Cognitive Impairment Patterns and Associated Factors in Elderly Patients at a Primary Care Clinic in North-central Nigeria: A Cross-sectional Study

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Abstract

Background: Cognitive impairment (CI) is a prevalent condition significantly impacting the quality of life of the elderly, particularly in developing nations. This study aimed to determine the patterns of CI and identify associated risk factors specifically age, hypertension, diabetes, and body mass index (BMI) among elderly patients attending a secondary healthcare facility in North-central Nigeria.

Materials and Methods: A hospital-based descriptive cross-sectional study was conducted at the General Hospital, Ilorin, Kwara State. The study recruited 228 elderly participants aged 60 years and above using a systematic random sampling technique. Cognitive function was assessed using the Mini-Mental State Examination (MMSE). Clinical measurements included blood pressure, BMI, and fasting blood glucose. Data were analyzed using SPSS Version 24, clinical variables were presented in frequency distribution tables and pattern of CI in bar charts. The chi-square test was used to assess significant associations between categorical variables, and multivariate logistic regression was used to identify predictors of cognitive impairment. The statistical significance was set at $p < 0.05$.

Results: The prevalence of Mild Cognitive Impairment (MCI) was 26.7%, while 10.1% of participants had severe CI. The majority (63.2%) were cognitively intact. Bivariate analysis revealed statistically significant associations between CI and age, BMI, hypertension, and diabetes. However, multivariate logistic regression indicated that only age (OR 1.125; $p < 0.001$) and diabetes (OR 3.243; $p = 0.001$) were independent predictors of cognitive impairment.

Conclusions and Recommendations: MCI is prevalent among the elderly in this study, with advanced age and diabetes serving as the primary predictors. Routine cognitive screening should be prioritized in primary care settings, particularly for patients over 70 and those with diabetes. Integrating cognitive assessments into non-communicable disease clinics and aggressively managing vascular risks are essential strategies to prevent or delay cognitive decline.

Keywords: Cognitive Impairment, Dementia, Elderly Patients, Primary Care Clinic

Introduction

Cognitive impairment (CI) is a prevalent health condition among the elderly population, significantly impacting public health worldwide, especially in developing countries.[1]

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It is a condition which manifests when an individual has trouble remembering, learning new things, concentrating, or making decisions that affect their everyday life.[2] CI can be mild or severe, in mild cognitive impairment (MCI), the cognitive deficit is less severe, and the normal daily functions and independence are generally maintained.[2] The severe form of CI is known as dementia, which is a syndrome characterized by a progressive decline in cognitive functions accompanied by deterioration in emotion, social behaviour, and motivation, but consciousness is not affected.[2]

The World Health Organization (WHO) and the United Nations define the elderly as persons aged 65 and 60 above, respectively.[3,4]

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The United Nations' definition is adopted in developing countries.[3] As a result of epidemiological and demographic transition, fertility and mortality rates are declining worldwide with an attendant increase in average life expectancy.[4] The effect of this is an overall increase in the geriatric population, which is projected to increase to around 8.5 billion in 2030 and 9.7 billion in 2050, according to the World Population Prospect Report in the year 2022.[5] This increase in the ageing population will be more in developing countries with the incidental rise in the number of non-communicable diseases (NCDs) and degenerative diseases in the region, including cognitive impairment. A systematic review reported a prevalence of MCI ranging from 0.5% to 42% in different countries and populations in the Western world.[6] A community-based study by Ogunniyi et al. in South-Western Nigeria reported that approximately 20% of elderly persons had major neuro-cognitive impairment, with MCI six times more common than dementia.[7] Adeloye et al, found the pooled crude prevalence of dementia in Nigeria to be 4.9%, with prevalence slightly higher in women. [6]

Age is the main risk factor for CI.[8] The prevalence of CI increases more rapidly with age, as a higher prevalence is found among the elderly compared to the younger population.[8] Specific risk factors, such as diabetes, hypertension, and extremes of weight, have been associated with greater cognitive decline and risk of developing CI.[9] Elevated blood pressure in the 4th and 5th decades of life, particularly untreated hypertension, increases the risk of CI 20-30 years later.[10] CI is a chronic complication of diabetes, and it occurs more commonly in older age.[11,12] Overweight and obesity may directly or indirectly increase other vascular risk factors linked to the development of CI.[12] In contrast, lower body mass index (BMI) has been reported to be associated with cognitive decline and its progression in the older population.[13]

A lower BMI may be associated with a decrease in muscle mass or fat due to inadequate nutrition; lack of vitamins reduces the production of leptin and essential fatty acids, resulting in oxidative damage to neuronal cells and consequential acceleration of neurodegenerative diseases.[13] Early identification, prompt treatment of hypertension and diabetes, and lifestyle modification to manage extremes of weight constitute potential targets for intervention to prevent or delay the progression of MCI among elderly people. Late detection and poor management may worsen the severity of the disease, which would consequently affect their quality of life. To bridge the knowledge gap and add to the existing literature on CI among elderly participants, this study was carried out to determine the pattern of CI and its associated risk factors, such as age, hypertension, diabetes, and body mass index, among elderly participants attending a secondary healthcare facility in north-central Nigeria.

Materials and Methods

This hospital-based descriptive cross-sectional study was conducted at the Family Medicine Clinics of the General Hospital, Ilorin (GHI), Kwara State. The study population comprised 228 elderly male and female participants aged 60 years and above attending family medicine clinics at GHI, who gave their consent and satisfied the inclusion criteria. This research was approved by the Ethical Review Committee of GHI, Kwara State (approval number GHI/ADM/134/VOL II/377). Lesley Kish's statistical formula for sample size estimation was used to calculate the minimum sample size for this study. $n = z^2pq/d^2$.[14] With the assumption of a 95% response rate and subsequently adjusted for the non-response, the estimated final sample size in this study was approximately 228 participants.

A systematic random sampling technique was used to select eligible participants for this study. With a sample size of 228, the sampling interval (sampling frame/sample size) was 1800/228 = 7.89, approximately 8. Every 8th elderly participant was recruited, and a total of 4 participants were seen daily. All the selected participants filled and signed the consent forms. Those with acute medical conditions or with major psychiatric illnesses were excluded from the study. Structured and Semi-structured questionnaires were used to obtain information from the participants. The Mini-Mental State Examination tool was used to assess levels of cognition. It was invented by Folstein et al in 1975 to assess mental status.[16] It is an 11-item questionnaire that tests five domains of cognitive function: orientation, registration, attention, recall, and language.[16] The maximum score is 30. A score of 24-30 is normal, 18-23 indicates mild cognitive impairment, and less than 18 indicates severe cognitive impairment.[17]

Blood pressure (BP) was measured by the auscultatory method using a standard mercury sphygmomanometer with an appropriately sized cuff and a Littmann stethoscope, following recommended guidelines and the mean BP was categorized using the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7).[18] The weight of each participant was measured to the nearest 0.5kg on a standard scale adjusted to zero points before each weighing, with the participant lightly clothed, devoid of any heavy objects and barefoot. Height was measured to the nearest 0.01m using a Stadiometer, with participants standing without headgear. Body mass index (BMI) was calculated as weight (kg) / height² (m²) and classified according to WHO guidelines: Underweight (BMI < 18.5), Normal weight (BMI 18.5-24.9), Overweight (BMI 25-29.9), and Obesity (BMI ≥ 30). Fasting blood samples were taken under aseptic conditions for glucose estimation after an overnight fast of 10-12 hours and then sent for laboratory analysis.

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The data collected were sorted out and coded before entry into the computer for analysis using the software package of the Statistical Package for Social Sciences (SPSS) Version 24. Frequency distribution tables were generated to present all the socio-demographic data and clinical variables. Bar charts were used to depict the pattern of CI among the respondents. The chi-square test was used to determine the statistical significance of the association between CI and associated risk factors. A *p*-value less than 0.05 was considered statistically significant. A multivariate logistic regression analysis was run further to determine the predictors of CI among the participants.

Results

Figure 1 shows the pattern of cognitive (CI) among the respondents. Of all the respondents (228) recruited for this study, only 23 (10.1%) had severe CI, among whom sixty-one respondents (26.7%) had mild cognitive impairment (MCI), while majority of the respondents 144 (63.2%) had no CI. Table 1 shows the proportion of the risk factors associated with CI among the elderly. Slightly more than half, 53.5% of respondents, were within the age range of 60 to 69 years. The majority of the respondents, 139 (61.0%), had a normal weight. About one-third, 84(36.8%) of the respondents were hypertensive, while respondents who were diabetic constituted only 16.7% of the participants.

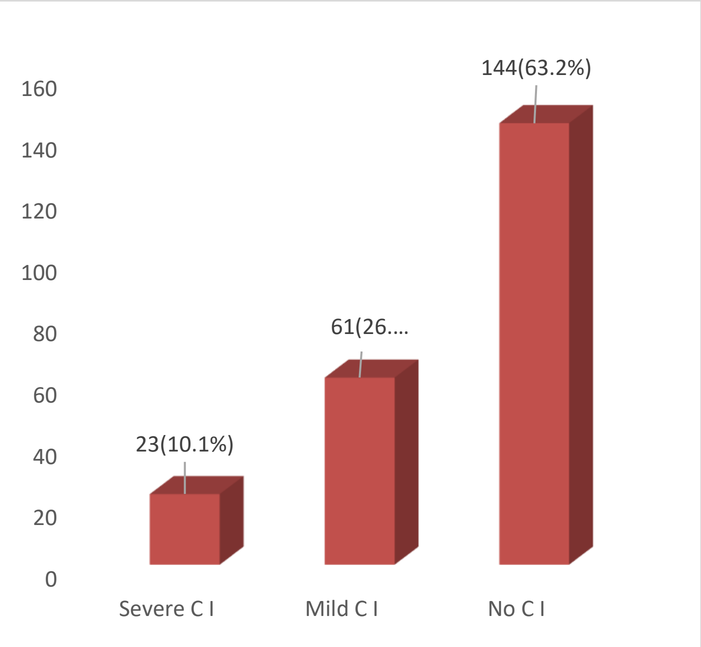

Figure 1: Pattern of Cognitive Impairment among the Respondents. N = 228

Table 2 shows the relationship between the pattern of CI and certain risk factors. There were a statistically significant associations between the patterns of CI and all the variables (age, BMI, hypertension and diabetes) among the respondents (*p*-values were < 0.001, < 0.001, 0.014, 0.002 respectively). The age group 80-89 years had the highest percentage of respondents with severe CI (n = 7, 24.1%). Among the respondents with severe CI, only 11.5% (n = 16) of them had normal BMI. The proportion of respondents with severe CI and hypertensive were 16% (19) while half 59.5% (n = 50) had no CI. Severe CI was found among only 4 (10.5%) respondents with diabetes while the majority 50.0% (n = 19) had MCI.

Table 1: Risk Factors Associated with Cognitive Impairment N= 228

Variables	n	%
Age Groups		
60 – 69	122	53.5
70 – 79	74	32.5
80 – 89	29	12.7
≥ 90	3	1.3
Mean ± SD (Range)	**69.78 ± 8.50**	(60 – 100)^{b}
BMI		
Underweight	4	1.8
Normal	139	61.0
Overweight	63	27.6
Obese	22	9.6
Blood Pressure		
Normal	104	45.7
Pre-Hypertension	40	17.5
Hypertensive	84	36.8
Fasting Blood Glucose		
Diabetic	38	16.7
Non-Diabetic	190	83.3

N= total number of respondents, n= number of respondents in various groups, %= proportion of respondents in each group, b = range of measurement in a variable.

Table 3 shows multiple logistic regression analysis to identify significant predictors of CI after taking into consideration the effects of significant confounders. The analysis shows two factors were independently significant and associated with CI, despite the facts that all the variables had significant associations during bivariate analysis. However, only both age (OR 1.125, 95% CI 1.082 – 1.169, p-value < 0.001) and diabetes (OR 3.243, 95% CI 1.581 – 6.650, p-value 0.001) were found as better predictors of cognitive impairment among the respondents in this study.

Discussion

Overall Pattern of Cognitive Impairment among Respondents

The findings from this study reveal that a sizeable proportion of the respondents had either mild (26.7%) or severe (10.1%) cognitive impairment, with mild impairment much more frequent than severe forms, while the majority (63.2%) of them had no CI. This pattern is the typical trends seen in most studies in which milder forms

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Table 2: Relationship between the pattern of cognitive impairment and certain risk factors N=228

Variables	Mini Mental State Examination Severe C I (%)	Mild C I (%)	No C I (%)	χ^2	P-value
Age Groups				63.446^f	**< 0.001**
≤ 69	0 (0.0)	22 (18.0)	100 (82.0)		
70 – 79	16 (21.6)	22 (29.7)	36 (48.6)		
80 – 89	7 (24.1)	14 (48.3)	8 (27.6)		
≥ 90	0 (0.0)	3 (100.0)	0 (0.0)		
Body Mass Index (BMI)				20.758^f	**< 0.001**
Underweight	0 (0.0)	0 (0.0)	4 (100.0)		
Normal	16 (11.5)	35 (25.2)	88 (63.3)		
Overweight	7 (11.1)	11 (17.5)	45 (71.4)		
Obese	0 (0.0)	15 (68.2)	7 (31.8)		
Hypertension status				12.148^f	**0.014**
Normal	4 (3.8)	32 (30.8)	68 (65.4)		
Pre hypertension	3 (7.5)	11 (27.50	26 (65.0)		
Hypertension	16 (19.0)	18 (21.4)	50 (59.5)		
Fasting blood Glucose				12.426^f	**0.002**
Diabetic	4 (10.5)	19 (50.0)	15 (39.5)		
Non-Diabetic	19 (10.0)	42 (22.1)	129 (67.9)		

^{f}= Fishers exact test

Table 3: Multivariate Logistic Regression to Determine the Predictor (risk factors) of Cognitive Impairment (CI)

Variables/Predictors	B	*p*-value	Odd ratio	95% CI
Age	0.117	< 0.001	1.125	1.082 – 1.169
Body Mass Index				
Normal	RC			
Overweight	-1.308	0.008	0.270	0.103 – 0.707
Obese	-1.68	0.002	0.187	0.065 – 0.534
Hypertension status				
Normal	RC			
Pre hypertension	0.017	0.965	1.017	0.473 – 2.186
Hypertension	0.250	0.409	1.284	0.709 – 2.327
Fasting blood Glucose				
Diabetic	1.176	0.001	3.243	1.581 – 6.650
Non-Diabetic	RC			

β = regression coefficient, CI=Confidence Interval, RC = Reference Category

of cognitive decline are usually several times more prevalent than severe CI (dementia). It is comparable to the study by Ramlall et al in South Africa, Gela et al in Gondar town, Ethiopia, Tawfik et al in Egypt, and Ucheagwu et al in Anambra, South-East Nigeria where the majority of the respondents with cognitive impairment had the mild form.[19-22] A recent global meta-analysis of 233 studies (676,974 participants) reported a pooled mild cognitive impairment (MCI) prevalence of 19.7% overall and noted even higher levels (around 34%) in hospital-based samples of older adults, which is comparable to the finding in the index study.[23,24] This aligns with international evidence that MCI, particularly when driven by vascular risk factors, is an important target for secondary prevention to delay or prevent progression to dementia.[24,25]

Age and Cognitive Impairment among Respondents

In this study, age group was found very statistically associated with cognitive status on bivariate analysis ($\chi^2 = 63.446$, $p < .001$). Respondents ≤69 years had no severe CI and the majority (82.0%) were cognitively intact, whereas those aged 70–79 and 80–89 years showed progressively higher proportions of both mild and severe CI (for example, in the 80–89 group, 24.1% had severe CI and 48.3% mild CI). In the multivariable logistic regression, age remained the most significant predictor of CI, and in tandem with previous research studies which reported age to be an independent risk factor for cognitive impairment.[8,26] This steep age gradient is consistent with both local and global literature. In a case control study of hypertensive elderly Nigerians, Imarhiagbe et al. found that older age was a significant determinant of poorer cognitive performance even after controlling for blood

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pressure and education, highlighting the cumulative impact of aging on brain function in this population.[26]

Recent study conducted among older adults with multimorbidity in Hong Kong also identified older age as a major risk factor for incident MCI over 10-year follow-up.[27] This index findings therefore fit well within the established understanding that age is the single strongest non-modifiable risk factor for late-life cognitive impairment.[26-28] In this study, no respondents were found to have severe CI at the extremes of the age groups. The reasons for these findings might be because of a higher proportion of younger age (young-old) or poor representation of the older adult respondents in the study, as only 3 elderly respondents who participated had MCI.

BMI and Cognitive Impairment

In this study, BMI showed a statistically significant association with CI on bivariate analysis level. Respondents with normal weight and overweight were more likely to be cognitively intact, whereas obese participants were clustered predominantly in the MCI category (68.2% mild CI, 31.8% no CI, and no cases of severe CI). After adjusting for age, hypertension and diabetes in the logistic regression, being overweight or obese appeared “protective” relative to normal BMI. This counter-intuitive pattern resembles the “late-life obesity paradox” described in geriatric literature, where higher BMI in advanced age sometimes correlates with better survival and function.[29,30] One likely explanation is reverse causality: chronic disease, frailty and neurodegeneration can lead to unintentional weight loss, so lower BMI may be a marker of underlying ill-health rather than a cause of better cognition. Moreover, BMI's inability to distinguish fat from lean mass means that an increased BMI in older adults might confer the resilience of higher muscle mass, while individuals with a 'normal' BMI could simultaneously suffer from sarcopenia and its associated cognitive decline.[29,31]

A hospital-based study of elderly diabetic patients in Lagos similarly found that underweight and low mid-upper arm circumference, markers of frailty and poor nutrition, were associated with higher odds of cognitive impairment, whereas mild overweight did not carry the same risk.[32] In a recent meta-analysis study conducted among African with diabetes, it was found that being underweight or malnourished was more consistently linked to CI than being overweight, and obesity (central) and long-standing one remain risk factors when present from mid-life.[33] Overall, the “protective” effect of higher BMI in this analysis should be understood in this late-life context and not interpreted as evidence that obesity is benign over the life course.[32,33]

Hypertension and cognitive status

In this study, after the multivariable logistic regression analysis, neither pre-hypertension (OR 1.017, p = .965) nor hypertension (OR 1.284, p = .409) remained significant after controlling for the cofounders (age, BMI and diabetes). This implies that the impact of raised blood pressure on cognition in this study may be mediated through age and coexisting metabolic disturbances (especially diabetes), or that many hypertensive patients achieved adequate BP control under treatment, reducing the independent effect of the hypertensive label. This finding aligns with the similar study conducted by Imarhiagbe et al, who found lower cognitive scores in hypertensive compared with normotensive older adults.[26] Furthermore, some meta-analytic evidences also suggests that effective antihypertensive treatment is associated with reduced cognitive decline, supporting strict BP control as a modifiable protective factor.[26,31,34] In contrast, a comprehensive review by Guzik et al. in 2022 concluded that mid-life and late-life hypertension, and arterial stiffness are key drivers of vascular cognitive impairment and dementia, often acting synergistically with other vascular risks such as diabetes and dyslipidaemia.[31] The unsignificant association between hypertension and CI found in this study also disagree with a recent case control study in China where it was reported that both hypertension and diabetes independently increased the odds of MCI and dementia, with their comorbidity conferring the highest risk, and longer duration of hypertension further increasing the likelihood of cognitive impairment.[35] The loss of statistical significance for hypertension in the present study likely reflects smaller sample size, unmeasured treatment, or the dominant effect of age and diabetes.[35]

Diabetes, Fasting Blood Glucose and Cognitive Impairment

By contrast, fasting blood glucose status showed a robust association with CI that persisted after adjustment. On bivariate analysis, diabetics had a much higher frequency of MCI (50.0% vs 22.1% in non-diabetics) and a lower proportion with no impairment (39.5% vs 67.9%). In multivariable logistic regression, diabetes remained a strong independent predictor: diabetic respondents had over threefold higher odds of CI than non-diabetics (OR 3.243, 95% CI 1.581–6.650, p = .001). This finding is comparable to some studies conducted in Nigerian and African regions at large. A hospital-based study from Abakaliki reported a 40% prevalence of CI among patients with type 2 diabetes, with advanced age, low education and diabetic complications as major risk factors.[36] In Lagos, Ogbonna et al. similarly found high rates of CI among elderly diabetic patients and identified low income, longer diabetes duration and coexisting hypertension and dyslipidaemia as key correlates.[32] Similarly, a 2024 systematic review and meta-analysis of diabetic patients in Africa reported a pooled prevalence of CI exceeding 40%, and highlighted poor glycaemic control, longer disease duration and vascular comorbidities as the most consistent predictors.[33] International reviews also confirm that

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diabetes roughly doubles the risk of dementia and MCI, likely through mechanisms that include chronic hyperglycaemia, microvascular damage, insulin resistance, inflammation and accumulation of advanced glycation end-products.[33,37] The finding from the index study underscores that older adults with diabetes form a particularly vulnerable subgroup for cognitive decline and should be routinely screened and prioritised for comprehensive vascular risk reduction.

In conclusion, the study found MCI (26.7%) to be predominant among the elderly population while the majority (63.2%) of them had no decline in cognition. Key predictors of CI were increasing age and being diabetics. This highlights the need for early screening for CI in primary care, particularly for elderly individuals with diabetes and other comorbidities, to improve their quality of life and overall health outcomes.

Implications for Clinical Practice and Policy Formulation

Prioritise cognitive screening in high-risk groups: Given the strong effects of age and diabetes, routine cognitive screening (e.g., MMSE or simpler validated tools) should be incorporated into care pathways for patients aged ≥ 60 years and for all older adults with diabetes, particularly where hypertension and other vascular risks coexist.[33,36,38]

Integrate cognitive assessment into NCD clinics: The high prevalence of cardiometabolic risk factors in this population suggests that hypertension and diabetes clinics in Nigerian primary care hospitals are ideal platforms for early identification of cognitive impairment, as advocated by recent African work on barriers and facilitators to cognitive screening in primary care.[38]

Aggressively manage modifiable vascular–metabolic risks: Evidence shows that treatment of hypertension does not worsen cognition and may reduce cognitive decline supports strict BP control in older adults. Combined with optimal glycaemic control, lipid management and lifestyle interventions (physical activity, diet, smoking cessation), this offers a realistic strategy to slow vascular cognitive decline in LMIC settings.[31,34,38]

Address frailty and nutrition in late life: The inverse association between BMI and cognitive impairment in this study cohort should not be interpreted as endorsing obesity, but rather as a signal that frailty, undernutrition and weight loss may be markers of high cognitive risk in very old adults. Comprehensive geriatric assessment, including nutritional and functional evaluation, is needed alongside cardiometabolic management.[33]

Limitations of the Study and future directions

As with many hospital-based cross-sectional studies, these results are subject to selection bias and cannot establish causality. The reliance on MMSE alone may underestimate certain domains of cognition (e.g., executive function) that are particularly sensitive to vascular injury. Key potential confounders such as educational level, depression, medication adherence, duration and control of hypertension and diabetes, and measures of central obesity were not included in the index study, and could help refine risk estimates in future work.[24]

Future studies in this setting would benefit from larger, community-based samples, longitudinal follow-up to track incident MCI and dementia, and more granular measurement of vascular risk exposure (e.g., cumulative BP and HbA1c, duration of comorbidity). Nonetheless, the current findings provide robust local evidence that age and diabetes are major drivers of cognitive impairment among older Nigerians, and they align closely with regional and global evidence on vascular–metabolic determinants of cognitive decline.[27,35]

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Declaration of conflict of interest

The authors declare that they have no competing interests.

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