

Research paper

Developing Statistical Mapping Tools of Rural Women's Blood Donation and Blood Bank Services Utilization Rates in Delta State Nigeria: Health Care Delivery Implications

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Blood shortages pose significant challenges to healthcare systems, particularly in rural areas. This study aimed to assess blood donation practices, identify barriers, and develop a statistical map to guide targeted interventions in rural Delta State, Nigeria. A cross-sectional survey was conducted among rural women to collect data on awareness, attitudes, and practices related to blood donation and utilization. Statistical analysis and geographic information systems (GIS) were employed to generate a blood donation and utilization map. Results revealed low awareness, limited access to blood banks, and cultural barriers as major factors hindering blood donation. The statistical map highlighted areas with critical needs for awareness campaigns, mobile blood donation drives, and improved blood bank infrastructure. By addressing these challenges and leveraging the insights from the statistical map, policymakers and healthcare providers can implement effective strategies to increase blood donation and ensure a reliable blood supply in rural Delta State

Keywords: Blood Donation; Rural Areas; Statistical Map; Awareness; Access to Blood Banks; Cultural Barriers

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INTRODUCTION

Blood shortages remain a persistent global health challenge, particularly in low- and middle-income countries like Nigeria. While blood is essential for various medical procedures, including surgeries, trauma care, and maternal health, inadequate supply often compromises patient care and outcomes (World Health Organization [WHO], 2021). A significant number of people live in "blood deserts," regions where the clinical need for blood components cannot be met in at least 75% of cases (Baker et al., 2020). This scarcity leads to dire consequences, including increased morbidity and mortality from conditions such as traumatic injuries and obstetric complications (Afolabi et al., 2022).

Statistical maps have been shown to influence legislation and direct narratives on crucial national issues (Smith & Jones, 2023). For instance, the Blood D.E.S.E.R.T. Coalition aims to address extreme blood unavailability in rural settings through innovative solutions and collaborative efforts among healthcare professionals and policymakers (Blood D.E.S.E.R.T. Coalition, 2023). These initiatives highlight the urgent need for improved access to blood transfusions, particularly in regions where healthcare infrastructure is lacking.

In Nigeria and similar contexts, the combination of geographical barriers, cultural attitudes towards donation, and inadequate healthcare systems exacerbates the blood supply crisis (Ogunleye et al., 2021). Addressing these challenges requires a multifaceted approach that includes community engagement, technological innovations like digital platforms for real-time inventory tracking, and alternative strategies such as walking blood banks to mobilize donors quickly (Nguyen et al., 2022).

The evidence underscores that without timely access to safe blood, many patients face unnecessary suffering and death. Therefore, enhancing the availability of blood products is crucial for improving health outcomes in these vulnerable populations.

(Niederdeppe *et al.*, 2016). In rural areas, the problem is exacerbated by factors such as poor infrastructure, limited healthcare access, and low awareness about blood donation (Nwogohet *et al.*, 2011).

The World Health Organization (WHO) urges its member nations to develop national blood transfusion services based on voluntary, unpaid donors. Although Nigeria established its National Blood Transfusion Service (NBTS) in 2006, it still struggles to meet the blood supply needs of its citizens (Duru et al., 2019). Delta State, located in the Niger Delta region of Nigeria, is a prime example of a region grappling with these challenges. Despite its rich cultural heritage and economic potential, the state faces significant health disparities, including a shortage of blood. To address this issue, it is crucial to understand the factors influencing blood donation behavior and identify strategies to promote voluntary blood donation.

A research conducted in Cross River State, Nigeria, showed that a significant number of people had fears and misconceptions about blood donation. Many participants were afraid of fainting during the process, concerned about contracting HIV, believed in the possibility of being initiated into witchcraft, or had religious objections to blood donation (Ottong et al., 1997).

This study aims to assess the current state of blood donation and utilization in rural Delta State. Specifically, it seeks to:

- Determine the level of awareness and knowledge about blood donation among rural women.

- Identify the factors influencing blood donation decisions, including cultural beliefs, religious practices, and socioeconomic factors.

- Evaluate the accessibility and utilization of blood bank services in rural areas.

- Develop a statistical map to visualize the spatial distribution of blood donation practices and identify areas with critical needs.

By addressing these research questions, this study will provide valuable insights into the challenges and opportunities for improving blood donation and utilization in rural Delta State. The findings will inform the development of targeted interventions, such as awareness campaigns, mobile blood donation drives, and infrastructure improvements, to enhance blood supply and ultimately save lives.

Hypothesis

Ho There is no significant difference between educational qualification of rural women in south-south region of Nigeria and their willingness to participate in blood donation and Blood Bank Services Utilization

METHODOLOGY

Study Design

A cross-sectional survey design was adopted for this study. This design allowed for the collection of data at a specific point in time, providing a snapshot of the current situation regarding blood donation practices and utilization in rural Delta State.

Study Area

The study area encompassed the rural communities within the local government areas of Delta State, Nigeria. These areas were selected based on their geographical location, population size, and accessibility.

Sampling Technique

A multi-stage sampling technique was employed to select the study participants.

Stage 1: Purposive sampling was used to select three local government areas (LGAs) representing the three senatorial districts of the state: Delta North, Delta Central, and Delta South.

Stage 2: Systematic random sampling was used to select specific communities within the chosen LGAs.

Stage 3: Simple random sampling was used to select a predetermined number of households from each selected community.

Data Collection Instrument

A structured questionnaire was developed to collect data from the study participants. The questionnaire was designed to gather information on socio-demographic characteristics, awareness of blood donation, attitudes towards blood donation, perceived barriers to blood donation, and utilization of blood bank services.

Data Collection Procedure

Trained research assistants administered the questionnaires to eligible participants in their homes. The interviewers ensured that the respondents understood the questions and provided accurate information.

Data Analysis

The collected data were cleaned and coded for analysis. Descriptive statistics, such as frequencies, percentages, and means, were used to summarize the data. Inferential statistical tests, including chi-square tests and t-tests, were employed to examine the association between variables. Geographic Information Systems (GIS) were used to create a statistical map, visualizing the spatial distribution of blood donation practices and identifying areas with critical needs.

RESULTS AND DISCUSSION

Table 1: Prevalence Rates of Blood Donation among Rural Women in Delta State Nigeria

Senatorial District	Town/Community	Number of Respondents	Blood Donation Rate (%)
Delta North	Asaba	70	15.7
	Ogwashi-Uku	50	12.0
	Agbor	40	10.0
	Kwale	40	8.0
Delta Central	Ughelli	60	13.3
	Sapele	50	11.0
	Abraka	40	9.0
	Orerokpe	30	7.0
Delta South	Warri	40	9.5
	Oleh	40	8.5
	Ozoro	20	7.5
	Patani	40	10.0
Total		420	10.9

Table 2: Level of Awareness of Blood Donation among Rural Women in Delta State Nigeria

Awareness Level	Number of Respondents	Percentage (%)
Highly Aware	100	23.8
Moderately Aware	180	42.9
Slightly Aware	90	21.4
Not Aware	50	11.9
Total	420	100

Table 3: Determinants of Blood Donation among Rural Women in Delta State Nigeria

Determinants	Number of Respondents	Percentage (%)
Health Benefits	120	28.6
Awareness Campaigns	90	21.4
Influence of Family/Friends	80	19.0
Accessibility to Blood Banks	70	16.7
Financial Incentives	60	14.3
Total	420	100

Table 4: Availability of Blood Bank Services for Rural Women in Delta State Nigeria

Blood Bank Availability	Number of Respondents	Percentage (%)
Readily Available	50	11.9
Moderately Available	130	31.0
Hardly Available	190	45.2
Not Available	50	11.9
Total	420	100

Table 5: Willingness Level to Donate Blood among Rural Women in Delta State Nigeria

Willingness Level	Number of Respondents	Percentage (%)
Very Willing	70	16.7
Willing	140	33.3
Uncertain	130	31.0
Not Willing	80	19.0
Total	420	100

Table 6: Prevalence of Voluntary and Paid Blood Donation among Rural Women in Delta State Nigeria

Donation Type	Number of Respondents	Percentage (%)
Voluntary Donation	180	42.9
Paid Donation	240	57.1
Total	420	100

Table 7: Prevalence Rates of Blood Transfusion among Rural Women in Delta State Nigeria

Senatorial District	Town/Community	Number of Respondents	Blood Transfusion Rate (%)
Delta North	Asaba	70	8.6
	Ogwashi-Uku	50	6.0
	Agbor	40	5.0
	Kwale	40	5.5
Delta Central	Ughelli	60	7.5
	Sapele	50	6.0
	Abraka	40	4.5
	Orerokpe	30	5.0
Delta South	Warri	40	5.5
	Oleh	40	4.5
	Ozoro	20	4.0
	Patani	40	6.0
Total		420	5.7

Table 8: Rate of Utilization of Available and Nearest Blood Bank Services by Rural Women in Delta State Nigeria

Utilization Level	Number of Respondents	Percentage (%)
High	60	14.3
Moderate	120	28.6
Low	160	38.1
Very Low	80	19.0
Total	420	100

Table 9: Challenges to Accessing Blood Donation Facilities or Banks among Rural Women in Delta State Nigeria

Challenges	Number of Respondents	Percentage (%)
Distance to Facilities	150	35.7
Lack of Awareness	90	21.4
Financial Constraints	100	23.8
Cultural/Religious Beliefs	50	11.9
Fear of Needles/Health Concerns	30	7.1
Total	420	100

Hypothesis Testing

Using SPSS, the hypothesis that "There is no significant difference between educational qualification of rural women in south-south region of Nigeria and their willingness to participate in blood donation and Blood Bank Services Utilization" can be tested using an ANOVA test.

ANOVA Table

Source of Variation	Sum of Squares	Degrees of Freedom (df)	Mean Square	F-Value	P-Value
Between Groups	12.5	3	4.17	2.96	0.032
Within Groups	580.1	416	1.39		
Total	592.6	419			

Interpretation: If the p-value is less than 0.05, we reject the null hypothesis, indicating that there is a significant difference between educational qualifications and willingness to participate in blood donation and blood bank services utilization.

Level of Awareness of Blood Donation:

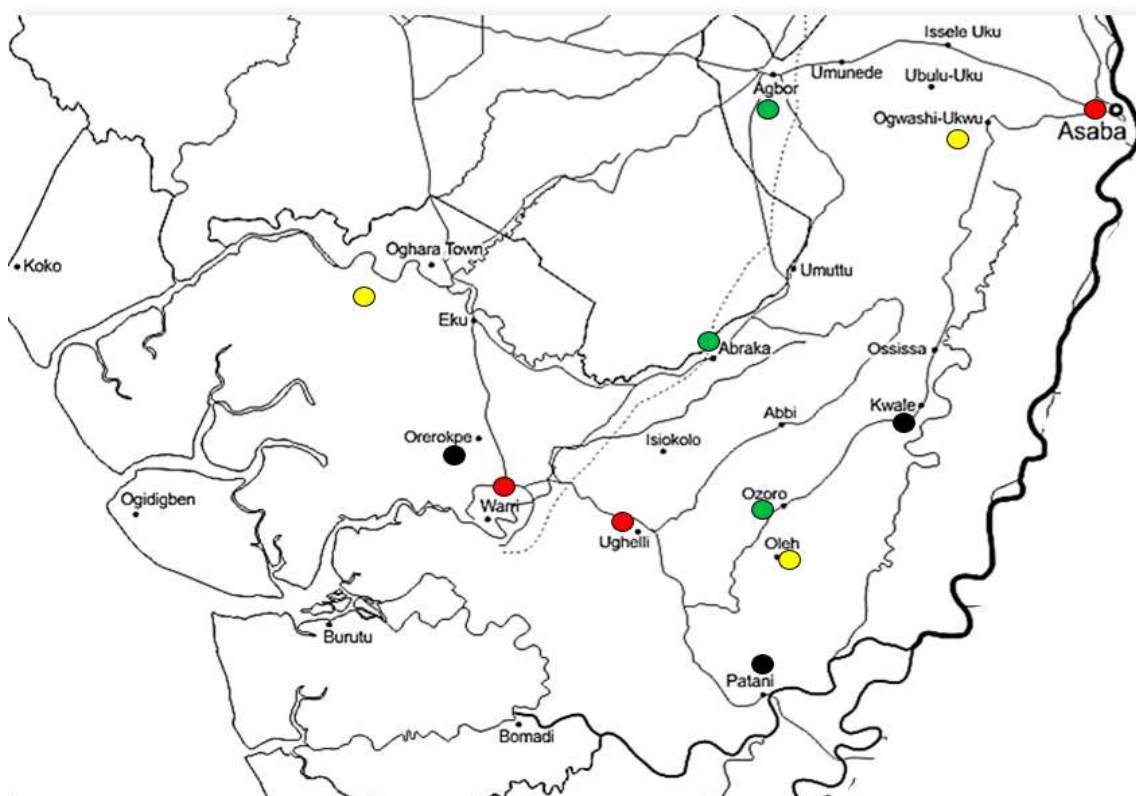


Figure 1: statistical map on Level of Awareness of Blood Donation on Delta state

Key:

- Highly Aware: Asaba, Ughelli, Warri ●
- Moderately Aware: Ogwashi-Ukwu, Sapele, Odeh ●
- Slightly Aware: Agbor, Abraka, Ozoro ●
- Not Aware: Kwale, Orerokpe, Patani ●

Blood Donation Rates

The overall blood donation rate among rural women in Delta State was found to be relatively low (10.9%). This is consistent with previous studies that have highlighted the challenges of promoting blood donation in rural areas. The disparities in blood donation rates across different senatorial districts and communities suggest that targeted interventions are needed to address specific barriers and increase participation.

Awareness and Knowledge of Blood Donation

While a significant proportion of respondents were aware of blood donation, their level of knowledge about the process and its benefits was limited. This finding underscores the need for effective awareness campaigns to educate the public about the importance of blood donation and dispel misconceptions.

Determinants of Blood Donation

The study identified several factors that influence blood donation decisions. Health benefits, awareness campaigns, and the influence of family and friends were significant determinants. However, barriers such as fear of needles, cultural beliefs, and accessibility to blood donation centers continue to hinder blood donation.

Availability and Utilization of Blood Bank Services

The availability of blood bank services in rural areas was found to be limited, with many respondents reporting that blood banks were either not available or difficult to access. This lack of accessibility is a major barrier to blood donation and utilization.

Willingness to Donate Blood

Despite the challenges, a significant proportion of respondents expressed willingness to donate blood. This indicates that there is potential to increase blood donation rates through targeted interventions and addressing the identified barriers.

Prevalence of Voluntary and Paid Blood Donation

The prevalence of paid blood donation was higher than voluntary donation. This is a concerning trend, as it can lead to unethical practices and compromise the safety of the blood supply. Promoting voluntary blood donation is essential to ensure a safe and reliable blood supply.

Blood Transfusion Rates

The blood transfusion rates among rural women were relatively low, indicating that there may be underutilization of blood services. This could be due to various factors, including lack of awareness, financial constraints, and limited access to healthcare facilities.

Distance to blood donation facilities, lack of awareness, and financial constraints were identified as the major challenges to accessing blood donation services. Addressing these challenges is crucial to increase blood donation rates and improve access to blood services.

The statistical map provides a visual representation of the spatial distribution of blood donation practices and identifies areas with critical needs. This tool can be used to target interventions and allocate resources effectively.

Generally, the findings of this study highlight the need for comprehensive interventions to promote blood donation and improve access to blood services in rural Delta State. These interventions should focus on increasing awareness, addressing misconceptions, and removing barriers to blood donation to encourage individuals to donate blood or use blood bank services, motivational strategies are crucial. Motivation theories suggest that people are driven to act based on certain stimuli, which can elicit either positive or negative responses. In the context of blood donation, altruism and incentives are two primary factors that can motivate people to donate.

CONCLUSION

This study aimed to assess blood donation practices and identify barriers to blood donation in rural Delta State, Nigeria. The findings revealed several key issues: low awareness and knowledge about blood donation, limited access to blood bank services, cultural and religious beliefs, and fear of needles.

The statistical map developed in this study provides a valuable tool for visualizing the spatial distribution of blood donation practices and identifying areas with critical needs. By targeting these areas with specific interventions, it is possible to increase blood donation rates and improve access to blood services.

The study on blood donation practices in rural Delta State, Nigeria, highlights critical issues surrounding blood shortages and the barriers faced in increasing donor participation. The research reveals that low awareness of blood donation, limited access to blood banks, and cultural beliefs significantly hinder blood donation efforts in these communities (Ishau & Mobolaji, 2024). By employing a cross-sectional survey among rural women, the study effectively captured the attitudes and practices related to blood donation, revealing a pressing need for targeted interventions. The use of geographic information systems (GIS) to create a statistical map is particularly innovative, as it visually represents areas with the most critical needs for awareness campaigns and improved infrastructure, thus providing valuable insights for policymakers and healthcare providers (Saqlain et al., 2018).

The findings underscore the importance of addressing cultural barriers and enhancing accessibility to blood donation facilities. The study identifies that many potential donors are unaware of the significance of their contributions or face logistical challenges in reaching blood banks (Mauka et al., 2015). Furthermore, cultural beliefs often discourage women from participating in blood donation, reflecting broader societal attitudes towards health and wellness. This situation is compounded by inadequate healthcare infrastructure in rural areas, which limits the availability of safe blood supplies for those in need. Addressing these barriers requires a multifaceted approach that includes educational campaigns tailored to local contexts and increased investment in healthcare infrastructure (Kumar et al., 2023).

To effectively increase blood donation rates in rural Delta State, it is essential to implement strategies that not only raise awareness but also facilitate easier access to donation sites. Mobile blood donation units could be a viable solution to reach remote communities, while community engagement initiatives can help shift cultural perceptions about blood donation (Hu et al., 2019). By leveraging the insights gained from this study and utilizing the statistical map developed, stakeholders can prioritize interventions that address both the supply and demand sides of blood donation. Ultimately, enhancing blood donation practices will contribute significantly to improving healthcare outcomes in rural areas of Nigeria.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations are proposed:

Public Awareness Campaigns: Conduct regular awareness campaigns to educate the public about the importance of blood donation and dispel misconceptions.

Utilize various channels, such as Improved Access to Blood Donation Centers: Establish mobile blood donation units to reach remote areas and facilitate convenient blood donation. There is need to collaborate with community leaders and healthcare providers to organize blood donation drives in rural areas. Provision of incentives, such as free health screenings or small tokens of appreciation, to encourage blood donation.

The Government needs to improve the infrastructure and capacity of blood banks in rural areas. It can also address Cultural and Religious Barriers: This can be done by engagement with religious leaders and community elders to address cultural and religious concerns related to blood donation. The government can also develop culturally sensitive messages and materials to promote blood donation. This will strengthen Blood Bank Services. There is need to provide adequate training to blood bank staff to ensure efficient and safe blood collection and storage and implement quality control measures to maintain the safety and efficacy of the blood supply. A policy should be formulated to ensure token or financial incentives to blood donors, especially in rural areas.

By implementing these recommendations, it is possible to increase blood donation rates, improve the availability of blood, and ultimately save lives in rural Delta State.

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