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Prevalence and correlates of psychiatric morbidity in Egyptian sample of dementia patients' caregivers: a comparative descriptive study

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Abstract

Background: A strong relationship between dementia caregiving and negative consequences on psychological health of caregivers has been established in numerous studies. A meticulous evaluation of caregiver mental status function is of utmost importance to gain better insight into daily caregiver functioning and to alleviate their high levels of burden. This study evaluated the prevalence of psychiatric morbidities and their sociodemographic and clinical correlates among a sample of dementia caregivers in Egypt. Twenty-five caregivers of patients with dementia were collected and compared with regard to their psychiatric morbidity with 25 caregivers of patients with chronic physical diseases. Patients were subjected to Mini-Mental State Examination (MMSE) and Arabic versions of activities of daily living (ADL) and instrumental activities of daily living (IADL), and caregivers were interviewed using the Arabic version of the General Health Questionnaire (GHQ), Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I), and Zarit Burden Interview (ZBI).

Results: Caregiver's burden was significantly higher among the dementia caregiver group than the non-dementia group. Moreover, dementia caregivers provided more aid with a higher total of ADLs and provided help for more IADLs than did the non-dementia caregivers. They also showed higher psychiatric morbidity. Such morbidity was found to be related to hours of caring, years of caring, GHQ, ZBI, ADL/IADL, BPSD, and MMSE. On the other hand, ADL, IADL, and GHQ scores had the highest predictive significance of caregiver's burden in our study.

Conclusions: Caregivers of patients with dementia are subjected to more burden and vulnerability to psychiatric disorders than the other caregiver group. That should raise a flag to pay extra support and care for those people, which in turn will benefit both the patient and the health care authorities in terms of quality and cost of the care provided.

Keywords: Caregiver, MMSE, Zarit Interview, Dementia, Burden

Background

Dementia is universally considered as one of the most serious and debilitating mental health problems. It tends to be disabling both the patients and their families [1]. There are an estimated 47 million people with dementia worldwide currently, and this figure is likely to expand by nearly 10 million new cases annually [2], doubling the number of people affected by dementia every 20 years [3].

Family has been considered the fundamental entity in health and medical care services [4]. However, the concept, structure, and function of the family unit vary considerably across different cultures [5]. The traditional collectivistic nature of the family unit is sacred among the Arabic culture, which could be viewed as a double-edged blade; on one hand, it may be helpful as family would support their unprivileged members (i.e., patients). On the other hand, it can carry over involvement and enmeshment patterns, which may interfere with their relative's proper management [6–8].

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The fact of being a relative caregiver for dementia patients though sometimes is positive, the general impacts are negative. With high rates of burden and psychological morbidity as well as social isolation, physical ill-health, and financial hardship, relative caregivers of patients with dementia are often seen as the invisible second patients [1].

Comparing the nature and effects of caregiving task to patients suffering from dementia and caring for other types of dependent family members showed that dementia caregiving task imposed an exceptional burden. It consumed more time and negatively affected the caregiver's emotional, occupational, and social life. Moreover, it causes caregiver tension and mental and physical health problems [9–11]. Various studies agreed that being a caregiver of a patient with dementia renders the person to develop psychological stress, mental health problems, and depression [12]. Caregiving burden plays a crucial role towards the decisions of patient institutionalization [11], for it is argued that caregiver exhaustion is the most important determinant [13].

Several studies explored factors associated with caregiver burden, and many determinants were proposed including characteristics of the caregiver, the recipient and the surroundings, such as age and gender of the caregiver, relationship with the recipient, caregiver's baseline physical and mental health, family history of mental illness, quality of relationship between caregiver and care receiver, life stressors and satisfaction, levels of physical disability, severity of behavioral and psychological symptoms of the recipient's illness, number and type of tasks required, duration of care, and level of support of the caregiver whether formal or informal from other family members and friends [14–17].

In spite of the growing body of research on caregiver burden and impact on individual and community well-being, there is scarce and inconsistent literature emphasis on the difference between the dementia and non-dementia caregivers. In addition, as of our knowledge, there are no studies on this field conducted in Egypt at least in the past 15 years. Such studies could help to properly modify and redirect the aids available to the family care providers in order to supply them with best possible support which in turn could reduce the pressure on the resources, putting in mind the huge saving in the national budgets insured by the informal community caregiving compared to formal home and institutional care [18, 19].

Objectives

This study is designed to evaluate the prevalence of psychiatric morbidities and their sociodemographic and clinical correlates among a sample of dementia caregivers in Egypt in comparison to caregivers of patients with other medical diseases.

Method

Study design and procedures

This study was a cross-sectional, comparative study. It was approved by the Ethics Committee of the Institute of Psychiatry, Ain Shams University. All participants gave informed written consent. A convenient sample of patients diagnosed with dementia and their caregivers was selected from the outpatient memory clinics, which was held once weekly in the period between September 2016 and December 2016.

Operational definition for a caregiver of patients with dementia

The selected caregiver should be the primary caregiver, be living with the patient during the study and for at least 1 year prior to enrollment in the study, having a daily contact with him or her, being involved in the care of the patient, and had an inclusive idea of how he/she typically behaved. Also, the care recipients should have needed help which included helping with personal needs, household chores, financial assistance, and providing transportation when necessary. Relatives with history of psychiatric disorders, cognitive disability, neurological disorder or being illiterate, and those who cared for more than one chronically ill person in the family were excluded from the caregiver group.

Selection of participants

Patients were included if only they were proved to have the diagnosis of any type of dementia at least 1 year prior to the study.

Over a 3-month time frame (the study interval), a total of 62 demented patients visited ASUIP memory clinic (based on DSM-IV diagnostic criteria). Of those, 19 patients were not eligible to participate as they were recently diagnosed with dementia (less than 1 year prior to the study). Fourteen patients did not have an accompanying relative and four patients, and their relatives refused participation for no clear reasons. Thus, a total of 25 patients and their relatives provided the data.

Then, 25 controls were recruited from the Ain Shams University hospitals and other general outpatient clinics who had responded to a hospital advertisement requesting volunteers for a research into burden for caregivers in the elderly. Socioeconomic status was established by asking the participants to estimate their net annual income. At the time of recruitment, all controls had relatives who were alive and did not have a diagnosis of dementia, and they did not, themselves, have any other caregiving responsibilities such as a disabled child. None of the caregivers or controls had an end-stage terminal illness or was receiving treatment (i.e., glucocorticoids or immunosuppressant drugs) for a coexisting illness that would affect the variables under investigation.

During the study interval, caregivers of eight diabetic patients, seven hypertensive ones, five patients with chronic obstructive pulmonary disease (COPD), and five who had chronic kidney disease (CKD) were consented to participate in the current study.

Measures

Assessment of the care recipients

The clinical history of the person with dementia was collected using a semi-structured clinical data sheet routinely used in Institute of Psychiatry, Ain Shams University Hospital (ASUIP) for geriatric patients. It consists of sociodemographic data, history of present illness, family history, and past history including medications; it also includes assessment of behavioral and psychological symptoms of dementia (BPSD), which represents heterogeneous group of non-cognitive symptoms and behaviors occurring in subjects with dementia. BPSD includes agitation, aberrant motor behavior, anxiety, elation, irritability, depression, apathy, disinhibition, delusions, hallucinations, and sleep or appetite changes.

The Arabic version of Mini-Mental State Examination (MMSE) was used to stage the severity of cognitive impairment in demented patients by testing the following components of cognitive functioning: concentration, orientation, language, praxis, and memory [20]. With scores ranging from 30 to 0, the following cutoff levels have been suggested: ≥ 27 = no cognitive impairment, 21–26 = mild, 11–20 = moderate, and ≤ 10 = severe [21].

Arabic versions [22] of activities of daily living (ADL) [23] and instrumental activities of daily living (IADL) [24] were used to assess the care recipients' functional status. The assessment included 14 items that inquired about the extent to which the care recipient can perform basic ADLs such as eating, bathing, dressing, toileting, mobility, and continence and the IADLs that inquired about more complicated tasks which have an impact on linking social competency with independent living, such as using the telephone, shopping, traveling or using transportation, taking medications, handling personal finances, preparing meals, doing housework, and washing clothes. For each of the items, respondents were asked to report on the ability of care recipients to perform the task without help, rated as follows: 0 = independent, 1 = with some help, and 2 = totally dependent. The total scores ranged from 0 to 28, with higher scores indicating the recipients' need for more assistance to carry out ADLs.

Assessment of caregivers of both patients with dementia and patients with medical disorders

Standard caregiver *demographic information* (age, gender, race, level of education, employment status, income, number of cohabitants in household, with the care receiver, working status, daily hours spent on caregiving)

was gathered for both groups, along with several measures of objective and subjective dementia caregiver burden and psychiatric symptomatology including the following:

The Arabic version [25] of the *General Health Questionnaire (GHQ)*, twelve item [26], was applied to screen for psychiatric well-being. It has reliability coefficients ranging from 0.78 to 0.95 in various studies with a well-established international validity. Scores of about 11–12 are normal. A score more than 15 indicates evidence of stress. A score more than 20 suggests severe problems and psychological distress.

Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I). The clinician version [27] was used to confirm the diagnosis of axis I psychiatric conditions. It was chosen for relatively easier administration in clinical setting. To conform to the cultural norms, we used the Arabic translated and validated version of the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I) [28].

Zarit Burden Interview (ZBI) [29], Arabic version [30], was also used to measure subjective burden among caregivers of adults with dementia. It is a 22-item self-report inventory that examines burden associated with functional/ behavioral impairments and the home care situation. The items are worded subjectively, focusing on the affective response of the caregiver.

Data analysis

It was performed using a Statistical Package for Social Sciences; version 20 (SPSS). The results were tabulated, grouped, and statistically analyzed using the suitable statistical parameters. Continuous variables were presented as mean \pm SD, and categorical variables as absolute numbers and percentages. Chi-square test and ANOVA test were used for the comparison of categorical variables. Continuous normally distributed variables were compared by independent sample *t* test. *P* value was considered significant when $*P < 0.05$ and highly significant when $**P < 0.001$.

Results

Sociodemographic and clinical characteristics of the study participants case and control group

Out of the 25 demented patients included in the study, 19 patients of them were females and six patients were males. Their age ranged between 61.75 ± 32.19 and $82.33(\pm 6.43)$ years. The severity scores of their dementia on (MMSE) scale ranged from 14.25 ± 4.11 to 10.33 ± 2.08 . The degree of patient's dependence on the caregiver for daily tasks and the caregiver's pressure (ADL/IADL) had a mean and SD of 18.96 ± 3.97 and total of 92% of demented patients had BPSD.

The caregivers of dementia patients (case group) was found to include 22 females and only 3 males, aged

48.84 ± 7 years old. Being a daughter represented more than three quarters of the number of caregivers (76%), followed by wives (12%), then sons (8%), and lastly husbands (4%). With regard to their education, 56% of caregivers had received at least 12 years of education and 24% were illiterates. Only 20% of the participants were employed. The monthly income in this group was less than 1000 and more than 3000EGP in 4%.

On the other hand, females represented 60% of the caregivers for non-dementia patients (control group) with mean age 51.72 ± 7 years old. Furthermore, sons and daughters were 44% and 32% respectively, and the rest were wives (24%). Fifty-six percent of them had at least 12 years of education whereas 32% were illiterate. Higher percentage (60%) of non-dementia caregivers was unemployed, and 36% earned less than 1000EGP.

Although the dementia caregivers spent 12.32 ± 5.54 h caring for their relatives compared to 5.80 ± 3.08 h spent by the control, they gave less years (4.48 ± 2.02) in comparison to 13.40 ± 13.57 years offered by the other group.

The comparison between the two groups regarding the previous characteristics revealed statistically significant difference regarding gender (P value = 0.024), the relationship of the caregivers with the patients (P value = 0.005), and years of caregiving (P value = 0.002). A high statistically significant difference between the two groups regarding daily hours spent giving (P value = 0.001) was detected as well. However, no statistically significant difference was found regarding age, educational level, occupation, and financial level (Table 1).

Caregiver burden

Caregivers of patients with dementia had significantly higher rates of burden than caregivers of patients with chronic medical illness as shown in ZBI scores. Additionally, dementia caregivers provided more aid with a higher total of ADLs and provided help for more IADLs than did the non-dementia caregivers (Table 2). There was a significantly higher total number of activities for which the caregivers provided assistance in the case than the control group.

Psychiatric morbidity among caregivers

Caregivers of demented patients scored significantly higher on GHQ than caregivers of patients with chronic medical illness (P value = 0.013).

Assessment of psychiatric morbidity by SCID-1 showed that the most frequently encountered axis 1 diagnoses were generalized anxiety disorders in 44% of dementia caregivers as opposed to 16% in the control group, followed by major depressive disorders and/or dysthymia in 28% of the cases compared to 8% of the controls, whereas only caregivers of dementia patients suffered mixed anxiety depressive disorder (12%). Only

16% of the dementia group did not have any axis 1 diagnosis against 76% of the non-dementia caregiver group. These findings were realized to be of statistical significance ($P < 0.001$) (Table 3).

Association of caregivers' psychiatric morbidity with patients' and caregivers' sociodemographic and clinical variables

The results showed that psychiatric morbidity among caregivers is significantly associated with their longer hours of caring, years of caring, higher scores on GHQ, ZBI, and ADL/IADL and positive scores of their dementia relative on BPSD, and lower scores on MMSE as detailed in Table 4.

Predictors of psychiatric morbidity among dementia patients' caregivers

The regression analysis in Table 5 showed that hours of caring, higher scores on GHQ and ZBI, and lower scores on MMSE are significant predictors for higher caregiver psychiatric morbidity profile (anxiety and depressive disorders). P value were 0.018, 0.043, < 0.001, and 0.030, respectively.

Predictors of caregiver burden

ADL, IADL, and GHQ scores were significant predictors of caregivers experienced burden ($P < 0.001$) (Table 6).

Discussion

In the current study, the typical profile of a dementia caregiver was a middle-aged female relative of the person with dementia or non-dementia (88% and 60% respectively). This was consistent several previous studies [1, 9]. Ory and his associates [9] reported that women represented 72.5% and 68.1% of caregivers of dementia and non-dementia patients correspondingly. In the same study, while spouses were more to care for dementia patients more than non-dementia patients, children cared more for non-dementia patients rather than those with dementia. Moreover, in their review, Sharma and colleagues [31] found several studies revealing that females represented about 57–81% of caregivers of the elderly in different countries all over the world, especially wives and adult daughters. Higher ratio of female caregivers were reviewed by Brodaty and Donkin [1], ranging from 59 to 95% in different countries with nearly equal proportions of spouses and children. This is mostly because women unlike men have less tendency to institutionalize their relatives in need [32]. Besides, it is considered as traditional role of women [1]. Nevertheless, that is changing recently, as more men are getting involved in the care of the elderly with approximately 50% ratio [31] or higher [32]. Our results show it is not the case in Egypt, which can be attributed to cultural factors, where females are providing direct instrumental and household

Table 1 Comparison between sociodemographics of both groups

Age (years)	Caregivers of patients with dementia		Caregivers of patients with other medical disorders		<i>t</i> test	<i>P</i> value
Mean ± SD	48.84 ± 7.55		51.72 ± 7.72		1.777	0.189
Range	36–69		40–70			
Sex	No.	Percent	No.	Percent	χ^2	<i>P</i> value
Female	22	88.0	15	60.0	5.094	0.024*
Male	3	12.0	10	40.0		
Total	25	100.0	25	100.0		
Education	No.	Percent	No.	Percent	χ^2	<i>P</i> value
Preparatory	2	8.0	2	8.0	5.286	0.382
Primary	3	12.0	1	4.0		
Illiterate	6	24.0	8	32.0		
Diploma	10	40.0	10	40.0		
College	4	16.0	4	16.0		
Total	25	100.0	25	100.0		
Occupation	No.	Percent	No.	Percent	χ^2	<i>P</i> value
Not working	20	80.0	15	60.0	3.667	0.170
Working	5	20.0	10	40.0		
Total	25	100.0	25	100.0		
Income	No.	Percent	No.	Percent	χ^2	<i>P</i> value
Less than 1000	12	48.0	9	36.0	4.154	0.271
From 1000 to 3000	12	48.0	14	56.0		
More than 3000	1	4.0	2	8.0		
Total	25	100.0	25	100.0		
Relative to patient	No.	Percent	No.	Percent	χ^2	<i>P</i> value
Daughter	19	76.0	8	32.0	12.712	0.005*
Husband	1	4.0	0	0.0		
Son	2	8.0	11	44.0		
Wife	3	12.0	6	24.0		
Total	25	100.0	25	100.0		
Hours of caring					<i>t</i> test	<i>P</i> value
Mean ± SD	12.32 ± 5.54		5.80 ± 3.08		26.474	< 0.001**
Range	4–24		2–13			
Years of caring					<i>t</i> test	<i>P</i> value
Mean ± SD	4.48 ± 2.02		13.40 ± 13.57		10.561	0.002*
Range	2–10		5–77			

*significant statistical difference

**Highly significant statistical difference

Table 2 Assessment of caregiver's burden

ZBI	Caregiver cases	Caregiver controls	<i>t</i> test	<i>P</i> value
Mean ± SD	33.32 ± 14.40	14.92 ± 7.40	31.250	<0.001**
Range	17–65	6–28		
ADL/IADL				
Mean ± SD	18.96 ± 3.97	8.20 ± 2.90	119.572	<0.001**
Range	12–26	4–14		

ZBI Zarit Burden Interview, ADL activities of daily living, IADL instrumental activities of daily living

**Highly significant statistical difference

support to elders and males providing financial support to meet elders' daily needs and health care costs.

The relationship to the care recipient was found to be 82% children and 16% spouses in dementia patient group compared to 67% and 24% respectively in non-dementia group, with significantly increased ratio of son in the second group. That seems to be inconsistent with previous study [9], where there was higher ratio of spouses caring for the dementia patients while higher ratio of older children cared for the non-dementia group. This can be considered a positive point in the Egyptian

Table 3 Psychiatric morbidity in caregivers of demented and non-demented patients

SCID	Caregivers of patients with dementia		Caregivers of patients with other medical disorders		Chi-square test	
	No.	Percent	No.	Percent	χ^2	P value
Anxiety disorders	11	44.0	4	16.0	18.827	<0.001**
Major depressive disorders	7	28.0	2	8.0		
Mixed anxiety and depression	3	12.0	0	0.0		
No psychiatric morbidity	4	16.0	19	76.0		
Total	25	100.0	25	100.0		

**Highly significant statistical difference

society reflecting deep-rooted integrated family relations and commitment, where children take care of their parents especially on getting older and disabled.

The current study revealed that dementia caregivers were spending more hours in caring than non-dementia caregivers. A previous study [33] found that weekly duration of caregiving in elderly was about 4.6 h for people with average cognition compared to around 13, 22, and 46 h in patients with mild, moderate, and severe dementia in that order. Others estimated the average hours spent caring for a patient with dementia by 21.9 h per caregiver per week [19] or 171 h per recipient monthly [34].

The average duration of dementia caregiving in this study was 4.48 years. It was reported that care provider of a person with dementia spent longer time that caregivers of older adults with other conditions, 2 years or more in 54% and 50% respectively, with about 57% caregivers of people with dementias had provided care for 4 or more years [19]. The relatively high average time in our study could be related to the criteria of selection of our sample, as we only included those who were diagnosed with dementia at least 1 year before the research.

Clinical characteristics of the study participants

Difference in activities of daily living (ADLs) and instrumental activities of daily living (IADLs) between two groups

The results of the current study also show that dementia caregivers provided significantly ($P < 0.001$) more aid with higher total of ADLs and IADLs (18.96 ± 3.97) than did non-dementia caregivers (8.20 ± 2.90) that comes in line with the results detected by Ory et al. [9], since they reported a significant increase in the total number of activities for which the dementia caregivers provided assistance ($P < .001$) than those assisted by non-dementia caregivers on both ADLs and IADLs. Alzheimer's Association in their annual reports [19] highlighted the difference between the tasks of caregivers of elderly people with and

without dementia, as 77% of care recipients with dementia demanded more assistance with at least one ADL and three IADL areas and 40% needed help with three or more ADL compared to only 20% and 14% correspondingly of the dementia-free group. Moreover, they need help with self-care and mobility (85% vs. 71%) and health or medical care (63% vs 52%).

Zarit Burden Interview

Our results showed that dementia caregivers had significantly higher scores of ZBI than non-dementia caregivers ($P < 0.001$).

This finding was congruent with previous studies that noted that individuals caring for people with dementia reported more personal and social burden with (55% and 52% in the order) compared to 40.9% and 38.1% of non-dementia caregivers [9].

Studies showed that caregivers of chronically ill patients suffer several types of burden: more than third reported schedule burden, around fifth had financial burden, 14% reported family burden, and 10% experienced health problems, which was almost stable over the time of caregiving [34, 35].

The burden in caregivers was found to be affected by the duration, amount, and intensity of the tasks [9] which can explain our results. It is previously mentioned that our dementia caregiver group spent longer time and had to support more ADL and IADL. Hence, it was not hardly anticipated that negative consequences were found to be spotted more in informal care provider for people with probable dementia among other factors [36]. Even the studies that questioned the impact of caregiving and the conditions that makes it stressful considered dementia a stressful situation in which the recipient is progressively deteriorating over a long period of time without expected cure or improvement [37].

Psychiatric morbidity

Study results of the relation between caregiving and psychological burden and morbidity in different cultures yielded different results [38]. In the current study, dementia caregivers had significantly higher scores of GHQ 12 than non-dementia caregivers, with more depression and anxiety. Previous study found that dementia caregivers had high scores on GHQ which was strongly related to the assessed burden [39]. Another study concluded that caregivers of dementia suffered from psychiatric morbidity in particular depression and anxiety more than matching general population or caregivers of other illnesses [40]. In the same context, another study [41] found that care provider's psychiatric morbidity is associated the most with the presence of dementia in the care recipients. Moreover, among wide range of physical

Table 4 Association between psychiatric morbidity in dementia caregivers and their sociodemographic and clinical variables

Caregiver/patient variables	Anxiety disorders	Major depressive disorders	Anxiety with co-morbid depression	No psychiatric morbidity	F/χ^2*	P value
Age of caregiver (years)	49.8 ± 10.2	48 ± 5.8	47.7 ± 3.51	48.5 ± 5.5	0.104	0.9
Sex of caregiver						
Female	9 (81.8%)	7 (100.0%)	3 (100.0%)	3 (75.0%)	2.402	0.493
Male	2 (18.2%)	0 (0.0%)	0 (0.0%)	1 (25.0%)		
Relation to patient						
Daughter	7 (63.6%)	6 (85.7%)	3 (100.0%)	3 (75.0%)	5.291	0.808
Husband	1 (9.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)		
Son	1 (9.1%)	0 (0.0%)	0 (0.0%)	1 (25.0%)		
Wife	2 (18.2%)	1 (14.3%)	0 (0.0%)	0 (0.0%)		
Education of caregiver						
College	2 (18.2%)	2 (28.6%)	0 (0.0%)	0 (0.0%)	9.560	0.655
Diploma	3 (27.3%)	3 (42.9%)	2 (66.7%)	2 (50.0%)		
Illiterate	4 (36.4%)	0 (0.0%)	1 (33.3%)	1 (25.0%)		
Preparatory	0 (0.0%)	1 (14.3%)	0 (0.0%)	1 (25.0%)		
Primary	2 (18.2%)	1 (14.3%)	0 (0.0%)	0 (0.0%)		
Occupation of caregiver						
Not	9 (81.8%)	6 (85.7%)	2 (66.7%)	3 (75.0%)	0.561	0.905
Working	2 (18.2%)	1 (14.3%)	1 (33.3%)	1 (25.0%)		
Income						
From 1000 to 3000	3 (27.3%)	5 (71.4%)	1 (33.3%)	3 (75.0%)	5.569	0.473
Less than 1000	7 (63.6%)	2 (28.6%)	2 (66.7%)	1 (25.0%)		
More than 1000	1 (9.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)		
Hours of caring	9.55 ± 4.44	17.57 ± 5.44	14.00 ± 2.00	9.50 ± 3.42	5.332	0.007**
Years of caring	3.55 ± 0.9	5.43 ± 1.9	6.67 ± 3.06	3.75 ± 2.2	3.442	0.035*
GHQ of caregiver	15.2 ± 3.8	19.86 ± 3.13	23.67 ± 5.86	12.00 ± 0.8	8.315	0.001**
ZBI of caregiver	25.6 ± 5.5	44.9 ± 12.4	52.3 ± 13.9	20 ± 2.6	14.730	<0.001**
ADL/IADL of patient	17.18 ± 3.09	21.43 ± 2.51	23.00 ± 3.6	16.50 ± 4.80	4.617	0.012*
BPSD of patient						
Negative	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (50.0%)	11.413	0.01*
Positive	11 (100.0%)	7 (100.0%)	3 (100.0%)	2 (50.0%)		
MMSE of patient	12.27 ± 3.61	10.86 ± 2.41	10.33 ± 2.08	14.3 ± 4.1	5.133	0.008**
Age of patient (years)	75.27 ± 5.69	82.29 ± 2.75	82.33 ± 6.43	61.8 ± 32.1	2.388	0.098
Sex of patient						
Female	7 (63.6%)	7 (100.0%)	3 (100.0%)	2 (50.0%)	5.562	0.135
Male	4 (36.4%)	0 (0.0%)	0 (0.0%)	2 (50.0%)		

ZBI Zarit Burden Interview, GHQ General Health Questionnaire, ADL activities of daily living, IADL instrumental activities of daily living, BPSD behavioral and psychological symptoms of dementia, MMSE Mini-Mental State Examination

*significant statistical difference

**Highly significant statistical difference

chronic conditions assessed in recipients, only arthritis or rheumatism was to demonstrate a significant relation with caregiver's psychiatric morbidity. Although higher levels of depression were found in spouse caregivers, there was no difference in anxiety level between both groups [42].

Relation between psychiatric morbidity and sociodemographic variables

No significant difference was found between both caregiver's genders and their psychiatric morbidity. The results of studies comparing outcomes of psychiatric morbidity especially anxiety and depression for

Table 5 Logistic regression for predictive factors of dementia caregivers' psychiatric morbidity

Factors	B	Wald	Sig.	Exp (B)	Lower	Upper
Hours of caring	-0.151	5.589	0.018*	0.860	0.301	1.462
Years of caring	-0.518	1.661	0.198	0.596	0.209	1.013
GHQ	-0.165	4.464	0.043*	0.848	0.297	1.442
ZBI	-0.170	13.259	<0.001**	0.844	0.295	1.435
ADL/IADL	-0.187	0.266	0.606	0.829	0.290	1.409
BPSD	0.000	0.012	0.911	1.000	0.350	1.700
MMSE	1.290	4.735	0.030*	3.634	1.272	6.178

GHQ General Health Questionnaire, ZBI Zarit Burden Interview, ADL activities of daily living, IADL instrumental activities of daily living, BPSD behavioral and psychological symptoms of dementia, MMSE Mini-Mental State Examination

*significant statistical difference

**Highly significant statistical difference

male versus female caregivers have yielded variable results. In one hand, some studies found that females had more psychiatric morbidity than males [43]. On the other hand, another study found that male caregivers had significantly more co-morbidity than female caregivers [44], while some did not report gender differences in psychiatric morbidity among caregivers as in ours [41]. Specifically, some reported females to have more depression than males [44–47].

There was no significant relationship between age, education, working status, income, and psychiatric morbidity among caregivers in our study. That agrees with other studies where psychiatric morbidity was detected in 8.8% of the caregivers, in whom the sociodemographic characteristics were not different than the rest except for relation to the care recipient, where the spouse affected by psychiatric morbidity were 29.5% compared to 18% of those without psychiatric symptoms [41].

On comparing caregivers with psychiatric morbidity with those without psychiatric symptoms, significantly higher proportion of those with psychiatric morbidity had an older relative who needed care much of the time [41], and longer duration of care could

contribute to 33% increase in risk of depression [47], as 40–79 of weekly care hours are predictor of depression in the caregiver [48]. That agrees with our results that showed significant relationship between duration of caregiving and developing depression and anxiety in caregivers.

Relation between psychiatric morbidity and clinical characteristics of dementia patients

In the current study, there was a significant relation between severity of dementia, higher ADL and IADL impairment, behavioral and psychological symptoms of dementia, and increased level of psychiatric morbidity among caregivers. The severer the symptoms of dementia and the longer the duration of care, the more the depression and anxiety in the caregiver [49]. Impaired ADL and hallucination are risk factors for depression [50].

A recent study [41] found that care provider's psychiatric morbidity is associated the most with the severity of behavioral and mental disturbances in the care recipients, rather than the type of such disturbance. In a systematic review [51] of studies of relation between patient's behavioral problems and caregiver's burden and depression, 19 groups of recipient's symptoms were identified to negatively impact the caregiver and contribute to their depression; however, no single cluster of symptoms was found to be conclusively accountable [52]. The only exception was the patient's depression, which could be the most consistent component of the dementia psychiatric and behavioral symptoms that drive higher caregiver depression [50, 52]. Increased severity of dementia as assessed by MMSE, ADL, and IADL is associated with increased depression and anxiety [53]: memory, movement, and perception deterioration associated more with stress, while behavioral symptoms associated with caregiver's depression. Other studies found limited relation between ADL and cognitive functions of the patient and the caregiver providers' burden and depression [54].

Table 6 Predictors of caregiver's burden

Factors	Regression	T	Sig.	95% CI	
				Lower	Upper
Hours of caring	0.087	0.272	0.788	-0.578	0.751
Years of caring	-1.092	-1.203	0.244	-2.992	0.808
GHQ	1.774	4.824	<0.001**	1.005	2.544
ADL/IADL	1.586	3.733	<0.001**	0.697	2.475
BPSD	0.104	0.327	0.946	-0.694	0.902
MMSE	-0.174	-0.348	0.731	-1.216	0.869

GHQ General Health Questionnaire, ADL activities of daily living, IADL instrumental activities of daily living, BPSD behavioral and psychological symptoms of dementia, MMSE Mini-Mental State Examination

**Highly significant statistical difference

Predictors of psychiatric morbidity (depression and anxiety)

The predictors of caregiver depression and anxiety in our study were found to be longer hours of caring, caregiver burden, higher scores on GHQ and lower scores of MMSE of demented patients. Some other studies included our predictors in addition to others as younger age of patient, the recipient's lower level of education, two or more ADL dependence, and behavioral disturbance, particularly angry or aggressive behavior, besides caregiver low income, the relationship to the patient, hours spent caregiving, and functional dependence [48]. Comparing predictors of depression and predictors of anxiety showed care

recipient ADL impairment, living with the patient, being a female caregiver, reporting a poorer quality of relationship, and caregivers reporting their health as being poor all predicted anxiety disorder, comparatively, irritability, caregivers reporting poor health, and a poorer quality of relationship with the caregivers' predicted depression [55].

Predictors of caregiver burden

The predictors of caregiver burden in our study were impairment of activities of daily living or instrumental activities of daily living and higher scores of GHQ. Proposing several models to predict caregiver's burden, Clyburn et al. [56] found that higher behavioral disturbance, lower level of support to the caregivers, and non-institutionalized patients were perceived as higher burden leading to elevated rates of depression. Regression analysis age of caregiver, self-reported health status, and duration of care were positively associated with caregiver burden, while self-reported income had negative association [57]. The same study found no association between number or type of impairment in ADL and caregiver burden. In a study to predict caregiver burden from ADL [58], the researchers differentiated between caregiver reported and observed ADL. They found that although the ADL reported by the caregiver is strongly correlated with their burden, the performance-based ADL showed weak association. This might explain our results, as we collected our ADL data from the relatives of the patients.

Strength and limitation

Our study is one of the fewest Egyptian studies that investigated the psychological well-being of dementia caregivers. This study illustrates a clear view of the most prevalent psychiatric morbidity in this population and their predictors.

The present study has some limitations, like small sample sizes and restricted inclusion criteria to the patients and families that accepted the participation in the study may limit the generalizability of the study. However, as the sample has been recruited from one of the largest centers that serve greater Cairo, this might help to some extent in randomization and variability of the selected sample.

Future research must continue to integrate family interventions into routine clinical settings for diagnosis and management of patients with dementia and to provide long-term follow-up studies.

Conclusion

Caregivers of patients with dementia are subjected to more burden and vulnerability to psychiatric disorders than the other caregiver group. That should raise the

awareness to improve various facilities providing extra emotional, psychological, and financial support and care for those people, which in turn will benefit both the patient and the health care authorities in terms of quality and cost of the care provided.

Acknowledgements

We are deeply grateful to all patients and healthy controls participating in this study.

Authors' contributions

YA analyzed and interpreted the patient data regarding the hematological disease and the transplant. WS, HH, and ME performed the psychiatric examination and psychometric tests of the patients and were major contributors in writing the manuscript. All authors read and approved the final manuscript.

Funding

The authors of this manuscript declared that there are no funding bodies involved in this research.

Availability of data and materials

All data generated or analyzed during this study are included in this published article.

Ethics approval and consent to participate

The study was approved by the Ethics Committee of the Institute of Psychiatry. Unfortunately, due to technical issues in our institutional IT system, our ethical committee reference number cannot be retrieved at the moment. However, we would be happy to supply a signed letter from our head of institution explaining that this research has been previously approved.

A written informed consent was taken from participants after discussing the aim and procedures of the study. Participation was totally free and voluntary and did not imply a direct benefit for them. Moreover, they were guaranteed the right to refuse or withdraw from the study at any point without justification or consequences on them or their treated relatives. They were informed that the results could be used for scientific publication, but their identities would be absolutely confidential.

Consent for publication

Not applicable

Competing interests

The authors declared that they have no competing interests.

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Received: 11 September 2019 Accepted: 24 September 2019

Published online: 20 November 2019

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