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# Investigating the Prevalence and Determinants of Mild Cognitive Impairment in the Elderly Population at Primary Care Facilities

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***Authors' contributions***

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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## ABSTRACT

**Aim:** To investigate the prevalence and determine profile of patients with mild cognitive impairment (MCI) among older adults attended at the first level of care and the possible factors associated with MCI.
**Study Design:** Observational, cross-sectional and analytical study.
**Methodology:** The study was conducted with Mexican patients attending the outpatient consultation of the Gerontology Speciality at the Family Medicine Clinic "División del Norte" (an Ambulatory Care Medical Unit), in Mexico City. Data was collected through a protective design using the Montreal Cognitive Assessment test and a structured survey on sociodemographic factors. A descriptive statistical analysis and univariate and multivariate logistic regression models were performed.
**Results:** The median age was 72 years old (IQR=66-78 years). The youngest participant was 60 years old and the oldest was 93 years old (range=33 years). The elderly population with MCI are female, septuagenarian, with a basic level of education. The prevalence of MCI was 28%, and 18% for dementia. The factors that increase the risk of MCI are: age (OR=1.072, 95% CI 1.034-1.111), hypertriglyceridemia (OR=13.709, 95%CI 1.267-148.294), peptic ulcer disease (OR=5.92, 95%CI 1.009-34.719), glaucoma (OR=4.048, 95%CI 1.051-15.596), chronic obstructive pulmonary disease (OR=5.616, 95%CI 1.024-30.802), and asthma (OR=12.323, 95%CI 1.128-134.578). The high educational level was associated as a protective factor (OR=0.336, 95%CI 0.189-0.596).
**Conclusion:** Prevention programmes are necessary to avoid MCI, along with interventions to improve patients' quality of life, and the promotion of educational and engaging activities to support cognitive health in elderly people.

*Keywords: Elderly; cognitive dysfunction; noncommunicable diseases; primary care; social security.*

## 1. INTRODUCTION

Dementia is a growing public health concern, being a major cause of morbidity and dependency among older adults, according to the World Health Organization [1]. Currently, more than 55 million people worldwide have dementia, with over 60% living in low- and middle-income countries [2]. In Mexico, the prevalence of dementia due to Alzheimer's disease, vascular causes, and mixed origins are 7.8, 4.3, and 2.1%, respectively [3]. However, the most common cognitive condition in older adults is Mild Cognitive Impairment (MCI).

MCI is well established as a boundary between normal aging and very early dementia. Moreover, memory is not the only cognitive domain affected; one or more of the following six cognitive domains can also be impacted, such as: learning and memory, language, complex attention, executive function, social cognition, and visuospatial function [4]. Therefore, MCI in older adults should be considered a preventable aspect of the natural aging process. It represents an initial stage in cognitive aging, where individuals can recognise that they have a problem with cognitive function [5,6]. This condition affects about 22.7% of older adults over 65 in Korea [7]. In this population, the prevalence of MCI decreased significantly with an increase in monthly income and with an increase in life quality, but it increased with an increase in depressive symptoms [5].

In Chinese population, older age and being single are risk factors for MCI among older adults with multimorbidity [8]. Similar findings were observed in the Moroccan population, where a decrease in the Mini-Mental State Examination score was associated with increasing age (p-value = 0.004) in patients with type 2 diabetes [9].

Previous studies have identified various risk factors for MCI [5]. Jia et al., reported that MCI had similar risk factors to those patients with dementia, such as old age, sex, family history, rural residence, low education, living alone, smoking, and chronic diseases [5,10]. Other researchers suggested additional risk factors, including subjective health, income level, a high-fat diet, and depression and anxiety [5,11-13]. According to Song et al., physical exercise is a protective factor that decreases the probability of MCI [14]. Therefore, factors associated with MCI can be categorized into: personal characteristics, modifiable and non-modifiable factors, [4,5] and Social Determinants of Health (SDOH). The research focused on identifying the prevalence of

probable MCI and their associated factors in older adults attended at the first level of care. In doing so, we contribute to a more comprehensive understanding of how socio-economic and health-related factors intersect to influence cognitive decline in ageing populations, particularly within low- and middle-income settings.

## 2. MATERIALS AND METHODS

### 2.1 Study Design and Setting

An observational, cross-sectional, and analytical study was designed. It was conducted with Mexican patients attending the outpatient consultation of the Gerontology Speciality (gerontological module) at the Family Medicine Clinic (FMC) “División del Norte”, belonging to the State Employees' Social Security and Social Services Institute (ISSSTE by its acronyms in Spanish), in Mexico City, from August 1st to October 31st ,2023. Data collection was conducted using a protective design with two questionnaires: 1) a sociodemographic factors questionnaire, and 2) the Montreal Cognitive Assessment (MoCA). The study was carried out from December 2022 to March 2023.

### 2.2 Study Population, Sampling Method and Sample Size Calculation

The study included 382 elderly patients aged from 60 years old and above, from gerontological module, ISSSTE. Intentional sampling was utilised by selecting individuals who either self-reported cognitive complaints or whose caregiver or clinician reported cognitive issues. This method ensured the inclusion of patients with potential cognitive concerns relevant to the study's objectives. The sample size was calculated considering a known population of 7,195 elderly patients. A 95% confidence interval (95% CI; Z=1.96), a 5% precision error, and an estimated probability value of 47% (p=0.47; q=0.53) were used. The expected sample size was 363 individuals.

### 2.3 Data Collection and Instruments

The data was collected using structured questionnaires, comprising a sociodemographic factors questionnaire and the MoCA version 8.1, which has been translated into Spanish. A data collection sheet was employed to gather detailed identification information (patient name, medical record number, date of birth, address, telephone number, type of entitlement), sociodemographic characteristics (age, sex, educational level, marital status), anthropometric measurements (height, weight, and BMI), as well as a pathological history (chronic/degenerative diseases) and protective factors for cognitive decline (bilingualism, Mediterranean diet, statin use, physical activity, and recreational activities). The MoCA assessment was used to evaluate the cognitive function of participants. The MoCA assesses multiple cognitive domains including: attention, concentration, executive functions, memory, language, visuospatial skills, abstraction, calculation and orientation [15]. The cognitive function of patients was classified into three categories: Dementia (0 to 18 points), MCI (outcome) (19 to 22 points), and patients with normal cognitive function (23 to 30 points), according to results of Pedraza et al, in elderly patients aged 60 and over (sensitivity 72.9%, specificity 61.8%) [16]. This assessment was administered individually by a healthcare professional, who had received formal training on the official MoCA website (https://mocacognition.com/). Each MoCA assessment was conducted in a single session within a controlled, quiet, and private environment to minimise distractions and optimise participant comfort. Each session lasted approximately 10 minutes. This setting ensured that participants could perform to the best of their abilities during the cognitive evaluation.

### 2.4 Training and Standardisation

The healthcare professional conducting the MoCA assessments underwent training to ensure standardisation and reliability in test administration and scoring. This training, accessed through the official MoCA website, provided the necessary competencies to accurately assess various cognitive domains, including attention, memory, language, visuospatial skills, executive functions, and orientation.

### 2.5 Selection Criteria

Participants were selected based on the following inclusion criteria: elderly individuals of both sexes, aged 60 years old or over, attending the outpatient consultation of the gerontological module. They needed to have at least five years of education, no visual impairment or total blindness, no language disability, and complete information on the study variables. Additionally, participants needed to voluntarily agree to

participate in the study and sign the informed consent. Exclusion criteria were as follows: elderly individuals who did not sign the informed consent, individuals who were illiterate or had less than five years of education, those with visual impairment or total blindness, those with a language disability, and those with incomplete information on the study variables, and patients diagnosed with mental disorders such as depression, anxiety, or schizophrenia.

An intentional sampling was employed. This method involved selecting individuals who either self-reported cognitive concerns or whose caregivers or clinicians reported cognitive issues. While this approach ensured the inclusion of individuals relevant to the study's objectives, it also introduced the potential for selection bias. The participants who did not report cognitive concerns or who were less engaged with healthcare services may have been underrepresented, potentially affecting the findings to be extrapolated to the broader population of older patients.

### 2.6 Data Recording and Statistical Analysis

Immediately following the MoCA assessment, results were recorded and scored. These scores were then systematically compiled and analysed to determine the cognitive status of participants. The sociodemographic data, anthropometric measurements, pathological history, and protective factors were also analysed to identify correlations and potential risk factors associated with cognitive decline. This methodical approach to data collection and cognitive assessment provided a robust framework for understanding the prevalence and determinants of cognitive impairment in the study population. Categorical variables were described using absolute and relative frequencies (percentages) with their 95% CI. Quantitative variables were described using mean, standard deviation (SD), median (Md), and interquartile range (IQR). Categorical variables were compared using the chi-square test ($\chi 2$) with Yates' correction and Fisher's exact test as appropriate. Quantitative variables were compared using Student's t-test for independent samples and the median test for independent samples. Associations between possible sociodemographic factors were analysed using univariate and multivariate logistic regression models. The data was analysed as numerical and dichotomous variables. A p-value $< 0.05$ (two-tailed test) was considered significant.

### 2.7 Ethical Considerations

The study was conducted in accordance with the Good Clinical Practice Guidelines of our laws and the Declaration of Helsinki for human experiments. The protocol was approved by two committees: The Research Committee and the Ethics Committee in Research of the FMC "División del Norte", ISSSTE. The Data was treated confidentially.

## 3. RESULTS AND DISCUSSION

### 3.1 General Characteristics of Study Population

The average age, weight, height, and body mass index are shown in Table 1. The median age was 72 years old (IQR=66-78 years). The youngest participant was 60 years old and the oldest was 93 years old (range=33 years). Nearly 54% of the elderly individuals had normal cognitive function. The prevalence of MCI was 28% and that of dementia was 18.1% (Table 1). The majority of the participants were women, septuagenarians, and sexagenarians. The top 10 comorbidities observed were: hypertension, type 2 diabetes, overweight (BMI between 27 and 31.99), smoking, history of obesity, obesity (BMI 32 and above), chronic venous disease, hypothyroidism, hypercholesterolemia, and alcoholism (Table 1). All observed comorbidities are listed in Table 1. The main protective factor observed in our population, according to the literature, was physical activity, followed by bilingualism, recreational activities, and statin use (Table 1).

### 3.2 Population with Mild Cognitive Impairment

The elderly population with MCI are mainly female, septuagenarian, with a basic level of education, and a normal weight. The main 15 comorbidities observed in this population group include hypertension, type 2 diabetes, smoking, history of obesity, gonarthrosis, hypercholesterolemia, glaucoma, chronic venous disease, hearing loss, alcoholism consumption, prediabetes, osteoarthritis, peptic ulcer disease, chronic obstructive pulmonary disease, and hypothyroidism (Table 2). When comparing the prevalence of non-transmissible chronic diseases between elderly with normal cognitive function and those with MCI, we observed a greater prevalence of hypertriglyceridemia, peptic acid disease, glaucoma, and chronic obstructive pulmonary disease in those patients with MCI (Table 2).

**Table 1. General characteristics of the study population.**

| Variables | Frequency, percentage (95% CI) |
|---|---|
| MoCA, mean (SD) | 22.47 (4.63) |
| No Cognitive Impairment (23 to 30) | 206, 53.9 (48.4-58.9) |
| Mild Cognitive Impairment (19-22) | 107, 28 (23.6-32.5) |
| Dementia (0-18) | 69, 18.1 (14.1-22.3) |
| Male | 129, 33.8 (29.1-38.5) |
| Female | 253, 66.2 (61.5-70.9) |
| Age, mean (SD) | 72.25 (7.78) |
| Sexagenarian | 153, 40.1 (35.6-45) |
| Septuagenarian | 158, 41.4 (36.4-46.3) |
| Octogenarian | 64, 16.8 (13.1-20.7) |
| Nonagenarian | 7, 1.8 (0.5-3.4) |
| Weight (Kg), mean (SD) | 68.31 (12.22) |
| Height (Metres), mean (SD) | 1.58 (0.09) |
| BMI, mean (SD) | 27.26 (4.06) |
| Underweight <22 | 22, 5.8 (3.4-8.1) |
| Normal Weight (22 to 26.99) | 176, 46.1 (41.1-51.3) |
| Overweight (27 to 31.99) | 145, 38 (33.2-43.2) |
| Obesity (32 and above) | 39, 10.2 (7.3-13.1) |
| History of Obesity | 76, 19.9 (15.4-23.8) |
| Type 2 Diabetes | 172, 45 (39.8-50) |
| Prediabetes | 12, 3.1 (1.6-5) |
| Hypercholesterolemia | 24, 6.3 (3.9-8.6) |
| Hypertriglyceridemia | 6, 1.6 (0.5-3.1) |
| Hypertension | 234, 61.3 (56.3-66) |
| Smoking | 85, 22.3 (18.3-26.4) |
| Alcoholism | 24, 6.3 (3.9-8.9) |
| Cardiovascular Risk | 1, 0.3 (0-0.8) |
| Ischaemic Heart Disease | 17, 4.5 (2.6-6.5) |
| Hypertensive Heart Disease | 3, 0.8 (0-1.8) |
| Mixed Heart Disease | 2, 0.5 (0-1.3) |
| Ischaemic Stroke | 7, 1.8 (0.5-3.4) |
| Haemorrhagic Stroke | 2, 0.5 (0-1.3) |
| Sinus Bradycardia | 1, 0.3 (0-1) |
| Atrioventricular Block with Pacemaker | 1, 0.3 (0-0.8) |
| Aortic Valve Carrier | 1, 0.3 (0-0.8) |
| Chronic Heart Failure | 1, 0.3 (0-0.8) |
| Atrial Fibrillation | 2, 0.5 (0-1.3) |
| Arrhythmia | 1, 0.3 (0-0.8) |
| Chronic Venous Disease | 28, 7.3 (4.7-9.9) |
| Diabetic Neuropathy | 3, 0.8 (0-1.8) |
| Gait Disorder | 1, 0.3 (0-0.8) |
| Essential Tremor | 1, 0.3 (0-0.8) |
| Urinary Incontinence | 5, 1.3 (0.3-2.6) |
| Parkinson’s Disease | 2, 0.5 (0-1.3) |
| Epilepsy | 1, 0.3 (0-0.8) |
| Multiple Sclerosis | 1, 0.3 (0-0.8) |
| Gonarthrosis | 19, 5 (2.9-7.3) |
| Osteoporosis | 17, 4.5 (2.4-6.5) |
| Low Back Pain | 11, 2.9 (1.3-4.7) |
| Disc Disease | 1, 0.3 (0-0.8) |
| Discartrosis | 1, 0.3 (0-0.8) |
| Coxarthrosis | 1, 0.3 (0-0.8) |
| Chronic Kidney Disease | 11, 2.9 (1.3-4.7) |
| Benign Prostatic Hyperplasia | 18, 4.7 (2.6-6.8) |

| Variables | Frequency, percentage (95% CI) |
|---|---|
| Hyperuricemia – Gout | 3, 0.8 (0-1.8) |
| Overactive Bladder | 1, 0.3 (0-0.8) |
| Kidney Stones | 1, 0.3 (0-0.8) |
| Rheumatoid Arthritis | 8, 2.1 (0.8-3.7) |
| Osteoarthritis | 13, 3.4 (1.8-5.5) |
| Hypothyroidism | 28, 7.3 (4.7-9.9) |
| Hyperthyroidism | 1, 0.3 (0-0.8) |
| Atopic Dermatitis | 12, 3.1 (1.3-5) |
| Psoriasis | 2, 0.5 (0-1.3) |
| Sleep Disorder | 3, 0.8 (0-1.6) |
| Depression | 11, 2.9 (1.3-4.7) |
| Anxiety Disorder | 12, 3.1 (1.6-5) |
| Schizophrenia | 1, 0.3 (0-0.8) |
| Irritable Bowel Syndrome | 11, 2.9 (1.3-4.7) |
| Gastroesophageal Reflux Disease | 1, 0.3 (0-0.8) |
| Peptic Ulcer Disease | 10, 2.6 (1.3-4.5) |
| Diverticular Disease | 3, 0.8 (0-1.8) |
| Upper Digestive Tract Bleeding | 1, 0.3 (0-0.8) |
| Glaucoma | 13, 3.4 (1.6-5.2) |
| Hearing Loss | 21, 5.5 (3.1-7.9) |
| Chronic Obstructive Pulmonary Disease | 9, 2.4 (1-4.2) |
| Asthma | 5, 1.3 (0.3-2.6) |
| COVID-19 Disease | 127, 33.3 (28.5-38.2) |
| Thyroid Cancer | 1, 0.3 (0-0.8) |
| Colon Cancer | 1, 0.3 (0-0.8) |
| Ovarian Cancer | 1, 0.3 (0-0.8) |
| Prostate Cancer | 2, 0.5 (0-1.3) |
| Fatty Liver | 2, 0.5 (0-1.3) |
| Liver Failure | 1, 0.3 (0-0.8) |
| Discoid Lupus | 1, 0.3 (0-0.8) |
| Non-Hodgkin Lymphoma | 1, 0.3 (0-0.8) |
| Bilingualism | 20, 5.2 (3.1-7.6) |
| Mediterranean Diet | 0, 0.0 (0-0) |
| Statin Use | 2, 0.5 (0-1.3) |
| Physical Activity | 38, 9.9 (7.1-13.1) |
| Recreational Activities | 11, 2.9 (1.3-4.7) |

*Source: Own elaboration with the results from the database*

**Table 2. Comparison between the normal cognitive function versus mild cognitive impairment population**

| Variables | Normal cognitive function (n=206) | mild cognitive impairment (n=107) |
|---|---|---|
| Male | 70, 34 (27.7-40.3) | 35, 32.7 (24.3-42.1) |
| Female | 136, 66 (59.7-72.3) | 72, 67.3 (57.9-75.7) |
| Sexagenarian | 107, 51.9 (44.7-59.2) | 35, 32.7 (23.4-42.1) |
| Septuagenarian | 78, 37.9 (31.6-44.7) | 49, 45.8 (36.4-55.1) |
| Octogenarian | 21, 10.2 (6.3-15) | 19, 17.8 (11.2-25.2) |
| Nonagenarian | 0, 0.0 (0.0-0.0) | 4, 3.7 (0.9-7.5) |
| Education* | | |
| BE | 114, 55.3 (49-62.6) | 82, 76.6 (68.2-84.1) |
| HPE | 92, 44.7 (37.4-51) | 25, 23.4 (15.9-31.8) |
| Underweight | 11, 5.3 (2.4-8.7) | 9, 8.4 (3.7-14) |
| Normal Weight | 96, 46.6 (40.3-52.9) | 49, 45.8 (35.5-55.1) |
| Overweight | 74, 35.9 (29.6-43.2) | 39, 36.4 (27.1-45.8) |
| Obesity | 25, 12.1 (7.8-16.5) | 10, 9.3 (4.7-15) |

| Variables | Normal cognitive function (n=206) | mild cognitive impairment (n=107) |
|---|---|---|
| Type 2 Diabetes | 89, 43.2 (36.9-49) | 51, 47.7 (38.3-57) |
| Prediabetes | 6, 2.9 (1-5.3) | 6, 5.6 (1.9-10.3) |
| Hypertension | 124, 60.2 (53.4-67) | 70, 65.4 (56.1-74.8) |
| Chronic Kidney Disease | 7, 3.4 (1-5.8) | 1, 0.9 (0-3.7) |
| Gonarthrosis | 5, 2.4 (0.5-4.9) | 8, 7.5 (2.8-13.1) |
| Cardiovascular Risk | 1, 0.5 (0-1.5) | 0, 0 (0-0) |
| Ischaemic Stroke | 3, 1.5 (0-3.4) | 2, 1.9 (0-4.7) |
| Haemorrhagic Stroke | 2, 1 (0-2.4) | 0, 0 (0-0) |
| Diabetic Neuropathy | 2, 1 (0-2.4) | 0, 0 (0-0) |
| Depression | 7, 3.4 (1.5-6.3) | 2, 1.9 (0-4.7) |
| Osteoporosis | 13, 6.3 (3.4-10.2) | 2, 1.9 (0-4.7) |
| Low Back Pain | 7, 3.4 (1.5-6.3) | 3, 2.8 (0-5.6) |
| Diabetic nephropathy | 0, 0 (0-0) | 1, 0.9 (0-2.8) |
| Gait Disorder | 1, 0.5 (0-1.5) | 0, 0 (0-0) |
| Hypertriglyceridemia** | 1, 0.5 (0-1.5) | 4, 3.7 (0.9-7.5) |
| Retinopathy | 0, 0 (0-0) | 0, 0 (0-0) |
| Ischaemic Heart Disease | 10, 4.9 (2.4-8.3) | 2, 1.9 (0-4.7) |
| Hypertensive Heart Disease | 1, 0.5 (0-1.5) | 1, 0.9 (0-2.8) |
| Mixed Heart Disease | 0, 0 (0-0) | 0, 0 (0-0) |
| BPH | 13, 6.3 (2.9-10.2) | 4, 3.7 (0.9-7.5) |
| History of Obesity | 47, 22.8 (17.5-28.2) | 20, 18.7 (11.2-26.2) |
| Radiculopathy | 0, 0 (0-0) | 0, 0 (0-0) |
| Hypercholesterolemia | 14, 6.8 (3.4-10.2) | 8, 7.5 (2.8-13.1) |
| Smoking | 49, 23.8 (18-29.6) | 21, 19.6 (12.1-27.1) |
| Rheumatoid Arthritis | 2, 1 (0-2.4) | 2, 1.9 (0-4.7) |
| Osteoarthritis | 7, 3.4 (1-6.3) | 6, 5.6 (1.9-10.3) |
| Hypothyroidism | 19, 9.2 (5.8-13.6) | 5, 4.7 (0.9-8.4) |
| Hyperthyroidism | 1, 0.5 (0-1.5) | 0, 0 (0-0) |
| Atopic Dermatitis | 9, 4.4 (1.9-7.3) | 1, 0.9 (0-2.8) |
| Sinus Bradycardia | 0, 0 (0-0) | 0, 0 (0-0) |
| Irritable Bowel Syndrome | 6, 2.9 (1-5.8) | 3, 2.8 (0-6.5) |
| Sleep Disorder | 2, 1 (0-2.4) | 0, 0 (0-0) |
| Anxiety Disorder | 6, 2.9 (1-5.3) | 5, 4.7 (0.9-8.4) |
| GRD | 0, 0 (0-0) | 0, 0 (0-0) |
| Peptic Ulcer Disease** | 2, 1 (0-2.4) | 6, 5.6 (1.9-11.2) |
| Diverticular Disease | 1, 0.5 (0-1.5) | 2, 1.9 (0-4.7) |
| Chronic Venous Disease | 16, 7.8 (4.4-11.7) | 7, 6.5 (1.9-11.2) |
| Glaucoma** | 4, 1.9 (0.5-3.9) | 8, 7.5 (2.8-12.1) |
| Hearing Loss | 8, 3.9 (1.5-6.8) | 7, 6.5 (2.8-11.2) |
| COPD** | 2, 1 (0-2.4) | 6, 5.6 (1.9-10.3) |
| Psoriasis | 0, 0 (0-0) | 1, 0.9 (0-2.8) |
| Schizophrenia | 0, 0 (0-0) | 1, 0.9 (0-2.8) |
| Urinary Incontinence** | 1, 0.5 (0-1.5) | 4, 3.7 (0.9-7.5) |
| Parkinson’s Disease | 0, 0 (0-0) | 1, 0.9 (0-2.8) |
| Epilepsy | 0, 0 (0-0) | 1, 0.9 (0-2.8) |
| Thyroid Cancer | 1, 0.5 (0-1.5) | 0, 0 (0-0) |
| Asthma** | 1, 0.5 (0-1.5) | 4, 3.7 (0.9-7.5) |
| Discartrosis | 0, 0 (0-0) | 1, 0.9 (0-3.7) |
| Arrhythmia | 0, 0 (0-0) | 1, 0.9 (0-2.8) |
| Coxarthrosis | 0, 0 (0-0) | 1, 0.9 (0-2.8) |
| Multiple Sclerosis | 0, 0 (0-0) | 1, 0.9 (0-2.8) |
| Colon Cancer | 1, 0.5 (0-1.9) | 0, 0 (0-0) |
| Ovarian Cancer | 1, 0.5 (0-1.5) | 0, 0 (0-0) |
| Prostate Cancer | 0, 0 (0-0) | 2, 1.9 (0-4.7) |
| ABP | 0, 0 (0-0) | 1, 0.9 (0-2.8) |

| Variables | Normal cognitive function (n=206) | mild cognitive impairment (n=107) |
|---|---|---|
| Aortic Valve Carrier | 0, 0 (0-0) | 0, 0 (0-0) |
| Hyperuricemia – Gout | 3, 1.5 (0-3.4) | 0, 0 (0-0) |
| Overactive Bladder | 1, 0.5 (0-1.5) | 0, 0 (0-0) |
| Essential Tremor | 1, 0.5 (0-1.5) | 0, 0 (0-0) |
| Fatty Liver | 2, 1 (0-2.4) | 0, 0 (0-0) |
| UDTB | 1, 0.5 (0-1.5) | 0, 0 (0-0) |
| Metastatic breast cancer | 0, 0 (0-0) | 0, 0 (0-0) |
| Disc Disease | 0, 0 (0-0) | 1, 0.9 (0-2.8) |
| Liver Failure | 0, 0 (0-0) | 1, 0.9 (0-2.8) |
| Discoid Lupus | 1, 0.5 (0-1.5) | 0, 0 (0-0) |
| Non-Hodgkin Lymphoma | 1, 0.5 (0-1.5) | 0, 0 (0-0) |
| Kidney Stones | 0, 0 (0-0) | 0, 0 (0-0) |
| Craniocerebral Trauma | 0, 0 (0-0) | 0, 0 (0-0) |
| Obstructive sleep apnea | 0, 0 (0-0) | 0, 0 (0-0) |
| Chronic Heart Failure | 0, 0 (0-0) | 1, 0.9 (0-2.8) |
| Atrial Fibrillation | 0, 0 (0-0) | 1, 0.9 (0-2.8) |
| Alcoholism | 10, 4.9 (2.4-7.8) | 7, 6.5 (2.8-12.1) |
| Social isolation | 0, 0 (0-0) | 0, 0 (0-0) |
| High IQ | 0, 0 (0-0) | 0, 0 (0-0) |
| Bilingualism | 16, 7.8 (4.4-12.1) | 4, 3.7 (0.9-7.5) |
| Mediterranean Diet | 0, 0 (0-0) | 0, 0 (0-0) |
| Statin Use | 1, 0.5 (0-1.5) | 1, 0.9 (0-2.8) |
| Physical Activity | 23, 11.2 (6.8-15.5) | 8, 7.5 (2.8-13.1) |
| Recreational Activities | 6, 2.9 (1-5.3) | 3, 2.8 (0-6.5) |

*Source: Own elaboration with the results from the database. BE: Basic education. HPE: Higher and postgraduate education. UDTB: Upper Digestive Tract Bleeding. ABP: Atrioventricular Block with Pacemaker. COPD: Chronic Obstructive Pulmonary Disease. GRD: Gastroesophageal Reflux Disease. BPH: Benign Prostatic Hyperplasia. Underweight (<22 kg/m2). Normal Weight (22 to 26.99 kg/m2). Overweight (27 to 31.99 kg/m2). Obesity (32 kg/m2 and above). * P value ≤0.001. ** P value <.0.05*

### 3.3 Factors Associated with Mild Cognitive Impairment

Table 3 shows the multivariate model with the best predictive accuracy. Data from the univariate models indicate that the risk of MCI, in older adults, is higher in those with peptic acid disease (6 times higher compared to their counterparts without the disease), at least 4 times higher in patients with glaucoma, and 6 times higher in patients with chronic obstructive pulmonary disease. The data also indicate that having a higher educational level is a protective factor for reducing the likelihood of MCI. In the multivariate analysis model, we observe that the independent risk variables are: hypertriglyceridemia, peptic acid disease, glaucoma, chronic obstructive pulmonary disease, and asthma. Similarly, the only independent protective factor was high education. For both the multivariate and univariate models, age is a risk factor. The models indicate that the probability of MCI increases with age.

### 3.4 Discussion

It´s well established that the population of Latin America and the Caribbean is aging rapidly, presenting the highest prevalence rates of dementia in the world [17]. Moreover, substantial evidence indicates that 10–15% of individuals with MCI aged over 65, develop dementia annually [17-19]. The study population had a median age of 72 years old, with a range spanning from 60 to 93 years old. Interestingly, 54% of the participants maintained normal cognitive function, while 28% exhibited MCI, and 18.1% had dementia. This distribution highlights the substantial proportion of elderly individuals at risk for cognitive decline. The prevalence of dementia in LAC countries is high and still increasing compared with estimations in Europe and the United States [17,20,21]. For this reason, it is essential to comprehend transitional states to dementia, such as MCI and their underlying associated factors. Furthermore, knowledge about the prevalence of MCI defines the target population that would benefit most from public health interventions. Our results

**Table 3. Factors associated with mild cognitive impairment**

| Variable | NCF (n= 206) n (%) | MCI (n=107) n (%) | RM crude (95% IC) | *P*[a] | RM adjusted (95% IC) | *P*[b] |
|---|---|---|---|---|---|---|
| Age | | | 1.070(1.035-1.106) | <0.001 | 1.072(1.034-1.111) | <0.001 |
| Education (1) | | | | | | |
| BSE (0) | 114(55.3) | 82(76.6) | 1 (reference) | | 1 (reference) | |
| HPE (1) | 92(44.7) | 25(23.4) | 0.378(0.223-0.639) | <0.001 | 0.336(0.189-0.596) | <0.001 |
| HTG (1) | | | | | | |
| No (0) | 205(99.5) | 103(96.3) | 1 (reference) | | 1 (reference) | |
| Yes (1) | 1(0.5) | 4(3.7) | 7.961(0.879-72.142) | 0.065 | 13.709(1.267-148.294) | 0.031 |
| PUD (1) | | | | | | |
| No (0) | 204(99) | 101(94.4) | 1 (reference) | | 1 (reference) | |
| Yes (1) | 2(0.97) | 6(5.6) | 6.059(1.202-30.557) | 0.029 | 5.92(1.009-34.719) | 0.049 |
| Glaucoma (1) | | | | | | |
| No (0) | 202(98.1) | 99(92.5) | 1 (reference) | | 1 (reference) | |
| Yes (1) | 4(1.9) | 8(7.5) | 4.081(1.200-13.879) | 0.024 | 4.048(1.051-15.596) | 0.042 |
| COPD (1) | | | | | | |
| No (0) | 204(99) | 101(94.4) | 1 (reference) | | 1 (reference) | |
| Yes (1) | 2(0.97) | 6(5.6) | 6.059(1.202-30.557) | 0.029 | 5.616(1.024-30.802) | 0.047 |
| Asthma (1) | | | | | | |
| No (0) | 205(99.5) | 103(96.3) | 1 (reference) | | 1 (reference) | |
| Yes (1) | 1(0.48) | 4(3.7) | 7.961(0.879-72.142) | 0.065 | 12.323(1.128-134.578) | 0.039 |

*Source: Own elaboration with the results from the database. NCI: normal cognitive impairment. MCI: mild cognitive impairment. COPD: Chronic Obstructive Pulmonary Disease. BSE: Basic and Secondary Education. HPE: Higher and postgraduate education. PUD: Peptic ulcer disease. HTG: Hypertriglyceridemia. a. p-value determined by univariate regression models. b. p-value determined by multivariate regression model. Variables included in the multivariate regression model: Education (Basic and Secondary Education=0, Higher and Postgraduate Education=1), Hypertriglyceridemia (No=0; Yes=1), Peptic ulcer disease (No=0; Yes=1), Glaucoma (No=0; Yes=1), Chronic Obstructive Pulmonary Disease (No=0; Yes=1), Asthma (No=0; Yes=1). Beta values: age: 0.069; education (1): -1.092; hypertriglyceridemia (1): 2.618; PUD (1): 1.778; glaucoma (1): 1.398; COPD (1): 1.726; asthma (1): 2.512; Constant: -5.483*

provide evidence that public health programs are needed to improve the cognitive health of elderly people. Public health interventions targeting people with MCI would further reduce the risk of dementia and the associated challenges for public health systems, especially in low- and middle-income countries [17]. From a public health perspective, to be timely and cost-efficient, interventions aiming at reducing the risk of dementia should focus on at-risk individuals [17]. While other studies have focused on interventions to eliminate or reduce dementia risk factors, defining the at-risk population with MCI is important to provide better projections of dementia prevalence and identify the population strata with the highest potential to benefit from interventions [17,22]. In our study, the major comorbidities observed include hypertension, type 2 diabetes, overweight, smoking, history of obesity, obesity, chronic venous disease, hypothyroidism, hypercholesterolemia, and alcoholism. These conditions are prevalent among the elderly and influence overall health and cognitive function. Among those with MCI, the majority were women, people in their seventies and with a baseline level of education. Sex remains controversial. Some studies found no sex differences (similar to our study), while others indicated a higher prevalence of MCI in men (different to the prevalence observed in our study population) [23-26]. The presence of comorbidities such as hypertension, type 2 diabetes, smoking, history of obesity, gonarthrosis, hypercholesterolemia, glaucoma, chronic venous disease, hearing loss, alcoholism, prediabetes, osteoarthritis, peptic ulcer disease, chronic obstructive pulmonary disease, and hypothyroidism was notably high in people with MCI. This suggests a complex interaction between multiple health conditions and cognitive decline.

Regarding the risk factors associated with MCI, previous studies have identified various factors: old age, sex, family history, rural residence, low education, living alone, being single, smoking, income level, a high-fat diet, and chronic diseases [5, 8-13, 26-31]. In our study, univariate analysis highlights that the risk of MCI is significantly higher in oldest adults, individuals with peptic acid disease, glaucoma, and chronic obstructive pulmonary disease. Specifically, those with peptic acid disease have a six-fold increased risk, those with glaucoma have at least a four-fold increased risk, and those with chronic obstructive pulmonary disease also have a six-fold increased risk. These findings underscore the importance of managing these conditions to potentially mitigate the risk of cognitive decline. Both univariate and multivariate models identified age as a significant risk factor for MCI. As age increases, so does the likelihood of cognitive decline. This is consistent with the understanding that aging is a primary risk factor for cognitive decline, highlighting the need for targeted interventions in older populations. However, these findings contrast with those reported by Lor et al. and Salama et al. in two separate studies of older adults from Taiwan and Egypt, respectively [31,32]. They identified male gender (OR=0.39, 95%CI=0.21–0.72), diabetes mellitus (OR=1.70, 95%CI=1.03–2.82), higher miRNA132 expressions (Adjusted OR=1.1, 95%CI=1.01-3.3), low monthly intake of vegetables (AOR=1.2, 95%CI=1.04-1.43), low education (AOR=2.7, 95%CI=1.9-7.4), higher alanine aminotransferase levels (AOR= 1.6, 95%CI=1.1-2.3), and hyperlipidemia (OR=0.47, 95%CI=0.25–0.89) as risk factors, while exercise (OR=0.44, 95%CI=0.34–0.56), unroasted nuts (AOR=0.8, 95%CI=0.8-0.98), albumin (OR=0.37, 95%CI=0.15–0.88), and high-density lipoprotein (OR=0.98, 95%CI=0.97–1.00) were identified as protective factors [31,32]. Moreover, physical activity, bilingualism, recreational activities, and statin use are significant protective factors against cognitive decline and provide cognitive health benefits. However, in our study population educational level was the only protective factor. Educational level emerged as a strong protective factor against MCI. Higher education levels were associated with a lower likelihood of developing MCI, suggesting that cognitive reserve built through education may provide resilience against cognitive decline. This aligns with the broader body of research emphasizing the protective effects of lifelong learning and mental engagement. Furthermore, low educational attainment was identified as a risk factor in the Egyptian population [32].

## 4. CONCLUSION

this study provides evidence and underscores the multifaceted nature of MCI, with various non transmissible chronic diseases contributing to increased risk, while higher education serves as a protective factor. The findings argue for comprehensive management of comorbidities and the promotion of educational and engaging activities to support cognitive health in the elderly. We found a higher prevalence of MCI compared to populations from Peru and the United States of America. Future research

should continue to explore these relationships and develop tailored interventions to address the specific needs of individuals at risk for mild cognitive impairment.

## DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Authors hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

## CONSENT

A medical professional informed all participants about the study's objective, its benefits, and potential adverse events. After providing a clear explanation, the signatures of those who voluntarily decided to participate in the study were collected, ensuring that participants had sufficient time to read and sign the corresponding informed consent form.

## ETHICAL APPROVAL

The study was conducted in accordance with the Good Clinical Practice Guidelines of our laws and the Declaration of Helsinki for human experiments. The protocol was approved by two committees: The Research Committee and the Ethics Committee in Research of the FMC "División del Norte", ISSSTE. The Data was treated confidentially.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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