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Original Study

Depression in People With Dementia and Caregiver Outcomes: Results From the European Right Time Place Care Study

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A B S T R A C T

Keywords:
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Objective: To investigate the cross-sectional associations between depression in people with dementia and both caregiver burden and quality of life in 8 European countries, and to test these associations compared with the presence of other neuropsychiatric symptoms.

Design: Cross-sectional study.

Setting and Participants: In total, 1223 dyads comprised of informal caregivers and people with dementia living in a community-dwelling setting, recruited from the Right Time Place Care study, a cohort survey from 8 European countries.

Measures: To test the associations between depression (according to the Cornell Scale for Depression in Dementia) and informal caregiver burden (defined by the Zarit scale and hours of supervision in terms of Resource Utilization in Dementia), distress (defined by the Neuropsychiatric Inventory Questionnaire distress score), and quality of life (according to the visual analogue scale and 12-item General Health Questionnaire).

Results: Linear regressions showed an association between depression and main outcomes (Zarit scale: β 3.7; $P = .001$; hours of supervision: β 1.7; $P = .004$; Neuropsychiatric Inventory Questionnaire distress score: β 1.2; $P = .002$). A similar association was found concerning psychological and overall well-being (12-item General Health Questionnaire: β 1.8; $P < .001$; Euroqol Visual Analogue Scale: β −4.1; $P = .003$). Both associations remained significant despite the presence of other NPS and after adjusting for confounders.

Conclusions and Implications: Further studies are needed to assess whether providing tailored strategies for optimizing diagnosis and managing of depression in people with dementia might improve caregiver quality of life and reduce their burden in the community-dwelling setting.

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Around the world, there are currently 50 million people living with dementia, and this number could rise up to 152 million by 2050.[1] It is well-known that the pathologic mechanisms underpinning this disease not only lead to cognitive dysfunctions but also to behavioral and psychological disorders or neuropsychiatric symptoms (NPSs). Almost 90% of people affected by dementia will present with NPS during the course of the disease.[2,3] In the community-dwelling setting, NPSs in people with dementia are often associated with caregiver's adverse

outcomes such as depression, reduced quality of life, and increased burden and distress.[4–6] On the other hand, the increase of caregiver burden could result in a reduction of care for the patient with dementia leading to an increased rate of institutionalization and healthcare costs.[4,7,8] Previous research investigating the impact of NPSs on caregiver burden and well-being mostly used an overall view of these symptoms;[9–11] however, to our knowledge, none specifically focused on depression. Published data on the prevalence of depression in patients with dementia are conflicting, with a variation of the estimated prevalence from 4% to 40%.[12,13] Depression may occur in different phases of dementia or could represent a risk factor of its onset.[14,15] The heterogeneity of the onset of depression, in the context of dementia, makes it difficult to clarify the possible links between these diseases. The presence of depression in people with dementia hastens cognitive decline, increases the risk of disability and mortality in patients, and increases the informal caregiver burden.[9,15,16] Currently, the effect of depression on burden, distress, and quality of "life of the informal caregiver" compared with other NPSs is not known.

The main goal of this study was to describe the characteristics of people with dementia affected by depression living in the community-dwelling setting in 8 European countries and to investigate the associations between depression and caregiver burden and quality of life using data from the Right Time Place Care (RTPC) study. Moreover, a secondary goal of this study was to evaluate the associations between depression and caregiver burden and quality of life compared with the presence of other NPSs.

Methods

Study Design and Study Population

The RTPC study is a prospective cohort survey conducted in 8 European countries (Finland, Sweden, Germany, Estonia, England, Spain, France, and the Netherlands).[17] The general goal of the RTPC study was to evaluate the transition of people with dementia from home care to institutional long-term care facilities (LTCFs), assessing quality of life and care in people with dementia and their informal caregivers in LTCFs and the community-dwelling setting. Participants were recruited if (1) they were recently admitted into a LTCF; and (2) they lived at home, had an identified informal caregiver, received professional care, and were at risk of institutionalization, defined as risk of admission within the next 6 months.

After baseline assessments, 1 follow-up visit was performed after 3 months from the period of inclusion, between November 2010 and December 2011. Main criteria of inclusion were patients over 65 years old, a primary diagnosis of dementia, and a Standardized Mini-Mental State Examination (SMMSE)[18] score under 24, together with the presence of an informal caregiver for those living in the community-dwelling setting. More details of RTPC study methods are available elsewhere.[17]

For the purpose of this study, only the data collected at baseline of the dyads living in the community-dwelling setting were included in the analysis (n = 1223).

Procedures

Eligible people with dementia and their informal caregiver were recruited at home by professionals in health or social care or medical/nursing/social care professionals with clinical experience and at least a bachelor's degree. All the participants gave their informed consent, and if the people with dementia were not able to provide a consent, a legal authorization was obtained, according to country-specific regulations. A manual that included the standardized operating procedures was furnished to all the participating countries by the leading

center (Maastricht University, the Netherlands); all delivered data were centrally managed by the RTPC coordinating center (Witten University, Germany). Ethical approval was granted by the German Society for Nursing Science and by ethical committees of all the participating countries in August 2011; the study was carried out in accordance with the Helsinki Declaration (https://www.wma.net/en/30publications/10policies/b3/index.html). Further information is available elsewhere.[17]

Main Outcomes

For the current study, burden, distress, and quality of life of informal caregiver were our main outcomes. The burden of informal caregiver was assessed by the Zarit scale and with the Neuropsychiatric Inventory Questionnaire (NPI-Q) distress score. The Zarit scale ranged from 0 to 88 with a higher score indicating a higher burden.[19] The distress of the informal caregiver was based on the NPI-Q distress score, which ranged from 0 to 5, with a higher score defining a higher distress.[19]

In addition, the time invested by the informal caregiver was assessed in terms of hours of supervision per day. The hours of supervision, assessed using the Resource Utilization in Dementia questionnaire,[20] indicate the time spent by the informal caregiver to avoid dangerous events and to manage NPSs.[20,21] Informal caregiver's quality of life was assessed using 2 self-reported rating scales of well-being. The EuroQol Visual Analogue Scale (EQ-VAS) is the second part of health-related quality of the live questionnaire (EuroQol Five-Dimensional).[22] It ranges from 0 to 100, a higher score indicating a higher quality of life. The psychometric properties of the EQ-VAS have been tested in patients and caregivers.[23,24] The General Health Questionnaire (GHQ-12) is a self-reported scale of psychological well-being ranging from 0 to 36 with an inverse proportional ratio to quality of life.[25] All main outcome variables were evaluated as continuous variables.

Assessment of Depression

Presence of depression was evaluated using the Cornell Scale for Depression in Dementia (CSDD). This scale consists of 19 items ranging from 0 to 36, with a higher score defining severe depression.[21] CSDD was assessed using the informal caregiver reports. People with dementia with depression were defined according to a CSDD score of ≥ 12, already defined and validated in the literature.[26,27]

Confounders

Confounders included were level of disability based on activities of daily living according to the Katz questionnaire,[22] comorbidity using the Charlson comorbidity index,[23] cognitive status defined by the SMMSE,[24] and demographic characteristics (sex and age of people with dementia and caregiver). The SMMSE is a faster test with less interobserver variability than the Mini-Mental State Examination.[18] Other NPSs were also considered as potential confounding factors based on the total severity score of the 12-item NPI-Q questionnaire, without the depression item.[25,26] In addition, 4 NPS subsyndromes were defined according to the presence of different NPS domains: psychosis (delusions and/or hallucinations), apathy, affective disorders (depression and/or irritability and/or anxiety), and hyperactivity (disinhibition and/or euphoria, and/or agitation/aggression, and/or aberrant motor behavior).[27] The presence of each subsyndrome was assessed using the first question of the NPI-Q questionnaire (ie, having or not one of the corresponding domains). The prescription of psychotropic drugs, classified according to the Anatomical Therapeutic Chemical classification, such as antipsychotics (N05A), anxiolytics (NO5B), hypnotics/sedatives (N05C), antidepressants (N06A), and

Table 1
Characteristics of People With Dementia and Informal Caregiver in Each Country and in All Sample

	Estonia		*	Finland		*	France		*	Germany		*	The Netherlands		*
	n = 172 (%)			n = 182 (%)			n = 175 (%)			n = 116 (%)			n = 177 (%)		
	Depressed	Not Depressed		Depressed	Not Depressed		Depressed	Not Depressed		Depressed	Not Depressed		Depressed	Not Depressed	
	90 (52)	82 (48)		55 (30)	127 (70)		53 (30)	122 (70)		58 (50)	58 (50)		44 (25)	133 (75)	
Caregiver demographic characteristics															
Age (SD)	54 (12)	58 (12)		64 (13)	65 (12)	.4	64 (13)	62 (12)	.5	61 (11)	63 (13)	.4	64 (14)	66 (13)	.5
Sex female (%)	68 (75)	63 (77)	.8	32 (60)	76 (60)	.9	36 (68)	83 (68)	.9	45 (77)	44 (76)	.8	32 (73)	85 (64)	.3
Zarith	43 (89)	36 (80)		31 (54)	27 (126)		39 (52)	28 (159)		34 (58)	29 (58)		33 (44)	24 (133)	
GHQ-12	16 (84)	13 (81)		12 (55)	11 (125)	.2	15 (52)	11 (122)		14 (58)	12 (58)	.07	13 (44)	11 (132)	.06
EQ-VAS	63 (90)	69 (82)		68 (54)	74 (125)		66 (53)	75 (121)		67 (58)	68 (58)	.9	67 (44)	74 (132)	
Hour of supervision per day	1.9 (90)	1.9 (82)	.8	1.3 (53)	1.2 (121)	.3	1.8 (49)	1.3 (118)		1.9 (58)	2 (57)	.8	1.6 (43)	1.4 (132)	.3
NPI-Q distress	16 (90)	9.6 (82)		14 (55)	7 (127)		22 (51)	8 (122)		15 (56)	9 (58)		17 (44)	9 (133)	
Persons with dementia's characteristics	172			182			175			116			177		
Age (SD)	82 (7)	81 (8)	.1	81 (5)	83 (6)	.09	82 (8)	84 (5)		82 (6)	82 (7)	.6	80 (6)	82 (6)	.4
Sex female (%)	68 (75)	59 (71)	.5	36 (65)	78 (61)	.6	33 (62)	86 (70)	.2	35 (60)	36 (62)	.8	27 (61)	82 (61)	.9
Charlson index	2.5 (902)	2.5 (82)	.7	2.2 (55)	1.7 (127)	.4	2 (53)	1.5 (122)		2.8 (58)	2.5 (58)	.2	2 (44)	2.1 (133)	.9
Cornell Scale	16 (51)	6.6 (82)		14 (38)	4.6 (127)		17.4 (35)	4.2 (122)		16 (41)	7 (58)		15 (37)	5.3 (133)	
% of depression in all sample	8	14		13.3	15.7		10.6	16.4		14.1	7.2		21.7		
NPI-Q severity	11.6 (90)	7 (82)		11 (55)	5.8 (127)		14 (53)	5.5 (122)		11 (58)	6.8 (58)		13.7 (44)	10.1	
Katz	2.5 (88)	3 (82)		4 (55)	4 (127)	.4	3 (49)	4 (117)		2 (58)	2.5 (58)	.09	3 (44)	7.3 (133)	
MMSE	9 (82)	11 (82)		18 (48)	16 (11)	.08	13 (44)	15 (106)	.08	12 (47)	12 (45)	.8	16 (37)	3 (131)	.7
Use of psychotropic (%)	47 (52)	34 (41)	.1	52 (94)	116 (91)	.4	53 (100)	113 (92)		41 (71)	43 (74)	.6	28 (63)	14 (123)	.3

MMSE, Mini-Mental State Examination; SD, standard deviation.
 *P value not reported if P < .05.

antidementia drugs (N06D) were considered as dichotomous variable (taking or not the psychotropic medication).

Statistical Analyses

Descriptive statistics were calculated and presented as mean ± standard deviation, absolute number, and percentage, as appropriate, to report information of the whole sample and for each country. To describe the characteristics of the population, according to the presence of depression, Student's t-test and χ^2 test were used. To test the association of depression, the independent variable, with burden, distress, and quality of life of the caregiver, 3 models of linear regression analysis were performed for each main outcome in the whole sample; in a first step the unadjusted model was performed, then the second model was adjusted by demographic characteristics (age and sex of both people with dementia and caregiver), and finally the third model was adjusted to all the potential confounders. After performing each regression, we undertook a test of multicollinearity between our independent variables using the variance inflation factor (VIF). To test the association between depression and our main outcome variations across the countries, we undertook a mixed-effect linear regression with a random effect of the level of the countries and with the interaction between the countries and the presence of depression. Results were adjusted for all confounders and presented as adjusted means obtained from the model.

Furthermore, a linear regression, using 4 different subsyndromes of NPSs (affective disorder, agitation, apathy, and psychotic symptoms) as dependent variables, was performed to evaluate the association between depression and our main outcomes despite the presence of other NPSs. Statistical significance was defined with a P value of <.05. Analysis was carried out using STATA v 14.2 (StataCorp, College Station, TX).

Results

Descriptive Statistics

The descriptive characteristics of the entire sample and for each country are shown in Tables 1 and 2.

Among 1233 people with dementia living in the community-dwelling setting, 414 (34%) people with dementia suffered from depression with an average CSDD score of 16 (standard deviation ±0.2). The degree of severity of the other NPSs, according to NPI-Q severity score, in people with dementia with depression was significantly higher than in people with dementia without depression.

The informal caregivers of depressed people with dementia displayed lower level of quality of life in terms of EQ-VAS scale than the informal caregiver of nondepressed people with dementia, although in one-half of the countries, this result was not statistically significant. Caregivers of depressed people with dementia showed higher level of burden defined by statistically significant higher Zarit score than the caregivers of nondepressed people with dementia, as well as a statistically significant higher level of distress, according to the distress score of the NPI-Q.

For the characteristics of people with dementia within countries, we observed that the averages of each characteristic displayed a similar trend of the entire sample except for the comorbidity level in Sweden, which was 1 point higher in the depressed participants compared with the nondepressed participants (P < .05).

Both distress and burden of caregiver were negatively impacted by the presence of depression. In particular, in Spain, England, and

Table 2
Characteristics of People With Dementia and Informal Caregiver in Each Country and in All Sample

	Spain		*	Sweden		*	England		*	All Sample		*
	n = 174 (%)			n = 146 (%)			n = 81 (%)			n = 1223 (%)		
	Depressed	Not Depressed		Depressed	Not Depressed		Depressed	Not Depressed		Depressed	Not Depressed	
	51 (29)	123 (71)		33 (23)	113 (77)		30 (37)	51 (63)		414 (34)	809 (66)	
Caregiver's demographic characteristics												
Age (SD)	62 (12)	68 (14)		72 (12)	71 (12)	.6	62 (12)	67 (12)	.09	62 (13)	65 (13)	
Sex female (%)	40 (78)	83 (67)	.1	22 (67)	76 (67)	1	20 (66)	34 (67)	1	269 (67)	506 (62)	.4
Zarith	41 (51)	32 (123)		42 (33)	28 (113)		44 (30)	32 (51)		38 (411)	29 (805)	
GHQ-12	17 (51)	14 (122)		16 (33)	11 (113)		16 (30)	11 (51)		15 (412)	12 (805)	
EQ-VAS	59 (51)	61 (123)	.6	63 (33)	69 (113)	.4	69 (30)	71 (51)	.7	65 (413)	70 (805)	
Hour of supervision per day	2.5 (51)	1.8 (120)		1.6 (33)	1.4 (112)	.3	1.9 (29)	1.4 (50)	.07	1.8 (406)	1.5 (792)	
NPI-Q distress	14 (51)	6.5 (122)		18 (29)	9 (51)		16 (409)	8.3 (807)		17 (409)	8 (807)	
Persons with dementia's characteristics	174			146			81			1223		
Age (SD)	84 (7)	82 (7)	.06	82 (6)	82 (6)	.8	80 (8)	81 (6)	.8	82 (7)	82 (6)	.7
Sex female (%)	35 (68)	80 (65)	.6	16 (48)	55 (48)	.9	19 (63)	30 (58)	.6	269 (65)	506 (62)	.4
Charlson index	2.5 (51)	1.6 (123)		3.4 (33)	2.5 (113)		1.9 (30)	1.9 (51)	.8	2.4 (414)	1.9 (809)	
Cornell Scale	18.2 (35)	5 (123)		17 (28)	5 (113)		16 (19)	6 (51)		16 (284)	5.2 (809)	
% of depression in all sample	12.8	15.1		12.3	15.2		7.2	6.3		100	100	
NPI-Q severity	11.1 (51)	5.3 (123)		11.6 (33)	7.6 (113)		14 (30)	8.7 (51)		12 (414)	6.6 (809)	
Katz	2 (51)	3.5 (123)		3 (33)	3.5 (113)	.2	3 (30)	4 (50)	.1	3 (408)	3.5 (801)	
MMSE	14 (31)	17 (105)		16 (25)	15 (103)	.7	13 (18)	14 (42)	.5	13 (332)	15 (717)	
Use of psychotropic (%)	46 (90)	116 (94)		24 (72)	92 (81)	.3	19 (63)	35 (68)	.6	310 (75)	621 (76)	.4

MMSE, Mini-Mental State Examination; SD, standard deviation.
*P value not reported if P < .05.

Sweden, there was at least a difference of 5 points more for caregivers caring for depressed people with dementia compared with nondepressed people with dementia according to the Zarit scale.

Regression Results

Tables 3 and 4 display the association between depression and the main outcomes evaluated for the entire sample.

VIF values suggest the absence of multicollinearity between the independent variables in the models (VIF values = 1.23).

Depression in People With Dementia and Informal Caregiver Burden and Distress

An association was found between depression and caregiver burden, both in terms of the Zarit scale and hours of supervision after controlling for all confounders. Moreover, a significant association was also found between informal caregiver distress and depression, according to NPI-Q distress score (Zarit: β 3.7; P = .001; hour of supervision: β 1.7; P = .004; NPI distress: β 1.2; P = .002).

Spain, Sweden, and England exhibited the highest score in Zarit scale, whereas France, Finland, and Germany displayed almost the same burden for both populations. Estonia and England were the countries with the highest number of hours employed in the supervision of depressed people with dementia. Finally, in all countries, the caregiver of depressed people with dementia displayed greater distress compared with the caregivers of nondepressed people with dementia in terms of NPI-Q distress score.

Depression in People With Dementia and Informal Caregiver Quality of Life

Concerning quality of life, a significant association was found between depression and psychological well-being of the informal caregiver, in terms of GHQ-12 score, and with the overall vision of quality of life, according to the VAS score (GHQ-12: β 1.8; P < .001; EQ-VAS: β −4.1; P = .003) (Table 3).

In all the countries, especially in Estonia and France, the presence of depression was associated with a reduction of the overall and psychological quality of life, excluding Germany, which shows the same scores for both scales of assessment in the 2 populations.

After testing the random effect of each country on the different outcomes and having demonstrated the existence of a significant change, we report in the adjusted averages of the main outcomes for each country (Supplementary Table 1).

Association Between Depression and Main Outcomes Adjusted by Other Cluster of NPS

The results of this analysis display how, even while coexisting depression with other clusters of NPS, depression remains independently associated with a decreased quality of life and with an increased burden and distress of informal caregiver. The results are reported in Table 5.

Table 3
Association Between Depression in People With Dementia and Burden and Distress of Informal Caregiver in All Sample Size

Outcomes	Unadjusted			Demographic			All Confounders*		
	β	P Value	Confidence interval	β	P Value	Confidence interval	β	P Value	Confidence interval
Zarit	9.1	<.001	(7.3; 10.9)	8.8	<.001	(7; 10.6)	3.7	.001	(1.55; 5.8)
Hours of supervision per day	2.8	<.001	(1.9; 3.9)	3.4	<.001	(2.4; 4.3)	1.7	.004	(0.5; 2.9)
NPI-Q distress	8.2	<.001	(7.2; 9.2)	8.2	<.001	(7.1; 9.2)	1.2	.002	(0.4; 1.9)

*Adjusted by demographic characteristics (sex and age of both people with dementia and caregiver).

Table 4
Association Between Depression in People With Dementia and Quality of Life of Informal Caregiver in All Sample Size

Outcomes	Unadjusted			Demographic			All Confounders*		
	β	*P* Value	Confidence interval	β	*P* Value	Confidence interval	β	*P* Value	Confidence interval
GHQ-12	3.1	<.001	(2.4; 3.7)	3	<.001	(2.3; 3.7)	1.8	<.001	(1.04; 2.7)
EQ-VAS	−4.9	<.001	(−7.1; −2.7)	−5.6	<.001	(−7.8; −3.5)	−4.1	.003	(−6.9; −;1.4)

*Adjusted by demographic characteristics (sex and age of both people with dementia and caregiver).

Discussion

The results of this study have shown that depression in people with dementia was independently associated with an increased burden and distress of informal caregivers and a reduction of their quality of life. This association remains significant despite the presence of other clusters of NPSs.

The results of this study are in line with previous findings showing that the presence of NPSs in people with dementia is associated with both increased burden and lower quality of life of caregivers,[16,28−30] thus extending the current knowledge with a focus on depression and offering a detailed overview in 8 European countries.

Furthermore, to our knowledge, this is the first study, based on data from 8 European countries, analyzing the impact of depression in people with dementia on the informal caregiver burden, in terms of hours of supervision.

Although the association between depression and burden and quality of life of informal caregivers is clear in most countries, some countries, such as Germany and Finland, do not follow the same trend. For instance, in Spain there are strong cultural values that promote taking care of older patients within the family systems, and institutionalization is the last resource when the family cannot provide the required care. Moreover, the number of hours that the family caregiver provides to the people with dementia is very high; in many cases, it is a full-time commitment. These cultural values coexist with an institutional long-term care system that cannot be afforded by many cases and a social community support that needs to be improved for people with dementia and their caregivers.[31] This discrepancy might be explained by the fact that intrinsic characteristics of informal caregiver, such as self-efficacy and environmental determinants, as well as socio-cultural factors and healthcare policy, may influence the level of burden that they perceive.[16,18,32]

Concerning the associations between depression and caregiver burden and well-being, compared with the other NPS clusters, the literature findings are conflicting.[33] Psychotic and disruptive behaviors were the mostly cited clusters of NPSs having a negative impact on caregiver burden,[34] but for quality of life, negative syndromes such as apathy and depression, seem to play a more important role.[32]

Moreover, although "positive" syndromes, such as agitation and irritability, were frequently considered as the major cause of burden and distress,[32] it is important to remember that often these "syndromes" are actually featured symptoms of clinical depression.[35] Our results show how depression remains significantly associated with both of our main outcomes, despite the presence of other NPS.

Serotonin reuptake inhibitor antidepressants are often considered as first-line pharmacologic agents to treat depression in people with dementia. Recent results from the clinical trial Citalopram for agitation in Alzheimer disease (CitAD) reported a significant effect of citalopram for treating several NPS such as agitation, delusions, anxiety, and irritability/lability in patients with Alzheimer's disease (AD).[36,37] However, it is known that the pharmacologic strategies adopted to treat depression in people with dementia are not often enough to guarantee a successful management of these patients, in the community-dwelling setting.[14,38,39] Furthermore, caregivers' psychological well-being was associated with, among other things, less caregiver burden and higher quality of life.

Our study is based on a large sample size of which 55% is affected by AD and depression. The main independent variable of this analysis was assessed using the Cornell scale, which is precisely designed and validated for the diagnosis of depression in people with dementia.[21] As a consequence, the depression prevalence of 34% found in our study could be considered as more accurate than those shown in previous reports that are conflicting, with a variation of the estimated prevalence from 4% to 40%.[12,13] Indeed, comparison of depression prevalence in patients with AD is difficult, as the clinical definitions used, the symptoms severity and the populations studied differ between studies. In addition, Chi et al highlighted in a large meta-analysis the importance of a standardized diagnostic approach for the evaluation of depression prevalence in patients with AD. Their results showed a 14% rate of major depression according to Diagnostic and Statistical Manual of Mental Disorder criteria vs 40% using the specific criteria for dementia in patients with mild AD.[40] Another strength of our study is that the main outcomes were based on 2 different validated scales for assessing quality of life and 2 different features of the burden (Zarit scale and hours of supervision in terms of Resource Utilization in Dementia questionnaire).

The main limitations of this study consist in the cross-sectional design that prevent us from investigating the association between depression in people with dementia and the main outcomes over time; furthermore, this is a secondary data analysis, therefore examining the association between depression in people with dementia

Table 5
Regression Analysis Between Depression and Other Cluster of NPS According to our Main Outcomes

	Zarit Score			Hour of Supervision			NPI Distress			GHQ-12 Score			VAS Score		
	β	*P* Value	Charlson Index	β	*P* Value	Charlson Index	β	*P* Value	Charlson Index	β	*P* Value	Charlson Index	β	*P* Value	Charlson Index
Agitation	4.1	.002	(1.9; 6.1)	1.6	.005	(0.5; 2.8)	1.1	.004	(0.3; 1.8)	1.9	<.001	(1.1; 2.7)	−4.1	.004	(−6.8; −1.2)
Psychotic	3.4	.002	(1.2; 5.5)	1.6	.005	(0.49; 2.8)	1.2	.001	(0.49; 1.9)	1.8	<.001	(0.9; 2.6)	−3.7	.008	(−6.5; −0.9)
Apathy	3.7	.001	(1.6; 5.8)	1.6	.005	(0.55; 2.9)	1.2	.001	(0.48; 1.9)	1.8	<.001	(1.1; 2.6)	−4.1	.003	(−6.8; −1.4)
Affective disorders	3.6	.001	(1.5; 5.8)	1.7	.004	(0.5; 2.9)	1.2	.002	(0.45; 1.9)	1.8	<.001	(1.04; 2.6)	−4.1	.003	(−6.9; −1.4)

NPI, Neuropsychiatric Questionnaire without depression item.

and the onset or worsening of depression in the informal caregiver was not possible.

Often, NPSs and especially depression have been shown to have a greater negative impact in the caregiver's life than cognitive disorders, such as memory complaint.[41]

Given the impact of depression among people with dementia on burden, distress, and quality of life of informal caregivers, it is crucial to detect depression in people with dementia over the course of the disease, a condition often underdiagnosed in this population.[12] A correct diagnostic timing could help the clinician find specific coping strategies and other nonpharmacologic treatments to manage people with dementia at home, reduce the informal caregiver's burden, and preserve their quality of life.[36,42–44]

Supporting informal caregivers in the home management of people with dementia is a challenge to reduce the onset of adverse events, such as mortality, and health costs related to institutionalization.[45]

Conclusions and Implications

The results of this study show that depression in people with dementia is associated with an increased burden and distress of informal caregivers and a reduction of their quality of life. This association remains significant despite the presence of other NPSs. Further studies are needed to assess if providing tailored strategies for optimizing diagnosis and managing of depression in people with dementia might be a strategy of choice to improve caregiver quality of life and to reduce their burden in the community-dwelling setting.

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Supplementary Material

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Supplementary Table 1
Association Between Depression in Burden, Distress, and Quality of Life of Informal Caregiver Within Countries (Adjusted Averages)

	Estonia		Finland		France		Germany	
	Depressed	Not Depressed	Depressed	Not Depressed	Depressed	Not Depressed	Depressed	Not Depressed
Zarit	38	35	31	31	33	34	28	29
Hours of supervision per day	11	8	7	7	6	6	3	1
NPI-Q distress	12	11	11	10	14	11	12	11
GHQ-12	16	13	12	11	14	12	12	12
EQ-VAS	61	68	68	73	70	72	69	69
	The Netherlands		Spain		Sweden		England	
	Depressed	Not Depressed	Depressed	Not Depressed	Depressed	Not Depressed	Depressed	Not Depressed
Zarit	28	24	40	35	42	29	41	33
Hours of supervision per day	5	4	8	8	3	3	12	7
NPI-Q distress	11	10	12	10	13	11	10	9
GHQ-12	12	12	16	15	16	12	15	12
EQ-VAS	71	74	60	61	69	71	69	71