



# The Impact of Neuropsychiatric Symptoms of Alzheimer's Disease on Family Caregiver's Distress

A Tomasello L<sup>1,2\*</sup>, Ranno<sup>1</sup>, Raffaele<sup>2</sup>, Laganà<sup>3</sup>, Pitrone<sup>3</sup> and Alibrandi<sup>4</sup>

<sup>1</sup>Faculty of Medicine and Dentistry, Sapienza University of Rome, Italy

<sup>2</sup>Department of Clinical and Experimental Medicine, University of Messina, Italy

<sup>3</sup>Department of Biomedical and Dental Sciences, Morphological and Functional Images, Italy

<sup>4</sup>Department of Economics, University of Messina, Italy

## Abstract

Neuropsychiatric disturbances usually appear earlier than the cognitive symptoms as a result of the heterogeneous neuropathic and neurochemical alterations present in different kinds of dementia.

Such disorders are highly affected (and often activated) by environmental factors, especially by the relationship between the patient and the caregivers

The bio-medical approach is based on the pathology and on interventions aiming at mitigating the symptoms or curing the disease.

We should aim at improving the quality of life, rather than focusing simply on health care.

Behavioural disorders severely affect the quality of life of the patients and their families, resulting in the patients' hospitalisation and frequently provoking burn-out syndrome on the carers.

The objective of our study was to evaluate the care burden in relation to behavioural Disturbances

**Keywords:** Alzheimer's disease; Caregiver burden; Caregiving; Dementia; Informal caregiver; Neuropsychiatric disorders

## Introduction

Dementia is today considered a "social disease", such as to involve not only the sick individual, but also the social network in which they lives. The disease affects different cognitive functions and deficits occur in each individual with different levels of clinical severity. Alzheimer's disease is characterized by an irreversible and progressive cognitive decline, is a common cause of dementia [1], estimated at 60-70% of dementia causes. Prevalence is about 24 million and it is estimated that in the next 20 years will tend to double, until 2040 [2]. Patients with Alzheimer's disease, have cognitive impairments in memory, speech, reasoning and visuospatial functions. In the early stages they are able to carry out some daily life activities, but as the disease progresses, they need continuous assistance and most become totally dependent on the caregiver.

In addition to cognitive problems, 90% of patients with Alzheimer's disease show behavioral symptoms including aggression, psychotic symptoms and other mood disorders and behavioral problems. Evidence also suggests that, along with cognitive decline, behavioural and Psychological symptoms could affect both patients' outcomes and the lives of their caregivers [3,4]. Moreover, the reduction of caregiver's quality of life is associated with behavioural and psychological symptoms presence [5,6].

Behavioural and psychological symptoms is associated with a higher mortality rate and is one of the main causes of institutionalization.

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**\*Corresponding author(s):** Letteria Tomasello, Faculty of Medicine and Dentistry, Sapienza University of Rome, 00185 Rome, Italy and Department of Clinical and Experimental Medicine, University of Messina, Italy

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A previous study showed that the overall score of Neuropsychiatric Inventory Questionnaires (NPI-Q), a tool used to evaluate behavioural and psychological symptoms, is associated with the load of the caregiver through caregiver stress and depression [7]. However, inconsistent results on the association between specific symptoms of behavioural and psychological symptoms and psychosocial outcomes in caregivers were found among studies [8,9]. Since each patient could be affected by different domains of behavioural and psychological symptoms, knowledge of which domain affects the caregiver most would be useful for clinical practice. This information would encourage doctors or the healthcare team to pay more attention to screening and treatment of behavioural and psychological symptoms. Few studies have characterized behavioural and psychological symptoms in accordance with the etiology of dementia [10] therefore, the purpose of this study is to determine the prevalence of behavioural and Psychological symptoms in Alzheimer's disease and its association with the severity of dementia. We also aim to explore the association between specific behavioural and psychological symptoms and stress, burdens and depression. Ory et al. Define the "burden", that is the burden of care, as the impact on the family determined by cognitive-behavioral changes of the patient [11]; other authors understand the "burden caregiver" in multi-dimensional subjective terms, stressing the overall impact on the caregiver of the request for care and assistance at the physical, psychological, social and economic levels. Existing care practices do not meet the needs of people with dementia and 80% of caregivers choose to treat family members at home, often at the expense of their health and quality of life [12].

Family members who become caregivers take on a role that will allow them childcare (caregiving), for which they are almost always unprepared and not trained. To become caregiver means therefore to assume a role that concurs to carry out care, function that but it demands an adequate formation.

## Patients and Caregivers

We enrolled 289 patients' caregivers of (61.2% F) (38.8% M), mean age 74.46 years, mean M.M.S.E: 14.96, mean Clinical Dementia Rating Scale 1.88, mean ADL 3.02, mean IADL 3.33, that practised a regular follow up at our Dementia Center. We considered one caregiver for patient, with no sex difference (women 74.7%, men 25.3%). As regards the familiar role, they were mainly sons (60.2%) and spouses (32.5%). Mean age was



56.8 ± 13.5 and the educational years level was very low (mean 9.3 ± 3.9). All patients underwent an extensive anamnestic, neuroradiological, neurological and cognitive screening. The caregivers were submitted to an extensive evaluation using , Caregiver Burden Inventory, NPY, Hdrs, Iadl, Iadl .

In the study were inserted patients from our Centre that gave authorization to a clinical research participation. We enrolled family caregiver no-professional assistants.

### Inclusion criteria were

Age > 50 years, diagnosis of probable AD according to the NINCS-ADRD criteria [13]; on the other hand we considered as exclusion criteria a previous stroke and / or brain trauma, co-morbidity with neurological or psychiatric diseases, co-existence of severe internal diseases, history of alcohol and / or drug abuse.

### Clinical evaluation

We also Investigated Activities of Daily Living (with ADL and IADL scales) as well as cognitive level (with MMSE).

### Cognitive assessment

The MMSE consists of thirty items that assess orientation, short and long-term memory, language, attention, visuospatial skills, and the ability to follow simple verbal and written commands. This easy-to-use and relatively quick neuropsychological test is often employed to assess the overall cognitive status we referred to norms for the Italian population considering age and education corrections [14].

Activity Daily Living Scale (ADL) [15] is the most appropriate instrument to assess functional status as a measurement of the client's ability to perform activities of daily living independently. Clinicians typically use the tool to detect problems in performing activities of daily living and to plan care accordingly. The Index ranks adequacy of performance in the six functions of bathing, dressing, toileting, transferring, continence, and feeding. Clients are scored yes/no for independence in each of the six functions. A score of 6 indicates full function, 4 indicates moderate impairment, and 2 or less indicates severe functional impairment.

Instrumental Activities of Daily Living Scale (IADL) [16].

IADL is an appropriate instrument to assess independent living skills. These skills are considered more complex than the basic activities of daily living as measured by the Katz. The instrument is most useful for identifying how a person is functioning at the present time. There are eight domains of function measured with the Lawton IADL scale. Clients are scored according to their highest level of functioning in that category. A summary score ranges from 0 (low function, dependent) to 8 (high function, independent) for women, and 0 through 5 for men.

HAM-D investigates different areas for assessing the depressive state of a subject. It cannot be used as a diagnostic tool for depression, but it allows to quantitatively assess the severity of the subject's conditions and to document the modifications of these conditions, for example during a psychotherapeutic treatment. The HAM-D consists of 21 items. The severity cut-off is ≥25 severe depression, 18-24 moderate depression, 8-17 mild depression, ≤7 absence of depression [17].

Clinical Dementia Rating (CDR) scale. The necessary information was collected through a family member or operator who knows the subject and through an assessment of the patient's cognitive functions. Each aspect must be evaluated independently from the others. Memory is considered a primary category; the others are secondary. If at least three secondary categories get the same of memory score, then the CDR is equal to the score obtained in the memory. If three or more secondary categories obtain a higher or lower value of the memory, then the CDR score corresponds to that obtained in most secondary categories. If two categories obtain a higher value and two a lower value than that obtained from the memory, the CDR value corresponds to that of the memory. The scale was later extended to classify the more advanced stages of dementia with better precision (Hayman et al.). Patients can therefore be classified

in stage 4 (very severe dementia) and stage 5 (terminal dementia) when they require total assistance because they are completely incapable of communicating, in a vegetative state, bedridden or incontinent [18].

Caregiver Burden Inventory is a rapidly compiling scale that measures the care burden created for caregivers of patients with AD and related dementias. It is a self-report tool, which must be completed by the main caregiver. It is structured according to a multidimensional perspective. The CBI is divided into 5 sections that measure the different aspects of the care burden: objective, psychological, physical, social, and emotional. The burden depending on the time required for assistance (T) (items 1-5) describes the load associated with the restriction of time for the caregiver. The evolutionary burden (S) (item 6-10) is the isolation perception of the caregiver, also considering the expectations and opportunities of their peers. The physical burden (F) (item 11-14) describes the feeling of chronic fatigue and somatic health problems while the social burden (D) examines the perception of a role's conflict. The emotional burden (E) (items 20-24) describes the feelings towards the patient, which can be induced by behavioural disorders of the latter. Each section consists of 5 items and the score for each individual item goes from 0 (factor with minimum value) to 4 (factor with maximum value), for a total ranging from 0 to 20 for each dimension, except for the physical burden which is composed of 4 items. A correction factor of 1.25 is then applied to the total score. The range of the total score varies from 0 to 100. The scores for each section increase proportionally to the perceived severity of the burden for each area; therefore, with the same total score, the burden profiles may be very different. These so defined profiles will be the evaluation basis on which to build ad-hoc psycho-social interventions [19].

### Statistical analysis

Categorical variables are expressed as absolute frequency and percentages, numerical variables as mean and standard deviation. The non-parametric approach was applied for the statistical analysis, because most of the examined variables were not normally distributed, such as verified by Kolmogorov-Smirnov test. Spearman correlation test was applied in order to find out the interdependence between the HDRS of Hamilton and the CBI (time loading, development loading, physical load, social load and emotional load ). The same test was applied to assess the correlation between MMSE and ADL, IADL, hours of treatment and, also, between clinical dementia and ADL, IADL and treatment hours. In order to perform statistical comparison between who lives in a house and who doesn't, in relation to numerical variable (such as the HDRM of Hamilton, service hours, emotional and social load , ecc.), the Mann Whitney test was applied. SPSS for Windows software, 22.0 version was adopted for all statistical analyses. A p-value lower than 0,050 was considered statistically significant.

### Results

Care is carried out mainly by sons (60.2%) and the spouse (32.5%), of average age 56.8 13.5 years, mostly poorly educated (9.4 3.9 years). 76.8% of the respondents live with the sick family member, 65% of whom are married). They dedicated an average of 11.6 ± 6.3 hours per day to care for a family member. 77.5% of caregivers live at home, more often housewives 52.9%.

With 74.7% women are the highest percentage of caregivers, significantly younger than men (p < 0.01), predominantly housewives (p < 0.05), able to devote more hours of the day to the care of their family members than men (p < 0.001). However, the average stress load, measured by the CBI score, in the two sexes was not significantly different.

The patients are 177 women (61.3%) and 112 men (38.7%) of average age 74.4 6 and schooling 7.5 3.9. Classifying patients according to their MMSE scores, according to the cut-off of the neuropsychological scale, we see that 56.4% of the sample has moderate to severe impairment, and 15.9% mild impairment. Regarding the scales that measure independence in carrying out daily activities, we have that the average score of ADL is 3.0 ± 1.9, while that of IADL is 3.3 ± 2.4. No statistically significant difference between the two sexes, for any clinical scale, was found.



The most frequent neuropsychiatric symptom in patients is anxiety (found in about 80% of subjects), followed by lack of sleep (78.2%), and agitation and depression (74.4% for both). On the other hand, lack of sleep, anxiety and agitation also seem to be the behavioral disorders that provide the greatest source of stress to family members (75.4%, 75.1% and 74% respectively). The results show strong correlations between CBI scores and clinical patient scales (MMSE, ADL, IADL). Going to look in more detail we see that the highest correlations are with the first 3 load dimensions (objective, evolutionary, physical), while the other two dimensions correlate slightly. There is a slight correlation between CBI and NPI ( $r = 0.4$ ;  $p < 0.001$ ). Looking in more detail we see that the highest correlations of CBI are with sleep ( $r = 0.47$ ), motor activity ( $r = 0.46$ ), disinhibition ( $r = 0.41$ ), delusions ( $r = 0.36$ ), and hallucinations ( $r = 0.29$ ). In particular, the objective load and the evolutionary load are related to disinhibition, motor activity and sleep; the physical load is related to irritability, motor activity and sleep; the social load is related to delusions and sleep; the emotional load is related to delusions, hallucinations, disinhibition, irritability, motor activity and sleep. Although weakly, clinical scale scores are related to the overall NPI score. In particular, the correlation between NPI and MMSE is  $r = -0.26$  ( $p < 0.001$ ),  $r = -0.39$  ( $p < 0.001$ ) that between NPI and ADL, and  $r = -0.33$  ( $p < 0.001$ ) that between NPI and IADL.

Going to investigate with respect to each item of the NPI, we see that the behavioral disorders of the patient that correlate more with the scores of clinical scales are motor activity, sleep and disinhibition, irritability, hallucinations and agitation. The daily care hours correlate strongly with the clinical test scores (MMSE, ADL, IADL) and the stress load measured by the CBI. In particular, they correlate with the objective load ( $r = 0.76$ ), the evolutionary load ( $r = 0.62$ ) and the physical load ( $r = 0.63$ ) (Tables 1-3).

As highlighted from the results of Spearman's correlation, reported in table 4, all of dimension of time, evolutionary and physical are significantly and negatively related with MMSE ( $p < 0.001$ ). All of dimension on social burden (except for D18) are significantly and negatively related with MMSE.

Finally, only one of the dimension related to emotional burden, the E20, turns out significantly and negatively related with MMSE, and the total emotional burden ( $p < 0.001$  for both). Other dimensions are not statistically significant ( $p > 0.050$ ).

As highlighted from the results of the correlations below in table 5 all of dimensions about time, evolutionary and physical burden are significantly and positively related with CDRS ( $p < 0.001$  for each dimension). All dimensions related to social burden (except for D18) are significantly and positively related with CDRS ( $p < 0.001$ ).

Finally, between the dimensions about emotional burden only E20 and E24 (as well as the total) turn out significantly and positively related with CDRS ( $p < 0.050$ ).

As can be seen from the results reported in table 6, delusions, hallucinations, agitation, disinhibition, irritability, motor activity and Nighttime Behavior correlate significantly and positively with all dimensions of time burden; depression and apathy correlate negatively with all dimensions except TD2; eating disorders correlate positively only with TD2 and total time burden; finally, anxiety and euphoria were not correlated with any dimension of time burden.

- Examining the results of the Spearman correlation between behavioral disorders and CBI (developmental load), reported in table 7, we note that there are positive and significant correlations for some dimensions and, more specifically, Delusions, disinhibition, motor activity and Nighttime Behavior correlate positively with all dimensions of the CBI;
- Hallucination correlates positively with everything except S7;
- Agitation correlates positively with everything except S6;
- Depression (only with S9);
- Anxiety correlates positively only with S7);
- Apathy correlates negatively with all dimensions except S7 and S8

**Table 1:** Absolute frequencies and percentages for categorical variables.

Gender			
		Frequency	Percentage
	Female	177	61,2
	Male	112	38,8
	Total	289	100,0
Family Relationship			
	Sister-in law	1	,3
	Daughter	130	45,0
	Son	36	12,5
	Husband	33	11,4
	Wife	61	21,1
	Nephew	15	5,2
	Daughter- in law	8	2,8
	Sister	5	1,7
Caregiver Gender			
	Female	216	74,7
	Male	73	25,3
Profession of Caregiver			
	Housewife	153	52,9
	Executive	13	4,5
	Employed	57	19,7
	Entrepreneur	1	,3
	Freelancer	5	1,7
	Worker	2	,6
	Pensioner	55	19,0
	Student	3	1,0
Marital Status Caregiver			
	Celibate	12	4,2
	Marrried	203	70,2
	Divorced	9	3,1
	Maiden	62	21,5
	Widow	3	1,0
Live in the House			
	No	65	22,5
	Yes	224	77,5

**Table 2:** Descriptive statistics for numerical variables

Variables	Mean	SD
Age	74,4671	5,99245
Schooling	7,4913	3,94151
MMSE	14,9635	5,21714
ADL	3,0242	1,87531
IADL	3,3322	2,39800
Caregiver Age	56,8304	13,50986
Scolar_Caregiver	9,3841	3,92568
Hours of Assistance for Day	11,6055	6,31880
Time Burden	11,3542	6,94425
Evolutionary Burden	11,5174	5,56680
Physical Burden	9,3261	5,07045
Social Buden	5,8685	5,43107
Emotional Burden	2,9481	3,02663



- Irritability directly correlates only with S9, S10 and total developmental burden
  - Eating disorders correlate positively only with S9 and S10;
  - Euphoria is not significantly correlated with any dimension.
  - Examining the results of the correlations between NPI and CBI (physical burden) shown in table 8, some statistical significance was highlighted; in particular:
    - Delusions, hallucinations, agitation, disinhibition, irritability, motor activity and Nighttime Behavior positively correlate with all the analysed dimensions;
  - Depression is inversely correlated with F11;
    - Apathy inversely correlates with F11, F14 and total physical burden;
  - Eating disorders with positively correlated to all dimensions except F14;
  - Anxiety and euphoria do not correlate with any dimension of physical load
  - With reference to the non-parametric correlations between NPI and CBI (social burden) shown in table 9, we obtained that:
    - Delusions, disinhibition, motor activity and Nighttime Behavior correlate positively with all dimensions; Hallucinations correlate positively with D17, D19 and total social burden;
    - Euphoria correlates positively with D19 and total social burden;
  - Irritability correlates negatively with D18;
    - Agitation, depression, anxiety, apathy, eating disorders do not correlate with any dimension.
- From the non-parametric correlations between NPI and CBI (EMOTIONAL load) reported in table 10 we could note that:
- Delusions correlates positively with all dimensions;
  - Hallucinations correlates positively with all dimensions except E21;
  - Agitation, depression, disinhibition, irritability and motor activity correlate with all dimensions except E22, E23;
  - Anxiety correlates positively only with E20;
  - Euphoria is positively correlated with all dimensions except E20;
  - Apathy was negatively correlated with all dimensions except E23, E24;
  - Sleep is positively correlated with everything except E22
  - Eating disorders are positively correlated with everything except E20, E21.

**Table 3:** Comparison between caregivers living at home vs not living at home.

	Living at Home	Not Living at Home	P-Value
HDRS	21.37±7.04	22.92±5.88	0.119
Hours of Assistance	13.23±6.16	5.98±2.43	<0.001
Time Burden	12.69±6.68	6.75±5.76	<0.001
Developmental Burden	12.35±5.34	8.64±5.33	<0.001
Physical Burden	10.43±4.82	5.49±3.93	<0.001
Social Burden	5.75±5.44	6.24±5.39	0.525
Emotional Burden	2.98±2.95	2.83±3.28	0.375

**Table 4:** Spearman's correlation between MMSE and CBI (Partial and total scores).

TEMP		MMSE	EVOL	MMSE	FIS	MMSE	SOC	MMSE	EMOT	MMSE
TD1	Coeff	-.766**	S6	-.644**	F11	-.606**	D15	-.419**	E20	-.458**
	Sig.	<.001		<.001		<.001		<.001		<.001
TD2	Coeff	-.746**	S7	-.610**	F12	-.590**	D16	-.337**	E21	-.043
	Sig.	<.001		<.001		<.001		<.001		.470
TD3	Coeff	-.766**	S8	-.577**	F13	-.475**	D17	-.216**	E22	.010
	Sig.	<.001		<.001		<.001		<.001		.861
TD4	Coeff	-.755**	S9	-.569**	F14	-.576**	D18	-.100	E23	-.054
	Sig.	<.001		<.001		<.001		.089		.357
TD5	Coeff	-.664**	S10	-.541**			D19	-.320**	E24	-.098
	Sig.	<.001		<.001				<.001		.097
TOT	Coeff	-.781**	TOT	-.698**		-.631**	TOT	-.355**	TOTi	-.370**
	Sig.	<.001		<.001	TOT	<.001		<.001		<.001

**Table 5:** Spearman's correlation between MMSE and CBI (Partial and total scores).

TEMP		CDRS	EVOL	CDRS	FIS	CDRS	SOC	CDRS	EMOT	CDRS
TD1	Coeff	.703**	S6	.582**	F11	.526**	D15	.424**	E20	.440**
	Sig.	<.001		<.001		<.001		<.001		<.001
TD2	Coeff	.681**	S7	.559**	F12	.541**	D16	.339**	E21	.001
	Sig.	<.001		<.001		<.001		<.001		.992
TD3	Coeff	.690**	S8	.474**	F13	.427**	D17	.230**	E22	.008
	Sig.	<.001		<.001		<.001		<.001		.895
TD4	Coeff	.676**	S9	.482**	F14	.511**	D18	.094	E23	.078
	Sig.	<.001		<.001		<.001		.11		.185
TD5	Coeff	.593**	S10	.484**			D19	.298**	E24	.140*
	Sig.	<.001		<.001				<.001		.017
TOT	Coeff	.703**	TOT	.616**	TOT	.564**	TOT	.355**	TOTi	.365**
	Sig.	<.001		<.001		<.001		<.001		<.001

## Discussion

Analyzing the weight that the neuropsychiatric symptoms have on scores of the single dimensions of the Caregiver Burden Inventory, we see that sleep, euphoria and disinhibition are those of greater weight for the objective load; sleep euphoria, irritability and anxiety are those of greater weight for the physical load; delirium, sleep, appetite, motor activity are those of greater weight for the social load, delusions, hallucinations, depression, irritability. Anxiety ate those most burdensome to the emotional burden. The overall level of subjective burden experienced by caregivers is mainly related to restrictions in personal time and the sense of failure relative to one's expectations. The greatest lack of information detected by caregivers concerns relational issues and the management of behavioural disorders. The average score obtained at the Caregiver Burden Inventory baseline was indicative of a mild-moderate stress of the caregivers and is significantly correlated with the degree of cognitive deterioration of the patient.

The result of this study detect the prevalence of behavioural and





**Table 6:** Spearman's correlation between NPI and CBI (Time burden).

	Delusions	Hallucinations	Agitation/ Aggression	Dysphoria/ Depression	Anxiety	Euphoria/ Elation	Apathy /Indifference	Disinhibition	Irritability Lability	Aberrant Motor	Nighttime Behavior	Appetite/ Eating
TD1 Coeff	.228**	.212**	.284**	-.137**	.077	-.003	-.161**	.384**	.197**	.432**	.368**	.094
Sig.	<.001	<.001	<.001	.019	.194	.954	.006	<.001	.001	<.001	<.001	.110
TD2 Coeff	.267**	.264**	.202**	-.092*	-.066	-.004	-.077	.306**	.189**	.409**	.386**	.175**
Sig.	<.001	<.001	<.001	.118	.913	.948	.192	<.001	.001	<.001	<.001	.003
TD3 Coeff	.227**	.211**	.250**	-.169**	.042	-.058	-.177**	.346**	.168**	.417**	.370**	.086
Sig.	<.001	<.001	<.001	.004	.476	.328	.003	<.001	.004	<.001	<.001	.144
TD4 Coeff	.292**	.235**	.279**	-.133*	.048	.014	-.164**	.390**	.200**	.434**	.374**	.102
Sig.	<.001	<.001	<.001	.024	.412	.817	.005	<.001	.001	<.001	<.001	.085
TD5 Coeff	.224**	.136*	.239*	-.129*	.001	.013	-.159**	.370**	.154**	.356**	.375**	.086
Sig.	<.001	.021	<.001	.029	.998	.829	.007	<.001	.009	<.001	<.001	.144
TIME BURD Coeff	.275**	.219**	.264**	-.132*	.024	.001	-.137*	.379**	.202**	.429**	.401**	.126*
Sig.	<.001	<.001	<.001	.025	.681	.997	.020	<.001	.001	<.001	<.001	.033

**Table 7:** Spearman's correlation between NPI and CBI (Developmental burden).

	Delusions	Hallucinations	Agitation/ Aggression	Dysphoria/ Depression	Anxiety	Euphoria/ Elation	Apathy /Indifference	Disinhibition	Irritability Lability	Aberrant Motor	Nighttime Behavior	Appetite/ Eating
S6 Coeff	.299**	.173**	.079	-.041	-.007	.036	-.127*	.208**	.073	.259**	.356**	.106
Sig.	<.001	.003	.179	.487	.904	.545	.031	<.001	.214	<.001	<.001	.072
S7 Coeff	.128*	.109*	.246**	-.004	.143	-.001	-.129*	.174**	.018	.240**	.242**	-.008
Sig.	.029	.063	<.001	.690	.015	.985	.028	.003	.762	<.001	<.001	.890
S8 Coeff	.194**	.220**	.170**	-.085	.042	.016	-.074	.326**	.071	.255**	.275**	-.010
Sig.	.001	<.001	.004	.149	.476	.786	.210	<.001	.229	<.001	<.001	.862
S9 Coeff	.273**	.208**	.188**	-.127*	.115	.045	-.147*	.377**	.151**	.357**	.378**	.120*
Sig.	<.001	<.001	.001	.030	.051	.444	.012	<.001	.010	<.001	<.001	.042
S10 Coeff	.307**	.172**	.174**	-.065*	.043	.052	-.124*	.307**	.183**	.303**	.354**	.148*
Sig.	<.001	.003	.003	.269	.462	.380	.035	<.001	.002	<.001	<.001	.012
DEVEL BURD Coeff	.298**	.232**	.189**	-.091	-.061	.046	-.148*	.338**	.116*	.347**	.391**	.100
Sig.	<.001	<.001	.001	.125	.302	.438	.012	<.001	.049	<.001	<.001	.089



**Table 8: Spearman's correlation between NPI and CBI (Physical burden).**

		Delusions	Hallucinations	Agitation/ Aggression	Dysphoria /Depression	Anxiety	Euphoria/ Elation	Apathy /Indifference	Disinhibition	Irritability Lability	Aberrant Motor	Nighttime Behavior	Appetite/ Eating
F11	Coeff	.176**	.212**	.188**	-.132*	-.101	-.014	-.147*	.257**	.280**	.389**	.365**	.204**
	Sig.	<.001	<.001	.002	.025	.088	.814	.013	<.001	<.001	<.001	<.001	<.001
F12	Coeff	.179**	.209**	.171**	-.067	-.077	-.020	-.115	.240**	.270**	.313**	.317**	.183**
	Sig.	<.001	<.001	.004	.255	.190	.741	.052	<.001	<.001	<.001	<.001	.002
F13	Coeff	.164**	.239**	.118*	-.035	-.105	-.031	-.043	.148*	.318**	.249**	.312**	.265**
	Sig.	<.001	<.001	.046	.552	.075	.587	.471	.012	<.001	<.001	<.001	<.001
F14	Coeff	.231**	.285**	.216**	-.103	-.030	.006	-.137*	.354**	.236**	.383**	.380**	.112
	Sig.	<.001	<.001	<.001	.079	.608	.920	.020	<.001	<.001	<.001	<.001	.058
PHYS BURD	Coeff	.211**	.275**	.189**	-.094	.097	-.008	-.122*	.283**	.319**	.380**	.394**	.224**
	Sig.	<.001	<.001	.001	.110	.101	.896	.038	<.001	<.001	<.001	<.001	<.001

**Table 9: Spearman's correlation between NPI and CBI (Social burden).**

		Delusions	Hallucinations	Agitation/ Aggression	Dysphoria /Depression	Anxiety	Euphoria/ Elation	Apathy /Indifference	Disinhibition	Irritability Lability	Aberrant Motor	Nighttime Behavior	Appetite/ Eating
D15	Coeff	.275**	.059	.067	.021	.085	.066	.006	.178**	.019	.225**	.228**	.011
	Sig.	<.001	.317	.257	.720	.904	.266	.921	.002	.752	<.001	<.001	.858
D16	Coeff	.277**	.091	.037	.013	.064	.091	-.040	.201**	.055	.213**	.247**	.026
	Sig.	<.001	.123	.534	.825	.280	.124	.499	.001	.347	<.001	<.001	.659
D17	Coeff	.322**	.155**	.058	-.061	.058	.143*	-.027	.191**	.079	.156**	.181**	.028
	Sig.	<.001	.009	.324	.304	.324	.015	.648	<.001	.182	.008	.002	.634
D18	Coeff	.161**	.068	.027	-.023	.053	.089	.007	.124*	-.123*	.148*	.215**	.083
	Sig.	.006	.252	.652	.693	.365	.133	.907	.036	.036	.012	<.001	.160
D19	Coeff	.344**	.169**	.014	.048	-.031	.154**	-.024	.131*	.023	.178**	.312**	.107
	Sig.	<.001	.004	.814	.414	.601	.009	.688	.026	.692	.002	<.001	.068
SOC BURD	Coeff	.361**	.140*	.023	.023	.030	.174**	-.011	.189**	.033	.220**	.309**	.103
	Sig.	<.001	.017	.701	.693	.610	.003	.856	.001	.582	<.001	<.001	.079



**Table 10: Spearman’s correlation between NPI and CBI (Emotional burden).**

		Delusions	Hallucinations	Agitation/ Aggression	Dysphoria /Depression	Anxiety	Euphoria/ Elation	Apathy /Indifference	Disinhibition	Irritability Lability	Aberrant Motor	Nighttime Behavior	Appetite/ Eating
E20	Coeff	.225**	.326**	.250	-.207**	.222	.026	-.180	.498**	.306**	.457**	.334**	.099
	Sig.	<.001	<.001	<.001	<.001	<.001	.266	.002	<.001	<.001	<.001	<.001	.092
E21	Coeff	.337**	.077	.140*	-.163**	-.002	.155	-.155	.265**	.139*	.257**	.227**	.099
	Sig.	<.001	.189<	.017	.005	.972	.008	.008	<.001	.018	<.001	<.001	.094
E22	Coeff	.167**	.153**	.039	-.033	.041	.126	-.124	.015	.111	-.008	.111	.117*
	Sig.	<.001	.009	.512	.571	.486	.032	.035	.802	.059	.890	.060	.047
E23	Coeff	.310**	.374**	-.044	.107	-.111	.266	.036	-.005	.166**	.034	.158**	.315**
	Sig.	.006	<.001	.457	.070	.059	<.001	.538	.931	.005	.570	.007	<.001
E24	Coeff	.377**	.368**	.155	.142*	-.016	.328	.039	.151*	.230**	.163**	.230**	.294**
	Sig.	<.001	<.001	.008	.016	.785	<.001	.505	.010	<.001	.006	<.001	<.001
EMOT BURD	Coeff	.402**	.445*	.217	-.150*	.100	.168	-.153	.449**	.325**	.442**	.386**	.251**
	Sig.	<.001	<.001	<.001	.011	.088	.004	.009	<.001	<.001	<.001	<.001	<.001

psychological symptoms in patients with AD. Our study found that the most frequent neuropsychiatric symptoms in patients is anxiety (found in about 80% of subjects), followed by lack of sleep (78,2%) and agitation and depression (74,4% for both). On the other hand, lack of sleep, anxiety and agitation also seem to the behavioural disorders that provide the greatest source of stress to family members (75,4%, 75,1 % and 74% respectively. Prevalence in line with previous research [20]. Current knowledge on the relationship between specific BPSD and the severity of dementia is inconsistent [21-24].

**Conclusion**

In our study clinical scale scores are weakly related to the scales detected by neuropsychiatric inventory. In particular anxiety domains where the severity of the symptom is related to the severity of Alzheimer’s Disease. Our results agree with previous results that the burden of the caregiver could be related to all types of behavioural and psychological symptoms [25]. In particular, the objective load and evolutionary load are related to disinhibition, motor activity and sleep. Previous studies found that agitation or aggressive behaviour was the predictor of the depressive symptoms of the caregiver [26-28]. Although it was found that more behavioural and psychological symptoms was associated with the symptoms of the caregiver than this study. Consistent with a study that reported that the caregivers showed a higher burnout when they deal with agitation. Sleep disturbances, wandering have affected the depression of the caregiver in our study. Sleep deprivation can cause depression due to change neurotransmitters [29,30].

The approach to the demented patient must be based on a principle of sharing both objectives and treatment plans.

The real sharing allows to concretely realize the project of care outlined for the individual patient; it allows to revise and adapt the same plan to the changing of the needs of the patient as well as to the changing of the contextual situations.

The needs analysis conducted within the already mentioned “social triangle of care”, person with dementia - informal Carers - formal Carers, allows you to enumerate and address the numerous ethical dilemmas that are evident in the course of the disease in compliance with the principles of autonomy-self-determination, charity and social justice [31].

The ability of each carer to use an interpretative approach to the disease with its set of cognitive and non-cognitive symptoms is the guarantee of an adequate interpretation of the behavioral disorders and this improves the relationship with the patient and the quality of life both the carer and the family member who takes care [32,33].

This study found a high prevalence of behavioural and Psychological symptoms in patients with Alzheimer’s disease. Our results provide additional support for routine screening and treatment of behavioural and Psychological symptoms in Alzheimer’s Disease patients.

**References**

1. World Health Organization. Global Action Plan on the Public Health Response to Dementia 2017–2025. Geneva. 2017.
2. Mayeux R, Stern Y. Epidemiology of Alzheimer disease. Cold Spring Harb Perspect Med. 2012; 2: a006239.
3. Brickman AM, Riba A, Bell K, Marder K, Albert M, Brandt J, Stern Y. Longitudinal assessment of patient dependence in Alzheimer disease. Arch Neurol. 2002; 59: 1304-1308.
4. McLaughlin T, Feldman H, Fillit H, Sano M, Schmitt F, Aisen P, et al. Dependence as a unifying construct in defining Alzheimer’s disease severity. Alzheimers Dement. 2010; 6: 482-493.
5. Chiu MJ, Chen TF, Yip PK, Hua MS, Tang LY. Behavioral and psychologic symptoms in different types of dementia. J Formos Med Assoc. 2006; 105: 556-562.
6. Cerejeira J, Lagarto L, Mukaetova-Ladinska EB. Behavioral and psychological symptoms of dementia. Front Neurol. 2012; 3: 73.



7. Pinyopornpanish M, Pinyopornpanish K, Soontornpun A, Tanprawate S, Nadsasarn A, Wongpakaran N, et al. Perceived stress and depressive symptoms not neuropsychiatric symptoms predict caregiver burden in Alzheimer's disease: A cross-sectional study. *BMC Geriatr*. 2021; 180.
8. Ornstein K, Gaugler JE. The problem with "problem behaviors": a systematic review of the association between individual patient behavioral and psychological symptoms and caregiver depression and burden within the dementia patient-caregiver dyad. *Int Psychogeriatr*. 2012; 24: 1536-1552.
9. Feast A, Moniz-Cook E, Stoner C, Charlesworth G, Orrell M. A systematic review of the relationship between behavioral and psychological symptoms (BPSD) and caregiver well-being. *Int Psychogeriatr*. 2016; 28: 1761-1774.
10. Cloak N, Khalili YA. Behavioral and Psychological Symptoms in Dementia (BPSD). 2022.
11. Alzheimer's Disease International & Dementia Australia. *Dementia in the Asia Pacific region*. London. 2014.
12. Campbell P, Wright J, Oyeboode J, Job D, Crome P, Bentham P, et al. Determinants of burden in those who care for someone with dementia. *Int J Geriatr Psychiatry*. 2008; 23:1078-1085.
13. McKhann G, Drachman D, Folstein M, Katzman R, Price D, Stadlan EM. Clinical diagnosis of Alzheimer's disease: report of the NINCDS-ADRDA Work Group under the auspices of Department of Health and Human Services Task Force on Alzheimer's Disease. *Neurology*. 1984; 34: 939-944.
14. Chuakhamfoo NN, Phanthunane P, Chansirikarn S, Pannarunothai S. Health and long-term care of the elderly with dementia in rural Thailand: a cross-sectional survey through their caregivers. *BMJ Open*. 2020; 10: e032637.
15. Shim YS, Park KH, Chen C, Dominguez JC, Kang K, Kim HJ, et al. Caregiving, care burden and awareness of caregivers and patients with dementia in Asian locations: A secondary analysis. *BMC Geriatr*. 2021; 230.
16. Muangpaisan W, Praditsuwan R, Assanasen J, Srinonprasert V, Assantachai P, Intalapaporn S, et al. Caregiver burden and needs of dementia caregivers in Thailand: A cross-sectional study. *J Med Assoc Thai*. 2010; 93: 601-7.
17. Lamliangpon, P. Anxiety-depression and quality of life in dementia caregivers. *J Ment Health Thail*. 2015; 23.
18. Mukherjee A, Biswas A, Roy A, Biswas S, Gangopadhyay G, Das SK. Behavioural and psychological symptoms of dementia: Correlates and impact on caregiver distress. *Dement Geriatr Cogn Dis Extra*. 2017; 7: 354-365.
19. Arthur PB, Gitlin LN, Kairalla JA, Mann WC. Relationship between the number of behavioral symptoms in dementia and caregiver distress: What is the tipping point? *Int Psychogeriatr*. 2018; 30: 1099-1107.
20. Folstein MF, Folstein SE, McHugh PR. "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res*. 1975; 12: 189-198.
21. Katz S. Assessing self-maintenance: Activities of daily living, mobility, and instrumental activities of daily living. *J Am Geriatr Soc*. 1983; 31: 721-727.
22. Lawton MP, Brody EM. Assessment of older people: Self-maintaining and instrumental activities of daily living. *Gerontologist*. 1969; 9: 179-186.
23. Hamilton M. Development of a rating scale for primary depressive illness. *Br J Soc Clin Psychol*. 1967; 6: 278-296.
24. Morris JC. Clinical dementia rating: a reliable and valid diagnostic and staging measure for dementia of the Alzheimer type. *Int Psychogeriatr*. 1997; 9: 173-176.
25. Novak M, Guest C. Application of a multidimensional caregiver burden inventory. *Gerontologist*. 1989; 29: 798-803.
26. Deardorff WJ, Grossberg GT. Behavioral and psychological symptoms in Alzheimer's dementia and vascular dementia. *Handb Clin Neurol*. 2019; 165: 5-32.
27. Lopez OL, Becker JT, Sweet RA, Klunk W, Kaufer DI, Saxton J, et al. Psychiatric symptoms vary with the severity of dementia in probable Alzheimer's disease. *J Neuropsychiatry Clin Neurosci*. 2003; 15: 346-353.
28. Canevelli M, Adali N, Cantet C, Andrieu S, Bruno G, Cesari M, et al. Impact of behavioral subsyndromes on cognitive decline in Alzheimer's disease: Data from the ICTUS study. *J Neurol*. 2013; 260: 1859-1865.
29. Tanaka H, Hashimoto M, Fukuhara R, Ishikawa T, Yatabe Y, Kaneda K, et al. Relationship between dementia severity and behavioural and psychological symptoms in early-onset Alzheimer's disease. *Psychogeriatrics*. 2015; 15: 242-247.
30. Hashimoto M, Yatabe Y, Ishikawa T, Fukuhara R, Kaneda K, Honda K, et al. Relationship between dementia severity and behavioral and psychological symptoms of dementia in dementia with lewy bodies and alzheimer's disease patients. *Dement Geriatr Cogn Dis Extra*. 2015; 5: 244-252.
31. Kim B, Noh GO, Kim, K. Behavioural and psychological symptoms of dementia in patients with Alzheimer's disease and family caregiver burden: A path analysis. *BMC Geriatr*. 2021; 160.
32. Fauth EB, Gibbons A. Which behavioral and psychological symptoms of dementia are the most problematic? Variability by prevalence, intensity, distress ratings, and associations with caregiver depressive symptoms. *Int J Geriatr Psychiatry*. 2014; 29: 263-271.
33. Covinsky KE, Newcomer R, Fox P, Wood J, Sands L, Dane K, et al. Patient and caregiver characteristics associated with depression in caregivers of patients with dementia. *J Gen Intern Med*. 2003; 18: 1006-1014.





