

Knowledge of Stroke Risk Factors, Warning Signs, Emergency Response, and Prevention among Adults in an Urban Community in Nigeria

Margaret Bukola Fatudimu*, Justina Obano, and Joshua Olumayowa Ojo

ABSTRACT

Background: Stroke is a leading cause of death and disability worldwide, requiring early intervention for effective management. Delays in seeking emergency care are often due to a lack of knowledge about stroke signs and the appropriate response. There is therefore the need to assess the knowledge of stroke risk factors, warning signs, emergency response, and prevention among adults in Ibadan, Nigeria.

Methods: This mixed method design study involved a cross-sectional aspect and a Focus Group Discussion (FGD). A questionnaire adapted from a previous study was used to obtain information on the level of knowledge of stroke risk factors, warning signs, emergency response, and prevention among the participants. Data collected through the FGD was transcribed and analyzed thematically.

Results: Majority of the participants had a poor knowledge of stroke risk factors and stroke warning sign and stroke prevention. "Health workers" are the most common source of stroke information for adults in the community studied. Younger age group participants and participants with tertiary education demonstrated higher proportions with good knowledge levels compared to the older age group participants and participants with lower levels of education.

Conclusion: From the findings of this study, it was concluded that there should be more implementation of stroke educational programs for adults in Ibadan with better emphasis on stroke risk factors, warning signs, and prevention.

Keywords: Emergency response, knowledge of stroke risk factors, prevention, warning signs.

Submitted: March 03, 2025

Published: April 18, 2025

 10.24018/lejmed.2025.7.2.2293

Department of Physiotherapy, College of Medicine, University of Ibadan, Nigeria.

*Corresponding Author:
e-mail: bukolaifatudimu@yahoo.com

1. INTRODUCTION

Stroke is the second leading cause of death, and the third leading cause of death and disability combined worldwide [1]. The global burden of stroke is increasing dramatically, and this continues to exert huge pressure on people affected by stroke, their families and societies. In 2019, globally there were over 12 million new stroke cases and 6.55 million deaths, accounting for 143 million Disability Adjusted Life Years (DALYs) lost [2]. In Africa, the annual incidence rate of stroke is up to 316 per 100,000, a prevalence of up to 1,460 per 100,000 and a 3-year fatality rate >80% [3]. It has been indicated that Africa could have up to 2–3 times greater stroke incidence and prevalence

than Western Europe and the United States [3]. Stroke risk factors include non-modifiable factors (age, sex, family history, race/ethnicity) and modifiable factors (hypertension, smoking, poor diet, physical inactivity, history of TIA) [4]. Increasing age and hypertension are widely considered to be the most powerful predictors of stroke [5]. Adults aged 40 and above show a steep rise in vascular risk factors leading to stroke [6], [7]. As many of the risk factors are modifiable, stroke is a largely preventable condition, this underscores the need for effective interventions to reduce the risk of stroke.

Stroke is regarded as a medical emergency that requires early recognition and timely management. Delay in seeking emergency medical attention has been attributed to failure



to recognize the warning signs of a stroke [8]. This may be due to a lack of awareness among the general populace on stroke symptoms and the need for a rapid response. The National Institute of Neurological Disorders and Stroke established five warning signs for stroke, these are; numbness or weakness in the face, arms, or legs (especially on one side of the body); confusion, difficulty speaking or understanding speech; vision disturbances in one or both eyes; dizziness, trouble walking, loss of balance or coordination; severe headache with no known cause [9]. In addition to these warning signs, the National Stroke Foundation recognized a sixth sign; difficulty swallowing [10].

Although stroke management has made significant progress over the years, stroke remains a debilitating condition that is becoming more prevalent due to the global aging population and epidemiological shifts in low- and middle-income countries. Ways to spread awareness of stroke are also currently evolving [11], however, knowledge about stroke among the public has not been found satisfactory in most of the studies worldwide, particularly in populations at risk [11], [12]. Studies in the Northern and Eastern parts of Nigeria indicate poor stroke awareness across various populations, including those at risk and even health workers [13]–[16]. There appears to be a dearth of literature on the level of knowledge, particularly among adults aged 40 years and above, in Ibadan on stroke risk factors, warning signs, emergency response, and prevention. Ibadan is the largest city in the Southwestern part of Nigeria, and it is classified as an urban city. Understanding the level of knowledge of stroke among different demographics is crucial for developing tailored interventions to mitigate the impact of stroke. This study therefore aims to evaluate the level of knowledge of adults in Ibadan on stroke risk factors, warning signs, emergency response and prevention.

2. METHOD

2.1. Study Design and Setting

This study adopted a mixed method design, comprising a cross-sectional study and a focus group discussion. Participants for this study were consenting adults aged 40 years and above living in Ibadan, Oyo state, Nigeria and who could speak, write and understand either English or Yoruba Language. Individuals were excluded if they had a previous history of a stroke or transient ischemic attack.

2.2. Sample Size and Sampling Technique

The sample size for this study was calculated using the Taro Yamane formula; $n = N/(1 + Ne^2)$, where N is the population size (63,032), according to the National Population Commission of Nigeria [17], [18] and “ e ” is the margin of error set at (5%). The minimum sample size was calculated to be 397, however, a total of 399 participants were recruited for the cross-sectional study. 10 participants were recruited for the FGD for ease of handling the questions and responses during the discussion. Participants were purposively recruited from churches and mosques in Ibadan North for both the cross-sectional survey and the FGD.

TABLE I: SOCIO-DEMOGRAPHIC CHARACTERISTICS OF PARTICIPANTS (N = 399)

Variable	Frequency (n)	Percentage (%)
Age (years)		
40–49	164	41.1
50–59	131	32.8
60–69	86	21.6
70–79	16	4.0
80–89	2	0.5
Sex		
Male	177	44.4
Female	222	55.6
Marital status		
Single	51	12.8
Married	316	79.2
Separated	10	2.5
Divorced	3	0.8
Widowed	19	4.8
Source of stroke information		
Health workers	113	28.3
Family members and friends	51	12.8
Radio/television	55	13.7
Newspaper or magazines	7	1.8
Stroke survivors	20	5.0
Church/mosque	3	0.8
Two sources	53	13.0
Three sources	27	6.8
Four sources	42	10.5
None of the sources	29	7.3
Level of education		
None	10	2.5
Primary	13	3.3
Secondary	58	14.5
Tertiary	318	79.7
Occupation		
Unemployed	36	9
Business owner	81	20.3
Civil servant	209	52.4
Professional	73	18.3
Medical condition		
Hypertension	80	20.1
Diabetes	22	5.5
Both hypertension and diabetes	8	2.0
Neither hypertension nor diabetes	289	72.4

2.3. Data Collection

Data for the cross-sectional survey was collected using a questionnaire on the knowledge of stroke risk factors, warning signs, emergency, response, and prevention previously developed and used by Arisegei et al. [19]. Permission to modify the questionnaire to suit the demographics of the participants was sought and obtained from the original author. The questionnaire was grouped into six sections:

Section A assessed the demographic information of the participants. This section comprised of eight items—age, sex, marital status, religion, educational level, occupation, medical condition (hypertension and/or diabetes), and previous history of stroke/TIA.

Section B comprised four items assessing the participants’ sources of stroke information and general knowledge of stroke.

Section C comprised 12 items on knowledge of stroke risk factors. Responses were “Yes,” “No,” or “I don’t know,” with correct answers scoring 1 point (maximum obtainable score was 12 points). The grading categories for this section were made using percentiles as follows; <33% (0–3 points) as poor knowledge, ≥33%–<66% (4–7 points) as fair knowledge, and ≥66% (8–12 points) as good knowledge.

Section D contained 10 items on knowledge of stroke warning signs. Responses followed the same format as Section C, with a maximum score of 10. The grading categories for this section was made using percentiles as follows; <33% (0–2 points) as poor knowledge, ≥33%–<66% (3–6 points) as fair knowledge, and ≥66% (7–10 points) as good knowledge.

Section E contained one item on knowledge of stroke emergency response. A correct response (call an ambulance/ take to the hospital) was assigned a score of 1 while an incorrect response (do nothing, for example, wait and see) or I do not know the response was assigned a score of 0. Participants were categorized as having poor knowledge if they scored 0 and having good knowledge if they scored 1.

Section F contained 8 items on knowledge of stroke prevention. Responses were scored similarly to Sections C and D, with a maximum score of 8. Knowledge was graded as poor (<33%, 0–2 points), fair (33%–66%, 3–4 points), or good (≥66%, 5–8 points).

The focus group discussion was carried out with a focus guide comprising five open-ended questions that explored the knowledge of stroke risk factors, warning signs, emergency response, and prevention among the participants. These semi-structured, open-ended questions only served as a guide. The moderator used comments from the discussants to stimulate the discussion and validate the discussants’ responses. A digital audio recorder was used to record information obtained from participants during the focus group discussion. Members of the focus group discussion included: (i) the moderator, (ii) the note-taker, (iii) the researcher, (iv) the participants, and (v) the transcriptionist. The FGD was facilitated by a moderator using the prepared focus guide. Participants were encouraged to speak freely and spontaneously, with an assurance of anonymity. Comments from the discussants and probes as may be necessary were also used to stimulate the discussion. The discussion was audio-taped and field notes were taken by the note taker while the researcher recorded the information obtained. The audio-taped information was transcribed verbatim by a transcriptionist.

2.4. Data Analysis

Data for the cross-sectional survey was analyzed using Statistical Package for Social Sciences (SPSS) version 27. Data was summarized using descriptive statistics of frequency and percentages. The chi-square test was used to test for association between selected socio-demographic variables (age and educational level) and each level of knowledge of stroke risk factors, warning signs, emergency response, and prevention. The level of significance was set at $p < 0.05$. Manual thematic content analysis was used to analyze data obtained from the focus group discussion.

3. RESULTS

A total of 399 adults completed the study questionnaire. Two hundred twenty-two (55.6%) participants were females, and 164 (44.1%) of the respondents were between 40 and 49 years of age. A total of 79.7% ($n = 318$) of the respondents had tertiary education as their highest educational level. A substantial majority of participants ($n = 371$, 93%) reported having heard of stroke before this study. Among the various sources of stroke information listed, health workers were the single most commonly cited source ($n = 113$, 28.3%) as reported in [Table I](#).

The participants had a good understanding of the description of the stroke. A total of 257 (64.4%) of the participants correctly identified stroke as a disease of blood vessels in the brain. Additionally, a good proportion correctly associated stroke with body parts such as the brain ($n = 293$, 73.4%) and limbs ($n = 347$, 87.0%) ([Table II](#)).

Only 100 (25.1%) of the respondents had good knowledge of stroke risk factors while 155 (38.8%) participants had poor knowledge of stroke risk factors. Hypertension was the most commonly known risk factor ($n = 365$, 91.5%) while polycythemia was the least identified stroke risk factor ($n = 57$, 14.3%) ([Table III](#)).

One hundred and sixty-four (41.1%) of the respondents had poor knowledge of stroke warning signs. Only 81 (20.3%) of participants had a good knowledge of stroke warning signs. Sudden weakness/paralysis on one side of the body was the most identified stroke warning sign by participants ($n = 361$, 90.5%). 359 (90%) wrongly identified sudden loss or reduced sensation all over the body as a warning sign of stroke ([Table IV](#)).

A total of 334 (83.7%) participants had a good knowledge of stroke emergency response where the same number of participants indicated that they would call an ambulance or be taken to the hospital in the case of a stroke suspicion ([Table V](#)).

An even distribution was obtained in the level of knowledge of stroke prevention by the participants with 133 (33.3%) of participants having good, fair, and poor levels of knowledge respectively. The most identified stroke prevention measure was “ensure appropriate treatment of hypertension” ($n = 382$, 95.7%). Less than half ($n = 154$, 38.6%) of the participants knew that avoidance of oral contraceptives by females was a preventative measure against stroke ([Table VI](#)).

Results showed that there was a significant association between participants’ age and each of their knowledge of stroke risk factors ($\chi^2 = 20.935$, $p = 0.007$), stroke warning signs ($\chi^2 = 21.655$, $p = 0.006$), and stroke prevention ($\chi^2 = 15.997$, $p = 0.042$). Also, there was a significant association between participants’ educational level and each of their knowledge of stroke risk factors ($\chi^2 = 15.41$, $p = 0.017$), stroke warning signs ($\chi^2 = 12.657$, $p = 0.049$), stroke emergency response ($\chi^2 = 23.086$, $p = 0.001$) and stroke prevention ($\chi^2 = 13.426$, $p = 0.037$) ([Table VII](#)).

Ten participants participated in the FGD. All participants were recruited from St Patrick Catholic Church, Bashorun. For the study and to ensure anonymity, participants were identified by numbers assigned to them; 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10. The socio-demographic information of the participants is summarised in [Table VIII](#).

TABLE II: PARTICIPANTS' UNDERSTANDING OF THE DESCRIPTION OF STROKES

Statements	No (%)	Yes (%)	I do not know (%)
Stroke can be described as which of the following?			
Disease of blood vessels in the brain	30 (7.5)	257 (64.4)	112 (28.1)
Disease of blood vessels in the heart	63 (15.8)	192 (48.1)	144 (36.1)
Disease of blood vessels in the kidney	144 (36.1)	66 (16.5)	189 (47.4)
Disease caused by germs (microorganisms)	188 (47.1)	51 (12.8)	160 (40.1)
Disease caused by spiritual attack	214 (53.6)	81 (20.3)	104 (26.1)
Which of the following organs or parts of the body can be affected after a stroke?			
Brain	32 (8.0)	293 (73.4)	74 (18.5)
Face and mouth	28 (7.0)	319 (79.9)	52 (13.0)
Heart	70 (17.5)	182 (45.6)	147 (36.8)
Kidneys	113 (28.3)	93 (23.3)	193 (48.4)
Limbs	20 (5.0)	347 (87.0)	32 (8.0)

TABLE III: DISTRIBUTION OF PARTICIPANTS' RESPONSES TO KNOWLEDGE OF STROKE RISK FACTORS

Statements	Correct response (%)	Incorrect response (%)
Aging (as age increases)	194 (48.6)	205 (51.4)
Not exercising regularly	243 (60.9)	156 (39.1)
Being overweight or obese	251 (62.9)	148 (37.1)
Smoking tobacco (cigarette)	205 (51.4)	194 (48.6)
High blood pressure (hypertension)	365 (91.5)	34 (8.5)
Diabetes mellitus	166 (41.6)	233 (58.4)
Eating food containing too much fat	205 (51.4)	194 (48.6)
Excessive alcohol intake	232 (58.1)	167 (41.9)
Family history of stroke	303 (75.9)	96 (24.1)
Heart diseases	217 (54.4)	182 (45.6)
Use of oral contraceptives by females	61 (15.3)	338 (84.7)
Too much blood in the body (polycythemia)	57 (14.3)	342 (85.7)
Overall knowledge of stroke risk factors	n	%
Poor	155	38.8
Fair	144	36.1
Good	100	25.1

TABLE IV: DISTRIBUTION OF PARTICIPANTS' RESPONSES TO KNOWLEDGE OF STROKE WARNING SIGNS

Statements	Correct response (%)	Incorrect response (%)
Sudden and severe headache	267 (66.9)	132 (33.1)
Sudden dizziness, loss of balance or coordination	297 (74.4)	102 (25.6)
Sudden loss of memory	229 (57.4)	170 (42.6)
Sudden loss of vision	162 (40.6)	237 (59.4)
Sudden difficulty in speaking	323 (81)	76 (19)
Sudden difficulty in swallowing	147 (36.8)	252 (63.2)
Sudden loss or reduced sensation on one side of the body	333 (83.5)	66 (16.5)
Sudden loss or reduced sensation all over the body	40 (10)	359 (90)
Sudden weakness/paralysis on one side of the body	361 (90.5)	38 (9.5)
Sudden weakness/paralysis all over the body	50 (12.5)	349 (87.5)
Overall knowledge of stroke signs/symptoms	n	%
Poor	164	41.1
Fair	154	38.6
Good	81	20.3

All ten participants interviewed for the discussion had heard of stroke before the focus group discussion. Participants demonstrated varying levels of understanding regarding stroke. Responses included definitions of stroke as a sudden illness leading to deformity, a loss of brain function due to interrupted blood supply, or a disease affecting the brain and limbs. Common terms used in the

definition and description of stroke were deformity and paralysis. This is shown in the excerpts below:

"From my knowledge, it is a kind of sudden illness that leads to deformity of both the hands and legs whereby the person will not be able to lift either the hand or leg" (P7, male).

TABLE V: DISTRIBUTION OF PARTICIPANTS' RESPONSES TO KNOWLEDGE OF STROKE EMERGENCY RESPONSE

Statements	Response (%)
Do nothing, for example, wait and see	55 (13.8)
Call an ambulance/take to the hospital	334 (83.7)
I do not know	10 (2.5)
Knowledge of stroke emergency response	n (%)
Poor	65 (16.3%)
Fair	0 (0)
Good	334 (83.7%)

"It is a disease that affects the brain" (P6, male).

"I know it as a loss of brain function caused by interruption of blood supply to the brain. A common word that comes to mind when I hear stroke is paralysis" (P2, male).

"It is a disease that affects the brain and the hands and legs" (P3, male).

"It is a disease that can occur as one is growing old" (P7, male).

Three out of the 10 participants expressed their understanding of partial and full strokes.

"As I said earlier, it is a kind of sudden illness that leads to deformity of the hands and legs whereby the person will not be able to lift either the hand or leg for partial stroke, and then for full stroke, the person will not be able to lift both the hand and the leg" (P7, male).

"Partial stroke is the type of stroke whereby the person loses the sense of touch in just half of the body, while full stroke is the one where the person loses his sense of touch all over the body" (P1, Male).

"Just looking at the words, partial means something that is not complete. So, for me, a partial stroke is just a stroke that can affect some parts of the body, and it will not be as serious as the full one. A full stroke affects everywhere, that one is very serious." (P4, Female).

Participants unanimously agreed that stroke is not contagious and is primarily a non-communicable disease. However, two of the participants expressed beliefs in spiritual causes, emphasizing personal anecdotes or attributing strokes to mysterious occurrences. This is shown in the excerpts below:

"No, stroke is not a contagious disease at all, it is medical" (P7, male).

"I agree with him, stroke is not something you can contact from another person" (All Participants).

"Although one cannot contract stroke from another person who has it, it can come suddenly as spiritual. I have a friend who was just in his living room and a strange breeze just blew in and that was how he had stroke. He was very fine before that day, and after that strange breeze, he had a stroke" (P1, male).

"Well, for me, it is both. It can be medical and spiritual. Sometimes, some things happen that we cannot explain" (P9, male).

Participants identified various risk factors for stroke. While some identified lifestyle factors such as excessive

alcohol consumption and smoking, some others identified advanced age, obesity, and hypertension. Two of the participants however considered too much thinking and exposure to cold as risk factors for stroke. This is seen below:

"I believe that once a person is over the age of 40, excess alcohol drinking, smoking and if you are the type that has high BP and you fall. Immediately you fall with high BP, It is a stroke. I have a friend who had a stroke. He had high BP and he fell, that was how he had a stroke" (P6, Male).

"Obesity, when someone is too fat. It can cause stroke" (P10, Female)

"From my knowledge, too much thinking can cause it. When you think too much, especially deep thinking, it can lead to stroke" (P4, Female).

"I know that too much of thinking, too much of drinking cold something and cold weather can lead to stroke. Also, old age, like 50 years and above" (P9, Male).

When probed on what they meant by "too much thinking," one of the participants explained further:

"When I mean deep thinking, it's not the right or normal thinking. It means thinking out of tension. Being tensed up, always anxious or worrying too much" (P4, Female).

When asked to list some of the signs and symptoms of stroke, participants commonly recognized paralysis, mobility impairment, and speech difficulties. This is shown in the excerpts below:

"Paralysis, deformed parts of some of the body such as the hands and legs. The mouth will also get disfigured; it will shift to one side" (P3, Male).

"Inability to move the upper limbs and lower limbs. There is also some level of atrophy because they are not using the limbs. So, the limbs tend to reduce in size" (P2, Male).

"The person cannot walk normally. Sometimes it can cause them to become deaf, they cannot hear and speak up as before" (P9, Male).

"Difficulty walking; someone with stroke will not be able to walk well. They will also have constant pain in their bones" (P6, Male).

"Loss of speech in some people" (P10, Female).

"The person will suddenly be dumb. It will be hard for the person to talk, he will just be making signs" (P1, Male).

In addition to the common signs of paralysis, mobility impairments, and speech difficulty listed by the majority of the participants, one of the participants attributed irrational behaviors to stroke signs. In his words he said

"Irrational behaviors. They tend to behave somehow because they are not in their right senses" (P7, Male)

When asked to explain further what he meant by irrational behaviors, P7 responded;

TABLE VI: DISTRIBUTION OF PARTICIPANTS' RESPONSES TO KNOWLEDGE OF STROKE PREVENTION

Statements	Correct response (%)	Incorrect response (%)
Engage in regular physical exercise	356 (89.2)	43 (10.8)
Lose weight (if overweight or obese)	318 (79.7)	81 (20.3)
Avoid or quit smoking	303 (75.9)	96 (24.1)
Ensure appropriate treatment of hypertension	382 (95.7)	17 (4.3)
Reduce consumption of fatty foods	314 (78.7)	85 (21.3)
Eat fruits and vegetables regularly	378 (94.7)	21 (5.3)
Avoid excessive alcohol intake	322 (83.2)	67 (16.8)
Females should avoid the use of oral contraceptives	154 (38.6)	245 (61.4)
Knowledge of stroke prevention	n	%
Poor	133	33.3
Fair	133	33.3
Good	133	33.3

TABLE VII: ASSOCIATION BETWEEN SELECTED SOCIO-DEMOGRAPHIC VARIABLES AND KNOWLEDGE OF STROKE RISK FACTORS, STROKE WARNING SIGNS, STROKE EMERGENCY RESPONSE AND STROKE PREVENTION

Knowledge/variable	Age		Educational level	
	χ^2	p	χ^2	p
Stroke risk factors	20.94	0.007	15.41	0.017
Stroke warning signs	21.655	0.006	12.657	0.049
Stroke emergency response	14.731	0.065	23.086	0.001
Stroke prevention	15.997	0.042	13.426	0.037

TABLE VIII: SOCIO-DEMOGRAPHIC CHARACTERISTICS OF FGD PARTICIPANTS

Participants' no.	Sex	Age (years)	Level of education
1	Male	57	Secondary
2	Male	44	Tertiary
3	Male	54	Tertiary
4	Female	40	Tertiary
5	Female	42	Tertiary
6	Male	47	Tertiary
7	Male	45	Tertiary
8	Male	42	None
9	Male	44	Primary
10	Female	41	Tertiary

"I mean abnormal behavior. They don't behave like they used to before, they behave abnormally. Like confusion, mixing things up"

Additionally, three of the participants wrongly identified stomach pain, deafness, and sleepless nights as stroke signs/symptoms respectively. This is shown in the excerpts below.

"It can affect their stomach and kidney because of too much drinking. They will complain of pains in their stomach" (P8, male).

The person cannot walk normally. Sometimes it can cause them to become deaf, they cannot hear and speak up as before" (P9, Male).

"Sleepless nights. They will find it difficult to sleep. Someone who has a stroke will be thinking too much and will not be able to sleep very well" (P4, Female).

There was a consensus among participants regarding specific body parts commonly affected by stroke. All participants agreed that the limbs, both the upper limbs and lower limbs, are affected after a stroke. Participant 9 clearly stated that:

"Stroke can occur either in the hand or leg. It will weak you such that you won't have any strength to walk or do anything with the hand" (P9, Male).

His statement was supported by participant 7 who stated that:

"It is a disease that affects the hands and the legs" (P7, Male).

Similarly, another participant stated that in addition to the hands and legs, the mouth is also affected. In her words:

"I know someone with a stroke that his mouth was a little bit disfigured, so aside from the hands and legs, the mouth too is affected" (P10, Female).

Having identified the signs/symptoms of stroke and body parts affected, participants highlighted functional limitations associated with stroke, such as mobility limitations, difficulties in eating, bathing, driving, and dependence on others for daily activities. This is shown in the excerpts below:

"Walking; the person cannot walk well and when you cannot walk well, a lot of activities become difficult" (P2, Male).

"Eating also, can become difficult because the hand is now weak, especially if it is the hand that the person uses normally that is now affected" (P6, Male).

"Driving" (P7, Male).

Even taking care of one's self like bathing, the person may not be able to pick up a bowl of water and pour on himself" (P10, Female).

"The person will mostly be bedridden. He/she cannot move around. If he could walk before, he will eventually stop walking and he will be at the mercy of others. My boss at work came down with a stroke and since last year February, he has not returned to work. It just affects everyone around you, directly or indirectly" (P5, Female)."

Responses regarding immediate response to a stroke episode varied, with suggestions ranging from immediate hospitalization to the use of herbal remedies or unconventional treatments. One of the participants advocated for cardiopulmonary resuscitation (CPR), while three others emphasized traditional or alternative approaches. Participant 5 stated that:

"Since I don't know the first aid to give to that person at that point, I will rush the person to the hospital to get help as quickly as possible" (P5, Female).

This was corroborated by Participant 10, who stated; *"I will rush the person to the hospital immediately" (P10, Female).*

One of the participants, participant 6, however, had a different response. He stated that:

"For me, I know two friends with stroke. One was given herbs and he was cured in the space of two months. The other person was taken to the hospital and treated with orthodox medicine and till now, the person cannot walk well. So, anywhere I see someone having a stroke, I will tell them not to go to the hospital but they should take herbs quickly instead" (P6, Male).

This was partly supported by another participant who stated that:

"I am not sure taking to the hospital is the first thing I will do. In a way, herbs are an option. This is because

I know someone that was taken immediately to the hospital and within 4–5 hours, he died" (P7, Male).

Preventive strategies proposed by participants included regular medical checkups, lifestyle modifications such as regular exercise, moderation of alcohol consumption, and stress reduction. Family history assessment and early immunization were also suggested as preventive measures, particularly for younger individuals. This is shown in the excerpts below:

"Regular body checkup; BP, sugar level and all that" (P7, Male)

"Check your blood sugar once in a while cause if it's too high or low it can lead to stroke" (P10, Female).

"Once you are over 40, ensure that you drink enough water. Exercise regularly and moderate your drinking" (P6, Male).

"Reduce thinking and worrying too much, it's not good for old age" (P4, Female).

"Immunization" (P8, Male).

When probed on why immunization, Participant 8 responded thus; *"like when the children are still young, there can be some immunization that they will give them that will prevent them from having it later on" (P8, Male).*

"For younger people and even everyone, it is very good to get your family history because there are some people that it is genetic. So, if you know your family is in this category, you can start to prevent it on time" (P6, Male).

4. DISCUSSION

4.1. Participants' Source(s) of Stroke Information

The majority of participants in this study had heard of stroke before the study with "Health workers" being the most commonly cited source of stroke information. This may be attributed to the fact that most people prefer to get medical information from healthcare personnel as they believe the information given may be more accurate and error-free. This finding is in line with a similar study conducted in Nigeria [20], [21]. However, Kayode-Iyasere and Odiase [22] reported contrasting findings in a study among Nigerian adults aged 18 years and above, where "faith-based organizations" were identified as the most common source of stroke information and hospital/health seminars was the least identified. It may be that there is poor access to healthcare professionals or a higher number of faith-based health conventions where the study was carried out. The finding in this study that the majority of participants had their information from health workers suggests that there should be adequate stroke educational programs for health workers so that they are better educated and informed on the appropriate information to give to patients and their relatives presenting in health care facilities.

4.2. Participants' Understanding of the Description of Stroke

Results from the quantitative and qualitative study showed that participants had a fair to good understanding of the description of strokes. This may be attributable to the easily noticeable affection of the hand and leg in the hemiplegic gait presentation of someone with a stroke and so the majority of the participants were able to associate the limbs with stroke. This is in line with a similar study in Nigeria by Arisege et al. [19] where the limbs were also the most affected body part known by participants. However, this finding was contrary to those by Alhazani et al. [23] and Khalil and Lahoud [24] conducted in Saudi Arabia and Lebanon respectively which had higher proportions of participants correlating stroke with the brain as the affected organ. Participants in these regions may have been exposed to more public health campaigns that emphasized the neurological aspect of stroke, leading them to associate stroke primarily with the brain.

4.3. Participants' Knowledge of Stroke Risk Factors

Results from the quantitative study showed that a larger proportion of participants had poor knowledge of stroke risk factors. This poor knowledge may be attributed to insufficient public health awareness campaigns on stroke risk factors. This finding is similar to that of a study by Hosseini-zhad et al. [25] where the largest proportion of respondents also had poor knowledge of stroke risk factors. However, another study by Arisege et al. [19] conducted in Nigeria reported good knowledge of stroke risk factors among the majority of participants. This difference may be because the latter study was conducted among known hypertensive and diabetes patients and thus might have influenced their knowledge.

The majority of participants were aware that hypertension is associated with an increased risk of stroke. This finding corroborates the findings in several studies done in Nigeria and other climes which identified hypertension as the most recognized modifiable stroke risk factor [20], [23], [26]. The use of oral contraceptives by females was one of the least identified risk factors in this study. Cultural sensitivities around discussions of female reproductive health and contraception in this part of the world may inhibit open dialogue about the risks associated with oral contraceptives and thus may have been a possible reason for this [27], [28]. Also, stroke awareness campaigns may focus on more commonly known risk factors, potentially overshadowing the role of oral contraceptives in stroke risk. This finding is similar to that of a study by Hosseini-zhad et al. [25] conducted among Iranian adults.

Participants in the FGD also had poor knowledge of stroke risk factors. A good number of participants believed thinking and worrying were risk factors for stroke. According to Vincent-Onabanjo and Moses [29], the expression "thinking" in the Nigerian setting depicts negative/depressive thoughts and worry, and it is widely regarded as a major cause of high blood pressure and cardiac disorders. This may have therefore been a possible reason why some of the participants linked "thinking" with stroke. This finding correlates with those of previous studies where

participants identified thinking, stress, and depression as risk factors for stroke [25], [29].

4.4. Participants' Knowledge of Stroke Warning Signs

Nearly half of the participants in the cross-sectional survey for this study had a poor level of knowledge of stroke warning signs. The participants from the FGD also had poor knowledge of stroke signs, as most of the participants could only list at most, two warning signs of stroke. This is in line with findings from other studies done in Nigeria which also reported inadequate and poor knowledge of stroke warning signs among the participants [20], [27]. However, findings from studies conducted in other parts of the world, Ethiopia and Iran, reported average and good knowledge levels, respectively [25], [30]. This variation may be attributed to the difference in healthcare provision such as access to healthcare information and health education across the different geographical locations.

Sudden weakness/paralysis on one side of the body was the most identified warning sign in this study. This was also seen in the FGD where participants identified paralysis and difficulty walking due to weakness as warning signs for stroke. The reason for the identification of sudden unilateral weakness by many may be that it is the most common manifestation of stroke that they have seen. While this is in line with findings from similar studies conducted in Nigeria [14], [30], it differs from the findings in studies conducted in Saudi Arabia and Ireland where sudden severe headache and slurred speech were the most common stroke signs identified, respectively [23], [31], [32]. It could also be that these are the most common manifestations of stroke seen by many in those regions.

4.5. Participants' Knowledge of Stroke Emergency Response

From the quantitative study, results showed that participants had a good level of knowledge of stroke emergency response. A substantial majority of the participants indicated that they would call an ambulance/taken to the hospital in response to a stroke suspicion. This means that a majority of participants are aware of and acknowledge the importance of time in the event of a stroke and that the seriousness of the stroke was not underestimated by the participants. Studies have also shown that females tend to have better health-seeking behaviors [32] and since there was a predominance of females in this study, this may explain why a substantial majority of the participants indicated that they would call an ambulance/take to the hospital. Other studies conducted in Spain and also Nigeria show similar findings in this regard [27], [33]. In contrast, participants in the FGD had poor knowledge of stroke emergency response. This suggests that there is still a need for educational programs on the importance of appropriate and immediate response in the case of a stroke suspicion.

4.6. Participants' Knowledge of Stroke Prevention

Interestingly, participants had an even distribution of good, fair, and poor knowledge of stroke prevention. This may be attributable to the fact that participants in this study had varying levels of education. Samal et al. [34]

reported contrasting findings among hospitalized patients in Austria, with the study reporting good knowledge of stroke prevention among the participants. A possible explanation for this variance could be improved access to health services and information that may be obtainable in more developed countries, such as Austria, compared to Nigeria.

Although the quantitative study showed an even distribution of good, fair, and poor knowledge levels of stroke prevention among the participants, the qualitative study reinforced the poor level of knowledge of stroke prevention among the participants. Less than a third of the participants were aware of more than two preventive measures for stroke. Regular medical check-ups especially blood pressure checks and blood sugar tests were the two commonly mentioned preventive measures in the qualitative study. This is encouraging as it shows that participants are aware of the risk of hypertension and diabetes in stroke.

4.7. Associations between Selected Socio-Demographic Variables and Knowledge of Stroke Risk Factors, Stroke Warning Signs, Stroke Emergency Response, and Stroke Prevention

There was a significant association between participants' age and their knowledge of stroke risk factors, warning signs, and prevention. This result is consistent with those of previous studies conducted in Ireland and Saudi Arabia [31], [35], [36]. This significant association could be attributed to the fact that a greater number of participants in this study belonged to the youngest age group and that younger people may have a higher exposure to knowledge due to advancements in technology as younger people are more adept at using technology, they are more able to navigate and search for information compared to older people and thus may be more knowledgeable than older participants.

There was no significant association between participants' age and knowledge of stroke emergency response. However, participants generally had good knowledge of stroke emergency response, regardless of age. This is in line with another study conducted by Hosseininezhad et al. [25] among an Iranian population where there was also no significant association between participants' age and their level of knowledge of stroke emergency response. A possible reason for the lack of association between age and knowledge of stroke emergency response could be that participants may have been exposed to different stroke educational programs such as from health workers, television, and family/friends, which may have influenced their knowledge, rather than their age.

There was also a significant association between participants' educational level and their knowledge of stroke risk factors, warning signs, emergency response, and prevention. This is consistent with findings reported by similar studies conducted in other regions [24], [30]. A likely reason for the significant association between educational level and knowledge of stroke risk factors, warning signs, emergency response, and prevention reported in this present study could be that individuals with higher educational levels may have greater access to educational materials and educational programs, allowing them to be more

knowledgeable about stroke-related issues. Also, educational attainment is often linked to socioeconomic status, so individuals with higher educational levels may have greater financial resources and access to health care, which can contribute to better knowledge about health-related issues such as stroke.

5. CONCLUSION

From the findings of this study, it was concluded that "Health workers" are the most common source of stroke information for adults in the community studied. There is a good level of knowledge of stroke emergency response among the participants, albeit a poor level of knowledge of stroke risk factors, warning signs, and prevention. There was a significant association between participants' age, educational level, and level of knowledge of stroke risk factors, warning signs, and prevention. Younger age group participants and participants with tertiary education demonstrated higher proportions with good knowledge levels compared to the older age group participants and participants with lower levels of education.

It is recommended that there should be more stroke educational programs for health workers in Ibadan. Other avenues for disseminating stroke-related information such as the media (television, radio, and Internet) should be explored as they have the potential to reach a wider audience. There should also be implementation of stroke educational programs for adults in Ibadan with more emphasis on stroke risk factors, warning signs, and prevention.

LIST OF ABBREVIATIONS

CPR	Cardiopulmonary Resuscitation
FGD	Focus Group Discussion
SPSS	Statistical Package for Social Sciences

ETHICAL APPROVAL

Ethical approval for the study was granted by the Health Research Ethics Committee of the University of Ibadan/University College Hospital (UI/UCH), under the reference number UI/EC/23/0792, before the commencement of the study. Permission to carry out the study was also obtained from the appropriate religious leaders of the religious centers. The nature, purpose, and procedure of the study were explained to the participants before participating in the study. Participants were informed of their freedom to refuse to take part in the study. Participants' informed consent was obtained before the administration of the questionnaire.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

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