

Original Research Article

Stroke: awareness of self-risk and superstitions among persons with sickle cell anemia in Calabar, Nigeria

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Abstract: Identification of gaps in stroke related knowledge among at risk individuals is vital to effective stroke prevention measures. This study aimed to assess the awareness of self risk of stroke and superstitions regarding stroke, among persons with sickle cell anemia in Calabar, Nigeria. We conducted a survey on eighty three members of the sickle cell support club, in Calabar, diagnosed with HbSS hemoglobinopathy. Univariate, bivariate and binary logistic regression were used to analyze data generated with a self-administered questionnaire on awareness of self risk of stroke conferred by inherited HbSS hemoglobin, held superstitions regarding stroke, knowledge of stroke symptoms and their opinion of where stroke is best managed. 34.9% of the respondents were unaware of their increased stroke risk. 27.7% of them believed that stroke is caused by witchcraft or voodoo. Four fifths of those who had up to tertiary level of education did not agree that stroke is caused by voodoo, compared to two thirds of those with less education ($p=0.047$). 65.1% of the respondents possessed poor awareness of stroke symptoms. High level of education ($p=0.04$) and recognizing hospital as where stroke is best managed ($p=0.047$) were identified predictors of awareness of increased self-risk of stroke. Many of the respondents were unaware of their increased stroke risk, believed voodoo to be a cause of stroke, and unable to correctly identify stroke symptoms. Improved population literacy rate and tailored public health education would help to address identified stroke related knowledge gaps and erroneous beliefs.

Keywords: sickle cell, stroke risk, hemoglobinopathy, superstitions

INTRODUCTION

Stroke is a catastrophic neurological condition contributing significantly to global mortality and morbidity (Grysiewicz RA *et al.*, 2008) It is estimated that about 85% of the global stroke mortality occur in Low and middle income countries (O'Donnell MJ, 2010; Song S, 2015). The consequences of stroke place additional burden on available health resources especially in sub-Saharan Africa; a region already grappling with inadequate available resources in the face of rising diverse health demands (Wahab KW, 2008; Chin JH, 2012). Stroke control is linked to measures aimed at identified risk factors.

Sickle cell disease (SCD) is recognized as one of the risk factors for stroke (Powars DR *et al.*, 2005; Strouse JJ *et al.*, 2009; Eke BC *et al.*, 2013). It is an autosomal recessive hemoglobinopathy found in tropical Africa, among populations of African origin,

and in some parts of Europe and Asia (Konotey-Ahulu F, 1996). In HbS, valine replaces glutamic acid at the 6th position of the amino acid sequence in the beta chain of hemoglobin (Timothy AW, 2000). The number of persons born with SCD is expected to increase in the coming decades (Piel FB *et al.*, 2013).

Nigeria is ranked among countries with the highest burden of SCD, with a prevalence of up to 2% (Hong GR, 1996; Odame I, 2014). In Nigeria, sickle cell disease is identified as a risk factor for stroke in the young, defined as the occurrence of stroke in a person younger than 50 years, which affects the more productive younger age groups in the society leading to loss of productivity in the local economy (Owolabi LF & Ibrahim A, 2012; Smajlovic D, 2015).

Despite the huge toll exacted by stroke, poor levels of stroke related knowledge have been reported

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among the general public; a trend that is observed even among individuals at increased risk of stroke (Anyanniyi O *et al.*, 2006; Zeng U *et al.*, 2012; Oparah SK *et al.*, 2017). Public health education has been advocated as a preventive strategy in stroke management (Wall HK *et al.*, 2008; Brown DL *et al.*, 2012; Prabhakaran S & Chong JY, 2014). Unfortunately, concerted public health efforts against the stroke menace in many sub-Saharan countries have been largely abysmal (Connor MD *et al.*, 2007; Wahab KW, 2008). Beliefs held by members of the society could affect the effectiveness of public health education (Bandura A, 1977). In many African societies, superstitious beliefs influence the concept of illness (Tenkorang EY, 2011). Indeed, spirituality is a recognized influential factor regarding health related outcomes (Oman D & Thoransen CE, 2002).

Identification of existing gaps in knowledge is necessary to devise appropriately tailored public health interventions, employed as preventive measures, to stem rising stroke incidence and the attendant adverse consequences (Mendis S, 2010).

In this study, we conducted a survey among persons living with sickle cell hemoglobinopathy in Calabar, Nigeria, to determine if they are aware of their increased risk of stroke, their beliefs regarding cause of stroke and stroke related health seeking practices, with the aim of unmasking existing gaps in their level of awareness in addition to generating data to guide the design of effective public health education on stroke; as an arm of the multifaceted approach to mitigate the stroke menace.

METHODS

This study was conducted in Calabar, the capital city of Cross river state, located in south eastern Nigeria. The city is a major tourist destination in the country with the total population put at 371,122 during the last national population census (National Population Commission, 2009). We conducted the study after obtaining approval for the study, and the process was in agreement with the Helsinki declaration of 1975, as revised in 1983.

The respondents were members of the Calabar sickle cell club; a nonprofit organization in the city of Calabar, Nigeria, whose membership includes persons diagnosed with sickle cell disease, health professionals and other stake holders. The club aims to provide needed support and promote optimal health for persons diagnosed with sickle cell disease. Convenience sampling method was employed to conduct this survey during proceedings at a biennial meeting of the club.

Data collection was restricted to consenting members aged 14 years and above who were previously diagnosed with sickle cell anemia (homozygous HbSS), following the determination of their hemoglobin (Hb)

genotype, using Hb electrophoresis. Those who declined to give consent were excluded from the study, in addition to those who are healthcare professionals.

Ninety one members of the Sickle cell club, non-healthcare professionals, were available for the survey. Three of the members, aged between 8 to 11 years, were excluded as they were considered too young to complete the survey instrument unaided. Five members of the club, unaffected by sickle cell disease, were excluded.

The survey instrument comprised of a structured self-administered questionnaire with sections on demographic characteristics of participants, including the age, gender and level of education. In the next section, the respondents were asked if their diagnosis of sickle cell hemoglobinopathy confers an increased risk for stroke; if stroke is caused by voodoo or witchcraft; to list five symptoms of stroke and where they consider as the most appropriate place to treat a person who has just suffered a stroke. A respondent who correctly listed two or more symptoms of stroke was considered to be aware of stroke symptoms.

Analysis of the generated data was done with SPSS version 20 statistical package. Simple proportions were used for categorized data whereas means and standard deviation (SD) were used for continuous variables. Student's t test and univariate analyses were used to compare numerical variables and explore association between variables, respectively. Binary logistic regression was used to determine predictors of variables. The level of significance was set at $p < 0.05$.

RESULTS

Eighty three respondents successfully completed the survey, comprising of 32 (38.6%) males and 51 (61.4%) females. The overall mean age of the respondents was 27.7 years \pm 8.87, with mean ages of 26.1 years \pm 9.51 and 28.7 years \pm 8.40 for the male and female respondents, respectively ($p= 0.20$). Twenty three (27.7%), 39 (48.2%) and 21 (24.1%) of them had up to secondary, tertiary and postgraduate levels of education, respectively.

Twenty nine (34.9%) of the respondents were unaware of the increased risk of stroke, conferred on them by the HbSS hemoglobin variant, and 60 (72.3%) of the respondents correctly identified stroke as an illness that is not caused by witchcraft or voodoo. Two thirds of the respondents who had up to a tertiary level of education knew they have increased risk of stroke whereas, half of those with less than tertiary level of education were unaware of their increased stroke risk ($p= 0.04$). Four fifths of those who had up to tertiary education affirmed that stroke is not caused by voodoo, compared to two thirds of those with less than tertiary education ($p=0.047$).

Fifty four (65.1%) of the respondents were deficient in the awareness of stroke symptoms. Three fifths of those who possessed up to tertiary education, were deficient in knowledge of stroke symptoms, compared to three quarters of those who had less education ($p = 0.30$). Two thirds of those who were aware of their increased risk of stroke from sickle cell hemoglobinopathy were deficient in the knowledge of stroke symptoms, compared to about three fifths of those who do not know of their increased risk of stroke ($p=0.68$).

Sixteen (19.3%) of the respondents do not believe that hospital is the best place for the treatment of someone who has just suffered stroke. Among those who do not approve of hospital as the best place to treat stroke; half believe that stroke is not treatable; a third of

them are of the opinion that stroke is best treated spiritually; while the rest believe that stroke is treated at a patent medicine dealer's shop.

Six out of seven, of those with further than secondary education, confirmed the hospital as the best place to manage a person who had just suffered stroke, compared to two thirds of those with less education ($p=0.03$).

Possessing further than secondary level of education and correctly identifying the hospital to be where acute stroke is best treated, were identified as predictors of awareness of increased self-risk of stroke from Sickle cell disease and appropriately not believing voodoo to be a cause of stroke, as shown in table1.

Table1. Predictors of awareness of self-risk of stroke and lack of superstitions regarding stroke among participants

Parameter	<i>p</i> -value ^a	<i>p</i> -value ^b
Gender	0.18	0.28
Age (in years)	0.67	0.24
Greater than secondary level education	0.04	0.047
Correct identification of where stroke is best treated	0.047	0.03
Good knowledge of stroke symptoms	0.68	0.59

a = Predictors of awareness of increased self-risk of stroke due to Sickle cell disease

b = Predictors of not attributing stroke to voodoo

DISCUSSION

Good levels of stroke related knowledge positively impacts on stroke prevention and mitigation of stroke burden (Spilker JA, 1996; Williams LS *et al.*, 1997). Our study reveals that a sizeable proportion of these at risk respondents were unable to identify their condition, of inherited HbSS hemoglobinopathy, as a risk factor for stroke. It is estimated that, barring intervention, 11% and 24% of persons with SCD will suffer from stroke by the time they attain the ages of 20 years and 45 years, respectively. The risk of stroke is highest among those with homozygous HbSS (Ohene-Frempong K *et al.*, 1998). The observed lack of awareness corroborates reports of poor knowledge of stroke risk factors and symptoms in the general public, which is seen even among populations at high risk of stroke (Kothari R *et al.*, 1997; Pancioli AM *et al.*, 1998; Sundseth A *et al.*, 2014; Oparah SK *et al.*, 2017).

In African societies, spirituality plays a remarkable role in cultural practices and diseases are commonly attributed to supernatural phenomena (Tenkorang EY, 2011; Ehiwe E *et al.*, 2013; Simmelink J *et al.*, 2013). This could explain our observation, despite the high level of education among the respondents, an appreciable proportion believe that stroke is caused by witchcraft. This held belief is reminiscent of the report from a similar study, in Ghana, in which up to a quarter of the interviewed

believed stroke to be an illness caused by witchcraft and evil spirits (Donkor ES *et al.*, 2014).

Furthermore, the poor knowledge of stroke symptoms seen in an even greater proportion of the respondents suggests that many of these at risk individuals would be unable to promptly recognize when they have suffered a stroke. Even the highly educated ones among the respondents were not spared of deficiency in the knowledge of stroke symptoms. Monitoring for chronic complications such as stroke, kidney disease and pulmonary hypertension, is an important component of comprehensive care for persons living with sickle cell disease (McGann PT *et al.*, 2013). Failure to recognize stroke symptoms could pose a barrier to the adoption of recommended health seeking behavior in stroke, which emphasizes on the prompt presentation to an appropriate health facility (Williams LS *et al.*, 1997). Adoption of the recommended practice of a prompt transfer to a hospital following onset of stroke is further hindered by the expressed belief, by some of the respondents, that stroke is not treatable. A proportion of those who agreed that stroke is treatable are of the opinion that the hospital is not the best place for stroke treatment, and would rather opt for spiritual or healing centers. Spirituality and traditional health practices largely dictate health beliefs and influence health seeking behavior in Nigerians (Chukwunke FN *et al.*, 2012).

Thus, prayers and spiritual interventions are commonly employed in managing illnesses (Vaughan LM & Holloway M, 2010).

Exploiting the opportunities presented by identification of barriers to treatment is of importance in designing the strategic measures to control the stroke menace (Brainin M *et al.*, 2007). Community stroke education, for example, is of immense benefits as a strategy to reduce delayed presentations and referrals of stroke patients (Spilker JA, 1996; Williams LS *et al.*, 1997; Pancioli AM *et al.*, 1998).

It is noteworthy that the participants in our study, who showed an appreciable ignorance of their increased stroke risk and beliefs regarding stroke, have a high literacy rate; as none of them possessed less than a secondary level of formal education, with over two-thirds of them possessing a graduate or post-graduate level of education. However, the positive impact of education on their performance was not lacking as the more highly educated participants, who had up to tertiary education, were better aware of the increased risk of stroke conferred by their HbSS status; were less likely to believe stroke to be a result of voodoo or witchcraft attacks in addition to being better informed on the appropriate place for stroke management. Indeed, some studies have identified high level of education as a predictor of good knowledge of stroke symptoms and risk factors (Zeng U *et al.*, 2012; Shravani K *et al.*, 2015; Vincent-Onabanjo G & Moses T, 2016). Notwithstanding, there are reports of inadequate stroke related knowledge even among populations in tertiary educational institutions (Obembe AO *et al.*, 2014).

The youthful ages of the respondents in our survey could be a reflection of the shortened lifespan of persons living with sickle cell disease. In the region, childhood mortality from sickle cell related causes is remarkably high that less than half of affected children survive up to the age of 5 years. This mortality trend continues throughout the periods of childhood and adolescence such that by the time they become adults, the prevalence of HbSS is ten times lower than the birth incidence rate (Grosse SD *et al.*, 2011).

CONCLUSION

We conclude that an appreciable proportion of the respondents, with sickle cell hemoglobinopathy, were unaware of their increased stroke risk and an even greater proportion failed to correctly identify stroke symptoms. Some believed that stroke is caused by voodoo and that the hospital is not the most appropriate place to treat stroke. Such deficiencies in awareness and erroneous beliefs about stroke hinder adoption of appropriate health seeking behavior, pivotal to stroke prevention and management.

There is need for appropriately tailored public health education to correct identified knowledge gaps and erroneous beliefs; as part of the preventive measures aimed at tackling the stroke menace. Furthermore, improvements in the quality and level of literacy in the general population would positively rub off on public stroke awareness.

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Authors` contributions

SKO was involved in the conception, design, data collection, supervised development of the work, data analysis and interpretation, initial manuscript draft, approval of final version, and acted as the corresponding author. He agreed to be accountable for all aspects of the work regarding accuracy and integrity. **SOO** contributed to data analysis, interpretation, critical review of article and approval of the final version. He agreed to be accountable for all aspects of the work regarding accuracy and integrity. **KOA** contributed to data collection, supervised development of the work, critical review of the article and approval of final version. He agreed to be accountable for all aspects of the work regarding accuracy and integrity.

Conflict of interests

The authors have no conflict of interests to declare. The study was wholly funded by the authors.

REFERENCES

1. Ayanniyi O, Akande O & Mustapha AF. (2006). "Knowledge and perception of stroke among adults in Osogbo, Nigeria," African Journal of Medicine and Medical Sciences; 35(4): 447– 452
2. Bandura A. (1977). Self-efficacy: toward a unifying theory of behavioural change. *Psych Rev*; 84(2): 191 – 125.
3. Brainin M, Teuschl Y & Kalra L. (2007). Acute treatment and longterm management of stroke in developing countries. *Lancet Neurol*; 6:553–561.
4. Brown DL, Conley KM, Resnicow K, Murphy J, Sánchez BN, Cowdery JE, Sais E, Lisabeth LD, Skolarus LE, Zahuranec DB, Williams GC & Morgenstern LB. (2012). Stroke Health and Risk Education (SHARE): design, methods, and theoretical basis. *Contemp Clin Trials*; 33:721–729.
5. Chin JH. (2012). Stroke in Sub-Saharan Africa: An Urgent Call For Prevention. *Neurology*; 78: 1007 - 8.
6. Chukwunke F N, Ezeonu CT, Onyire B N & Ezeonu P O. (2012). Culture and biomedical care in Africa: The influence of culture on biomedical care in a traditional African society, Nigeria, West Africa. *Nigerian Journal of Medicine*; 21(3): 331-3343

7. Connor MD, Walker R, Modi G & Warlow CP. (2007). Burden of stroke in black populations in sub-Saharan Africa. *Lancet Neurology*; 6: 269–78
8. Donkor ES, Awolabi M O, Bampoh P, Aspelund T & Gudnason V. (2014). Community Awareness of Stroke in Ghana. *BioMed Central Public Health*; 14:196-204.
9. Ehiwe E, McGee P, Thomson K & Filby M. (2013). How black West African immigrants perceive cancer. *Diversity and Equality in Health and Care*; 10: 115-121.
10. Eke BC, Ogunniyi AO & Isamade EI. (2013). Stroke Risk Factors among Patients in a Nigerian Teaching Hospital. *Journal of Medicine in the Tropics*; 15(1): 33 – 6.
11. Grosse SD, Odame I, Atrash HK, Amendah DD, Piel FB & Williams TN. (2011). Sickle cell disease in Africa: a neglected cause of early childhood mortality. *Am J Prev Med*; 41(6 Suppl 4): S398 - 405.
12. Grysiewicz RA, Thomas K & Pandey DK. (2008). Epidemiology of Ischemic and Hemorrhagic Stroke: Incidence, Prevalence, Mortality, and Risk Factors. *Neurol Clin*. 26: 871 - 95.
13. Hong G R. (1996). Haemoglobin Disorders. In Nelson W E, Behrman R E, Kliegman RM & Jenson, Hal B. (eds) *Nelson Textbook of Paediatrics*. Philadelphia: W B Saunders company 15th (ed), 1396 – 405
14. Konotey-Ahulu F. (1996). The history and Geographical Distribution of Sickle Cell. In, *The Sickle Cell Patient*. London: P Watford Tetteh Adomeno Company, 75 - 90.
15. Kothari R, Sauerbeck L, Jauch E, Broderick J, Brott T, Houry J & Liu T. (2013). Patients' awareness of stroke signs, symptoms, and risk factors. *Stroke* 1997; 28: 1871–1875.
16. McGann PT, Nero AC & Ware RE. (2013). Current Management of Sickle Cell Anemia. *Cold Spring Harb Perspect Med*. 3(8): a011817. doi: 10.1101/cshperspect.a011817
17. Mendis S. (2010). Prevention and care of stroke in low- and middle-income countries: the need for a public health perspective. *Int J Stroke*; 5:86–91.
18. National Population Commission (2009). 2006 population census of the Federal Republic of Nigeria. Analytical Report at the National level. National Population Commission, Abuja, 2009.
19. Obembe AO, Olaogun MO, Bamikole AA, Komolafe MA & Odetunde MO. (2014). "Awareness of risk factors and warning signs of stroke in a Nigeria University." *Journal of Stroke and Cerebrovascular Diseases*; 23(4): 749–758
20. Odame I. (2014). Perspective: we need a global solution. *Nature*; 515:S10.
21. O'Donnell M J, Xavier D, Liu L, Zhang H, Chin SL, Rao-Melacini P, Rangarajan S, Islam S, Pais P, McQueen MJ, Mondo C, Damasceno A, Lopez-Jaramillo P, Hankey GJ, Dans AL, Yusuf K, Truelsen T, Diener HC, Sacco RL, Ryglewicz D, Czlonkowska A, Weimar C, Wang X & Yusuf S. (2010). Risk factors for Ischemic and Intracerebral Hemorrhagic Stroke in 22 countries (the INTERSTROKE study): a case-control study. *Lancet*; (376): 112 -23
22. Ohene-Frempong K, Weiner SJ, Sleeper LA, Miller ST, Embury S, Moohr JW, Wethers DL, Pegelow CH & Gill FM. (1998). Cerebrovascular accidents in sickle cell disease: rates and risk factors. *Blood*; 91(1): 288-294.
23. Oman D & Thorensen CE. (2002). Does Religion Cause Health?: Differing Interpretation and Diverse Meanings. *Journal of Health Psychology*; 7: 365 - 380
24. Oparah S K, Uhegbu V M & Etokidem A J. (2017). Knowledge of Stroke Among At Risk Persons: A Survey of Patients At A Tertiary Hospital in Calabar, Southern Nigeria." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*; 16 (08): 97-100
25. Owolabi LF & Ibrahim A. (2012, Feb). Stroke in Young Adults: A Prospective Study from Northwestern Nigeria. *ISRN Neurol*. 2012: 468706. doi: 10.5402/2012/468706
26. Pancioli AM, Broderick J, Kothari R, Brott T, Tuchfarber A, Miller R, Houry J & Jauch E. (1998). Public perception of stroke warning signs and knowledge of potential risk factors. *JAMA*. 279:1288–1292.
27. Piel FB, Hay SI, Gupta S, Weatherall DJ & Williams TN. (2013, July). Global burden of sickle cell anaemia in children under five, 2010-2050: modelling based on demographics, excess mortality, and interventions. *PLoS Med*; 10 (7): e1001484.
28. Powars DR, Chan LS, Hiti A, Ramicone E & Johnson C. (2005). Outcome of sickle cell anemia: a 4-decade observational study of 1056 patients. *Medicine (Baltimore)*. 84(6):363–376.
29. Prabhakaran S & Chong JY. (2014). "Risk factor management for stroke prevention," *CONTINUUM: Lifelong Learning in Neurology*; 20(2): 296–308
30. Shrivani K, Parmar MY, Macharia R, Mateti UV & Martha S. (2015, Aug). "Risk factor assessment of stroke and its awareness among stroke survivors: a prospective study," *Advanced Biomedical Research*; 4:187 doi: 10.4103/2277-9175.164011
31. Simmelink J, Lightfoot E, Dube A, Blevians J & Lum T. (2013). Understanding the health beliefs and practices of East African refugees. *American Journal of health Behaviors*, 37(2): 155-161.
32. Smajlović D. (2015). Strokes in young adults: epidemiology and prevention. *Vasc Health Risk Manag*. 11: 157–164
33. Song S. (2015, Oct). The Global Stroke Burden. *World Neurology*; Vol 30, No 5
34. Spilker JA. (1996). The importance of patient and public education in acute ischemic stroke. In: *Proceedings of the National Symposium on Rapid*

- Identification and Treatment of Acute Stroke.* Washington, DC: National Institute of Neurological Disorders and Stroke; 73–78.
35. Strouse JJ, Jordan LC, Lanzkron S & Casella JF. (2009). The excess burden of stroke in hospitalized adults with sickle cell disease. *Am. J. Hematol.* 84(9):548–552.
 36. Sundseth A, Faiz KW, Rønning OM & Thommessen B. (2014). “Factors related to knowledge of stroke symptoms and risk factors in a Norwegian stroke population,” *Journal of Stroke & Cerebrovascular Diseases*, 23 (7): 1849–1855.
 37. Tenkorang EY, Gyimah SO, Maticka-Tyndale E & Adjei J. (2011). Superstition, witchcraft and HIV prevention in sub-Saharan Africa: The case of Ghana. *Culture, Health, and Sexuality*; 13(9): 1001-1014. doi:10.1080/13691058.
 38. Timothy AW. (2000). Gastrointestinal manifestations of sickle cell disease. <http://www.dcmsonline.org/jaxmedicine/2000journals/june2000/gastro.htm> accessed 8th August, 2018
 39. Vaughan L M & Holloway M. (2010). West African immigrant families from Mauritania and Senegal in Cincinnati: A cultural primer on Children’s health. *Journal of Community Health* 2010; 35: 27-35. doi:10.1007/s10900-009-9191-3
 40. Vincent-Onabajo G & Moses T. (2016). Knowledge of Stroke Risk Factors among Stroke Survivors in Nigeria. *Stroke Research and Treatment* 2016; Article ID 1902151, 5 pages <http://dx.doi.org/10.1155/2016/1902151>
 41. Wahab KW. (2008). The burden of stroke in Nigeria. *International Journal of Stroke*; 3: 290 – 2.
 42. Wall HK, Beagan BM, O’Neill J, Foell KM & Boddie-Willis CL. (2008). Addressing stroke signs and symptoms through public education: the Stroke Heroes Act FAST campaign. *Prev Chronic Dis.* 5: A49
 43. Williams LS, Bruno A, Rouch D & Marriott DJ. (1997). Stroke patients’ knowledge of stroke: influence on time to presentation. *Stroke*; 28:912–915.
 44. Zeng Y, He GP, Yi GH, Huang YJ, Zhang QH & He LL. (2012). “Knowledge of stroke warning signs and risk factors among patients with previous stroke or TIA in China,” *Journal of Clinical Nursing*; 21(19-20): 2886–2895