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## THE PROFILE AND IMPACT OF PROBABLE DEMENTIA IN A SUB-SAHARAN AFRICAN COMMUNITY: RESULTS FROM THE IBADAN STUDY OF AGEING

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### Abstract

**Objective**—To determine the profile of dementia in a Sub-Saharan Africa country and assess its effects on role functioning and quality of life.

**Methods**—Using a multi-stage stratified clustered sampling of households in the Yoruba-speaking areas of Nigeria representing 22% of the national population, 2152 persons aged 65 years and over were studied. Probable dementia was evaluated with a validated cognitive test, the 10-word delayed recall test. Activities of daily living (ADL), instrumental activities of daily living (IADL), as well as quality of life were also assessed.

**Results**—The prevalence of probable dementia in this sample was 10.1% (95% CI, 8.6 – 11.8%). Female gender and increasing age were risk factors. Also, lifetime history of alcohol use doubles the risk. Affected persons had relatively preserved functioning and quality of life.

**Conclusion**—The findings suggest that the diagnosis of dementia may be downwardly biased in this culture due to relatively preserved levels of social and functional roles.

### Keywords

Dementia; prevalence; role functioning; quality of life

## INTRODUCTION

Dementia is a growing problem worldwide[1, 2]. With increasing longevity, the health and social costs of the disorder are bound to increase. In spite of the scourge of the human immunodeficiency infection and the acquired immunodeficiency syndrome on its populations, Sub-Saharan African countries can expect the number of their elderly people to grow substantially in the next several decades[3]. Estimates of the proportions of such persons that may be affected by dementia are crucial for policy planning. Even though dementia appears to be the most studied disease of the elderly in Africa, the number of studies is still relatively few[4]. Researchers in Ibadan, Nigeria, in collaboration with colleagues in Indianapolis, USA have followed up large cohorts of community-dwelling Yoruba Nigerians and African Americans and have provided data on the prevalence, incidence and the putative risk factors for dementia and Alzheimer's disease (AD), the commonest type of dementia, using both the DSM-IV and ICD-10 classifications[5, 6]. Interestingly, the findings suggest that the prevalence and incidence rates of dementia and AD were significantly lower in the Yoruba than in African Americans. However, the study in Ibadan was conducted in a relatively socially homogenous inner-city section of the city

and so did not permit examination of the association of dementia with socioeconomic indices of interest. Also, extrapolation of results from one study to other parts of the same region not to mention the whole country is fraught with problems because interactions between genes and environment have been shown to be important in AD pathogenesis. It thus becomes important that similar studies be carried out in other parts of the same country, and involving groups or people of same ethnic origin, for teasing out the possible environmental factors involved.

This study reports the results of a survey that was conducted among elderly Yoruba residing in the south-west and north-central parts of Nigeria. We determined the prevalence of probable dementia as well its association with role functioning and quality of life among persons with 65 years and over.

## METHOD

### Sample

The Ibadan Study of Aging (ISA) is a community based survey of the mental and physical health status as well as the functioning and disability of elderly persons (aged 65 years and over) residing in the Yoruba-speaking areas of Nigeria, consisting of eight contiguous states in the south-western and north-central regions (Lagos, Ogun, Osun, Oyo, Ondo, Ekiti, Kogi and Kwara). These states account for about 22% of the Nigerian population (approximately, 25 million people). The survey was conducted between November 2003 and August 2004.

Respondents were selected using a four-stage area probability sampling of households. In the first stage of the sampling, 14 strata were created from an ordered list of all Local Government Areas (LGA's) in 7 of the states on the basis of 2 strata per state (rural or urban). LGAs in Lagos State were constituted into one self-representing stratum, on the basis of the size and cosmopolitan nature of the state. The LGAs thus formed the Primary Sampling Units (PSUs). An LGA is a geographic unit with a defined administrative and political structure. Two LGAs were selected from each of the 14 strata (except in Kogi State where there was only one rural LGA), with the probability of selection proportional to size. With the 17 self-representing PSUs in Lagos, a total of 44 PSUs was obtained. (One selected PSU in Kwara was subsequently dropped before fieldwork commenced in view of an on-going civil strife in the LGA). In the second stage, four Enumeration Areas (EAs) were systematically selected from each of the 43 PSUs. EAs are geographic units of LGAs and consist of between 50 and 70 housing units. They are a creation of the National Population Commission and are used by the Commission in the conduct of national census.

All selected EA's were visited by research interviewers prior to the interview phase of the survey and an enumeration and listing of all the household units in which persons aged 65 years and older resided was conducted. These lists were entered into a centralized computer data file from which the survey sample of households was drawn randomly from each EA. In the final stage of the selection, which was conducted during the interview phase of the survey, interviewers obtained a full listing of all persons aged 65 years and over residing in the household from an informant. In each households with more than one eligible person (aged 65 years and fluent in the language of the study, Yoruba), the Kish table selection method was used to select one respondent[7]. When the primary respondent was either unavailable following repeated calls (5 repeated calls were made) or refused to participate, no replacement was made within the household. On the basis of this selection procedure, face-to face interviews were carried out on 2152 respondents, giving a response rate of 74.2%. Respondents were informed about the study and provided consent, mostly verbal but sometimes signed, before interviews were conducted.

The survey was approved by the University of Ibadan/University College Hospital, Ibadan Joint Ethical Review Board.

## Measures

**Cognitive Assessment**—Assessment of cognition was performed using the adapted 10-Word Delay Recall Test (10-WDRT). Adapted from the Consortium to Establish a Registry of Alzheimer's Disease (CERAD) ten-word learning list [8] the 10-WDRT is a test of memory. In the learning phase, respondent is asked to repeat a list of ten words immediately after it is read out to him or her. This process is repeated three times to ensure adequate learning. The respondent is asked to recall the ten words after 5 minutes and the delayed recall score is the number (out of possible 10) that is correctly recalled. In an earlier study in developing Asian, South American, and African country sites, the 10-WDRT was shown to have discriminatory ability of 90 (95% confidence interval, 89 – 91) for cases of dementia when compared with non-cases and only 4.7% of group effect due to education [9].

The adapted 10-WDRT used in this survey is a component of the battery of tests included in the Indianapolis-Ibadan Dementia Project (IIDP), a community-based study comparing the prevalence and incidence of dementia among Yoruba Nigerians and African-Americans aged 65 years and above [5, 6]. In the adaptation, butter, arm, letter, queen, grass, and engine were taken from the original CERAD list. Ticket, pole, shore, and cabin were replaced with ocean, hut, tree, and nail. In the IIDP, a comprehensive clinical assessment formed the basis for the diagnosis of dementia, using both the DSM-IV and the ICD-10 criteria. Drawing on data derived from the Ibadan component of that project, we used logistic regression models to classify demented from normal subjects based on the performance on the 10-WDRT after adjusting for gender and age. The results indicated that, in this setting, the 10-WDRT has a sensitivity of 76.9% and a specificity of 73.5% at a cut-off score threshold of 1/2. These values suggest that the 10-WDRT is a good and adequate tool for the diagnosis of probable dementia in this sample. A test-retest study of 38 respondents in the current sample, conducted about 7 days apart, also showed good reliability: intraclass coefficient of 0.66 (95% Confidence Interval: 0.35 – 0.82,  $p < 0.001$ ).

Depression was assessed using the World Mental Health Survey version of the WHO Composite International Diagnostic Interview [10], a fully structured diagnostic interview. Diagnosis was based on the criteria of the *DSM-IV* [11]. In this report, persons with 12-month DSM-IV major depressive disorder were excluded from analysis in view of the well-known association of cognitive impairment with depression. By excluding cases of depression, we have therefore sought to increase the specificity of the 10-WDRT even further.

Functional limitations were rated in two domains using the Katz Index of Independence in Activities of Daily Living (bathing, dressing, toileting, arising and transferring, continence, and feeding) [12] and an adaptation of the Nagi Physical Performance Scale and the Health Assessment Questionnaire (walking, climbing a flight of stairs, reaching above the head to carry something as heavy as 10 pounds, stooping, gripping small objects with hands, shopping, and activities such as sweeping the floor with a broom or pruning the grass around the yard) [13]. Each of the activities in was rated: 1) can do without difficulty, 2) can do with some difficulty, 3) can do only with assistance, or 4) unable to do. In this report, a rating of 3 or 4 was used to determine functional limitation on an item. Any such rating of at least one item was regarded as functional disability. A sub-group of 37 respondents was assessed twice, about 7 days apart, to determine the test-retest reliability of the disability items. Agreement was generally very good to excellent, ranging from a kappa of 0.65 to 1.0.

**Quality of Life**—All respondents also completed the World Health Organization Quality of Life assessment instrument, WHOQOL-Bref [14, 15]. The WHOQOL-Bref was developed to be a cross-culturally applicable tool for the subjective evaluation of health-related quality of life [14]. It has been shown to be a valid measure of quality of life in the elderly. In the current total sample, it has an excellent internal reliability (Cronbach alpha = 0.86).

### Training and Quality Control

The interviews were conducted by 24 trained interviewers, all of whom had at least a high school education. Many had been involved in field surveys and were experienced at conducting face-to-face interviews. Interviewers received a two-week training consisting of an initial six-day training followed by a further 2 days of debriefing and review after each of them had conducted two pilot interviews in the field. Six supervisors, all of whom underwent the same level of training, monitored the day-to-day implementation of the survey.

Quality control was implemented at various levels. A supervisor was responsible for the work of four interviewers and checked every questionnaire returned by those interviewers for completeness and consistency. He or she made random field checks on at least 10% of each interviewer's prospective respondents (more at the beginning of the survey) to ensure the correct implementation of the protocol and full adherence to interview format. Special emphasis was placed on the detection of systematic errors or bias in the administration of the interview. Each supervisor made regular returns to the project coordinator who, along with the principal investigator, also conducted random checks on the field. During the field work, regular debriefing sessions were held when all interviewers and supervisors returned to the central office for review of experience and discussion of difficulties. Following data collection, an extensive data cleaning was conducted to identify and rectify inconsistencies in dating, missing values, etc.

### Data analysis

In order to take account of the stratified multistage sampling procedure and the associated clustering, weights have been derived and applied to the rates presented in this report. Also, post-stratification to the target sex and age range were made to adjust for differences between the sample and the total Nigerian population (according to 2000 United Nations projections). The weight so derived was normalized to reset the sum of weights back to the original sample size of 2152. As earlier indicated, persons with 12-month DSM-IV diagnosis of major depressive disorder were excluded from analysis thus leaving a total sample of 1904 for this report.

In this report, we have examined the association of probable dementia with socio-demographic variables of age, sex, education, and economic status. Economic status was assessed by taking an inventory of household and personal items such as chairs, clock, bucket, radio, television set, fans, stove or cooker, car, telephone, etc. The list was composed of 21 such items. This is a standard and validated method of estimating economic wealth of elderly persons in low income settings [16]. Respondents' economic status is categorized by relating each respondent's total possessions to the median number of possessions of the entire sample. Thus, economic status is rated low if its ratio to the median is 0.5 or less, low-average if the ratio is 0.5 – 1.0, high-average if it is 1.0 – 2.0, and high if it is over 2.0. Residence was classified as rural (less than 12,000 households), semi-urban (12,000 – 20,000 households) and urban (greater than 20,000 households). Also, the quality of house floor was categorized into two (concrete vs. earth) as another proxy of economic status.

We report prevalence rates of probable dementia based on weighted data, along with estimates of standard errors. Logistic regression analysis [17] was used to estimate the association of probable dementia with sociodemographic and lifestyle variables, the latter after adjusting for age and sex. The logistic regression coefficients were transformed to odds ratios (ORs) for ease of interpretation. Significance of each logistic regression effect was determined using a Wald  $X^2$  test statistic. In view of the complex sample design and weighting, we used the jackknife replication method implemented with the STATA statistical package to estimate standard errors for proportions [18]. All of the confidence intervals reported are adjusted for design effects.

We assessed the association of probable dementia with the domains of quality of life using linear regression [19]. The total possible score in each domain was converted to 100. We then computed the percent score of persons with and without probable dementia in each domain. We produced the adjusted mean difference between the two groups as representing the decrement in quality of life due to the effect of probable dementia, after controlling for age and sex. The analysis was repeated for the physical, psychological, social, and environmental domains as well as overall quality of life as assessed by the WHOQOL. This analysis sought to answer the question: how much decrement in quality of life is due to the presence of probable dementia after controlling for age and sex?

## RESULTS

The prevalence of probable dementia in this sample was 10.1% (95% CI, 8.6 – 11.8%). Females were significantly affected than males (Table 1) and there were the expected higher rates with increasing age, with more than 1 in 5 persons aged 80 years and over having the diagnosis.

We next examined the risk of probable dementia across sociodemographic subgroups (Table 2). Women had a higher risk than men (OR, 2.8) and compared with persons in the age-group 65 – 69 years, those in the age group 80+ years had more than three-fold increase in risk (3.4). Neither educational level nor economic status was associated with the occurrence of probable dementia. Also, the place of residence was not a risk factor. In regard to lifestyle features, lifetime tobacco use was not a risk factor for dementia. However, after adjusting for the possible effects of sex and age, persons reporting a lifetime history of alcohol use were almost 2 times more at risk of having probable dementia than those who have been abstinent all life.

Table 3 shows that the odds were elevated for persons with probable dementia to be disabled in all of the areas of activities of daily living and instrumental activities of daily living. The highest risk was for bathing (OR, 4.88) and the lowest was for walking (OR, 1.27). However, in view of the variability of the risks within the group, the increased risks were only significant for bathing, stooping and shopping. Among the three, the increased risk was highest for bathing, intermediate for stooping (OR, 3.22), and lowest for shopping (OR, 1.86).

As shown in Table 4, persons with probable dementia had lower quality of life than those without in all domains. The unadjusted decrement was highest in the environmental domain (4.85%) and lowest in the social domain (2.81) but it was statistically significant in each case. The table shows that once the effects of age and sex were taken into account, while the decrement in the physical, psychological, and environmental domains ranged between 2.14% to 4.19% and remained significant, albeit reduced, that in the social domain was negligible and no longer significant (0.27%).

## DISCUSSION

This paper reports the results of a large community-based study of cognitive impairment, functional disability as well as quality of life of a regionally representative sample of elderly persons in Nigeria. The population of the Yoruba-speaking people of Nigeria is over 25 million and they represent about 22% of the Nigerian population. This survey is therefore, to our knowledge, the most comprehensive assessment of the elderly in Sub-Saharan Africa. Our results suggest that probable dementia, using a previously validated cognitive test, is present in about 1 in every 10 persons aged 65 years and over. Its occurrence is commoner in females and increases with advancing age, reaching a prevalence of about 21% in those aged 80 years and over. Our rates are higher than previously reported among elderly Yoruba. In the longitudinal comparative survey of dementia in Yoruba Nigerians and African Americans, our group has reported a prevalence rate for dementia of 2.29% in the Yoruba as against a rate of 8.24% in African Americans [5]. Our current rate is therefore closer to the previously reported rate among African Americans and indeed to the rate reported in some studies conducted among Caucasians. For, example, a large Canadian study reports an age-adjusted prevalence rate of 8.0% for dementia [20].

Several possible reasons can be advanced for the higher rate in the present report. One, we have used a screening tool in the current survey rather than conducting a whole gamut of clinical assessments as was done in our earlier comparative study. Even though the screen was validated using data derived from that comparative study and has also been shown by others to be a valid tool for the diagnosis of dementia, our assessment still fell short of a full clinical assessment with detailed informant interview and indicative laboratory and imaging studies. Two, we are reporting a survey that covered a much wider terrain than in the comparative study which was conducted in an inner city community in Ibadan. It is plausible to speculate that if environmental factors are important in the etiopathogenesis of dementia, as is widely believed, rates may vary in a study involving a wider geographic area in which possible lifestyle differences may obtain. Three, and of fundamental importance, is the fact that functional impairment is a major criterion for the diagnosis of dementia using either the DSM-IV or ICD-10 classification [11, 21]. As is shown in our present report, the association of cognitive impairment with social dysfunction or disability is not as high as may be the case in Western societies. The implication of this is that persons who show sufficient evidence of cognitive impairment on a cognitive test but who do not show commensurate level of social impairment may not receive a clinical diagnosis of dementia based on either DSM-IV or ICD-10. Prevalence rates of dementia in our setting that are based on either of these systems may therefore be affected by false positives.

The associations of dementia with age and with the female sex are well known [2]. They have been reported by others and have been found to apply in our own setting in previous reports [22]. In this sample, the risk for probable dementia increased with age but only reached statistical significance when those aged 80 years and over are compared to those in the group 65 – 69 years. Lack of association with education has been previously reported by us [22]. Significantly, this observation also confirms the robustness of the ascertainment tool as it suggests that scores on it are not very much related to level of education. As reported by Prince and colleagues, the group effect due to education on the 10-WDRS is less than 5% across several developing country sites. We found no association between probable dementia and either economic status or place of residence. In some studies, especially those conducted among African Americans, rural residence has been found to increase the risk of dementia [22]. It has been speculated that this association may indicate some exposure to environmental toxins. In regard to lifestyle issues, we found no association between dementia and smoking. The literature on this has been mixed with some finding that smoking increased the risk for dementia, especially of the Alzheimer type, and others

finding no such link[23, 24]. Our observation of an increased risk of dementia among elderly persons reporting a lifetime use of alcohol is of some interest. However, the link between alcohol consumption and dementia appears not to be a simple one. Some studies have suggested that a little alcohol protects against the development of cognitive decline while excessive consumption increases risk [25-27]. Our data does not permit us to examine this pattern of association as we did not enquire about amount and pattern of consumption.

There were very few significant associations between probable dementia and functional disability in this study. Even though the odds ratios suggest that persons with probable dementia were at elevated risk to be disabled in all of the areas assessed, there was wide variability within the group as indicated by the spread of the confidence intervals. Consequently, among the thirteen variables representing activities of daily living and instrumental activities of daily living, only three (bathing, stooping, and shopping) were significantly associated with the presence of probable dementia. This observation is striking given the implied widespread functional impairment that a diagnosis of dementia connotes. The lack of the expected level of functional disability in this sample is most probably a reflection of at least two factors. One, the daily living of our subjects is likely to have been very simple and basic. The living environment is often without sophisticated utilities and therefore posing very little cognitive challenges. Two, the social environment is one that protects elderly persons rather than imposes tasks on them. Most elderly persons will have people around them that help conduct daily activities thus providing a buffer even in the face of declining cognitive capacity [28]. The finding in regard to quality of life further reinforces these speculations. While we are not unaware of the problems that may be associated with self-reports of quality of life in dementia[29], it is nevertheless true that most people with mild to moderate degrees of cognitive impairment are able to give a valid assessment of their own quality of life[30]. In this report, the levels of decrement in quality of life in the domains examined were very small indeed. They do suggest that the effect of cognitive decline on the quality of life of affected persons was rather minimal. The lack of a significant decline in the social domain is particularly interesting. It is a further proof of the extent to which the social life of elderly persons in out setting may be relatively unaffected probably until very late in the dementing process. Together, these findings provide a strong, albeit tentative, indication that rates of dementia from traditional and developing societies may be downwardly biased because of diagnostic bottlenecks that reflect a relatively undemanding social environment for the elderly. It may be that only elderly persons at the severe end of cognitive impairment are likely to cross the threshold of the social impairment criterion and receive a diagnosis.

In conclusion, our findings suggest that dementia, or at least comparable level of cognitive impairment, may be more common than previously thought. Elderly persons with probable dementia may not be reaching categorical diagnosis based on DSM-IV or ICD-10 due to a relatively unaffected level of social and functional roles.

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**TABLE 1**

Prevalence of probable dementia by socio-demographic groups

	%	95% Confidence Interval
Entire sample (n= 1904)	10.1	8.6-11.8
<b>SEX</b>		
Female	14.6	12.6-16.9
Male	7.0	5.2-9.4
<b>AGE</b>		
65-69	7.2	5.5-9.4
70-74	7.7	4.7-12.2
75-79	10.7	7.3-15.4
80+	20.9	16.7-26.0
<b>EDUCATION, yrs</b>		
0	12.3	10.0-15.0
1-6	6.7	4.6-9.7
7-12	8.8	5.1-14.6
13+	9.7	5.1-17.6

**Table 2**

Socio-Demographic and Lifestyle Predictors of Probable Dementia

	Odds Ratio	95% Confidence Interval	P
<b>SEX</b>			
Male	1	-	
Female	2.78	1.61-3.22	0.001
<b>AGE</b>			
65-69	1	-	-
70-74	1.07	0.57-2.01	0.835
75-79	1.54	0.99-2.63	0.112
80+	3.40	2.91-5.06	0.001
<b>EDUCATION, yr</b>			
13+	1	-	-
7-12	0.89	0.32-2.48	0.825
1-6	0.67	0.30-1.46	0.302
0	1.31	0.59-2.87	0.498
<b>ECONOMIC STATUS</b>			
High	1	-	-
High Average	0.71	0.29-1.76	0.451
Low Average	0.92	0.38-2.19	0.844
Low	1.62	0.70-3.78	0.255
<b>RESIDENCE</b>			
Rural	1	-	-
Semi-Urban	1.08	0.68-1.71	0.734
Urban	1.27	0.81-1.99	0.293
<b>TOBACCO USE</b>			
Never	1	-	
Ever use	1.10*	0.74-1.63	0.633
<b>ALCOHOL USE</b>			
Never	1	-	
Ever Use	1.92*	1.38-2.79	0.001

\* Adjusted for sex and age

**Table 3**

Risk of functional disability in persons with probable dementia

	<b>Adjusted Odds Ratio *</b>	<b>95% Confidence Interval</b>	<b>P</b>
Bathing	4.88	1.68-14.15	<b>0.005</b>
Dressing	2.88	0.89-9.35	0.076
Toileting	1.41	0.57-3.50	0.455
Arising/Transferring	2.73	0.95-7.85	0.062
Continence	2.01	0.39-10.20	0.392
Feeding	2.12	0.47-9.66	0.323
Walking	1.27	0.52-3.11	0.590
Climbing stairs	1.56	0.87-2.81	0.132
Reaching	2.37	0.97-5.77	0.057
Stooping	3.22	1.28-8.08	<b>0.014</b>
Griping	2.17	0.90-5.26	0.084
Shopping	1.86	1.08-3.18	<b>0.026</b>
Activities around the house	1.53	0.91-2.59	0.107

\* Odds ratio adjusted for sex and age.

**Table 4**

Impact of probable dementia on quality of life

WHOQOL-Bref Domains <sup>I</sup>	Persons with no probable dementia, % of possible total scores	Persons with probable dementia, % of possible total scores	Percentage reduction (unadjusted)	Percentage reduction (adjusted) <sup>I</sup>
Physical	77.56	73.06	-4.49**	-2.14*
Psychological	79.58	76.20	-4.29**	-3.05*
Social	70.37	67.28	-2.81*	-0.27
Environmental	72.55	68.69	-4.85**	-4.19**
TOTAL	76.09	72.27	-5.20**	-3.23**

<sup>I</sup> WHOQOL is the WHO Quality of Life assessment, short version.

<sup>I</sup> Adjusted for sex and age

\* p <0.05

\*\* p <0.01