



Depression and clinical functioning among cognitively normal and mildly impaired older adults

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Abstract

This study examines the relationship between depression and clinical functioning among cognitively normal (CN) and mildly cognitively impaired (MCI) older adults, with a specific focus on cross-ethnic comparisons between Hispanic and White non-Hispanic (WNH) populations. Despite a significant body of research linking depression to cognitive decline, limited studies have explored how this relationship differs across ethnic groups. Using data from the 1Florida Alzheimer's Disease Research Center (1Florida ADRC), multiple ordinal logistic regression models were applied separately for Hispanic and WNH samples to assess the impact of cognitive status, depression severity, and age on clinical functioning, as measured by the modified Clinical Dementia Rating (mCDR) scale. Results indicated that among Hispanics, higher depression levels were significantly associated with greater clinical impairment, whereas this association was not significant among WNHs. Given the cross-sectional nature of this study, future longitudinal research should examine whether clinical impairment leads to increased depressive symptoms over time. These findings underscore the need for culturally informed interventions targeting depression in aging Hispanic populations.

Keywords Depression · Clinical functioning · Mild cognitive impairment · Hispanic older adults · Alzheimer's disease

Introduction

Hispanic older adults are disproportionately affected by MCI and Alzheimer's disease and related dementias (ADRD) compared to WNH [16]. MCI is a critical transitional stage between normal aging and ADRD, yet it has been underexamined in Hispanic populations. It has been predicted that Hispanic older adults will have the most significant projected

increase in ADRD cases by 2060, with an increase in prevalence from 400,000 to about 2.5 million [16]. There is a discernible disparity in the prevalence of MCI and ADRD, with older Hispanic adults being 1.5 times more susceptible compared to WNH. Studies indicate that approximately 13% of older Latinos in the United States are affected by dementia [26]. Despite higher risks and prevalence, missed or delayed diagnosis is more common among Hispanic individuals with cognitive impairment than among WNH, leading to increased disease burden because the disease is more advanced in this ethnic/racial group by the time of diagnosis [4]. Additionally, lower educational attainment and limited access to healthcare contribute to these disparities.

Depression is a common comorbidity among older adults with ADRD and can further exacerbate cognitive and functional impairments [25]. The prevalence of depression in individuals with mild-to-moderate Alzheimer's disease (AD) ranges from approximately 14.8% to 40% [7]. Common depressive symptoms include insomnia, social withdrawal, reduced purpose-oriented behavior, and sadness [7]. Cognitively, deficits associated with depression can be observed across domains of processing speed, attention,

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concentration, and memory. Notably, depression is more prevalent among Hispanic individuals with AD. Previous studies show that Hispanic patients with ADRD present with higher prevalence of delusions and elation/euphoria, more frequent behavioral symptoms such as disinhibition and agitation, and meet criteria for a higher number and severity of neuropsychiatric symptoms than do WNH patients (Lassell, 2022, Salazar et al., 2017).

While previous studies have shown a clear association between depression and cognitive and functional impairment, the extent to which depression increases the risk of developing dementia remains uncertain. Some studies have suggested that depression only mildly affects dementia and does not increase the risk of developing ADRD [25]. Other researchers have argued that depression increases the risk of behavioral disturbance and accelerates functional decline [25]. There is evidence to support that poorer baseline clinical functioning is associated with long-term cognitive decline among Hispanics [12]. Among Hispanics, these trends may be particularly concerning due to a range of health disparities that impact baseline functioning and cognitive outcomes. Research suggests that older Hispanics are disproportionately affected by conditions such as hypertension, diabetes, and obesity, all of which have been linked to both depression and cognitive decline [2].

These comorbidities can exacerbate the risk of developing dementia and other neurodegenerative conditions. Furthermore, socioeconomic factors such as limited access to healthcare, lower educational attainment, and higher rates of poverty among Hispanic populations may lead to delayed diagnoses of both depression and cognitive impairments.

The impact of dementia on activities of daily living (ADLs) and instrumental activities of daily living (IADLs) becomes increasingly significant as the disease progresses. In the early stages of AD, individuals may encounter difficulties in complex tasks, such as managing finances, transportation, and medications [12]. As the disease progresses, individuals also begin to experience deficits in both ADLs and IADLs. Of note, it has been well-documented that neuropsychiatric symptoms can further exacerbate functional status, increase caregiver burden, and worsen patients' quality of life [8]. Nevertheless, the majority of available studies on this topic have predominantly focused on WNH samples, thereby highlighting the present significant gap in research with the aging Hispanic population. An additional but relevant limitation is the underrepresentation of Hispanics in research studies focused on the prevalence and risk factors associated with ADRD and depression in this ethnic/racial population. Research examining associations between cognitive functioning and clinical functioning among Hispanics have found that it is associated with worse functioning in instrumental activities of daily living (Stickel et al., 2020). Further studies are warranted to examine the role

that emotional functioning has on clinical functioning and ADRD symptomatology.

To our knowledge, this study contributes to the limited body of research examining the role of depression and clinical functioning among Hispanic older adults with ADRD. As such, the current study aimed to examine associations between clinical functioning within a multi-ethnic ADRD sample. However, rather than focusing solely on ADRD, this study specifically examined cognitively normal (CN) and mild cognitive impairment (MCI) individuals, which allows for a better understanding of early-stage functional decline.

We hypothesized that depression would be more strongly associated with poorer clinical functioning in the Hispanic than in the WNH group. The goal of this study was to examine the relationship between depression and clinical functioning among both cognitively normal CN and MCI individuals rather than only those with ADRD. This distinction is important, as depression may play a different role in functional decline among those with and without cognitive impairment. The term clinical functioning in this study refers to the ability to perform daily tasks and maintain independence, as measured by the mCDR [23].

Methods

De-identified data were collected by the 1Florida Alzheimer's Disease Research Center (1Florida ADRC), Clinical Core. This research was approved by Mount Sinai Medical Center, Miami Beach. Two graduate research assistants from Albizu University recruited participants from the 1 Florida Alzheimer's Disease Research Center (1 Florida ADRC) cohort. Due to the restrictions imposed by Covid-19, the recruitment and data collection process was conducted through phone calls. To this end, the research assistants administered the Clinical Dementia Rating (CDR), modified Clinical Dementia Rating (mCDR), and Alzheimer's Disease Cooperative Study Activities of Daily Living-Mild Cognitive Impairment (ADCS-ADL-MCI) measures over the phone. One research assistant conducted the initial interview and administered the functional measures. After one month, participants returned for a second assessment over the phone to evaluate the inter-rater reliability of the functional measures.

Participants

The sample consisted of 260 older adults with either CN or MCI diagnoses. Table 1 displays the demographic characteristics of the sample. Specifically, there were 32 Hispanics with CN, 127 Hispanics with MCI, 20 WNHs with CN, and 81 WNHs with MCI. All participants were recruited from the 1Florida ADRC cohort, in collaboration

Table 1 Demographic information

Variables	Hispanics	White non-hispanic
Age (range 60–90 years.)	70.87 (7.28)	73.24 (7.72)
Education	14.93 (3.57)	16.30 (2.83)
Male (42%)	62	48
Female (58%)	97	53
Cognitive status—Normal	32	20
Cognitive status—MCI	127	81

data points in gender and cognitive status represent raw frequency counts

with the clinical core, in Miami, Florida, from 2015 to 2019. This study was part of a larger initiative funded by the Ed and Ethel Moore Alzheimer's Disease Research Program, which aimed to investigate cognitive decline, depression, and functional impairment in aging populations. The parent study, conducted within the 1Florida ADRC, involved comprehensive neurocognitive and medical assessments, longitudinal follow-ups, and biomarker analyses to identify factors contributing to ADRD risk and progression. The present study is a focused analysis derived from this larger dataset, specifically examining the association between depression and clinical functioning among older adults with CN and MCI across ethnic groups. Cognitively normal older adults were included to provide a baseline comparison to determine whether the relationship between depression and clinical functioning was unique to individuals with MCI or extended to those without cognitive decline. Additionally, including CN individuals allowed us to assess whether depression contributes to early functional impairment before significant cognitive deficits emerge.

Inclusion criteria

To be included in the 1FL ADRC study, participants had to be between the ages of 60 and 90. It was additionally required that they had completed a minimum of a 6th-grade education and comparable reading comprehension level. They were further required to have either English or Spanish as their primary language, have an available study partner, and age and education-corrected MoCA score of at least 20 points. Moreover, subjects provided their consent to participate in all interviews, brain scans, blood tests, and neuropsychological testing. Lastly, they consented to complete clinical and neuropsychological follow-ups for at least five years. For the current study, participants had to demonstrate willingness to complete additional measures of clinical functioning.

Exclusion criteria

Significant sensory (visual and hearing) or motor deficits; clinical stroke; major medical or psychiatric illnesses that might prevent participation in longitudinal studies. The exclusion criteria for major medical or psychiatric illnesses were established to ensure a study sample that accurately reflects the relationship between depression and clinical functioning while minimizing confounding effects from severe health conditions that could independently impact cognition and daily functioning. In this context, a major medical illness refers to conditions that significantly impair an individual's ability to participate in research, such as advanced cardiovascular disease, severe renal or hepatic failure, or active malignancies requiring intensive treatment. Major psychiatric illness refers to conditions that cause severe functional impairment, such as schizophrenia, bipolar disorder, or other psychotic disorders that may substantially affect cognition and behavior. Although major depression is a key focus of this study, the exclusion criteria apply to individuals with severe or uncontrolled depression that could interfere with their ability to participate reliably in assessments (e.g., active suicidal ideation, recent psychiatric hospitalization).

Diagnostic procedures

Cognitive Diagnoses assigned followed the NACC D1 classification protocol, which included CN and amnesic and non-amnesic MCI. Please find brief nosological descriptions below.

Cognitively normal (CN)

CN: 60 + years of age, (b) no evidence of memory complaint preferably confirmed by an informant, (c) MMSE score of 26 + ; (d) Global Clinical Dementia Rating (CDR) Scale score of 0; (e) no neuropsychological impairment; (f) no functional impairment reflected on the CDR or FAQ scores.

Mild cognitive impairment (MCI)

MCI: 60 + years of age; a) memory complaint(s), preferably confirmed by an informant; b) a CDR scale score of 0.5; c) MMSE score of 24 + d) no impairment in social and/or occupational function; e) no evidence of DSM5 criteria for Major Neurocognitive Disorder; f) confirmation of memory impairment at 1.5 SD or greater, below expected levels, based on age and education adjusted normative data for each cultural/language group, on the Hopkins Verbal Learning Test (HVLTR: [14]) delayed recall or on the delayed paragraph recall of the Wechsler Memory Scale – 3rd edition (WMSIII: [28]).

Neuropsychological evaluation

A standard neuropsychological battery was administered in the preferred language to self-identified Hispanic and non-Hispanic participants, by a Spanish/English bilingual psychometrician who was blinded to the clinical evaluation and to the CDR score. This neuropsychological protocol included the following tests: (1) the Hopkins Verbal Learning Test-Revised (HVLTR; [6]), (2) delayed recall from the Logical Memory subtest of the National Alzheimer's Coordinating Center (NACC) Uniform Dataset Neuropsychological Battery [5], (3) Category Fluency (Lucas et al., 1998); (4) the Block Design subtest of the Wechsler Adult Intelligence Scales-Fourth Edition (WAIS-IV), and (5) Parts A and B of the Trail Making Test (TMT A & B; [21]). Translated and standardized Spanish versions of all tests were used with their corresponding age and education normative data [1, 3, 19].

Functional Measures

Modified clinical dementia rating (mCDR) scale

Clinical functioning was assessed using the modified Clinical Dementia Rating (mCDR) Scale, a clinician-administered measure based on informant interviews. The mCDR captures functional abilities in key domains such as memory, judgment, and social activities. Higher scores on the mCDR indicate greater functional impairment. The range of mCDR scores extends from 0 (no impairment) to 3 (severe impairment).

The geriatric depression scale (GDS)

The GDS [29] is a widely used screening tool specifically designed to assess depression in older adults. The GDS consists of a series of questions that cover various aspects of emotional well-being and mood. The questions are typically presented in a dichotomous yes/no format, making it relatively easy for older adults to respond. The scale contains both positive and negative statements, addressing a range of depressive symptoms and experiences commonly seen in older adults. The GDS evaluates feelings of sadness, hopelessness, loss of interest or pleasure, social withdrawal, fatigue, and changes in appetite and sleep patterns. It also explores self-perception, cognition, and thoughts about death or dying. The individual is asked to indicate which statements most accurately describe their current state. This instrument has demonstrated high sensitivity (ranging from 0.75 to 0.81) and specificity (ranging from 0.75 to 0.77), respectively [27].

Statistical analysis

Statistical analysis was performed using SPSS Statistical Software. Multiple linear regression analyses were applied with mCDR scores as the dependent variable. Diagnosis, age, and total score for the GDS were used as predictor variables.

Results

Sociodemographic characteristics

Table 2 presents the sociodemographic characteristics of the sample. Hispanic participants had a mean age of 70.87 years ($SD = 7.28$) and an average of 14.93 years of education ($SD = 3.57$). In contrast, WNH participants had a mean age of 73.24 years ($SD = 7.72$) and an average of 16.30 years of education ($SD = 2.83$). Additionally, 42% of the sample were male, and 58% were female.

Multiple regression analyses

The multiple linear regression analyses were stratified by ethnicity, with separate models conducted for Hispanic and WNH samples. Residuals were examined and found to be consistent with assumptions of linearity, normality, and homoscedasticity. For both the Hispanic and WNH samples, the regression models assessed the effects of cognitive status (CN vs. MCI), total GDS scores, age, and their interaction on clinical functioning as measured by mCDR. The same regression analyses were conducted for WNH participants, as detailed in Table 3.

For the Hispanic sample, the analysis indicated a significant positive association between total GDS scores and mCDR ($\beta = 0.01$, $SE = 0.00$, $t = 2.33$, $p = 0.02$), suggesting that higher levels of depression were linked to greater clinical impairment in this group. Age also had a statistically significant but minimal effect on mCDR scores ($\beta = 0.00$, $SE = 0.00$, $t = 2.23$, $p = 0.03$). This suggests that although age contributed to clinical impairment, its effect size was small, indicating that other factors (e.g., depression severity and

Table 2 Results of multiple linear regressions between depression and clinical functioning—hispanics

	Estimate	Std. Error	<i>t</i>	<i>p</i>
(Intercept)	- 0.18	0.10	- 1.71	0.09
CN vs. MCI	0.07	0.03	2.68	0.01
Total GDS	0.01	0.00	2.33	0.02
Age	0.00	0.00	2.23	0.03
CN vs. MCI *GDS	0.00	0.01	- 0.41	0.68

Table 3 Results of multiple linear regressions between depression and clinical functioning—white non-hispanic

	Estimate	Std. Error	<i>t</i>	<i>p</i>
(Intercept)	− 0.13	0.11	− 1.10	0.28
CN vs. MCI	0.12	0.03	3.92	0.00
Total GDS	0.01	0.00	1.13	0.26
Age	0.00	0.00	1.35	0.18
CN vs. MCI *GDS	0.01	0.01	0.40	0.69

cognitive status) may be more influential predictors. Additionally, cognitive status emerged as a significant predictor ($\beta=0.07$, $SE=0.03$, $t=2.68$, $p=0.01$), indicating that cognitively normal individuals had higher mCDR scores compared to those with MCI. However, the interaction between cognitive status and total GDS did not show statistical significance ($\beta=0.00$, $SE=0.01$, $t=-0.41$, $p=0.68$), suggesting that the combined effects of cognitive status and depression level did not significantly impact clinical functioning for this group.

For the WNH sample, the model yielded somewhat different results. Cognitive status was a significant predictor ($\beta=0.12$, $SE=0.03$, $t=3.92$, $p=0.00$), with cognitively normal individuals showing higher mCDR scores than those with MCI. However, neither total GDS ($\beta=0.01$, $SE=0.00$, $t=1.13$, $p=0.26$) nor age ($\beta=0.00$, $SE=0.00$, $t=1.35$, $p=0.18$) were statistically significant predictors. Similarly, the interaction between cognitive status and GDS did not reach statistical significance ($\beta=0.01$, $SE=0.01$, $t=0.40$, $p=0.69$), indicating no combined effect of depression and cognitive status on clinical functioning within this group.

Discussion

The current study investigated disparities in clinical functioning by examining the associations between depression, clinical functioning, and age among Hispanic and WNH populations. Our findings revealed that higher depression levels were significantly linked to increased clinical impairment among Hispanics, suggesting an association between depression and compromised cognitive performance. While the findings highlight the role of depression in clinical impairment among Hispanics, they are consistent with prior research and should be interpreted with caution due to sample size limitations. Notably, this effect was not significant in WNH participants, underscoring potential ethnic differences in how depression influences clinical functioning.

Additionally, the lack of cross-ethnic comparisons due to sample size constraints limits the ability to draw broader conclusions about ethnic disparities. Future research

should aim to include larger and more diverse samples to facilitate direct comparisons across groups. Moreover, longitudinal designs and inclusion of more diverse sociodemographic measures, such as acculturation, health-care access, and socioeconomic status will enhance the understanding of these relationships across ethnic groups. Furthermore, key sociodemographic factors, including income, language preference, country of origin, and duration of residence in the U.S., were not collected. These factors are known to influence ADRD risk among Hispanics, and their omission limits the scope of our discussion. Future research should employ larger, more representative samples to strengthen the generalizability of findings.

Results from our study demonstrate that assessing psychological and functional symptoms in addition to cognition has implications for diagnosis and treatment. These factors should be considered when making diagnostic and treatment decisions among Hispanic ADRD patients. Healthcare general practitioners who identify Hispanic older adults as having significant depressive symptoms and functional impairment should follow up with psychiatric or therapeutic treatment and monitor for possible progression to ADRD diagnosis. Incorporating psychiatric treatment may serve as a potential protection against further functional impairment and cognitive decline.

Author contributions A.D. conceptualized the study, performed statistical analyses, and wrote the initial manuscript draft. M.J.R. coordinated data collection and contributed to the interpretation of results. P.G. reviewed the manuscript for critical intellectual content and contributed to revisions. All authors reviewed and approved the final manuscript and agree to be accountable for all aspects of the work.

Data availability The data that support the findings of this study were obtained from the 1Florida Alzheimer's Disease Research Center (1Florida ADRC) under a data use agreement. These data are not publicly available due to participant privacy restrictions but may be made available from the 1Florida ADRC upon reasonable request and approval.

Declarations

Conflicts of interest Authors declare that they have no conflicts of interest related to this submission.

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