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Health Risk Factors in Caregivers of Terminal Cancer Patients

A Pilot Study

KEY WORDS
Affective symptoms
Cancer
Caregivers
Emotional stress
Health status indicators
Physiological stress
Terminal care

Background: A large body of literature sustains the association between long-lasting caregiving for impaired significant others and increased health risk. Depression, elevated heart rate, and blood pressure at rest are key measures of health risk, mostly cardiovascular, which have been generally studied in caregivers of patients affected by dementia or chronic illness. Limited research has been conducted on emotional and cardiovascular impact of family caregiving for terminally ill cancer patients. **Objective:** The aim of the present study was to examine psychological and cardiovascular responses in terminal cancer caregivers. **Methods:** Twenty relative caregivers who provided in-home or hospice care to terminally ill cancer patients and 20 age- and gender-matched controls were interviewed and assessed for emotional distress. Measures of cardiovascular risk, blood pressure, and heart rate were recorded at rest in 4 separate sessions. **Results:** Caregivers reported higher levels of depression, state anxiety, and more sleep dysfunctions than controls. They also revealed heightened systolic and diastolic blood pressure in some measurements. Moreover, elevation of heart rate was associated with caregiving length. **Conclusions:** The caregiving stressor is associated with considerable psychological vulnerability, sleep disorders, and risk of alterations in the cardiovascular system, which seem to be modulated by caregiving characteristics. **Implications for Practice:** This study shows the importance of screening caregivers for psychological as well as physical symptoms and disorders. An awareness of burden of terminal cancer caregivers could lead to timely proactive preventive interventions on their physical and mental health, to decrease negative outcomes.

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The role of the caregiver, which has always been recognized as a socioeconomic value to society, will be even more important in the future because the elderly population and prevalence of chronic illness are growing.[1] Given the critical functions that caregivers perform, both government agencies and researchers have been concerned with understanding and preventing caregiving health consequences, based on the assumption that negative responses to caregiving may interfere with the caregiver's ability to provide care or to care for himself/herself.

The stress process model by Pearlin and coworkers[2] and its applications to the context of cancer[3–5] and end-of-life care[6–8] indicate that the core variables in caregiving are primary stressors (eg, caregiving demands) that can proliferate in secondary ones (eg, interpersonal relationship issues, social functioning). Psychological and physical outcomes are modulated not only by caregiver's resources and socioemotional support, but also by contextual variables related to the caregiver (eg, age, education, employment status, health status) and to the patient (eg, stage of cancer, course of illness, and symptoms). Caregivers are commonly family members who undertake the majority of the assistance. Therefore, levels of family cohesion, patient's and family adjustment, and emotional and practical support by relatives influence the family caregiving process.[9]

Caregiving is regarded as a chronically stressful process with potentially negative psychological and physical consequences. Most research concerns caregiving provided by family members of elderly or dementia patients.[10,11] With respect to the psychological outcomes, reviews and meta-analysis reveal increased psychiatric disorders, mostly anxiety disorders and depression, in caregivers than controls.[12–14] Moreover, compared with the general population, caregivers are more likely to access mental health services and to receive psychopharmacological treatments.[14,15] Caregiving is also considered a risk factor for physical health, because it may set forth a cascade of stress responses through activation of the hypothalamic-pituitary-adrenal axis and the sympathetic adrenomedullary axis, involving humoral, immunologic, cardiovascular, and metabolic alterations.[16,17] Caregiving strain has been reported as an independent risk factor for mortality among elderly spousal caregivers.[18] Moreover, a large amount of literature shows an increased risk of coronary heart disease in caregivers of demented patients compared with noncaregivers.[17,19] As regards the cardiovascular risk factors, caregivers, mostly when elderly, show higher systolic blood pressure (SBP) and increased risk for hypertension over time, compared with noncaregivers.[20–22] Risk of cardiovascular alterations can be associated with sleep disorders[23,24] and can be modulated by the caregiver's emotional state, quality of the relationship between caregiver and care recipient, care demands, and perceived social support.[25,26] Hypertensive caregivers also express exaggerated cardiovascular reactivity (blood pressure [BP] and heart rate [HR]) to acute stressors.[27]

Compared with other caregiving contexts (eg, caring for patients with progressive neurological disorders), the framework of cancer caregiving presents distinctive characteristics: caregivers are usually younger and provide care during shorter periods and for younger patients who often show specific symptoms (eg, pain or vomiting).[6,28] Caring for a dying patient creates considerable stress in the life of caregivers, affecting emotional, physical, social, and financial areas. Moreover, in the terminal phase, caregivers are faced with the dual challenges of providing care for the patient and dealing with anticipatory grief. These concerns are well recognized by health organizations that consider patients and families as a unit of care and offer them a support system during the patient's sickness and bereavement.[29] Thus, palliative care also includes psychological support to relatives during bereavement, which is a further stressor that involves physical and mental health consequences.[30–32]

Reviews on cancer caregiving describe increased anxiety, depressive and psychosomatic symptoms, particularly during the late stages of cancer.[33–38] It has been reported that 13% of caregivers of patients with advanced cancer meet the criteria for a psychiatric disorder, and 25% of them access treatment for mental health.[39] Moreover, approximately 40% of significant others of patients dying of lung cancer show symptoms of strain (depression, burden, and decrease in quality of life).[40] Family members involved in caregiving with a strong impact on daily activities often report fatigue and exhaustion associated with cognitive dysfunctions and physical impairments.[41,42]

Unfortunately, only a few studies with caregivers of terminally ill cancer patients have included control groups: Karlin and Retzlaff[43] and Chentsova-Dutton and coworkers[28] showed that caregivers of terminally ill cancer patients have higher levels of anxiety, depression, anger and psychosomatic symptoms than controls. Literature on physical health consequences in caregivers of terminally ill cancer patients is also very limited. Chentsova-Dutton and coworkers[28] reported a higher number of nonpsychiatric hospitalizations in the last year, in caregivers than in controls. Moreover, despite the previously mentioned literature on other forms of caregiving, the association between emotional distress and cardiovascular changes has received no attention in research on caregivers of terminally ill cancer patients. In a single study, these indices have been assessed at the early stage of cancer, and results showed an increased sympathetic cardiac control.[44]

The present study was aimed at analyzing psychological and physical concerns in caregivers of terminally ill cancer patients compared with age- and gender-matched controls. Moreover, unique features of our design include the comparison of both physical health functioning (particularly cardiovascular variables) and emotional distress. Psychological variables (depression and mood disorders, anxiety, and anger) were analyzed. These affective states have also been associated with physical health problems, particularly cardiovascular risk.[45,46] Therefore, BP and HR were measured in rest conditions. A wide literature indicates that resting BP and HR, even if not clinically relevant, are significant precursors of cardiovascular risk.[47–55] Moreover, several studies have suggested a potential association between alterations of these indices and caregiving,[20–22] or depression.[56–58]

We hypothesized the following:

(1) Caregivers would report higher levels of depression, anxiety, anger, and physical concerns than age-matched control subjects.

(2) Caregivers would show higher BP and HR levels than controls. An association between psychological distress, health complaints, and cardiovascular activity was also hypothesized.

(3) Last, a longer caregiving duration was hypothesized to be associated with higher BP and HR and reported distress.

This is a pilot study, part of a longitudinal investigation of the health effects of caregiving and bereavement in the context of palliative care. This article focuses on caregiver adjustment prior to the death of a family member.

■ Methods

Participants

First-grade relative (either spouse or adult children) caregivers of terminally ill cancer patients were recruited for the study from a palliative care domiciliary team and a hospice. Control subjects were age- and gender-matched volunteers recruited into the study among friends and neighbors of the unit staff and who were not involved in health assistance.

The caregiver subjects were included in the study if they had provided care for at least 1 month, at 10 hours per week. The control subjects were excluded if they had experienced the death of a first- or second-degree relative or a spouse and if they had any experience of caregiving. All participants taking cardiovascular medications or having cardiovascular diseases were excluded from the study. Subjects were also excluded if they were younger than 18 years or older than 70 years, or unwilling to sign an informed consent to participate in the study.

Twenty caregivers and 20 control subjects participated in the study. Demographic characteristics of the 2 samples are listed in Table 1. Adequate statistical analyses (*t* test or χ^2 test) performed on sociodemographic variables (ie, educational qualification, marital status, employment status, and cohabitant family members) revealed that caregiver and control groups were similar in many respects. The groups differed only for employment status: 5 caregivers (25%), compared with 13 noncaregivers (65%), were employed ($\chi^2_1 = 14.34$, $P = .046$).

General physical health information, particularly cardiovascular risk factors, was collected by a trained clinical psychologist through a semistructured interview. Caregivers and control subjects did not differ either in number of chronic diseases and troubles in immune system or skin and gastrointestinal problems in the last 6 months. Moreover, cardiovascular risk factors (such as body mass index, smoke, and hypertension familiarity) and drug use were similar in the 2 groups.

Although caregiving concerned the whole family context, all the caregivers in the present study were the primary providers of care. Caregiver group included 13 spouses (65%) and 7 adult children (35%). Care recipients were mainly men (70%), with a mean age of 65 (SD, 9.38) years (range, 52–83 years). They had different primary tumors, and mean time from diagnosis was about 56.43 (SD, 60.71) months. At the time of assessment, patients had a functional status between 30 and 50 score at Karnofsky Performance Status (see Instruments). Palliative care was offered at home (45%), in a hospice (35%), or through both these forms (20%). Caregiving mean duration was 16.39 (SD, 29.10) months, with a wide range (1–132 months). The majority of the caregivers provided assistance for more than 7 h/d (85%).

Table 1 • Demographic Characteristics for Caregivers and Controls

	Group		
Demographic Characteristic	Caregivers (n = 20)	Controls (n = 20)	*P*
Gender, n (%)			
Male	2 (10)	2 (10)	
Female	18 (90)	18 (90)	
Age, mean (SD) (range)	50.1 (12.32) (25–70)	50.55 (12.42) (25–69)	
Educational qualification, n (%)			$\chi^2 = 0.50$, $P = .918$
Less than high school	12 (60)	14 (70)	
High school or more	8 (40)	6 (30)	
Marital status, n (%)			$\chi^2 = 2.20$, $P = .531$
Single	3 (15)	5 (25)	
Married	16 (80)	13 (65)	
Separated/divorced	1 (5)	1 (5)	
Widow/widower	0 (0)	1 (5)	
Employment status, n (%)			$\chi^2 = 14.34$, $P = .046$
Employed	5 (25)	13 (65)	
Retired	5 (25)	3 (15)	
Stopped working because of caregiving	3 (15)	0 (0)	
Unemployed	2 (10)	0 (0)	
Other	5 (25)	4 (20)	
Cohabitant family members, mean (SD) (range)	2.8 (0.95) (1–5)	3.05 (1.05) (1–4)	$t = -0.79$, $P = .435$

Instruments

INTERVIEW

Based on the stress process model, an ad hoc semistructured interview was designed to investigate demographic characteristics (age, gender, marital status, employment status, education, family members' status), general physical health, actual or past diseases, stressful life events, and caregiving duration (only for caregivers). It also assessed sleep disorders, use of psychotropic drugs, and history of psychological consults.

STATE-TRAIT ANXIETY INVENTORY

The Italian version[59] of the State-Trait Anxiety Inventory-Y (STAI-Y) Form[60] assesses state (STAI-Y1) and trait (STAI-Y2) anxiety. The internal consistency (Cronbach α) for the 2 subscales is .92 and .87, respectively. Test-retest reliability (Pearson r) for the trait anxiety scale is 0.80.

STATE-TRAIT ANGER EXPRESSION INVENTORY II

The Italian version[61] of the State-Trait Anger Expression Inventory II (STAXI-II)[62] comprises the following scales: state and trait anger, anger inside expression, anger outside expression, anger control (Cronbach α = .78–.93; test-retest r = 0.59–0.79).

PROFILE OF MOOD STATES

The Italian version[63] of the Profile of Mood States (POMS)[64] evaluates the intensity of 6 affective states: tension/anxiety, depression/dejection, anger/hostility, vigor/activity, fatigue/inertia, and confusion/bewilderment (Cronbach α = .84–.95; test-retest r = 0.65–0.74).

BECK DEPRESSION INVENTORY

The Italian version[65] of the Beck Depression Inventory—Second Edition (BDI-II)[66] assesses the intensity of depressive symptoms by 2 subscales: somatic-affective (α = .84) and cognitive one (α = .72).

QUESTIONARIO PSICOFISIOLOGICO—REVISED

The Questionario Psicofisiologico—Revised (QPF-R), a scale of the Cognitive Behavioural Assessment (CBA 2.0),[67] measures the frequency of common psychophysiological reactions (α =.89, r = 0.74).

FAMILY STRAIN QUESTIONNAIRE

The Family Strain Questionnaire (FSQ),[68] assessing various characteristics of burden of care (emotional burden, problems of social involvement, need for knowledge of the disease, quality of family relationships, and thoughts about death), was administered only to caregivers (Cronbach α = .61–.85).

KARNOFSKY PERFORMANCE STATUS

The Karnofsky Performance Status[69,70] was collected only for care recipients. It assesses patient's independence at work, in daily activities, and personal care. It is a reliable measure of symptom's severity and need of health assistance.

Physiological Measures

A validated automatic BP device (model UA-767, A&D instruments) was used to measure BP and HR. Device calibration was performed according to the Association for Advancement of Medical Instrumentation and British Hypertension Society recommendations.[71]

Design and Procedure

The study was conducted according to the Declaration of Helsinki and its amendments on research involving human subjects.[72] Participants were informed of the study protocol, and written consent was obtained. Interview and self-report questionnaires were administered during 1-hour single session. Caregivers were assessed in the caregiving setting (home or hospice), whereas control subjects were assessed at their own home. None of the caregivers dropped out of the study because of excessive effort in completing the assessment.

Given the practical difficulties to perform a longitudinal study, a paradigm of repeated measurements at rest over 2 weeks was chosen, to compensate for the variability of the BP and HR measurements between and within subjects. Clinic BP was measured following the recommendations of the British Society of Hypertension and other committees.[73–75] The physiological measures (BP and HR) were collected by the same trained psychologist during 4 separate visits 2 weeks apart, in the same setting of caregiving (home or hospice). In each visit, the first measurement was taken after the subject had rested 5 minutes in a seated position, and the other 2 following readings 3 minutes apart.

Subjects were asked to avoid caffeine and smoke for at least 3 hours before measurement and alcohol assumption for at least 12 hours before.

Statistical Analyses

Independent t tests were used to compare self-report data between caregivers and controls. For each significant comparison, Cohen d was calculated as index of effect size. χ^2 Tests were used to compare dichotomic variables collected through interview between the 2 groups. A mixed-model analysis of variance (ANOVA), with group (caregivers vs controls) as a between-subjects factor and day (first, second, third, and fourth day) and measurement (first, second, and third measurement) as within-subjects factors, was conducted on SBP, diastolic BP (DBP), and HR measures at rest. Significant main effects and interactions ($P < .05$) were followed by Newman-Keuls post hoc comparisons to identify specific differences. For each main effect or interaction, partial η^2 (η^2_p) was calculated. Correlations between psychological and physiological measures were examined using Pearson product-moment correlation coefficients (r). A value of $P < .05$ was taken as the level of statistical significance.

Results

Interview

With respect to the quantitative measures of the interview, no significant differences emerged between the 2 groups, except for sleep disorders, which resulted more frequent in caregivers than in controls ($\chi^2_1 = 8.12$, $P = .004$); in details, 14 caregivers (70%) versus 5 noncaregivers (25%) reported insomnia. Instead, contrary to our expectation, caregivers did not report using tranquillizers or antidepressants more than controls ($\chi^2_1 = 0.23$, $P = .633$). In particular, 3 caregivers (15%) versus 2 controls (10%) used tranquillizers, and nobody in the 2 groups used antidepressants.

Self-report Data

Caregivers' mean scores were significantly higher than controls on state anxiety (STAI-Y1, $t_{38} = 2.69$, $P = .011$), BDI total score ($t_{38} = 3.01$, $P = .005$), and BDI somatic-affective ($t_{38} = 3.01$, $P = .005$) and cognitive ($t_{38} = 2.29$, $P = .028$) subscales. Forty-five percent of caregivers exceeded the cutoff for clinical depression, 50% for state and 40% for trait anxiety.

Higher levels of anxiety and depression in caregivers, compared with controls, were also obtained in the POMS tension/anxiety ($t_{38} = 2.52$, $P = .016$) and depression/dejection ($t_{38} = 2.99$, $P = .005$) subscales. Moreover, caregivers showed higher scores on POMS fatigue/inertia ($t_{38} = 2.03$, $P = .049$) and confusion/bewilderment ($t_{38} = 2.78$, $P = .008$) factors. Experimental and control participants did not differ significantly on POMS anger/hostility and vigor/activity subscales and all factors of STAXI-II.

With respect to physical complaints, differences between groups were marginally significant in the QPF-R total score ($t_{38} = 1.79$, $P = .081$), as caregivers reported more frequent psychophysiological symptoms than controls. When including only items investigating the common, mostly autonomic, symptoms of the stress response (eg, tachycardia, excessive sweating, frequent urination), no differences were found between caregivers and controls (QPF-R autonomic score; $t_{38} = 1.08$, $P = .286$). Results are presented in Table 2.

As to the emotional burden of caregiving, a large part of caregivers (40%) showed higher levels of distress, exceeding the cutoff (≥9) of the "emotional burden" factor of the FSQ.

Physiological Variables

BLOOD PRESSURE

Twenty-five percent (n = 5) of caregivers versus 10% (n = 2) of controls showed BP values in the range of prehypertension or hypertension stage, according to the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure guidelines.[72]

For the SBP, significant day ($F_{3,114} = 8.87$; $P < .0001$; $\eta^2_p = 0.19$), measurement ($F_{2,76} = 7.73$; $P = .0008$; $\eta^2_p = 0.17$), and day × measurement ($F_{6,228} = 2.92$; $P = .009$; $\eta^2_p = 0.07$) effects were obtained: As expected, participants showed higher SBP during the first day and the first measurement compared with the following measures.

The significant group × day interaction ($F_{3,114} = 3.68$; $P = .014$; $\eta^2_p = 0.09$) showed higher SBP in caregivers than controls in the first day (Figure 1).

Moreover, the significant group × day × measurement interaction ($F_{6,228} = 2.43$; $P = .027$; $\eta^2_p = 0.06$) indicated that caregivers had higher SBP than controls during the first day and 2 of 3 measurements on the fourth day.

For the DBP, a significant day ($F_{3,114} = 11.56$; $P < .0001$; $\eta^2_p = 0.23$) main effect was obtained: Data showed higher DBP during the first day compared with following ones.

The significant group × day × measurement interaction ($F_{6,228} = 2.33$; $P = .033$; $\eta^2_p = 0.06$) showed higher DBP in caregivers than controls on all measurements in the first and the fourth days and in 1 of 3 measurements on the first and the second day (Figure 2).

HEART RATE

A significant measurement main effect ($F_{2,76} = 5.20$; $P = .007$; $\eta^2_p = 0.12$) was obtained: Participants showed higher HR on the first 2 measurements than in the third one.

CORRELATIONS

Given our specific interest in investigating how caregiving influenced both psychological and physical health, we focused on the relationship between physical symptoms and psychological variables.

In both caregivers and controls, significant positive correlations were obtained between reported somatic symptoms (QPF-R) and state anxiety (STAI-Y1) ($r = 0.51$, $P = .02$; and $r = 0.72$, $P < .0001$, respectively) and trait anxiety (STAI-Y2) ($r = 0.45$, $P = .042$; and $r = 0.75$, $P < .0001$, respectively). Significant correlations were also obtained in caregivers and controls between QPF-R and POMS tension/anxiety ($r = 0.62$, $P = .003$; and $r = 0.58$, $P = .007$, respectively) and depression (BDI-II total score) ($r = 0.46$, $P < .04$; and $r = 0.71$, $P < .0001$, respectively).

Only in caregivers, a significant positive correlation emerged between state anger (STAXI S-Anger) and total somatic symptoms (QPF-R) ($r = 0.48$, $P = .032$) and autonomic symptoms ($r = 0.46$, $P < .042$). Moreover, only in caregivers, significant correlations between QPF-R and factors depression/dejection ($r = 0.56$, $P < .011$), anger/hostility ($r = 0.57$, $P = .009$), fatigue/inertia ($r = 0.63$, $P = .003$), and confusion/bewilderment ($r = 0.53$, $P = .015$) of the POMS were found. Significant positive correlations were also obtained between frequency of autonomic symptoms and tension/anxiety ($r = 0.68$, $P = .001$), depression/dejection ($r = 0.63$, $P = .003$), anger/hostility ($r = 0.59$, $P = .006$) Fatigue/Inertia ($r = 0.65$, $P = .002$), and confusion/bewilderment ($r = 0.54$, $P = .014$) of the POMS.

Only in caregivers, correlations between psychophysiological reported symptoms (QPF-R) and factors of FSQ were examined. Significant positive correlations emerged between "emotional burden" factor and total reported symptoms ($r = 0.55$, $P = .012$) and autonomic symptoms ($r = 0.59$, $P = .006$). Moreover,

Table 2 • Self-report Data for Caregivers and Controls

	Group			
Psychological Outcomes	Caregivers (n = 20)	Controls (n = 20)	*P*	*d*
STAI-Y				
State anxiety (Y1)	49.70 (12.71)	39.25 (11.87)	.011	.87
Trait anxiety (Y2)	44.74 (10.75)	40.10 (9.14)	.149	
STAXI-II				
State anger (S-Anger)	12.75 (3.60)	11.90 (4.41)	.508	
Trait anger (T-Anger)	17.53 (3.31)	18.25 (5.82)	.632	
Anger disposition (T-Anger/T)	6.58 (1.35)	7.05 (2.74)	.500	
Anger reaction (T-Anger/R)	8.10 (2.12)	7.85 (2.92)	.759	
Anger inside expression (Ax/In)	17.60 (5.18)	15.10 (4.27)	.104	
Anger outside expression (Ax/Out)	13.58 (5.10)	13.80 (4.15)	.882	
Anger control (Ax/Con)	24.14 (4.88)	22.10 (5.24)	.209	
Anger expression (Ax/Ex)	20.64 (8.35)	22.70 (9.40)	.928	
POMS				
Tension/anxiety	13.30 (6.56)	8.45 (5.56)	.016	.82
Depression/dejection	14.90 (10.71)	6.45 (6.72)	.005	.97
Anger/hostility	9.80 (7.27)	7.15 (7.44)	.262	
Vigor/activity	12.90 (5.39)	15.75 (4.34)	.073	
Fatigue/inertia	8.05 (4.54)	5.35 (3.83)	.049	.66
Confusion/bewilderment	9.80 (5.80)	5.25 (4.45)	.008	.90
BDI-II				
Total score	15.25 (7.49)	7.80 (8.19)	.005	.98
Somatic-affective factor	11.45 (4.87)	6.15 (6.19)	.028	.98
Cognitive factor	3.80 (3.38)	1.65 (2.50)	.005	.74
QPF-R				
Total score	44.39 (9.64)	39.55 (7.29)	.081	.58
Autonomic score	19.85 (5.17)	18.2 (2.86)	.286	.35

Abbreviations: BDI-II, Beck Depression Inventory—Second Edition; POMS, Profile of Mood States; QPF-R, Questionario Psicofisiologico—Revised; STAI-Y, State-Trait Anxiety Inventory-Y Form; STAXI-II, State-Trait Anger Expression Inventory II.
Values are presented as mean (SD).

autonomic symptoms significantly positively correlated with "need for knowledge of the disease" (r = 0.45, P = .049) and "thoughts about death" (r = 0.57, P = .009).

With respect to physiological variables, both in caregivers and controls, significant positive correlations between HR and "cognitive BDI-II score" (r = 0.45, P = .048; and r = 0.45, P = .046, respectively) were found. Moreover, in caregivers only, a significant positive correlation was found between frequency of autonomic symptoms (QPF-R autonomic scores) and DBP (r = 0.50, P = .023).

CAREGIVING DURATION

Duration of caregiving was reported as a major complain by participants. To highlight potential effects of this factor on caregiving outcomes, as a supplementary analysis, caregivers were divided into 2 groups, according to the duration of the caregiving (<6 months vs >6 months). Independent-sample *t* tests were conducted on psychological variables, and ANOVAs with caregiving duration as a between-subjects factor and day and measurement as within-subjects factors were conducted on SBP, DBP, and HR. None of the psychological variables differed between long-duration and short-duration caregiving. Instead, among physiological measures, HR was significantly influenced by caregiving duration. A significant caregiving duration main effect ($F_{1,18}$ = 5.35, P = .032; η^2_p = 0.23) was obtained. Participants with a caregiving duration longer than 6 months showed higher HR than caregivers for less than 6 months (Figure 3). A significant measurement main effect ($F_{2,36}$ = 4.17, P = .023; η^2_p = 0.19) was also obtained: As expected, participants showed higher HR on the first 2 measurements compared with the following ones.

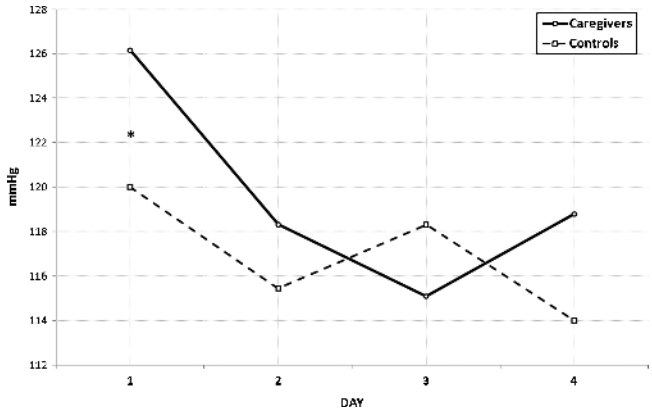

Figure 1 ■ Mean systolic blood pressure in caregivers and controls over 4 days.

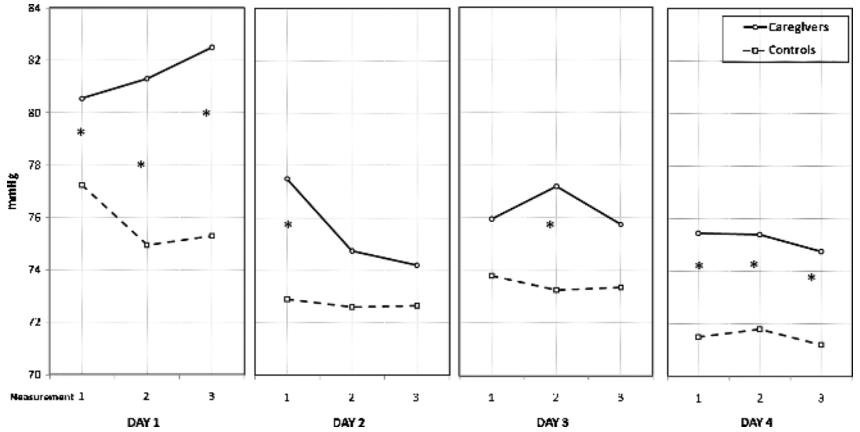

Figure 2 ■ Mean diastolic blood pressure in caregivers and controls in 3 separate measurements over 4 days.

Supplementary analyses on the caregiving group were also conducted dividing the sample on the basis of age, daily hours of assistance (median value), and family relationship (spouse or adult children). No significant effects were obtained.

■ Discussion

This is a preliminary investigation that included the assessment of emotional distress as well as health consequences of caregiving for a closely dying family member. Few controlled studies investigated the emotional burden,[28,43] and to our knowledge, no study included the assessment of cardiovascular risk among terminally ill cancer caregivers.

As expected, caregivers showed higher psychological distress than controls. Caregivers reported higher state anxiety and more cognitive, somatic, and affective symptoms of depression compared with controls. These results support previous findings on affective disorders in caregivers and suggest a similarity between psychological consequences of caregiving in dementia and terminal cancer settings. Moreover, in the present study, caregivers showed high levels of tiredness and confusion. Previous researches reported fatigue as a major concern of caregivers, and the present data extend the limited literature in the area of caregiving for cancer patients.[41,42] Instead, confusion and shock responses, as possible manifestations of fatigue, have so far received very little attention, and they can be object of future interest as potential risk factors for caregivers' psychological adjustment and ability to provide care.

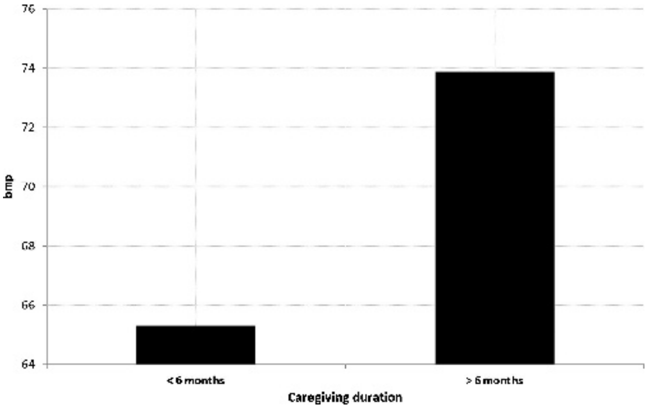

Figure 3 ■ Mean heart rate of 12 measurements collected over 4 days in caregivers as a function of caregiving duration (<6 months vs >6 months).

Surprisingly, there were no significant differences in anger between caregivers and controls. Literature reports that cancer caregivers often feel angry with the cancer itself, or with themselves, their loved one, family members, doctors, or others,[9] and a controlled study showed higher levels of hostility in caregivers than controls.[28] Clinical experience with family members often reveals difficulties in accepting anger feelings, particularly in the relationship between the caregiver and the patient. This effect might have dampened the expression of anger in our study and should be taken into account in following investigations. Future studies are also necessary to clarify how caregiving burden, or instead social support provided by health assistance, modulates anger expression in caregivers.

Moreover, no significant differences emerged between caregivers and controls in the use of psychotropic drugs. In particular, none of the caregivers of the present study used antidepressant drugs, and only a small percentage used tranquilizers. These results look dissimilar from those reported in previous studies, which documented higher use of psychotropic drugs in caregivers than controls and indicated that about one-third of caregivers ask for mental health interventions (mainly antidepressants, tranquilizers, and psychotherapy).[12,28,39] The results obtained in the present study can be interpreted on the basis of cultural differences in the attitude for use medications, or lower awareness of mental health problems by the caregivers, whose need for treatment emerged through assessment. Caregivers may be disinclined to search help for their mental health concerns when faced with the demands of caregiving. This hypothesis is supported by Bellani,[76] who observed that family members of terminally ill cancer patients tend to minimize their emotional concerns, rather focusing on the patient's medical needs. Interestingly, in our study, after service's proposal of psychological help, about one-third of caregivers (35%) made use of psychological support during caregiving or bereavement. Future studies should focus on determining whether caregivers neglect their own needs of psychological care as a result of the involvement in the caregiving activities, or if caregiving itself might reduce these needs. Again, our results support the need for more clinical attention to the mental health needs of this vulnerable group.

With respect to the psychophysiological concerns, results showed that caregivers are at greater risk of sleep disorders than controls, reporting a significant reduction of sleep. These data are in line with previous studies[23] and highlight the importance of including the assessment of sleep and sleep-related behaviors in routine evaluation. It is noteworthy that sleep disorders can also contribute to the caregiver's cardiovascular risk, as reported by Mausbach and coworkers.[24] As to the frequency of the other reported symptoms, the differences between groups were only marginally significant. However, based on the significant correlations between somatic symptoms and some affective variables (anxiety, depression, anger, fatigue, confusion, emotional burden), it is reasonable that some caregivers appear to be at risk for developing somatic symptoms, particularly stress-related ones. These family members seem to experience high levels of emotional burden, frustration, fatigue, and confusion. They also report a higher need for information about the patient's disease and care and frequently think about death of their loved one.

In the present study, BP and HR levels were analyzed as measures of cardiovascular risk. Although these physiological indices have a moderately wide normal range both between and within subjects, several studies indicate that they can be considered significant precursors of cardiovascular risk.[47–55] In general, BP and HR levels were not clinically elevated, when compared with healthy controls. Nevertheless, caregivers tended to show elevated SBP and DBP, with significant differences in some measurements across days. The higher BP levels in caregivers than controls during the first-day measurements might also indicate a heightened alarm response. According to the white coat phenomenon, elevated BP values, measured by healthcare workers, are mostly observed during the initial measurements, whereas the response tends to habituate in the following ones. However, the isolated BP response observed in the white coat phenomenon has been considered to indicate enhanced anxious responding, which can reflect increased reactivity to daily life stressors, thus becoming a possible health risk factor.[77] Diastolic BP elevations seem to be more stable across days and measurements. Indeed, elevation of DBP was associated with higher frequency of reported autonomic symptoms, thus suggesting a possible psychophysiological pathway to stress-related cardiovascular dysfunctions, as indicated by previous studies.[16,44] These results, although preliminary, might indicate a possible risk for developing hypertension and related cardiovascular diseases in advanced cancer caregivers, as observed in other forms of caregiving.[20–22] Large sample investigations will possibly confirm the role of these parameters in contributing to cardiovascular risk in cancer caregivers.

With respect to HR, no significant differences emerged between caregivers and controls. Nevertheless, when analyzing the duration of caregiving, according to our third hypothesis, results showed that elevated HR distinguished participants with a long history of caregiving. Indeed, elevated HR during stressful situations has been previously observed in long-lasting caregiving for dementia patients.[27] If confirmed in future research, elevated HR at rest could be used as a cardiovascular risk factor in long-duration caregiving. The elevated HR reflects a sympathetic hyperactivity, which in the long run can lead to atherosclerosis and cardiovascular morbidity, increasing the pulsatile nature of blood flow and therefore the mean BP. Recent studies also suggest that HR and BP reduction (by means of lifestyle modifications or β-blockers) could be useful in prolonging life expectancy, not only in patients with hypertension or diabetes but also in subjects free of disease.[75,78] These results should drive healthcare professionals to pay attention to caregivers' HR and BP and to recommend lifestyle modification or pharmacological treatment, necessary to reduce cardiovascular risk.

Some limitations of the present study must be acknowledged. Even though participants have been carefully selected without any evidence of cardiovascular disease and properly matched, a major limitation regards the relatively small group of caregivers, which prevents the generalization of the results to cancer caregiver population. As a further limitation, because of ethical constraints, it was not possible to use a control blinded protocol, mostly in the assessment of cardiovascular responses. To minimize the presence of a measurement bias, an automatic cuff device was used for measuring BP and HR. Still, large variability is a specific feature of the selected indices, and it implies the need for a higher number of subjects and more repeated measurements in further studies. Moreover, it should be advised a more prolonged assessment, extending from the early phases of caregiving to bereavement. Indeed, this study was based on a single time point, during patients' terminal stage, and thus we could not describe the time course of previous changes. It would further benefit future investigations of the impact of caregiving to compare caregivers of patients at various stages of illness to assess the effects of caregiving burden on their physical and emotional well-being.

In summary, the results of the present pilot study confirm that caregiving for terminally ill cancer patients is a stressful condition with potentially negative physical and psychological consequences. The study highlights the importance of screening caregivers for both psychological and psychophysiological reactions, particularly sleep disorders and cardiovascular modifications. These factors are likely to be worsened by the closely following bereavement, thus leading to cumulative health risk effects. The analysis of the psychological and physical consequences of bereavement and later grief reactions in caregivers will be the next step of the study.

With respect to the feasibility of the study, research protocols used in epidemiological studies with wide samples (eg, Chicago study, Framingham study, CARDIAC, HARVEST)[79–82] demonstrated that BP and HR monitoring is effective in detecting important relationships between cardiovascular changes and mortality rates. Moreover, data from the present study suggest that psychophysiological measures can be collected through a quickly delivered and relatively inexpensive procedure, with full cooperation of caregivers and no dropouts because of excessive effort. Therefore, this protocol could be easily extended to large samples, also involving different palliative care services (eg, domiciliary and hospice settings). Moreover, given the short period of caregiving to terminally ill cancer patients, delivering the assessment in a short, but well-defined time slot, is recommended to increase the number of eligible participants.

Identifying caregivers who experience clinically relevant distress is essential to provide adequate psychological treatment. Moreover, the inclusion of cardiovascular variables in routine assessment can provide a more comprehensive picture of the psychophysiological risk associated with caregiving, thus decreasing its negative impact on physical and psychological health.

Last, the results of the present study can contribute to increase the awareness about the physical and emotional distress of the family members who take care of a loved person, in palliative care units.

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