# Mild neurocognitive disorder and mood disorder: Possible relationships

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## ABSTRACT

Introduction. While depressive symptoms may represent a primary mood disorder, they may also reflect early signs of cognitive decline. Goal. To evaluate the possible relationships between Mild Neurocognitive Disorder (NLD) and Mood Disorder. Method. This is an exploratory, descriptive study with a quantitative approach, in which 19 medical records were analyzed with results of patients with a clinical diagnosis of TNL through clinical analysis data (medical consultations and laboratory tests and neuropsychological evaluation), between August 2018 and August 2019. The instruments used were a structured interview, Mini Mental State Examination (MMSE), Picture Memory Test (FMT), Semantic Verbal Fluency Test (Animal Category), Proverbs, Clock Drawing Test (TDR), Geriatric Depression Scale (GDS) and Geriatric Anxiety Inventory (GAI). Findings. Of the 19 patients, they had a mean age of 74.36±1.31 (66-88) years and a mean education of 2.26±0.37 (0-4) years. There was a significant correlation between the mean MMSE and RDT, Proverbs and GAI, thus showing the worse cognitive performance, worse results in metalanguage and greater anxiety symptoms. There was also significant evidence between GDS and GAI, showing correlation between symptoms and their severity, with clinical intensity for anxiety (M=12.00±1.14). Conclusion. Mood disorders suggest neurocognitive impairments, which may contribute to or aggravate symptoms related to TNL, such as impairments associated with memory.


**Keywords:** Depression, Mild Neurocognitive Disorder, Mood Disorder, Elderly.

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## INTRODUCTION

In the elderly, there is speculation to understand the possible relationship between the decline in cognitive processes and Mood Disorder, two weaknesses intensely present in the lives of these individuals, and which are associated, especially depression, with higher mortality, regardless of the social context of the country (BHUI, 2019).

Mental disorders are created to designate a set of non-psychotic symptoms that are usually related to subclinical conditions of anxiety, depression, stress, insomnia, fatigue, irritability, forgetfulness, difficulty concentrating and somatic complaints that designate situations of mental suffering, which due to their high prevalence are considered one of the greatest public health problems worldwide (MURCHO et al., 2016).

Mood disorders refer to disorders that provoke a depressive reaction, impairing mental functioning. Depression, anxiety, fear, delusions, and apathy are examples of non-cognitive mental state disorders (SOARES et al., 2012). In the elderly, depression has been characterized as several etiopathogenic clinical aspects. It is usually associated with functional and structural problems of the brain, increasing the risk of clinical morbidity and mortality, if left untreated (STELLA et al., 2002).

The diagnosis of depression goes through some steps such as; general clinical examination, detailed psychiatric examination, anamnesis with the patient, family members and caregivers, neurological evaluation and occupational and neuroimaging examinations. These are essential procedures for diagnosis. Depression in the elderly is usually accompanied by other complaints, in addition to the common ones, such as hypochondriasis, low self-esteem, sleep and appetite alterations, feelings of worthlessness, dysphoric mood, paranoid ideation and recurrent thoughts of suicide (STELLA et al., 2002). In addition, depression in patients with cognitive impairments is associated with several complications, such as progression of cognitive decline, exacerbation of physically aggressive behavior, decreased activities of daily living and decreased quality of life, increased risk of institutionalization, and mortality (KUBO et al., 2019).

From a biochemical point of view, depression is associated with elevated cortisol levels, and may be another explanatory hypothesis that takes into account the possibility of this hypercortisolemia leading to the death of neurons in the hippocampus and consequent cognitive decline. Although there is a frequent association between the presence of depression and cognitive dysfunction, there is the possibility that there is no causal relationship between the two, that is, there may be only two comorbid presenting diseases (STEIBEL; ALMEIDA, 2010).

Cognitive functions are important factors in the evaluations of quality of life in senescence, and their decline contributes to the increase in dependence in the elderly. The appearance of mild forgetfulness in daily life can evolve into mild neurocognitive disorder, which consists of a transitory state between normal and pathological cognitive aging, in which the elderly person has cognitive loss

greater than expected for their age. This clinical condition does not meet the criteria for Alzheimer's Disease (AD), although it is a predictor in the identification of people at increased risk of developing it, and it is necessary to have an evaluation and follow-up of the current clinical picture for better definition and treatment direction (DA PENHA SOBRAL; CARRÉRA; DE ARAÚJO, 2015).

Just as there is a risk of developing dementia, there is a risk that the TNL will have comorbidity with depressive symptoms. Several studies show greater susceptibility of the elderly to the progression of diseases, such as pathologies such as depression, which can lead to the development of TNL and dementia or coexist with the disease (GALHARDO; MARIOSA; TAKATA, 2010). TNL includes complaints about impairment in other cognitive domains, in addition to memory-restricted complaints, but it is important that the diagnosis of dementia is excluded, and functionality preserved. Cognitive decline is identified from clinical evaluation or through neuropsychological tests, with a performance lower than expected for age and education (LEAL, 2020).

In the elderly, neuropsychological evaluation is of paramount importance when there are complaints of cognitive deficits, because memory problems, such as mild forgetfulness present in TNL, make it difficult to differentiate between dementia processes and depressive pseudodementia, since major depression can lead to similar cognitive deficits in mild cognitive impairment (SOARES et al., 2012; STELLA et al., 2002).

A relevant factor that may relate the link between mild cognitive impairment and depression is the fact that this is considered a biochemical disorder in the brain, characterized by the decrease in the hormone serotonin, which is responsible for balancing the mood level. The decrease in serotonin consequently generates an increase in cortisol, which contributes to the death of neurons in the hippocampus (GALHARDO; MARIOSA; TAKATA, 2010). Depression can be a stimulus to damage neuropathological processes in the brain, for example, through changes in the nervous, vascular and inflammatory systems. Episodes of severe depression have previously been associated with pathological changes in specific regions of the brain. The symptoms of depression can also be a psychological reaction to cognitive and functional decline or reflect a prodromal state of dementia (JOHANSSON et al., 2019).

In fact, depression, mild neurocognitive disorder (NLD) and dementia are frequently diagnosed in the elderly population and, in fact, depression may reflect an increase in the development of NLT. It is understood that depression is an event that causes extremely unsatisfactory symptoms for individuals who are affected by it, bringing with it changes in social life, affecting relationships and producing suicidal ideations, generating great damage to mental health (POZZOLI; DE CARLO; MADONNA, 2019).

The objective of this study was to evaluate the possible relationships between Mild Neurocognitive Disorder and Mood Disorder, as well as to analyze the data from the neuropsychological assessment and correlate it with depressive and anxious symptoms. To correlate demographic data with neuropsychological assessment findings and verify the prevalence of depression and anxiety symptoms.

## METHODOLOGY

### SAMPLE

This study is part of a parent project submitted to the Research Ethics Committee of the Medical School of São José do Rio Preto (CEP/FAMERP), CAAE: 93761118.0.0000.5415.

Analysis of 19 medical records of elderly patients, over 60 years old, who underwent Neuropsychological Assessment and clinical consultations at the Geriatrics and Neurogeriatrics Outpatient Clinics, between August 2018 and August 2019 and received a nosological diagnosis of Mild Neurocognitive Disorder. The inclusion criteria were: complete medical records with demographic and neuropsychological data information.

### PROCEDURES

The following instruments were used: Brief Battery of Cognitive Screening, structured interview and the ICF – Informed Consent Form.

The Brief Battery of Cognitive Screening (NITRINI et al., 2004; VITIELLO et al., 2007) is composed of the following tests: Mini Mental State Examination (MMSE), Figure Memory Test (FMT), Semantic Verbal Fluency Test (Animal Category), Proverbs, Clock Drawing Test (RDT), Geriatric Depression Scale (GDS) and Geriatric Anxiety Inventory (GAI).

The Mini Mental State Examination (MMSE) is a measure with 30 items, of quick and brief application, which tracks the impairment of cognitive functions, assessing temporal and spatial orientation, immediate memory and word recall, calculation, naming, repetition, execution of a command, reading, writing (elaboration of a sentence) and visual-motor ability (copying of a drawing). The cut-off scores depend on the level of education, illiterate - 17 points, 1 to 4 years - 22 points, 5 to 8 years - 24 points, 9 or more - 26 points (BRUCKI et al., 2003; DE MELO; BARBOSA; NERI, 2017).

The Picture Memory Test (MPT) is a mini-battery that obtains five measures related to memory (incidental memory, immediate memory, learning, delayed memory and recognition). A sheet of paper with 10 drawings of concrete figures is presented and the individual is asked to name them. Then, the sheet is removed and he is asked to say which figures were on the sheet, allowing a time of one minute for recall. The sheet is then re-presented, with the instruction that the items be

memorized by the individual. After 30 seconds, the sheet is removed again, and the figures shown are asked to be mentioned (time of one minute). This procedure is repeated once again, with the instruction that a souvenir will be requested after a break. Two other tests are applied in this period (verbal fluency – animals and TDR – Clock Drawing Test). After about five minutes, in which these two tests are performed, the examiner asks the individual to evoke the figures previously presented, without the sheet being represented, offering one minute for evocation. After this, we present a sheet with 20 figures, which contains the 10 figures previously shown and 10 other figures, and the patient must recognize which figures he had already seen (VITIELLO et al., 2007). In naming, the cutoff point is 10, that is, when making a mistake by one figure or more, the participant is classified as inferior. In immediate memory, the cut-off point used is 5, learning 7, delayed memory 6 and recognition 9 (NITRINI et al., 2004; NITRINI et al., 1994).

The Semantic Verbal Fluency Test evaluates various cognitive skills, such as language, semantic memory, and executive function. When performing the test, the examiner asks the participant to speak as many animals as he remembers in a short period of time of 1 minute. Responses are scored, but repetitions are not considered. The cutoff point is made according to schooling, for illiterate people - 9 points, 1 to 8 years - 12 points and over 9 years - 13 points (Chagas, 2020; Montiel et al., 2014).

The Clock Design Test (RDT), according to Chagas (2020) is used to verify the existence of impairments in some cognitive abilities such as visuospatial functions, visuoconstructive, semantic memory, symbolic and graphomotor representation, and executive functions. To apply the test, the participant is given a blank sheet of paper and a pencil, then the participant is asked to draw a clock with all the numbers inside, then the clock is asked to draw the time of 2h 45min. The criterion used for correction is the Shulman scale, which presents a criterion of 0 to 5 points, regarding the quality of the watch and that its cut-off score is equal to 3 (Chagas, 2020; Montiel et al., 2014).

The Geriatric Depression Scale (GDS) aims to investigate the occurrence of depressive symptoms in the elderly. This instrument consists of a questionnaire of 15 questions with "yes" or "no" answers. The scores range from 0 to 15, with a cut-off score greater than 5 indicative of the presence of depression (Maximiano-Barreto; De Oliveira Fermoselei, 2017).

The Geriatric Anxiety Inventory (GAI) is used to assess the severity of the most common symptoms of anxiety in the elderly. And it consists of 20 items with a dichotomous answer "agree" or "disagree". The total number of answers "I agree" being greater than 10 characterizes the individual with signs of anxiety (Maximiano-Barreto; De Oliveira Fermoselei, 2017).

Proverbs evaluates semantic memory and abstract thought. The individual is presented with two proverbs, asking him to say their meaning (Sé, 2011).

The structured interview will consist of questions related to name, age, gender, education, profession, time of complaint and main complaint.

## RESULTS

Of this sample, a total of 19 medical records, referring to the sociodemographic questionnaire addressed in Table 01, shows that 63.2% were female, with a mean age of 74.36±1.31 (66-88) years and a mean schooling of 2.26±0.37 (0-4) years. 52.6% were housewives and 42.1% had complaints of forgetfulness for 24 months.

Table 01. Sample demographics

| Variable | | N | % |
|---|---|---|---|
| Sex | Female | 12 | 63,2 |
| | Male | 7 | 36,8 |
| Years of schooling | 0 | 5 | 26,3 |
| | 2 | 6 | 31,6 |
| | 3 | 1 | 5,3 |
| | 4 | 7 | 36,8 |
| Profession | From Home | 10 | 52,6 |
| | Rural worker<br>Bricklayer/Driver/Caregiver/Porter/Salesperson/Civil Servant | 3<br>1 | 15,8<br>5,3 |
| Complaint Time | 5 months | 1 | 5,3 |
| | 7 months | 1 | 5,3 |
| | 12 months | 5 | 26,3 |
| | 18 months | 2 | 10,5 |
| | 24 months | 8 | 42,1 |
| | 36 months | 1 | 5,3 |
| | 60 months | 1 | 5,3 |
| Main complaint | Oblivion | 19 | 100 |

Source: Prepared by the authors.

Regarding cognitive data, the mean MMSE score was 21.78±3.77 points for the 19 participants. Subdividing in relation to the cutoff point related to education, there were (n=5) illiterate people, with a mean of 21±2.54. Patients with up to 4 years of schooling showed a mean of 24.87±2.74, resulting in 8 patients, and a mean of 18.33±2.33, resulting in 6 patients, with an overall mean of 22.07±4,17, resulting in 14 participants.

Data related to the Visual Memory Test, in nomination, 15 participants obtained 10 points in the task. More than one error is suggestive of naming disorder or visual perception, related to the 4 patients who were unable to correctly name all the figures. Table 2 shows a breakdown of the results

of each stage, such as the activity of naming, immediate memory, learning, delayed memory and recognition. The results include the distribution of performance.

Table 02. Visual Memory Activity Results - CERAD

| Activity | Average | Standard deviation | N | % | Punctuation | Classification |
|---|---|---|---|---|---|---|
| **Nomination** | 9,78 | 0,41 | 15 | 78,9 | 10 | Average |
| | | | 4 | 21,1 | < 10 | Inferior |
| **Immediate Memory** | 6,89 | 1,55 | 18 | 94,7 | ≥ 5 | Average |
| | | | 1 | 5,3 | < 5 | Inferior |
| **Learning** | 7,26 | 1,62 | 12 | 63,2 | ≥ 7 | Average |
| | | | 7 | 36,8 | < 7 | Inferior |
| **Late memory** | 6,26 | 1,99 | 12 | 63,2 | ≥ 6 | Average |
| | | | 7 | 36,8 | < 6 | Inferior |
| **Recognition** | 9,42 | 0,76 | 16 | 84,2 | ≥ 9 | Average |
| | | | 3 | 15,8 | < 9 | Inferior |

Source: Prepared by the authors.

When the language construct was verified, the neuropsychological assessment data showed that n=12 (63.2%) patients obtained a lower classification in the domains related to semantic verbal fluency and only n=7 (36.8%) with average performance. In activities that evaluated metalanguage, it was observed that n=9 (47.4%) patients had lower performance and n=10 (52.6%) had average performance. This shows that 55.26% of the patients showed impairments in the language construct.

In the cognitive domain that assesses executive functions and visuospatial skills, n=17 (89.5%) of the participants scored 3 points or less. This is equivalent to how committed this sample is in relation to these domains. Table 3 shows the number of participants and their performance in relation to the constructive domains (points) of performance.

Table 03. Data regarding the Clock Design Test.

| Clock Design Test | | | |
|---|---|---|---|
| **Participants** | **Stitches** | **%** | **Classification** |
| 3 | 0 | 15,8 | inferior |
| 8 | 1 | 42,1 | inferior |
| 2 | 2 | 10,5 | inferior |
| 4 | 3 | 21,1 | inferior |
| 1 | 4 | 5,3 | average |
| 1 | 5 | 5,3 | average |

Source: Prepared by the authors.

When the values of the mood scales aimed at the elderly population were computed, the GDS showed that n=10 (52.6%) of the participants showed evidence of depressive symptoms and in the GAI scale n=11 (57.9%) of the participants showed symptoms of anxiety. This shows that 55.26% of the patients had symptoms of mood disorder.

## DISCUSSION

The study indicates a higher proportion of females (63.2%), which is also found in another study21. These data can be understood by the greater care and demand for health services by women and may also be related to the higher life expectancy of women compared to men (Costa et al., 2021).

The participants had a mean age of 74.36±1.31 (66-88) years and a mean education of 2.26±0.37 (0-4) years. Corroborating the literature that points out that Brazilians over 60 years of age have low levels of education (Dias, 2020). With advancing years, not only do physical functions decrease, but cognitive functions also change, concluding that memory complaints should be considered an important factor that causes impairment in the elderly and, sometimes, may indicate early dementia, despite normal scores in simple screening tests (O'Brien et al., 1992).

Regarding work activities, there was a predominance of Household Workers with 52.6%, followed by Rural Workers with 15.8% and others with 5.3% each. However, all participants are retired, and therefore do not practice the work activities they have developed throughout their lives.

Regarding the duration of complaint, the patient had a mean age of 1.73 years ±0.23, with forgetfulness as the main complaint, which is confirmed by the literature, which shows that one of the criteria that frequently appears in neuropsychological evaluations are complaints related to memory deficits (Gil; Busse, 2009). However, the subjective perception of memory loss has a low predictive value for the diagnosis of dementia, since it does not correspond to the objective impairment of function, generally reflecting the affective state of the patients and not necessarily the cognitive decline (Charchat-Fichman et al., 2005).

The results found through the MMSE showed that the average was 21.76 points, results that are similar to the average of another study focused on the elderly community (Costa et al., 2021). It is important to emphasize that the application of the MMSE in Brazil faces some obstacles, such as heterogeneity and the presence of some items for the assessment of cognitive dysfunctions that require formal education, which ends up becoming an obstacle for elderly Brazilians, since there are high rates of low education in this community. In addition, there are problems due to the way, based on only one question, how the MMSE evaluates certain cognitive functions, such as working memory. Such a problem can generate dubious results. Despite this, the application of the MMSE in Brazil has been very relevant for studies and research (Silva et al., 2020).

The RDT presented a mean of 1.73±0.32 points, with 89.5% of the participants presenting lower performance, and a moderate correlation was observed associated with MMSE performance in relation to RDT, since the lower the performance in the MMSE, the lower the performance in the RDT, with a value of p (0.012). This result is in line with the literature, as in one study significant correlations were also found between the MMSE, the RDT and other instruments used (Chagas, 2020).

In the Proverbs test, the mean was 1.26±0.2, with a moderate correlation with the MMSE, the lower the performance in the MMSE, the lower the performance in Proverbs, with a value of p (0.04). Some studies corroborate this result, explaining that such variables may also be related to years of schooling. The fewer years of schooling, the worse the performance in the MMSE and the worse the performance in Proverbs. Therefore, deficits in general cognition and metalanguage tend to worsen with age (Wachholz; Yassuda, 2011).

Regarding the affective functions assessed by the Geriatric Depression Scale, there is a correlation between performances, the worse performance in GDS, the worse performance in GAI, with a value of p (0.02). The IAB also correlated with the MMSE, with a value of p (0.03). The greater the presence of anxious symptoms, the lower the MMSE score. As the literature points out, depression and anxiety are proportionally associated with cognitive decline, making it necessary to evaluate demographic and clinical determinants so that there are strategies for prevention and intervention of cognitive impairments and dementia, through a deepening of neuropsychological assessment (Amorim; Pereira, 2020).

Also in relation to the GAI, an association was noted with the years of schooling, the more years of schooling, the lower the score on the GAI, corroborating results in the literature, such as in a study where a relationship was found between the variables years of schooling with a higher prevalence of anxiety disorders. The group studied with the highest prevalence of anxiety disorders was the one with the fewest years of schooling (Costa et al., 2019).

According to the literature, the interference of the level of education and its impacts are not only related to psychiatric or psychopathological disorders; but it can also have consequences related to difficulty in accessing health, decreased quality of life, difficulty in handling medications, and other factors that can characterize aspects that drive anxiety and depression in this population (Maximiano-Barreto; De Oliveira Fermoselei, 2017).

The literature hypothesizes about the impact of depression on cognitive decline. The correlated symptoms not only refer to the level of affect, but also influence cognition, triggering signs of anhedonia, wandering, sleep disturbances, and mood swings. In addition, depression causes damage to the life of the elderly, because in addition to causing isolation, it decreases memory capacity, causing learning difficulties and changes in various cognitive functions. Fatigue and tiredness related to depression can cause impairment in the performance of several cognitive functions, and especially memory (Silva, 2020).

## CONCLUSION

Through this study, it is concluded that depression causes neurocognitive impairments, which can contribute to or aggravate symptoms related to TNL, such as impairments associated with memory. However, there are not enough studies to prove the total link between depression and TNL. A correlation with depression and dementia is noted as ratified by the literature, but with TNL there are still many uncertainties to be explored and solved through further studies and research.

In order to have a real knowledge about the cognitive and behavioral characteristics of individuals suffering from depression and TNL, it is essential to understand and interpret the performance in the execution of daily activities and the implication that these diseases can have on the lives of these individuals. Thus, it is essential to conduct further research using screening instruments, since these are relevant to assess cognitive functions and detect possible impairments in them.

Finally, it is important to identify and understand the individual's neuropsychological profile and mood, as this makes it possible to develop intervention strategies to contribute to the alleviation of suffering and the damage caused. Consequently, providing the contribution to new methods of neuropsychological assessment.

With the study, there is a scarcity of research aimed at in-depth knowledge regarding depression and possible associations with TNL, so it is necessary to continue research and invest in new ones, so that it is possible to identify possible relationships, better understand the clinical and neuropsychological picture, and then develop interventions that contribute to improving the quality of life of these individuals.

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