

FREQUENCY AND SEVERITY OF NEUROPSYCHIATRIC SYMPTOMS ACROSS ALZHEIMER'S DEMENTIA SEVERITY SPECTRUM: A HOSPITAL-BASED CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Neuropsychiatric symptoms are common in Alzheimer's dementia and can substantially affect patients' functioning, quality of life, and caregiver burden. Their frequency and severity may vary across different stages of dementia. The objective is to determine the frequency and severity of individual neuropsychiatric symptom domains in patients with Alzheimer's dementia and describe their distribution across mild, moderate, and severe stages. **Materials and Methods:** A hospital-based cross-sectional study was conducted among 62 consecutive patients aged 60–90 years with clinically diagnosed Alzheimer's dementia attending the Psychiatry Outpatient Department of a tertiary-care hospital in Tamil Nadu. Neuropsychiatric symptoms were assessed using the Neuropsychiatric Inventory (NPI), while dementia severity was assessed using the Clinical Dementia Rating Scale (CDRS). Frequency, severity, and frequency-by-severity composite scores were evaluated for individual neuropsychiatric symptom domains. **Result:** The study included 36 (58.1%) men and 26 (41.9%) women, with a mean age of 71.10 ± 4.95 years. Sleep/night-time behavioural disturbance was the most frequently reported symptom (98%), followed by appetite changes (92%) and apathy (90%). Agitation/aggression was present in 68%, irritability in 61%, aberrant motor behaviour in 60%, dysphoria/depression in 56%, and anxiety in 45%. Delusions were reported in 34%, while hallucinations and disinhibition occurred in 16% each. Elation/euphoria was not reported. The highest mean NPI composite scores were observed for sleep/night-time disturbances (9.84 ± 2.88), apathy (5.44 ± 3.96), and appetite changes (4.98 ± 4.55). Based on CDRS staging, 20 (32.3%) patients had mild, 24 (38.7%) moderate, and 18 (29.0%) severe dementia. Anxiety and dysphoria were relatively prominent in mild dementia, whereas agitation/aggression, delusions, irritability, and aberrant motor behaviour were more frequently represented in moderate and severe stages. **Conclusion:** Neuropsychiatric symptoms were highly prevalent and heterogeneous among patients with Alzheimer's dementia. Sleep disturbances, appetite changes, and apathy represented the most prominent symptom domains. Routine domain-specific assessment of neuropsychiatric symptoms across dementia stages may facilitate comprehensive clinical management and caregiver support. Larger multicentre longitudinal studies are warranted to clarify the progression and temporal relationship of these symptoms.

INTRODUCTION

Dementia is a clinical syndrome characterised by acquired decline in cognitive function that interferes with independence and everyday activities. It affects memory, thinking, communication, mood, behaviour, and the ability to perform daily tasks, and

represents an increasing challenge for patients, families, health services, and public-health systems.^[1] Alzheimer's disease is the most common cause of dementia. Although cognitive impairment is central to the diagnosis, the illness is not limited to memory and other cognitive deficits. Neuropsychiatric symptoms may emerge at different

points in the illness and can become a major determinant of clinical care. Neuropsychiatric symptoms (NPS), also referred to in parts of the literature as Behavioural and Psychological symptoms of Dementia, comprise a heterogeneous group of disturbances in mood, perception, thought content, behaviour, motivation, sleep, appetite, and motor activity.^[2] Common manifestations include apathy, depression or dysphoria, anxiety, agitation or aggression, irritability, delusions, hallucinations, disinhibition, aberrant motor behaviour, sleep disturbance, and appetite or eating abnormalities.^[3,4] These symptoms may occur singly or in combination and may fluctuate over time. Their presence can complicate diagnostic assessment, increase the need for supervision, impair quality of life, and contribute to distress among family caregivers.^[5]

The prevalence of NPS in Alzheimer's disease is substantial, although estimates vary according to the population studied, disease severity, assessment instrument, informant, and definition of a clinically significant symptom. In a systematic review and meta-analysis of 48 studies using the Neuropsychiatric Inventory, apathy was the most frequent symptom, followed by depression, aggression, anxiety, and sleep disorder.^[6] Delusions, hallucinations, disinhibition, and euphoria were less frequent but may be particularly important because of their clinical and safety implications. These findings indicate that NPS should be assessed as a multidimensional component of Alzheimer's disease rather than treated as an incidental accompaniment to cognitive decline. The clinical importance of NPS extends beyond symptom counting. Apathy may reduce participation in self-care and rehabilitation, while agitation, irritability, disinhibition, psychosis, and aberrant motor behaviour can increase supervision needs and complicate the delivery of care. Sleep and night-time disturbances may disrupt both patient and caregiver rest. Appetite and eating abnormalities may affect nutrition and routine. Because the symptom domains differ in presentation, severity, and management needs, a description of the overall NPI score alone may conceal clinically meaningful patterns. Domain-specific assessment, including frequency and severity, is therefore important for identifying the symptoms most relevant to each stage of dementia.^[7-10]

The distribution of NPS may also vary with the clinical severity of Alzheimer's dementia.^[11] Some affective and motivational symptoms may be apparent in relatively mild disease, whereas psychosis, agitation, disinhibition, motor disturbance, sleep disruption, and eating abnormalities may become more prominent as cognitive and functional impairment increases.^[12] However, stage-specific patterns are not necessarily uniform across settings. Differences in referral pathways, caregiver characteristics, cultural expectations, medication use, diagnostic practices, and access to specialist care may influence the symptoms observed in hospital populations. Local

clinical data are consequently important for planning assessment and caregiver-support services, particularly in settings where dementia care is delivered predominantly through families and outpatient services. Despite the practical importance of these symptoms, neuropsychiatric manifestations may receive less systematic attention than cognitive impairment during routine dementia assessment. A structured evaluation of NPS can support more comprehensive formulation, improve communication with caregivers, identify potentially modifiable sources of distress, and help clinicians prioritise non-pharmacological and pharmacological interventions. Describing the frequency and severity of individual domains across dementia stages may also provide a clinically useful baseline for future longitudinal and intervention studies. The present hospital-based cross-sectional study therefore assessed the frequency and severity of neuropsychiatric symptoms in patients with clinically diagnosed Alzheimer's dementia using the Neuropsychiatric Inventory and examined their distribution across mild, moderate, and severe dementia stages. The study was designed to identify the dominant symptom domains and to determine whether clinically relevant differences in NPS profiles were observed across stages of dementia.

MATERIALS AND METHODS

Study design and setting: This was a cross-sectional observational study conducted in the Psychiatry Outpatient Department of tertiary care hospital in Tamil Nadu, India. The study aimed to identify the frequency and severity of neuropsychiatric symptoms among patients with Alzheimer's dementia and to compare the symptom profile across clinically defined stages of dementia.

Participants and recruitment: The study population comprised of 62 consecutive patients attending the Psychiatry Outpatient Department who had a clinical diagnosis of Alzheimer's dementia. Participants were approached during routine outpatient attendance. After explanation of the study, informed consent was obtained from participants who were able to consent. Where a participant was unable to provide informed consent, consent was obtained from an appropriate proxy in accordance with institutional requirements.

Eligibility criteria: Participants were eligible if they had a clinical diagnosis satisfying the study's operational ICD-10 criteria for Alzheimer's dementia; evidence of multiple cognitive deficits sufficient to impair activities of daily living; insidious onset and gradual progression; clear consciousness at assessment; no systemic or neurological condition judged to explain the dementia; no sudden apoplectic onset or early focal neurological deficit suggestive of another primary cause; illness duration of at least six months; age between 60 and 90 years; and ability to

provide informed consent or availability of an appropriate proxy.

Patients were excluded if they were younger than 60 years or older than 90 years; had delirium; had potentially reversible or treatable dementia; had mixed dementia; had a psychiatric disorder preceding the onset of memory loss; had a history of head injury with loss of consciousness; had alcohol or other substance-use disorder considered relevant to the presentation; had a brain tumour, cerebrovascular disorder, or other neurological condition likely to account for the presentation; or did not provide consent or have an eligible proxy.

Clinical assessment: A detailed history, mental-status examination, neurological examination, and neuropsychological evaluation were performed. A semi-structured proforma recorded sociodemographic and clinical information, including age, sex, age at onset, duration of illness, relationship of the primary caregiver to the participant, and caregiver sociodemographic information.

Assessment instruments:

Mini-Mental State Examination: Global cognitive function was assessed using the Mini-Mental State Examination (MMSE), a 30-point instrument assessing orientation, registration, attention, calculation, recall, language, and visuospatial construction. Lower scores indicate poorer cognitive performance.^{13,14}

Clinical Dementia Rating Scale: Dementia severity was assessed using the Clinical Dementia Rating Scale (CDRS).^{15,16} The participants were classified into having mild, moderate, and severe dementia based on the scores.

Neuropsychiatric Inventory: Neuropsychiatric symptoms were assessed using the Neuropsychiatric Inventory based on information provided by the primary caregiver. The NPI evaluates 12 symptom domains: delusions, hallucinations, agitation/aggression, dysphoria/depression, anxiety, apathy, elation/euphoria, disinhibition, irritability, aberrant motor behaviour, night-time behavioural disturbances, and appetite/eating abnormalities. A screening question was followed by domain-specific assessment when symptoms were present.^{5,17}

Scoring of Neuropsychiatric Symptoms: For each NPI domain, symptom frequency was rated on a four-

point scale: 1, occasionally or less than once per week; 2, often or approximately once per week; 3, frequently or several times per week but not every day; and 4, very frequently or once per day or continuously. Symptom severity was rated on a three-point scale: 1, mild; 2, moderate; and 3, severe. A frequency-by-severity composite score was calculated for each symptom domain by multiplying the frequency score by the severity score. The total NPI composite score was obtained by summing the composite scores across all domains.

Ethical Considerations: Ethical approval was obtained from the Institutional Ethics Committee. Informed consent was obtained from all participants who were able to provide consent, while an appropriate proxy provided consent for participants who were unable to provide informed consent.

Data Analysis: The study findings were summarized descriptively. Sociodemographic and clinical characteristics were expressed using appropriate descriptive measures. The frequency and severity of individual NPI domains were summarized, and frequency-by-severity composite scores were calculated. Neuropsychiatric symptom domains were also described across mild, moderate, and severe dementia categories based on CDRS staging. The available study methodology supports descriptive analysis of the symptom distribution across dementia-severity groups.

RESULTS

Participant characteristics: Of the 62 patients with Alzheimer's dementia, 36 were men and 26 women. The mean age was 71.10 years (SD 4.951), and the mean duration of illness was 3.34 years (SD 2.058). The mean age at onset was 67.76 years (SD 4.575). The mean MMSE score was 15.66 (SD 4.149), and the mean CDRS score was 12.1694 (SD 4.59592). Based on CDRS staging, 20 patients (32.3%) were classified as having mild dementia, 24 (38.7%) as moderate dementia, and 18 (29.0%) as severe dementia. The mean total NPI composite score was 40.4355 (SD 17.48875) (Table 1).

Table 1: Sociodemographic and clinical characteristics of the study sample

Characteristic	Value
Men	36 (58.1%)
Women	26 (41.9%)
Age, mean (SD), years	71.10 (4.951)
Age at onset, mean (SD), years	67.76 (4.575)
Illness duration, mean (SD), years	3.34 (2.058)
MMSE score, mean (SD)	15.66 (4.149)
CDRS score, mean (SD)	12.1694 (4.59592)
Mild dementia by CDRS	20 (32.3%)
Moderate dementia by CDRS	24 (38.7%)
Severe dementia by CDRS	18 (29.0%)

Frequency of neuropsychiatric symptom domains: Sleep/night-time behavioural disturbance was the most frequently reported NPI domain, occurring in 61 of 62 patients (98%). Appetite changes were reported in 57 patients (92%), and apathy in 56 (90%). Agitation/aggression occurred in 42 patients (68%), irritability in 38 (61%), aberrant motor behaviour in 37 (60%), dysphoria in 35 (56%), and anxiety in 28 (45%). Delusions were reported in 21 patients (34%), while hallucinations and disinhibition were each reported in 10 patients (16%). Elation was not reported [Figure 1].

Severity of neuropsychiatric symptom domains: Based on severity of NPI scores, delusions (33.8%), hallucinations (16.1%), and sleep disturbances (100%) were mostly severe, among the patients in the

study group. Similarly disinhibition (16.1%) and irritability (38%) were found to be severe in the patients [Table 2]. Domains of depression and anxiety were predominantly mild in severity.

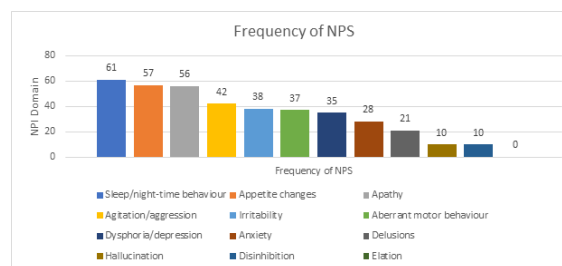


Figure 1: Frequency of neuropsychiatric symptom domains.

Table 2: Distribution based on severity of NPI domains

NPI domain	Mild n (%)	Moderate n (%)	Severe n (%)	Total n (%)
Delusions	8 (12.9)	3 (4.8)	10 (16.1)	21(33.8)
Hallucinations	0	0	10 (16.1)	10(16.1)
Agitation/aggression	20 (32.3)	15 (24.2)	7 (11.3)	42(67.7)
Dysphoria/depression	17 (27.4)	9 (14.5)	9 (14.5)	35(56.4)
Anxiety	22 (35.5)	1 (1.6)	5 (8.1)	28(45.1)
Elation/euphoria	0	0	0	0
Apathy	14 (22.6)	24 (38.7)	18 (29.0)	56 (90.3)
Disinhibition	0	7 (11.3)	3 (4.8)	10(16.1)
Irritability	8 (12.9)	19 (30.6)	11 (17.7)	38 (61.2)
Aberrant motor behaviour	16 (25.8)	7 (11.3)	14 (22.6)	37(59.6)
Sleep/night-time behaviour	0	23 (37.1)	39 (62.9)	62(100)
Appetite changes	26 (41.9)	18 (29.0)	13 (21.0)	57 (91.9)

Composite scores: The highest mean NPI composite scores were observed for sleep disturbances (9.84 ± 2.881), apathy (5.44 ± 3.961), and appetite changes (4.98 ± 4.550). Irritability had a mean composite score of 4.06 ± 4.494 and aberrant motor behaviour 3.84 ± 5.022 . Lower mean composite scores were reported for dysphoria (2.90 ± 4.031), agitation/aggression (2.74 ± 3.666), delusions (2.34 ± 4.383), hallucinations (1.79 ± 4.153), anxiety (1.42 ± 3.272), disinhibition (1.08 ± 2.569), and elation (0.00 ± 0.000).

Distribution across dementia-severity stages: The frequency of NPI domains within mild, moderate, and severe CDRS categories were evaluated. In the mild group, anxiety was reported in 20 patients (32% of the total sample), sleep/night-time disturbance in

19 (30.6%), dysphoria in 15 (24%), appetite changes in 15 (24%), and apathy in 14 (22%). In the moderate group, apathy, sleep/night-time disturbance, and appetite changes were each reported in 24 patients (38% of the total sample), while agitation/aggression was reported in 18 (29%) and irritability in 17 (27%). In the severe group, agitation/aggression and aberrant motor behaviour were each reported in 18 patients (29%), delusions in 15 (24%), and irritability in 16 (25%) [Table 3]. These descriptive data suggest that anxiety and dysphoria were relatively prominent in the mild-stage group, whereas agitation/aggression, delusions, irritability, and aberrant motor behaviour were more prominent in the moderate or severe stages of Dementia.

Table 3: Frequency of NPI domains by CDRS dementia-severity stage

NPI domain	Mild Dementia n (%)	Moderate Dementia n (%)	Severe Dementia n (%)	Total n (%)
Delusions	5 (8)	1 (1.6)	15 (24)	21 (34)
Hallucinations	0	2 (3.2)	8 (12.9)	10 (16)
Agitation/aggression	6 (9.6)	18 (29)	18 (29)	42 (68)
Dysphoria/depression	15 (24)	10 (16)	10 (16)	35 (56)
Anxiety	20 (32)	5 (8)	3 (4.8)	28 (45)
Elation/euphoria	0	0	0	0
Apathy	14 (22)	24 (38)	18 (29)	56 (90)
Disinhibition	1 (1.6)	7 (11)	2 (3.2)	10 (16)
Irritability	5 (8)	17 (27)	16 (25)	38 (61)
Aberrant motor behaviour	6 (9.6)	13 (20)	18 (29)	37 (60)
Sleep/night-time behaviour	19 (30.6)	24 (38)	18 (29)	61 (98)
Appetite changes	15 (24)	24 (38)	18 (29)	57 (92)

DISCUSSION

In this hospital-based cross-sectional study of patients with Alzheimer's dementia, neuropsychiatric symptoms were frequent and multidimensional. Sleep/night-time behavioural disturbance, appetite changes, and apathy were the most frequently reported domains, while agitation/aggression, irritability, aberrant motor behaviour, and dysphoria were also common. Sleep disturbance, apathy, and appetite changes had the highest mean frequency-by-severity composite scores. The stage-wise descriptive distribution suggested that anxiety and dysphoria were prominent in the mild group, whereas agitation/aggression, delusions, irritability, and aberrant motor behaviour were more prominent in moderate or severe disease. The high frequency of NPS in this study is consistent with the broader literature showing that behavioural and psychological symptoms are common components of Alzheimer's disease rather than rare complications.^[18] A systematic review and meta-analysis of 48 studies using the NPI identified apathy as the most frequent symptom, followed by depression, aggression, anxiety, and sleep disorder.^[19] The present study showed a particularly high reported frequency of sleep/night-time disturbance, appetite changes, and apathy.

Apathy was present in approximately nine out of ten participants and had the second-highest mean composite score. Apathy may be difficult to distinguish from depression, reduced initiation due to cognitive impairment, or general functional decline. Its high frequency supports the inclusion of apathy-specific questions in routine dementia reviews.^[18] Apathy may also be clinically relevant because reduced initiation can interfere with personal care, rehabilitation, social participation, and adherence to treatment plans. Sleep and night-time behavioural disturbance was the dominant reported domain, occurring in 98% of participants and showing the highest mean composite score. Sleep-related symptoms can affect the patient and the caregiver simultaneously, potentially increasing supervision requirements and caregiver exhaustion. Appetite changes were reported in 92% of participants and had the third-highest mean composite score. Appetite and eating abnormalities may have implications for nutritional status, medication administration, swallowing safety, and caregiver workload. Anxiety and dysphoria were relatively frequent in the mild dementia spectrum, while agitation/aggression, delusions, irritability, and aberrant motor behaviour were more frequently represented in the moderate and severe groups. Such a pattern may reflect increasing cognitive and functional impairment, reduced behavioural regulation, communication difficulties, or greater caregiver recognition of disruptive symptoms at later stages.^[20] However, cross-sectional comparisons cannot determine whether an individual patient develops one symptom

after another over time. Longitudinal studies are needed to establish temporal trajectories.

The study has several clinical implications. First, assessment of Alzheimer's dementia should include a structured evaluation of NPS rather than relying only on cognitive screening. Second, clinicians should ask caregivers specifically about sleep and night-time behaviour, appetite, apathy, agitation, irritability, and motor behaviour because these domains were prominent in the present study sample. Third, management should begin with a search for reversible contributors and non-pharmacological approaches tailored to the symptom, patient, and care environment. Pharmacological treatment, when considered, requires an individualised risk-benefit assessment and monitoring.^[4,21] The study also provides a locally relevant clinical profile from a psychiatry outpatient setting. This is useful because symptom prevalence may differ between community samples, memory clinics, psychiatric services, and long-term-care settings. The findings may help clinicians anticipate the types of caregiver concerns likely to arise during outpatient consultations and may support the development of caregiver education concerning sleep routines, nutrition, behavioural triggers, and safety planning. The findings should be interpreted in light of important limitations. The study was cross-sectional, so temporal sequence and causality cannot be established. It was conducted at a single hospital and may not represent people with Alzheimer's dementia in the community or those who do not reach specialist services. NPS were assessed through caregiver report, which is clinically appropriate but may be influenced by caregiver burden, recall, interpretation, and contact time.

Limitations: This study has several limitations. First, its cross-sectional design prevents establishing temporal relationships or causality between dementia severity and neuropsychiatric symptoms. Second, the study was conducted in a single tertiary-care hospital with a relatively small sample of 62 patients, which may limit the generalizability of the findings to community-based populations and patients who do not access specialist psychiatric services. Third, neuropsychiatric symptoms were assessed primarily through caregiver-reported information using the Neuropsychiatric Inventory, which may be influenced by caregiver burden, recall, interpretation, and the amount of time spent with the patient. In addition, the study did not follow patients longitudinally; therefore, the observed differences between mild, moderate, and severe dementia stages cannot establish how individual symptoms evolve within the same patient over time. Larger, multicentre, community-based longitudinal studies are needed to confirm these stage-specific patterns and better understand their clinical progression.

CONCLUSION

Neuropsychiatric symptoms were highly prevalent and heterogeneous among patients with Alzheimer's dementia in this hospital-based study. Sleep/night-time behavioural disturbances, appetite changes, and apathy were the most frequently observed and highest-burden symptoms. Anxiety and dysphoria were relatively prominent in mild dementia, whereas agitation/aggression, delusions, irritability, and aberrant motor behaviour were more frequently observed in moderate and severe stages. These findings highlight the importance of routine, domain-specific assessment of neuropsychiatric symptoms alongside cognitive and functional evaluation. Early recognition and appropriate management of these symptoms may support patient care and reduce caregiver burden. Larger multicentre longitudinal studies are warranted to confirm these stage-specific patterns and determine their progression over time.

REFERENCES

1. American Psychiatric Association. Diagnostic and statistical manual of mental disorders: DSM-5. Arlington, VA: American Psychiatric Association; 2013.
2. Finkel, S., J. C., G. C., S. M. & Sartorius, N. Behavioral and Psychological Signs and Symptoms of Dementia: a consensus statement on current knowledge and implications for research and treatment. *International Psychogeriatrics* 8, 497–500 (1996).
3. Finkel SI. Behavioral and Psychological Symptoms of Dementia (BPSD): A Current Focus for Clinicians, Researchers, Caregivers, and Governmental Agencies. In: Miyoshi K, Shapiro CM, Gaviria M, Morita Y, eds. *Contemporary Neuropsychiatry*. Springer Japan; 2001:200-210. doi:10.1007/978-4-431-67897-7_32
4. Kales HC, Gitlin LN, Lyketsos CG. Assessment and management of behavioral and psychological symptoms of dementia. *BMJ*. 2015;350:h369. doi:10.1136/bmj.h369
5. Cummings JL, Mega M, Gray K, Rosenberg-Thompson S, Carusi DA, Gornbein J. The Neuropsychiatric Inventory: comprehensive assessment of psychopathology in dementia. *Neurology*. 1994;44(12):2308-2314. doi:10.1212/wnl.44.12.2308
6. Lyketsos CG, Lopez O, Jones B, Fitzpatrick AL, Breitner J, DeKosky S. Prevalence of neuropsychiatric symptoms in dementia and mild cognitive impairment: results from the cardiovascular health study. *JAMA*. 2002;288(12):1475-1483. doi:10.1001/jama.288.12.1475
7. Lyketsos CG. Neuropsychiatric symptoms (behavioral and psychological symptoms of dementia) and the development of dementia treatments. *Int Psychogeriatr*. 2007;19(3):409-420. doi:10.1017/S104161020700484X
8. Chung JA, Cummings JL. Neurobehavioral and neuropsychiatric symptoms in Alzheimer's disease: characteristics and treatment. *Neurol Clin*. 2000;18(4):829-846. doi:10.1016/s0733-8619(05)70228-0
9. Cerejeira J, Lagarto L, Mukaetova-Ladinska EB. Behavioral and psychological symptoms of dementia. *Front Neurol*. 2012;3:73. doi:10.3389/fneur.2012.00073
10. Yahya A, Chandra M, Anand KS, Garg J. Behavioral and Psychological Symptoms in Dementia and Caregiver Burden. *Clin Med Res*. 2015;4(2):8-14. doi:10.11648/j.cmr.s.2015040201.12
11. Srikanth S, Nagaraja AV, Ratnavalli E. Neuropsychiatric symptoms in dementia-frequency, relationship to dementia severity and comparison in Alzheimer's disease, vascular dementia and frontotemporal dementia. *J Neurol Sci*. 2005;236(1-2):43-48. doi:10.1016/j.jns.2005.04.014
12. Piccininni M, Di Carlo A, Baldereschi M, Zaccara G, Inzitari D. Behavioral and psychological symptoms in Alzheimer's disease: frequency and relationship with duration and severity of the disease. *Dement Geriatr Cogn Disord*. 2005;19(5-6):276-281. doi:10.1159/000084552
13. 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(3):189-198. doi:10.1016/0022-3956(75)90026-6
14. Crum RM, Anthony JC, Bassett SS, Folstein MF. Population-based norms for the Mini-Mental State Examination by age and educational level. *JAMA*. 1993;269(18):2386-2391.
15. Morris JC. The Clinical Dementia Rating (CDR): current version and scoring rules. *Neurology*. 1993;43(11):2412-2414. doi:10.1212/wnl.43.11.2412-a
16. O'Bryant SE, Waring SC, Cullum CM, et al. Staging Dementia Using Clinical Dementia Rating Scale Sum of Boxes Scores. *Arch Neurol*. 2008;65(8):1091-1095. doi:10.1001/archneur.65.8.1091
17. Cummings JL. The Neuropsychiatric Inventory. *Neurology*. 1997;48(5_suppl_6):10S-16S. doi:10.1212/WNL.48.5_Suppl_6.10S
18. Lyketsos CG, Steinberg M, Tschanz JT, Norton MC, Steffens DC, Breitner JCS. Mental and behavioral disturbances in dementia: Findings from the Cache County Study on Memory in Aging. *The American Journal of Psychiatry*. 2000;157(5):708-714. doi:10.1176/appi.ajp.157.5.708
19. Zhao QF, Tan L, Wang HF, et al. The prevalence of neuropsychiatric symptoms in Alzheimer's disease: Systematic review and meta-analysis. *Journal of Affective Disorders*. 2016;190:264-271. doi:10.1016/j.jad.2015.09.069
20. Haupt M, Kurz A, Jänner M. A 2-year follow-up of behavioural and psychological symptoms in Alzheimer's disease. *Dement Geriatr Cogn Disord*. 2000;11(3):147-152. doi:10.1159/000017228
21. Anand A, Khurana P, Chawla J, Sharma N, Khurana N. Emerging treatments for the behavioral and psychological symptoms of dementia. *CNS Spectr*. 2018;23(6):361-369. doi:10.1017/S1092852917000530