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Climate change-induced conflicts in rural Nigeria: Experience from herder-arable crop farmers in selected rural communities of Ekiti State

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ABSTRACT
The problem of climate change is multidimensional, especially in countries where the capacity to cope with shocks is limited. This is further aggravated by socioeconomic conditions, limited buffer stock and insurance, poor credit markets, and an unstable macroeconomic environment. While arable crop farmers in rural Nigeria thrive on proceeds from farming activities, the incessant herder-arable crop farmer conflict exacerbated by climate change has brought untold hardship to these farmers. The study examined determinants of herder-arable crop farmer conflicts in selected rural communities of Ekiti State, Nigeria. Data were collected from a random sample of 220 smallholder farmers via a multistage random sampling technique. Analytical tools employed include descriptive statistics and a probit regression model. A descriptive analysis of respondents' socioeconomic characteristics revealed their average age and household size to be 56 years and 4 members, respectively. Respondents' distribution by educational level showed that one-third of them (68.5%) had less than secondary education, with 73.2% having no access to credit. Herder-arable crop farmer conflict determinants include age, years of schooling, farming experience, credit access, planting time, extension contacts, and farm location, among others. The findings have implications for food security, employment, investment drive, rural-urban drift, and security in the study area.

Contribution/Originality: This paper highlights several key enablers of herder-arable crop farmer conflict in Ekiti State, Nigeria. This is an incessant issue that impacts food security and other aspects of the lives of those living in rural Nigeria. Some of the findings have implications for welfare programs and developmental initiatives of relevant stakeholders.

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1. INTRODUCTION
The ongoing conflict between herders and smallholder arable crop farmers is a significant economic and environmental issue in Nigeria (Tenuche & Ifatimehin, 2009). This is because it has grave consequences for

household livelihoods, food security, and community development. Generally, there is no economy that can grow where there is conflict. Conflict is a situation in which two or more parties strive to acquire the same scarce resources at the same time (Swanstrom & Weissman, 2009). However, conflicts are based on perceptions, that is, incompatibility in the behavior of parties whose perceptions and interests differ (Ofuoke & Isife, 2010). A conflict can be further defined as a situation in which a party has been negatively affected or frustrated, or is about to negatively affect or frustrate something the first party considers important (Vestegaard, Helvard, & Sorensen, 2011).

Ekong (2003) noted that conflicts have two outcomes: positive and negative. It is not a win-win situation, as it brings to the fore nagging issues in society. Thus, conflicts lead to critical problem identification, which is the first condition for solving problems. In conflicts, group cohesion and solidarity abound, and such strengths can be put into positive and productive use for community development.

Moreover, two dissenting views exist in the literature concerning the activities of herders in Nigeria. Some studies have identified herders as emerging terrorist groups (Institute for Economics and Peace, 2016; Ogebe, 2016; Omilusi, 2016). Others view herder-crop farmers' conflict as a purely "resource-scarcity" driven issue and climate change as a contributing factor (Olayoku, 2014). Whichever standpoint is adopted, conflict between herders and agrarian communities or crop farmers undermines food security and the well-being of affected households. In addition to feeding on crops, livestock compete with local communities for water, as streams and rivers provide the majority of the water consumed locally. The competition perceived as parasitic has generated negative feelings and aggressive tendencies between herders and crop farmers (Audu, 2014; Okoli & Atelhe, 2014).

For example, Fulani herdsmen have been named the fourth deadliest terrorist group in the world (Institute for Economics and Peace, 2016). Fulani herdsmen and Boko Haram terrorists accounted for 7,512 fatalities from terrorist attacks in 2014 (Institute for Economics and Peace, 2016). The conflict has claimed many lives, with 7,000 persons displaced in Benue as of February 2016 (Vanguard, 2016). Similarly, an Amnesty International report indicated that 168 people were killed as a result of farmer–herder clashes, whereas 18,000 were displaced, with some who were landowners becoming tenants in internally displaced persons camps (Udosen, 2021). According to Omilusi (2016), there are social, political, and ecological conflicts between Fulani herdsmen and crop farmers. Pastoral development in Nigeria is characterized by several environmental limitations, such as drought, resulting in grass shortages, water scarcity, pest infestations, diseases, and climatic factors (Adebayo & Olaniyi, 2008). While crop farmers need water and land for their production (Oladele & Oladele, 2011), pastoralists require water and vegetation at the right time, quantity and quality, hence causing conflicts (Audu, 2014; Oladele & Oladele, 2011). The most frequent cause of conflicts, according to the literature, results from crop damage caused by animals belonging to herders.

Conflicts have arisen from encroachment along cattle routes, water points, and sometimes the grazing of harvested crops (Balogun, 2008). It has also been reported that farmers deliberately cultivate cattle routes to serve as baits for herdsmen to foment trouble. Accusing fingers are usually pointed at herders, as they are linked to crop destruction without the loss of livestock. The frequent clashes between herders and crop farmers have resulted in welfare losses. In other words, while herders allow their animals to graze on farmlands, the farmers are frustrated by resisting the animals' entry into farms, killing or stealing cattle, or poisoning them (Okeke, 2014; Omilusi, 2016). The herders consequently carry out reprisal attacks, claiming lives, property, and communities.

Conflict has become a national issue, as it was previously confined to the North Central part of Nigeria, especially Benue, Plateau, Kaduna, and Nassarawa. The conflicts have spread to Oyo, Ekiti, Ondo, and other states in the southwest and southeast regions of the country (Omilusi, 2016). Herders' attacks are characterized by violence, kidnapping, armed robbery, murder, and rape. The number of lives claimed by herders is enormous, forcing smallholder farmers producing food for the growing population to abandon farming because their lives are at risk (Institute for Economics and Peace, 2015; Omilusi, 2016). Between 1997 and 2015, 461 reported that attacks left thousands of people dead and displaced more (SBM Intelligence, 2016). In 2016 alone, there were twenty-one attacks, with the number of victims ranging from 526-820 (SBM Intelligence, 2016). Additionally, the tragedy of the commons and resource-induced contestation between herders and farmers resulted in an estimated 1,868 lives in Nigeria in 2018 (ACLED, 2019). Approximately 26% of terror-related deaths in 2019 were linked to Fulani extremists' attacks on their victims (Institute for Economics and Peace, 2020). Since 2011, approximately 60,000 people have been killed during nomad-farmer conflicts in the country (Institute for Economics and Peace, 2020).

2. THEORETICAL UNDERPINNING AND LITERATURE REVIEW

We attempt here to link two important strands of literature that are key in discussing other-herder conflicts: ecoscarcity and frustration and aggression. We link the two strands to provide insights into how transhumance, influenced by climate change, results in conflict with farmers. The ecoscarcity theory of Homer-Dixon (1999) and the frustration and aggression theory of Dollard, Miller, Dool, Mowrer, and Sears (1939) are very influential in the natural resource conflict debate, which is usually linked to climate change. According to Tadess and Dereje (2018), climate change is viewed as a long-term and significant change in the expected patterns of a particular location's average weather conditions for a period of time (usually 30 years) due to the accumulation of greenhouse gases (CO_2, CH_4 and NO_2) in the atmosphere, leading to global warming. The consequences of global warming include increased runoff, changes in water quality, rising temperatures (Institute for Economics and Peace, 2020), severe drought and resource-induced competition, decreasing vegetation cover, and desertification in the Sahel savannah, resulting in the transmigration of herders (Onuh, 2023).

Migration to other regions with relatively favorable weather conditions caused by climate change is usually associated with conflicts and tensions resulting from competition between herders and farmers created by the overstocking of herds beyond the carrying capacity of arable land (Olaniyan, Francis, & Okeke-Uzodike, 2015; Onuh, 2023). The inadequacy of resources to sustain herders' livelihoods leads to frustration among herders, whose cattle graze indiscriminately on both noncrops and crops along their grazing routes. The indiscriminate grazing of cattle

on crops results in frustration among farmers, who in turn display aggression by attacking destructive cattle. The attack on herders' cattle leads to herders' aggression, who also usually embark on a reprisal attack on the farmers, setting in motion a cycle of conflict (Olaniyan et al., 2015). A review of the relevant literature that has attempted to link farmer–herder conflicts with climate change reveals mixed findings. While some studies indicate that variations in climatic conditions influence farmer–herder conflicts, others have not linked farmer–herder conflicts to climate change. A study conducted by Otaida and Yusufu (2022), which investigated climate change, farmer-herder conflict and security challenges in Benue State, Nigeria, revealed that a significant relationship exists between climate change and farmer-herder conflict.

Similarly, Effevottu and Ihuoma (2019) examined the nexus between climate change and conflict among farmers and herdsmen in Nigeria by adopting historical research methods and drawing data primarily from secondary sources such as books, journal articles, and internet sources. Their findings revealed that climate change and its underlying implications are the root causes of conflicts between farmers and herders in Nigeria. Similarly, Suleiman and Salisu (2022) investigated the effects of climate change-induced farmer–herder conflicts on the socioeconomic development of farmers in the Giwa Local Government Area of Kaduna State, Nigeria, by employing descriptive statistics to analyse the data collected. The results from the study revealed that climate change consequences such as irregular rainfall, increased temperatures/high incidence of sunshine, high livestock mortality, decreased crop yields, and increased incidence of drought-induced conflicts between farmers and herders negatively impacted the socioeconomic development of both farmers and herders. Olaniyan et al. (2015), in their efforts to situate farmer-herder conflicts in a real context, conducted a study entitled "The Cattle Are "Ghanaians," but the Herders Are Strangers: Farmer-Herder Conflicts, Expulsion Policy, and Pastoralist Questions in Agogo, Ghana." They collected data through unstructured interviews, participant observations, key informant interviews, and focus group discussions. The study's findings indicate that while climate change is leading to or contributing to conflict, it should not be seen as a direct cause, as climate change-linked conflict is building on existing relationships. Sarkin (2022) conducted a study on the implications of herdsmen and farmers' conflict on food security in Doma Local Government Area of Nasarawa State, Nigeria, using both quantitative and qualitative data. While the quantitative data were analyzed through univariate analysis, the qualitative data were transcribed verbatim into English. The study concluded that the farmer–herder conflict has been exacerbated by the global trend of climate change, which has led to the shrinking of ecological space and resources, resulting in increased pressure on and competition for available resources.

Ufuoma, Adewale, and Ibrahim (2021) reported no evidence of a significant relationship between conflicts and desertification (a climate change indicator) in Nigeria. Similarly, Umale (2023) used autoregressive distributed lag methodology to examine the influence of climate change (proxied by the carbon dioxide equivalent) and herder–farmer conflict (dummy variable) on food security, proxied by crop and livestock production. He investigated whether climate change is the cause of the intense conflict between herders and farmers experienced in recent years in Nigeria. He reported that climate change does not cause herder–farmer conflict in Nigeria.

3. METHODOLOGY

3.1. Study Area

The study was conducted in selected rural communities of Ekiti State, where herder–farmers' conflict is prevalent. Ekiti State is one of the six states in the six geopolitical zones of Southwest Nigeria. The Southwest region is primarily agrarian, except for Lagos, Ogun, and Oyo states, which have several industrial hubs. Agriculture significantly contributes to the region's economy, providing employment for more than three-quarters of the residents. It predominantly sustains the livelihoods of the majority of people living in Ekiti State, many of whom are smallholder arable crop farmers growing yams, cassava, maize, rice, vegetables, and other staple crops.

Figure 1 illustrates the different local government areas in Ekiti State, including the areas where data were collected.

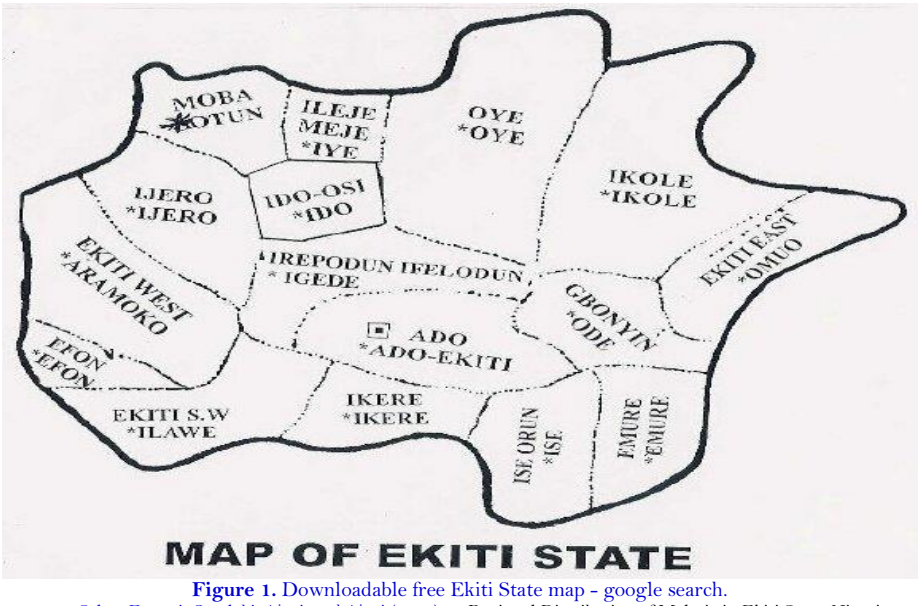

Figure 1. Downloadable free Ekiti State map - google search.
Source: Salau, Ewumi, Owolabi, Ajayi, and Ajayi (2016) on Regional Distribution of Malaria in Ekiti State, Nigeria.

Figure 2. Cows ravaging farmland in one of the study locations.

Figure 2 illustrates cows ravaging cassava and sorghum farmland in one of the study locations.

3.2. Sampling Method and Data Collection

The data for this study were collected through the administration of a structured questionnaire to a sample of 220 arable crop farmers selected through a combination of purposive and random sampling techniques. Purposive sampling was used to select communities where herder–farmer conflict is prevalent in the state, and random sampling was employed to ensure proper representation and avoid bias. These locations border the northern part of Ekiti State. Climate change caused by desertification and drought has led to a scarcity of forage crops, and this has forced livestock farmers in the northern part of Nigeria to move southwards in their quest to obtain food and fodder for their animals. A multistage sampling procedure was used to select samples for the study. The first stage involved purposive selection of the Ekiti northern Senatorial district, where the incidence of herder-arable crop farmer conflicts occurs more frequently relative to other districts in Ekiti State. The second stage involved a random selection of three local government areas (LGAs) from the five LGAs (Ido-Osi, Ikole, Ilejemeje, Moba, and Oye) in the Senatorial district. In the third stage, twenty-two communities were randomly selected from the chosen LGAs (eight communities from Ikole, which is the largest of the LGAs, and seven communities each from Moba and Ilejemeje). In the fourth stage, the snowball sampling method was employed to select ten farmers from each of the selected communities because the sampling frame of the farmers was not available. Finally, two hundred and twenty farmers were selected for the study.

3.3. Ethical Issues

Appropriate ethical procedures were followed while the data was collected for this study. These include the confidentiality of the information provided by the respondents and the anonymity of the participants in the survey, such that no names or identities of individuals were disclosed. Additionally, there was no coercion or forceful inclusion of any participants, as only those willing to provide the needed information were interviewed, and they were at liberty to discontinue the interview at any time they deemed fit. The research instrument was scrutinized by an appropriate university board on ethics for approval before data collection commenced.

3.4. Data analysis

The primary data collected for this study were analyzed using both descriptive and inferential statistics. While descriptive statistics were employed to analyze the socioeconomic characteristics of the smallholder arable crop farmers, a probit regression model was used to analyze the determinants of herder-arable crop farmer conflict in the study area. The descriptive statistics tools used include tables, frequencies, table means, standard deviations, etc. The probit model function employed is of the following form:

$$Y = f(X_s)\, U_i$$

In the probit model, a project rated (Y) successful is given a value of 1, whereas a project rated unsuccessful is given a value of 0. Successful projects are those rated as successful or highly successful. The probability p_i of having a successful rating over an unsuccessful rating can be expressed as:

$$p_i = Prob\,(Y_i = 1|\boldsymbol{X}) = \int_{-\infty}^{x_i'\beta} (2\pi)^{-1/2} \exp\left(-\frac{t^2}{2}\right) dt = \Phi(\boldsymbol{x}_i'\beta)$$

where Φ is the cumulative distribution function of a standard normal variable that ensures $0 \leq p_i \leq 1$, $\boldsymbol{x}$ is a vector of factors that determine or explain the variation in project outcome and β is a vector of parameters or coefficients that reflects the effect of changes in $\boldsymbol{x}$ on the probability of success.

where Y = the dependent variable indicating the incident of herder-arable farmer conflict (1) and no incident of herder-arable farmer conflict (0).

X_s = Independent variables, which include:

X_1 = Gender (Dummy – male = 1, female = 0).

X_2 = Age (Years).

X_3 = Educational status (Years).

X_4 = Marital status (Dummy - married, 0 otherwise).
X_5 = Extension contacts (Number).
X_6 = Previous encounter (Dummy - yes = 1, 0 otherwise).
X_7 = Membership of association (Dummy - yes = 1, 0 otherwise).
X_8 = Planting time (Dummy - on-season, 0 otherwise).
X_9 = Credit access (Dummy - yes = 1, 0 otherwise).
X_{10} = Household size (Number).
X_{11} = Farming experience (years).
X_{12} = Farm location (Dummy - Enroute herder lane, 0 otherwise).
X_{13} = Farm barricade/Fence (Dummy - yes =1, 0 otherwise).
X_{14} = Relationship with herder (Dummy - good = 1, 0 otherwise).
X_{15} = Political affiliation (Dummy – Member of dominant party in the state = 1, 0 otherwise).
U_i = Disturbance (Error) term

4. RESULTS AND DISCUSSION

4.1. Socioeconomic characteristics of the respondents

An analysis of the respondents' socioeconomic characteristics (as depicted in Table 1) revealed that the average age of the smallholder arable crop farmers in the study area was 56 years, with a mean household size of 4 members. This indicates that the farmers are older, approaching the mandatory retirement age of 60 years (in the case of civil servants), which has many implications for food production, coupled with the incessant conflict exacerbated by climate change. The distribution of respondents by years of schooling shows that three-quarters (68.5%) of them had up to secondary school education, an indication that the majority of the respondents could read and write. Only a few of them do not have any formal education. The respondents' distribution by extension reveals this to be very low in the study area, with less than 19% having contact with extension officers, which might be a contributor to the incessant conflicts experienced by these farmers with herders. Extension officers are trained on how to manage conflicts and provide farmers with information that can enhance their production, but these officers are not available to provide these services. The respondents' analysis by access to credit facilities indicates that approximately 73.2% do not have access to credit facilities; hence, they are unable to have enough capital to secure their farms and provide other infrastructure needed to enhance production. The majority of the farmers do not have barricades/fences around their farms, which makes their farms accessible to cows and other animals reared by these herders in their search for food.

Table 1. Respondent distribution by socioeconomic characteristics.

Age	Frequency	Percentage
< 30	20	9.1
31-40	27	12.3
41-50	41	18.6
51-60	95	43.2
>60	37	16.8
Gender		
Male	167	75.9
Female	53	24.1
Household size		
1 - 3	55	25.0
4 - 6	87	39.5
7 - 9	42	19.1
10 - 12	36	16.4
Education		
No formal education	14	6.4
Primary	29	13.2
Secondary	151	68.6
Tertiary	26	11.8
Marital status		
Single	39	17.7
Married	102	46.4
Divorced/Separated	46	20.9
Widowed	33	15.0
Extension contact		
Yes	41	18.6
No	179	81.4
Credit access		
Yes	59	26.8
No	161	73.2

4.2. Determinants of herd–smallholder arable crop farmer conflict

Some possible correlates/enablers of herder–smallholder arable crop farmer conflicts were considered in the probit model analysis on the basis of previous studies and reviews on conflicts, especially in developing countries. The results of the data analysis are presented in Table 2. The results revealed that some of the possible determinants of herder–smallholder arable crop farmers include the age of the farmer, years of schooling, farming experience, credit access, planting time, previous encounters, extension contacts, farm location, availability of barricades/fences, membership in associations and marital status. The coefficients of farm location ($p<0.00$), extension contact ($p<0.10$), access to credit ($p<0.05$), planting time ($p<0.10$), and household size ($p<0.65$) were positive, whereas those of age ($p<0.05$), educational status ($p<0.00$), previous encounters ($p<0.00$), farming experience ($p<0.10$), gender ($p<0.05$), membership in associations ($p<0.10$), and barricades ($p<0.01$) were negative. In other words, farms that are not fenced or barricaded and are located along or near the regular routes of herders are more likely to be invaded; hence, conflicts tend to erupt more frequently than in farms that are far fenced and located away from the herders' routes. Additionally, farmers with limited or no extension contacts, farms operating off-season, and those with estranged relationships with herders have a higher probability of being invaded, along with attendant conflicts, than those with regular extension contacts, operating in-season, and maintaining cordial relationships with herders.

On the other hand, the coefficients of farming experience, years of schooling, gender, and membership of associations were negative, indicating that a unit increase in the value or size of these variables reduces the likelihood of herder–smallholder arable crop farmer conflict in the study area. For example, farmers with tertiary education and previous encounters, those belonging to associations, and those with more farming experience are better able to manage herder–farmer conflict. The same applies to those with fenced or barricaded farms as well as those with access to credit facilities, as they are better able to provide the necessary infrastructure to protect their farms from being destroyed by grazing animals.

Table 2. Results of the probit regression analysis of the determinants of herder–farmer conflict.

Variable	Coefficient
Gender (X_1)	-0.301** (0.141)
Age (X_2)	-0.167* (0.086)
Educational status (X_3)	-1.355*** (0.409)
Marital status (X_4)	0.577 (0.923)
Extension contact (X_5)	2.319* (1.199)
Previous encounter (X_6)	-1.008*** (0.033)
Membership of association (X_7)	-8.327* (3.073)
Planting time (X_8)	3.208* (1.742)
Credit access (X_9)	0.601** (0.321)
Household size (X_{10})	2.621 (1.894)
Farming experience (X_{11})	-0,515* (0.288)
Farm location (X_{12})	3.833*** (1.207)
Farm barricade (X_{13})	-0.209*** (0.083)
Relation with herder (X_{14})	2.157 1.401)
Political affiliation (X_{15})	0.179* (0.097)

Note: ***, ** and * represent coefficients of variables significant at the 1%, 5% and 10% levels, respectively.

This result agrees with that of Obi-Egbedi, Okonkwo, and Adeyemi (2023), whose findings revealed that the years of education of arable crop farmers had a negative relationship with their conflict status. This result disagrees with that of Lawal, Joshua, Ochube, and Adamu (2021), who reported that unhealthy relationships/conflicts are due to previous experiences of emotional pain, which make both parties feel that they have been more affected and waiting for opportunities to retaliate. This result corroborates the findings of Amankwaa (2019), who reported that conflicts become more violent in the dry and hotter season of the year, which is from October through the start of the rainy season around April. These results support those of Mezie-Okoye and Asike (2020), who reported that farmer-herder clashes are politically motivated by ethnic colouration in Nigeria. The results agree with those of Okeke and Nnamani (2023), who reported that farmers whose property is adjacent to a road or animal route risk having their crops ruined if the cattle are allowed to run uncontrolled. These results agree with those of Eriksen and Lind (2005),

who reported that men, unlike women, always participate in the defence of their territory from attacks. These results conform with those of Olugbemiro, Alabi, and Tijani (2022), who reported that fencing farm areas and barricading routes leading to farm areas ranked low among the strategies used to prevent the invasion of herders. This result supports Adelakun, Adurogbangba, and Akinbile (2015), who previously reported that agricultural extension activities were substantial and impactful. However, these results contradict those of Chamo, Umar, and Sulaiman (2020), who reported that the contact of extension agents with their clients yielded benefits such as peaceful coexistence between farmer and pastoralist groups in communities and capacity building.

5. CONCLUSION AND RECOMMENDATIONS

The study examined some correlates of herder–smallholder arable crop farmer conflict in some randomly selected areas of Ekiti State, Nigeria. The findings from the study revealed that incessant conflict has led to many upheavals in the development of the study area, with reported cases of kidnapping, killing, and destruction of property and farm infrastructure, among others. The study's findings therefore have implications for food security, income, employment opportunities, investment drive, rural–urban drift, and the security of lives and property in the study area. The study therefore recommends enhanced access to credit facilities, awareness creation, and the provision of timely information to curtail this menace in the study area.

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Institutional Review Board Statement: The Ethical Committee of the University of Venda, South Africa has granted approval for this study on 16 April 2024 (FSEA/23/AECA/07).
Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: Literature review, data analysis, interpretation, conceptualisation, review and editing, Isaac Busayo Oluwatayo (IBO); literature review, data cleaning and entry, result interpretation, discussion, Olaniyi Oluwatosin Ojo (OOO). Both authors have read and agreed to the published version of the manuscript.

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