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Burnout, coping and resilience of the cancer care workforce during the SARS-CoV-2: A multinational cross-sectional study

Constantina Cloconi, Mary Economou^{*}, Andreas Charalambous

Cyprus University of Technology, Cyprus

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ABSTRACT

Purpose: Over the past year, the SARS-CoV-2 pandemic has significantly increased the demand placed on health care professionals around the world. The already complex cancer care has been complicated further by the restructuring of services (e.g., working processes, treatment allocation). This study was designed to explore the level of burnout, coping and resilience of the cancer care workforce during SARS-CoV-2.

Methods: Cross-sectional, multinational study undertaken between March–May 2021. In total 271 healthcare professionals were recruited in the study. These were specialized and/or working in the oncology sector from around the globe. Data were collected with an online survey with the Connor-Davidson Resilience Scale, Brief-COPE (Coping Orientation to Problems Experienced) Scale and The Maslach 's Burnout Inventory.

Results: The majority of the participants were cancer nurses followed by oncologists. The mean overall Burnout score was 64.86 (SD 17.15), the overall COPE score was 31.72 (SD 12.39) and the overall Resilience score was 69.48 (SD 12.4). Positive correlations were found between the COPE dimensions and the burnout overall score (0.316, 0.388, 0.398). The burnout overall score was negatively correlated with the resilience score ($p = -0.126$).

Conclusion: The findings showed significant levels of burnout, diminished coping abilities and reduced resilience among cancer care professionals. This study emphasizes the need for a timely and appropriate preparation of the healthcare systems to better support cancer care professionals in the event of a new SARS-CoV-2 healthcare emergency.

1. Introduction

The healthcare emergency of SARS-COV-2 has challenged health systems around the world to rapidly adapt to dynamic and uncertain circumstances. Simultaneously, this has triggered severe concerns by the fact that many aspects of this new coronavirus disease are not known, therefore posing an additional threat to the health and safety of the healthcare workforce. The complex experience and impact on frontline healthcare workers from previous healthcare emergencies has been well documented, although the evidence specific to oncology services is notably limited (Gasper et al., 2020). Furthermore, the evidence from previous healthcare emergencies (e.g., SARS and MERS) demonstrated that variables such as burnout, coping and resilience of the healthcare workforce can be significantly influenced and the explicit way that this is manifested warrants further attention. What is more important is the lack of evidence on the specific associations between these three variables as these are co-existing variables.

Oncology health care professionals have experienced unprecedented

challenges, with an acute increase of the physical and emotional burden of cancer care. Health care professionals have been addressed to make treatment and care decision making adaptations, in order to ensure cancer patients' reduced risk of exposure to SARS-COV-2 (Kuderer et al., 2020). This included many modifications in the treatment such as delay of critical surgeries, suspension or reduction of chemotherapy treatments and change of chemotherapy regimens (Desai et al., 2020; Le Gouill et al., 2017). The uncertainty on the implementation of clinical practice along with longer shifts, disruption of work-personal life balance and limited resources were associated with worsening levels of burnout, posttraumatic stress, anxiety, and depression (Pappa et al., 2020).

Previously to the SARS-COV-2 pandemic, recorded that health care professionals in oncology have been traditionally at a high risk of burnout due the multifaceted nature of cancer care (Parola et al., 2017). Managing the psychosocial aspects of cancer, the demanding workload related with the care of critically ill patients and their caregivers and the limited autonomy due to the daily professional responsibilities, are only

^{*} Corresponding author. School of Health Sciences, Department of Nursing 15th Vragadinou Street, 3041, Limassol, Cyprus.

E-mail address: economoum@gmail.com (M. Economou).

a fraction of the challenges that contribute to the increased risk of burnout among oncology health care professionals (Rotenstein et al., 2018). In a study by Cañadas-De la Fuente et al. (2018), prevalence of high levels of emotional exhaustion and low levels of personal success among oncology nurses was 30% and 35%, respectively (Cañadas-De la Fuente et al., 2018). Even higher are the rates of burnout among physicians (Rotenstein et al., 2018). Studies from the SARS-COV-2 pandemic period showed that the levels of burnout have been deteriorated. For example, a study among Front Line nurses during the pandemic showed a moderate-to-severe level of burnout in depersonalization and emotional exhaustion (Jose et al., 2020). Evidence from two online surveys (Banerjee et al., 2021) conducted by the European Society for Medical Oncology (ESMO) Resilience Task Force between April 16 and May 3, 2020 and July 16 to Aug 6, 2020, showed an exacerbation of burnout rates among the oncology health care professionals during the SARS-COV-2 period. During the first survey, at the onset of the pandemic the burnout among oncology health care professional was 35%, raising to 49% at follow up. Similarly, the percentage of health professionals at risk of distress was increased from 25% to 33%.

On the contrary, resilience, described as the ability of individuals to bounce back or cope successfully (Foster, 2020; Panter-Brick and Leckman, 2013), has been found to have a protective effect on health care professionals health status against burnout (Banerjee et al., 2021; Kutluturkan et al., 2016; Labrague, 2020), by enhancing and strengthening their adaptation and coping abilities to overcome difficulties raised during the pandemic (Petzel, 2021; Rieckert et al., 2021). High levels of resilience promote the well-being of health care professionals by strengthening their vitality, self-efficacy, engagement, and the ability to cope (Hlubocky et al., 2021). However, the pandemic has also challenged the health care systems' organizational mechanisms of resilience forcing them to develop alternative and novel mechanisms that would ensure and promote resilience and support their personnel (Haldane et al., 2021).

Coping mechanisms adopted have also been associated with reduced burnout in clinicians. This includes the knowledge and the implementation of measures with regards to SARS-COV-2 transmission and prevention, exhibiting positive self-attitude and seeking for social support, both from the family as well as the working environment. (Cai et al., 2020). In order to overcome burnout during SARS-COV-2, a number of coping strategies have been reported including positive thinking, changes in physical activity, talking to colleagues to get information, and using humor or laughing (Zhang et al., 2020).

The association of resilience, coping and burnout has been studied in general to some extent, however it has not been studied specifically in Oncology Health Care Professionals during the SARS-COV-2 pandemic (Chaukos et al., 2017; McKinley et al., 2020). This study aims to provide an insight about the levels of burnout, the coping strategies and the resilience among oncology health care professionals and most importantly it will demonstrate explicitly how these three variables associated during the SARS-COV-2 pandemic.

2. Materials and methods

2.1. Study design and setting

This was an online cross-sectional, multinational study conducted between March 2021–May 2021. It involved the participation of 271 healthcare professionals specialized and/or working in the oncology sector from around the globe. Approval for the study was obtained from the Cyprus Bioethics Committee (Reference number: EEBK EΠ, 2021.01.40).

2.2. Eligibility and recruitment

Eligible participants had to identify themselves as: 1) older than 18

years; 2) having a good understanding of written English, 3) a clinician and/or practitioner, including a physician, nurse, pharmacist, psychologist, nutritionist, rehabilitation specialist, or other allied healthcare professional, and 4) spending a minimum of 5% of their time providing direct clinical care to cancer patients.

2.3. Instrument survey

The online survey included a short introduction describing the overall objective of the study followed by the first section on demographics and work-related information. The second section included the Connor-Davidson Resilience Scale, Brief-COPE (Coping Orientation to Problems Experienced) Scale, and the Maslach 's Burnout Inventory. The description of the scales include:

1) Connor-Davidson Resilience Scale is a self-administered questionnaire developed by Connor and Davinson (Connor and Davidson, 2003). It includes 25 statements scored on a 5-point Likert scale from zero to four where zero corresponds to "not true at all" and four addresses to "true nearly all of the time". The original scale describes five dimensions of personal resilience namely: 1) personal competence, high standards, and tenacity, 2) trust in one's instincts, tolerance of negative affect, and strengthening effects of stress, 3) positive acceptance of change, and secure relationships, 4) Control (i.e., the ability to control the attainment of goals and seek help from others), and 5) spiritual influences. The sum score ranges from 0 to 100, with the higher score representing higher levels of resilience (Waage, 2017). Cronbach's alpha for the original scale was 0.89. The tool was used in different populations (Alarcón et al., 2020; Baek et al., 2010; Yu and Zhang, 2007) and translated in various languages (Baek et al., 2010; Yu and Zhang, 2007). For this study, the dimensions were extracted from the factor analysis that was conducted for the original questionnaire due to the heterogeneity of the participating population.

2) Brief-COPE (Coping Orientation to Problems Experienced) Scale: The Brief COPE scale includes in total 28 statements. The statements are assessed on a 4-point Likert scales ranging from zero to three with zero referring to "I haven't been doing this at all", 1 "A little bit", 2 "A medium amount" and 3 "I have been this a lot". The statements are divided into 2 categories; the first one refers to avoidant coping and the second to approach coping (García et al., 2018). Each of the two categories is divided into subcategories of coping factors. In total, the COPE items measure 14 different coping approaches, two items for each coping approach. The 14 Coping approaches in the COPE scale are Instrumental Support, Emotional Support, Active Coping, Planning, Acceptance, Self-distraction, Denial, Humor, Self-blaming, Behavioral disengagement, Venting, Positive Reframing, Substance use and Religion.

3) The Maslach 's Burnout Inventory: The inventory was developed by Maslach and Jackson in 1981 (Maslach et al., 1996). It is composed of 22 items assessed on a 5-point Likert scale where 0 denotes "never", and 4 denotes "always." The Maslach 's Burnout inventory is divided in three subscales: emotional exhaustion, depersonalization, and personal accomplishment (Maslach et al., 1996). The emotional exhaustion subscale includes eight items that aim to assess fatigue, being fed up, and the reduction of emotion energy. Depersonalization is composed of six items that refer to individual's behaviours that lack emotions toward those who were cared for and were given service to. In the personal accomplishment dimension, eight items defined the situation where the person felt sufficient and successful. Higher sum scores denote a higher degree of burnout. For participants experiencing burnout, emotional exhaustion (30 and above: high; 19–29: moderate; 8–18: low) and depersonalization scores (23 and above: high; 15–22: moderate; 6–14: low) were found to be high and personal accomplishment scores (30 and above: high; 19–29: moderate; 8–18: low) were found to be lower.

2.4. Data collection

Study participants were recruited using a combination of

convenience and snowball sampling approaches. An online survey link with the Google Forms platform was distributed through Twitter, Facebook and LinkedIn of professional societies (i.e. European Oncology nursing Society), specialist cancer organisations (i.e. European Cancer Organisation) and specialist cancer networks (i.e. OncoAlert). The link has also been shared via emails (convenience sampling-by sending the online survey link to fill the form) to the extensive professional network of the researchers during the period of March–May 2021. Participation to the online survey, required from the respondents to state their compliance to the inclusion criteria. The submission of the survey implied informed consent to participate. The respondents were assured about the anonymity of the provided data throughout the study including the reporting phase. In order to increase the snowball recruitment of the survey, at the conclusion of the survey, the respondents (both those recruited via social media and email contacts) were encouraged to further disseminate the survey link to colleagues who fulfilled the inclusion criteria.

2.5. Statistical analysis

Participant responses were recorded anonymously and retrieved electronically using the Google Sheets (Google LLC). Summary statistics (frequencies, mean/SD and median/IQR as appropriate) were used for the description of the socio-demographic characteristics of the participants as well as burnout, resilience, COPE and their dimensions. Normality of burnout, resilience and cope scores was tested by assessing the graphical distribution of the variables. Differences in mean burnout, resilience, and cope dimensions between subgroups of participants based on their sociodemographic and other characteristics were explored in one-way analysis of variance (ANOVA) and independent *t*-test as appropriate. The association of burnout and each of each dimension (emotional exhaustion, Depersonalization, personal accomplishment) with resilience and cope dimensions (self-sufficiency, avoidant-coping and social support) was assessed in multilinear regression models. Statistical Package for Social Sciences (SPSS) for Windows Version 21 (SPSS Inc., Chicago, IL, USA) was used for all other analyses.

3. Results

3.1. Sample characteristics

Two hundred seventy-one oncology health care professionals participated in this study between March and May of 2021. Table 1 shows the socio-demographic and working characteristics of the participants. The majority of the participants at a proportion of 80% were from Europe, followed by America (8.5%), Asia (3%), Oceania (1.1%) and Africa (0.7%). The proportion of female participants in the study was 82.7%. One out of four participants were 30–39 years old. Slightly higher was the proportion of age 40–49 and 50–59 years at 29.9% and 28.8% respectively. With regards to the educational level of the participants, one out of three participants held a postgraduate degree (i.e. masters) and 29.9% held an undergraduate degree. Almost half of the participants (49.1%) had over 15 years of working experience in cancer care. About 69.4% were cancer nurses. Regarding the work setting, 31.4% worked at oncology inpatient wards, 19.6% worked at chemotherapy day cares and 15.9% worked at outpatient clinics.

3.2. Descriptive characteristics of burnout, COPE and resilience scales

The mean overall Burnout score was 64.86 (SD 17.15) with the subscales scores as follows: personal accomplishment 32.26 (SD 8.95), emotional exhaustion 26.50 (SD 11.19) and depersonalization 7.01 (SD 5.6), comprising 40.8%, 10.8% and 49.7%, respectively (Table 2). The overall COPE score was 31.72 (SD 12.39) with the subscales scores as follows: Self-sufficient 17.24 (SD 6.89), avoidance 7.67 (SD 4.95) and

Table 1

Socio-demographic characteristics of health professionals that participated in the study.

	N	%
Total	271	
Gender		
Female	224	82.7
Male	47	17.3
Age (in years)		
18–29	29	10.7
30–39	66	24.4
40–49	81	29.9
50–59	78	28.8
60 or older	7	6.3
Education		
Diploma	34	12.5
Bachelor	81	29.9
Specialization	6	2.2
Master	92	33.9
Doctorate	58	21.4
Region		
Europe	235	86.7
Africa	2	0.7
America	23	8.5
Oceania	3	1.1
Working Experience in Cancer Care (in years)		
Less than one year	7	2.6
1–2	15	5.5
3–5	33	12.2
6–10	41	15.1
11–15	42	15.5
>15	133	49.1
Current Position		
Cancer Nurse	188	69.4
Oncologist (e.g. medical. radiation. surgical)	41	5.1
Pharmacist	6	2.2
Psychologists	3	1.1
Clinical Dietitian	4	1.5
Administrative	8	3.0
Research/Academic	14	5.2
Other (Physiologists. Radiologist Technologists.	7	2.6
Work setting		
Chemotherapy Day Care	53	19.6
Radiation Oncology	23	8.5
Oncology Inpatient Ward	85	31.4
Home care	9	3.3
Outpatient Clinic	43	15.9
Haematology Department	12	4.4
Academic/Education/research	26	9.6
Palliative Care	8	3.0
Pharmaceutical Care	5	1.8
Administrative	3	1.1
Other	4	1.5

Frequencies of categorical variables were estimated accordingly.

social support 6.81 (SD 3.78). The overall Resilience score was 69.48 (SD 12.4) with personal competence.

Table 3 shows that the statistically significance mean of emotional exhaustion was higher among females (27.25, SD 11.03) than men (22.89, SD 11.34). There are no statistically significant differences between the mean of emotional exhaustion and personal accomplishment according to the age. Older participants had lower depersonalization score. The personal accomplishment mean scores were similar among different age groups (*p* value = 0.466).

3.3. Sum of overall resilience and dimensions by sociodemographic characteristics

Female health care professionals had statistically significant positive acceptance with 14.72 (SD 2.94) in comparison with male participants (*p*-value = 0.047). There was no statistical significance with regards of the overall Resilience score, Tolerance of negative affect and Spiritual influence. Similarly, no statistically significant results were found with

Table 2
Descriptive Characteristics of Burnout, COPE and Resilience scales.

	Mean (S.D.)	%	Median (IQR)	Kurtosis	Skewness	95% CI
Burnout						
Overall	64.86 (17.15)	100	63.00	-0.183	0.086	62.81–66.92
Domains/Dimensions						
Emotional Exhaustion (9 items)	26.50 (11.19)	40,8	27.00 (17.00)	-0.698	-0.066	25.16–27.83
Depersonalization (5 items)	7.01 (5.60)	10,8	6.00 (8.00)	0.046	0.765	6.34–7.69
Personal Accomplishment (8 items)	32.26 (8.95)	49.7	35.00 (13.00)	-0.287	-0.468	32.19–34.33
COPE						
Overall	31.72 (12.39)		32.00 (17.00)	0.006	-0.012	30.23–33.20
Domains/Dimensions						
Self-sufficient (problem and emotional focused)	17.24 (6.89)		17.00 (9.00)	-0.178	0.071	16.41–18.06
Avoidance -Cope	7.67 (4.95)		7.00 (7.00)	-0.171	0.607	7.08–8.26
Social Support	6.81 (3.78)		6.00 (6.00)	-0.234	0.411	6.36–7.26
Resilience						
Overall	69.48 (12.40)		70.00 (15.00)	-0.105	-0.267	68.00–70.97
Domains/Dimensions						
Personal Competence. high standards. tenacity	23.27 (4.74)		23.00 (5.00)	-0.042	-0.254	22.70–23.84
Tolerance of negative affect. strengthening effects of stress. trust one's instincts	18.88 (3.69)		19.00 (17.00)	-0.483	-0.077	18.44–19.32
Positive acceptance of change and secure relationships	14.55 (2.99)		15.00 (4.00)	0.371	-0.431	14.20–14.91
Control	8.64 (1.90)		9.00 (2.00)	0.210	-0.440	8.42–8.88
Spiritual influence	4.13 (2.12)		4.00 (3.00)	-0.126	-0.743	3.88–4.39

2327 (SD 4.74), tolerance of negative affect 18.88 (SD 3.69), positive acceptance of change and secure relationships 14.55 (SD 2.99), control 8.64 (SD 1.9) and spiritual influence 4.13 (SD 2.12).

Overall, Sum of Burnout and its Dimensions by Sociodemographic characteristics.

regards of age, work setting and region. Participants with less than one year of work experience had the highest Personal Competence score and those with one to two years of work experience had the lowest score. The difference was statistically significant. Similar were the results for Control. Cancer nurses had higher Positive Acceptance of change score than Oncologists and followed by the other health care professionals ($p = 0.055$) (Table 4).

Table 5 shows the correlations between burnout overall score and dimensions with resilience and COPE. COPE' dimensions were positively and strongly correlated with burnout overall score. Strong correlations were also found between the avoidance cope dimension and the emotional exhaustion and depersonalization. The burnout overall score was negatively correlated with the resilience score ($p = -0.126$).

Table 6 summarizes the results of the regression analysis of the three scales. Multifactorial analyses showed that avoidant coping dimension had significant association on burnout overall score. Burnout is associated with three dimensions of COPE, specifically for every 1 unit increase of avoidant coping there is an increase of burnout by 0.768. The association was statistically significant (p -value = 0.001). On the contrary, there was a reduction of burnout by -0.136 for unit increase of resilience. A positive association was found between social support and burnout, suggesting that there was a lack of support due to the unprecedented condition of SARS-CoV-2 pandemic (b -coefficient = 0.887). Similar to social support were the findings of the association between self-efficient and overall burnout score. A negative association was found between resilience and emotional exhaustion (coefficient = -0.161 ; p -value = 0.002). Contrary, emotional exhaustion was found to be positively associated with avoidant coping and social support. Association was found to be statistically significant for both avoidant coping and social support (p -value < 0.001, 0.040). No association was found between self-sufficiency and emotional exhaustion. Only avoidant coping was found to be positively associated with depersonalization. For every unit of increase of avoidant coping, there was an increase in depersonalization by 0.482 (p -value < 0.001). Self-sufficient and resilience were negatively associated with depersonalization (coefficient = -0.142 , p -value = 0.024; coefficient = -0.069 , p -value < 0.001, respectively). No statistically significant association was found between social support and depersonalization (p -value = 0.705). Personal accomplishment was positively associated with resilience, with coefficient = 0.170 (p -value < 0.001). Similarly, with every unit of increase of self-efficiency, there was an increase of personal accomplishment by

0.577 (p -value < 0.001). Avoidant coping was negatively associated with personal accomplishment with coefficient = -0.473 , (p -value < 0.001). The social support did not predict all the dimensions of burnout (depersonalization, $p = 0.705$ and personal accomplishment, $p = 0.066$) and (2) resilience in overall did not predict burnout in overall ($p = 0.093$) (see Table 7).

The analysis was repeated for the professional group of nurses. However, no significant differences can be observed with the findings derived from analyses for all professionals. An attenuation in all effect sizes was observed. This observation was a result of the analyses that carried out.

No statistically significant differences were found in mean scores of the three COPE' dimensions by sociodemographic characteristics, with only minor exceptions. A statistically significant association was found between avoidant coping and age. Higher age was correlated with lower mean scores for avoidant coping. Health care professionals with a working experience up to ten years had higher avoidant coping scores than those with more than 11 years of working experience.

4. Discussion

The SARS-CoV-2 pandemic has imposed unprecedented challenges to the many already existing ones on health care systems worldwide and health care professionals have to maintain patient care while facing personal risks. Although due to the SARS-CoV-2 outbreak several studies were undertaken in an effort to record the possible effect on the healthcare professionals, to the best of our knowledge this is the first one that explores the topic in the cancer care workforce. Whilst existing studies have explored the topic within the professionals' well-being and burnout context the current study acknowledges the complexity of the effect thus exploring the concepts of burnout, coping and resilience. It also takes into consideration the effect of the pandemic in a truly multi-professional context whilst previous studies emphasized primary on oncologist or radiologists and nurses separately.

The study was undertaken during the time that many countries around the world were experiencing what has been considered as the "third wave" of the pandemic. The findings showed that cancer care professionals experienced significant levels of burnout, diminished coping abilities and reduced resilience. In the context of burnout, these results coincide to those reported from various different regions in either National or International studies. For example, in a digital survey of 188

Table 3
Overall Sum of Burnout and its Dimensions by Sociodemographic characteristics.

	N (%)	Overall		Emotional Exhaustion		Depersonalization		Personal Accomplishment	
		Mean (SD)	P value	Mean (SD)	P value	Mean (SD)	P value	Mean (SD)	P value
Gender									
Female	224	65.60 (17.01)	0.119	27.25 (11.03)	0.015	6.84 (5.55)	0.249	433.51 (8.90)	0.326
Males	47	61.32 (17.57)		22.89 (11.34)		7.8 (5.82)		32.06 (9.16)	
Age (in years)									
18–29	29	64.69 (17.60)	0.264	25.97 (10.47)	0.139	8.41 (5.60)	0.021	32.41 (7.82)	0.466
30–39	66	66.97 (18.44)		28.97 (11.14)		8.15 (5.60)		31.77 (8.51)	
40–49	81	64.47 (17.09)		25.19 (11.63)		6.75 (5.77)		34.30 (8.78)	
50–59	78	65.40 (15.78)		26.87 (10.83)		6.54 (5.55)		33.86 (9.28)	
60 or older	17	65.41 (16.89)		22.00 (10.95)		3.65 (3.28)		32.77 (11.50)	
Education									
Diploma	34	66.41 (16.05)	0.464	26.09 (10.35)	0.478	6.06 (5.37)	0.729	36.47 (8.16)	0.033
Bachelor	81	66.40 (19.10)		27.41 (12.93)		7.58 (6.21)		33.11 (8.94)	
Specialization	6	39.83 (18.00)		25.67 (14.68)		6.83 (7.25)		40.50 (3.89)	
Master	92	64.69 (15.39)		27.33 (9.68)		6.77 (5.21)		32.72 (8.39)	
Doctorate	58	61.55 (17.54)		24.22 (10.95)		7.19 (5.37)		31.71 (10.00)	
Working Experience in Cancer Care (in years)									
Less than one year	7	57.29 (16.63)	0.800	21.71 (12.82)	0.423	6.86 (4.45)	0.126	31.57 (8.08)	0.076
1–2	15	63.60 (23.55)		26.20 (13.72)		9.60 (6.24)		29.60 (7.79)	
3–5	33	66.64 (18.18)		27.30 (9.55)		8.18 (6.29)		41.64 (8.00)	
6–10	41	65.54(17.20)		29.00 (10.76)		7.63 (5.30)		33.64(8.77)	
11–15	42	66.40 (17.27)		27.52 (11.90)		7.38 (5.20)		30.21 (9.25)	
>15	133	64.27 (19.77)		25.48 (11.06)		6.14 (5.54)		34.39 (9.11)	
Current Position									
Cancer Nurse	188	64.47 (15.98)	0.068	26.16 (10.61)	0.074	6.80 (5.41)	0.016	33.68 (9.05)	0.833
Oncologist (e.g. medical, Radiation, surgical)	41	70.12 (22.10)		28.95 (13.91)		9.66 (6.58)		32.68 (9.61)	
Pharmacist	6	60.00 (21.42)		24.50 (14.79)		6.17 (3.31)		30.67 (7.97)	
Psychologists	3	60.33 (11.59)		27.00 (9.85)		6.00 (6.56)		28.67(9.71)	
Clinical Dietitian	4	65.75 (11.70)		30.75 (9.46)		6.75 (4.65)		29.00 (6.06)	
Administrative	8	71.63(13.77)		32.87 (11.09)		4.50 (3.34)		35.25 (7.03)	
Research/Academic	14	52.64 (14.02)		18.57 (7.45)		3.57 (4.48)		32.29 (8.54)	
Other (Physiologists, Radiologist, Technologists etc.)	7	66.71 (15.63)		28.71 (6.50)		8.43(5.74)		31.71 (8.36)	
Work setting									
Chemotherapy Day Care	53	65.28 (17.06)	0.335	26.32 (10.93)	0.251	7.83 (5.73)	0.005	32.98 (9.26)	0.459
Radiation Oncology	23	74.04 (21.36)		32.43 (11.87)		11.00 (6.26)		31.65 (9.16)	
Oncology Inpatient Ward	85	64.59 (14.60)		27.01 (10.20)		6.66 (4.92)		33.25 (7.83)	
Home care	9	66.44 (18.88)		26.00 (11.15)		6.78 (6.38)		36.78 (13.90)	
Outpatient Clinic	43	64.11 (18.24)		24.81 (13.03)		5.70 (5.85)		35.23 (9.37)	
Haematology Department	12	62.00 (23.86)		24.58 (12.31)		9.25 (6.41)		29.50 (11.40)	
Academic/Education/research	26	61.12 (16.21)		24.27 (10.14)		5.07 (4.91)		33.50 (7.97)	
Palliative Care	8	60.25 (14.18)		22.63 (10.49)		5.00 (5.20)		34.50 (7.48)	
Other (administrative, pharmaceutical care)	12	62.92 (15.77)		27.91 (10.95)		6.50 (4.17)		30.42 (9.05)	
Region									
Europe	235	64.86 (16.98)	0.492	26.48 (10.99)	0.098	7.05 (5.47)	0.744	33.20 (8.74)	0.404
Asia	8	57.25 (16.24)		19.00 (11.39)		5.00 (6.72)		36.75 (9.29)	
Africa	2	80.50 (9.19)		39.50 (6.36)		4.00 (5.66)		39.50 (6.36)	
America	23	66.35 (17.91)		28.78 (11.91)		7.70 (6.68)		31.52 (10.61)	
Oceania	3	63.67 (31.66)		21.67 (16.07)		6.67 (6.42)		38.33 (11.72)	

p-values as estimated using independent *t*-test or ANOVA test for continuous variables, as appropriate.

medical oncologists from 16 cities in Argentina, the 14.9% of the sample fulfilled the burnout Maslach criteria (Guercovich et al., 2021). Furthermore, 25% (43) of subjects reported high levels of DP, 39.9% (75) reported high levels of EE and 53.7% (101) reported low levels of PA. Aiming at exploring the well-being in oncology healthcare professionals over time since SARS-COV-2, two international surveys were launched by the ESMO (Banerjee et al., 2021). Responses from survey I (1520 participants from 101 countries) indicate that SARS-COV-2 is effecting oncology professionals; in particular, 25% of participants indicated being at risk of distress (poor well-being, eWBI ≥ 4), 38% reported feeling burnout, and 66% reported not being able to perform their job compared with the pre-SARS-COV-2 period. Higher job performance since SARS-COV-2 (JP-CV) was associated with better well-being and not feeling burnout ($P < 0.01$). In the second survey which included 272 participants who completed both surveys, while JP-CV improved (38% versus 54%, $P < 0.001$), eWBI scores ≥ 4 and burnout rates were significantly higher compared with survey I (22% versus 31%, $P = 0.01$; and 35% versus 49%, $P = 0.001$, respectively), suggesting well-being and burnout have worsened over a 3-month period during the SARS-COV-2 pandemic.

In the context of coping, the findings can be related to those reported in the wider healthcare context and not necessarily specific to the cancer care context. For example, Babore et al. in an Italian study of 595 healthcare professionals aimed to explore the effect of the SARS-CoV-2 pandemic on their perceived stress (PSS) and coping strategies (COPE-NVI-25) (Babore et al., 2020). The findings demonstrated that a positive attitude towards the stressful situation was considered as the main protective factor. On the contrary, the findings showed that being a female, seeking social support, avoidance strategies and working with SARS-COV-2 patients were considered as risk factors. Furthermore, in a French cross-sectional survey by Laurent et al. that included 77 French hospitals, the researchers explored the effect of the SARS-CoV-2 pandemic on the ICU frontline healthcare workers (Laurent et al., 2021). Aspects that were investigated included the mental health, pandemic-related sources of stress as well as coping strategies employed by the health professionals. With regards to the coping strategies employed by the healthcare professionals across zones of epidemic intensity, the findings showed that healthcare professionals more frequently employed the avoidance coping strategy in zones with high epidemic intensity, as compared to low-intensity zones. Furthermore,

Table 4
Sum of overall resilience and dimensions by sociodemographic characteristics.

	N (%)	Overall		Personal Competence. high standards. tenacity		Tolerance of negative affect. strengthening effects of stress. trust ones instincts		Positive acceptance of change and secure relationships		Control		Spiritual influence	
		Mean (SD)	P value	Mean (SD)	P value	Mean (SD)	P value	Mean (SD)	P value	Mean (SD)	P value	Mean (SD)	P value
Gender													
Female	224	69.93 (12.21)	0.193	23.46 (4.64)	0.149	18.88 (3.69)	0.975	14.72 (2.94)	0.047	8.75 (1.90)	0.069	4.13 (2.21)	0.985
Male	47	67.34 (13.19)		23.36 (5.17)		18.90 (3.77)		13.77 (3.12)		8.19 (1.88)		4.13 (1.57)	
Age (in years)													
18–29	29	66.79 (11.47)	0.414	22.24 (4.97)	0.360	17.93 (3.09)	0.344	14.41 (3.01)	0.935	8.41 (2.04)	0.287	3.79 (1.84)	0.750
30–39	66	67.97 (12.04)		22.74 (4.37)		18.41 (3.82)		14.35 (3.28)		8.33 (1.83)		4.14 (2.06)	
40–49	81	70.57 (12.83)		23.75 (5.02)		19.26 (3.58)		14.53 (3.28)		8.98 (1.94)		4.05 (2.27)	
50–59	78	70.82 (12.53)		23.77 (4.68)		19.22 (3.84)		14.74 (2.94)		8.72 (1.81)		4.37 (2.18)	
60 or older	17	68.65 (12.59)		22.47 (4.62)		18.94 (3.91)		14.82 (2.67)		8.41 (2.09)		4.00 (1.70)	
Education													
Diploma	34	68.44 (12.81)	0.138	22.29 (5.14)		19.00 (3.58)	0.306	13.91 (3.04)	0.194	8.85 (1.78)	0.473	4.38 (1.83)	0.014
Bachelor	81	67.44 (12.20)		22.74 (4.59)	0.204	18.19 (3.75)		14.50 (3.12)		8.49 (1.94)		3.53 (2.23)	
Specialization	6	78.33 (6.12)		26.33 (2.94)		20.17 (1.17)		16.67 (1.37)		9.83 (1.17)		5.33 (1.97)	
Master	92	71.04 (10.87)		23.64 (4.28)		19.29 (3.44)		14.87 (2.51)		8.71 (1.72)		4.53 (2.16)	
Doctorate	58	69.55 (14.61)		23.67 (5.41)		18.98 (4.16)		14.29 (3.49)		8.54 (2.23)		4.07 (1.87)	
Working Experience in Cancer Care (in years)													
Less than one year	7	72.86 (9.69)	0.029	25.57 (3.50)	0.018	19.00 (2.77)	0.197	14.86 (3.02)	0.129	9.86 (1.77)	0.011	3.57 (2.07)	0.096
1–2	15	63.13 (9.01)		20.53 (3.94)		17.07 (2.84)		13.53 (3.09)		7.87 (1.76)		4.13 (1.96)	
3–5	33	66.94 (10.38)		22.09 (4.37)		18.70 (3.27)		14.37 (2.99)		8.15 (1.52)		3.64 (1.85)	
6–10	41	66.56 (13.59)		22.44 (5.12)		18.24 (3.88)		13.59 (3.24)		8.07 (2.04)		4.22 (2.21)	
11–15	42	69.07 (12.79)		23.14 (4.53)		18.71 (4.31)		14.95 (2.52)		8.76 (1.75)		3.50 (2.19)	
>15	133	71.68 (12.42)		24.05 (4.75)		19.37 (3.61)		14.87 (2.99)		8.94 (1.94)		4.46 (2.11)	
Current Position													
Cancer Nurse	188	70.47 (11.58)	0.187	23.38 (4.49)	0.216	19.15 (3.59)	0.221	14.92 (2.78)	0.055	8.81 (1.85)	0.103	4.21 (2.15)	0.879
Oncologist (e.g. medical. radiation. surgical)	41	65.37 (15.25)		21.73 (5.63)		18.17 (4.26)		13.59 (3.61)		7.98 (2.16)		3.90 (2.04)	
Pharmacist	6	66.00 (8.63)		22.67 (4.13)		17.33 (3.56)		13.33 (1.63)		7.83 (1.72)		4.83 (2.14)	
Psychologists	3	65.67 (4.73)		24.00 (2.65)		17.33 (1.53)		12.33 (2.52)		8.00 (0.00)		4.00 (1.00)	
Clinical Dietitian	4	59.50 (15.29)		21.25 (7.23)		15.00 (2.71)		12.00 (2.45)		7.25 (2.36)		4.00 (3.16)	
Administrative	8	70.75 (12.12)		24.75 (5.31)		19.75 (2.91)		13.75 (2.12)		8.50 (2.20)		4.00 (1.85)	
Research/Academic	14	70.71 (14.95)		25.14 (4.69)		18.50 (4.15)		14.36 (4.05)		9.29 (1.82)		3.43 (1.99)	
Other (Physiologists. Radiologist Technologists etc.)	7	73.43 (12.40)		25.29 (3.55)		19.71 (2.75)		15.29 (2.50)		8.86 (0.69)		4.29 (2.21)	
Work setting													
Chemotherapy Day Care	53	68.53 (10.85)	0.859	22.91 (4.03)	0.285	18.53 (3.49)	0.993	14.32 (2.56)	0.596	8.53 (1.94)	0.863	4.25 (1.94)	0.234
Radiation Oncology	23	66.74 (11.38)		22.87 (4.63)		18.78 (3.88)		13.48 (2.78)		8.35 (1.61)		3.26 (2.64)	
Oncology Inpatient Ward	85	69.19 (13.31)		22.42 (4.88)		18.99 (3.88)		14.68 (3.26)		8.64 (1.96)		4.44 (2.10)	
Home care	9	74.44 (11.91)		25.56 (3.91)		19.67 (2.74)		15.11 (3.52)		9.11 (1.76)		5.00 (2.45)	
Outpatient Clinic	43												

(continued on next page)

Table 4 (continued)

	N (%)	Overall		Personal Competence. high standards. tenacity		Tolerance of negative affect. strengthening effects of stress. trust ones instincts		Positive acceptance of change and secure relationships		Control		Spiritual influence	
		Mean (SD)	P value	Mean (SD)	P value	Mean (SD)	P value	Mean (SD)	P value	Mean (SD)	P value	Mean (SD)	P value
Haematology Department	12	71.12 (15.86)		23.81 (5.96)		18.84 (4.21)		14.91 (3.72)		8.91 (2.29)		3.65 (2.19)	
Academic/Education/research	26	69.00 (9.02)		23.33 (3.94)		19.42 (3.55)		14.17 (1.75)		8.00 (1.41)		4.08 (2.02)	
Palliative Care	8	71.81 (10.92)		25.00 (4.19)		18.96 (3.53)		15.08 (2.56)		8.85 (1.78)		3.92 (1.81)	
Palliative Care	8	70.25 (5.06)		23.25 (2.96)		18.25 (2.49)		15.25 (1.75)		8.88 (1.36)		4.63 (2.07)	
Other (administrative. pharmaceutical care)	12	70.00 (10.83)		24.17 (4.86)		19.08 (3.50)		13.83 (2.21)		8.50 (1.68)		4.42 (1.78)	
Region													
Europe	235	68.94 (12.14)	0.278	23.10 (4.67)	0.323	18.86 (3.71)	0.887	14.45 (2.87)	0.145	8.56 (1.88)	0.236	3.98 (2.06)	<0.001
Asia	8	75.25 (12.96)		24.50 (4.38)		18.63 (2.72)		15.88 (2.90)		9.50 (2.20)		6.75 (1.58)	
Africa	2	73.00 (16.97)		24.00 (7.07)		18.00 (4.24)		14.00 (2.83)		9.00 (2.83)		8.00 (0.00)	
America	23	71.26 (14.06)		23.87 (5.26)		18.96 (3.98)		14.74 (4.01)		9.04 (1.87)		4.65 (1.90)	
Oceania	3	80.33 (14.22)		28.33 (5.51)		21.00 (3.46)		18.33 (2.08)		10.33 (1.53)		2.33 (2.08)	

Correlation between burnout, overall and dimensions, with resilience and cope.

Table 5

Correlations between burnout, overall and dimensions, with resilience and cope.

	Resilience	Self-Sufficient	Avoidance cope	Social support
Burnout –overall	-0.126*	0.316¥	0.388¥	0.398¥
Emotional Exhaustion	-0.246¥	0.202**	0.443**	0.338**
Personal Accomplishment	0.376¥	0.390**	-0.169**	0.150
Depersonalization	-0.294¥	-0.018	0.443**	0.217**

¥p-value < 0.001; *p-value = 0.038; **p-value<0.01 Pearson statistical analysis was conducted for the assessment of the correlation of burnout and its dimensions with resilience and cope.

Multiple Linear Regression Analysis of Burnout Scale, overall and dimensions, on Resilience, and COPE scale.

there was a positive correlation between the general health of the healthcare professionals and each of the following coping strategies: social support, problem solving, and avoidance. In the context of resilience of healthcare professionals, the findings also support those of earlier studies. For example, in a French study, Douillet et al. assessed the level of resilience demonstrated by physicians and identified the factors that improved or decreased the resilience levels during the SARS-CoV-2 pandemic (Douillet et al., 2021). The researchers found that the median total resilience score was 69 points, but the range was wide, spanning from 38 to 97 points. Factors associated with higher resilience scores were anesthesia as a specialty, parenthood, no previous history of anxiety or depression and nor increased anxiety. In another study in Indonesia, Setiawati et al. aimed to determine the level of resilience and anxiety in healthcare workers and explore any correlations between the level of resilience and anxiety. 227 respondents filled out the questionnaire online with 33% of them having high state anxiety and 26.9% had high trait anxiety (Setiawati et al., 2021). The mean score of the respondents' resilience was 69 ± 15.823. A significant relationship between anxiety and resilience was found based on the Spearman test.

As demonstrated by the findings of this study, statistically significant correlations were found between burnout, resilience, and coping.

Explicitly, burnout and resilience were negatively correlated with higher burnout levels contributing to lower resilience. West et al. in a cross-sectional survey evaluated resilience among physicians and US workers and determined the association between resilience and burnout among US physician (West et al., 2020). A total of 5445 US physicians and a probability-based sample of 5198 individuals in the US working population participated in this cross-sectional national survey. Physicians without overall burnout had higher mean (SD) resilience scores than physicians with burnout (6.82 [1.15] vs 6.13 [1.36]; adjusted mean difference, 0.68 points, 95% CI, 0.61–0.76; P < 0.001). Each 1-point increase in resilience score was associated with 36% lower odds of overall burnout (odds ratio, 0.64; 95% CI, 0.60–0.67; P < 0.001).

The findings of this study also demonstrated that coping was positively and strongly correlated with the burnout overall score. AlJhani et al. in a descriptive cross-sectional study aimed to estimate the frequency and level of burnout and its association with coping strategies among physicians and nurses in Saudi Arabia during the SARS-CoV-2 Pandemic (AlJhani et al., 2021). The personal burnout dimension had inverse correlations with the overall adaptive coping category (r = -0.116; p = 0.020) and the instrumental support (r = -0.116; p = 0.020), emotional support (r = -0.099; p = 0.047) and positive reframing (r = -0.100; p = 0.045) subscales, respectively. Work-related burnout had negative correlations with the overall adaptive coping category (r = -0.113; p = 0.023) and the emotional support (r = -0.109; p = 0.029), active coping (r = -0.196; p < 0.001), self-distraction (r = -0.110; p = 0.027) and positive reframing (r = -0.099; p = 0.048) subscales, respectively.

4.1. Strengths and limitations of this study

The study results should be read taking into consideration of some limitations. Despite the multinational sampling frame, respondents from certain regions (e.g. Africa) were under-represented in the sample most likely due to language barriers, and limited access to the internet for survey completion. At the same time, we speculate that since the SARS-CoV-2 pandemic has affected different countries at different times, those regions might have experienced a more severe effect at the time of the survey preventing them from taking part. Here lies perhaps the

Table 6
Multiple Linear Regression Analysis of Burnout Scale, overall and dimensions, on Resilience and Cope Scales.

	Unadjusted Coeff	SE	t	P	95% CI	R Square	Adjusted R Squared
Burnout Overall							
Self-Sufficient	0.401	0.171	2.350	0.019	0.065, 0.737	0.227	0.215
Avoidant –Coping	0.768	0.225	3.410	0.001	0.325, 1.212		
Social Support	0.887	0.323	2.676	0.008	0.235, 1.541		
Resilience	−0.136	0.081	−1.684	0.093	−0.296, 0.023		
Emotional exhaustion							
Self-Sufficient	0.110	0.110	0.998	0.339	−0.107, 0.327	0.243	0.231
Avoidant –Coping	0.687	0.145	4.723	<0.001	0.401, 0.974		
Social Support	0.442	0.214	2.065	0.040	0.021, 0.863		
Resilience	−0.161	0.052	−3.080	0.002	−0.264, −0.058		
Depersonalization							
Self-Sufficient	−0.142	0.062	−2.266	0.024	−0.265, −0.019	0.246	0.235
Avoidant –Coping	0.482	0.073	6.641	<0.001	0.339, 0.625		
Social Support	0.041	0.107	0.379	0.705	−0.170, 0.252		
Resilience	−0.069	0.026	−2.669	<0.001	−0.184, −0.083		
Personal Accomplishment							
Self-Sufficient	0.577	0.094	6.126	<0.001	0.392, 0.763	0.328	0.318
Avoidant –Coping	−0.473	0.109	−4.326	<0.001	−0.689, −0.258		
Social Support	0.298	0.162	1.844	0.066	−0.020, 0.616		
Resilience	0.170	0.039	4.352	<0.001	0.190, 0.349		

Table 7
Multiple Linear Regression Analysis of Burnout Scale, overall and dimensions, on Resilience and Cope Scales among nurses.

	Unadjusted Coeff	SE	t	P	95% CI	R Square	Adjusted R Squared
Burnout Overall							
Self-Sufficient	0.412	0.222	1.857	0.065	−0.026, 0.849	0.197	0.180
Avoidant –Coping	0.530	0.266	1.996	0.047	0.006, 1.055		
Social Support	0.924	0.396	2.331	0.021	0.142, 1.706		
Resilience	−0.160	0.099	−1.627	0.105	−0.355, 0.034		
Emotional exhaustion							
Self-Sufficient	0.005	0.145	0.032	0.975	−0.281, 0.290	0.226	0.209
Avoidant –Coping	0.656	0.173	3.784	<0.001	0.314, 0.998		
Social Support	0.471	0.259	1.822	0.070	−0.039, 0.981		
Resilience	−0.162	0.064	−2.525	0.012	−0.289, −0.035		
Depersonalization							
Self-Sufficient	−0.185	0.077	−2.408	0.017	−0.336, −0.033	0.162	0.143
Avoidant –Coping	0.378	0.092	4.117	<0.001	0.197, 0.560		
Social Support	0.093	0.137	0.676	0.500	−0.178, 0.363		
Resilience	−0.042	0.034	−1.238	0.217	−0.110, −0.025		
Personal Accomplishment							
Self-Sufficient	0.672	0.115	5.856	<0.001	0.445, 0.898	0.330	0.315
Avoidant –Coping	−0.542	0.138	−3.937	<0.001	−0.813, −0.270		
Social Support	0.265	0.205	1.292	0.198	−0.140, 0.670		
Resilience	0.129	0.051	2.524	0.012	0.028, 0.229		

Sum of COPE scale, overall and by dimension, by sociodemographic characteristics.

relatively small sample size despite this being a multinational survey. Regardless of these limitations, this study is the first to provide preliminary insights about the possible effect of the SARS-COV-2 on coping, burnout and resilience levels of the cancer care professionals at a global level.

5. Conclusion

The study of the association between resilience, coping and burnout has not received appropriate attention within the context of Oncology

Health Care Professionals during the SARS-COV-2 pandemic. Exploring these variables contributes to the increased understanding of cancer care professionals' experiences during the pandemic. This is essential to enable evidence-driven decisions on how best to help the cancer care workforce. The results demonstrate that burnout, coping and resilience are interrelated variables in the context of the healthcare workforce. Therefore, supporting the oncology workforce is meaningful when those supportive measures are directed to include all these three variables and not independently and in isolation. The study's findings will be critical to inform research agenda, build capacity, and shape implementation

efforts towards appropriately and timely preparing the cancer care professionals for current and future healthcare emergencies.

CRedit authorship contribution statement

Constantina Cloconi: Writing – original draft. **Mary Economou:** Formal analysis, Writing – original draft. **Andreas Charalambous:** Conceptualization, Supervision, Writing – original draft.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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