

RESEARCH ARTICLE

Assessment of Burnout Levels Before and During COVID-19 Pandemic: A Web-Based Survey by the (Italian) Association of Medical Endocrinologists (AME)

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Abstract: Background: Some endocrinologists were involved in the management of patients with suspected or confirmed COVID-19 during the first wave of the pandemic. This study aims to analyze burnout levels among the Association of Medical Endocrinologists (AME) members before and during the pandemic.

Methods: We recruited two AME members samples at two different times: before COVID-19 ($n = 811$) and during the first wave of the ongoing pandemic ($n = 579$). Both the samples filled the Maslach Burnout Inventory. We performed MANOVAs to evaluate demographic and COVID-19 related differences in burnout levels and Pearson's Chi-square test to compare burnout severity before and during the pandemic.

Results: Women reported higher Emotional Exhaustion and reduced Professional Accomplishment than men. The oldest physicians had lower levels of Emotional Exhaustion and Depersonalization and higher Professional Accomplishment than younger workers. Independent contractors displayed lower levels of burnout compared to established contractors. Finally, the pandemic, *per se*, did not lead to changes in burnout levels.

Discussion: Women and young physicians are at higher risk of burnout. It is also possible that front-line professionals are at higher risk during a health care crisis. Moreover, it is likely that the length of exposure to the pandemic has not been sufficient to impact burnout levels.

Conclusion: Short-term exposure to pandemic-related activities seemed to have a low impact on burnout severity, except for physicians directly involved in managing COVID-19 cases. It is strongly recommended the availability of psychological support in public hospitals.

Keywords: Burnout, COVID 19, emotional exhaustion, depersonalization, personal realization, accomplishment, endocrinologists.

1. INTRODUCTION

Burnout (BO) is classically defined as a “pathological outcome of a stressful process that affects health care

providers in case they do not respond adequately to the excessive stress loads that their work leads them to take on” [1]. The deterioration in the emotions associated with work is greater if there is a discrepancy between the nature of the work and the people who carry it out [2]. In this sense, BO becomes a stress syndrome no longer exclusive to the aid professions but likely present in any working environment. The international scientific literature has increasingly been paying attention to this problem [3]. By September 2020, typing “Burnout” into the main search engines (Medline, Pubmed, Psychinfo) resulted in about 77,000 entries in peer-

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reviewed journals and 145,000 online resources. The particular attention to this issue is justified because BO is associated with increased probabilities of inaccuracies. Many studies correlate BO severity in health care professionals to medical errors [4] and adverse patients' health outcomes [5]. However, the consequences of BO are not only harmful to patients' health, but also for health care professionals who suffer from elevated stress such that are at higher risk for depression, drop out, suicidal ideation, and higher suicide rate compared to the general population in both men (RR=3.4) and women (RR=5.7) [6-8]. Indeed, the health care professional who made mistakes during patient management is the "second victim" of BO. Feelings of guilt, inadequacy, incompetence, and negligence inexorably undermine the sense of empowerment and self-confidence in personal abilities [9]. Therefore, BO is a challenge for health care systems, especially considering its widespread diffusion among physicians.

According to Maslach, BO can be defined as a "psychological syndrome, articulated in three subparts (Emotional Exhaustion, Depersonalization, Reduced Personal Realization), in response to chronic interpersonal stressors at work" [10]. The first BO measure that relied on a comprehensive psychometric research program was the Maslach Burnout Inventory (MBI) [11, 12].

Health policy objectives must be set up worldwide in order to face BO risk. Health organizations, therefore, should be encouraged to invest resources to improve health care workers' well-being, particularly for early-career individuals. Young professionals, especially women, are at the highest risk of developing the BO syndrome due to their greater family involvement. It is necessary, therefore, to monitor BO outcomes within the health care system [13].

1.1. Burnout in the Time of Coronavirus Disease 2019 (COVID-19)

Stressful events usually induce people to be resilient in order not to succumb, or they can even find new strengths to react positively. However, in the minority of cases, people may experience negative feelings. Thus, BO levels could increase when health care personnel were involved in health crises and emergency states, precisely due to extreme workload and negative emotions. Therefore, the recent outbreak of COVID-19 could have increased psychological stress [14] and induced, in some individuals, symptoms of post-traumatic stress disorder, anxiety, depression, insomnia, and substance use disorders [15]. In a Chinese cross-sectional study on 1257 health care workers from 34 hospitals equipped with fever clinics or wards to assist patients with COVID-19, a considerable proportion of the personnel reported symptoms of depression, anxiety, insomnia, and psychophysical distress. Notably, women, nurses, personnel working in Wuhan, and health care workers directly involved in the care of patients with suspected or confirmed COVID-19 reported high levels of distress [16]. According to the recently published Chinese survey results, the prevalence of anxiety, irritability, depression, and sleep disorders

(mainly insomnia) were increased during the pandemic. Frontline medical staff, persons living in Hubei province, those who had close contact with a confirmed case of COVID-19, and those aged 35 – 49 years were at high risk of symptoms [17, 18]. An Italian online survey from Lombardy reported a high level of work-related psychological stress after five weeks from the beginning of the COVID-19 pandemic and emotional burnout among 1,153 health care professionals [19]. Similar data have been observed among Italian General Practitioners who experienced difficulty in managing work-overload [20].

Social isolation was found to increase the risk of living with anxiety [21], especially among physically or financially unstable people [22]. These findings may be the results of an overload of several sources of stress listed in Table 1. Moreover, some health care professionals had been shifted to other duties different from those they were familiar with, with a relevant increase in workload [23]. This condition is stressful *per se* since it requires good compliance for better fitting with a novel clinical experience. On the other hand, health care professionals are also exposed to stressful agents similar to the general population due to social distancing and quarantine, concerns of financial loss, and fear of losing the job shortly (especially for those without a stable work contract). Last, acute stress may induce significant endocrine and immune system changes. These alterations have been reviewed more in detail elsewhere and include alteration in natural killer cells number and activity, level of systemic inflammation and cytokines [24]. Despite some findings confirm possible immune dysfunction in people with BO, the main studies about the issue lead to non-homogeneous results. Clinical risks related to infectious diseases in this group of patients should be quantified more in detail [24].

1.2. COVID-19 Pandemic Impact Among Endocrinologists

Several concerns are of interest to endocrinologists during the pandemic. First, the prognosis of COVID-19 may be worsened by underlying endocrine and metabolic diseases, especially in patients whose disease is poorly controlled [25-27]. Besides, the management of endocrine and metabolic diseases has become complicated due to the Authority's initiatives to tackle the spread of COVID-19 (lockdown, social distancing, reduced access to public services, including health facilities). Therefore, it is expected that disease control may deteriorate over time with possibly burdens for public health. Finally, concerns have been raised about the interference of medications with the clinical evolution of the disease. The European Society of Endocrinology published recommendations about managing people with diabetes who had COVID-19 and suggested paying attention to obesity, adrenal insufficiency and undernourishment. They also provided a practical set of "ten commandments" for the self-protection of those endocrinologists involved in the COVID-19 pandemic [28]. According to the Italian experience, many endocrinologists were asked to directly manage patients with suspected or confirmed COVID-19, leading to concerns for themselves and others [29]. Conversely, those

Table 1. Summary of stressors expected to increase the severity of BO and their related consequences among health care professional [63-66].

Sources of Stressors	Clinical Consequences
Scarce knowledge about the disease	Fear of inadequacy to deal with pandemic issue
Apprehension for shortage of personal protective devices	Anxiety and sleep disturbance
Risk of transmit the disease to others (family and work)	Depressive mood
Apprehension for severe shortages of resources (diagnostic and therapeutic)	Compulsion to acquire novel information
Concerns about how protect patients and colleagues	
Poor communication from supervisor	
Need of effective strategies for screen and isolate infected patients	
Unexpected shift to other working roles and need to acquire novel duties	
Increased workload at work and at home	
Social isolation and quarantine in case of suspected or confirmed cases	
Financial loss and concerns for future	

engaged in managing outpatients, as an example through telemedicine (emergency phone calls, social media messaging, teleconsulting), were faced with a novel and more technological approach, challenging especially those with poor technological skills.

1.3. Aim of the Study

The (Italian) Association of Medical Endocrinologists (AME) for Sustainable Medicine Study Group promoted an online survey to estimate the prevalence and severity of BO among its members for the specific purpose of stemming the phenomenon in the last months of 2019. Since the data extraction and analysis of results occurred in concomitance with the beginning of the first phase of the COVID-19 pandemic, the authors unexpectedly had a chance to analyze the situation during the first pandemic phase. For this purpose, each member of the AME was invited to respond to a second online survey spontaneously. The latter data were finally extracted, analyzed, and compared to the previous results.

1.4. Working Hypothesis

Among physicians, the prevalence and severity of BO during the first wave of the ongoing pandemic are currently under investigation. The pandemic should be considered an extraordinary event with a worldwide resonance that induces both emotional and works overload among health care professions due to several factors (Table 1). Despite this assumption, BO should be considered as a specific syndrome differing from stress. BO is not a consequence or reaction to either tension or dissatisfaction but includes symptoms related to interpersonal relationships that have been chronically created in helping relationships, such as detachment from patients. Thus, it is hypothesized that stress levels certainly increase during the pandemic, but BO does not [16].

Nevertheless, health care professionals directly involved in COVID-related clinical activities (including physicians) are expected to report higher BO levels than colleagues who are not engaged in those activities. On the contrary, coping strategies could play a positive role [30].

Finally, several variables are expected to influence levels of BO. In general, women may have been more likely to

exhibit BO symptoms than men [31], and this gender difference could be maintained or emphasized during the pandemic too. Several other variables have been hypothesized to influence BO levels in studied physicians, including place of residence and work, especially concerning different epidemiological impacts among Italian regions, type of employment contracts, family characteristics, and more.

2. MATERIALS AND METHODS

2.1. Participants

Participants were recruited and allocated in two samples of AME members, mainly Endocrinologists, at two different times: before COVID-19 (pre-COVID), specifically from September 9 to October 10, 2019 ($n = 811$), and during the first wave of the current pandemic (during-COVID), from the May 1 to 31, 2020 ($n = 579$). All participants were asked to fill in a simple questionnaire exploring a wide range of information regarding their age, sex, type of employment contract, types of activities, place of residence. The first sample was made up mainly of females (61%), working in hospitals (38.1%), as independent contractors (25%), or in a private clinic (24.5%). Most of them had a permanent contract (54.1%), while a few had a fixed-term contract (6.8%), scholarship (6.8%), or no specific contract (1.2%). Only a minority of participants (3.5%) stated having another type of contract not listed among the options (usually an agreement with the National Health Care System).

The geographical distribution was as follows: North Italy (43.4%), Central Italy (27.4%), and South Italy (27.3%). Finally, 87.2% of participants were between 31 and 65 years, 12.1% were over 65, and 5.7% less than 31.

The second sample - for whom we gathered more detailed demographic information - included some participants (37.5%) who stated that they had previously replied to the pre-COVID survey. In this second sample, participants' ages were 21-82 years (mean 53.24 ± 12.09), mostly women (57.3%). The majority were married (67.7%); 10.7% were not married or engaged, with 10% co-habitants; 4.5% divorced, 3.7% engaged, and 1.2% widowed. Twenty-seven

percent of participants had no children, 21.6% had one child, and 49.4% had more than one child. Geographical distribution was as follows: North Italy (39.9%), Central Italy (25.7%), and South Italy (31.4%). Most (80.6%) were endocrinologists, diabetologists, or andrologists; the remaining had other kinds of specialization (10.6%), worked in General Internal Medicine (4.3%), or had no specialization (1.0%); this information was missing in 3.5% of participants. Most had a permanent contract (47.2%), while the others were independent contractors working in private (17.1%) and public clinics (13.6%). Finally, a few colleagues had a fixed-term contract (3.5%), a scholarship (4.1%), or other unspecified contracts (10.4%).

2.2. Materials

Participants were asked to fill out the Maslach Burnout Inventory [32] in its Italian version [33]. The MBI is a 22-items self-administered, anonymous, rapid-scale questionnaire, and it allows a quantitative translation of the phenomenon concerning the type of work and individuals' characteristics. The purpose of this questionnaire is to analyze how health care professionals see their work and the people with whom they are most in contact. The 22 items allow to measure, on a scale from 1 to 6 points, the following elements, indicated as sub-dimensions of BO: 1) Emotional Exhaustion (9 items) – it consists of the feeling of being emotionally emptied and alienated from own's work, as the result of an emotional “drying up” relationships with others; 2) Depersonalization (5 items) – it manifests itself as an attitude of removal and rejection towards those who require or receive professional service or care; 3) Reduced Personal Realization (8 items) – it is about the perception of one's inadequacy at work, reduction in self-esteem and the feeling of failure in the working setting.

The participants answered each item using a Likert scale ranging between 0 (*Never*) and 6 (*Every Day*). Based on the cut-off suggested by Sirigatti and Stefanile [34], it was possible to distinguish between Italian health professionals with high, average, and low levels of BO. In the present sample ($n = 1390$), the internal consistency reliability is good for all the scales: Emotional Exhaustion, $\alpha = .92$; Depersonalization, $\alpha = .72$; Personal Accomplishment, $\alpha = .80$.

2.3. Procedures

A web-based survey constructed with Lime-Survey, an open-access platform that provides various question templates, was used. Invitations were sent by e-mail to all participants (about 2,000 AME members, mainly endocrinologists or with other specialties, in any case, involved and interested in the field of Endocrinology), including adequate and easy-to-understand instructions for correctly completing the questionnaire, with weekly reminders to non-respondents. Survey responses were collected and electronically stored by the survey service, where they were accessible by inserting the personal password. The survey service automatically blocked repeat submissions from the same IP address. The internal ethics committee approved these AME surveys, and each participant gave consent before starting those.

2.4. Data Analysis

We conducted the analyses using the statistical software SPSS.25.

Five MANOVAs analyzing BO severity differences concerning age, gender, type of work activity, type of contract, and place of living were performed on the pre-COVID group ($n = 811$). On the second sample (during-COVID, $n = 579$), the authors performed six MANOVAs testing BO differences about age, gender, type of work activity, type of contract, and living place (as for the previous sample), as well as having or not having children. Pearson's correlations between BO and age were also evaluated, and the levels of BO in pre-COVID and during-COVID groups were compared using MANOVA. Finally, a Pearson's *Chi-square* test was used to assess a statistically significant difference in the prevalence of high, moderate, and low BO levels between the two groups.

Among personnel who worked in the so-called COVID-19 hospitals or departments, an additional 10 MANOVAs were performed to assess the impact on BO severity of having lost a family member, friend, or colleague due to COVID-19, and of having appropriate Personal Safety Devices at work.

Since in the second sample (that is, the one gathered during the COVID-19 pandemic) we performed many comparisons (16), we adjusted the *alpha* level through a Bonferroni correction for multiple comparisons. Hence, we set an adjusted alpha level of .003 [35]. For the first sample, a standard alpha value of .05 was used instead, as we performed only five comparisons. For all the MANOVAs, a Bonferroni post-hoc test was performed when the independent variables were more than two groups.

3. RESULTS

3.1. Burnout Severity in the Pre-COVID Group

First, we conducted five MANOVAs with the three MBI scales (*i.e.*, Emotional Exhaustion, Depersonalization, and Professional Accomplishment) as dependent variables to test if there were differences in BO severity in relation to gender, age, type of work, type of contract, and place of living in the first sample (pre-COVID, $n=811$). Regarding gender, the multivariate tests showed an overall statistically significant effect [$F(3,677) = 4.97, p = .002$, partial $\eta^2 = .02$]. More specifically, follow-up ANOVAs showed a statistically significant difference on Emotional Exhaustion ($p = .004$) between males ($M = 17.37, SD = 11.80$) and females ($M = 20.10, SD = 11.89$): $F(1,679) = 8.41$, partial $\eta^2 = .01$. Moreover, there was a marginally statistically significant difference ($p = .051$) between males ($M = 40.16, SD = 6.88$) and females ($M = 39.09, SD = 6.96$) on Professional Accomplishment: $F(1,679) = 3.83$, partial $\eta^2 = .006$. Thus, females reported higher Emotional Exhaustion and lower Professional Accomplishment than males. There was not a difference on Depersonalization.

The authors coded the ages of participants into the following categories: 31-35, 36-40, 41-45, 46-50, 51-55, 56-60,

61-65, over 65. The multivariate tests showed a statistically significant effect for age, $F(21,1858.39) = 3.79, p < .001$, partial $\eta^2 = .04$; follow-up ANOVAs showed a statistically significant difference on all the BO scales: Emotional Exhaustion, Depersonalization, Professional Accomplishment (Table 2). Bonferroni post-hoc test showed that physicians who were over 65 had statistically significant lower levels of Emotional Exhaustion than all the other age groups, with $p < .001$, except for the group 46-50 ($p = .05$) and the groups 41-45 and 61-65 ($p = .001$). Moreover, the over 65 years group also had lower Depersonalization levels than all the other age groups except for 46-50. The p values were: $< .001$ for the 31-35 and 36-40 groups; $.001$ for the 41-45 group; $.005$ for 51-55 years; $.013$ for 56-60 years; and $.002$ for the 61-65 group. Finally, the over 65 years groups had higher Professional Accomplishment than the 31-35 group ($p < .001$). The 31-35 group had lower Professional Accomplishment than the 56-60 group ($p = .035$).

With regard to the type of work (*i.e.*, private clinic, independent contractor, hospital physicians, other medical activities), the multivariate tests showed a statistically significant effect: $F(6, 1216) = 10.05, p < .001$, partial $\eta^2 = .05$. More specifically, follow-up ANOVAs showed a statistically significant difference on all the three MBI scales: Emotional Exhaustion, $F(2,610) = 25.72, p < .001$, partial $\eta^2 = .08$; Depersonalization: $F(2,610) = 17.02, p < .001$, partial $\eta^2 = .05$; Professional Accomplishment: $F(2,610) = 9.36, p = .001$, partial $\eta^2 = .03$. Independent contractors had lower levels of Emotional Exhaustion ($M = 13.84, SD = 9.86$) than those who worked in private clinics ($M = 20.42, SD = 9.86; p < .001$), in hospitals ($M = 21.36, SD = 11.94; p < .001$), or were engaged with other medical activities ($M = 20.96, SD = 13.49; p = .013$). Also, contractors had lower levels of Depersonalization ($M = 3.43, SD = 3.93$) than those who worked in private clinics ($M = 5.53, SD = 4.81; p < .001$) and in hospitals ($M = 5.99, SD = 5.02; p < .001$), as well as higher Professional Accomplishment ($M = 41.28, SD = 6.03$) than colleagues who operated in hospitals ($M = 38.43, SD = 7.29; p < .001$). Independent contractors were found to be a type of workers who experienced lower severity of BO.

Regarding the type of contract (*i.e.*, permanent contract, fixed-term contract, scholarship), the multivariate test showed a statistically significant effect: $F(6,920) = 4.21, p < .001$, partial $\eta^2 = .03$. More specifically, follow-up ANOVAs showed statistically significant differences on Depersonalization [$F(2,462) = 5.79, p = .003$, partial $\eta^2 = .02$] and Professional Accomplishment [$F(2,462) = 7.55, p = .001$, partial $\eta^2 = .03$]. Physicians with a permanent contract had lower levels of Depersonalization ($M = 5.55, SD = 4.77; p = .002$) and higher Professional Accomplishment ($M = 39.18, SD = 7.62; p < .001$) than those with a scholarship, whose mean scores on these scales, respectively, were $M = 8.13 \pm 5.94$ and $M = 34.93 \pm 7.62$.

Finally, considering place of living (North, Central, South Italy), the multivariate test showed a statistically significant effect: $F(6, 1352) = 2.46, p = .023$, partial $\eta^2 = .01$.

However, follow-up ANOVAs showed a statistically significant difference only on Professional Accomplishment: $F(2,678) = 5.08, p = .006$, partial $\eta^2 = .02$. More specifically, Professional Accomplishment in South Italy is higher ($M = 40.83, SD = 5.80$) than in both North ($M = 39.22, SD = 6.97; p = .038$) and Central ($M = 38.66, SD = 7.71; p = .007$) Italy.

3.2. Burnout Severity in the During-COVID Group

The BO levels regarding gender, age, type of work, type of contract, and living place were also assessed in this second group ($n = 579$).

For gender, the multivariate test demonstrated a statistically significant effect [$F(3,501) = 4.97, p < .001$, partial $\eta^2 = .06$]. More specifically, follow-up ANOVAs showed statistically significant differences on Emotional Exhaustion [$F(1,503) = 13.67, p < .001$, partial $\eta^2 = .03$] and Professional Accomplishment [$F(1,503) = 5.46, p = .02$, partial $\eta^2 = .01$] between males and females. Females had higher Emotional Exhaustion ($M = 21.84, SD = 13.25$) and lower Professional Accomplishment ($M = 39.32, SD = 7.02$) than males, whose mean scores were respectively 17.48 ± 12.88 and 40.74 ± 6.44 .

Concerning age, applying the same coding for the first sample's age ranges, the multivariate test showed a statistically significant effect, $F(21,1370.237) = 4.11, p < .001$, partial $\eta^2 = .06$. Moreover, follow-up ANOVAs showed statistically significant differences in all BO scales: Emotional Exhaustion, Depersonalization, and Professional Accomplishment (see Table 2). Bonferroni's posthoc test showed that physicians older than 65 have statistically significantly lower Emotional Exhaustion levels than the other age groups. The p values were $< .001$ for all the age groups, except for 31-35 ($p = .016$), 41-45 ($p = .001$), and 61-65 ($p = .003$). Physicians over 65 years had lower levels of Depersonalization compared to almost all the other age groups, as follows: 31-35 ($p = .019$), 36-40 ($p = .009$), 41-45 ($p = .002$), and 51-55 ($p = .010$). At the same time, physicians over 65 years had higher Professional Accomplishment than observed among the youngest (31-35, $p = .006$). Also, those aged 61-65 had higher Professional Accomplishment than younger participants and more specifically compared to the 31-35 ($p = .001$) and 36-40 ($p = .011$) years old.

In line with these results, Pearson's correlation showed that there were negative correlations between age and severity of both Emotional Exhaustion ($r = -.14, p = .002$) and Depersonalization ($r = -.19, p < .001$). Conversely, a positive correlation between age and Professional Accomplishment was also found ($r = .27, p < .001$).

For the type of work (*e.g.*, independent contractor, general practitioners, hospital physician who worked in the so-called COVID hospitals or departments, hospital-physician who worked in the so-called COVID-free departments), the multivariate test showed a statistically significant effect: $F(9, 985.814) = 5.34, p < .001$, partial $\eta^2 = .04$. More specifically, follow-up ANOVAs showed statistically significant

Table 2. Descriptive statistics and ANOVA results for burnout levels by age for the pre-COVID and during-COVID samples.

Burnout Variable	Age	Time	n	M(SD)	F	df	p	Partial η^2
Em.Exhaustion		Pre-COVID			6.23	7,649	<.001	.06
		During COVID			7.24	7,487	.001	.10
	31-35	Pre-COVID	82	20.13±11.21				
		During COVID	34	19.65±12.51				
	36-40	Pre-COVID	83	20.35±11.32				
		During COVID	52	22.08±13.78				
	41-45	Pre-COVID	79	19.42±11.75				
		During COVID	43	20.63±12.66				
	46-50	Pre-COVID	64	17.75±11.78				
		During COVID	47	23.96±14.28				
	51-55	Pre-COVID	84	22.21±12.35				
		During COVID	63	22.98±12.58				
	56-50	Pre-COVID	107	20.31±12.51				
		During COVID	99	22.93±14.38				
	61-65	Pre-COVID	74	19.59±12.61				
		During COVID	91	18.48±12.01				
	>65	Pre-COVID	84	11.69±9.37				
		During COVID	58	10.09±8.73				
	Total	Pre-COVID	657	19.00±11.99				
		During COVID	505	19.99±13.26				
Depersonalization		Pre-COVID			6.05	7,649	<.001	.06
		During COVID			3.77	7,487	.001	.05
	31-35	Pre-COVID	82	6.33±4.82				
		During COVID	34	6.62±5.37				
	36-40	Pre-COVID	83	6.33±4.82				
		During COVID	52	6.37±5.53				
	41-45	Pre-COVID	79	5.38±4.92				
		During COVID	43	7.02±6.67				
	46-50	Pre-COVID	64	4.53±3.85				
		During COVID	47	5.15±5.11				
	51-55	Pre-COVID	84	5.10±4.75				
		During COVID	63	6.17±5.84				
	56-50	Pre-COVID	107	4.79±4.38				
		During COVID	99	5.31±5.55				
	61-65	Pre-COVID	74	5.38±5.87				
		During COVID	91	4.53±4.96				
	>65	Pre-COVID	84	2.44±2.44				
		During COVID	58	2.67±3.50				
	Total	Pre-COVID	657	5.03±4.87				
		During COVID	505	5.34±5.45				
Prof. Accomplishment		Pre-COVID			3.54	7,649	.001	.04
		During COVID			4.41	7,487	<.001	.06
	31-35	Pre-COVID	82	36.98±8.14				
		During COVID	34	36.59±8.45				
	36-40	Pre-COVID	83	38.98±6.87				
		During COVID	52	38.08±6.82				
	41-45	Pre-COVID	79	39.19±6.87				
		During COVID	43	38.60±8.24				
	46-50	Pre-COVID	64	40.42±5.96				

Burnout Variable	Age	Time	n	M(SD)	F	df	p	Partial η^2
		During COVID	47	39.98±6.46				
	51-55	Pre-COVID	84	39.60±6.37				
		During COVID	63	39.78±6.32				
	56-50	Pre-COVID	107	40.18±6.53				
		During COVID	99	40.62±5.83				
	61-65	Pre-COVID	74	40.01±7.27				
		During COVID	91	42.10±5.04				
	>65	Pre-COVID	84	41.85±5.56				
		During COVID	58	41.79±6.58				
	Total	Pre-COVID	657	39.65±6.83				
		During COVID	505	39.92±6.81				

Note. Em. Exhaustion = Emotional Exhaustion; Prof. Accomplishment = Professional Accomplishment.

differences on Emotional Exhaustion [$F(3,407) = 14.55, p < .001, \text{partial } \eta^2 = .10$] and Depersonalization [$F(3,407) = 7.24, p < .001, \text{partial } \eta^2 = .05$]. In particular, independent contractors had lower levels of Emotional Exhaustion (13.48±10.82) than all the other types of workers, including general practitioners (22.13±13.50, $p = .004$), physicians in a COVID department (22.25±13.31, $p < .001$), and physicians in a non-COVID department (22.87±13.57, $p < .001$). Along the same lines, they had also lower Depersonalization levels than the other types of workers, namely 6.94±4.99, $p = .016$; 6.25±6.04, $p = .004$; 6.33±6.11, $p < .001$. Hence, independent contractors appear to have been protected against BO compared to physicians working in hospitals during the pandemic.

Concerning the type of contract (*i.e.*, independent contractor working in a public or private structure in convention, physicians with a permanent contract), the multivariate tests showed a statistically significant effect: $F(6, 816) = 5.73, p < .001, \text{partial } \eta^2 = .04$. Specifically, follow-up ANOVAs showed a statistically significant difference on Emotional Exhaustion, $F(2,410) = 16.60, p < .001, \text{partial } \eta^2 = .08$, and Depersonalization: $F(2,410) = 5.21, p = .006, \text{partial } \eta^2 = .03$. Those who worked in hospitals as permanent contractors reported higher Emotional Exhaustion (22.74±13.64) than both independent contractors (13.70±12.11, $p < .001$) and independent contractors working in a public or private organization (18.06±12.06, $p = .023$). Moreover, the formers had higher Depersonalization levels (5.94±6.00) than independent contractors (3.83±4.89, $p = .007$). Thus, colleagues employed in hospitals with a permanent contract have experienced more BO during the pandemic than those who did not work in public hospitals with stable contracts.

No difference in the severity of BO was found regarding geographical distribution (North, Central, and South Italy), as indicated by the multivariate tests (adjusted α level for the significance of .003): $F(6, 1000) = 2.91, p = .008, \text{partial } \eta^2 = .02$.

Moreover, the multivariate test did not show a statistically significant effect on BO levels between physicians having children and those who did not (using an adjusted α level): $F(6, 1000) = 3.19, p = .004, \text{partial } \eta^2 = .02$. Finally, the

multivariate analysis showed that the pandemic *per se* did not have a significant impact on BO severity [$F(3,1182) = 1.37, p = .25, \text{partial } \eta^2 = .003$]: there are no statistically significant differences in BO severity as evaluated in the samples from before and during the pandemic. In the same line, Pearson’s chi-squared tests highlighted that the prevalence of physicians with high, moderate, and mild levels of BO did not differ statistically in both the pre-COVID and during-COVID groups. The results for Emotional Exhaustion, Depersonalization, and Professional Accomplishment, are respectively $\chi^2(2) = 1.79, p = .41; \chi^2(2) = 2.44, p = .30; \chi^2(2) = .61, p = .74$ (Table 3).

3.3. Burnout Levels During the Pandemic with a Focus on COVID-Related Variables

Descriptive statistics highlighted that 32.1% of participants were directly involved in COVID-related clinical activities. Moreover, for almost all the participants (92.4%), work activities were modified due to the pandemic. Most of them (85.0%) reported that government and non-government initiatives aimed at tackling the spread of COVID-19 had profoundly influenced their work directly or indirectly. More than 1 out of 3 participants (37.5%) reported that the pandemic had led them to modify their job duties significantly. Only for a little part of the sample (8.3%) and a tiny part of the sample (0.7%) had the pandemic had just a mild and no influence on work activities, respectively. Despite most of them reporting to be vulnerable to pandemic effects to at least some extent (for them, their family, and patients), a not negligible portion had been personally affected by COVID-19 (7.8%) or had lost someone due to COVID-19 (17.6%). The majority of endocrinologists (61.8%) affirmed being worried about work duties changing to deal with the pandemic, mainly due to quarantine measures.

The pandemic generates feelings of vulnerability: 4.5% of participants reported having this feeling for themselves only; 23.3% for them and their family; 53.0% for them, their family, and their patients; 13.0% reported no feelings of vulnerability. Despite these findings, 55.3% of participants declared being able to protect themselves and their patients during the pandemic; 38.2% did not; 6.6% did not respond. Only 21.1% of participants were directly involved in the decision process about organizing the activities in their depart-

Table 3. Contingency table for burnout scales and time of measurement.

			Time of Measurement		
			Before COVID	During COVID	Total
Emotional Exhaustion	Mild	n	301	215	516
		%	41.7	42.5	42.0
	Moderate	n	193	119	312
		%	26.7	23.5	25.4
	Severe	n	228	172	792
		%	31.6	34.0	32.6
Depersonalization	Mild	n	316	238	554
		%	46.2	47.1	46.6
	Moderate	n	237	156	393
		%	34.6	30.9	33.1
	Severe	n	131	111	242
		%	19.2	22.0	20.4
Professional Accomplishment	Mild	n	526	377	903
		%	72.7	74.7	73.5
	Moderate	n	133	86	219
		%	18.4	17.0	17.8
	Severe	n	65	42	107
		%	9.0	8.3	8.7

Note. To distinguish among mild, moderate, and severe burnout, we used Sirigatti and Stefanile (1992)'s cut-off scores.

ment or hospital during the pandemic. Some participants (26.6%) declared they were satisfied with Personal Safety Devices availability, while 47.5% had not always had prompt and adequate devices, and 18.7% stated they had not received adequate devices. Also, less than half of them (41.1%) had been provided with psychological support at work (7.8% not applicable). Additionally, 7.8% of the participants had tested positive for SARS-CoV-2. 17.6% of them had experienced the loss of a known person: relatives (2.2%), a friend (6.9%), or a colleague (11.1%).

With regard to the MANOVA analyses, we performed 10 MANOVAs with the three BO scales as dependent variables and COVID-related variables as independent variables (Table 4 for the descriptive statistics and the ANOVAs results for these analyses). The multivariate analyses highlighted a statistically significant effect for the following variables (using the adjusted α value of .003): being directly involved with COVID-related clinical activities, $F(3, 501) = 8.36, p < .001$, partial $\eta^2 = .05$; having had to change job tasks due to COVID, $F(3, 501) = 6.88, p < .001$, partial $\eta^2 = .04$; vulnerability feelings, $F(9, 1214.585) = 3.30, p = .001$, partial $\eta^2 = .02$; feelings of having been able to protect themselves and their patients, $F(3, 501) = 7.93, p < .001$, partial $\eta^2 = .05$.

Those who were involved directly in COVID-related clinical activities reported higher levels of Emotional Exhaustion and Depersonalization, as well as lower Professional Accomplishment than colleagues who were not (Table 4). Those who did not experience feeling of vulnerability for themselves and others experienced lower levels of Emotional Exhaustion compared to colleagues who reported experiencing feeling of vulnerability for themselves and their fami-

ly ($p = .037$), and those feeling vulnerable for themselves, their family, and their patients ($p = .004$). Besides, those not experiencing vulnerability feelings had higher Professional Accomplishment than colleagues who felt vulnerable for themselves and their relatives ($p = .002$). Finally, physicians who were sufficiently confident of protecting themselves and others experienced lower levels of Emotional Exhaustion and Depersonalization than those who did not experience these positive feelings ($p < .001$).

4. DISCUSSION

During the first phase of the current pandemic, health care services in both hospital and ambulatory settings have been considerably re-organized [36, 37]. The efficiency of medical and intensive care departments was increased to manage COVID-19 related emergencies better, even if at the cost of decreasing other health services [38]. In most cases, departments and hospitals were entirely converted to dedicated facilities to deal with the aforementioned aim. The amount of access to emergency rooms and hospital admissions for acute diseases and ambulatory services for managing chronic disorders was restricted also to tackle the spread of COVID-19 among patients and health care professionals. Health care staff was shifted to other activities, and for some clinicians, this shift included the need to change duties.

The role of occupational BO among clinicians is an issue, and the AME study group started to monitor its severity, especially among endocrinologists. In the last year, AME members were invited to respond to a thematic survey spontaneously. Data-gathering was successful, and the first data were collected and analyzed, thus highlighting preliminary information about the specific theme. Given that the

Table 4. ANOVAs results of burnout by COVID-related variables.

COVID-Related Variable	Burnout	Group	n	M(SD)	F	df	p	partial η^2
Involved in COVID-19 activities	Em.Exh.	Yes	176	23.78±14.38	23.03	1,503	<.001	.04
		No	329	17.97±12.17				
		Tot	505	19.99±13.26				
	Dep.	Yes	176	6.54±5.80	13.32	1,503	<.001	.03
		No	329	4.71±5.15				
		Tot	505	5.34±5.45				
	Prof.Acc.	Yes	176	39.38±7.42	1.74	1,503	n.s.	.003
		No	329	40.21±6.45				
		Tot	505	39.92±6.81				
Changed duties due to COVID-19	Em.Exh.	Yes	196	22.81±13.57	14.80	1,503	<.001	.03
		No	309	18.21±12.77				
		Tot	505	19.99±13.26				
	Dep.	Yes	196	6.56±6.03	16.32	1,503	<.001	.03
		No	309	4.58±4.90				
		Tot	505	5.34±5.45				
	Prof.Acc.	Yes	196	38.93±7.29	6.81	1,503	.009	.01
		No	309	40.55±6.42				
		Tot	505	39.92±6.81				
Worries about changes in work due to quarantine ^o	Em.Exh.	Yes	336	21.45±13.75				
		No	169	17.11±11.75				
		Tot	505	19.99±13.26				
	Dep.	Yes	336	5.65±5.81				
		No	169	4.73±4.60				
		Tot	505	5.34±5.45				
	Prof.Acc.	Yes	336	39.50±6.91				
		No	169	40.76±6.54				
		Tot	505	39.92±6.81				
Feeling of vulnerability	Em.Exh.	No	73	15.15±12.00	3.95	3,501	.008	.02
		For me	25	19.92±12.11				
		For me and my family	123	20.49±13.31				
		Me, family, and patients	284	21.03±13.43				
	Dep.	Total	505	19.99±13.26	1.52	3,501	n.s.	.009
		No	73	4.63±4.58				
		For me	25	4.40±3.66				
		For me and my family	123	6.12±5.45				
	Prof.Acc.	Me, family, and patients	284	5.27±5.75	5.03	3,501	.002	.03
Total		505	5.34±5.45					
No		73	42.04±5.33					
For me		25	38.20±7.76					
	For me and my family	123	38.46±7.60					
	Me, family, and patients	284	40.16±6.56					
	Total	505	39.92±6.81					
Feeling of have been able to protect themselves and others	Em.Exh.	Yes	300	17.98±11.96	17.55	1,503	<.001	.03
		No	205	22.93±14.49				
		Tot	505	19.99±13.26				
	Dep.	Yes	300	4.49±4.64	18.98	1,503	<.001	.04
		No	205	6.60±6.25				
		Tot	505	5.34±5.45				
Prof.Acc.	Yes	300	40.38±6.76	3.38	1,503	n.s.	.007	

COVID-Related Variable	Burnout	Group	n	M(SD)	F	df	p	partial η^2
		No	205	39.25±6.84				
		Tot	505	39.92±6.81				
Confronted on decisions with Heads°	Em.Exh.	Yes	117	17.45±10.99				
		No	388	20.76±13.79				
		Tot	505	19.99±13.26				
	Dep.	Yes	117	4.37±4.25				
		No	388	5.64±5.73				
		Tot	505	5.34±5.45				
	Prof.Acc.	Yes	117	41.67±5.49				
		No	388	39.39±7.08				
		Tot	505	39.92±6.81				
Adequate Personal Safety Devices°	Em.Exh.	No	99	17.60±13.47				
		Not always	262	21.81±13.30				
		Yes	144	18.35±12.64				
		Tot	505	19.99±13.26				
	Dep.	No	99	4.58±4.56				
		Not always	262	5.94±5.82				
		Yes	144	4.79±5.22				
		Tot	505	5.34±5.45				
	Prof.Acc.	No	99	41.14±6.65				
		Not always	262	39.31±6.68				
		Yes	144	40.19±7.07				
		Tot	505	39.92±6.81				
Psychological support at work°	Em.Exh.	Yes	226	20.90±13.57				
		No	279	19.26±12.98				
		Tot	505	19.99±13.26				
	Dep.	Yes	226	5.26±5.36				
		No	279	5.41±5.53				
		Tot	505	5.34±5.45				
	Prof.Acc.	Yes	226	39.67±6.80				
		No	279	40.13±6.82				
		Tot	505	39.92±6.81				
Affected by COVID-19°	Em.Exh.	Yes	39	22.44±15.47				
		No	466	19.79±13.06				
		Tot	505	19.99±13.26				
	Dep.	Yes	39	6.44±7.25				
		No	466	5.25±5.27				
		Tot	505	5.34±5.45				
	Prof.Acc.	Yes	39	37.15±9.18				
		No	466	40.15±6.53				
		Tot	505	39.92±6.81				
Lost someone due to COVID-19°	Em.Exh.	Yes	98	23.20±14.82				
		No	407	19.22±12.76				
		Tot	505	19.99±13.26				
	Dep.	Yes	98	5.63±5.48				
		No	407	5.28±5.44				
		Tot	505	5.34±5.45				
	Prof.Acc.	Yes	98	40.19±5.97				
		No	407	39.86±7.00				
		Tot	505	39.92±6.81				

Note. Em.Exh. = Emotional Exhaustion; Dep. = Depersonalization; Prof.Acc. = Professional Accomplishment; ° = The multivariate test is not statistically significant accordingly to an adjusted alpha level of .003.

procedure was successful, another cross-sectional survey was proposed to reassess BO severity during the first phase of the pandemic to compare the results to the previous one. It was expected that the pandemic would elicit several factors typically considered as risk factors for BO, including emotional stress, work overload, and organization inefficiency.

Higher levels of Emotional Exhaustion and lower Personal Accomplishment were found among women than men, and this difference remained stable before and during the pandemic. These data are generally in line with others that found a greater prevalence of BO [39] in women. Specifically, Emotional Exhaustion was more frequent among women than men, even though they are more prone to Depersonalization than the former [40, 41]. Conversely, women and front-line physicians were found to experience more BO during the first phase of the pandemic [42]. These considerations are crucial because endocrinology is currently expected to become a female-related specialty in the near future [43].

The participants' age was a relevant factor in BO levels since the oldest physicians (>65y) displayed the lowest levels of Emotional Exhaustion and Depersonalization and higher Personal Accomplishment than younger colleagues. Negative correlations between age and both Emotional Exhaustion and Depersonalization, and a positive correlation between age and Professional Accomplishment, were also found. Despite some controversy, these observations generally confirm those of other authors [13, 44-49], mainly that women and young physicians (residents or early-career) are at risk to BO [50]. Work engagement and workaholism and work-family conflict may represent a significant risk factor for BO, for a recent review of the workaholism literature [51].

Higher levels of BO were also found among residents and the youngest participants, especially those engaged directly in COVID-related activities [52, 53].

A higher prevalence of BO was reported among affected health care workers [54]. However, our observations did not confirm previous results since the BO levels remained stable during the pandemic.

Having children was hypothesized to be associated with increased concerns for family safety during the pandemic, potentially damaging BO severity at work. Loscalzo and Giannini [54], for example, found that having children is associated with higher work-family conflict, which in turn might expose to higher BO. However, the results did not confirm this, even in contrast to other observations [47, 55]. In other words, family-related concerns have been probably positioning as less relevant stressors than others encountered during carrying-out of clinical activities.

Independent compared to established contractors, in both hospitals, and in private clinics, displayed a lower level of BO, showing lower levels of both Emotional Exhaustion and Depersonalization than general practitioners and hospital physicians working either in COVID or non-COVID depart-

ments. On the other hand, physicians with stable contracts had lower Depersonalization levels and higher Professional Accomplishment than those with a scholarship, and these findings are similar before and during the pandemic. Several hypotheses could be made explaining this phenomenon, including the physician age and type of contract and its impact on clinical activities. Despite established contractors displaying higher trust in their job stability and salary, they have experienced more BO than independent contractors, probably due to higher workload, possibly more responsibility, and certainly restricted flexibility and autonomy. Indeed, according to the latter point of view, independent contractors may be able to decide easily to discontinue work activities in order to ensure their safety. Moreover, younger age, and therefore a lower capacity to manage workload, relationships with colleagues, and restricted chances for future advancement and accomplishment, may lead the scholarship participants to be more vulnerable to BO than permanent contractors.

Only a minority of physicians declared to have been directly involved in a decisional process for organizing health care services during the pandemic by the head of their department or hospital. Besides, hospital physicians may have been more involved in the emergency and experienced higher workloads and unwanted changes in tasks, and higher risks for themselves.

Responders who worked in the South of Italy showed higher Professional Accomplishment levels than those working in North and Central Italy before the pandemic, although this difference disappeared in the pandemic group. This difference has not been evaluated, but it could be related to socio-cultural differences. A higher appreciation of the medical profession in the South might explain higher feelings of Professional Accomplishment of physicians living in Southern Italy. Although several regions of Northern Italy, namely Lombardy, Veneto, Emilia-Romagna, and Piedmont, have been more seriously involved during the first phase of the pandemic compared to those in the Center and Southern Italy, the levels of stressors were similarly perceived among Italian physicians, generating a collegial spirit of devotion and abnegation in working hard in such a difficult situation. This was cross-sectionally observed irrespective of baseline BO severity. Finally, the pandemic *per se* did not appear to exacerbate BO severity among Italian AME members. Possible explanations for these results include appropriate measures taken to cope with the pandemic and higher collaboration among physicians engaged with more efficiency in their workdays with a consequent reduction in working monotony and a higher sense of resilience.

We did not find either an increase or a decrease in BO levels across the two study populations. These results are similar to those of other authors [56, 57], probably suggesting that the relatively short period of exposure to the pandemic (*i.e.*, ten weeks between surveys) is not sufficient to reveal relevant differences in BO levels compared to baseline. In contrast, Azoulay *et al.* [58] assessed and analyzed 1,000 intensivists, reporting that about half of them had

symptoms suggestive of severe BO and anxiety and 30% reported symptoms of depression. Similar data have been reported among otolaryngologists [59]. Finally, BO levels were lower, and Personal Accomplishment was higher among neurosurgeons, probably due to reduced workload and better organization than usual [60].

Despite studies' heterogeneities of populations and methods of assessing the levels of stress and BO, these differences highlight that workload, fear of contracting the disease, or attempting to manage as best as possible infected people and patients remain the most important sources of stress; but, they are not the only variables influencing psychological outcomes. In this AME study, at least 2 out of 3 participants underwent a relevant change in their activities due to the pandemic, and this induced a greater sense of vulnerability and possibly higher levels of BO. Indeed, mean BO levels were higher among participants who were engaged in the management of patients with a confirmed or suspected disease (higher levels of Emotional Exhaustion and Depersonalization, and lower Personal Accomplishment) as well as in those who changed duties and those who felt vulnerable for themselves and patients. This result has been confirmed by Lai *et al.* [16]. Having adequate personal safety devices and psychological services at work was not associated with lowering BO levels. This contrasts with other observations, but it should be considered that only a minority of participants reported always being provided with adequate personal safety devices. Finally, physicians who were less confident of adequately reducing the risk of contagion and those who felt more vulnerable to COVID-19 for themselves and others displayed higher BO levels.

Therefore, we suggest that feeling vulnerable and not being able to protect themselves (and hence their families) and their patients adequately during the COVID pandemic led to the experience of more BO, probably due to increased fear for the well-being of themselves and their families, and their patients.

4.1. Study Limitations

Several limitations may be considered for this study. First, the two groups of participants are different, considering that the number of responders to the second survey (during-COVID) was lower than those who responded to the first one (pre-COVID). Given this consideration, the levels of BO collected and analyzed during the first phase of the pandemic had a bias related to the baseline (pre-COVID) characteristics of responders. Did responders have low levels of BO, hence finding more time to fill the questionnaire? Did responders have high BO levels, being more interested in providing their contribution to a topic they feel relatable to themselves? That is an issue and might lead to a lack of difference in BO severity between the two groups. Even though it is hard to understand the precise impact of workload, need to change duties, or quickly acquire novel expertise on BO, front-line professionals should likely be considered at higher risk of BO during a health care crisis. According to this point of view, only a minority of responders de-

clared that they were engaged as front-line providers, which could explain the lack of relevant differences in BO levels between the two groups before and during the pandemic. Finally, this study assessed BO severity only, while other psychological variables possibly affected during the pandemic, such as workaholism, work engagement (among work-related constructs), or anxiety, depression, and stress, were not evaluated.

4.2. Study Strengths

Data collection and analysis were performed across all Italian regions, thus exploring the overall situation from those highly affected to those less involved during the pandemic. Moreover, BO levels were collected previously at baseline and then during the pandemic, thus providing the unexpected opportunity to compare them.

CONCLUSION

The present study represents a step aiming to provide a comprehensive analysis of BO levels among AME members during their everyday activities and facing a health crisis such as a pandemic. It was conducted to reflect on strategies for improving the effectiveness of health care system interventions and preserve both the health and well-being of health care personnel. Surprisingly, short-term exposure to pandemic-related activities seemed to have a low impact on BO severity, except for physicians directly involved in the management of suspected or confirmed cases of COVID-19. Nevertheless, it is still quite possible that the current health care crisis may have further (long-term) influences on physicians' psychological health. Health care professionals should be adequately informed about the risks of psychological stress, invited to search for help, strictly monitored for their stress reactions, and adequately supported if needed [61]. In particular, recognizing different sources of anxiety allows health care organizations to develop adequate approaches for addressing concerns of health care personnel and providing specific supports. More precisely, the role of psychological support should be emphasized, especially for physicians directly involved in managing affected patients to restore their long-term well-being [62]. According to this Italian survey, only a half of personnel reported having the possibility of receiving psychological support (data not reported). This is not recommended, and public hospitals should always be prepared for psychologically supporting physicians; psychological debriefing should be implemented as a routine at the end of the working day/weeks for all the personnel. This could be more useful than just providing individual psychological support upon request, which could also induce to avoid asking for help for fear of colleagues' negative judgments.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The survey was approved by the Board of Directors of the Italian Association of Clinical Endocrinologists (AME), Reference Number (19/20), Italy.

HUMAN AND ANIMAL RIGHTS

No animals were used in the study. All human procedures were followed in accordance with the Helsinki Declaration of 1975 as revised in 2013 (<http://ethics.iit.edu/ecodes/node/3931>).

CONSENT FOR PUBLICATION

All participants were asked fill out a simple questionnaire. They freely consented to the collection, analysis and publication of data when compiling the responses.

AVAILABILITY OF DATA AND MATERIALS

The data sets used and analyzed during the current study are available from the corresponding authors on reasonable request.

FUNDING

None.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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