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## **Apathy and Leukoaraiosis in Mild Cognitive Impairment and Alzheimer's Disease: Multicenter Diagnostic Criteria according to the Latest Studies.**

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## Original Research Article

# Apathy and Leukoaraiosis in Mild Cognitive Impairment and Alzheimer's Disease: Multicenter Diagnostic Criteria according to the Latest Studies

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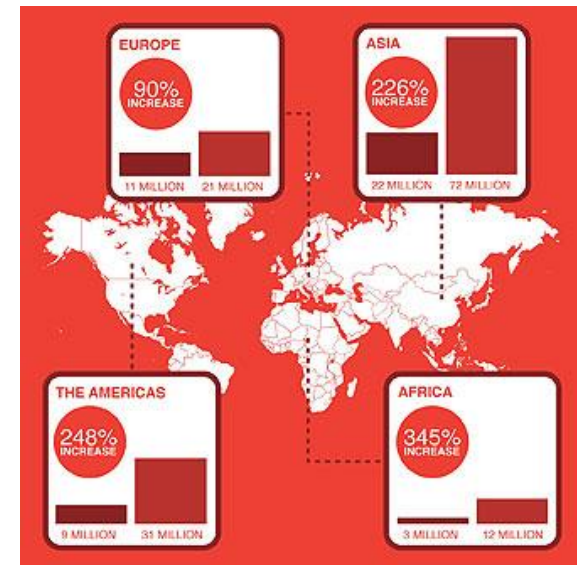
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# Introduction

- Alzheimer's disease (AD) is the leading cause of dementia and is characterized by a **progressive decline** of cognitive function, which typically begins with memory impairment.



# Introduction

- The latest recommendations by the National Institute of Neurological Disorders and Communication and the Association of Related Alzheimer's Disease in the United States (NINCDS-ADRDA) for the **diagnosis** of AD disorders and Mild Cognitive Impairment (MCI) emphasize the importance of **early detection**, broadening diagnostic criteria to items such as biomarkers, neuroimaging of specific injuries, and a battery of psychological tests that is as complete as possible.

# Introduction

Given the fact that MCI is a taxonomy that has become particularly relevant in recent years and based on the ever-growing literature on the subject that speaks of a **high percentage of patients progressing to AD**, it is interesting to look for factors that may influence the evolution towards dementia in order to establish **early screening** and therapeutic measures.

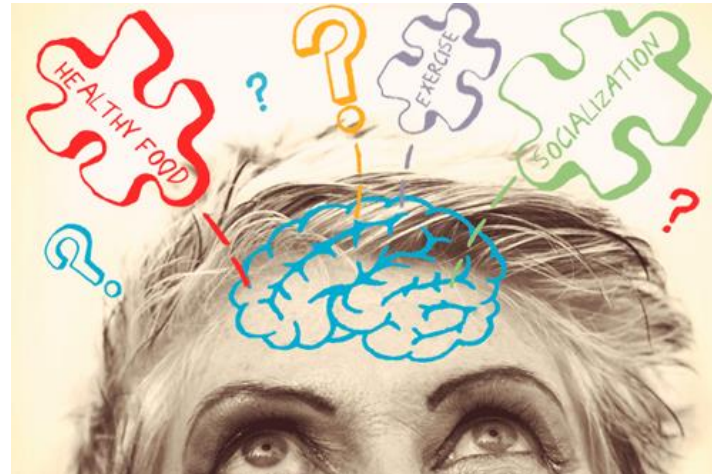
# Introduction

The presence of **leukoaraiosis** and the high prevalence of **apathy** have been addressed together in very few studies.

Our research is a pioneer study in our country as it addresses the **prevalence of both processes** in patients with **MCI and AD** according to recent consensus criteria that have been developed for the diagnosis of apathy, MCI, and AD.

# Introduction

Apathy and leukoaraiosis are mostly detected in asymptomatic individuals over 60 and in subjects with **cognitive impairment**, particularly in cases of cerebrovascular disease or vascular risk factors for ischemic stroke.





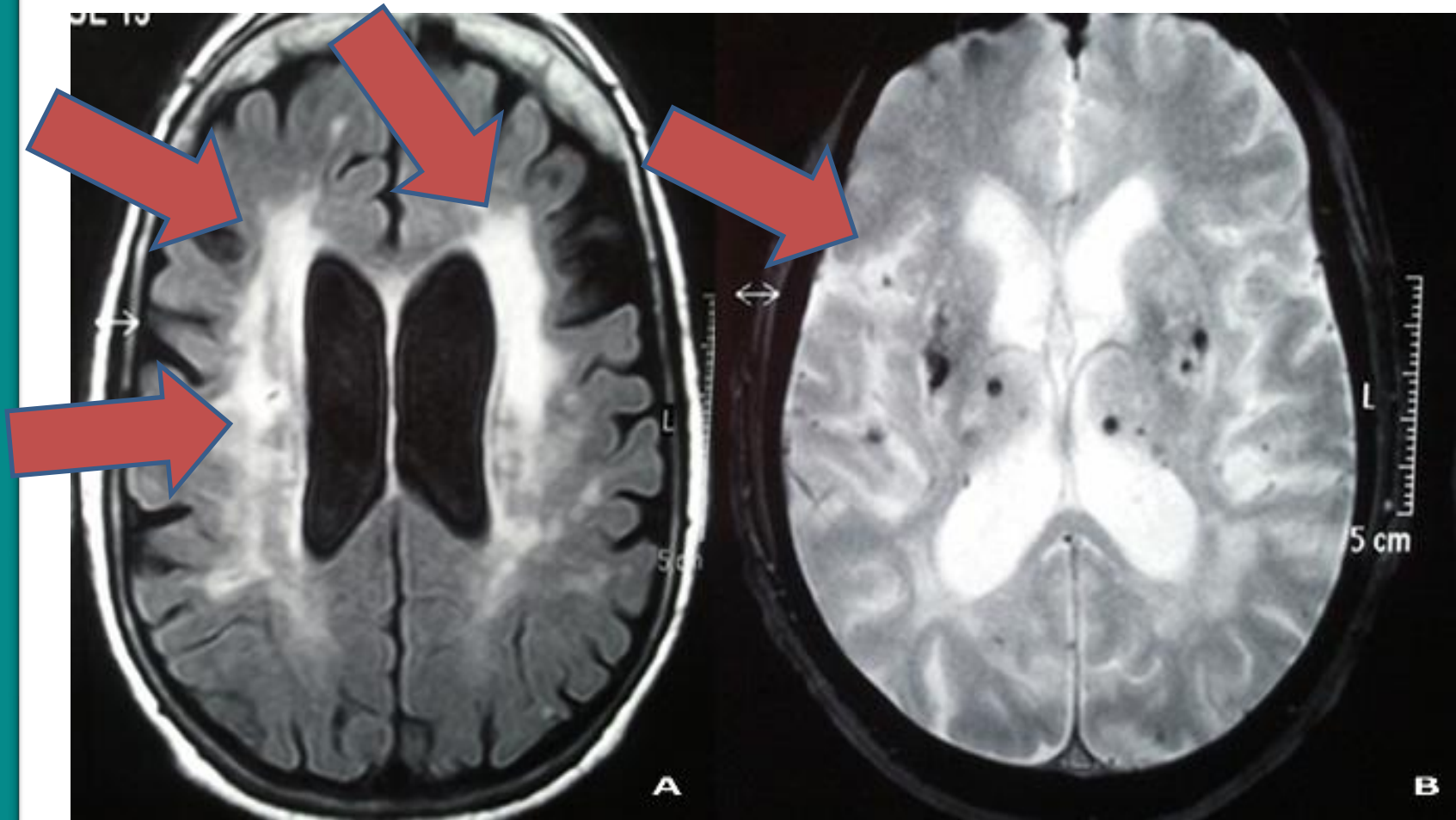
# Leukoaraiosis

The term leukoaraiosis is a nonspecific radiological term.

Denotes patches of hypo- or hyperintensity mainly in periventricular white matter and subcortical regions.

Are also known as nonspecific white matter changes and small vessel ischemia.

# Leukoaraiosis



# Leukoaraiosis

Leukoaraiosis is therefore a finding of heterogeneous neuroimaging.

There is not yet a clear consensus in the scientific community for its correct identification.

There is evidence of a significant relationship between leukoaraiosis and impaired cognitive functions.

There are few studies linking leukoaraiosis and dementia.

# Apathy

- Of the possible emotional affective disorders that can present with dementia, **the most prevalent** is apathy.
- Can be **defined** as a persistent deficit of motivation, a lack or decrease in feelings, emotions, or interests that give rise to a significant reduction in self-generated goal directed behavior.



# Apathy


Is the most frequent symptom in neuropsychiatric AD and other dementias, and is associated with increased cognitive and functional impairment and a high burden on the caregiver.



# Apathy

A study from 2008 developed a set of several international associations to establish a consensus on the diagnostic criteria for apathy, mainly in AD cases.



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Original article

Proposed diagnostic criteria for apathy in Alzheimer's disease and other neuropsychiatric disorders

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# Objective

Following the **new consensus on leukoaraiosis and apathy**, especially in cases of **dementia**, this study was proposed with the intent of establishing the **prevalence and possible association** of leukoaraiosis and apathy in two clinical groups, one with **MCI** (prodromal state as possible AD) and another with **AD** institutionalized in seven nursing homes in Spain.

# Method

- Cross-sectional, descriptive, multicenter study.
- **Sample:** 109 patients AD and 59 MCI. Residents in 5 nursing homes.
- Criteria inclusion/exclusion.
- **Variables:** sociodemographic, apathy (NPI-  
apathy subscale), leukoaraiosis (MRIs, Fazekas  
scale), dependence (Barthel Index), Mini-  
Mental (MEC).
- Data collection was carried out during 2012  
and 2013.



# Results

**Table 1.** Averages and percentages of sociodemographic variables and other tests

	MCI (n = 59)	AD (n = 109)	p
Age, years	77.8 (5.47)	82.3 (5.66)	0.124
Female, %	66	73	0.09
Years of schooling	6.24 (3.75)	6.08 (2.40)	0.165
Chronic diseases, %			
Hypertension	63.8	69	0.02
Diabetes mellitus	31.7	29.6	0.321
Hyperlipidemia	26.8	35.4	0.078
MEC	28.05 (0.93)	19.6 (2.17)	0.01
Barthel	75 (0.90)	55 (1.63)	0.00

Values are represented as mean (SD), unless otherwise indicated.

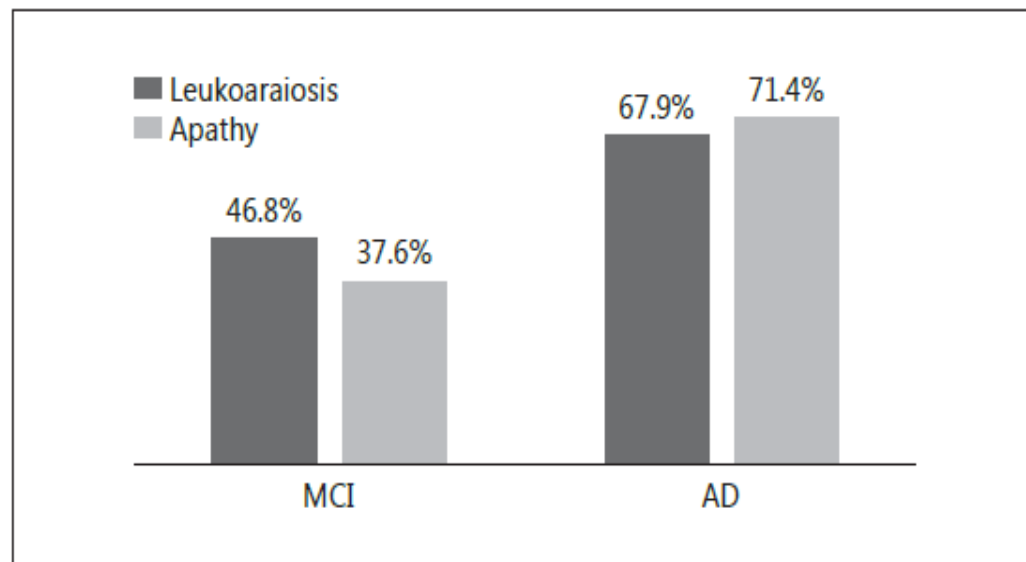
The p values were determined either by Student's t (quantitative variables) or the  $\chi^2$  (qualitative variables) tests;  $p < 0.05$ .

# Results

**Table 2.** Percentages of leukoaraiosis and apathy as well as statistical significance

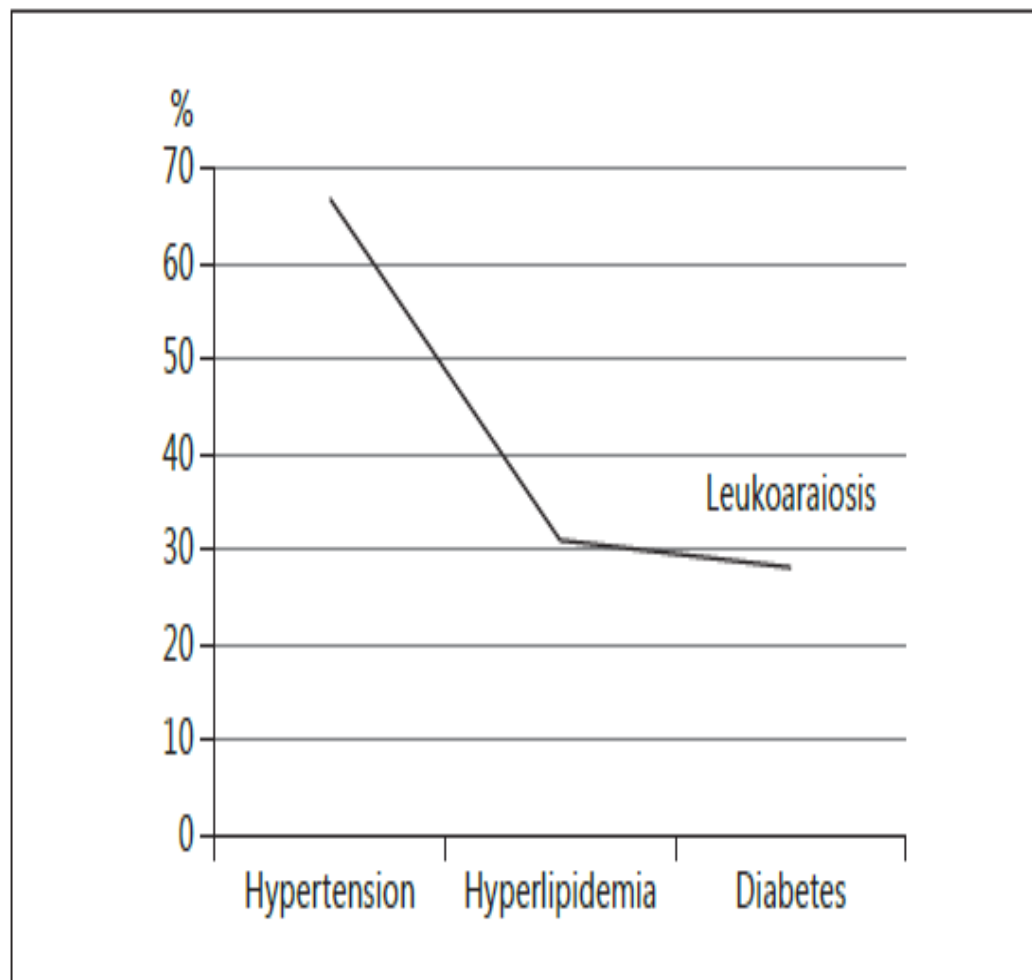
	MCI	AD	p
Leukoaraiosis	46.8%	67.9%	0.00
Apathy	37.6%	71.4%	0.00

The p values were determined by the  $\chi^2$  test.  $p < 0.05$ .



**Fig. 1.** Percentages of leukoaraiosis and apathy in both groups.

# Results



**Fig. 2.** Percentages of chronic disease in patients with leukoaraiosis.

# Results

- The existence of a **positive correlation** between age and leukoaraiosis ( $r_s = 0.567$ ,  $p = 0.00$ ) but not between age and apathy ( $r_s = 0.236$ ,  $p = 0.085$ ) was observed.
- A **correlation** between apathy and leukoaraiosis ( $r_s = 0.478$ ,  $p = 0.01$ ) was also found. In addition, the results of the correlation between the stage of AD and apathy were significant ( $r_s = 0.568$ ,  $p = 0.00$ ), as were those between AD and the stage of leukoaraiosis ( $r_s = 0.654$ ,  $p = 0.00$ ).
- Regarding the presence of leukoaraiosis and MEC ( $r_s = 0.685$ ,  $p < 0.05$ ), a **negative correlation** between apathy and MEC ( $r_s = 0.425$ ,  $p < 0.05$ ) was also found.

# Discussion/Conclusions

- Our results showed a **high prevalence** of leukoaraiosis and apathy in AD patients and to a lesser but still significant extent in patients with MCI.
- **Apathy and leukoaraiosis negatively correlated** with patients' scores using MEC, indicating greater cognitive apathy and increased presence of leukoaraiosis impairment in these patients.

# Discussion/Conclusions

- These results are consistent with the findings of other studies that found a **high prevalence** of apathy and leukoaraiosis in patients with dementia.
- Different researches suggested that **apathy in AD is a marker of evolution** characterized by a more rapid progression of cognitive, functional, and emotional impairment compared to patients without apathy.

# Conclusions

- The presence of apathy and leukoaraiosis is associated with cognitive impairment and may prove to be a **predictor** of future dementia through the study of populations with MCI.





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