



Enhancing Stroke Prevention through Early Detection: A Critical Strategy for Risk Reduction and Improved Outcomes – A Case Study of Duala, Bushrod Island, Montserrado County, Monrovia, Liberia.

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Abstract

Stroke remains a major public health challenge in Liberia, with an increasing burden due to both traditional and emerging risk factors. Early detection and prevention strategies are critical for reducing stroke incidence and improving health outcomes. This study focuses on the prevalence of stroke-related risk factors among the population of Duala, Bushrod Island, Montserrado County, Monrovia, Liberia, highlighting both modifiable and non-modifiable contributors to stroke. A cross-sectional study was conducted with a sample population of 300 individuals. Data were collected on traditional risk factors such as hypertension, diabetes mellitus, & non-traditional risk factors such as oral contraceptive use among smokers; and were analyzed. Awareness levels regarding stroke symptoms and prevention strategies were also assessed. The findings revealed that high cholesterol/dyslipidemia (23.3%), obesity/high BMI (20%), and hypertension (16.6%) were the most prevalent traditional risk factors, while drug abuse (24.6%), pregnancy and postpartum period (23.0%), and oral contraceptive use in smokers (18.3%) emerged as significant non-traditional risk factors. The study also highlighted a gap in stroke awareness, with 32.6% of participants having no knowledge of stroke, and only 20% having participated in awareness programs. The high prevalence of both traditional and emerging risk factors for stroke underscores the need for enhanced public health strategies, on early detection, lifestyle reform, community-based awareness, and improving healthcare access, to reducing stroke incidence in this population.

Index Terms: Stroke Prevention, Risk Factors, Early Detection, Hypertension. Awareness, Liberia

INTRODUCTION

Stroke is a major public health concern and a leading cause of morbidity/disability and mortality worldwide, significantly impacting public health systems and economies (Feigin et al., 2021). It occurs due to the sudden interruption of blood supply to the brain, resulting in cell death and neurological impairment. Stroke burden is particularly high in low- and middle-income countries, where healthcare access and preventive measures are often inadequate (Owolabi et al., 2020). Early detection of stroke risk factors is crucial in reducing its incidence and improving health outcomes.

The Burden of Stroke in Liberia

Liberia's healthcare system continues to grapple with challenges in managing non-communicable diseases (NCDs), with stroke being a major contributor to morbidity and mortality (Liberian Ministry of Health, 2023). The limited availability of routine health screenings and diagnostic tools exacerbates the situation, leading to delays in identifying high-risk individuals. Furthermore, cultural beliefs and financial constraints discourage many from seeking preventive care, increasing the likelihood of severe complications when strokes occur (Sartori et al., 2020).

Early Detection as a Preventive Strategy

Early detection plays a critical role in stroke prevention, particularly through the identification of risk factors such as hypertension, atrial fibrillation, hyperlipidemia, and uncontrolled diabetes (Ovbiagele et al., 2019). Evidence suggests that proactive screening and timely medical interventions significantly lower stroke incidence and improve recovery rates (Johnston et al., 2020). Implementing community-based awareness programs and strengthening primary healthcare services could be game-changing strategies in addressing the high burden of stroke in Liberia.

In Liberia, like many other developing nations, stroke cases have been on the rise, primarily due to lifestyle changes, inadequate health screening, urbanization, lifestyle risk factors, limited awareness, and inadequate preventive healthcare (World Health Organization [WHO], 2019). In Duala Community, Bushrod Island, Montserrado County, Liberia, stroke prevalence is rising, influenced by both traditional risk factors such as hypertension, diabetes, and obesity, as well as non-traditional factors including drug abuse, pregnancy-related complications, and oral contraceptive use among smokers. However, limited research has been conducted to quantify these risks within the local population.

This study aims to assess the prevalence of traditional and emerging stroke risk factors among the residents of Duala, highlighting gaps in awareness and preventive healthcare. The findings will inform targeted interventions to reduce stroke incidence through early detection, community education, and policy recommendations.

LITERATURE REVIEW

Global Burden of Stroke

Stroke is a major health concern globally, accounting for approximately 12% of total deaths and a significant proportion of disability-adjusted life years (DALYs) (Johnson et al., 2020). The global incidence of stroke has nearly doubled over the past four decades, with sub-Saharan Africa experiencing a growing burden due to poor healthcare infrastructure and inadequate management of risk factors (Mensah et al., 2019).

Traditional Risk Factors for Stroke

Several well-established risk factors contribute to stroke incidence, including:

Hypertension: The most significant modifiable risk factor, responsible for nearly 50% of stroke cases globally (Kjeldsen, 2018). In the current study, hypertension was prevalent in 16.6% of the population.

Diabetes Mellitus: A known contributor to vascular damage, diabetes increases stroke risk by promoting atherosclerosis and microvascular complications (Zhou et al., 2018). In the study, 10% of participants had diabetes.

Dyslipidemia: High cholesterol levels contribute to atherosclerosis, leading to ischemic stroke (Koton et al., 2019). This study identified dyslipidemia in 23.3% of participants.

Smoking and Alcohol Use: Smoking accelerates atherosclerosis and increases clot formation, while excessive alcohol consumption contributes to atrial fibrillation and hypertension (Thun et al., 2020). This study found 10% of participants smoked, while 6.6% reported high alcohol use.

Obesity and Physical Inactivity: Excess body weight and sedentary lifestyles contribute to metabolic syndrome and cardiovascular disease, increasing stroke risk (Booth et al., 2017). Obesity was observed in 20% of the study population, and physical inactivity in 13.3%.

Emerging and Non-Traditional Risk Factors

Beyond conventional risk factors, recent studies highlight additional contributors to stroke risk, including:

Oral Contraceptives in Smokers: The combination of smoking and hormonal contraceptives increases clotting risk and stroke incidence (Roach et al., 2019). In this study, 18.3% of participants had this risk factor.

Pregnancy and Postpartum Period: Hormonal changes and increased clotting factors make pregnancy a hypercoagulable state, leading to a higher risk of stroke, particularly in women with pre-existing conditions (James et al., 2021). This study found a 23% prevalence in this category.

Migraine with Aura: Studies suggest that migraine, particularly in women, is associated with an elevated stroke risk due to vascular dysfunction (Kurth et al., 2020). In this study, 16.3% of participants reported migraines with aura.

Drug Abuse (Cocaine, Amphetamines, Heroin): Illicit drug use is linked to vasospasm, hypertension, and clot formation, significantly increasing stroke risk (Bernstein et al., 2018). This study revealed drug abuse in 24.6% of participants.

Hyperhomocysteinemia: Elevated homocysteine levels contribute to endothelial damage and increased clot formation, raising the risk of ischemic stroke (Spires et al., 2019). This study recorded a prevalence of 17.6%.

Stroke Awareness and Prevention

Public awareness plays a crucial role in reducing stroke incidence through early detection and lifestyle modification. Studies indicate that knowledge of stroke symptoms and risk factors is often low in developing countries, leading to delayed treatment and poorer outcomes (Mohan et al., 2018). In this study, 32.6% of participants had no awareness of stroke, while only 20% had participated in stroke prevention programs. The increasing burden of stroke in Liberia necessitates urgent public health interferences. This study highlights the need for targeted awareness programs, improved screening for both traditional and emerging risk factors, and enhanced healthcare accessibility. Preventive strategies, including lifestyle modifications and early medical interventions, are crucial in mitigating the growing stroke prevalence in Duala and similar communities.

METHODOLOGY

This cross-sectional pilot study recruited 300 participants aged 18 years and above, from community health clinics, hospitals, and public awareness events. Participants were selected based on inclusion criteria: adults 18 years and older who provided informed consent. Exclusion criteria included individuals with existing severe neurological impairments and complicated cardiovascular diseases. Data collection tools included structured questionnaires assessing demographic details, medical history, lifestyle factors, awareness, and clinical biometric measurements. Blood pressure, blood sugar levels, cholesterol levels, and ECG readings were recorded. Data analysis utilized descriptive and inferential statistics, with Likert-scale responses categorized to assess stroke awareness levels.

FINDINGS/RESULTS**Table 1: Fig 1: Demographic Characteristics of Respondents (Age Range of the Respondents)**

No	Characteristic	Frequency (n=300)	Percentage %
1	18-30	84	28%
2	31-50	120	40%
3	51 and above	96	32%
	Total	300	100%

Table Interpretation:

The largest age group falls within 31-50 years, 120 persons responded, representing 40% of the total participants. This suggests that middle-aged adults form the majority of those engaged in the study, which could indicate higher awareness or greater vulnerability to stroke risk factors in this demographic. For the age group of 18-30 years, 84 subjects contributed accounting for 30% of the participants. Younger adults (18-30) may be included due to lifestyle-related risk factors such as smoking, alcohol consumption, and obesity. The older age group of 51 and above, 96 subjects, accounting for 32% responded. This age group is typically at higher risk due to aging-related conditions like hypertension and cardiovascular diseases. The fairly balanced distribution across age groups ensures a comprehensive assessment of stroke risk factors across different life stages, strengthening the study's findings on early detection and prevention.

Table 1: Fig 2: The Gender Ratio of the Respondents

No	Characteristic	Frequency	Percentage %
1	Male	193	64.33%
2	Female	107	35.66%
3	Total	300	100%

Table Interpretation:

The data presents the gender distribution of the study population, consisting of 300 participants. Males accounted for a significantly higher proportion (64.33%), while females made up 35.66% of the sample. This suggests that men were more represented in the study, which may indicate a higher prevalence of stroke risk factors or greater willingness among men to participate in health screenings and assessments. The gender disparity in the study is important to consider when analyzing risk factor distribution, as some stroke-related risk factors, such as smoking and drug abuse, tend to be more prevalent among men, while others, such as pregnancy-related risks and oral contraceptive use, are exclusive to women.

Table 1, Fig 3: The Ethnic Ratio of the Respondents

No	Characteristic	Frequency	Percentage %
1	Kpelleh	32	10.6%
2	Bassa	53	17.6%

3	Kru	98	32.6%
4	Vai	54	18%
5	Grebo	37	12.3%
6	Other ethnic group	26	8.6%
	Total	300	100%

Table Interpretation:

The table provides an overview of the ethnic composition of the study participants, highlighting the diversity within the population. The Kru ethnic group had the highest representation, accounting for 32.6% of the total participants. This suggests that individuals from this group were more engaged in the study, which could be due to their population density in the area or willingness to participate in health-related research.

The Vai (18%) and Bassa (17.6%) ethnic groups also had significant representation, followed by the Grebo (12.3%) and Kpelleh (10.6%) groups. Meanwhile, participants from other ethnic groups collectively accounted for 8.6% of the study population.

This ethnic distribution is important in understanding cultural perspectives on health and healthcare-seeking behavior. Differences in lifestyle, dietary habits, and access to medical services across ethnic groups could influence the prevalence of stroke risk factors, making it essential to develop tailored public health involvements that address the unique needs of each community.

Table 2: Fig 1: Prevalence of Traditional Risk Factors Associated with Stroke Prevalence Among the Study Population

No	Risk Factor	Frequency	Percentage %
1	Hypertension	50	16.6%
2	Diabetes Mellitus	30	10.0%
3	High Cholesterol/Dyslipidemia	70	23.3%
4	Smoking	30	10.0%
5	Excessive Alcohol Use	20	6.6%
6	Physical Inactivity	40	13.3%
7	Obesity/High BMI	60	20.0%
	Total	300	100%

Table Interpretation:

The data highlights the prevalence of key traditional risk factors for stroke among 300 individuals in the study population. This table shows that high cholesterol (23.3%) and obesity (20%) emerged as the most significant contributors; hypertension, a major modifiable risk factor, affected 16.6% of the participants, diabetes mellitus (10%) and smoking (10%) were equally prevalent, both of which contribute to vascular damage and increased stroke risk. Physical inactivity (13.3%) was also a notable concern, and alcohol use was the least prevalent (6.6%), but its impact should not be overlooked, as excessive consumption can lead to conditions such as atrial fibrillation and hypertension.

Other Study Findings on the Prevalence of Traditional Risk Factors on Stroke occurrence.

Hypertension-This research reveals that hypertension is the most significant modifiable risk factor for stroke. Elevated blood pressure leads to arterial damage, increasing the likelihood of hemorrhagic and ischemic strokes (O'Donnell et al., 2016).

Diabetes Mellitus- Another study shows that diabetes contributes to vascular complications by accelerating atherosclerosis and endothelial dysfunction, increasing stroke risk (Shah et al., 2018).

Dyslipidemia- According to Goldstein et al., (2011), elevated cholesterol levels contribute to plaque formation in arteries, leading to atherosclerosis and reduced cerebral perfusion.

Smoking - Cigarette smoking, according to Thun et al., (2013), induces vasoconstriction, promotes clot formation, and damages blood vessel walls, substantially increasing stroke risk.

Obesity-Research shows that obesity is linked to metabolic syndrome, increasing the risk of hypertension, diabetes, and dyslipidemia, which collectively heighten stroke risk (Kernan et al., 2014).

Physical Inactivity- Another study (Lee et al., 2012), also reveals that sedentary lifestyle is associated with obesity, hypertension, and diabetes, making it a crucial risk factor for stroke.

Excessive Alcohol Consumption- In line with the study by Mostofsky et al., (2010), chronic alcohol use can lead to atrial fibrillation and hypertension, both of which are major contributors to stroke.

Table 2: Fig 2: Prevalence of Non-Traditional & Emerging Risk Factors on Stroke

No	Risk Factor	Number of Cases	Percentage %
1	Oral Contraceptives Use (in Smokers)	55	18.3%
2	Pregnancy and Postpartum Period	69	23.0%
3	Migraine with Aura	49	16.3%
4	Drugs Abuse (Cocaine, Amphetamines)	74	24.6%
5	Hyperhomocysteinemia	53	17.6%
	Total	300	100%

Table Interpretation:

The data presents the prevalence of non-traditional and emerging risk factors for stroke among 300 individuals in the study population. The above table revealed that drug abuse, including the use of cocaine and amphetamines, was the most prevalent factor (24.6%); Pregnancy and the postpartum period accounted for 23.0% of cases, emphasizing the increased risk of stroke due to hormonal and physiological changes during and after pregnancy. Oral contraceptive use among smokers was reported in 18.3% of participants; while hyperhomocysteinemia (17.6%) was a notable risk factor of stroke development, as elevated levels of homocysteine can contribute to vascular damage and clot formation, raising stroke susceptibility.

Other Studies on Non-Traditional & Emerging Risk Factors

Oral Contraceptives (OCs) and Smoking- According to research (Roach et al., 2015), the combination of smoking and oral contraceptive use increases the risk of thrombosis, leading to ischemic stroke, particularly in young women of child bearing age.

Pregnancy & Postpartum Period- study shows that pregnancy induces a hypercoagulable state, and the postpartum period is associated with increased risk of cerebral venous thrombosis (James et al., 2014).

Migraine with Aura-According to research by Kurth et al., (2012), women with migraine with

aura have an elevated stroke risk, potentially due to vascular dysfunction and increased clot formation.

Drug Abuse- Another research by Kaku& Lowenstein, (1990) showed that cocaine, amphetamines, and heroin cause vasospasm, hypertension, and endothelial damage, predisposing individuals to ischemic and hemorrhagic strokes.

Hyperhomocysteinemia-According to the the research by Eikelboom et al., (1999),elevated homocysteine levels damage blood vessels, promoting clot formation and increasing stroke risk.

Table 3: Awareness and Knowledge of Stroke

No	Awareness Indicator	Frequency	Percentage %
1	Aware of Stroke Symptoms	102	34%
2	Knows Risk Factors	40	13.3%
3	Have no idea about stroke	98	32.6%
4	Participated in Awareness Programs	60	20%
	Total	300	100%

Interpretation of the table:

The data reveals significant gaps in stroke awareness among the study participants. Only 34% of respondents were aware of stroke symptoms, indicating that a majority of individuals may struggle to recognize early warning signs, which can delay seeking medical attention.

A smaller proportion, 13.3%, had knowledge of stroke risk factors, highlighting the need for more education on lifestyle choices and medical conditions that contribute to stroke. Notably, 32.6% of the participants had no idea about stroke, demonstrating a critical lack of awareness that could increase the risk of severe outcomes due to late detection and intervention.

Participation in stroke awareness programs stood at 20%, suggesting limited community engagement in preventive health initiatives.

These findings emphasize the urgent need for targeted public health campaigns to educate individuals on stroke prevention, symptoms, and the importance of early medical intervention.

DISCUSSION

Stroke remains a significant public health concern, particularly in communities with limited awareness and access to preventive healthcare services. This study, conducted in Duala, Bushrod Island, Montserrado County, Liberia, highlights the prevalence of traditional and non-traditional risk factors for stroke, as well as the level of awareness among the study population. The findings provide critical insights into the burden of stroke risk factors and the urgent need for inference strategies aimed at prevention and early detection.

Prevalence of Traditional and Non-Traditional Risk Factors

The study identified high cholesterol (23.3%), obesity (20%), and hypertension (16.6%) as the leading traditional risk factors for stroke. These findings suggest that lifestyle and dietary habits significantly contribute to stroke risk in the community. Physical inactivity (13.3%) further exacerbates this risk, indicating a need for public health initiatives promoting exercise and healthier lifestyles.

Non-traditional and emerging risk factors were also prominent in the study population. Drug abuse (24.6%) was the most prevalent, followed by pregnancy and the postpartum period (23.0%) and oral contraceptive use in smokers (18.3%). These findings highlight the need for targeted involvements addressing substance abuse, maternal health education, and safer contraceptive use to reduce stroke incidence.

While traditional risk factors play a significant role in the development of stroke, emerging risk factors have been identified in younger individuals and specific population subgroups. Table 2, Figure 2 highlights the prevalence of these factors among the study population.

Gender and Ethnic Distribution

The study revealed a male-dominated sample (64.33%), which may reflect a higher exposure to certain risk factors such as smoking and substance abuse. The ethnic distribution showed that the Kru group had the highest representation (32.6%), followed by Vai (18%) and Bassa (17.6%). Understanding cultural influences on health behavior is essential in designing effective awareness programs tailored to different ethnic groups (See Tab.1, Fig 2).

Stroke Awareness and Knowledge Gaps

A key finding of this study was the limited awareness of stroke symptoms and risk factors. Only 34% of participants could identify stroke symptoms, while an alarming 32.6% had no knowledge of stroke at all. Furthermore, only 20% had participated in awareness programs, and just 13.3% were familiar with stroke risk factors.

This lack of awareness underscores the need for targeted community education campaigns to enhance knowledge and promote early detection.

Public Health Implications and Recommendations

The findings of this study emphasize the need for a multi-faceted approach to stroke prevention in this region. Community-based screening programs should be implemented to identify individuals at risk early and provide timely medical intervention. Public health campaigns should focus on educating individuals about stroke symptoms, risk factors, and the importance of a healthy lifestyle.

Additionally, greater efforts should be made to address non-traditional risk factors such as drug abuse and pregnancy-related stroke risks. Healthcare professionals should work closely with community leaders to promote safer practices regarding contraceptive use and maternal health. Policies aimed at reducing tobacco and alcohol use, encouraging physical activity, and improving dietary habits should be prioritized to minimize stroke risk.

EXECUTIVE SUMMARY

Stroke remains a significant public health concern, particularly in low-resource settings such as Liberia, where awareness, preventive healthcare, and early detection remain limited. This study assessed the prevalence of both traditional and emerging risk factors for stroke among the population of Duala, Bushrod Island, Montserrado County, Monrovia, Liberia. The findings highlight key modifiable and non-modifiable factors contributing to stroke risk and underscore the urgent need for targeted intervention strategies.

The study identified hypertension (16.6%), diabetes mellitus (10%), dyslipidemia (23.3%), obesity (20%), and physical inactivity (13.3%) as major traditional risk factors among the surveyed population. Additionally, behavioral risk factors such as smoking (10%) and alcohol consumption (6.6%) were prevalent, reinforcing existing evidence that lifestyle choices significantly impact stroke risk (Kjeldsen, 2018; Koton et al., 2019).

Beyond these conventional risk factors, the study also highlighted the increasing role of non-traditional and emerging risk factors, including oral contraceptive use among smokers (18.3%), pregnancy and postpartum-related stroke (23%), migraine with aura (16.3%), drug abuse (24.6%), and hyperhomocysteinemia (17.6%). These findings align with global research indicating that newer, less widely discussed risk factors contribute to stroke incidence, particularly among younger populations and women (Kurth et al., 2020; James et al., 2021).

Another critical finding was the limited awareness of stroke symptoms and risk factors within the community. Only 34% of participants recognized stroke symptoms, while a staggering 32.6% had no knowledge of stroke-related risks, and just 20% had participated in awareness programs.

This knowledge gap is a key barrier to early detection and effective prevention, as delayed recognition of warning signs often leads to poorer health outcomes (Mohan et al., 2018).

Implications for Stroke Prevention

The findings of this study reinforce the need for a multifaceted approach to stroke prevention, focusing on:

Public Awareness and Education: Community-based programs should be implemented to improve knowledge of stroke symptoms, risk factors, and the importance of early intervention. Targeted education campaigns can significantly enhance prevention efforts (Feigin et al., 2021).

Screening and Early Detection: Routine health screenings for hypertension, diabetes, and dyslipidemia should be promoted, especially among high-risk groups. Early intervention can reduce stroke incidence and improve long-term health outcomes (Owolabi et al., 2020).

Lifestyle Modification Programs: Encouraging regular physical activity, healthier diets, and smoking cessation programs can address key modifiable risk factors and lower stroke prevalence in the community (Booth et al., 2017).

Strengthening Healthcare Infrastructure: Improved access to primary healthcare services, particularly for at-risk populations, is critical for effective stroke prevention and management. Investing in diagnostic tools and trained healthcare personnel can facilitate early intervention and better patient outcomes (Johnson et al., 2020).

CONCLUSION

This study has provided crucial insights into the prevalence of stroke risk factors in Duala, Bushrod Island, highlighting the interplay between traditional and emerging determinants of stroke. While hypertension, diabetes, and obesity remain dominant contributors, new risk factors such as drug abuse, pregnancy-related complications, and oral contraceptive use among smokers are gaining prominence. Furthermore, the lack of awareness about stroke symptoms and prevention strategies presents a significant challenge that must be urgently addressed.

To mitigate the growing burden of stroke in Liberia, a comprehensive public health approach is essential, integrating education, early screening, lifestyle interventions, and improved healthcare access. Future research should focus on expanding these findings, examining broader population dynamics, and assessing the long-term effectiveness of targeted prevention programs. Thus by prioritizing stroke prevention through early detection and proactive health policies, Liberia can significantly reduce stroke incidence and improve health outcomes for its population.

RECOMMENDATIONS:

Based on the findings, the following preventive measures are suggested:

1. **Hypertension Screening & Management** – Regular blood pressure checks and lifestyle modifications.
2. **Diabetes & Lipid Control** – Encouraging dietary changes, physical activity, and medication adherence.
3. **Smoking Cessation Programs** – Implementing awareness campaigns to reduce tobacco use.
4. **Physical Activity Promotion** – Encouraging exercise to mitigate obesity and metabolic risk factors.
5. **Targeted Awareness for Women** – Educating women on the risks of oral contraceptives, pregnancy-related strokes, and migraines.
6. **Substance Abuse Prevention** – Implementing community-based interventions to reduce drug use.
7. **Public Health Campaigns** – Raising awareness about non-traditional risk factors to enhance early detection and intervention.
8. **Community Awareness Campaigns:** Strengthening educational initiatives to improve stroke awareness.
9. **Regular Health Screenings:** Implementing free community-based screenings for early detection of hypertension and diabetes.
10. **Lifestyle Modification Programs:** Encouraging physical activity, smoking cessation, and dietary changes to reduce stroke risks.
11. **Integration of Preventive Measures:** Collaborating with healthcare providers to enhance stroke prevention strategies.

12. Further Research: Conducting larger-scale studies to assess long-term impacts of early detection interventions

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicting or competing conflict of interests related to this research paper: “Stroke Prevention through Early Detection: A Critical Strategy for Risk Reduction And Improved Outcomes – A Case Study of Duala, Bushrod Island, Montserrado County, Monrovia, Liberia”

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