Nat. Volatiles & Essent. Oils, 2022; 9(4): 131-144

NVEO
Natural Volatiles & Essential Oils

Severe Cognitive-Communicative Impairment In The Clinical Phase Of Moderately Severe Alzheimer's Disease

Katia Zambrano Ruiz[1], Marinella Álvarez Borrero[1], Jhon J. Feria Díaz[2]

[1]Faculty of Health Sciences, Universidad de Sucre, Colombia
[2]Faculty of Engineering, Universidad de Sucre, Colombia

Abstract

This is case study research aimed at determining the Alzheimer's disease-ASD progress deterioration in a 74-year-old male patient with a diagnosis of dementia and bipolar affective disorder with an evolutionary clinical picture of 9 years. For this, a linear comprehensive assessment plan was designed and implemented for six years in the period from 2017 to 2021 with biennial periodic evaluations of global cognitive-communicative functioning. It is made through standardized neuropsychological methods administration to assess the impact state on basic, instrumental, and advanced activities of daily living. The Barthel index, Lawton and Brody scale, Katz index, FAST functional scale, and Yesavage geriatric depression were applied. Likewise, the mini-mental state examination test, global deterioration scale, adult intelligence scale, and Neuropsi were used to establish the cognitive level. A descriptive profile of the linguistic-communicative skills profile was performed to identify expressive, comprehension and reading-writing language disorders in the severe stage of AD, language skills, rectifications, turn-taking, and thematic domain were evaluated. The results indicated the presence of severe cognitive-communicative impairment in the clinical phase of moderately severe Alzheimer's disease. This requires a specialized interdisciplinary medical and neuro-rehabilitation approach to contribute to the life quality of the patient and his family.

Keywords: Cognitive-Communicative Iimpairment, Alzheimer Disease, Neuropsychological Assessment, Comprehensive Linear Assessment

1. Introduction

Alzheimer's disease is the most common chronic dementia type in the global and progressive nature that generates a global deterioration in cognitive function accompanied by a decline in emotional control, social behavior, and motivation skills (ADI, 2022). Worldwide, a prevalence of 55 million people with AD is estimated with a projected increase by 2030 of almost 74.7 million, and by 2050 the rates could exceed 131.5 million people generating a large economic impact to each country of 321 billion with a tendency to increase in 2050 of one trillion dollars. Likewise, AD is the seventh leading cause of death and one of the main disability determinants. Elderly dependence causes an important situation for their caregivers and family members in physical, psychological, social, and economic aspects (WHO,

2022). Thus, the AD subtype presentation is increasing with age and is more prevalent in women with a representation of 60% to 80% of the clinical pictures. It is evidenced in 10% of the elderly between 65 and 69 years are becoming more frequent as the population ages. It indicates that 6 out of 10 people over 80 years may have Alzheimer's disease due to a predisposition to certain genetic, environmental, and medical conditions (WHO, 2022).

1.1 Pathophysiological and clinical aspects of dementia type AD.

AD is a gradual neurodegenerative entity due to biological markers' presence of beta-amyloid and neurofibrillary tangle deposits in the cerebral cortex and subcortical gray matter. It shows decreased transparency and lepto-meninges fibrosis, with subarachnoid lacunae between the cerebral sulci, loss of color and weight causing global atrophy, bilateral, symmetry, increased circumvolutions in both hemispheres, frontal-temporal-parietal involvement in the primary sensorimotor areas and paracentral lobe in the mesial temporal lobe aspect. It shows sclerosis signs with increased volume of the ventricles and changes in the subcortical white matter (Sánchez et al., 2008). Therefore, a cognitive deficit is generated by the loss of short-term memory, impaired reasoning for the management of complex tasks and lack of judgment, oral-written language dysfunction, incipient visuospatial inability to recognize faces or common objects and psychopathological behavioral disorders of hallucinations and delusions (Jessen et al., 2020 and Kinney et al., 2018).

1.2 Neuropsychological course of AD

AD can be experienced differently by each individual. It depends on the disease's impact and stage. Which early on starts with insidious symptomatology with episodic memory loss, difficulties in learning and retaining new information, tempo-spatial disorientation, and implications in autobiographical memory (Saranzin, 2004 as cited in Lanfranco et al., 2012). This is how the disease evolution passes to an intermediate stage with symptoms of moderate severity, the patient depends on a caregiver to perform daily tasks (Romano et al., 2007) or in more complex cases in the late, with gradual affections that evidence inability to care for themselves and difficulties in the essential aspects of daily life. (ADI, 2022).

1.3 Diagnostic Criteria for AD

The Diagnostic and Statistical Manual of Mental Disorders- DSM 5 establishes the diagnostic criteria for neurocognitive disorders with the AD etiological entity specification. It is based on gradual and continuous semiology ranging from mild to a major degree in the cognitive, behavioral, and social domains with clinical threshold guidelines. It is determined by significant cognitive decline compared to the previous performance level in one or more cognitive domains of complex attention, executive function, learning, memory, language, perceptual-motor ability, or social cognition that interfere with the individual's autonomy in basic and instrumental activities of daily living. (DSM 5, 2013).

1.4 Comprehensive neuropsychological assessment process in AD.

The evaluation of AD requires a comprehensive process that should begin with an anamnesis, clinical history review, neurological examination, psychiatric, para-clinical, imaging, neuropsychological tests,

and interdisciplinary assessments of the neuro-rehabilitation group to establish the differential diagnosis between the other classes of dementias (Jack et al., 2011, McKhann et al., 2011, and Chetelat et al., 2020). Thus, it is evident the importance of presenting a linear global evaluative experience from the neuropsychological care practice in a patient with AD. Considering the signs and symptoms in the global cognitive-communicative function, because allows establishing a differential diagnosis to determine behaviors to follow in the pharmacological and interdisciplinary neuro-rehabilitation treatment.

2. Methods and Material

2.1 Participant

Male patient, 74 years old, married, father of two children, economist by profession with a clinical picture of 9 years of evolution due to dementia and bipolar affective disorder with degenerative changes in cognitive processes in attentional functions, language, and memory. He is monitored by neurology, psychiatry, and pharmacological management with quetiapine 25mg 1 tablet every 24 hours, memantine hydrochloride 20 mg 1 tablet every 24 hours, and galantamine 16 mg 1 tablet daily. He also receives interdisciplinary home treatment of comprehensive rehabilitation therapy of physiotherapy and speech therapy three times a week.

2.2 Evaluation technique and instruments

The evaluation process was based on the suggestions established by Ayuso et al. (2007) in the approaching dementias guide. It proposes guidelines for the evaluation pathway establishment and differential diagnosis. Which, an assessment plan was designed and implemented through standardized methods to characterize the overall cognitive functioning of the patient. Likewise, a linear comparison of previous evaluations was performed to determine the course progress of AD deterioration in the patient. The clinical history of cognitive impairment was reviewed including aspects of family history, personal history, medication, onset-evolution of symptoms, anamnesis of neurology, psychiatry, and interdisciplinary rehabilitation services (Bausela, 2009 and Tirapu, 2007). In addition, the Barthel index (Mahoney & Barthel, 1965), Lawton and Brody scale (Lawton and Brody, 1969), Katz index (Katz et al., 1993), FAST functional scale (Reisberg et al., 1984), and Yesavage geriatric depression scale (Aguado, 2000) were administered to assess functionality and impact status in basic, instrumental and advanced activities of daily living. Mini-mental state examination-MMSE (Folstein et al., 1975 and Lobo et al., 1979), Global Deterioration Scale-GDS (Reisberg et al., 1982) and GDS-FAST (Reisberg et al., 1982, 1984), Adult Intelligence Scale-WAIS-IV (Wechsler, 2012), Neuropsi (Ostrosky et al., 2012) were administered. Jointly, a description of the patient's linguistic-communicative skills profile was performed according to the approaches of Jaramillo, 2010 as cited in Brizuela, 2017 for the identification of expressive, comprehensive, and literate-written language impairments in the severe stage of AD. Also, linguistic abilities, rectifications, turn-taking onset, and thematic domain were evaluated through the two language samples analysis in two different contexts with an approximate duration of 10 minutes respectively, and a family member interview to learn about themes, behaviors, styles, and

communicative situations to establish a conversational interaction referencing with the interlocutors according to the guidelines of Whitworth et al., 1997 as cited in Gallardo 2002.

2.3 Data collection

Initially, the respective permissions were established for the documentation of the case study through the filling out and signing of the informed consent by the patient's relatives according to the current national and international regulations for research with human beings (Resolution No. 008430 of the MinSalud, 1993 and Declaration of Helsinky, 2013). Likewise, the current evaluation of the neuropsychological profile of the patient was implemented through the application of standardized assessment methods for which 6 sessions of approximately 1 hour were scheduled. Along the same line, the review and systematization of the two previous evaluations were performed to compare the performance in the biennial periods to determine the cognitive impairment course and establish a differential diagnosis according to the type of dementia.

2.4 Data analysis

The systematized record booklets were used for the recording and data coding of each neuropsychological test. This is for the analysis and interpretation of results, using the normative and corrective data of each test accordingly. In addition, a registration matrix was organized in a template in Microsoft Excel 0.19 (2019) to make performances comparisons of the three evaluations represented in linear graphs.

3. Results

The patient was alert and conscious during the evaluation process. Likewise, difficulties were evidenced in the temporo-spatial orientation, he showed interest in the administration of neuropsychological tests. Table 1 shows the results of the mini-mental state examination test, determining compromises by clinical risk indicator - CI in the processes of fixation, delayed recall, concentration, and calculation with a score of 12 points, which indicates that he is located in a dementia reference level. It is according to the normative data based on the schooling of higher education studies should obtain a performance of 28 possible points.

Table 1. Description of the results of the mini-mental-MMSE test application

AREAS	SCORE 2021	QUALITATIVE DESCRIPTION
Time Orientation	3/5	Low average
Spatial orientation	3/5	Low average
Fixation	0/3	I.C
Concentration and calculation	0/5	I.C
Delayed recall	0/3	I.C
Language	6/9	Average

P. TOTAL	12	Dementia

Figure 1 compares the current application results of the MMSE test with previous assessments at two-year intervals from the onset of the diagnosis of pathological suspicion to the current dementia state, which indicates a significant progression of the overall deterioration of cognitive functions with a current compromise of greater severity.

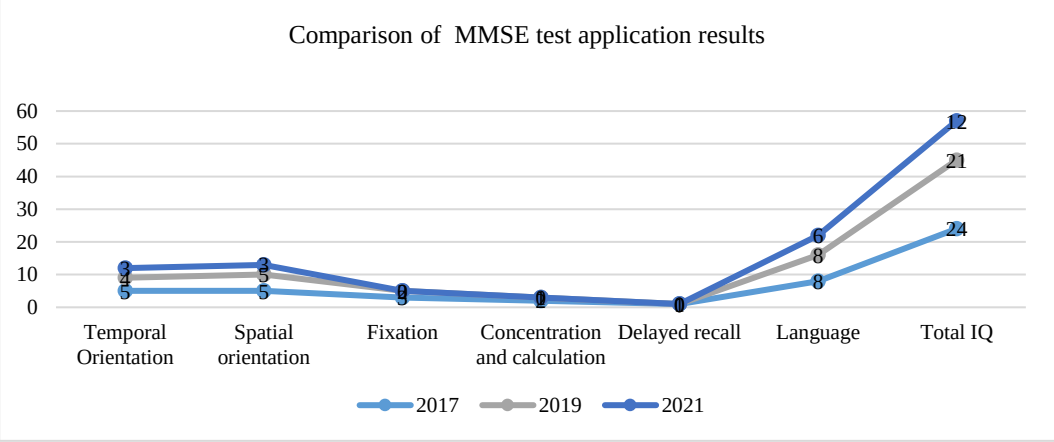

Figure 1. Results Comparison of the MMSE test application.

Table 2 describes the cognitive impairment scale by features means of the Global Deterioration Scale (GDS) scores with respect to the correspondence of the GDS-FAST stages. It indicates that the patient has severe cognitive impairment because of Alzheimer's disease due to compromises in the daily living functional activities of dressing, bathing, grooming, and decreased anal and bladder contingency. Likewise, he evidenced significant amnestic symptoms of forgetting his wife's name, temporo-spatial disorientation, difficulties in counting in regression, compromised diurnal rhythms, and personality, and affective changes.

Table 2. Results Description of the cognitive impairment scales application.

Scales	Score	Qualitative Description
Global deterioration scale GDS	6	Intermediate dementia
Global deterioration scale GDS-FAST	6	Severe cognitive deficit Moderately severe Alzheimer's disease

Table 3 shows the descriptive analysis of the Wechsler intelligence scale application for adults. It establishes that the patient has a low IQ, which is indicated by difficulties in fluid perceptual reasoning, spatial processing, and visuo-motor integration, and incipient short-term working memory skills due to

commitments to temporarily retain certain types of information, work or operate with it and generate a result, in tasks of repeating a list of numbers in the same order or in reverse order and remembering a series of numbers and letters. Also, inadequate ability in processing speed to perform simple tasks of scanning, ordering, and discriminating visual information quickly and correctly. However, in verbal comprehension, she evidenced certain conservation in the ability to define and express conceptual similarities between words and to respond to questions involving general principles and social situations.

Table 3. Results Description of the Wechsler Intelligence Scale application for Adults - WAIS-IV.

Sub-Tests	**Score Scalar**	**Media / Mean**	**S.D.**	**Interpretation Qualitative**
Cube designs	1	10	3	Low
Similarities	6	10	3	Low average
Digit retention	4	10	3	Low
Matrices	3	10	3	Low
Vocabulary	6	10	3	Average
Arithmetic	4	10	3	Low
Symbol search	5	10	3	Low
Visual puzzles	4	10	3	Low
Information	7	10	3	Standart
Clues	3	10	3	Low
Scale	**Score Scalar**	**Rank**	**D.E**	**Interpretation Qualitative**
Verbal comprehension	82	100	15	Average
Perceptual reasoning	56	100	15	Low
Working memory	66	100	15	Low
Processing speed	70	100	15	Low
Total IQ	68	100	15	Low

Figure 2 describes the results comparison of the WAIS-IV test application in periods of two consecutive years. It establishes a significant decrease in the cognitive profile of the patient due to a progressive deterioration in the performance in the scales of perceptual reasoning, working memory, and processing speed.

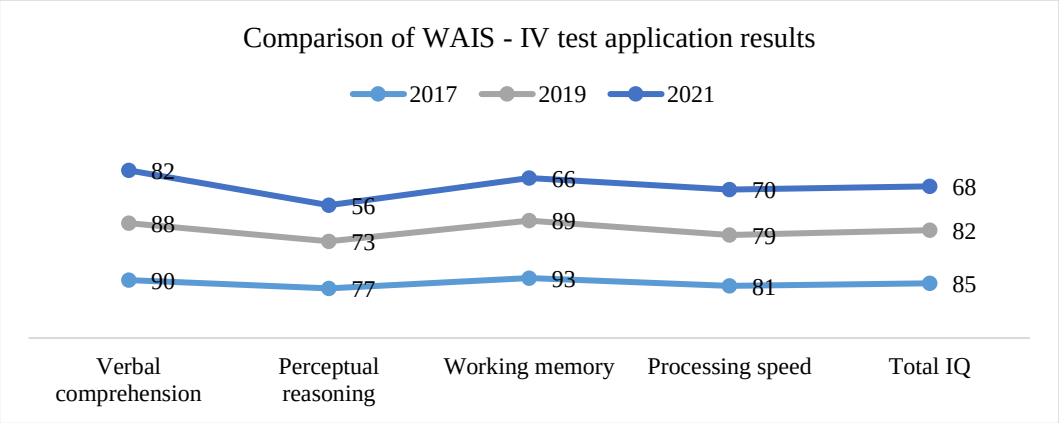

Figure 2. Results Comparison of the Wechsler Adult Intelligence Scale application - WAIS-IV.

Table 3 details the results analysis of the functional tests. It indicates a severe gradual compromise in daily living activities and a deterioration in the execution of instrumental activities. It requires permanent accompaniment and dependence on the caregiver part. Likewise, there was evidence of an establishment in the affective component determined by changes in mood, behavior, feelings, and way of thinking.

Table 3. Results Description of the functional tests and/or activities application of daily living.

Criteria	Score	Qualitative Description
Barthel Index	25/100	Severe dependence
Lawton and Brody Scale	1/8	Severe dependency
Katz Index	G	Severe dependence
FAST functional scale	6/7	Degree of AD: Moderate - severe dementia
Yesavage geriatric depression scale	10	Established depression

Table 4 shows the evaluation results of global cognitive functioning. It determines compromises in time-space orientation, failures in attentional skills, recall memory, and encoding. It also shows difficulties in the process of semantic, phonological, and reading fluency. In the conceptual functions, deficiencies were determined in the similarity tasks, in the executive functions for planning and organization for the completion of tasks, and in the maintenance of flexible thinking during problem-solving. It obtained a severe performance of global cognitive functioning.

Table 4. Results Description of the Neuropsi test application of global cognitive functioning.

Test	Subtests	PD	PN	Category Descriptive
ORIENTATION	Time	2	-3	Severe
	Space	1	-2	Moderate

	Person	1	1	Normal
ATTENTION AND CONCENTRATION	Digits	2	-2	Moderate
	Visual Detection Hits	1	-3	Severe
	Subtraction 20-3	3	-2	Moderate
MEMORY CODING	Words	2	-3	Severe
	Semi-complex figure	4	-2	Moderate
MEMORIES OF EVOCATION	Spontaneous recall	0	-3	Severe
	By category	0	-3	Severe
	Recognition	2	-2	Moderate
	Semi-complex Figure	2	-3	Severe
LANGUAGE	Naming	5	-2	Moderate
	Repetition	3	-2	Moderate
	Comprehension	3	-2	Moderate
	Verbal semantic fluency	1	-3	Severe
	Verbal phonological fluency	1	-3	Severe
READING WRITING	Reading	1	-2	Moderate
	Dictation	1	-2	Moderate
	Copying	1	-2	Moderate
CONCEPTUAL AND MOTOR EXECUTIVE FUNCTIONS	Similarities	3	-2	Moderate
	Calculation	1	-2	Moderate
	Sequencing	1	-3	Severe
	Right Hand	1	-2	Moderate
	Left Hand	1	-2	Moderate
	Alternating movements	1	-2	Moderate
	Opposite reactions	1	-2	Moderate
TOTAL NEUROPSI		41		SEVERE

Figure 3 details the comparison analysis of the Neuropsi test results in progressive periods of two years. It indicates that the patient presents a decrease in the overall significant performance in the cognitive functions of orientation, attention, memory, executive function, and oral and written language.

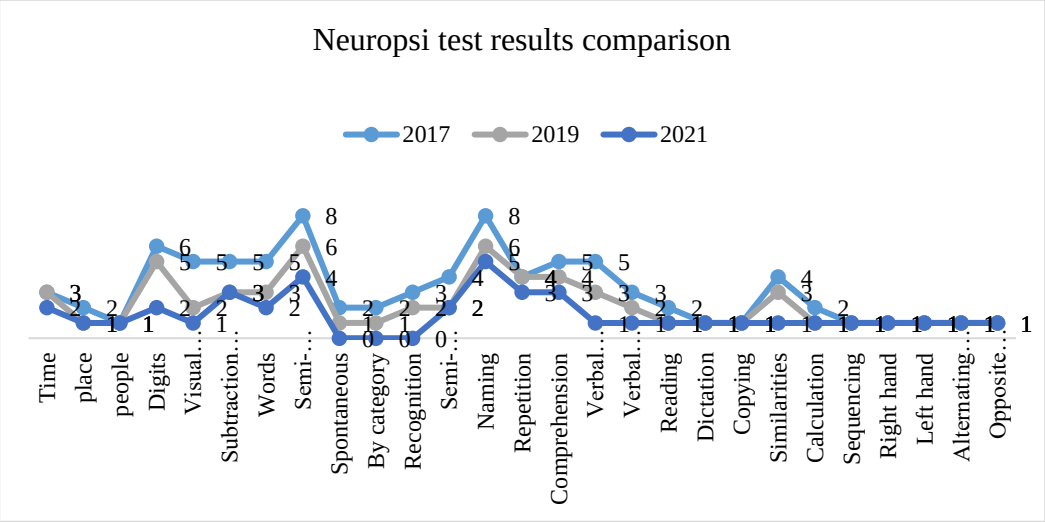

Figure 3. Comparison of Neuropsi test application results of global cognitive functioning.

Table 5 describes the difficulties in communicative behavior determined by failures in the oral language process. They are caused because the presence of linguistic errors such as anomic, echolalic, perseverative, circumlocutions, and semantic paraphrasing that limit the conversational exchange and the patient's discursive skills. Likewise, failures in reading and writing were evidenced by the reduction in reading comprehension and semantic-grammatical writing of varying complexity.

Table 5. Evaluation of linguistic-communicative skills

Areas evaluated	**Patient characteristics**
Expression	-Difficulty in naming and categorization of words due to word-finding failures. -Increased linguistic errors of circumlocutions, echolalia, and semantic paraphasias. -Limited organization and structuring of oral discourse.
Comprehension	- Failures in lexical access. -Difficulties in comprehension of complex ideational material. -Failures in oral language processing.
Reading and writing	-Difficulties in reading comprehension of high grammatical complexity. - Variety reduction of elements in semantic-grammatical writing.
Linguistic ability	-Limitation of linguistic abilities due to eminent anomic and echo linguistic processes.
Rectifications	-Difficulties in initiating corrections to the interlocutor's turn. Reduced ability to self-correct.
Turn-taking and turn-taking	- Presence of long silence during the turn in search of a word or idea. -Failures in conversational proportion

Thematic mastery	- Difficulties in maintaining the communicative exchange due to the loss of conversational linkage. -Perseverations of topics and ideas in the communicative exchange.

4. Cognitive-Communicative Profile

The patient presents a severe cognitive impairment profile in the clinical phase of moderately severe Alzheimer's disease determined by a global deficit in memory, attentional compromises, executive dysfunction, visuospatial failures with a decrease in basic and instrumental daily living tasks, and established depression. Likewise, he evidenced a deterioration in communicative skills characterized by multiple linguistic errors presence of anomic type, circumlocutions, and semantic para-phasias that limit the communicative exchange with the interlocutor. In addition, in the reading and writing language process and in the aspects of reading comprehension and semantic-grammatical writing.

According to the previous results, an inter-consultation with the Neurology service is suggested to present the integral evaluation results to determine the conduct to follow in the treatment from the point of view of pharmacological management. Likewise, therapeutic treatment of cognitive neurorehabilitation and interdisciplinary home treatment by phono-audiology, psychology, physiotherapy, and occupational therapy three times a week for three months is indicated, subject to the patient's evolution.

5. Discussion

The linear comprehensive cognitive-communicative assessment process was based on the clinical history review of deterioration, interview of the caregiver-informant, and cognitive and complementary tests application for the current assessment of the patient's global cognitive functioning compared to previous estimates. Likewise, a characteristics description of functional-instrumental daily living and linguistic-communicative skills was included according to the complexity of dependence for their functionality and generalized aphasia-apractoagnostic type alterations. In addition, the neurology service requirements were considered to determine the differential diagnostic criteria of dementia according to the progressive symptomatology evidenced to establish a position to be contemplated to determine behaviors to follow in the pharmacological, interdisciplinary, and rehabilitative treatment (Ayuso et al., 2007). Thus, the neuropsychological assessment role in AD is crucial for its differentiation from cortical and subcortical entities, alterations of cognitive functions typical of normal aging, and early signs of dementia. However, in the case of AD, it has proven to be useful to determine its severity, evaluate its progression and assess the pharmacological medication effectiveness used in treatment (Comesaña and Gonzalez, 2009). For which, it is considered that the professional who performs the evaluation must have the theoretical knowledge and training in clinical practice and must have the ability to consider different aspects that may affect the performance of the tests that allow establishing a cognitive altering diagnosis (Lezak, 2004 as cited by Dake, 2007).

However, the evaluation results determined a decrease in higher brain functions, basic and instrumental for daily life. In addition, the alternations in the access to the lexicon for naming generate a language fluency loss with multiple linguistic errors present and, in the psycho,-affective component, established depression. Consequently, a comparison with previous evaluations allows for determining a significant advance in global deterioration. It classifies a differential diagnosis of AD in the moderately severe clinical phase. In the same sense, in an analysis of a case, it was found that the patient presented memory, attention, and language problems.

Likewise, they showed that the patient with AD evidenced depression and with compromises in the development of daily living activities (Tarrazaga, 2014). It establishes that during AD a decline in their cognitive abilities and functions is observed (Chira, 2014). Along the same line, the neuropsychological evaluation description of a patient group with dementia in the late stage indicated a moderate cognitive impairment and the presence of AD according to the sensitive cut-off point of dementia type requiring a differential diagnosis (Hackspiel & Paredes, 2020). Thus, the clinical-neuropsychological evaluation in multiple cognitive domains makes it possible to distinguish and characterize neurocognitive disorders of possible Alzheimer's type determined by a neuropsychological profile of major cognitive impairment originating a functional deficit of memory, complex attention, language, executive dysfunction, and the relative integrity of perceptual and motor functions (Ocaña et al., 2019). Therefore, neuropsychological assessment requires a thorough review of symptoms evolution that does not replace imaging studies and other neuropathological findings for the definitive diagnosis but allows for objectifying the neuropsychological profile of the disease, for a more accurate diagnosis that will determine not only the intervention but also the care in the disease course (Garzón et al., 2015). Consequently, it is suggested the design and implementation of a rehabilitation stimulation program in which actions are directed in the neurocognitive, communicative, emotional, psychosocial, functional, and motor aspects through the intervention methods application that allows life quality improving with interdisciplinary participation of the neuro-rehabilitation group in the home environment according to the clinical conditions of the patient (Deus et al., 2018).

6. Conclusions

In summary, the comprehensive linear neuropsychological evaluation allowed us to determine the patient's gradual compromise degree and to establish a profile of severe cognitive-communicative impairment in the clinical phase of moderately severe Alzheimer's disease. Due to a decrease in the global functioning of higher, basic, and instrumental brain functions with affection in the psycho-affective component. It is secondary to established depression that merits the design and implementation of a neurocognitive stimulation program aimed at contributing to the patient's life quality and his family.

References

- Aguado, C., Martínez, J., Onís, M., et al. (2000). Adaptación y validación al castellano de la versión abreviada de la Geriatric Depression Scale (GDS) de Yesavage. Atención Primaria, 26 (1), 382. 31. http://inger.gob.mx/pluginfile.php/96260/mod_resource/content/355/Archivos/C_Intervenciones/6.%20sintomas%20depresivos/lecturas/4.%20Escala%20de%20Depresion%20Geriatrica%20de%20Yesavage%20(GDS).pdf
- Alzheimer's Association. (2020). Alzheimer's disease facts and figures. Alzheimers Dement, 16 (3), 391–460. https://doi.org/10.1002/alz.12068
- Asociación Americana de Psiquiatría. (2013) Guía de consulta de los criterios diagnósticos del DSM 5. Arlington, VA, Asociación Americana de Psiquiatría.
- Ayuso, T., Ederra, M., Manubens, J., et al. (2007). Abordaje de la demencia. Guía de actuación en la coordinación atención primaria-neurología. Servicio Navarro de Salud- Osasunbidea.
- Bausela, E. (2009). Test y evaluación neuropsicológica. Revista Chilena de Neuropsicología, 4(2), 78-83. http://www.redalyc.org/articulo.oa?id=179314913001
- Brizuela, M. (2017). Comunicación en la enfermedad de Alzheimer: Evaluación de las estrategias comunicativas empleadas por los cuidadores informales. [Tesis de pregrado- Universidad de Valladolid, España]. https://uvadoc.uva.es/handle/10324/28476
- Chételat, G., Arbizu, J., Barthel, H., et al. (2020). Amyloid-PET and 18 F-FDG-PET in the diagnostic investigation of Alzheimer's disease and other dementias. Lancet Neurol 19, 951–962. doi: 10.1016/S1474-4422(20)30314-8
- Chira, M. (2014). Demencia tipo Alzheimer: últimos avances en el ámbito neuropsicológico. [Tesis pregrado, Universidad de Jaén]. https://tauja.ujaen.es/bitstream/10953.1/1418/1/TFG_ChiraChira%2CMariaCornelia.pdf
- Comesaña, A., y González, M. (2009). Evaluación neuropsicológica en la enfermedad de Alzheimer: memoria episódica y semántica. Cuad. Neuropsicol, 3(2) 199- 203. http://www.redalyc.org/articulo.oa?id=439642484005
- Deus, J., Deví, J., y Sáinz, M. (2018). Neuropsicología de la enfermedad de Alzheimer. Editorial Síntesis, España.
- Drake, M. (2007). Introducción a la evaluación neuropsicológica. Bs. As: Paidós.
- Federación internacional de asociaciones de Alzheimer y de demencia. (2022). Guía para planificar con éxito una campaña del Mes Mundial del Alzheimer. https://www.alzint.org/u/World-Alzheimers-Month-2022-Campaign-toolkit-ES.pdf

- Folstein, M., Folstein, S., & McHugh, P. (1975). «Mini-mental state». A practical method for grading the cognitive state of patients for the clinician. Journal of Psychiatric Research, 12(3), 189-198. http://search.ebscohost.com/login.aspx?direct=true&db=mdc&AN=1202204&site=eds-live
- Gallardo, B. (2002). Fronteras disciplinarias: pragmática y patologías del lenguaje. Universidad de Valencia. ISBN: 84-7642-669-0.
- Garzón, M., Montoya, D., Carvajal, J. (2015) Perfil clínico y neuropsicológico: enfermedad de Parkinson/enfermedad por cuerpos de Lewy. Rev CES Med, 29(2), 255-270. http://www.scielo.org.co/pdf/cesm/v29n2/v29n2a09.pdf

- Hackspiel, M., y Paredes, O. (2020). Descripción de los resultados de las pruebas neuropsicológicas en el diagnóstico diferencial de los pacientes con Alzheimer. Investig Enferm Imagen Desarr, 22, ISSN: 2027-128X. https://doi.org/10.11144/Javeriana.ie22.drpn

- Jack, CR., Albert, M., Knopman, D., et al. (2011). Introduction to the revised criteria for the diagnosis of Alzheimer's disease: National Institute on Aging and Alzheimer's Association workgroups. Alzheimers Dement, 7(3), 257–262, 2011. doi: 10.1016/j.jalz.2011.03.004

- Jessen, F., Amariglio, R., Buckley, R., et al. (2020). The characterization of subjective cognitive decline. Lancet Neurol 19 (3), 271–278. doi: 10.1016/S1474-4422(19)30368-0

- Katz, S., Ford, A., Moskowitz, R., et al. (1993). Studies of illness in the aged. The index of ADL: A standarized measure of biological and psychosocial function. JAMA, 185, 914-9. doi: 10.1001/jama.1963.03060120024016

- Kinney, J., Bemiller, S., Murtishaw, A., et al. (2018). Inflammation as a central mechanism in Alzheimer's disease. Alzheimers Dement (NY), 4, 575–590. doi: 10.1016/j.trci.2018.06.014

- Lanfranco, R; Manríquez, P; Avello, L; Canales, A. (2012). Evaluación de la enfermedad de Alzheimer en etapa temprana: biomarcadores y pruebas neuropsicológicas. Rev Med Chile, 140, 1191-1200. https://scielo.conicyt.cl/pdf/rmc/v140n9/art14.pdf

- Lawton, M., y Brody, E. (1969). Assessment of older people: self-maintaning and instrumental activities of daily living. Gerontologist, 9, 179-186. https://pubmed.ncbi.nlm.nih.gov/5349366/
- Lobo, A., Gómez, A., y Folstein, M. (1979). El Mini-Examen Cognoscitivo en pacientes geriátricos. Folia Neuropsiquiátrica, 14, 245-251. https://dialnet.unirioja.es/servlet/articulo?codigo=5478271
- Mahoney, F., y Barthel, D. (1965). Functional evaluation: the Barthel Index. Md Estado Med J, 14, 61-65. https://pubmed.ncbi.nlm.nih.gov/14258950/
- McKhann, G., Knopman, D., Chertkow, H., et al. (2011). The diagnosis of dementia due to Alzheimer's disease: Recommendations from the National Institute on Aging-Alzheimer's

Association workgroups on diagnostic guidelines for Alzheimer's disease. Alzheimers Dement, 7(3), 263–269. doi: 10.1016/j.jalz.2011.03.005

- Ocaña, C., Montoya, A., y Bolaño, G. (2019). Perfil clínico neuropsicológico del deterioro cognitivo subtipo posible Alzheimer. Medisad, 23(5) ISSN:1029-3019. http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1029-30192019000500875.

- Organización Mundial de la salud-OMS. (21 de septiembre de 2020). Demencia. https://www.who.int/es/news-room/fact-sheets/detail/dementia

- Organización Panamericana de la salud-OMS. (20 de septiembre de 2022). Demencia. https://www.paho.org/es/temas/demencia

- Reisberg, B., Ferris, S., Anand, R., De León, et al. (1984). Functional staging of dementia of the Alzheimer's type. Ann NY Acad Sci, 435(1), 481-483. https://doi.org/10.1111/j.1749-6632.1984.tb13859.x
- Reisberg, B., Ferris, S., De León, M., et al. (1982). The Global Deterioration Scale for assessment of primary degenerative dementia. Am J Psychiatry, 139 (9), 1136-1139. doi: 10.1176/ajp.139.9.1136.
- Romano, M., Nissen, M., Del Huerto, M., Parquet, C. (2007). Enfermedad de Alzheimer. Revista de Postgrado de la Via catedra de medicina, 175, 9- 12. https://med.unne.edu.ar/revistas/revista175/3_175.pdf
- Sánchez, A., Pedroso, I., De la Fe, A., Padron, A., et al. (2008). Fisiopatología de la enfermedad de Alzheimer. Revista Mexicana de Neurociencia, 9(3): 196-201. https://www.medigraphic.com/pdfs/revmexneu/rmn-2008/rmn083f.pdf
- Tarrazaga, M. (2014). Evaluación neuropsicológica y plan de tratamiento de un caso de demencia tipo Alzheimer. Rev Dis Cli Neuro, 1(1), 1-16. doi: https://doi.org/10.14198/DCN.2014.1.1.01

- Tirapu, J. (2007). La evaluación neuropsicológica. Psychosocial Intervention, 16(2), 189-211. http://www.redalyc.org/articulo.oa?id=179814016005