

## Factors associated with Severity of Cognitive Impairment among Older Adults attending a Geriatric Centre in Southwest Nigeria

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### Abstract

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**Background:** Cognitive impairment (CI) is a major public health concern among older adults. Its severity worsens disability and increases dependency. Empirical evidence on factors associated with the severity of CI is scarce among older Nigerians. This study determined the severity, and factors associated with the severity of CI among older adults ( $\geq 60$  years) at the Geriatric Centre, University College Hospital, Ibadan, Nigeria.

**Methods:** A cross-sectional study was conducted among 349 older adults with cognitive impairment. Data were collected with a semi-structured interviewer-administered questionnaire that included the sociodemographic characteristics and clinical parameters. The Mini-Mental State Examination and Katz index were used to assess the severity of CI and activities of daily living respectively. Descriptive and inferential statistics were carried out at  $\alpha 0.05$ .

**Results:** Participants' mean age was  $75.7 \pm 8.3$  years and 249 (71.3%) were females. The proportions of mild, moderate, and severe CI were 57.6%, 36.4%, and 6.0% respectively. Increasing age, marital and educational status, living arrangement, income, comorbidity of hypertension, diabetes mellitus and functional disability were significantly associated with CI. Ordinal logistic regression analysis showed that increasing age  $\geq 80$  years OR=2.098(1.351-4.754), being currently married OR=1.925(1.058-3.505) and needing assistance in bathing OR=2.706(1.105-6.628) were the most significant factors of increased severity of CI.

**Conclusion:** This study showed the severity of CI among older adults in our setting. Advancing age, being currently married, and dependence in bathing were the most significant factors. Routine assessment and taking cognizance of the severity of CI are advocated at first-contact consultation with older adults.

**Keywords:** Cognitive impairment, functional ability, Activities of Daily Living, co-morbidity, older adults.

### Introduction

The proportion of older adults is increasing globally, especially in Africa.<sup>1</sup> More than one-tenth (11.9%) of the African population are older than 60 years and this will continue to escalate with increasing life expectancy.<sup>1</sup> Most African governments have not taken into consideration this increasing aging population thus they are not adequately prepared to meet the emerging challenges associated with it.<sup>1</sup>

Cognition refers to “a process of identifying, selecting, interpreting, storing, and using the information to make sense of and interact with the physical and social world, to conduct one's everyday activities, and to plan and enact the course of one's occupational life”.<sup>2</sup> Cognitive impairment (CI) has been defined as when a person has trouble remembering, learning new things, concentrating, or making decisions that affect their everyday life.<sup>3</sup> CI is a spectrum that ranges from mild to severe. Older adults with CI generally may have difficulties with memory, and problems with communication, attention, thinking, and judgment.<sup>3</sup> Older adults with mild CI may notice subtle changes in cognitive function but are still able to perform Basic Activities of Daily Living (BADL). While those with severe CI will have difficulty in performing BADL.<sup>4</sup> The prevalence and incidence projections indicate that the number of older adults with CI is increasing.<sup>5</sup> Globally, the prevalence of CI ranges from 5.1% to 41% with a median of 19.0%.<sup>6</sup> In a Nigerian study, 49.1% of older adults was reported to have cognitive impairment.<sup>7</sup>

The etiology of CI is multifactorial with modifiable (mutable) factors and non-modifiable (immutable) factors. The non-modifiable factors include age which is the strongest risk factor, and genetic predisposition.<sup>2,4,8,9</sup> Modifiable factors include chronic conditions such as diabetes mellitus, heart disease, high blood pressure, dyslipidemia, atrial fibrillation, congestive heart failure, cerebrovascular disease, systemic inflammation such as the presence of C-reactive protein, neuropsychiatric conditions like depression and anxiety and nutrition problems such as vitamin B12, folic acid deficiency, and long-term alcohol abuse.<sup>2</sup> Few Nigerian studies have examined factors associated with progression from mild to severe cognitive impairment.

This study determined the severity of CI and its associated factors among older adults at the pioneer geriatric center in Nigeria.

### Methods

**Study design and setting:** This hospital-based descriptive cross-sectional study was conducted at the Chief Tony Anenih Geriatrics Centre (CTAGC) of the University College Hospital (UCH), Ibadan. The CTAGC is a purpose-built facility for the care of older patients in Nigeria established on 17<sup>th</sup> November 2012. Ibadan has a population of 3.6 million inhabitants and is the capital city of Oyo State in the southwestern area of Nigeria. CTAGC has facilities for inpatient and outpatient care in addition to theatre, physiotherapy, dietetics, ophthalmology, old age psychiatry, and dental care.

**Study population:** Male and female older patients with cognitive impairment (CI) aged 60 years and above who presented consecutively at the CTAGC outpatient clinic during the study period of January to March 2021 were recruited.

**Study protocol:** The first phase of the study was to screen all eligible older adults with Folstein's Mini-Mental State Examination (MMSE) tool. A total of 683 consenting older adults were screened and 349 who scored less than 25 points were recruited. This study population was derived from the best estimate for CI in Nigeria 49.1%<sup>7</sup> using the Leslie and Kish single proportion formula for populations less than 10,000. The age of the respondents was determined by asking them first, and estimation from historical events, the age at marriage, and the age of their first child for those unable to provide information on their age. Those who were too ill to participate were excluded.

The second phase was carried out by administering a pretested semi-structured interviewer-administered questionnaire to the participants. Information on the sociodemographic characteristics such as age, sex, marital status, family type, educational level, religion, ethnicity, occupation, monthly income, the family type was obtained. Also, their functional status and medical histories such as their morbidities verified from records and anthropometric measurements were obtained.

The severity of CI was graded as mild (21 – 24 points), moderate (10 – 20 points), and severe (<10 points).<sup>10</sup> The MMSE is the most used tool for assessing cognitive impairment,<sup>2,10</sup> and has been used worldwide including in Nigeria though it may be influenced by education, language and cultural factors.<sup>11</sup> The total score for all the domains of MMSE is 30 and higher scores indicate better cognition.<sup>2</sup> The Katz Index of Independence in Activities of Daily Living tool was used to determine the degree of their functionality.<sup>12</sup> It ranks the independence in performance in the six domains of bathing, dressing, transferring, continence, and feeding. A score of 6 indicates full function, 4, indicates moderate impairment, and 2 or less indicates severe functional impairment.<sup>12</sup> It has been validated and used in Nigeria with a correlation coefficient of 0.70.<sup>12</sup> The participants' anthropometric measurements of height were measured to the nearest centimeter using a stadiometer (Seca, Hanover, USA) and weight to the first decimal (kg) using a weighing scale [Hana, Shenzhen] with the zero-mark checked after each reading for accuracy. The body mass index (BMI) was calculated as weight/height<sup>2</sup>. BMI values lower than 18.4 were defined as underweight, 18.5–24.9 as normal, 25.0–29.9 as overweight and ≥30.0 as obese.<sup>13</sup>

Ethical approval was obtained from the University of Ibadan/ University College Hospital Institutional Ethical Board (UI/UCH IRB UI/EC/19/0156). Informed consent was sought from the participants and their proxies (caregivers or family members) if they were unable to give consent.<sup>14</sup> The questionnaire was translated into Yoruba, the local language and backtranslated to English to ensure the original meaning was retained. The questionnaire was administered by trained research assistants.

The data collected was cleaned and analyzed using the Statistical Package for Social Sciences (SPSS) software version 27. The confidence interval was set to 95% and a p-value of less than 5% was

considered as significant. Descriptive statistics were carried out using Tables and appropriate Charts. Chi-square was used to test for association between categorical variables. Ordinal logistic regression was used to identify independent predictors of CI severity. The proportional-odds (parallel-lines) assumption was tested and satisfied, indicating that the relationship between predictors and increasing severity categories was consistent across thresholds. Variables that were significant at  $p < 0.05$  in bivariate analysis were entered into the multivariable model using a forced-entry approach, with all selected variables included simultaneously.

## Results

The mean age of the participants was  $75.7 \pm 8.3$  years and 249 (71.3%) were females. Table I shows that the majority were not currently married 183 (52.4%), had two or more caregivers 206 (59.0%), were not currently engaged in occupational activities 271 (77.7%), and earned more than the Nigerian minimum wage as at the time of the study of ₦30,000 per month 283 (81.1%).

**Table I: Sociodemographic characteristics of the participants (N= 349)**

| Variables                                        | N   | %    |
|--------------------------------------------------|-----|------|
| <b>Age group (years)</b>                         |     |      |
| 60-69                                            | 79  | 22.6 |
| 70-79                                            | 159 | 45.6 |
| ≥80                                              | 111 | 31.8 |
| <b>Sex</b>                                       |     |      |
| Male                                             | 100 | 28.7 |
| Female                                           | 249 | 71.3 |
| <b>Marital status</b>                            |     |      |
| Married                                          | 166 | 47.6 |
| Separated                                        | 10  | 2.9  |
| Divorced                                         | 5   | 1.4  |
| Widowed                                          | 168 | 48.1 |
| <b>Family Type among married participants</b>    |     |      |
| Monogamous                                       | 133 | 38.1 |
| Polygamous                                       | 33  | 9.5  |
| <b>Live-in caregivers</b>                        |     |      |
| Children                                         | 220 | 63.0 |
| Extended family                                  | 37  | 10.6 |
| Spouse                                           | 92  | 26.4 |
| <b>Number of caregivers</b>                      |     |      |
| 1                                                | 143 | 41.0 |
| ≥2                                               | 206 | 59.0 |
| <b>Highest education attained</b>                |     |      |
| No formal education                              | 58  | 16.6 |
| Primary                                          | 85  | 24.4 |
| Secondary                                        | 63  | 18.0 |
| Tertiary                                         | 143 | 41.0 |
| <b>Occupational status</b>                       |     |      |
| Currently engaged in occupational activities     | 78  | 22.3 |
| Not currently engaged in occupational activities | 271 | 77.7 |
| <b>Monthly allowance (Naira)</b>                 |     |      |
| Earn less than minimum wage (₦30,000)            | 66  | 18.9 |
| Earn more than minimum wage (₦30,000)            | 283 | 81.1 |

The severity of CI by gender is shown in Figure 1. The majority, 201

(57.6%) had mild CI, 127 (36.4%) had moderate CI and 21 (6.0%) had severe CI. The proportions of older females with CI were higher than those of their male counterparts across the severity of CI.

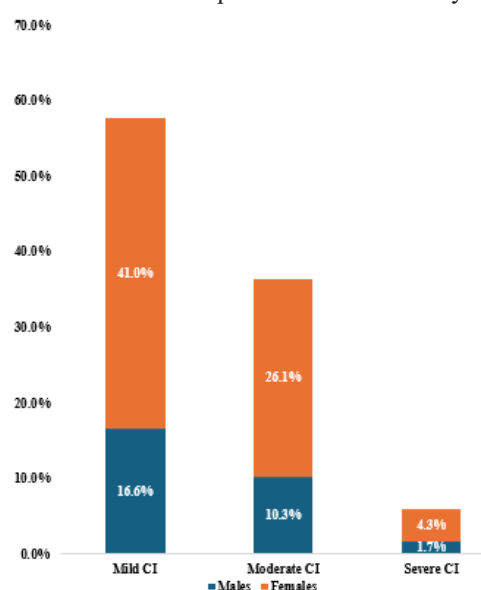


Figure 1: Severity of Cognitive Impairment by Gender

Table II shows the relationship between sociodemographic characteristics of the participants and the severity of cognitive impairment. Increasing age ( $p = 0.008$ ), not currently married ( $p = 0.015$ ), living with the extended family ( $p = 0.043$ ), having no formal educational qualification ( $p = 0.012$ ), and earning below the Nigerian minimum wage ( $p = 0.031$ ) were significantly associated with increasing severity of CI.

**Table II: Sociodemographic characteristics and severity of Cognitive Impairment**

| Sociodemographic                 | Cognitive Impairment |                       |                    | Total=349<br>N (%) | $\chi^2$ | p-value |
|----------------------------------|----------------------|-----------------------|--------------------|--------------------|----------|---------|
|                                  | Mild=201<br>n (%)    | Moderate=127<br>n (%) | Severe=21<br>n (%) |                    |          |         |
| <b>Age</b>                       |                      |                       |                    |                    |          |         |
| 60-69                            | 48 (60.8)            | 28 (35.4)             | 3 (3.8)            | 79 (100.0)         | 13.843   | 0.008*  |
| 70-79                            | 98 (61.6)            | 57 (35.9)             | 4 (2.5)            | 159 (100.0)        |          |         |
| $\geq 80$                        | 55 (49.6)            | 42 (37.8)             | 14 (12.6)          | 111 (100.0)        |          |         |
| <b>Marital Status</b>            |                      |                       |                    |                    |          |         |
| Currently married                | 88 (53.0)            | 72 (43.4)             | 6 (3.6)            | 166 (100.0)        | 8.434    | 0.015*  |
| Not currently married            | 113 (61.7)           | 55 (30.1)             | 15 (8.2)           | 183 (100.0)        |          |         |
| <b>Family Type</b>               |                      |                       |                    |                    |          |         |
| Monogamous                       | 143 (57.2)           | 91 (36.4)             | 16 (6.4)           | 250 (100.0)        | 0.238    | 0.888   |
| Polygamous                       | 58 (58.6)            | 36 (36.4)             | 5 (5.0)            | 99 (100.0)         |          |         |
| <b>Who Live with You</b>         |                      |                       |                    |                    |          |         |
| Spouse                           | 47 (51.1)            | 41 (44.6)             | 4 (4.3)            | 92 (100.0)         | 9.868    | 0.043*  |
| Children                         | 127 (57.7)           | 80 (36.4)             | 13 (5.9)           | 220 (100.0)        |          |         |
| Extended Family                  | 27 (73.0)            | 6 (16.2)              | 4 (10.8)           | 37 (100.0)         |          |         |
| <b>Number of caregivers</b>      |                      |                       |                    |                    |          |         |
| 1                                | 85 (59.4)            | 49 (34.3)             | 9 (6.3)            | 143 (100.0)        | 0.475    | 0.789   |
| $\geq 2$                         | 116 (56.3)           | 78 (37.9)             | 12 (5.8)           | 206 (100.0)        |          |         |
| <b>Educational Qualification</b> |                      |                       |                    |                    |          |         |
| No formal                        | 24 (41.4)            | 31 (53.4)             | 3 (5.2)            | 58 (100.0)         | 8.820    | 0.012*  |
| Formal education                 | 177 (60.8)           | 96 (33.0)             | 18 (6.2)           | 291 (100.0)        |          |         |
| <b>Occupational Status</b>       |                      |                       |                    |                    |          |         |
| currently working                | 49 (62.7)            | 28 (36.0)             | 1 (1.3)            | 78 (100.0)         | 4.226    | 0.121   |
| not currently working            | 152 (56.1)           | 99 (36.5)             | 20 (7.4)           | 271 (100.0)        |          |         |
| <b>Monthly income</b>            |                      |                       |                    |                    |          |         |
| < 30,000 Naira                   | 31 (47.0)            | 33 (50.0)             | 2 (3.0)            | 66 (100.0)         | 6.945    | 0.031*  |
| $\geq 30,000$ Naira              | 170 (60.1)           | 94 (33.2)             | 19 (6.7)           | 283 (100.0)        |          |         |

\*Statistically Significant at  $p < 0.05$

Table III shows the common co-morbidities and the severity of cognitive impairment. There was a statistically significant association between having hypertension ( $p = 0.020$ ), diabetes mellitus ( $p = 0.008$ ) and the severity of CI.

**Table III: Co-morbidities and the severity of Cognitive Impairment**

| Co-Morbidity                 | Cognitive Impairment |                        |                    | Total=349<br>N (%) | $\chi^2$ | P-value            |
|------------------------------|----------------------|------------------------|--------------------|--------------------|----------|--------------------|
|                              | Mild=201<br>n (%)    | Moderate<br>=127 n (%) | Severe=21<br>n (%) |                    |          |                    |
| <b>Hypertension</b>          |                      |                        |                    |                    |          |                    |
| Yes                          | 162 (55.1)           | 116 (39.5)             | 16 (5.4)           | 294 (100.0)        | 7.855    | 0.020*             |
| No                           | 39 (70.9)            | 11 (20.0)              | 5 (9.1)            | 55 (100.0)         |          |                    |
| <b>Diabetes Mellitus</b>     |                      |                        |                    |                    |          |                    |
| Yes                          | 63 (53.4)            | 53 (44.9)              | 2 (1.7)            | 118 (100.0)        | 9.643    | 0.008*             |
| No                           | 138 (59.8)           | 74 (32.0)              | 19 (8.2)           | 231 (100.0)        |          |                    |
| <b>Arthritis (Any Joint)</b> |                      |                        |                    |                    |          |                    |
| Yes                          | 101 (62.7)           | 55 (34.2)              | 5 (3.1)            | 161 (100.0)        | 5.989    | 0.050              |
| No                           | 100 (53.2)           | 72 (38.3)              | 16 (8.5)           | 188 (100.0)        |          |                    |
| <b>Obesity</b>               |                      |                        |                    |                    |          |                    |
| Yes                          | 3 (1.5)              | 4 (3.1)                | 0 (0.0)            | 7 (100.0)          |          | 0.640 <sup>f</sup> |
| No                           | 198 (98.5)           | 123 (96.9)             | 21 (100.0)         | 342 (100.0)        |          |                    |
| <b>Asthma</b>                |                      |                        |                    |                    |          |                    |
| Yes                          | 7 (3.5)              | 1 (0.8)                | 0 (0.0)            | 8 (100.0)          |          | 0.313 <sup>f</sup> |
| No                           | 194 (96.5)           | 126 (99.2)             | 21 (100.0)         | 341 (100.0)        |          |                    |
| <b>Peptic Ulcer Disease</b>  |                      |                        |                    |                    |          |                    |
| Yes                          | 13 (6.5)             | 7 (5.5)                | 2 (9.5)            | 22 (100.0)         | 0.513    | 0.774              |
| No                           | 188 (93.5)           | 120 (94.5)             | 19 (90.5)          | 327 (100.0)        |          |                    |
| <b>Musculoskeletal</b>       |                      |                        |                    |                    |          |                    |
| Yes                          | 52 (25.9)            | 38 (29.9)              | 5 (23.8)           | 95 (100.0)         | 0.776    | 0.678              |
| No                           | 149 (74.1)           | 89 (70.1)              | 16 (76.2)          | 254 (100.0)        |          |                    |
| <b>Respiratory</b>           |                      |                        |                    |                    |          |                    |
| Yes                          | 4 (2.0)              | 3 (2.4)                | 1 (4.8)            | 8 (100.0)          |          | 0.554 <sup>f</sup> |
| No                           | 197 (98.0)           | 124 (97.6)             | 20 (95.2)          | 341 (100.0)        |          |                    |
| <b>Neurology</b>             |                      |                        |                    |                    |          |                    |
| Yes                          | 11 (5.5)             | 12 (9.4)               | 3 (14.3)           | 26 (100.0)         | 3.299    | 0.192              |
| No                           | 190 (94.5)           | 115 (90.6)             | 18 (85.7)          | 323 (100.0)        |          |                    |
| <b>General Signs</b>         |                      |                        |                    |                    |          |                    |
| Yes                          | 29 (14.4)            | 21 (16.5)              | 2 (9.5)            | 52 (100.0)         | 0.782    | 0.676              |
| No                           | 172 (85.6)           | 106 (83.5)             | 19 (90.5)          | 297 (100.0)        |          |                    |
| <b>Other Complaints</b>      |                      |                        |                    |                    |          |                    |
| Yes                          | 12 (6.0)             | 14 (11.0)              | 2 (9.5)            | 28 (100.0)         | 2.762    | 0.251              |
| No                           | 189 (94.0)           | 113 (89.0)             | 19 (90.5)          | 321 (100.0)        |          |                    |

\*Statistically Significant at  $p < 0.05$ , f = Fisher Exact Test

Figure 2 shows the severity of CI across the Body Mass index of the older adults with CI. All older adults who were underweight had moderate CI. More than half of older adults with normal weight, overweight and obesity have mild CI. The proportion of older adults with severe CI decreased from 8.5% among those with normal BMI to 5.6% and 3.5% in those who were overweight and obese respectively.

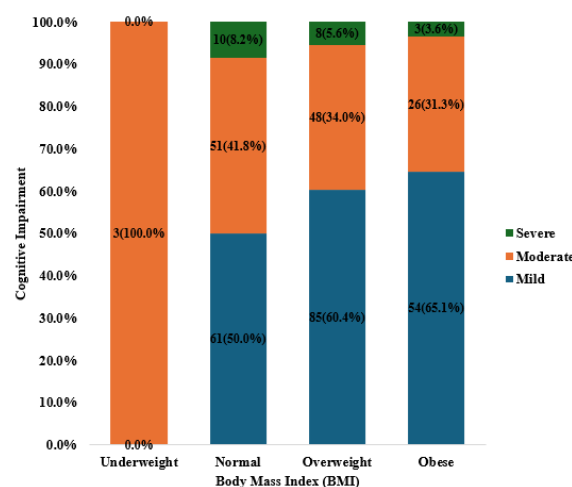


Figure 2: Body Mass Index (BMI) in the older adults and the severity of cognitive impairment

Table IV describes the association between the domains of Activities of Daily Living (ADL) and the severity of CI. There was a statistically significant association between all the domains of ADL

and the increasing severity of CI. Similarly, the proportions of severe CI increased significantly from 1.8% in those with full functionality, through 3.2% in those with moderate functional impairment to 17.7% in participants with severe functional impairment ( $p < 0.0001$ ).

**Table IV: Association between Basic Activities of Daily Living and the severity of Cognitive Impairment**

| Basic Activities of Daily Living | Cognitive Impairment |                       |                    | Total=349<br>N (%) | $\chi^2$ | p-value  |
|----------------------------------|----------------------|-----------------------|--------------------|--------------------|----------|----------|
|                                  | Mild=201<br>n (%)    | Moderate=127<br>n (%) | Severe=21<br>n (%) |                    |          |          |
| <b>Bathing</b>                   |                      |                       |                    |                    |          |          |
| Yes                              | 27 (35.6)            | 34 (44.7)             | 15 (19.7)          | 76 (100.0)         | 40.467   | <0.0001* |
| No                               | 174 (63.7)           | 93 (34.1)             | 6 (2.2)            | 273 (100.0)        |          |          |
| <b>Dressing</b>                  |                      |                       |                    |                    |          |          |
| Yes                              | 99 (49.3)            | 84 (41.8)             | 18 (8.9)           | 201 (100.0)        | 16.323   | <0.0001* |
| No                               | 102 (68.9)           | 43 (29.1)             | 3 (2.0)            | 148 (100.0)        |          |          |
| <b>Toileting</b>                 |                      |                       |                    |                    |          |          |
| Yes                              | 17 (33.3)            | 25 (49.0)             | 9 (17.7)           | 51 (100.0)         | 22.147   | <0.0001* |
| No                               | 184 (61.8)           | 102 (34.2)            | 12 (4.0)           | 298 (100.0)        |          |          |
| <b>Transferring</b>              |                      |                       |                    |                    |          |          |
| Yes                              | 70 (45.8)            | 68 (44.4)             | 15 (9.8)           | 153 (100.0)        | 17.982   | <0.0001* |
| No                               | 131 (66.8)           | 59 (30.1)             | 6 (3.1)            | 196 (100.0)        |          |          |
| <b>Continence</b>                |                      |                       |                    |                    |          |          |
| Yes                              | 16 (34.0)            | 21 (44.7)             | 10 (21.3)          | 47 (100.0)         | 27.275   | <0.0001* |
| No                               | 185 (61.3)           | 106 (35.1)            | 11 (3.6)           | 302 (100.0)        |          |          |
| <b>Feeding</b>                   |                      |                       |                    |                    |          |          |
| Yes                              | 10 (30.3)            | 17 (51.5)             | 6 (18.2)           | 33 (100.0)         | 15.967   | <0.0001* |
| No                               | 191 (60.4)           | 110 (34.8)            | 15 (4.8)           | 316 (100.0)        |          |          |
| <b>Overall functional status</b> |                      |                       |                    |                    |          |          |
| Fully functional                 | 81 (71.7)            | 30 (26.5)             | 2 (1.8)            | 113 (100.0)        | 42.535   | <0.0001* |
| Moderate functional Impairment   | 94 (59.9)            | 58 (36.9)             | 5 (3.2)            | 157 (100.0)        |          |          |
| Severe functional impairment     | 26 (32.9)            | 39 (49.4)             | 14 (17.7)          | 79 (100.0)         |          |          |

\*Statistically Significant at  $p < 0.05$

Ordinal logistics regression analysis in Table V shows the predictors of increased severity of cognitive impairment as being aged 80 years and above OR= 2.098 (1.351- 4.754),  $p = 0.036$ , being currently married OR= 1.925 (1.058- 3.505),  $p = 0.032$ ,  $p = 0.019$  and being dependent in functional activity of bathing OR= 2.706 (1.098 – 2.920),  $p = 0.029$ .

**Table V: Ordinal Regression of factors associated with severity of cognitive impairment**

| Associated Variables             | Odd Ratio | 95% Confidence Interval |       | p-value |
|----------------------------------|-----------|-------------------------|-------|---------|
|                                  |           | LCL                     | UCL   |         |
| <b>Age (years)</b>               |           |                         |       |         |
| ≥ 80                             | 2.098     | 1.351                   | 4.754 | 0.036*  |
| 70 – 79                          | 0.951     | 0.241                   | 1.966 | 0.582   |
| 60-69                            | 1         |                         |       |         |
| <b>Marital Status</b>            |           |                         |       |         |
| Currently married                | 1.925     | 1.058                   | 3.505 | 0.032*  |
| Not currently married            | 1         |                         |       |         |
| <b>Who lives with you</b>        |           |                         |       |         |
| Spouse                           | 1.859     | 0.693                   | 4.982 | 0.218   |
| Children                         | 2.123     | 0.918                   | 4.912 | 0.079   |
| Extended Family                  | 1         |                         |       |         |
| <b>Educational Qualification</b> |           |                         |       |         |
| No formal                        | 1.819     | 0.991                   | 3.338 | 0.053   |
| Formal education                 | 1         |                         |       |         |
| <b>Income</b>                    |           |                         |       |         |
| <30,000                          | 1.415     | 0.794                   | 2.557 | 0.235   |
| ≥30,000                          | 1         |                         |       |         |
| <b>Hypertension</b>              |           |                         |       |         |
| Yes                              | 0.735     | 0.373                   | 1.448 | 0.373   |
| No (ref)                         | 1         |                         |       |         |

|                                     |       |       |       |        |
|-------------------------------------|-------|-------|-------|--------|
| <b>Diabetes Mellitus</b>            |       |       |       |        |
| Yes                                 | 1.088 | 0.668 | 1.771 | 0.736  |
| No (ref)                            | 1     |       |       |        |
| <b>Domains of BADL</b>              |       |       |       |        |
| Required assistance in bathing      | 2.706 | 1.105 | 6.628 | 0.029* |
| Did not require assistance (ref)    | 1     |       |       |        |
| Required assistance in dressing     | 1.794 | 0.760 | 4.234 | 0.182  |
| Did not require assistance (ref)    | 1     |       |       |        |
| Required assistance in toileting    | 0.847 | 0.330 | 2.174 | 0.730  |
| Did not require assistance (ref)    | 1     |       |       |        |
| Required assistance in transferring | 1.545 | 0.790 | 3.021 | 0.202  |
| Did not require assistance (ref)    | 1     |       |       |        |
| Did not have continence             | 2.250 | 0.970 | 5.218 | 0.059  |
| Have continence (ref)               | 1     |       |       |        |
| Required assistance in feeding      | 0.884 | 0.361 | 2.166 | 0.692  |
| Did not require assistance (ref)    | 1     |       |       |        |

## Discussion

In this study, the severity pattern showed over half (57.6%) of older adults had mild cognitive impairment, while 36.4% and 6% had moderate and severe CI respectively. The proportion of older adults in our study was similar to the report of Anieto et al, (59.4%) which used a 10-word delayed recall test (10-WDRt)<sup>15</sup> But lesser than the findings of Elugbadebo et al, (14.3%) who used a similar tool (MMSE) at an orthopaedic clinic in Nigeria.<sup>16</sup> mild CI is often subtle and might be unnoticeable as the affected individuals can still manage their daily activities because it is an intermediate between normal cognition and dementia. However, up to a sixth of those with mild CI progress to dementia.<sup>17</sup>

Few of the respondents in this study had severe CI. Al-Maqbali *et al.*, reported a rate of severity (18%) in Oman,<sup>18</sup> while Rosdinom et al. found higher rates in Malaysia, with 44.6% showing moderate CI and 47.7% severe CI.<sup>19</sup> This was in contrast to the findings of a Nigerian study in a similar setting that reported no severe CI in older people.<sup>7</sup> Severe cognitive impairment is now the seventh leading cause of death in all diseases.<sup>20</sup> In Ethiopia, severe CI accounted for 1.36% of total deaths.<sup>20</sup> This is not surprising as about 90% of people with severe CI in low and middle-income countries do not obtain a diagnosis for this disorder.<sup>20</sup> Making a diagnosis of CI and determining its severity is particularly difficult for culturally heterogeneous populations in Nigeria because no gold-standard screening tools have been developed specifically for these population groups.<sup>21</sup> This may be attributed to the different screening tools used as well as other methodological differences including the study sites, the ease of administration of the tools, and the knowledge of the researchers on cognitive impairment.<sup>9</sup>

The sociodemographic characteristics of older adults significantly influence CI severity. Our study identified associations between CI severity and factors such as increasing age, lack of formal education, and living arrangements. Consistent with previous research, CI severity tends to rise with advancing age, especially among those aged 80 years and above, aligning with conclusions from studies by Okokon et al.<sup>7</sup> Olayinka et al.<sup>8</sup>, and Dorsil et al.<sup>22</sup>, However, Rodriguez et al.<sup>14</sup> found higher rates of CI among individuals younger than 80 years. Low income was also associated with CI severity, as evidenced by studies from South Brazil,<sup>22</sup> and India.<sup>23</sup> Wealthier older adults may enjoy better living conditions and reduced stress levels, potentially benefiting cognitive health.<sup>22</sup> Similarly, a Nigerian study found that most older adults with CI

were unemployed, highlighting the association between low income and CI.<sup>7</sup> Prior research consistently associates the absence or low level of formal education with CI severity, a trend observed in our study as well.<sup>22</sup>

Living arrangements also play a role, with those living with family members, especially spouses and children, experiencing decreased severity of CI, a pattern reported in studies by Okokon et al. emphasizing the importance of family support in cognitive health.<sup>7</sup>

The association between common morbidities such as hypertension and diabetes mellitus with CI severity likely stems from the increased prevalence of chronic diseases with aging, as evidenced by Nigerian studies by Faronbi et al.<sup>12</sup> Olayinka et al. emphasized the association between CI and common co-morbidities like Hypertension and Diabetes mellitus.<sup>8</sup> Research indicates a heightened risk of CI, particularly in vascular dementia and Alzheimer's disease, among individuals with vascular conditions such as hypertension and diabetes mellitus.<sup>24,25</sup> Hypertension impacts cognitive function by affecting blood vessel structure and function, resulting in decreased cerebral blood flow, small vessel disease, and white matter lesions.<sup>24</sup> "In our study, arthritis showed a borderline association with CI severity but did not meet the threshold for inclusion in the multivariable model. Nonetheless, literature suggests that arthritis-related inflammation, oxidative stress, and chronic pain may contribute to cognitive changes.<sup>26</sup> Liu et al. reported a slightly accelerated cognitive decline among individuals with arthritis compared to those without.<sup>27</sup>

The ability to carry out Activities of Daily Living (ADL), including bathing, dressing, feeding, managing incontinence, toileting, and transferring, is significantly affected by CI, as demonstrated in our study and supported by previous research.<sup>28,29</sup> CI can disrupt daily activities, emphasizing the importance of assessing ADLs to identify impairment and ensure an accurate early diagnosis of CI, as emphasized by Cornelis et al.<sup>29</sup> Similar findings were observed in a study by Sabzawari et al. in Pakistan, where all older adults required assistance with at least one ADL, highlighting the widespread impact of CI on functional independence.<sup>28</sup> Moreover, our study revealed an association between the inability to perform basic ADLs, particularly bathing, and the severity of CI. This inability often precedes or accompanies declines in other functional abilities, serving as an early indicator of cognitive decline or dementia, as also noted by Johansson et al.<sup>2</sup>

## Conclusion

This study examined the factors associated with the increase in the severity of cognitive impairment in older adults, which is different from most studies that looked at the magnitude of CI alone. Advanced age, marital status and dependence in bathing were the key factors associated with greater severity of cognitive impairment. The association of the increasing severity of CI with the loss of independence in the basic activities of daily living underscores the importance of identifying these factors to improve the lives of older adults.

## Limitation of the study

This hospital-based study may limit the generalisability of the findings to community-dwelling older adults. Its cross-sectional

design also prevents establishing temporality or causality. Educational influence on MMSE scores is acknowledged as a limitation, as no formal adjustment was applied. In addition, several relevant factors known to affect cognitive function such as depression, anxiety, nutritional status and other neuropsychiatric conditions were not assessed, raising the possibility of residual confounding.

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Design of methodology, data collection and data analysis were done by Obadare AO, and Adebuseye LA.

The presentation of findings and discussion of the findings were done by Obadare AO.

All the authors gave final authorization of the completed work.

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