THE FREQUENCY AND PATTERN OF COGNITIVE IMPAIRMENT IN THE ELDERLY AT THE OUT PATIENTS' CLINIC OF THE HOLY FAMILY HOSPITAL, TECHIMAN, GHANA

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Abstract

Background: Ghana's elderly population increased by 367 percent from 1960 to the year 2000. There have been few studies on cognitive impairment amongst elderly patients in Ghana.

Aim: This study was conducted to determine the frequency and pattern of cognitive impairment in the elderly at the outpatients' clinic of the Holy Family Hospital, Techiman, Ghana.

Methods: The study was a descriptive cross-sectional study. Cognitive impairment was assessed using modified versions of test your memory test, 10 word recall test, trail making test part B and the mini mental state exam. The effect of cognitive impairment on daily activities was assessed using the activities of daily living scale. Multiple regression analysis was done to determine factors associated with the various cognitive tests chosen.

Results: Forty-nine (49) percent of respondents had cognitive impairment using the Ten (10) word list recall whereas 72% of the respondents had cognitive impairment on the modified Test your memory test. On the Mini mental state exam, 76% of respondents had cognitive impairment. Six percent of respondents had cognitive impairment on the Trail making test B. The cognitive domains most affected were visuospatial skills, semantic knowledge, arithmetic and attention. The least affected cognitive domains were verbal fluency, ability to copy, calculation, verbal recall and orientation. A higher educational level was associated with higher scores on all the cognitive tests chosen ($p< 0.003$).

Conclusion: It can be concluded that the frequency of cognitive impairment amongst elderly patients in Techiman is high with visuospatial skills, semantic knowledge, arithmetic and attention being the most affected cognitive domains.

Key Words*: Cognitive impairment, 10 word recall test, mini mental state exam, trail making test-B, test your memory test*

Introduction

The current population of adults aged 60 years and older in sub-Saharan Africa is 4.9% and this is projected to increase to 7.6% by 2050[7]. Within sub-Saharan Africa, Ghana is older than the average with 5.3% of older adults in the total population. This is expected to increase to 8.9% by 2050[7]. Reduction in fertility rates and improved health services have accounted for the rise in the elderly population in Ghana[8]. Ghana's life expectancy has also increased for both males and females[9]. Population ageing has security, health, social and economic consequences ranging from high demands on welfare and social needs to changes in family structure[10].

In sub-Saharan Africa, population ageing is particularly problematic because it is taking place with neither a comprehensive formal social security system nor a well-functioning traditional care system in place for elderly people[10].

The prevalence of age-related health problems is becoming an important public health concern as proportions of older individuals in populations worldwide grow[11]. Dementia is one of the major causes of disability in older people[12]. It is characterized by irreversible cognitive decline that is severe enough to affect daily functioning[13]. It arises from an interaction between genetic, environmental and behavioural factors, with severe adverse influences on social and physical activities and quality of life[13].

Dementia is common among elderly individuals and Alzheimer's disease (AD) may be present years before clinical symptoms present[14,15]. The rise in conditions such as hypertension, type two diabetes mellitus and obesity in developing countries and increasing urbanization has increased the risk for cognitive impairment (16–20). The age-adjusted dementia prevalence estimates are high (≥5%) in certain Asian and Latin American countries, and about (1—3%) in India and sub-Saharan Africa [21]. Dementia will cost developing countries an estimated US$73 billion yearly[21].

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In cognitive impairment and mild cognitive impairment, the cognitive deficit is less severe than in dementia and normal daily function and independence are generally maintained. It is a chronic condition that is a precursor to dementia in up to one third of cases[13]. Mild cognitive impairment is the transition between normal ageing and dementia[21].

Justification of the study

Developing countries are ageing faster than developed countries with major consequences and implications for all facets of human life[22]. In December 2004, the African Union Commission launched a Policy Framework and Plan of Action to raise awareness about the special situation, needs and welfare of elderly people on the continent[23]. The main goal of the Policy Framework and Plan of Action is to guide African Union Member States to design, implement, monitor and evaluate appropriate integrated national policies and programmes to meet the needs of the elderly [24].

Chronic diseases are on the rise in Ghana especially amongst the elderly population and this has implications for the quality of life of the elderly[25]. There have been few studies on cognitive impairment in the elderly in Ghana.

Relevance of the study to the practice of medicine.

The findings of this study will:

a) Provide baseline and reference data on the frequency of cognitive impairment in the elderly at the out patients' clinic of the Holy Family hospital, Techiman.
b) Provide information on the pattern of cognitive impairment in the elderly at the out patients' clinic of the Holy Family Hospital, Techiman.
c) Provide information for health care professionals on the need to assess for cognitive impairment in elderly patients in Techiman.
d) Provide local data that can be the basis for future research projects

Main objective

To determine the frequency and the pattern of cognitive impairment in the elderly at the out patients' clinic of the Holy Family Hospital, Techiman, Ghana.

Specific objectives

1. To determine the frequency of cognitive impairment amongst elderly patients at the Holy Family Hospital, Techiman.
2. To determine the pattern of cognitive impairment amongst elderly patients at the Holy Family Hospital Techiman.
3. To determine the association between cognitive impairment and quality of life amongst elderly patients at the Holy Family Hospital, Techiman.
4. To determine factors associated with cognitive impairment amongst elderly patients at the Holy Family Hospital, of Techiman, Ghana

Methodology

Study area

The study was conducted at the out patients' clinic of the Holy Family Hospital, Techiman, a 210 bed facility hospital that provides primary and secondary levels healthcare to the people of the municipality and beyond. Techiman is the capital of the Bono East Region of Ghana. It is a leading market town and has one of the biggest commodity markets in West Africa. Techiman had a settlement population of 104,212 people as at 2013. The study on population ageing in Ghana showed that the Brong Ahafo region (now divided into the Bono, Bono East and Ahafo regions) was one of the regions in Ghana with the highest numbers of elderly patients[22].

Study design

The study was a descriptive cross-sectional study.

Study period

The study was conducted over 5 months, from March 2015 to July 2015.

Sampling method

All Patients 65 years and older who reported at the out patients' clinic of the Holy Family Hospital, Techiman within the study period were potential participants for recruitment into the study and were approached for their participation into the study. They were then selected by a systematic sampling technique. Patients who agreed to participate in the study were asked to sign and date an informed consent form. Those who could not read and write were asked to thumbprint in the presence of an independent witness. Having consented, the patients were interviewed using a structured questionnaire to gather data on the socio-demographic characteristics, current and past medical histories after which physical examination was done. Anthropometric measurements were standardized using the same scales. Further, a neurological examination was done. Participants were examined for signs of Parkinson's disease, gait abnormalities and paresis in the limbs. The tendon reflexes were also assessed.

Relevant laboratory tests like fasting blood glucose, renal function test, liver function test and lipid profile were also done.

The estimated glomerular filtration rate (e GFR) was calculated using the Cockcroft-Gault equation[6].

Cognitive tests

Cognitive impairment was assessed using modified versions of test your memory test (TYM), 10 word recall test, trail making test part B and the mini mental state exam. Three assistants were trained to help administer the tests. Participants had a sample preview done with regards to the trail making test B.

In this study, the effect of cognitive impairment on daily activities was assessed using the activities of daily living scale[26]. The test your memory test assessed orientation, semantic knowledge, calculation, verbal fluency, similarities, naming, visuospatial skills, ability to copy, ability to do test and recall of sentence. The mini mental state examination assessed orientation, registration, attention and arithmetic, verbal recall and speech.

The tasks were translated into the Twi language and back translated into English. Participants who could neither read nor write answered using the Twi language [27]. Again, the tests had been modified to use local examples for knowledge questions. The mini mental state examination has been validated in many populations and its usefulness in elderly uneducated Nigerian subjects has been assessed [28]. Our search did not find any validation of the test in Ghana. To validate test your memory test in our population, we compared it to the mini mental state exam using 30 randomly selected elderly patients at the out patients' clinic of the Holy family hospital, Techiman. When compared to the mini mental state exam, TYM had a sensitivity of 100% and a specificity of 100%.

Eligibility criteria

Inclusion criteria

All elderly patients (65 years and above) who attended the Out Patients' Clinic at the Holy Family Hospital, Techiman

All elderly patients who consented to partake in the study

Exclusion criteria

All patients below 65 years of age. All patients with background diseases that impair cognition like stages 3 to 5 chronic kidney disease, chronic liver disease and post stroke. All patients who declined to give consent.

Sample size estimation

The sample size was calculated using the formula:

$n= z^2pq/d^2$

n = the desired sample size

z = the standard normal deviation, set at 1.96 which corresponds to the 95% confidence level[29].

p = the proportion in the target population estimated to have a particular characteristic

q = 1.0- p

d= degree of accuracy desired, set at 0.05.

Using an estimated elderly population of 2.3% in Brong Ahafo Region [22] and using the above formula, a minimum sample size of 35 was required. However, 100 people were recruited into the study.

Ethical consideration

Ethical approval was obtained from the Committee on Human Research, Publication and Ethics of the Kwame Nkrumah University of Science & Technology School of Medical Sciences/Komfo Anokye Teaching Hospital.

All efforts were made to maintain confidentiality of patients' information. All patients' records were anonymized with a study number which was used in the data entry. Information of patients were kept confidential with access to the investigator and the supervisor only**.**

Statistical analysis

A database was created using EpiInfoTM 2008 version 3.5.1 for data entry. The data was exported first from EpiInfoTM to Excel spreadsheet for cleaning, and then to Stata Intercool 10 software for analysis. The analysis was done in three stages: Basic descriptive analysis, Chi square test and logistic regression. Basic descriptive analysis was performed in the form of frequency tables and charts for categorical variables and summary statistics for continuous variables to investigate the distribution of the variables. Chi square test was done to find out the association between the various outcome variables and the demographic characteristics. Age, sex, educational level, alcohol intake and estimated glomerular filtration rate were matched against the four cognitive tests chosen. Finally, multiple logistic regression analysis was employed to determine the risk factors of cognitive impairment. For the purposes of this study a p-value of less than or equal to 0.05 was deemed statistically significant and a 95% confidence interval was used.

Results

Age category of Respondents

There were more respondents within the 65-70 age group than any other age group. Eighty six percent (86%) of all respondents were between the ages of 65 and 82.

Educational level of Respondents

Fifty two percent (52%) of all respondents had no formal education.

Medical condition of respondents

The commonest medical condition was systemic hypertension and this accounted for 34.4% of all medical conditions. Other medical conditions of respondents included peptic ulcer disease (24.6%), chronic hepatitis B infection (3.3%), benign prostate enlargement (3.3%), lumbar spondylosis (9.8%) and sickle cell disease (1.6%).

Test your Memory test results according to age group

The highest scores in the test your memory test was in verbal fluency, ability to copy and calculation whereas the least scores were in visuospatial skills and semantic knowledge.

Mini Mental State Exam results according to age group

The highest scores on the mini mental state exam were in registration, recall and orientation whereas the least scores were in attention and arithmetic.

Socio-demographic characteristics of elderly population in Techiman

There were more respondents in the 65-70 age group than any other age group. 52 percent (52%) of respondents had no formal education whereas 48(48%) had some form of formal education.

Cuts offs for Cognitive impairment were 20 for 10 word recall test; 43 for test your memory test; 27 for mini mental state exam and 5 minutes for trail making test-B.

Table 1 showed that forty nine percent of respondents had cognitive impairment using the 10 word list recall test whereas in the modified test your memory test, 72% of the respondents had cognitive impairment. On the Mini mental state exam, 76% of respondents had cognitive impairment.

In the Trail making test-B, 50% of respondents were unable to do the test due to a lack of education. Only 6% out of the remaining 50% who were able to do the test scored above 5 minutes.

Table 1: Frequency of cognitive impairment in the elderly population in Techiman

Factor, N=100	Number	Percentage
Total Score (10 Word Recall Test)		
1 – 10	5	5.0
11 – 20	44	44.0
21 – 30	46	46.0
31 – 40	5	5.0
Total Score (Modified Test Your Memory Test)		
BELOW 26	14	14.0
27 – 30	19	19.0
31 – 34	18	18.0
35 – 38	12	12.0
39 – 42	9	9.0
43 – 46	10	10.0
47 – 50	18	18.0
Total Score (Mini mental State exam)		
0 – 10	10	10.0
11 – 20	40	40.0
21 – 26	26	26.0
27 – 30	24	24.0
Trail making test-B (Minutes)		
0.1 – 2	22	22.0
2.1 – 3	9	9.0
3.1 – 4	9	9.0
4.1 – 5	4	4.0
ABOVE 5	6	6.0
Unable To Do= 0	50	50.0

Performance of study participants on individual cognitive tests

The highest scores in the test your memory test was in verbal fluency, ability to copy and calculation whereas the least scores were in visuospatial skills and semantic knowledge.

The highest scores on the mini mental state exam were in registration, recall and orientation whereas the least scores were in attention and arithmetic.

Low educational levels limited the use of the trail making test-B with only 50% of respondents being able to perform the test.

Level of education and total scores on the various cognitive tests

Table 2 showed that a higher educational level was associated with higher scores on all the cognitive tests chosen.

Logistic regression models of predictors of cognitive impairment on the four cognitive tests

The unadjusted and adjusted estimates of independent predictors of cognitive impairment on each of the four tests of cognition for this study are shown in tables 3, 4, 5 and 6. Educational status and eGFR were independently associated with cognitive impairment on the 10 word recall test as well as Trail making test-B. Educational status was the only factor independently associated with cognitive impairment on the TYM whereas increasing age and educational status were found to be associated with cognitive impairment on the MMSE. Educational level was associated with cognitive impairment on all four tests (95% Confidence interval: CI 0.1-0.6, p value= 0.003; 95% CI: CI 0.0-0.1 p< 0.001).

Table 2: Level of education and total scores on the various cognitive tests

Factor, N=100	Education Level					P value
	None	Primary	JHS/Form 4	Secondary/ Technical/SHS	Tertiary	
Total Score (10 word recall test)						0.003*
1 – 10	4(7.7%)	-	1(6.7%)		-	
11 – 20	31(59.6%)	7(53.9%)	4(26.7%)	1(11.1%)	1(9.1%)	
21 – 30	16(30.8%)	6(46.2%)	8(53.3%)	8(88.9%)	8(72.7%)	
31 – 40	1(1.9%)	-	2(13.3%)	-	2(18.2%)	
Total	52(100.0%)	13(100.0%)	15(100.0%)	9(100.0%)	11(100.0%)	
Total Score (TYM)						<0.001*
Below 27	12(23.1%)	1(7.7%)	1(6.7%)	-	-	
27 – 30	16(30.8%)	2(15.4%)	-	-	-	
31 – 34	13(25.0%)	5(38.5%)	1(6.7%)	-	-	
35 – 38	7(13.5%)	3(23.1%)	2(13.3%)	-	-	
39 – 42	2(3.9%)	2(15.4%)	2(13.3%)	2(22.2%)	1(9.1%)	
43 – 46	2(3.9%)	-	3(20.0%)	1(11.1%)	4(36.4%)	
47 – 50	-	-	6(40.0%)	6(66.7%)	6(54.6%)	
Total	52(100.0%)	13(100.0%)	15(100.0%)	9(100.0%)	11(100.0%)	
Total Score MMSE						<0.001*
0 – 10	9(17.3%)	1(7.7%)	-	-	-	
11 – 20	33(63.5%)	5(38.5%)	2(13.3%)	-	-	
21 – 26	9(17.3%)	7(53.9%)	7(46.7%)	2(22.2%)	1(9.1%)	
27 – 30	1(1.9%)	-	6(40.0%)	7(77.8%)	10(90.9%)	
Total	52(100.0%)	13(100.0%)	15(100.0%)	9(100.0%)	11(100.0%)	
TRAIL MAKING TEST(Minutes)						<0.001*
0.1 – 2	4(7.7%)	3(23.1%)	2(13.3%)	6(66.7%)	7(63.6%)	
2.1 – 3	1(1.3%)	3(23.1%)	3(20.0%)	1(11.1%)	1(9.1%)	
3.1 – 4	-	4(30.8%)	4(26.7%)	1(11.1%)	-	
4.1 – 5	-	2(15.4%)	2(13.3%)	1(11.1%)	-	
ABOVE 5	-	1(7.7%)	2(13.3%)	-	3(27.3%)	
UNABLE TO DO= 0	47(90.4%)	-	2(13.3%)	1(11.1%)	-	
Total	52(100.0%)	13(100.0%)	15(100.0%)	9(100.0%)	11(100.0%)	

*Fisher's exact test

Table 3: Logistic regression of 10 word recall test against various factors

10 Word recall Test						
Factors	**Crude OR**	**95% CI**	**p value**	**Adjusted OR**	**95% CI**	**p value**
Age (years)						
65-70(Ref)	1					
71-76	2.6	0.9-7.6	0.09	1.6	0.4-5.6	0.493
77-82	5.4	1.8-16.3	0.003	3.5	0.1-12.9	0.055
83-88	1.7	0.2-11.9	0.592	0.6	0.1-4.9	0.615
89-94	12.8	1.3-12.5	0.029	3.5	0.3-37.9	0.311
Above 94	1.3	0.1-15.9	0.849	0.7	0.0-12.0	0.790
Sex						
Male (Ref)	1					
Female	1.5	0.7-3.3	0.322	0.8	0.3-2.1	0.622
Education level						
less educated (Ref)	1					
Junior level and higher	0.1	0.1-0.4	<0.001	0.1	0.1-0.6	0.003
Alcohol intake						
Yes (Ref)	1					
No	0.5	0.2-1.6	0.260	0.8	0.2-2.9	0.749
e GFR						
90 and below (Ref)	1					
above 91	0.1	0.3-0.4	0.001	0.2	0.0-0.7	0.012

OR: Odds Ratio, CI: Confidence Interval

Table 4: Logistic regression of modified test your memory test against various factors

Modified Test Your Memory Test						
Factors	**Crude OR**	**95% CI**	**p value**	**Adjusted OR**	**95% CI**	**p value**
Age (years)						
65-70(Ref)	1					
71-76	2.1	0.7-6.4	0.188	1.3	0.2-7.7	0.794
77-82	3.6	1.1-11.8	0.036	3.4	0.5-23.7	0.219
83-88	3.1	0.3-31.0	0.333	0.1	0.0-2.2	0.139
89-94	-	-	-	-	-	-
Above 94	1.6	0.1-18.9	0.729	0.4	0.0-89.7	0.754
Sex						
Male (Ref)	1					
Female	2.5	1.0-6.2	0.051	0.6	0.1-3.2	0.593
Education level						
less educated (Ref)	1					
Junior level and higher	0.01	0.0-0.5	<0.001	0.005	0.0-0.1	<0.001
Alcohol intake						
Yes (Ref)	1					
No	0.5	0.1-1.7	0.246	2.3	0.2-22.7	0.488
e GFR						
90 and below (Ref)	1					
above 91	0.2	0.1-0.6	0.005	0.5	0.1-2.5	0.438

OR: Odds Ratio, CI: Confidence Interval

Table 5: Logistic regression of mini mental state exam against various factors

Mini Mental State Exam						
Factors	**Crude OR**	**95% CI**	**p value**	**Adjusted OR**	**95% CI**	**p value**
Age (years)						
65-70(Ref)	1					
71-76	2.1	0.7-6.4	0.188	1.3	0.2-7.9	0.778
77-82	10.1	2.0-50.0	0.005	11.7	1.3-108.3	0.031
83-88	-	-	-	-	-	-
89-94	-	-	-	-	-	-
Above 94	1.6	0.1-18.9	0.729	0.5	0.0-55.6	0.782
Sex						
Male (Ref)	1					
Female	2.8	1.1-7.6	0.038	0.8	0.1-4.7	0.820
Education level						
less educated (Ref)	1					
Junior level and higher	0.01	0.0-0.1	<0.001	0.01	0.0-0.1	<0.001
Alcohol intake						
Yes (Ref)	1					
NO	0.2	0.0-1.2	0.074	0.9	0.1-15.1	0.938
e GFR						
90 and below (Ref)	1					
above 91	0.3	0.1-0.8	0.016	0.7	0.1-3.8	0.713

OR: Odds Ratio, CI: Confidence Interval

Table 6: Logistic regression of trail making test part B against various factors						
Factors	**Crude OR**	**95% CI**	**p value**	**Adjusted OR**	**95% CI**	**p value**
Age(years)						
65-70(Ref)	1					
71-76	1.1	0.4-3.1	0.897	1.0	0.3-3.5	0.977
77-82	3.1	1.1-8.9	0.037	3.2	0.9-11.8	0.081
83-88	-	-	-	-	-	-
89-94	-	-	-	-	-	-
Above 94	2.9	0.2-35.7	0.401	2.0	0.1-32.8	0.625
Sex						
Male (Ref)	1					
Female	1.4	0.6-3.1	0.393	0.7	0.2-2.1	0.552
Education level						
less educated (Ref)	1					
Junior level and higher	0.1	0.0-0.3	<0.001	0.1	0.0-0.3	<0.001
Alcohol intake						
Yes (Ref)	1					
No	1.8	0.6-4.9	0.279	3.6	1.0-13.0	0.048
e GFR						
90 and below (Ref)	1					
above 91	0.2-1.3	0.172	1.3	0.4-4.5	0.635	0.2-1.3

OR: Odds Ratio, CI: Confidence Interval

Discussion

This study showed that the most common age range for the elderly population in Techiman is the 65-70 age group. This is consistent with the Study of Ageing in Ghana, that found Ghana's elderly population to be concentrated in the younger age group of 60 to 69 years[22].

This study found a high level of illiteracy amongst study participants. The illiteracy rate was, however, lower than the 73.4% illiteracy rate detected by Tawiah in the study on Population ageing in Ghana[24].

More than half of the respondents had a chronic condition with systemic arterial hypertension being the most common medical condition. The frequency of systemic arterial hypertension(34.4%) was higher than the 14.2% detected[25].

We found 1.6% of respondents had a stroke as against 2.8% detected in the study[25].

This study showed that the frequency of cognitive impairment is high ranging from 49% to 76% depending on the cognitive test used. Fifty percent of the respondents were unable to perform the Trail making test-B owing to a lack of education with 6% of the remainder scoring more than 5 minutes. This is higher than the percentage cognitive impairment detected in a review[30].

In that review to determine the prevalence of cognitive impairment, the prevalence ranged from 6.3% in Nigeria to 25% in Central Africa Republic[30]. The higher prevalence rate may be as a result of the study being conducted in a hospital setting as against some of the studies, that were conducted in the community[30]. Most of the respondents had a chronic illness especially systemic arterial hypertension and diabetes mellitus and this increases the risk of cognitive impairment.

Again, the cognitive battery tests used in this study were different from the cognitive studies[30]. The cognitive tests used in the review by Mavrodaris et al were adjusted to reflect literacy levels but that was not the case in this study. Finally, the age cut off in the review study by Mavrodaris et al was 50 years and above and may account for the lower figures of prevalence in that study.

In this study the cognitive domains least affected in the Test your memory test was verbal fluency, ability to copy and calculation whereas the least affected on the mini mental state exam were registration, verbal recall and orientation.

The cognitive domains most affected were visuospatial skills, semantic knowledge, attention and arithmetic.

In contrast, in a study to determine the profile of dementia in a Nigerian community-types, pattern, and severity rating, the most impaired cognitive domains were in memory and judgment[31]. Low literacy levels amongst respondents in this study may explain the lower scores on visuospatial skills, semantic knowledge and arithmetic.

Only 6% of respondents who could complete the trail making test B scored above 5 minutes. This is consistent with the study by Ogunniyi et al on the profile of Dementia in Nigeria that found personality changes to be the least affected[31].

When multiple logistic regression analysis was done, increasing age was not associated with lower scores on all the four cognitive tests chosen (tables 3, 4, 5 and 6). This is inconsistent with the Study on Global Ageing and Adult health that found increasing age to be associated with lower cognitive scores on the 10 word recall test[32]. It is also in contrast to the study by Mavrodaris et al that found older age to be associated with dementia. The smaller sample size in this study as compared to the other studies may account for this[30].

Sex was not associated with lower scores on the on all the four cognitive tests chosen (tables 3, 4, 5 and 6). This is inconsistent with the study of Global ageing and Adult Health and the study by Mavrodaris et al that found female sex being associated with lower scores on cognitive tests[30, 32]. The smaller sample size in this study may account for this finding.

This study showed that higher total scores were associated with higher levels of education with most respondents at the junior high level of education and above having higher scores than their less educated colleagues. Multiple logistic regression showed an association between higher educational levels and higher scores on all the four cognitive tests chosen. This is consistent with the study of Global ageing and Adult health that found higher educational level being associated with higher cognitive test scores on the 10 word recall test[32].

None of the respondents drank more than 21 units of alcohol a week. Logistic regression did not find an association between alcohol intake and scores on the 10 word recall test, mini mental state exam and Test your memory test (tables 3, 4 and 5). The low alcohol consumption amongst respondents may account for this. However, alcohol intake was associated with lower scores on the trail making test-B (95% CI: 1.0-13.0, p 0.048). Alcohol intake has an impact on visuospatial skills and may account for this.

Multiple logistic regression found an association between low eGFR and lower scores on the 10 word recall test (95% Confidence interval: CI 0.0-0.7, p value= 0.012). Thus kidney disease was associated with lower cognitive scores on the 10 word recall test. This is consistent with the study by Williams et al that found chronic kidney disease to be associated with cognitive impairment[33]. However, e GFR did not affect scores on the other cognitive tests chosen. The low sample size in this study may account for this.

Limitations

1. Additional surrogate biomarkers to evaluate the risk for cognitive impairment, such as apolipoprotein (apo) A-I, apoB, homocysteine, or noninvasive markers for atherosclerosis such as carotid intimal wall thickness or coronary calcium scores, could not be measured in this study due to financial constraints.

Magnetic Resonance Imaging brain scans and Cranial CT scans could not be done in patients with cognitive impairment since these investigative modalities were not available at the study site.

2. Several aspects of the study used self-report such as duration of smoking, family history of cognitive impairment, and associated risk factors. Therefore, under-reporting or over-reporting cannot be ruled out.

3. Several factors known to contribute to cognitive impairment i.e. Nutritional factors, infections like HIV were not screened for. Tests like thyroid function were also not done since they were not available at the study site.

4. The data collected and results or conclusions cannot be generalised for the whole of Ghana.

Conclusion

It can be concluded from this study that the elderly population in Techiman are in the relatively younger age group of 65-70 years. The frequency of cognitive impairment in elderly patients presenting at the out patients' clinic at the Holy Family Hospital, Techiman is high ranging from 49% to 76%. The cognitive domains most affected were visuospatial skills, semantic knowledge, arithmetic and attention. The least affected cognitive domains were verbal fluency, ability to copy, calculation, verbal recall and orientation.

Higher educational levels were associated with higher scores on all the cognitive tests chosen.

List of abbreviations

AD	:	Alzheimer's disease
ADLS	:	Activities of daily living scale
CIND	:	Cognitive impairment no dementia
eGFR	:	Estimated glomerular filtration rate
HIV	:	Human immunodeficiency virus
JHS	:	Junior high school
MCI	:	Minimal cognitive impairment
MMSE	:	Mini mental state examination
SHS	:	Senior high school
SD	:	Standard deviation
TMTB	:	Trail making test-B
TYM	:	Test your memory test

Definition of terms

1. Cognitive impairment was defined as a deficit in at least two aspects of cognitive function[1]. The key areas of cognition are attention, memory, language, visuospatial skills, and frontal/executive functions[2, 3].

2. Elderly patients were defined as patients aged 65 years and above[4].

3. A high alcohol intake was defined as ≥ 14U per week for women, ≥ 21U per week for men[5]. Current or past alcohol intake status was ascertained from either the patient or a reliable relative**.**

4. Low estimated glomerular filtration rate was defined as stages 3-5 using the Cockroft-Gault equation[6].

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