

Predictors and moderators of quality of life in caregivers of amputee patients by type 2 diabetes

Maria Suely Alves Costa PhD (Assistant Professor)  and Maria Graça Pereira PhD (Associate Professor) 

School of Psychology, University of Minho, Braga, Portugal

Scand J Caring Sci; 2018; 32; 933–942

Predictors and moderators of quality of life in caregivers of amputee patients by type 2 diabetes

Background: The amputation of a foot or a leg is one of the complications caused by diabetes that creates fear. After the amputation, the patient becomes dependent on a caregiver, who is often not prepared for this new phase of life. Knowing the factors that influence care delivery in caregivers of amputee type 2 diabetes patients is important from an heuristic point of view, since very few studies have focused on this population.

Objectives: This study analysed the predictors and moderators of quality of life, in caregivers of amputee patients due to type 2 diabetes.

Methods: This study has a cross-sectional design. All ethical standards were followed in the conduct of this study. The sample comprised 101 caregivers who answered the following instruments: Carer's Assessment of Managing Index, Burden Assessment Scale, Depression Anxiety Stress Scales, Revised Impact of Events Scale, Family Assessment Device, Family Disruption from Illness Scale and the Short Form Health Survey-36.

Results: The practice of physical activity, lower burden, better family functioning and less traumatic symptoms were predictors of better mental quality of life. Having no chronic disease and less physical symptoms predicted better physical quality of life. Duration of care moderated the relationship between traumatic symptoms and mental quality of life, but not with physical quality of life. Receiving help in caregiving moderated the relationship between traumatic symptoms and mental quality of life. The limitations of this study include the exclusive use of self-report instruments and the fact that the caregivers who have participated in this study were those who accompanied the patient to the hospital.

Conclusion: In order to promote physical quality of life, future intervention programmes should consider the presence of chronic disease in the caregiver and the duration of care, as well as the caregivers' physical symptoms.

Keywords: caregivers, diabetic foot, amputation, mental quality of life, physical quality of life.

Submitted 12 May 2017, Accepted 23 August 2017

Introduction

Type 2 diabetes is a metabolic disease characterised by hyperglycaemia resulting from insufficient secretion and/or insulin action (1–3). Data provided by the World Health Organization (WHO) (4) show that the prevalence of diabetes rose from 4.7% in 1980 to 8.5% in 2014, with approximately 22 million adults living with diabetes. In Portugal, the estimated prevalence of diabetes, in 2014, in the population aged 20–79 years was 13.1%; that is, more than 1 million of the Portuguese population have diabetes. It is estimated that the medical costs of a single patient with diabetes require about 1700 euros per year to the Portuguese State, resulting in a total of 1.7

million euros per year with diabetes, corresponding to 10% of health costs and 1% of national gross domestic product (GDP) (1).

The chronic nature of diabetes is associated with long-term complications such as diabetic foot, blindness, renal failure and cardiovascular diseases, resulting from lesions in the peripheral nerves, eyes, kidneys and vascular system, respectively. These health complications in patients with diabetes significantly compromise their daily and professional activities (2).

The amputation of a foot or a leg is one of the complications caused by diabetes that creates fear. In fact, the complication of an ulcer leads to gangrene and infection due to poor healing, which may result in amputation. A patient with diabetes submitted to an amputation is 50% more likely to suffer a second one (4). After the amputation, the patient becomes dependent on a caregiver, who is often not prepared for this new phase of life (5).

Correspondence to:

Maria Suely Alves Costa, Rua Macau, Nº 32, 2 direito, Vermoim, Código Postal 4470326, Maia, Portugal.
E-mail: suelyacosta@gmail.com

The informal caregiver is responsible for promoting or coordinating the resources needed by the dependent patient. Often, the caregiver exercises the care in an unprepared, unpaid way, and is responsible by all or some care tasks (6, 7). Care is a dynamic and complex process that changes over time, due to the length of care, the disease progression, the level of dependency, family functioning and the existing support network (8).

According to this perspective, caregivers may experience burden, which may also be associated with traumatic stress symptoms (9, 10), affecting not only the caregivers' life, but also the whole family. A study with caregivers of relatives, who were hospitalised in intensive care units, identified reactions of traumatic stress associated with increased rates of anxiety and depression and decreased quality of life (11).

Several studies suggested that caregivers of chronic, older and less educated patients who spend more hours caring with a fragile bond with the patient showed greater vulnerability to stress, depression, anxiety and physical symptomatology, when compared with the general population (12–17).

The role of caregiver requires a series of changes, at the level of family relationships, work and finances, leisure time, health and mood. These changes may be associated with a set of physical, psychological, emotional, social and financial problems, which may compromise the caregiver's health and, indirectly, the health of the patient (18). In fact, caring for a sick family member has been associated with physical health problems with an impact on quality of life (19, 20), including the caregiving of amputee diabetic patients (21–24).

Although caregiving has an impact on the whole family, it is often a family member that takes the primary responsibility for caregiving, while other family members provide, sometimes, social and emotional support. Families are an important source of social and emotional support for their members, but also a potential source of stress and, therefore, disturbances in family functioning may have a harmful effect on all members (17, 25).

Over the last few years, the regular practice of physical exercise has been recognised as a nondrug alternative to the treatment and prevention of chronic-degenerative diseases, promoting health and physical and mental well-being (26).

Given the impact of caregiving in several domains of caregivers' lives, it is important to analyse variables directly related to caregiving, such as its duration and the presence of help. Indeed, the literature has suggested that the prolonged duration of care may expose the caregiver to burden, as well as to challenging or traumatic experiences, which require the development of coping strategies, by the caregivers, in order to deal with the tasks of care that could have an impact on their quality of life (16, 17, 27). Also receiving help in caregiving is

important, since social support influences behaviour change, especially in a situation involving changes and restrictions in the daily living patterns such as caregiving (28). The prolonged illness situation of a relative represents a stressful situation, extrinsic variables such as the duration of care and help in caring can soften or potentiate the crisis, that is, act as moderators (7). To our knowledge, no study has addressed the moderator role of duration of care and the presence of help in caregiving in the relationship between coping/traumatic symptoms/burden and quality of life, in caregivers of patients with diabetic foot.

According to the model of psychosocial adaptation to the chronic disease of Livneh (29), quality of life is the result of a process of adaptation to the disease that is composed by three phases. The first phase includes the antecedents that in this study comprise the presence of chronic disease in caregivers. The second phase highlights the reactions to the disease (which in the present study are assessed as coping, burden, depression, anxiety, traumatic symptoms, physical symptoms and family functioning regarding caregiving), the contextual influences (such as practice of physical activity and the presence of help in caregiving) and the disease-related variables (such as duration of care). Finally, the third phase includes the outcome variable – quality of life – that, in the present study, was assessed at physical and mental levels. Knowing the factors that influence care delivery in caregivers of amputee type 2 diabetes patients is important from an heuristic point of view, since very few studies have focused on this population (30–32).

Taking into consideration the model of Livneh (29), the present study aimed to (i) assess the differences in quality of life according to the presence of chronic disease and the practice of physical activity; (ii) analyse the predictors of quality of life; (iii) assess the moderator role of duration of care and the presence of help in caregiving in the relationship between traumatic symptoms/coping/burden and quality of life in caregivers of amputee type 2 diabetes. It is expected that (i) those who practice physical activity would report better mental and physical quality of life; (ii) practicing physical activity, lower levels of burden and better family functioning would be positive predictors of better physical and mental quality of life; (iii) and finally, that caregiving variables such as duration of care and receiving help in caregiving would be moderators in the relationship between traumatic symptoms/coping/burden and mental and physical quality of life, as suggested by Livneh's model.

Method

Sample

The sample is composed by 101 caregivers of type 2 diabetic patients with diabetic foot; eight of the caregivers

approached did not participate in the study. Five caregivers were absent from the study, one caregiver withdrew from the study, one patient was not able to come to the clinic, one patient without consultation at the hospital, who were submitted to an amputation surgery, in six hospital units in the northern region of Portugal. All ethical standards were followed in the conduct of this study, having been approved by the ethics committees of the hospital institutions involved. Caregivers were assessed 6 months after the patient's surgery. The caregivers' age ranged between 19 and 82 years ($M = 51.60$, $SD = 15.32$). The sociodemographic and clinical characteristics of the sample are presented in Table 1.

Procedure

This study has a cross-sectional design. Type 2 diabetes patients with diabetic foot before amputation surgery were identified by health professionals from the Diabetic Foot Consultation Team. Health professionals asked patients' permission to invite their caregivers to participate in the study, this phase was defined considering clinical criteria for the adaptation process to the patient's amputation (6 months after surgery – the period in which the patient initiates the rehabilitation treatments) and requires the caregiver to adapt more consistently to the caring process. Caregivers were contacted before the patients' surgery, in order to obtain their intention to participate in the study and to schedule postsurgical interview. Caregivers were informed about the aims of the study and the confidentiality of the data. Participation was voluntary, and all patients signed an informed consent.

The inclusion criteria included the following: being a caregiver of a family member with type 2 diabetes with diabetic foot, the patient has undergone an amputation surgery; the caregiver was over 18 years old.

Instruments

Sociodemographic and Clinical Questionnaire. That assess sociodemographic variables (age, relationship with the amputee patient, level of education), variables related to caregiving (duration of care in months and before vs. after amputation; number of hours spent in caring and receiving help in caring for the patient) and clinical variables (duration of daily sleep, practice of physical activity and presence of chronic disease) (Costa, MSA ; Pereira, MG).

Carer's Assessment of Managing Index (CAMI). This questionnaire assesses the coping strategies used by caregivers and their effectiveness (8, 33). It consists of 38 items assessing the difficulties from the delivery of care, grouped into three subscales. Higher results indicate the use of more effective coping strategies. In the original version, Cronbach alpha was 0.84, 0.80 and 0.37,

Table 1 Descriptive statistics (N = 101)

Continuous measure	Min	Max	Mean	SD
Age	19	82	51.54	15.33
Duration of care (in months)	1	720	62.58	102.09
Categorical measure	%			
Gender				
Female	85.1			
Male	14.9			
Years of schooling				
No schooling	5.8			
4 years	42.3			
6 years	15.4			
9 years	14.4			
12 to 15 years	22.1			
Employment status				
Employed	29.5			
Unemployed	40.0			
Retired	27.9			
License health	2.9			
Marital status				
Single	14.3			
Married or cohabitant	81.0			
Divorced	4.8			
Hours spent with the patient				
2 hours or less	6.8			
6 hours	8.6			
12 hours	4.8			
18 hours	17.1			
24 hours	62.9			
Practice physical activity or exercise at least once a week?				
Yes	28.6			
No	71.4			
Chronic disease				
Yes	54.3			
No	45.7			
Presence of help				
Yes	50.5			
No	49.5			
Type of amputation				
Minor	74.3			
Major	25.7			

respectively, for the three subscales and 0.90 for the total scale. In the Portuguese version, the Cronbach alpha values found for the total scale were 0.80 and for the subscales were 0.75, 0.62 and 0.60, respectively. In the present sample, the alpha for the total scale was 0.85 and 0.84, 0.63 and 0.61 for the respective subscales.

Burden Assessment Scale (BAS). This questionnaire evaluates family exhaustion in objective terms, that is, the demands from caring for someone with limitations in the activities and resources (34, 35). The scale is composed by 19 items, organised into three subscales. Higher overall results indicate higher burden. Cronbach alpha ranges

from 0.89 to 0.91 in the original version. In the Portuguese version, the Cronbach alpha for total scale was 0.81, while in the present study was 0.88.

Depression, Anxiety and Stress Scales (DASS-21). It is composed by 21 items divided into three subscales: depression, anxiety and stress (36, 37). In this study, only the first two scales were used. Higher scores indicate more negative affective states. In the original version, Cronbach alpha was 0.81 for the subscale of depression and 0.73 for anxiety. In the Portuguese adapted version, the depression subscale showed a Cronbach alpha of 0.78 and the anxiety of 0.75. In the present study, the alphas were 0.90 for the depression scale and 0.84 for the anxiety scale.

Family Assessment Device (FAD). In this study, only the 12-item of the Global Functioning Scale was used that assesses the perception of the family functioning in the following domains: problem-solving, communication, roles, affective responsiveness, behaviour control and general functioning (38, 39). Higher scores indicate problematic/dysfunctional family functioning. Cronbach alpha in the original version for this subscale was 0.92, in the original version, Portuguese version; the Cronbach alpha values found were 0.75 (the scale is translated and validated for the Portuguese population by the work group responsible for the scale). The FAD scale is in charge of the working group of (Abigail K. Mansfield Marcaccio, unpublished data); in the present sample, the alpha value for the scale was 0.88.

Revised Impact of Events Scale (IES-R). This scale assesses the frequency of post-traumatic symptoms and consists of 22 items organised in three subscales (40, 41). Higher results indicate greater psychological, behavioural and cognitive difficulties resulting from the exposure to trauma. In the original version, alphas were of 0.94 for the Intrusion subscale, of 0.87 for the Avoidance and of 0.91 for Hypervigilance. In the Portuguese adapted version, that comprises only 21 items, the alpha was 0.96 for the total scale, 0.96 for the Intrusion subscale, 0.88 for the Avoidance and 0.68 for Hypervigilance.

Family disruption from illness scale. It consists of 42 items, assessing the disruption of the disease in the familiar/caregiver at the level of the physical symptoms (42, 43). In the original version, the alpha was 0.93. In the Portuguese adapted version, the alpha was 0.96, whereas in the present study was 0.88.

Short Form Health Survey-36 (SF-36). This questionnaire allows to evaluate the quality of life in two dimensions, the physical dimension and the mental dimension (44, 45). It consists of 11 items and 36 questions grouped into eight components. Higher results in the physical dimension

indicate better physical quality of life, just as higher results in the mental dimension indicate better mental quality of life. In the Portuguese version, Cronbach alpha for the physical dimension was 0.92 and for the mental dimension, 0.91. In the present study, the alpha was 0.92 for the physical dimension and 0.89 for the mental dimension.

Data analysis

Pearson coefficient correlations were performed to analyse the association between clinical variables and quality of life. To test the differences on quality of life according to clinical variables, *t*-tests were performed for independent samples. To assess the predictors of quality of life, a hierarchical regression (enter method) was performed, in which only the variables related to the dependent variable were introduced. Thus, in the first block, the following clinical variables were included – practice of physical activity or exercise at least once a week and the presence of chronic disease and in the second block all the psychological variables. Multicollinearity was tested using VIF (≤ 5) and tolerance (>0.20) (46). To test moderation, the Macro Process for SPSS (47) was used.

Results

Preliminary analyses

The associations between sociodemographic variables (age, relationship with the amputee patient, level of education), caregiving variables (duration of care, hours of contact with the patient and presence of help in caregiving), clinical variables (hours of sleep, physical activity practice and chronic disease) and psychological variables (coping, burden, depression, anxiety, family functioning, traumatic symptoms and physical symptoms) and quality of life are shown in Table 2. Better mental quality of life was associated with lower levels of burden, depression, anxiety and traumatic symptoms, as well as with better family functioning. In addition, better physical quality of life of the caregivers was associated with lower levels of burden, depression, anxiety, traumatic symptoms and physical symptoms. Finally, it was found that sleep time and practicing physical activity or exercise (at least once a week) were associated with better mental quality of life, while having no chronic disease is associated with better physical quality of life.

Differences on mental and physical quality of life according to the practice of physical activity

There were significant differences according to the practice of physical activity at least once a week on mental quality of life [$t(99) = -4.04$, $p = 0.001$], but not on physical quality of life [$t(99) = -1.55$, $p = 0.123$]. There were also significant differences according to the presence of chronic disease

Table 2 Correlation between clinical variables and quality of life

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. Age																				
2. Relationship of caregiver	0.369**																			
3. Duration of care (before and after amputation, yes or no)	-0.111	0.202																		
4. Duration of care (months)	0.007	-0.012	0.351**																	
5. Work situation			-0.101	-0.405**																
6. Education (years)			0.043	-0.043	0.043															
7. Hours of patient care			-0.005	-0.146	-0.005	-0.146														
8. Physical activity practice (At least once a week yes or no)							0.197	0.111	-0.002	0.046	-0.153	0.112	-0.073	-0.142	-0.202	-0.105	-0.070	-0.154	0.132	0.043
9. Hours do you sleep per night (in hours from 3 h to 10 h of sleep)							0.021	-0.066	-0.097	0.355**	-0.079	-0.235*	0.110	0.172	0.063	-0.052	0.301**	-0.045	0.030	-0.321**
10. Chronic disease							-0.102	0.208*	0.192	-0.300**	0.160	0.243*	0.027	-0.168	-0.191	-0.084	-0.137	-0.120	0.063	0.241*
11. Help in the care (yes or no)							-0.132	-0.007	0.101	0.101	-0.179	0.116	0.317**	0.249*	0.224*	0.053	0.108	0.261**	-0.194	-0.185
12. Coping									0.330**	-0.025	0.075	0.153	-0.280**	-0.260**	-0.252*	-0.065	-0.204*	-0.095	0.376**	0.155
13. Burden										0.022	0.096	0.195	-0.083	-0.109	-0.236*	-0.051	-0.129	0.026	0.303**	0.120
14. Depression											-0.110	-0.016	-0.060	0.030	-0.025	-0.044	0.261**	-0.089	0.007	-0.464**
15. Anxiety											0.256**		-0.058	-0.207*	-0.261**	-0.241*	-0.195	-0.069	0.096	0.076
16. Family functioning																				
17. Physical symptoms																				
18. Traumatic symptoms																				
19. Mental quality of life																				
20. Physical quality of life																				
M	51.54	0.63	0.44	62.58	2.12	6.85	3.91	0.36	3.95	0.54	0.50	66.67	39.15	3.59	3.86	1.78	12.98	14.09	50.29	70.53
DP	15.33	0.77	0.49	102.09	1.04	3.99	1.39	0.48	1.55	0.50	0.50	13.50	12.29	4.82	5.11	0.57	17.02	15.58	10.78	13.01

the use of e is to indicate that it is the relationship between clinical variables (indirect variables) and quality of life (direct variables / outcome)

on physical quality of life [$t(99) = 5.21, p = 0.001$], but not on mental quality of life [$t(99) = 0.068, p = 0.946$]. Caregivers who practice physical activity or exercise showed better mental quality of life and those who did not have a chronic disease showed better physical quality of life.

Predictors of mental quality of life

The hierarchical regression model was significant ($F_{6,94} = 15.88, p < 0.001$), explaining 47% of the variance of the mental quality of life. The practice of physical activity or exercise at least once a week, lower levels of burden and traumatic symptoms as well as better family functioning were predictors of better mental quality of life (Table 3). However, depression and anxiety were not significant predictors of the mental quality of life in this assessment moment.

Predictors of physical quality of life

The hierarchical regression model was significant ($F_{6,94} = 10.64, p < 0.001$), explaining 37% of the variance of physical quality of life. Caregivers without chronic disease and with lower levels of physical symptoms showed better physical quality of life. However, burden, depression, anxiety and traumatic symptoms were not significant predictors of physical quality of life (Table 3).

Duration of care as moderator in the relationship between traumatic symptoms and quality of life

The model that tested the moderating role of duration of care in the relationship between traumatic symptoms and mental quality of life was significant ($F_{3,73} = 14.90, p < 0.001$,

$\beta = -0.002, 95\% \text{ CI } [0.005, 0.001], t = -2.02, p = 0.048$) explaining 28% of the variance (Figure 1). The negative relationship between traumatic symptoms and mental quality of life was significantly moderated by both shorter duration of care, $\beta = -0.32, 95\% \text{ CI } [-0.45, -18], t = -4.56, p < 0.001$, and longer duration of care, $\beta = -0.69, 95\% \text{ CI } [-1.03, -0.36], t = -4.09, p < 0.001$, although it was stronger for a longer duration of care. However, duration of care did not moderate the relationship between traumatic symptoms and physical quality ($F_{3,73} = 0.25, p = 0.86, \beta = 0.001, 95\% \text{ CI } [-0.003, 0.005], t = 0.49, p = 0.62$).

Duration of care as moderator in the relationship between coping and quality of life

The model that tested the moderating role of duration of care in the relationship between coping and mental quality of life was not significant ($F_{3,73} = 2.64, p = 0.06, \beta = 0.002, 95\% \text{ CI } [0.002, 0.007], t = 1.08, p = 0.28$). The model of moderation for physical quality of life was not performed, since the assumptions for moderation analysis were not fulfilled.

Duration of care as moderator in the relationship between burden and quality of life

The model that tested the moderating role of duration of care in the relationship between burden and mental quality of life was not significant ($F_{73,00} = 12.66, p = 0.001, \beta = -0.001, 95\% \text{ CI } [-0.005, 0.002], t = -0.81, p = 0.41$) but not between burden and physical quality of life ($F_{73,16} = 1.75, p = 0.16, \beta = -0.002, 95\% \text{ CI } [-0.007, 0.003], t = 0.80, p = 0.42$).

Table 3 Predictors of quality mental and physical life

Variables	Quality of mental life				Physical quality of life			
	AR ²	β	t	p	AR ²	β	t	p
Model 1	0.142				0.215			
Do some activity or exercise at least once a week		0.376	4.04	<0.001*		-	-	-
Presence of chronic disease		-	-	-		-0.464	-5.21	<0.001**
			R ² aj.: 0.133				R ² aj.: 0.208	
Model 2	0.503				0.405			
Physical activity practice		0.212	2.74	<0.05*		-	-	-
Presence of chronic disease		-	-	-		-0.400	-4.62	<0.001**
Burden		-0.277	-3.33	<0.001**		-0.075	-0.823	0.413
Depression		-0.209	-1.62	0.108		-0.155	-1.10	0.273
Anxiety		-0.001	0.005	0.996		0.022	0.148	0.882
Traumatic symptoms		-0.193	-2.542	<0.013*		-0.074	-0.776	0.439
Family functioning		-0.221	-2.56	0.012*		-	-	-
Physical symptoms		-	-	-		-0.269	-2.35	0.021*
			R ² aj.: 0.472				R ² aj.: 0.367	

**p < .01, *p < .05

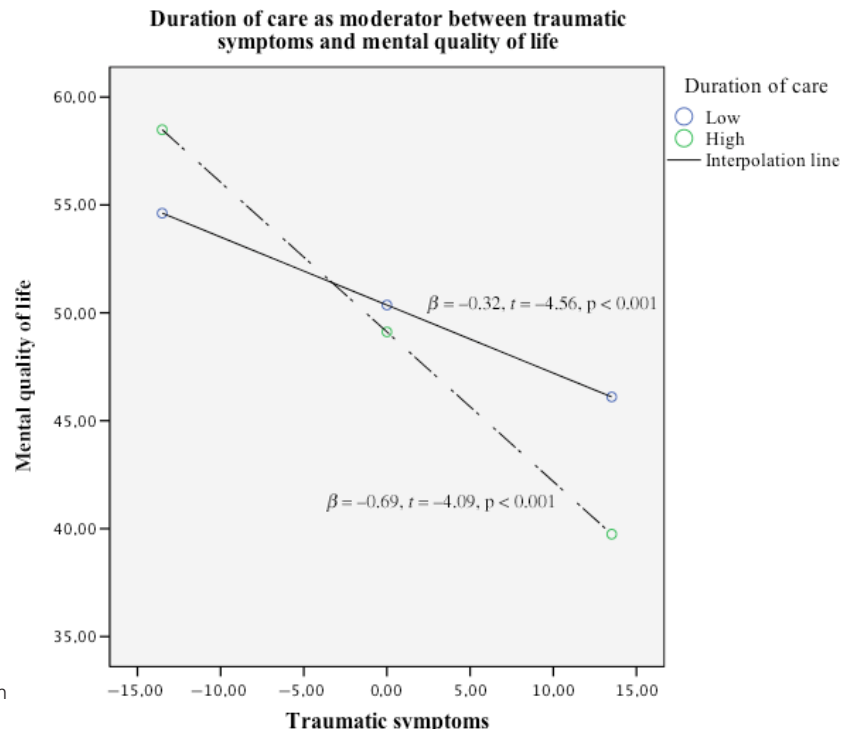


Figure 1 Moderators in the relationship between coping/traumatic symptoms and quality of life.

Help in caregiving as moderator in the relationship between traumatic symptoms and quality of life

The model that tested the moderating role of having help in caregiving in the relationship between traumatic symptoms and mental quality of life was significant ($F_{3,97} = 8.88$, $p < 0.001$, $\beta = -0.051$, 95% CI [-0.316, 0.214], $t = 0.133$, $p = 0.701$) but not in the relationship between traumatic symptoms and physical quality of life that was not significant ($F_{3,97} = 2.11$, $p = 0.103$, $\beta = -0.177$, 95% CI [-0.565, 0.210], $t = -0.909$, $p = 0.365$).

Help in caregiving as a moderator in the relationship between coping and quality of life

The model that tested the moderating role of having help in caring in the relationship between coping and mental quality of life was not significant ($F_{3,97} = 3.42$, $p = 0.02$, $\beta = -0.26$, 95% CI [-0.60, 0.08], $t = -1.54$, $p = 0.13$). The model of moderation for physical quality of life was not performed, since the assumptions for moderation analysis were not fulfilled.

Help in caregiving as a moderator in the relationship between burden and quality of life

The model that tested the moderating role of having help in caring in the relationship between burden and physical quality of life was not significant ($F_{3,97} = 2.87$,

$p = 0.04$, $\beta = 0.33$, 95% CI [-0.06, 0.72], $t = -1.63$, $p = 0.16$) neither between burden and mental quality of life ($F_{97,00} = 15.93$, $p = 0.001$, $\beta = -0.08$, 95% CI [-0.36, 0.19], $t = -0.58$, $p = 0.56$).

Discussion

This study found significant results taking into consideration the dimensions of Livneh's model. Regarding the antecedents that, in this study, comprised the presence of chronic disease in the caregivers, it was found that those without a diagnosis of chronic disease showed better physical quality of life what is in accordance with previous literature (48, 49). However, there was no impact on mental quality of life as might be (50). Concerning the process of adaptation and adjustment to the disease, caregivers who practiced physical activity at least once a week showed better mental quality of life. Indeed, physical activity contributes to the mental health of its practitioners, as it promotes moments of pause in the daily and stressful routines, also contributing to socialisation (26, 51, 52). The physical activity has impact on mental quality of life, particularly in older people. (53, 54). In the same sense, studies have suggested an association between physical activity and health when it is a moderate physical activity (55, 56). However, in this study, no significant results were found on the contextual influences, represented by the practice of physical activity on the physical quality of life of the caregivers. On the other hand, younger caregivers, active workers, with higher

level of education and who slept more hours showed better physical quality of life. These results are in accordance with previous studies (57, 58).

The results revealed that lower levels of burden and traumatic symptoms, as well as perceptions of healthy family functioning, were predictors of a better mental quality of life, corroborating other authors (59). The presence of chronic disease (antecedent) and physical symptoms revealed to be predictors of quality of life, corroborating the theoretical model (28). Interestingly, in this dimension, anxiety and depression were not predictors of mental quality of life, as traumatic symptoms and burden were not predictors of physical quality of life. These results may be due to the period chosen for caregiver's assessment, that is, 6 months after patients' amputation that might be too early. Future studies should test this hypothesis in caregivers over time, after patient's amputation.

The longer duration of care moderated the negative relationship between traumatic symptoms and mental quality of life. In fact, prolonged duration of care exposes caregivers to challenging or traumatic experiences that interfere with quality of life (16, 17). Results also showed that duration of care did not moderate the relationship between traumatic symptoms/burden and physical quality of life, neither the relationship between coping/burden and mental quality of life. Also, having help in caring did not moderate the relationship between burden and quality of life. It reinforces the findings of the study with family caregivers of functional dependent patients that the longer duration of care was associated with lower levels of psychological burden and morbidity and the use of coping strategies (60). One may hypothesised that these results may be due to the characteristics of the sample, since the majority of the amputee patients were submitted to minor amputations (74.3%), which may have influenced the levels of burden and caregiver's coping strategies. In Portugal, markedly in major amputations, reveals a total of 1385 amputations, 171 fewer amputations than in 2014. This reduction was more marked in the group of major amputations (560), minus 129 major amputations in 2014 compared to 2013. In relation to minor amputations, we found less variation in the pattern alteration. The lowest numbers in the north of the country translate the implementation of effective multidisciplinary consultation with wide experience and with the presence of multidisciplinary teams (1).

Limitations

The limitations of this study include the exclusive use of self-report instruments and the fact that the caregivers who have participated in this study were those who accompanied the patient to the hospital. Future

studies should take into consideration socioeconomic factors and assess caregivers over time using a longitudinal design.

Conclusion

The results showed that caregiving of amputee patients has an impact on the caregiver's quality of life (20, 28). In order to promote physical quality of life, future intervention programmes should consider the presence of chronic disease in the caregiver and the duration of care, as well as the caregivers' physical symptoms. In order to promote mental quality of life, the focus should be on burden, traumatic symptoms and family functioning. Future studies should evaluate the process of adaptation of the caregivers for longer periods, on the level of overload, family functioning and physical and traumatic symptomatology, besides variables such as post-traumatic growth, resilience and its impact on the quality of life of informal caregivers.

Acknowledgements

The authors would like to thank the contribution of the health professionals of the Multidisciplinary Consultations of the Diabetic Foot of the Hospital Center of Santa Luzia in Viana do Castelo, of the Hospital Center of Tâmega and Sousa, of the Hospital Center of Vila Nova de Gaia/Espinho and of the Hospital Center of Porto; of Vascular Surgery Service of the Hospital de São João and of the Hospital de Braga.

Authors' contribution

All authors participated in the analysis and interpretation of the data, in their writing and review and the first author in addition to the data collection. All authors approve the final version submitted.

Ethical approval

All ethical standards were followed in the conduct of this study. The study was approved by the ethics committees of the hospital institutions involved Hospital Center of Tâmega and Sousa (CES 03/13-P), of the Hospital Center of Porto (029-DEFI/058-CES) of the Vascular Surgery Service of the Hospital of St. John (CES 277 - 13).

Funding

This study was supported by a scholarship from the Coordination Foundation for the Improvement of Higher Education Personnel/Full Doctoral Program Abroad Financed by CAPES – Brazil (reference number 1010-14).

References

- 1 National Diabetes Observatory. Diabetes Facts and Figures 2014. *Annual report of the National Diabetes Observatory - Portugal* 2015; 2–64.
- 2 Hwang DJ, Lee KM, Park MS, hee CS, Park JI, Cho JH, Woo SJ. Association between diabetic foot ulcer and diabetic retinopathy. *PLoS ONE* 2017; 12: 2–19.
- 3 Semenkovich CF, Danska J, Darsow T, Dunne JL, Huttenhower C, Insel RA, McElvaine AT, Ratner RE, Shuldiner AR, Blaser MJ. American diabetes association and JDRF research symposium: diabetes and the microbiome. *Diabetes* 2015; 64: 3967–77.
- 4 World Health Organization. Global report on diabetes 2016; 86–86.
- 5 Dardik A. *Vascular Surgery: A Global Perspective*. 2016, Springer, New Haven, CT, USA.
- 6 Sequeira C. *Caring for Elderly People with Physical and Mental Dependence*. 2010, Lidel Editora, Portugal.
- 7 Burgio LD, Gaugler JE, Hilgeman MM. *The Spectrum of Family Caregiving for Adults and Elders with Chronic Illness*. 2016, Oxford University Press, New York, NY.
- 8 Nolan M, Grant G, Keady J. *Understanding Family Care: A Multidimensional Model of Caring and Coping*. 1996, Open University Press, Buckingham.
- 9 Calhoun PS, Beckham JC, Bosworth HB. Caregiver burden and psychological distress in partners of veterans with chronic posttraumatic stress disorder. *J Trauma Stress* 2002; 15: 205–12.
- 10 Ryu JH, Kredentser MS, Bienvenu OJ, Blouw M, Sareen J, Olafson K. Post-Traumatic Stress Disorder in Survivors of Critical Illness. *Comprehensive Guide to Post-Traumatic Stress Disorders*. 2016; 263–80.
- 11 Azoulay E, Pochard F, Kentissh-Barnes N, Chevret S, Aboab J, Adrie C, Annane D, Bleichner G, Bollaert PE, Darmon M, Fassier T, Galliot R, Garrouste-Orgeas M, Goulenok C, Goldgran-Toledano D, Hayon J, Jourdain M, Kaidomar M, Laplace C, Larché J, Liotier J, Papazian L, Poisson C, reignier J, Saidi F, Schlemmer B, FAMIREA Study Group. Risk of post-traumatic stress symptoms in family members of intensive care unit patients. *Am J Respir Crit Care Med* 2005; 171: 987–94.
- 12 Bandeira DR, Pawlowski J, Gonçalves TR, Hilgert JB, Bozzetti MC, Hugo FN. Psychological distress in Brazilian caregivers of relatives with dementia. *Aging Ment Health* 2007; 11: 14–19.
- 13 Conde-Sala JL, Garre-Olmo J, Turró-Garriga O, Vilalta-Franch J, López-Pousa S. Differential features of burden between spouse and adult-child caregivers of patients with Alzheimer's disease: an exploratory comparative design. *Int J Nurs Stud* 2010; 47: 1262–73.
- 14 Ferrara M, Langiano E, Di Brango T, Di Cioccio L, Baucó C, De Vito E. Prevalence of stress, anxiety and depression in with Alzheimer caregivers. *Health Qual Life Outcomes* 2008; 6: 93.
- 15 Figueiredo DA, Sousa LI. Perception of health status and overload in family caregivers of elderly people with and without dementia. *Portuguese J Public Health* 2008; 26: 15–24.
- 16 Martins T, Ribeiro JLP, Garrett C. Estudo de validação do questionário de avaliação da Sobrecarga para cuidadores informais. *Psicologia, saúde e doenças* 2003; 4: 131–48.
- 17 Pearlin LI, Mullan JT, Semple SJ, Skaff MM. Caregiving and the stress process: an overview of concepts and their measures. *Gerontologist* 1990; 30: 583–94.
- 18 Imaginário C. *The Dependent Elder in Family Context: An Analysis of the Family and Primary Caregiver's View*, 2nd edn. 2008, Formasau, Coimbra.
- 19 Vitaliano PP, Zhang J, Scanlan JM. Is caregiving hazardous to one's physical health? A meta-analysis *Psychol Bull* 2003; 129: 946–72.
- 20 Hoerger M, Coletta M, Sörensen S, Chapman BP, Kaukeinen K, Tu X, Duberstein PR. Personality and perceived health in spousal caregivers of patients with lung cancer: the roles of neuroticism and extraversion. *J Aging Res* 2016; 7: 1–9.
- 21 Anaforoğlu İ, Ramazanoğulları İ, Algün E, Kutanis R. Depression, anxiety and quality of life of family caregivers of patients with type 2 diabetes. *Med Princ Pract* 2011; 21: 360–5.
- 22 Kochar J, Fredman L, Stone KL, Cauley JA. Sleep problems in elderly women caregivers depend on the level of depressive symptoms: results of the Caregiver–Study of Osteoporotic Fractures. *J Am Geriatr Soc* 2007; 55: 2003–9.
- 23 Pawlowski J, Gonçalves TR, Hilgert JB, Hugo FN, Bozzetti MC, Bandeira DR. Depression related to age in family caregivers of patients with dementia. *Psychol Stud (Natal)* 2010; 15: 174–80.
- 24 Quadros LFC. *The prevalence and psychological and functional repercussion of pain and phantom sensation in amputation of the lower limb by advanced ischemia*. Master Thesis, Faculty of Medicine, University of Lisbon, Portugal, 2010.
- 25 Seltzer MM, Li LW. The dynamics of caregiving transitions during a three-year prospective study. *Gerontologist* 2000; 40: 165–78.
- 26 Warburton DE, Nicol CW, Bredin SS. Health benefits of physical activity: the evidence. *CMAJ* 2006; 174: 801–9.
- 27 Peixoto MJ, Santos C. Coping strategies in the caregiver's family. *Health Notebooks* 2009; 2: 87–93.
- 28 Vinaccia S, Quiceno JM, Fernández H, Gaviria AM, Chavarría F, Orozco O. Social support and adherence to antihypertensive treatment in patients with a diagnosis of arterial hypertension. *Psychol Rep* 2016; 13: 89–106.
- 29 Livneh H. Psychosocial adaptation to chronic illness and disability a conceptual framework. *Rehabil Couns Bull* 2001; 44: 151–60.
- 30 Dall'Aglio MH, Martins MRI, Mazaro LM, Martins MID, Godoy JMP. Quality of life of caregivers of lower limb amputees. *J Neurosci*, 2009; 17: 8–13.
- 31 Malhotra S, Steinberg J. Evolution of the diabetes caregiver: tying together limb salvage and patient education. *Diabetes Manag* 2014; 4: 293–7.
- 32 Nabuurs-Franssen MH, Huijberts MS, Kruseman AN, Willems J, Schaper NC. Health-related quality of life of diabetic foot ulcer patients and their caregivers. *Diabetologia* 2005; 48: 1906–10.
- 33 Brito L. *Mental Health of Caregivers of Elderly Relatives*, 2008. Quarteto, Coimbra.
- 34 Reinhard SC, Gubman GD, Horwitz AV, Minsky S. Burden assessment

- scale for families of the seriously mentally ill. *Eval Program Plann* 1994; 17: 261–9.
- 35 Cotrim H, Pereira MG. *Impact of Colorectal Cancer on Patients and Caregivers/Family: Implications for Caring*. 2007, University of Minho, PT, Thesis of Doctorate.
- 36 Lovibond PF, Lovibond SH. The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behav Res Ther* 1995; 33: 335–43.
- 37 Ribeiro JL, Honrado AA, Leal IP. Contribution to the study of the Portuguese adaptation of the Stress Anxiety Stress Scales of Lovibond and Lovibond. *Psychol Health Dis* 2004; 5: 2229–39.
- 38 Epstein NB, Baldwin LM, Bishop DS. The McMaster family assessment device. *J Marital Fam Ther* 1983; 9: 171–80.
- 39 Ryan CE, Epstein NB, Keitner GI. *Evaluating and Treating Families: The McMaster Approach*, 2005. Taylor & Francis, New York, NY.
- 40 Weiss DS, Marmar CR, Wilson JP, Keane TM. Assessing psychological trauma and PTSD. *The Impact of Events Scale—Revised* 1997; 19: 399–411.
- 41 Teixeira R, Pereira MG. Family functioning and exhaustion in a parental cancer situation. In Proceedings of the VII National Symposium on Psychological Research (Nogueira C, Silva I, Lima L, Almeida AT, Cabecinhas R, Gomes R, Machado C, Maia A, Sampaio A, Taveira MC eds), 2010, 1271–85.
- 42 Ide BA, Gragert M. Reliability and validity of a revised family disruption from illness in a rural sample. *RN Online Journal of Rural Nursing and Health Care* 2001; 2: 165–166.
- 43 Silva Malheiro M. *MG Pereira*. 2009, A couple of study (Thesis) Health Psychology University of Minho, Psychosocial variables in Fibromyalgia.
- 44 Ware JE, Kosinski M, Dewey JE, Gandek B. SF-36 health survey: manual and interpretation guide. Boston New England Medical Center 1993. ed. Quality Metric Inc. 1:2000.
- 45 Ferreira PL. Development of the Portuguese version of MOS SF-36. Part I. Cultural and linguistic adaptation. *Acta Med Port* 2000; 13: 55–66.
- 46 Field A. *Discovering Statistics using SPSS*. 2009, Sage publications, London.
- 47 Hayes AF. *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-based Approach*, 2013. Guilford Press, New York, NY.
- 48 Elsen I, Souza AIJ, Prospero ENS, Barcellos WBE. Professional care for families who experience chronic illness in their daily lives. *Sci Care Health* 2009; 8: 11–22.
- 49 Cristina C, Pedrozo R, Gomes MJ. Systematic review of studies on quality of life indexed in the Scielo database. *Sci Collective Health* 2011; 16: 4257–4266.
- 50 Shiue I, Sand M. Quality of life in caregivers with and without chronic disease: Welsh Health Survey, 2013. *J Public Health* 2016; 39: 34–44.
- 51 Guallar-Castillon P, Santa-Olalla PP, Banegas JR, Lopez E, Rodriguez-Artalejo F. Physical activity and quality of life in older adults in Spain. *Clin Med* 2004; 16: 606–10.
- 52 Oliveira EM, Aguiar RC, Almeida MT, Eloia SC, Lira TQ. Benefits of physical activity for mental health. *Collective Health* 2011; 8: 126–30.
- 53 Antigo26 Silva M, Medeiros F, Filho AL, Silva APS, Antunes PC, Leite JO. Body and experience: to think about bodily practices In: orgs. Falcão, JLC; Saraiva, MC Body Practices in the Contemporary Context: (In) Tense Experiences. Copiart, Florianópolis. 2009.
- 54 Silva RS, Silva ID, Silva RA, Souza L, Tomasi E. Physical activity and quality of life. *Sci Collective Health* 2010; 1: 115–20.
- 55 Batista MR, Batista JP, Furtado JC, Rocha Junior LD, Tavares EH, Araújo HN, Pinto RD, Morales ND. Effect of exercise on health and burden of mothers of children and adolescents with cerebral palsy. *Braz J Sports Med* 2016; 22: 222–6.
- 56 Deslandes A, Moraes H, Ferreira C, Veiga H, Silveira H, Mouta R, Pompeu FA, Coutinho ES, Laks J. Exercise and mental health: many reasons to move. *Neuropsychobiology* 2009; 59: 191–8.
- 57 Burgio LD, Gaugler JE, Hilgeman MM. *The Spectrum of Family Caregiving for Adults and Elders with Chronic Illness*, 2016. Oxford University Press, New York, NY.
- 58 Araujo JS, Vidal GM, Brito FN, Gonçalves DC, Leite DK, Dutra CD, Pires CA. Profile of caregivers and the difficulties faced in elderly care in Ananindeua, PA. *Braz J Geriatr Gerontol* 2013; 16: 149–58.
- 59 Andrade F. *Informal care for the dependent elderly person in the home context: educational needs of the primary caregiver*. Master's Dissertation, University of Minho 2009.
- 60 Guedes AC, Pereira MG. Burden, confrontation, physical symptoms and psychological morbidity in caregivers of functional dependents. *Latin Am J Nurs* 2013; 21: 935–40.