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Assessment of stress in caregivers of acutely hospitalized elderly and its relation to hospital outcomes

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Abstract

Background It is important to understand and identify the physical and emotional strain among caregivers of the elderly as caregivers may have much more strain and burden than non-caregivers, which subsequently may affect their well-being and the clinical outcome of the elderly they are caring for.

Methods To assess caregiver stress and its effect on hospital outcomes at the geriatric department in Ain Shams University Hospitals, a cross-sectional study was done that included adults, aged ≥ 60 years, hospitalized for treatment of acute medical conditions and their accompanied caregivers where the patients were subjected to complete comprehensive geriatric assessment while caregivers' stress was assessed using Caregiver Self-Assessment Questionnaire.

Results Many elderly were found to need caregivers and the need increased with age as well as multiple comorbidities especially dementia, delirium, and urinary incontinence. Stress prevalence among caregivers is high (85%) and it increases with the age of the patients and the patient having several comorbidities such as cancer, neurological diseases, and sleep problems. Stress was also associated with high mortality of patients.

Conclusion As there is an increase in the elderly population with a subsequent increase in the need for caregivers who suffer from caregiver stress, more studies are needed in the future to highlight this problem and find ways to relieve caregivers' stress.

Keywords Caregiver stress, Elderly, Mortality, Caregiver dependence

Introduction

The elderly population, particularly those aged 80 and above, is on the rise due to increased life expectancy. This demographic shift has led to a surge in individuals with comorbidities and dependence [1]. With the growing number of dependent elderly individuals, there is a pressing need for adequate care. However, institutions are struggling to meet these demands, making caregivers indispensable in ensuring a good quality of life for

those in dependent situations. Being a caregiver is far from an effortless task. It involves not only physical and psychological challenges but also intricate sociocultural difficulties. The role of a caregiver extends beyond mere assistance; it encompasses navigating complex societal norms and expectations, making it a multifaceted responsibility. In essence, caregivers play a pivotal role in enhancing the quality of life for the elderly. As the elderly population continues to grow, understanding and addressing the challenges faced by caregivers is essential to provide the necessary support and ensure a dignified life for the dependent elderly individuals in our society [2].

When categorizing caregivers, the primary caregiver assumes the central role, responsible for the elderly

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person's daily care and handling most day-to-day tasks. In contrast, the secondary caregiver engages in sporadic tasks without a fixed schedule or decision-making power, providing support to the primary caregiver through complementary activities [3].

In the realm of healthcare, particularly in the care of elderly patients with chronic comorbidities, evaluating caregiver stress and understanding their needs are pivotal aspects of comprehensive clinical care [4]. Caregiver stress encompasses physical, financial, social, and psychological challenges experienced while caring for an elderly family member dealing with chronic health issues. Many individuals caring for terminally ill older adults undergo significant life changes and personal sacrifices to fulfill their caregiving duties [5].

Additionally, caregiver burden has been recognized as a risk factor for deteriorating physical and mental health, reduced health-related quality of life [6, 7], weakened immunity [8], and even mortality [9]. The psychological stress associated with caregiving and its connection to numerous adverse health outcomes have been observed across caregivers from diverse nationalities and cultures [10–12]. Previous research on caregiver burden has predominantly focused on specific groups, such as caregivers of patients with significant cognitive impairment [13] or those in palliative care units [14].

Comparisons across studies involving different patient populations, like caregivers of patients with heart failure [15] or chronic obstructive pulmonary disease [16], hint at potential variations in caregiver stress related to specific diseases. However, direct comparisons within a single study are lacking, making it challenging to discern genuine differences from methodological variations between these studies. Furthermore, there has been limited exploration of caregiver characteristics associated with stress, as opposed to patient characteristics. Long-term changes in caregiver stress have also been insufficiently studied, leading to conflicting findings. For instance, while a study involving spouses of Parkinson's disease patients demonstrated escalating stress levels over time [17], another study involving Alzheimer's disease caregivers found stability in coping strategies and depressive symptoms over the same period [18].

Over the past two decades; caregiver stress has been the subject of scientific interest by investigators around the globe representing a variety of disciplines. The knowledge base is massive and growing, particularly as it relates to the phenomenology and correlates of caregiver stress, and must be an interest for future research. The purpose of this study was to assess stress among caregivers of acutely hospitalized elderly, look into different factors which may increase their stress, and subsequently

affect the elderly outcome (mortality and prolonged length of stay).

Materials and methods

Study subjects

We accomplished a cross-sectional study of adults aged 60 and older who were hospitalized for treatment of acute medical conditions and their accompanied caregivers at the geriatric department of Ain Shams University Hospitals. This study was done over a period of about 6 months (from May 2018 to November 2018).

Sample size

Using the PASS 15 program for sample size calculation, reviewing results from the previous study [19] showed that the caregiver stress score is positive and significantly correlated with illness severity ($r=0.4$). Based on this result, a sample size of 123 produces a two-sided 95% confidence interval with a width equal to 0.299 when the estimate of Pearson product-moment correlation is 0.400.

During the period of the study 192 patients were admitted consequently to an acute geriatric unit of the geriatric hospital, 135 patients needed a caregiver, while 57 patients did not need a caregiver. Among those who needed a caregiver. Only 101 caregivers were interviewed, the remaining 34 were either not available during the time of the interview, refused to participate, or were paid personnel to take care of the patient only during hospitalization.

Patient assessment

During the interview, each patient was subjected to a detailed history (age, sex, education, and disease and drug history). The cognitive state of the patients was assessed by employing the Arabic version of the Mini Mental State Examination (MMSE); for the functional activity Activenesses of Daily Living Scale (ADLS) [19]: the capability of the cases to achieve the basic self-care exercises (e.g., bathing, dressing, toileting, transfer, continence, and feeding). The Instrumental Activities of Daily Living Scale (IADLS) [20] estimated the case competence to form an autonomous household (capacity to handle telephone, shopping, food construction, housekeeping, laundry, mode of conveying, efficiency of intrinsic medication, and capability to check commerce). Nutritional assessment was done by using Mini-Nutritional assessment (MNA) [21] to define those who are malnourished or at risk of malnutrition. Screening for depression using the Geriatric Depression Scale [22] as a part of comprehensive geriatric assessment patients who refused to participate, patients admitted to ICU or died during the first 24 h of admission were excluded.

Caregiver assessment

As for the caregiver's personal history (including any social problems or marital problems), medical history including neurological and psychiatric diseases and drug history were taken (those with any neurological or psychiatric disorders were excluded), the duration of caregiving, the relation with the patient and if the present caregiver is the only caregiver or has participants. All the interviewed caregivers were the primary caregivers of the patients during the hospitalization of the elderly. Stress was assessed by using the Caregiver Self-Assessment Questionnaire which was asked by the investigators in the Arabic language). The Caregiver Health Self-Assessment Questionnaire was basically promoted and confirmed by the American Medical Association [23] (approval was conducted from the author to use the questionnaire). Caregivers are presented with a series of statements and are instructed to respond either "yes" or "no." These statements include queries such as "During the past week or so, I have felt completely overwhelmed" and "During the past week or so, I have felt strained between work and family responsibilities."

Additionally, in item #17, family caregivers are required to rate their stress levels on a scale from 1 to 10. In item #18, they are asked to evaluate their current health compared to their health 1 year ago.

To calculate the score, two steps are followed. The first is the reverse scoring, questions 5 and 15 are reverse scored. In other words, a "no" response is counted as "yes," and a "yes" response is counted as "no." The second is totaling "yes" responses. The total number of "Yes" responses across all the statements is calculated.

Interpreting the caregiver's score involves several criteria to determine distress:

Positive distress if "yes" to questions 4 and/or 11:** If the caregiver responded "yes" to either or both questions 4 and 11, it indicates distress.

Positive distress if total "yes" score is 10 or more:** If the total number of "Yes" responses across all questions is 10 or higher, it suggests distress.

Positive distress if the score on question 17 is 6 or higher:** If the caregiver's stress level, as indicated by their response to question 17 (rated on a scale from 1 to 10), is 6 or higher, it signifies distress.

Positive distress if the score on question 18 is 6 or Higher:** If the caregiver rates their perception of their current health in comparison to their health 1 year ago as 6 or higher on Question 18, it implies distress.

Patient consent and ethical approval

The research received approval from the Research Ethical Committee at the Geriatric Hospital, Ain Shams

University. Informed oral consent was obtained from all participants, including both elderly patients and their caregivers. The participants were briefed about all aspects of the study, including their right to withdraw from the study at any point.

For patients lacking the capacity to provide consent, their next of kin was approached to act as a personal consultee. These consultees were responsible for supporting their relative's participation in the study, ensuring that ethical guidelines and standards were maintained throughout the research process. This comprehensive approach ensured the ethical conduct of the study while respecting the rights and well-being of all participants involved.

Statistical analysis

A database in Access format was meticulously developed, and subsequent statistical analyses were conducted using Statistical Package for Social Sciences (SPSS) version 20. Quantitative data were represented using key metrics such as mean, standard deviation (SD), and range values, providing a comprehensive overview of the numerical aspects of the study. On the other hand, qualitative data were succinctly presented as frequencies (n) and percentages (%), capturing the categorical aspects of the research.

To discern variations and disparities within the data, the "chi-square" test, a robust statistical method, was applied.

To identify differences and discrepancies within the data, the Shapiro–Wilk test was employed to assess data normality. The chi-square test, a robust statistical technique, was utilized to identify associations between the two qualitative variables. Additionally, an independent t -test was used to compare the two quantitative variables with a normal distribution, while the Mann–Whitney test was applied for variables without a normal distribution. Finally, a simple logistic regression analysis was conducted to calculate the crude odds ratio for each variable. A significance threshold of $p < 0.05$ was set, indicating that results were considered statistically significant if the p value fell below this critical value.

Results

Clinical characteristics and demographic data of the patients are shown in Table 1. A female predominance was found with 125 females (65.1%) and 67 males (34.95). The mean age for the patients was 72.25 ± 8.47 . Most of the patients had a low educational level (82.3%), moderate (9.9%), and then a high educational level (7.8%).

As regards marital status, half of the patients were married (50.5%) and (46.4%) were widows and almost an equal percentage of the patients were single or divorced

Table 1 Demographic data of the patients and caregivers

Characteristics	Patients	Caregivers
Age mean (SD)	72.25 ± 8.47	45.34 ± 12.26
Sex		
Males	67 (34.9%)	14 (13.9%)
Females	125 (65.1%)	87 (86.1%)
Education level		
Low	158 (82.3%)	39 (38.6%)
Moderate	19 (9.9%)	34 (33.7%)
High	15 (7.8%)	28 (27.7%)
Marital status:		
Single	3 (1.6%)	14 (13.9%)
Married	89 (46.4%)	76 (75.2%)
Widow	97 (50.5%)	8 (7.9%)
Divorced	3 (1.6%)	3 (3.0%)
Child no. median (IQR)	4 (2–5)	3 (1–3)
No. of co-morbidities median (IQR)	5 (4–7)	
Charlson median (IQR)	6 (5–7)	
Delirium		
Yes	26 (13.5%)	
No	166 (86.5%)	
MNA		
Malnourished	65 (33.9%)	
At risk	82 (42.7%)	
Normal	45 (23.4%)	
Depression		
Yes	50 (26.0%)	
No	142 (74.0%)	
ADL median (IQR)	2 (0–6)	
IADL median (IQR)	1 (0–5)	
Medications no. median (IQR)	3 (1–5)	
Hearing imp		
Yes	36 (18.8%)	
No	156 (81.3%)	
Visual imp		
Yes	74 (38.5%)	
No	118 (61.5%)	
LOS median (IQR)	11 (7–18)	
Sleep problem		
Yes	63 (50.4%)	
No	62 (49.6%)	
Sleep no median (IQR)	6 (4–8)	
Caregiver		
Yes	135 (70.3%)	
No	57 (29.7%)	
Available caregiver		
Yes		101 (74.8%)
No		34 (25.2%)
Job		
Yes		35 (34.7%)
No		66 (65.3%)

Table 1 (continued)

Characteristics	Patients	Caregivers
Relative		
Spouse		19 (18.8%)
Child		64 (63.4%)
Others		18 (17.8%)
No. of caregivers		
One		70 (57.4%)
More than 1		52 (42.6%)
Co-morbid		
Yes		51 (50.5%)
No		50 (49.5%)
Duration of care median (IQR)		33 (5.5–60)

SD Standard deviation, MNA Mini-nutritional assessment, ADL Activities of daily living, IADL Instrumental activities of daily living, LOS Length of stay

(1.6%). A total of 42.7% of the patients were at risk of malnutrition, 33.9% were malnourished and 23.45 were normal. As regards comorbidities, sleep problems were predominant among patients (50.4%) followed by visual impairment (38.5%), depression (26%), and then hearing impairment (18.8%), and depression was 13.5% with a mean number of comorbidities as 4 comorbidities.

Also, it is shown in Table 1 that the length of stay was an average of 11 days and most of the patients were dependent on caregivers (70.3%). The average score of ADL was 2 and IADL was 1. As regards caregivers' demographics, their mean age was 45.34 ± 12.26 with female predominance (86.1%) and males (13.9%). 38.6% of the caregivers were low in education level, 33.7% were moderate, and 27.7% were highly educated with about 75.2% were married, 13.9% were single, 7.9% were widows, and 35 were divorced. Also shown in Table 1 is that 101 patients had caregivers (74.8%) and those patients who continued in our study with about 34.7% of them had jobs and 63.4% were the children of the patients and 18.8% were the spouses. Number of caregivers percentage as one caregiver was (57.4%) and (50.5%) of the caregivers had comorbidities. Thirty-three days was the average number of duration of care.

As shown in Table 2, increasing age was significantly higher among patients who needed caregivers with a mean of 73.73 ± 6.62. Also, neurological diseases (34.1%) especially dementia (43.7%) were significantly higher among patients who need caregivers, and also delirium (17.8%) was associated with an increase in the need for a caregiver. A number of comorbidities 6(4–7) was significantly associated with the need for a caregiver with the predominance of urinary incontinence (65.2% HS) and infections (51.5% HS). Dependence was highly significantly associated with the need for a caregiver with a

Table 2 Comparison between elderly patients who needed caregivers and those who did not regarding sociodemographic data, medical condition, and functional status

		Caregiver		Test value	P value	Sig
		Yes	No			
Age	Mean ± SD	73.73 ± 8.62	68.74 ± 6.99	3.870	0.000	HS
	Range	60–96	60–87			
Sex	Male	49 (36.3%)	18 (31.6%)	0.393	0.531	NS
	Female	86 (63.7%)	39 (68.4%)			
LOS	Median (IQR)	12 (7–18)	11 (7–18)	– 1.193	0.233	NS
	Range	2–68	4–34			
Education level	Low	108 (80.0%)	50 (87.7%)	2.114	0.348	NS
	Moderate	16 (11.9%)	3 (5.3%)			
	High	11 (8.1%)	4 (7.0%)			
Marital status	Single	2 (1.5%)	1 (1.8%)	2.361	0.501	NS
	Married	59 (43.7%)	30 (52.6%)			
	Widow	71 (52.6%)	26 (45.6%)			
	Divorced	3 (2.2%)	0 (0.0%)			
Child no	Median (IQR)	4 (2–5)	3.5 (2–4)	– 0.332	0.740	NS
	Range	0–10	0–10			
Smoking	Yes	13 (9.6%)	5 (8.8%)	0.267	0.875	NS
	No	100 (74.1%)	41 (71.9%)			
	Ex-smoker	22 (16.3%)	11 (19.3%)			
COPD	Yes	25 (18.5%)	6 (10.5%)	1.891	0.169	NS
	No	110 (81.5%)	51 (89.5%)			
BA	Yes	10 (7.4%)	6 (10.5%)	0.510	0.475	NS
	No	125 (92.6%)	51 (89.5%)			
Infections	Yes	69 (51.1%)	20 (35.1%)	4.138	0.042	S
	No	66 (48.9%)	37 (64.9%)			
DM	Yes	64 (47.4%)	30 (52.6%)	0.438	0.508	NS
	No	71 (52.6%)	27 (47.4%)			
Neurological	Yes	46 (34.1%)	9 (15.8%)	6.555	0.010	S
	No	89 (65.9%)	48 (84.2%)			
Dementia	Yes	59 (43.7%)	0 (0.0%)	35.962	0.000	HS
	No	76 (56.3%)	57 (100.0%)			
HF	Yes	25 (18.5%)	13 (22.8%)	0.464	0.496	NS
	No	110 (81.5%)	44 (77.2%)			
CLD	Yes	19 (14.1%)	13 (22.8%)	2.201	0.138	NS
	No	116 (85.9%)	44 (77.2%)			
Thyroid dis	Yes	7 (5.2%)	5 (8.8%)	0.880	0.348	NS
	No	128 (94.8%)	52 (91.2%)			
HTN	Yes	88 (65.2%)	33 (57.9%)	0.914	0.339	NS
	No	47 (34.8%)	24 (42.1%)			
ISHD	Yes	41 (30.4%)	19 (33.3%)	0.164	0.686	NS
	No	94 (69.6%)	38 (66.7%)			
CKD	Yes	16 (11.9%)	11 (19.3%)	1.839	0.175	NS
	No	119 (88.1%)	46 (80.7%)			
Cancer	Yes	8 (5.9%)	6 (10.5%)	1.255	0.263	NS
	No	127 (94.1%)	51 (89.5%)			
DVT	Yes	7 (5.2%)	1 (1.8%)	1.181	0.277	NS
	No	128 (94.8%)	56 (98.2%)			

Table 2 (continued)

		Caregiver		Test value	P value	Sig
		Yes	No			
UI	Yes	88 (65.2%)	9 (15.8%)	39.119	0.000	HS
	No	47 (34.8%)	48 (84.2%)			
OA	Yes	57 (42.2%)	31 (54.4%)	2.389	0.122	NS
	No	78 (57.8%)	26 (45.6%)			
Delirium	Yes	24 (17.8%)	2 (3.5%)	6.970	0.008	HS
	No	111 (82.2%)	55 (96.5%)			
MNA	Malnourished	56 (41.5%)	9 (15.8%)	13.290	0.001	HS
	Risk	54 (40.0%)	28 (49.1%)			
	Normal	25 (18.5%)	20 (35.1%)			
Depression	Yes	33 (24.4%)	17 (29.8%)	0.602	0.438	NS
	No	102 (75.6%)	40 (70.2%)			
Charlson	Median (IQR)	6 (5–7)	5 (3–6)	– 3.599	0.000	HS
	Range	2–12	2–8			
ADL	Median (IQR)	1 (0–2)	6 (6–6)	– 10.495	0.000	HS
	Range	0–6	4–6			
IADL	Median (IQR)	0 (0–2)	8 (6–8)	– 10.611	0.000	HS
	Range	0–6	0–8			
Medications no	Median (IQR)	3 (2–5)	2 (1–4.5)	– 1.479	0.139	NS
	Range	0–10	0–9			
Hearing imp	Yes	25 (18.5%)	11 (19.3%)	0.016	0.899	NS
	No	110 (81.5%)	46 (80.7%)			
Visual imp	Yes	53 (39.3%)	21 (36.8%)	0.099	0.753	NS
	No	82 (60.7%)	36 (63.2%)			
Sleep prob	Yes	58 (53.7%)	5 (29.4%)	3.467	0.063	NS
	No	50 (46.3%)	12 (70.6%)			
Sleep no	Median (IQR)	6 (4–7)	7 (6–8)	– 3.682	0.000	HS
	Range	2–11	4–12			
Mortality	Yes	27 (20.0%)	8 (14.0%)	0.957	0.328	NS
	No	108 (80.0%)	49 (86.0%)			
Comorbid	Median (IQR)	6 (4–7)	4 (3–5)	5.408	< 0.001	HS
	Range	1–10	1–8			

NS Non-significant, S Significant, HS Highly significant, LOS Length of stay, COPD Chronic obstructive pulmonary disease, BA Bronchial asthma, DM Diabetes mellitus, HF Heart failure, CLD Chronic liver disease, HTN Hypertension, ISHD Ischemic heart disease, CKD Chronic kidney disease, DVT Deep venous thrombosis, MNA Mini-nutritional assessment, ADL Activities of daily living, IADL Instrumental activities of daily living, LOS Length of stay

Table 3 Presence of stress among caregivers

Stress	No	%
No	15	14.9
Yes	86	85.1

mean of (0–2) in ADL and (0–6) in IADL. Among malnourished patients (41.5%) and risk malnutrition patients (40%) the need for caregivers was significantly high.

As shown in Table 3 and Fig. 1, caregiver stress was predominant among caregivers (85.1%). In Table 4 which shows the characteristics of patients that affect caregiver

stress, the number of malnourished patients was bigger among the group of caregivers who had stress (56 malnourished patients). Also, the patients who had visual impairment (32 out of 37) and hearing impairment (16 out of 20) had more stress among caregivers. Sleep problems were more common among the group with caregiver stress with a percentage of 58.1%.

In Table 5, which shows the characteristics of caregivers in relation to caregiver stress, age was significantly associated with increased caregiver stress (46.35 ± 12.21). Among all male caregivers (100%) of them had caregiver stress (16.3%) and in Table 6 caregiver stress was significantly associated with increased mortality.

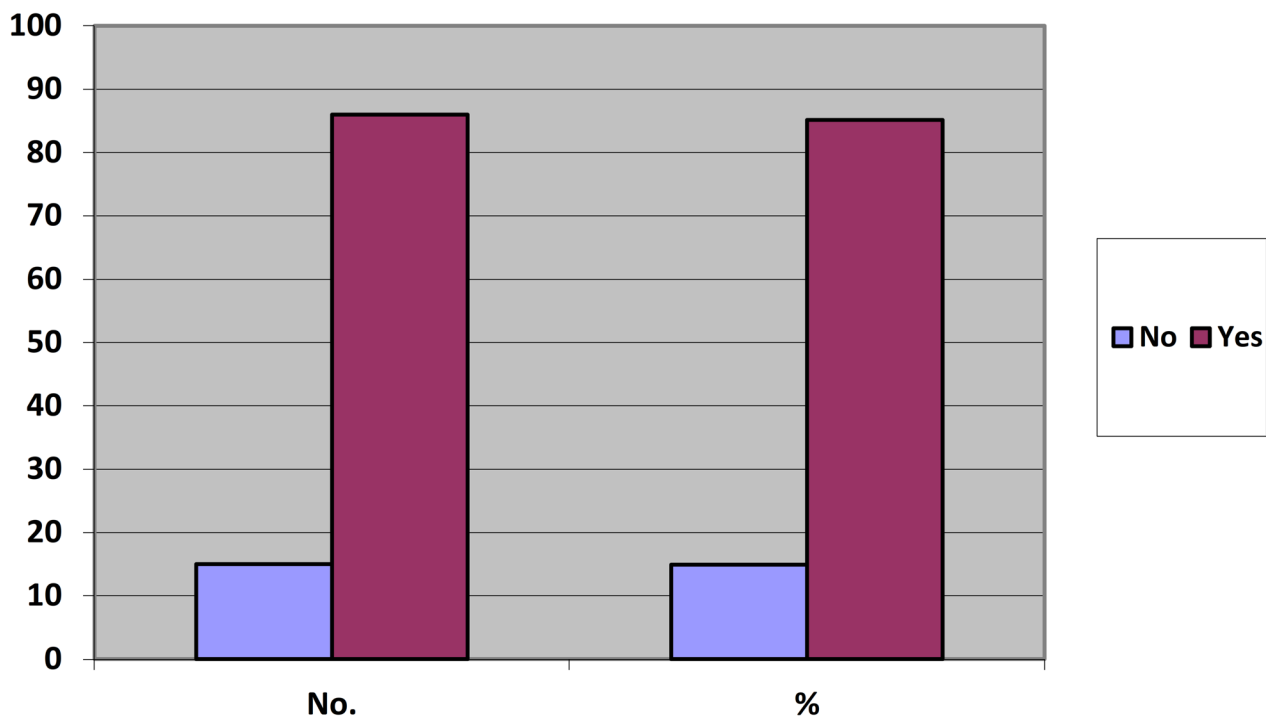


Fig. 1 Presence of stress among caregivers

In Table 7, logistic regression analysis was done between caregiver stress and characteristics of patients and caregivers which revealed that caring for elderly patients with cancer with (p value 0.006) and being related to the patient (spouses and children) with (p value 0.018 and 0.044) were the main factors that affect caregiver stress.

Discussion

In our study, we determined the risk factors of older patients who need a caregiver in addition to an assessment of caregiver stress in hospitalized elderly patients and its relation to hospital outcomes (mortality and LOS).

Our study revealed that 70.3% of admitted patients are dependent on caregivers, which is higher than previous studies [24–26] ranging from 2.9 to 17.2% as they assessed the need of caregivers in communities rather than hospitalized patients.

It was observed that 86.1% of the caregivers are females, agreed with different studies ranging between 55 and 81% and 67% [27, 28] as it is a traditional role of females to be a caregiver due to social and cultural experiences [29, 30]. The current study demonstrated that increasing age, dementia, and neurological problems are higher in the caregiver dependence group, agreed with studies done in different countries [24, 31].

As regards urinary incontinence, our research discovered that UI is higher in older patients who need a caregiver it agreed with two studies done by Yang et al. [32] and Wyman et al. [33] who revealed that older women with incontinence more likely to receive care for ADLs.

Our research found that delirium is higher among older patients who need a caregiver than independent patients, it can be explained by either delirium causing acute functional decline that renders older patients needing a caregiver or due to disability or is associated with premorbid poor functional state [34, 35].

In our study, the estimate of chronic diseases is higher in elderly need caregivers than independent elderly, it agreed with a study created by Bayliss et al. 2004 [36] which admitted that four or more chronic aspects, were foreboding of a clinically serious functional decrease in PCS.

In their study, Gijsen et al. [37] discovered that comorbidity serves as a predictor for elevated mortality rates, poorer functional status, and a reduced quality of life. What unites these chronic diseases is their tendency to restrict functional abilities, highlighting the commonality in their impact on individuals’ daily functioning.

As regards caregiver stress, it was found in 85.1% of our studied population. However, the prevalence of caregiver

Table 4 Relation between caregiver stress and patients' characteristics

		Stress		Test value	P value	Sig
		No	Yes			
Age	Mean \pm SD	72.47 \pm 8.11	73.48 \pm 8.15	0.443	0.659	NS
	Range	60–88	60–87			
Sex	Male	2 (13.3%)	34 (39.5%)	3.823	0.051	NS
	Female	13 (86.7%)	52 (60.5%)			
LOS	Median (IQR)	16 (7–18)	13 (8–21)	0.234	0.815	NS
	Range	5–50	2–68			
Child no	Median (IQR)	3 (2–4)	4 (3–5)	0.881	0.379	NS
	Range	0–7	0–10			
Education level	Low	14 (93.3%)	64 (74.4%)	3.045	0.218	NS
	Moderate	0 (0.0%)	13 (15.1%)			
	High	1 (6.7%)	9 (10.5%)			
Marital status	Single	0 (0.0%)	2 (2.3%)	0.749	0.862	NS
	Married	8 (53.3%)	39 (45.3%)			
	Widow	7 (46.7%)	44 (51.2%)			
	Divorced	0 (0.0%)	1 (1.2%)			
Smoking	Yes	0 (0.0%)	9 (10.5%)	3.040	0.219	NS
	No	14 (93.3%)	63 (73.3%)			
	Ex-smoker	1 (6.7%)	14 (16.3%)			
COPD	Yes	1 (6.7%)	16 (18.6%)	1.300	0.254	NS
	No	14 (93.3%)	70 (81.4%)			
BA	Yes	2 (13.3%)	6 (7.0%)	0.708	0.400	NS
	No	13 (86.7%)	80 (93.0%)			
Infections	Yes	6 (40.0%)	44 (51.2%)	0.637	0.425	NS
	No	9 (60.0%)	42 (48.8%)			
DM	Yes	9 (60.0%)	37 (43.0%)	1.484	0.223	NS
	No	6 (40.0%)	49 (57.0%)			
Neurological	Yes	3 (20.0%)	31 (36.0%)	1.473	0.225	NS
	No	12 (80.0%)	55 (64.0%)			
Dementia	Yes	4 (26.7%)	39 (45.3%)	1.823	0.177	NS
	No	11 (73.3%)	47 (54.7%)			
HF	Yes	3 (20.0%)	15 (17.4%)	0.057	0.811	NS
	No	12 (80.0%)	71 (82.6%)			
CLD	Yes	4 (26.7%)	12 (14.0%)	1.548	0.213	NS
	No	11 (73.3%)	74 (86.0%)			
Thyroid dis	Yes	1 (6.7%)	5 (5.8%)	0.017	0.897	NS
	No	14 (93.3%)	81 (94.2%)			
HTN	Yes	11 (73.3%)	53 (61.6%)	0.754	0.385	NS
	No	4 (26.7%)	33 (38.4%)			
ISHD	Yes	4 (26.7%)	25 (29.1%)	0.036	0.849	NS
	No	11 (73.3%)	61 (70.9%)			
CKD	Yes	2 (13.3%)	8 (9.3%)	0.233	0.630	NS
	No	13 (86.7%)	78 (90.7%)			
Cancer	Yes	4 (26.7%)	3 (3.5%)	10.638	0.001	HS
	No	11 (73.3%)	83 (96.5%)			
DVT	Yes	0 (0.0%)	6 (7.0%)	1.113	0.292	NS
	No	15 (100.0%)	80 (93.0%)			
UI	Yes	7 (46.7%)	58 (67.4%)	2.403	0.121	NS
	No	8 (53.3%)	28 (32.6%)			

Table 4 (continued)

		Stress		Test value	P value	Sig
		No	Yes			
OA	Yes	6 (40.0%)	35 (40.7%)	0.003	0.960	NS
	No	9 (60.0%)	51 (59.3%)			
Delirium	Yes	2 (13.3%)	15 (17.4%)	0.154	0.695	NS
	No	13 (86.7%)	71 (82.6%)			
No. of comorbidities	Median (IQR)	5 (4–7)	6 (5–7)	1.342	0.180	NS
	Range	1–7	2–10			
Charlson	Median (IQR)	6 (4–7)	6 (5–7)	0.116	0.908	NS
	Range	2–11	2–12			
MNA	Malnourished	3 (20.0%)	39 (45.3%)	3.571	0.168	NS
	Risk	8 (53.3%)	34 (39.5%)			
	Normal	4 (26.7%)	13 (15.1%)			
Depression	Yes	4 (26.7%)	19 (22.1%)	0.152	0.697	NS
	No	11 (73.3%)	67 (77.9%)			
Hearing imp	Yes	4 (26.7%)	16 (18.6%)	0.523	0.470	NS
	No	11 (73.3%)	70 (81.4%)			
Visual imp	Yes	5 (33.3%)	32 (37.2%)	0.083	0.774	NS
	No	10 (66.7%)	54 (62.8%)			
ADL	Median (IQR)	2 (0–4)	1 (0–2)	1.366	0.172	NS
	Range	0–6	0–6			
IADL	Median (IQR)	0 (0–3)	0 (0–2)	0.618	0.537	NS
	Range	0–4	0–5			
Med. No	Median (IQR)	4 (2–5)	3 (2–5)	0.689	0.491	NS
	Range	1–6	0–10			
Sleep prob	Yes	6 (40.0%)	50 (58.1%)	1.701	0.192	NS
	No	9 (60.0%)	36 (41.9%)			
Sleep no	Median (IQR)	6 (4–6)	5.5 (4–6)	0.383	0.701	NS
	Range	2–10	2–11			

NS Non-significant, S Significant, HS Highly significant, LOS Length of stay, COPD Chronic obstructive pulmonary disease, BA Bronchial asthma, DM Diabetes mellitus, HF Heart failure, CLD Chronic liver disease, HTN Hypertension, ISHD Ischemic heart disease, CKD Chronic kidney disease, DVT Deep venous thrombosis, MNA Mini nutritional assessment, ADL Activities of daily living, IADL Instrumental activities of daily living, LOS Length of stay

burden ranges from 23 to 59.2% found in about 20 studies derived from PubMed and Scopus done by Loo et al. [38].

Regarding factors affecting caregiver stress, it was found that almost all male caregivers had a caregiver burden, it was different from other studies which either found females had more burden than males [39] or there are similarities in both genders [40]. It can be explained by the cultural role of males in our country as they are not adapted to the new role as a caregiver.

Delirium is more prevalent among patients dependent on caregivers with caregiver burden, and it agrees with a study done by Kaplana [41] who revealed that delirium is associated with higher caregiver burden among hospitalized patients.

It was found that malnourished hospitalized elderly are common among the caregiver stress group agreed with

a study done by Tana [42] who revealed that nutritional state in older patients is significantly correlated with caregiver burden using the Caregiver Burden Inventory Score, it can be explained by anorexia of aging causing time-consuming for caregivers to persuade the older for eating and it was perceived as a stress for them [43].

As regards sleep issues, Caregiver burden is significantly associated with sleep problems of elderly caregivers in addition older patients with sleeping issues had a higher percentage among the caregivers' burden group, it was demonstrated in a study that revealed sleep problems were significantly correlated with caregiver stress and can be explained that needs of care during the night increase caregiver burden [44].

It was demonstrated that caregiver burden is more prevalent in low education levels. It agreed with a study done by Chinwe et al. [45] who revealed low level of

Table 5 Relation between caregiver stress and caregivers’ characteristics

		Stress		Test value	P value	Sig
		No	Yes			
Age 1	Mean ±SD	39.53 ± 11.17	46.35 ± 12.21	2.018	0.046	S
	Range	21–63	19–75			
Sex1	Male	0 (0.0%)	14 (16.3%)	2.835	0.092	NS
	Female	15 (100.0%)	72 (83.7%)			
Marital status1	Single	2 (13.3%)	12 (14.0%)	0.615	0.893	NS
	Married	12 (80.0%)	64 (74.4%)			
	Widow	1 (6.7%)	7 (8.1%)			
	Divorced	0 (0.0%)	3 (3.5%)			
Education level	Low	4 (26.7%)	35 (40.7%)	3.188	0.203	NS
	Moderate	4 (26.7%)	30 (34.9%)			
	High	7 (46.7%)	21 (24.4%)			
Child no1	Median (IQR)	2 (2–3)	3 (1–4)	0.214	0.831	NS
	Range	0–5	0–7			
Job	Yes	5 (33.3%)	30 (34.9%)	0.014	0.907	NS
	No	10 (66.7%)	56 (65.1%)			
Smoking 1	Yes	0 (0.0%)	9 (10.5%)	1.936	0.380	NS
	No	15 (100.0%)	76 (88.4%)			
	Ex-smoker	0 (0.0%)	1 (1.2%)			
Relative	Spouse	1 (6.7%)	18 (20.9%)	3.791	0.150	NS
	Children	9 (60.0%)	55 (64.0%)			
	Others	5 (33.3%)	13 (15.1%)			
No of helpers	One	8 (53.3%)	51 (59.3%)	0.187	0.665	NS
	More than 1	7 (46.7%)	35 (40.7%)			
Duration	Median (IQR)	36 (9–96)	33 (4–60)	1.336	0.185	NS
	Range	2–196	0.5–240			
Comorbidities of caregivers	Yes	5 (33.3%)	46 (53.5%)	2.076	0.150	NS
	No	10 (66.7%)	40 (46.5%)			

NS Non-significant, S Significant, HS Highly significant

Table 6 The effect of caregiver stress on hospitalization outcome (mortality and length of stay)

		Caregiver stress		Test value	P test	Significance
		No	Yes			
Mortality	Yes	0(0.00%)	25(29.1%)	5.795	.016	S
	No	15(100.0%)	61(70.9%)			
Length of stay	No	13(86.7%)	61(70.9%)	1.615	0.204	NS
	Yes	2(13.3%)	25(29.1%)			

education of the caregiver was a significant predictor of caregiver burden and can be explained by lower caregiver’s knowledge and understanding of the illness. While it disagrees a study done by Monika et al. [46] revealed that caregivers with higher educational levels highly perceived mental burden than lower educated caregivers.

In our study, it was proved that higher age is statistically associated with caregiver burden, which agrees with

Serrano-Aguilar et al. 2006 [47] and Rinaldi et al.2005 [48]. It disagrees that caregivers’ age was not a predictor of caregiver burden [49, 50].

The capacity of caregivers to manage stress diminishes with age due to the additional responsibilities tied to their jobs, family commitments, and their own health issues.

The percentage of spouses or adult children in the caregiver group is higher than non-stress group. It agreed

Table 7 Logistic regression analysis results between caregiver stress and characteristics of patients and caregivers

Variables	Odd ratio	95% C.I. for odd ratio		P value	Ref category
		Lower	Upper		
Age	0.974	0.918	1.034	0.391	
Sex	3.064	0.948	9.900	0.061	Female
LOS	1.021	0.980	1.063	0.318	
COPD	5.333	0.666	42.681	0.115	No
BA	0.822	0.154	4.388	0.818	No
Infections	1.986	0.750	5.264	0.167	No
DM	1.005	0.389	2.595	0.992	No
Neurological	0.669	0.253	1.770	0.418	No
Dementia	1.794	0.660	4.879	0.252	No
HF	0.969	0.284	3.308	0.960	No
CLD	0.550	0.168	1.796	0.322	No
Thyroid dis	1.419	0.157	12.819	0.755	No
HTN	0.762	0.279	2.084	0.597	No
ISHD	1.095	0.381	3.150	0.866	No
CKD	1.127	0.221	5.734	0.886	No
Cancer	0.088	0.016	0.494	0.006**	No
DVT	1.419	0.157	12.819	0.755	No
UI	1.699	0.649	4.443	0.280	No
OA	0.612	0.236	1.585	0.312	No
Delirium	0.886	0.848	0.886	0.848	No
Comorbid no	1.218	0.935	1.586	0.143	
Charlson	0.930	0.742	1.166	0.530	
MNA (malnourished)	2.083	0.556	7.812	0.276	Normal
MNA (risk)	1.333	0.377	4.710	0.655	Normal
Depression	1.425	0.429	4.731	0.563	No
ADL	0.894	0.690	1.157	0.394	
IADL	1.004	0.724	1.392	0.983	
Med no	0.963	0.791	1.171	0.703	
Hearing imp	0.422	0.144	1.238	0.116	No
Visual imp	1.015	0.380	2.709	0.976	No
Sleep no	1.000	0.790	1.267	0.998	
Sleep prob	0.598	0.231	1.547	0.289	No
Age 1	1.017	0.977	1.059	0.404	
Sex1(1)	4.136	0.510	33.522	0.184	Female
Child no	0.896	0.666	1.206	0.468	
education (moderate)	2.605	0.803	8.454	0.111	Low
education (high)	1.827	0.579	5.764	0.304	Low
Job	0.556	0.212	1.457	0.232	No
Relative (spouse)	14.400	1.567	132.311	0.018*	Others
Relative (children)	3.138	1.033	9.536	0.044*	Others
No	1.548	0.599	4.003	0.367	One
Duration	0.997	0.988	1.007	0.592	
Co-morbid	2.090	0.788	5.542	0.138	No

Odd ratio is the crude odds ratios detected by simple logistic regression

*Significant at $P < 0.05$, ** $P < 0.001$

with a study done by Heejung et al. [51] as the spouses or adult children living with the patients, spend more hours in caregiving. In addition, it is considered a part of their familial responsibilities [52] also adult caregivers had conflicts between their roles as a caregiver and their jobs, affording more hours of caregiving and considering more answerable for caregiving burdens as a piece of their inherited duties and background which leads to more enormous physical and emotional stress [53]. It can be explained by the nearest the caregiver is to the patient, the caregiving passionately made more vigorously and the burden is huge.

It was observed that there is no difference between caregiver stress and non-caregiver stress group regarding working or feeling strained between work and caregiver responsibilities it agreed with many studies, which revealed there is no difference was found in caregiver stress levels denoting that work does not affect caregiver experience [54, 55]).

Other studies [56–58] revealed that unemployed caregivers experienced a higher caregiving burden compared to their employed counterparts, suggesting that having outside employment alleviates the caregiver burden. It can be explained by employed caregivers spending less time with the patients in comparison to unemployed caregivers Chiou et al. [59].

Previous research has indicated that employed caregivers, especially those caring for patients with Alzheimer’s disease, experience a lower level of caregiver burden compared to their unemployed counterparts [60]. Additionally, a separate study discovered that self-employed caregivers tend to have lower caregiver burden scores [61]. One possible explanation for the reduced burden among employed caregivers is their limited availability for caregiving duties due to their outside jobs. Unlike caregivers without employment, those who hold jobs outside the home cannot dedicate as much time to caregiving, potentially leading to a lighter burden [62]. However, it is worth noting that in a study conducted by Yeşil, Uslusoy, and Korkmaz in 2016, no significant difference in caregiver burden was found based on employment status [57].

It can be explained by even caregivers who are not working are strained by their own family responsibilities as a husband, wife, or parenthood.

It was found that there is no difference between the two groups as regards the number of helpers agreed with a study done by Papastavrou et al. (2007) [63]. Subjective caregiver burden is not affected by a number of helpers or direct physical assistance during care provision as most caregivers seek emotional coping strategies to alleviate the stress. While it disagrees with a study done by Selen et al. (2014) who revealed that as the number of

collaborators who assist primary caregivers' boosts, the caregiver burden scale point diminishes [64].

In our study, there is no significant difference between the stress and non-stress caregiver groups regarding the duration of caregiving but it was shorter in the caregiver stress group, agreed with a study done by Zainuddin et al. [65] which was done on 51 caregivers taken from geriatrics clinic and revealed Majority of the longer duration caregivers reported low level of burden while it disagree with another study which those who had been administering care for a deeper period of time declared huger burden as the caregiver burden was detected to boost with the duration of caregiving up to a definite degree yet afterwards it declined as the caregivers became less sensitive and emerged to adapt their habits [66].

It was found that caregivers in the stress group had a higher comorbid conditions percentage than the non-stress group. It agrees with a study done on 92 caregivers of multiple sclerosis patients in Turkey which revealed the Zarit Caregiver Burden Interview of those who had any chronic disease was higher than healthy caregivers as they are providing their patients with care in addition to their own comorbid conditions may cause a burden on caregivers [67].

It was found there is no difference between the 2 groups regarding LOS or prolonged LOS. It disagrees with a study done in China that revealed caregiver stress is a predictor of prolonged LOS [68]. Family members may face work overload, change family dynamics, or fear with need for time to make suitable arrangements at home or in their social life before discharging the patient [69]. This is not the case in our study as the caregivers of the studied patients of admitted patients already settled their arrangement and the place of caregiving before hospital admission.

In our study, it was found that there is a statistically significant difference between the stress and non-stress groups as elderly patients of the caregiver stress group had 29.1% in-hospital mortality while no mortality was found in patients of the non-caregiver stress group. It agreed with a study done by Hooley et al. [70] which was done on 50 outpatients with HF and revealed death or hospitalization at 6 months was associated with caregiver burden using ZARIT It may be related to the severity of illness of the patient increasing caregiver stress.

By regression analysis the study revealed that caring for elderly patients with cancer with (p value 0.006) and being related to the patient (spouses and children) with (p value 0.018 and 0.044) were the main factors that affect caregiver stress, this agreed with other studies which revealed that caregiver burden has been found to be associated with more advanced cancer, increased patient distress, higher caregiving demands, and a lack of caregiver resources, all of which characterize geriatric oncology care [71, 72].

It also agreed with many studies [73, 74] who stated that older spousal caregivers provide more extensive comprehensive care, maintain the caregiving role longer, and harder experience more profound adjustment demands on lifestyle, and report greater stress and personal strain than spouses who are younger or other caregivers.

The research findings from UC Berkeley, involving 176 dementia patients and their caregivers, support the idea that caregiver mental stress is a significant predictor of patient mortality. Remarkably, this relationship persisted even after accounting for various patient-related factors such as diagnosis, age, sex, dementia severity, and mental health [75]. This phenomenon has been attributed to the impact of caregiver mental stress on the quality of care provided. Caregivers experiencing high levels of stress are more prone to offering suboptimal care, leading to potential neglect and abuse of patients, which can ultimately contribute to the patient's demise. This neglect might manifest in various ways, including a lack of awareness regarding changes in the patient's health, non-compliance with medications, and missed medical appointments [76].

Additionally, the mental stress experienced by caregivers can strain the social bond between caregivers and patients. Such strained relationships are associated with poorer physical health, compromised immune systems, and an increased risk of mortality among the caregiving partners [77]. Importantly, this stress experienced by caregivers can be transmitted to the patients under their care. High levels of stress have been linked with poor health and increased mortality rates in patients. Consequently, patients under the care of stressed caregivers may face heightened risks to their own health and well-being [78–80].

The research identified specific sociodemographic factors linked to caregiver dependence, including age, ethnicity, marital status, educational background, and employment status. Moreover, the study highlighted several health conditions such as dementia, depression, stroke, eyesight problems, persistent cough, asthma, paralysis, and cancer as significant contributors to caregiver dependence [25]. Among these conditions, dementia emerged as the most substantial factor associated with dependency, emphasizing its prominent role in caregiver burden and dependency [81–84].

Conclusions

This study shows that many elderly need caregivers and the need increases with age as well as multiple comorbidities especially dementia, delirium, and urinary incontinence. Stress prevalence among caregivers is high (85%) and it increases with the age of the patients and the patient having several comorbidities such as cancer, neurological diseases, and sleep problems. Stress was also associated with high mortality of patients.

Abbreviations

ADLS	Activities of Daily Living Scale
IADLS	Instrumental Activities of Daily Living Scale
MMSE	Mini-Mental State Examination
MNA	Mini-Nutritional assessment
SD	Standard deviation

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Authors' contributions

EM, RA, and HS gathered the data and performed the assessments and the questionnaires. EM and HS analyzed the data. EM, RA, and HS participated in writing the manuscript. EM revised the manuscript. All authors contributed to the study substantially and approved the final version of the manuscript.

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Availability of data and materials

Data are available from the corresponding author upon reasonable request.

Declarations**Ethics approval and consent to participate**

Approval of the Research Ethical Committee of the geriatric hospital, Ain Shams University was obtained. Informed oral consent was obtained from all participants (elderly patients and their caregivers) by addressing all the steps of the study and the right to withdraw from the study. Patients who lack the capacity to consent, their next of kin asked to act as personal consultees and to support their relative taking part in the study.

Consent for publication

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Competing interests

The authors declare that they have no competing interests.

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