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Urban–Rural Comparison of Elevated Prostate-Specific Antigen Levels and Urinary Glucose Prevalence among Elderly in Bayelsa State, Nigeria

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ABSTRACT

Background: Prostate cancer and diabetes are major public health concerns among elderly populations, with prevalence patterns often differing between urban and rural settings. Elevated prostate-specific antigen (PSA) levels may indicate prostate disorders, while urinary glucose can serve as a simple screening tool for diabetes risk, particularly in resource-limited environments. This study aimed to compare the prevalence of elevated PSA levels and urinary glucose among elderly individuals in urban (Yenagoa metropolis) and rural (Sampou and environ) communities in Bayelsa State, Nigeria.

Methods: A descriptive cross-sectional comparative study was conducted among elderly residents aged 60 years and above. Data on PSA levels (males only) and urinary glucose (both sexes) were collected using standardized protocols. PSA positivity was defined according to accepted clinical thresholds, while urinary glucose detection was based on urinalysis strip readings. Data analysis was performed using SPSS version 21, with Chi-square tests used to assess significant differences between the two communities. Statistical significance was set at $p < 0.05$.

Results: The prevalence of elevated PSA levels among elderly males was 5.1% in Yenagoa and 2.4% in Sampou, with no statistically significant difference between the two communities ($p = 0.2484$). Urinary glucose positivity was observed in 5.4% of respondents in Yenagoa compared to 1.5% in Sampou, also showing no statistically significant difference ($p = 0.2430$). Although differences were not significant, urban residents had higher proportions of both elevated PSA and urinary glucose.

Conclusion: Urban elderly residents tended to have higher rates of elevated PSA levels and urinary glucose than their rural counterparts, possibly reflecting lifestyle and dietary differences, as well as disparities in healthcare access and screening uptake. These findings highlight the need for location-specific health interventions and community-based screening programs targeting prostate and metabolic health among elderly populations in Bayelsa State.

INTRODUCTION

Globally, non-communicable diseases (NCDs) such as diabetes and cancer remain significant causes of morbidity and mortality among older adults. The World Health Organization (WHO) reports that these conditions disproportionately affect the elderly, with prostate cancer being one of the most common malignancies in men (Schroeder et al., 2020). In Nigeria, the Nigerian Cancer Registry identifies prostate cancer as a leading cancer diagnosis in men, often detected at late stages due to inadequate early screening (Shoji & Shimizu, 2018). Coupled with rising rates of diabetes, these trends stresses a growing public health challenge, particularly when factoring in lifestyle and socioeconomic differences between urban and rural communities (Sweet et al., 2022).

Evidence suggests that rural populations often experience worse health outcomes than urban populations, largely due to limited access to preventive healthcare services, screening programs, and specialist care (Blake et al., 2017). In rural Nigerian communities, challenges such as inadequate healthcare infrastructure, financial constraints, and cultural stigma surrounding male health screenings contribute to delays in seeking medical attention. These disparities highlight the urgency of targeted interventions aimed at populations that face systemic healthcare inequities (Chang et al., 2025).

Diabetes prevalence is rising steadily in Nigeria, with the elderly population carrying a substantial proportion of the burden. The Nigerian Diabetes Association estimates that over 3 million Nigerians live with the disease, many undiagnosed (Adeoye et al., 2022). Rural areas may have higher rates due to dietary changes and lower physical activity, compounded by limited healthcare access. Conversely, urban residents often benefit from better diagnostic facilities and awareness programs, resulting in earlier detection and improved disease management (Kiciak et al., 2023).

Prostate-specific antigen (PSA) testing is a well-established tool for assessing prostate health and detecting prostate cancer at earlier stages (Kiciak et al., 2023). Elevated PSA levels can signal benign prostatic hyperplasia, prostatitis, or malignancy, making prevalence studies valuable for both clinical and policy purposes. In Nigeria, prostate cancer remains a major contributor to male cancer mortality, and disparities in screening access (particularly between rural and urban communities) may influence detection rates and outcomes.

Urinary glucose testing, though less specific than blood glucose analysis, offers a cost-effective and accessible method for identifying individuals at risk of diabetes, especially in resource-limited settings (Adeoye et al., 2022). This simple screening approach can be particularly impactful in rural areas where laboratory infrastructure is scarce (Albers et al., 2024). Therefore, establishing the prevalence of urinary glucose alongside PSA levels can provide a more comprehensive picture of elderly health needs and guide community-level health planning.

Despite the significance of these conditions, there is a paucity of research examining the prevalence of both elevated PSA and urinary glucose among elderly populations in Bayelsa State, particularly in the context of urban-rural disparities. Existing studies often focus on isolated populations or single disease conditions, leaving a gap in understanding how prostate and metabolic health indicators intersect within this region's unique demographic and healthcare setting.

The study determined and compared the prevalence of elevated prostate-specific antigen (PSA) levels among elderly males in urban and rural communities of Bayelsa State, Nigeria. It also assessed the occurrence of glucose in urine among elderly males and females across both settings. The findings will help in early detection of prostate-related and metabolic health issues in the elderly. They will provide data for targeted health interventions in urban and rural areas. The results will also guide policymakers and healthcare providers in planning community-based screening and preventive programs.

METHODOLOGY

Study Area

The study was conducted in Yenagoa metropolis and Sampou and environs communities in Bayelsa State, Nigeria. Yenagoa is the state capital and represents an urban setting. Sampou is a rural community located in Kolokuma/Opokuma Local Government Area.

Study Design

A comparative cross-sectional study design was used.

Study Population

The study population consisted of elderly males aged 60 years and above living in the selected communities for PSA and sex (male and female) for urinary glucose.

Sample Size

For the glucose analysis, the study targeted elderly individuals aged 60 years and above, including both males and females who were permanent residents of the study locations. The sample size was determined using standard statistical methods for comparing two proportions (Pathmanathan & Brownlee et al., 1991), with reference values from Omotara et al. (2015), who reported that 43.2% of elderly individuals had social support from children while 56.8% did not. Based on these proportions, a statistical power of 80% and a 5% significance level were applied, yielding a required sample size of 208 participants per group. To account for a 10% non-response rate (21 participants per group), the sample size was adjusted to 229 per group, resulting in a total of 458 participants across both urban and rural settings. An additional 30 participants per group were oversampled to compensate for potential attrition, incomplete responses, and other data quality concerns. Eventually, 458 elderly individuals were included in the analysis, ensuring sufficient statistical power for subgroup comparisons and overall representativeness.

For the PSA analysis, a total of 160 elderly male respondents participated. A multi-stage sampling approach was employed. In the first stage, communities were selected using simple random sampling. The second stage involved the use of systematic sampling to identify households. Within each selected household, one eligible elderly male was chosen through simple random sampling.

Sampling Technique

A multi-stage sampling method was employed to select participants for both the glucose and PSA analyses. In the first stage, all eight Local Government Areas (LGAs) in Bayelsa State were listed and assigned both alphabetical and numeric codes. They were stratified into rural and urban categories. Using a random number table, two LGAs were selected: Yenagoa (urban) and Kolokuma/Opokuma (rural). In the second stage, all communities in the selected LGAs were listed and coded. From these, one urban community (Yenagoa) and one rural community (Sampou) were randomly chosen.

The third stage involved sampling at the community level in two steps. First, houses were selected, followed by the selection of elderly participants from eligible households. A modified cluster sampling method was applied using the spin-the-bottle technique to determine the starting point in each cluster. The bottle was spun to point in the direction with the highest concentration of dwellings, and the starting household was randomly chosen. From this point, the "next nearest" eligible households were visited sequentially until all targeted households were covered.

For the glucose analysis, all eligible elderly individuals (both male and female) in the selected households were assigned identification numbers, and final participants were randomly chosen to achieve the required sample size. For the PSA analysis, only elderly male residents were considered. In each selected household, one eligible male respondent was chosen at random when more than one was present.

Data Collection

Trained health personnel collected blood samples for PSA testing, with results classified as positive or negative according to standard laboratory reference values. Midstream urine samples were collected in sterile, labeled bottles, and urinalysis was performed using reagent test strips to assess glucose and other relevant parameters.

Data Analysis

SPSS version 21 was used for the statistical analysis. Data were analyzed using descriptive statistics such as frequencies and percentages. The chi-square test was used to compare PSA positivity between the two communities. Statistical significance was set at $p < 0.05$.

Ethical Considerations

Ethical approval was obtained from the ethics committee of Niger Delta University Teaching Hospital. At the community level, ethical permission was obtained in writing from the Community Health Chairman, while at the household level, permission was secured from the head of the household and the participant themselves. Participants were allowed to participate voluntarily after they understood the informed consent process.

RESULTS AND DISCUSSION

Table 1 shows the comparative analysis of glucose in the urine among elderly individuals in urban and rural communities of Bayelsa State using urinalysis. In Yenagoa, 14 respondents (5.4%) tested positive for glucose in the urine, while 244 respondents (94.6%) tested negative. In Sampou, 3 respondents (1.5%) had glucose present in their urine, whereas 197 respondents (98.5%) tested negative. The difference between the two communities was not statistically significant ($\chi^2 = 1.363$, $df = 1$, $p = 0.243$).

Table 1: Comparative analysis of observance of glucose in the urine amongst elderly in urban and rural communities in Bayelsa State. Glucose using urinalysis.

Variable	Variable Range	Yenagoa		Sampou		X^2	DF	P
		Frequency	Percentage	Frequency	Percentage			
Glucose	Positive	14	5.4	3	1.5	1.3630	1	0.2430
	Negative	244	94.6	197	98.5			

The observations of the study suggest potential health risks related to diabetes and other metabolic issues in urban environments. Urbanization often brings lifestyle changes, increased stress levels, and dietary modifications, which are associated with adverse health outcomes, as noted in studies assessing health behaviors across different demographics (Cadmus et al., 2021; Ukweh et al., 2024; Onyeonoro et al., 2016).

Moreover, lower glucose levels in rural populations may result from dietary practices influenced by traditional lifestyles and reduced access to processed foods, similar to findings reported in nutritional studies focused on children's health in urban and rural settings (Obionu et al., 2022; Senbanjo et al., 2016). Comparative studies in various Nigerian contexts support these observations, illustrating that urban areas frequently face higher health risks, including non-communicable diseases, due to lifestyle factors. Conversely, rural areas tend to show more favorable health metrics, though recent trends of urban migration are altering these patterns (Onyeonoro et al., 2016; Fasiku et al., 2021).

Table 2 presents the comparative analysis of PSA test results among elderly males in urban (Yenagoa) and rural (Sampou) communities in Bayelsa State. In Yenagoa, 4 respondents (5.1%) tested positive for elevated PSA levels, while 74 (94.9%) tested negative. In Sampou, 2 respondents (2.4%) tested positive, and 80 (97.6%) tested negative. The chi-square test value of 1.332 with 1 degree of freedom and a p-value of 0.2484 indicates no statistically significant difference in PSA positivity between the two communities. This finding suggests that the prevalence of elevated PSA levels among elderly males is relatively uniform across the two settings, potentially reflecting similarities in risk factors, screening practices, or access to diagnostic services within the region.

Table 2: Comparative analysis of observance of PSAamongst elderly males in urban and rural communities in Bayelsa State

Variable	Variable Range	Yenagoa		Sampou		X^2	df	P
		Frequency	Percentage	Frequency	Percentage			
PSA	Positive	4	5.1	2	2.4	1.332	1	0.2484
	Negative	74	94.9	80	97.6			
Total		78	100	82	100			

The differences in PSA testing results between urban and rural settings can be attributed to several factors. Urban areas typically have better healthcare infrastructure, which results in greater access to medical screenings, including PSA tests. Research in China highlights that urban populations report significantly higher access to healthcare services compared to rural communities, primarily due to financial barriers and inadequate infrastructure in rural areas (Zhang XuFan et al., 2017). These findings are consistent with observations in Nigeria, where urban residents often enjoy better access to healthcare services, leading to higher utilization rates, particularly for preventive health services (Ahuru et al., 2021) like PSA testing.

Additionally, health insurance access could have significantly influenced healthcare utilization. Reports show that rural populations, especially in regions like Bayelsa State, face disparities in health insurance coverage compared to their urban counterparts, leading to hesitance in seeking medical attention or preventive services. Studies focused on maternal health in Nigeria indicate that urban residents are more likely to utilize healthcare services than those in rural areas, underscoring the systemic barriers still present in the healthcare framework (Oyedele, 2023). This has important implications for PSA testing among elderly males, suggesting that health policies should emphasize strategies that enhance insurance enrollment and access to early screening services in rural communities.

In aging and health outcomes, biological differences in immune response between genders may contribute to the disparities observed in PSA positivity rates among elderly men living in urban and rural areas. Research indicates that aging significantly impacts immune function, leading to variations in the immune responses of elderly males compared to females, which may increase susceptibility to infections and affect prostate health (Valiathan et al., 2016; Reddy et al., 2024). Given that rural elderly populations may have a higher prevalence of undiagnosed health conditions due to lower screening rates, there is a pressing need for targeted health education and screening initiatives tailored to these communities.

Moreover, cultural beliefs and practices may influence health-related behaviors and attitudes towards seeking medical help in both urban and rural scenarios. Studies have identified socio-cultural factors as barriers to health service utilization, particularly among men who may perceive seeking medical care as a sign of weakness (Olasehinde & Olaniyan, 2017). Such cultural norms are often more pronounced in rural settings, where traditional beliefs can overshadow formal healthcare interventions.

CONCLUSION

This study found no statistically significant differences in the prevalence of glucose in urine or elevated PSA levels between elderly residents in urban and rural communities of Bayelsa State. While glucose positivity was slightly higher in the urban area of Yenagoa compared to rural Sampou, the rates of elevated PSA levels among elderly males were similar across both settings. These results suggest that although urbanization may contribute to metabolic risks through lifestyle changes and dietary patterns, the distribution of prostate health concerns appears relatively uniform. Factors such as healthcare access, screening practices, and socio-cultural influences likely play a role in shaping these outcomes. To address potential health risks, targeted community-based screening and health education programs should be implemented in both urban and rural areas, with a focus on early detection of metabolic and urological conditions. Efforts should also prioritize expanding access to preventive health services in rural communities by improving healthcare infrastructure, increasing health insurance coverage, and addressing socio-cultural barriers to seeking care. Such interventions would help bridge the urban–rural gap in healthcare utilization, promote early diagnosis, and support healthier aging in Bayelsa State's elderly population.

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