 ± 7.36; mean ± SD) when compared to their not burned-out peers. Concerning the dimension of DP, the professionals who were experiencing burnout also showed high levels (15.63 ± 5.94; mean ± SD) when compared to professionals who were not experiencing burnout, whose levels of DP were moderate (7.16 ± 5.07; mean ± SD). Finally, it was found that professionals who were experiencing burnout had low levels of PA (29.42 ± 7.30; mean ± SD) (Table 4).

An independent sample t test ($\alpha = 0.05$) was performed for age, and Pearson's χ^2 analyses were performed for the rest of the sociodemographic and work-related variables, to evaluate whether there was an association between them and the existence of burnout. No significant differences, however, were found. Thus, further analyses were deemed unnecessary (Table 5).

Discussion

The COVID-19 pandemic has brought a very high workload on the Portuguese PHMR. Hence, not surprisingly, the present study shows extreme levels on all the three components of burnout, as well as a high prevalence of the syndrome among this population.

The awareness these professionals have toward the issue of mental health, along with the proximity to the researchers – fellow residents – might explain the high response rate (about 42% of the total universe of Portuguese PHMR answered the questionnaire), when compared with similar studies on the same topic (24% on Lancee et al. [59] and 39% on Manzano García et al. [60], for instance). There may be, however, a selection bias, as we do not know the participants' mental illness backgrounds. Respondents in a worse mental health state may have been more motivated to participate in the study. Conversely, the exact opposite can be true, as some of those who are already experiencing burnout may not have had the willpower to share their experience.

Another factor of note was the scores themselves, which seem to be exceptionally high. When looking at other studies on the same topic, we get confronted with much lower scores. Silva et al. [61] found in their sample that a mere 7% of participants showed high levels of EE, and a 2017 review of 1,406 health professionals by Parola et al. [16] found that 17.3% of them were experiencing burnout. A 2016 study by Marôco et al. [62] done on Portuguese nurses and doctors found higher values, with 43.6% of participants suffering from burnout, which, while expressive, is still far from the 62.6% obtained in the present study. However, when focusing our attention on similar studies done during the COVID-19 pandemic, we find results more on par with the ones obtained in the present study. A 2020 review by Amanullah and Ramesh Shankar. [63] reports that Giusti et al. [64], who surveyed 330 health professionals working in a health institution in Northern Italy using the MBI-HSS, found that more than two-thirds of participants had reported moderate to severe levels of EE and reduced PA, and more than a quarter of the sample reported moderate to severe levels of DP. These findings were corroborated by Dimitriu et al. [65],

Table 5. Sociodemographic data and risk factors

	Burnout							p value
	total		no		yes			
	n = 83		n = 31		n = 52			
Age (mean ± SD)	30.46	3.91	30.84	4.68	30.23	3.4		0.50
	n	%	n	%	n	%		
Gender								
Male	34	41.0	14	45.2	20	38.5		
Female	48	57.8	17	54.8	31	59.6		0.77
Rather not say	1	1.2	0	0	1	1.9		
Marital status								
Married or in a civil partnership	27	32.5	13	41.9	14	26.9		
Single	55	66.3	18	58.1	37	71.2		0.18
Unknown	1	1.2	0	0	1	1.9		
Dependent children								
No	70	84.3	26	83.9	44	84.6		
Yes	12	14.5	5	16.1	7	13.5		0.76
Rather not say	1	1.2			1	1.9		
Workplace region								
ARS Norte	39	47.0	16	51.6	23	44.2		
ARS Centro	19	22.9	7	22.6	12	23.1		
ARS LVT	18	21.7	6	19.4	12	23.1		0.43
ARS Alentejo	4	4.8	0	0.0	4	7.7		
ARS Algarve	3	3.6	2	6.5	1	1.9		
Work level								
Local	75	90.4	27	87.1	48	92.3		0.72
Regional/national	8	9.6	4	12.9	4	7.7		
Work type								
At the office	63	75.9	26	83.9	37	71.2		0.27
From home/mixed	20	24.1	5	16.1	15	28.8		
Number of periods worked								
1	26	31.3	10	32.3	16	30.8		
2	36	43.4	14	45.2	22	42.3		0.88
3	21	25.3	7	22.6	14	26.9		

who, using the Maslach Burnout Inventory – Medical Personnel, surveyed 100 medical residents and, on average, 76% of the sample reported burnout. The authors also noted that this level of burnout was "superior to studies conducted in normal periods" [65].

As to what the sociodemographic data are concerned, the absence of any statistically significant differences among the different tiers can be an indicator of a de facto poor influence of these factors on such syndrome or, simply, that a sample of 83 individuals is of an insufficient size for it to be possible to detect how these data can be associated, as either risk or protective factors, with the burnout syndrome. A major limitation that this study has, however, has to do with the fact that no information was gathered regarding the characteristics of the work each PHMR had to do, and the conditions they had to work in. There is also no information regarding each participant's mental health background, specifically on what concerns burnout syndrome. Therefore, to be able to design effective interventions to mitigate the burden this syndrome has, further studies need to address these two issues.

These results are, nevertheless, congruent with the increased workload that fell upon the PHMR during the pandemic, with little to no time left for adequate resting and other extra-work activities. The rising wave of new cases, despite the professionals' best efforts, might have led to a sense of lack of control in the workplace, as well as frustration for knowing one was struggling against the tide. The lack of sufficient resources in the work setting

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could have exacerbated these feelings, contributing to disengagement, and aggravating the risk of burnout. This study suggests, therefore, that there is an urgent need for the reinforcement of Public Health Units' resources, especially through the recruitment of more personnel. This way the workload in future pandemic situations can be mitigated and better managed.

Conclusion

The present study shows strong indicators that a considerable portion of the Portuguese PHMR exhibited high risk or was, indeed, experiencing burnout syndrome during the months of the COVID-19 pandemic. The study has, however, limitations. Further studies should be done to determine whether this phenomenon was specific to this period or if similar findings would come up during more normal times. The characteristics of the work and its conditions should also be assessed, so better clues for effective interventions may be obtained. A greater sample might also have shed light on putative protective and risk factors for burnout syndrome among this population.

Although some sociodemographic and work-related data were collected, several other putative preponderant factors were left out of the analysis, which could have contributed to a better more comprehensive approach to the problem. Further studies should also assess factors such as the ratio of professionals (doctors, nurses, environmental health technicians, and so on) per thousand people served by the local healthcare cluster the PHMR is working at, how the PHMR had felt their work demands had changed and how they felt it had influenced their health, and whether they felt they had sufficient material and human resources to meet the demands.

Overall, however, this study suggests that the Portuguese Public Health infrastructure is not adequately prepared to sustain the strain a global pandemic such as the SARS-CoV-2 imposes. We are dealing with cyclical events which are bound to be repeated. The information systems in existence proved insufficient to deal with the overflow of data and had to be optimized as the pandemic was progressing. This issue, therefore, should be addressed. The existent contingency plans also turned out to be inadequate to curb the impact of the crisis. Better contingency plans, which contemplate the creation of emergency teams of professionals (such as the military) that could be called upon when necessary and plans to better and more effectively communicate with the population should therefore be created.

Statement of Ethics

Participants informed written consent was obtained by the World Medical Association Declaration of Helsinki, before the participation in the study. The collected data were anonymized using the *Microsoft Forms*® software, and care was taken to exclude people whose geodemographic data might have allowed their identification among the participants. Those people were identified before answering the questionnaire and were not allowed to follow through. Confidentiality of the data and the anonymity of the participants were preserved.

Conflict of Interest Statement

The authors report no kind of conflict of interest.

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Author Contributions

Diogo Sampaio Viana researched the subject, wrote the informed consent document, embedded it into *Microsoft Forms*® as well as the Portuguese version of the MBI-HSS and the sociodemographic questionnaire, shared the questionnaire with the potential participants, collected and organized data, wrote the Abstract and Introduction, co-wrote the Discussion and Conclusion, wrote and edited the paper's document, and reviewed other people's parts. Paula Teixeira: data analysis, wrote Methods and Results, and reviewed the document. Eduarda Ferreira: co-wrote the Discussion and Conclusion, and reviewed the document.

Data Availability Statement

All data generated or analyzed during this study are included in this article. Further inquiries can be directed to the corresponding author.

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