



Spatiotemporal Trends in Human Immunodeficiency Virus Epidemics in Nigeria: A Systematic Review Protocol

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ABSTRACT: The scourge of the Human Immunodeficiency Virus infection is not abating fast as expected despite the many strategies put in place by various stakeholders. Geographical variations in its distribution have been implicated in its slow decline in sub-Saharan Africa, and Nigeria carries the highest burden in West Africa with subnational variations in 2019. This may negatively impact the implementation of interventions if not properly targeted. Geospatial technique is very important for spatial identification of hotspots and clusters which makes it easy to implement strategies, allocate scarce resources, interventions and programs to achieve a success in the fight against the epidemics. It is on this note that the researcher is set to conduct this systematic review to assess trends in human immunodeficiency virus epidemics in Nigeria. The protocol will follow the preferred reporting items for systematic review and meta-analysis (PRISMA-P) 2020 guideline. The protocol was registered with the International Prospective Register for Systematic Reviews (PROSPERO) with registration number CRD42023488081. Articles would be retrieved electronically through database such as PubMed, Medline, Scopus, web of Science citation index, Google Scholar, and the open grey. Search period would be December 15th 2023 to June 15th, 2024 for related published articles. Two researchers will independently review articles for inclusion and if there are any disagreements, a third researcher would be called. Risk of bias would be assessed using New Castle Ottawa Scale and JBI critical appraisal checklist. Furthermore, statistical analysis will be conducted using the Review Manager Version 5.4. In conclusion, the Identification of clusters/hotspots helps the targeted allocation of scarce resources, implementation of interventions and programs more efficiently and effectively. This strategy combined with the already existing ones, is a sure way to win the fight against the HIV epidemics.

KEYWORDS: Spatiotemporal, Human Immunodeficiency Virus Epidemics, Hotspots, Clusters

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I. INTRODUCTION

The human immunodeficiency Virus (HIV) is a life-threatening infection that attacks and weakens a person's body immune system. If untreated, it progresses to AIDS, a most advanced stage of the disease with severe consequences (opportunistic infection) like tuberculosis, carcinomas etc. and eventually death ensues [1,2]. Furthermore, it is also a major STI that shares common behavioral and social determinants with other STIs which makes it a double threat to the society. The HIV epidemics has continued to be a global and national concern since its discovery in the year 1981 [2,3] and so far, about 79.3 million people have been infected worldwide, with 36.3 million AIDS related deaths. In 2020, 37.7million people worldwide were reported to be living with HIV, with an annual incidence of 1.5million people and 680,000 AIDS related deaths, while 6.1million people were unaware that they have the infection [4]. In Western and Central Africa, 4.7million people were said to be infected, with a recorded 150,000 Acquired Immune Deficiency Syndrome (AIDS) related deaths and an annual incidence of 330,000 people, while 3.5million out of the 4.7 million people living with the infection were assessing care [4]. Nigeria alone accounts for 1.8million people living with the disease (PLHIV) according to the Spectrum estimates of 2019, with an estimated 107,112 (38%) new infections making her the country with the fourth largest HIV burden in the world and the highest in West and Central Africa sub-Region [5,6]. The Nigeria HIV/AIDS Indicator and Impact Survey' (NAIIS) report in 2018, revealed that 1.4% of adults aged 15-64 years were living with the

infection in the country. This age limit falls within the working class, reproductive age and youths, who are vibrant enough to enable the easy transmission of the infection. More so, NAIIS reported that the prevalence of HIV was lower in urban areas (1.3%) than in rural areas (1.5%) [5].

Quite recently, reports from the Global HIV Statistics of the Joint United Nations Program on HIV/AIDS (UNAIDS) revealed a decline in the incidence and prevalence of the infection globally, with an estimated 3.0 million people in 1997 to 1.5 million newly infected individuals in 2020 so far, a 52% reduction since its peak in 1997 [2], [4]. Studies also conducted in Nigeria has shown similar decline from 3.4% in 2012 NARHS report to 1.4% in 2018 NAIIS report, so far, a 2% reduction indicating some form of success in the fight against the epidemic. However, these reports also indicated variation of HIV prevalence among individual states. More so, the NAIIS and NDHS report of 2018, showed that Nigerians have a low comprehensive knowledge (46% for all women and 45% for all men, within the age limit of 15-49 years with variations between individual states), of the epidemics for both rural and urban dwellers [5], [7,8], which may negatively impact on any possible progress that have been made by stakeholders in the course of achieving the UNAIDS 95-95-95 target of 2030 in the country [4,5,9]. Interestingly, evidences from other researches have also revealed that despite the progress that have been achieved over the years, its distribution globally, nationally, geopolitical zones and across states over these years have been uneven [10,11,12,13]. Knowledge of these disparities in the prevalence of HIV and the interaction between geography and time is important to aid policy making by targeting available resources to the right population and at the same time, considering sociocultural and religious peculiarities, thereby serving as an effective prevention and control tool [13, 14,15, 16,17].

Spatiotemporal analysis of HIV epidemics, is a powerful technique in identifying trends of the infection, areas of high risks and clusters which is achieved by assessing the geographical distribution of the epidemics as it occurs in time and space [2,18,19]. This enables researchers understand the behavior (trends and pattern) of the disease and arrive at best options of tackling its spread [20,21,22]. It is on this note that the researcher set out to conduct a systematic review to assess spatiotemporal trends of the Epidemics in Nigeria.

II. RATIONAL FOR THE STUDY

Achievement of the UNAIDS 95-95-95 target by 2030 needs evidence-based sustained strategies globally [1,2,5]. More so, studies have shown that the environment is most often implicated in the pattern and spread of an infection and poses a stimulus which helps in the transmissibility or manifestation of the HIV virus [23,24]. These studies have also proven the existence of a direct relationship between the density and pathology of a disease which depends on the degree of connectivity, as well as the epidemic dynamics. This to a large extent, accounts for regional prevalence ('the who and where') and was one of the 5 strategic directions of achieving HIV elimination by WHO in 2019 [2,25,26,27,28]. Geospatial analysis with a time component is an important tool in identifying regions with unmet needs of possible interventional programs [29]. It is proven to be very effective in detecting hot spots and clusters for the effective decentralization of informed interventions priorities, policy formulations, quality decision making and expert management in the allocations of funds. Therefore, conducting a spatiotemporal systematic review on the trends of HIV is very important to ascertain the state of the epidemic and identify geographic areas most in need of interventions to achieve massive progress in the fight against the HIV epidemic.

III. AIM AND OBJECTIVES OF THE SYSTEMATIC REVIEW

The systematic review will assess trends in human immunodeficiency virus epidemics in Nigeria. The primary objective of this review is to estimate the prevalence of HIV epidemics in Nigeria over the years. The secondary objective is to explore spatial patterns of occurrence of the epidemics over the years in Nigeria and thirdly, to identify factors associated with HIV prevalence in Nigeria.

IV. RESEARCH QUESTION

What is the spatiotemporal trend in HIV epidemics in Nigeria?

V. METHODS

The protocol will follow the preferred reporting items for systematic review and meta-analysis (PRISMA-P) 2020 guideline [30]. Registration of the protocol for this systematic review was done on the International Prospective Register for Systematic Reviews (PROSPERO) with the registration number CRD42023488081.

VI. ELIGIBILITY CRITERIA

Studies selection for this systematic review would follow the PICO framework thus: P-population would be people living with HIV, I- intervention would be HIV Counseling and Testing (HIV) with results, C- Control/comparator- not applicable and finally, O-outcome would be spatial display of HIV positive clients

(clusters of HIV clients, hotspots and spatial trends analysis). Literature search would be restricted to articles published within the past ten years till date (2012-2023) and articles with only abstracts available, posters and commentaries and scoping reviews were excluded. However, observational and experimental studies meeting the defined eligibility criteria would be included.

VII. SOURCE OF ARTICLE FOR THE REVIEW

The source of literature information for the systematic review will be articles retrieved through database searches, such as PubMed, EBSCOhost Medline, Cochrane central library, Scopus, web of Science citation index, Google Scholar, Springer Nature, JSTOR, AJOL and the open grey. Government websites such as the ministries of health would also be searched and finally, hand searching of the reference list.

VIII. SEARCH TERMS AND SEARCH STRATEGIES

Search terms were developed by the researchers, and search strategy include: (HIV OR AIDS OR "Human Immunodeficiency Virus" OR "Human Immunodeficiency syndrome") AND ("Prevalence mapping" OR "Hotspot analysis" OR Clusters OR "Geospatial analysis" OR "Geographical Distribution" OR "Spatial analysis") AND Nigeria. The search would include only articles published in English Language.

IX. STUDY SELECTION PROCESS

Selection of studies would include: the Title, abstract, and full text. Two of the researchers will independently review the studies for final inclusion in the study; where there is disagreement, a third reviewer will be contacted. Differences will be resolved by discussion and consensus. A data extraction form would be developed for the purpose of collecting information such as: name of lead author(s), the title, name of journal, year and type of publication, study design and objectives, study population and Location of study, sample size and sampling method, instrument and data type / source, analysis done, main findings or main results, conclusion, grade of evidence, comment/critique and funding if any. Eligibility of the article would be based on relevance of the article (i.e., if it meets the standard) while the outcome depends on the results of the investigation obtained as it concerns the type of spatial analysis. Comments on strengths, or limitations of the spatial method would be done as was reported by the researchers. The reviewers will assess the risk of bias using the New Castle Ottawa Scale and JBI critical appraisal checklist for cohort and cross-sectional studies respectively while ROBINS-1 tool (Cochrane) would be used for non-randomized studies of intervention. This will exclude bias and prevent the result of the systematic review arriving at invalid conclusions.

X. DATA ANALYSIS

Qualitative and quantitative analysis will be conducted and a fixed-effect meta-analysis model will be conducted if all studies in the analysis share a common effect. Where variations exist in methodologies and analyses across selected studies, a random effect meta-analysis model will be conducted. A narrative synthesis using tabulation or combining their P-values will be conducted with the assumption that most studies may not report accurate data. All statistical analysis will be conducted using the Review Manager Version 5.4. A Meta-regression, Forest plot, Subgroup analysis and heterogeneity would be conducted also were necessary.

XI. ASSESSMENT OF META-BIAS

Potential publication bias would be assessed using a funnel plot and Egger's test.

XII. CERTAINTY OF EVIDENCE

The GRADE framework for assessing certainty of evidence will be used to estimate the quality of evidence generated in the systematic review and meta-analysis (either as 'high', 'moderate', 'low' or 'very low'). Observational studies will be upgraded if the effect is so significant that it cannot be explained by chance alone, while inconsistency of results and indirectness of evidence would be reasons for downgrading.

XIII. DISCUSSION

Despite the decline recorded in HIV prevalence over the years, it is still a major public and socioeconomic health burden that has negatively impacted the lives of millions of people worldwide. Various strategies have been employed by various countries in collaboration with partners and related agencies (WHO, UNAIDS etc.) in the fight against this epidemic with remarkable success. Nevertheless, Geospatial analysis with a time component is an important tool in identifying regions with unmet needs of possible interventional programs. It improves cost effectiveness and enable programmers target interventions to the right location, right people and right timing to achieve maximum results. This it does by effectively detecting hot spots and clusters for the effective decentralization of informed interventions priorities, policy formulations, quality decision making and expert management in the allocations of funds. For Nigeria to achieve the elimination of HIV epidemic by 2030 as

projected by UNAIDS, effective use of spatial analytical tool is key in achieving targeted program implementation.

XIV. CONCLUSION

The use of geospatial techniques in the fight against the ravaging HIV epidemics cannot be over emphasized, there is express need of scarce resource maximization and at the same time achieving informed, targeted intervention implementation. Therefore, conducting a systematic review to assess spatiotemporal trends in HIV epidemics is of utmost importance.

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