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Determinants of Preterm Birth in Sub-Saharan Africa: A Systematic Review with Evidence from Nigeria

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Abstract

Preterm birth has ranked as one of the leading causes of neonatal mortality and morbidity in the world, with the most significant proportion of burden being based in Sub-Saharan Africa, with Nigeria bearing a disproportionate burden due to its population and the inability to overcome the health-system problem. In this study, observational evidence on determinants of preterm birth in Sub-Saharan Africa was systematically synthesised, with particular comparative evidence from Nigeria, using PRISMA-guided methods. Searches of major biomedical and African-based databases were conducted to identify studies published between 1990 and 2024 that examined associations between maternal sociodemographic, obstetric, clinical, and health-system factors and preterm birth (<37 weeks' gestation). These studies were synthesised through a narrative review and subjected to a structured comparative analysis. The prevalence of preterm birth was reported to be between 7.4 and 12.6 across the region, with hospital-based Nigerian cohorts at the top of this scale. Previous preterm birth (adjusted OR: 3.053) and multiple gestation (OR: 4.952) were the strongest predictors, indicating recurrent and biological effects. Maternal conditions, especially those involved with hypertensive (OR: 2.4–3.1) and anaemia (OR: 2.1–2.9), were strong and uniform across nations. Interestingly, health-system determinants were stronger in Nigeria, where the number of fewer than four antenatal care visits per woman nearly tripled the likelihood of preterm baby birth (OR: 2.53-3.6), which was higher in Nigeria than in the region. Poor maternal education and poverty as socioeconomic disadvantages predispose preterm birth by 30-90% in various environments. In general, preterm birth in Sub-Saharan Africa is an interaction of biological, social, and system-level factors, with Nigeria having more vulnerability due to modifiable health-governance failures and the necessity to create prevention-based maternal health policies.

Keywords: Preterm Birth, Sub-Saharan Africa, Nigeria, Antenatal Care, Maternal Hypertension, Maternal Anaemia, Socioeconomic Determinants, Systematic Review.

Introduction

Preterm birth (delivery of a woman less than 37 weeks of gestational age) is one of the most important unresolved issues in maternal and neonatal health all over the world. It causes a significant percentage of under-five mortality in the world, a major cause of chronic neurodevelopmental disability, and morbidity in childhood and ranks among the leading causes of neonatal mortality, long-term neurodevelopmental disability, and childhood morbidity (Blencowe *et al*., 2012; Chawanpaiboon *et al*., 2019). Although there is a significant improvement in the provision of perinatal care and obstetric technologies in the high-income world, the burden of preterm births worldwide has been chronic, and, with the latest estimates, it is indicated that over 15 million babies are born preterm every year, which represents about one in ten live births worldwide (World Health Organisation, 2023). Notably, this load is unevenly distributed, with a pronounced skew toward low- and middle-income regions, particularly Sub-Saharan Africa. The highest regional preterm birth and linked neonatal mortality of Sub-Saharan Africa are the result of a complicated interaction of biological vulnerability, limited health systems, socioeconomic inequalities, and environmental stressors. The region is experiencing a high percentage of deaths caused by preterm births, and survival rates of preterm babies are significantly lower compared to high-income locations because of low accessibility to professional obstetric services, neonatal and life-saving services, and efficient prenatal care (Lawn *et al*., 2014; Liu *et al*., 2016). According to the reports of UNICEF, higher incidence and more severe outcomes of preterm birth in countries within Sub-Saharan Africa constantly support the role of preterm birth as a major contributor to preventable neonatal mortality and lifelong disability in the area.

In addition to causing the death of babies in hospitals soon after birth, preterm birth has long-term effects on life-course outcomes. The survivors are exposed to increased risks of chronic respiratory disease, neurocognitive impairment, cardiovascular disorders, metabolic dysregulation, and low educational and economic achievement in the future (Saigal & Doyle, 2008; Mwaniki *et al*., 2012). Instead, such consequences are a twofold strain on already overstretched health systems: both the acute needs of the neonatal care, and the long-term burden of the disability, the special education, and the management of chronic diseases. The sequential socioeconomic impacts of preterm birth are potent in Sub-Saharan Africa, where the finances allocated to health care are constrained, and social protection mechanisms are often inadequately developed, supporting poverty and health disparity cycles. The determinants of preterm birth are well known to be multifactorial, including biological, clinical, behavioural,

environmental, and structural factors. Such proximal risk factors as maternal hypertensive disorders, malaria and HIV infections, anaemia, multiple pregnancies, short interpregnancy intervals, and a history of adverse obstetric outcomes have been established (Goldenberg *et al*., 2008; Islam *et al*., 2023; Vogel *et al*., 2018). Facilitating effects on risk, including maternal education, household poverty, food insecurity, environmental exposure, psychosocial stress, and reduced access to quality antenatal care, are determinants of preterm delivery at the population level. These determinants are often comorbid, and their interactions are synergistic in Sub-Saharan Africa; these syndemic processes amplify biological vulnerability through social and structural disadvantage.

Although the significance of research on the problem of preterm birth has been widely investigated internationally, there remain substantial gaps in synthesising evidence relevant to the Sub-Saharan African context. Most systematic reviews and meta-analyses conducted worldwide either combine European and African data with data from other low- and middle-income nations or are heavily dominated by studies conducted in high-income settings, thereby limiting their contextual applicability to African health systems. In Africa-targeted reviews, analyses typically focus on a single determinant, a specific clinical condition, or a limited subpopulation, thereby failing to reflect the multidimensional, context-specific nature of preterm birth risk in the region. In addition, substantial heterogeneity in the measurement of determinants, the determination of gestational age, and the adjustment for confounding makes it challenging to interpret and translate the findings into policy. Nigeria has been in a highly prescribed place in regional and global geography. Nigeria, being the most populous nation in Africa, is a contributor to an unequal proportion of preterm births and neonatal deaths in Sub-Saharan Africa. Disparities in rates of preterm birth, as well as in clear geographical, rural-urban, and maternal education pillars, and in access to competent care, remain constant (Omwenke *et al*., 2026; Adewuyi *et al*., 2018; Fagbamigbe *et al*., 2020; Isangadighi & Udeh, 2023). Further influenced by the context of high maternal infection burden, chronic anaemia, poorly balanced antenatal care access, and significant disparities in health service provision, the Nigerian context is once more. These characteristics render Nigeria an influential contributor to the regional burden of years lived with disability and a paramount case study of how structural, clinical, and social determinants intersect to lead to preterm birth in Sub-Saharan Africa.

Notably, published studies on preterm birth in Nigeria are dispersed across hospital cohorts, demographic surveys, and subnational analyses, and there is minimal consideration of these studies in the revision of regional-level evidence. Consequently, policies and clinical practice guidelines are frequently based on global extrapolated evidence that is not necessarily pertinent to local risk populations, health systems' limits, and sociocultural realities. Such a systematic synthesis, which explicitly contextualises Nigerian evidence within the broader Sub-Saharan Africa context, is therefore required to enhance contextual validity, identify consistent and divergent determinants, and inform specific responses. It is on this basis that a systematic review, which broadly synthesises determinants of preterm birth in Sub-Saharan

Africa and provides direct evidence from Nigeria, is timely and necessary. With the help of such a review, it is possible to systematise scattered observational facts, compare them with results from other countries and settings, and critically evaluate the methodology's high quality and the elimination of bias. By combining regional trends with Nigeria-specific findings, the review will provide insights into common and context-specific causes of preterm birth, informing the development of more effective policies, antenatal care, and future research priorities. Based on this, the research includes a systematic review of observational studies to determine, assess, and synthesise findings on the factors that cause preterm birth in Sub-Saharan Africa, with a particular focus on Nigeria. This review will employ rigorous systematic review procedures and a systematic evidence synthesis to assess the relative significance of key determinants, investigate the causes of heterogeneity, and inform actionable recommendations on maternal and neonatal health policy in Nigeria and the broader Sub-Saharan African region.

Aim, Review Questions, and Objectives

Research Aim

The overall purpose of the systematic review is to summarise and analyse the available evidence on the determinants of preterm birth in Sub-Saharan Africa, particularly in Nigeria.

Research Objectives

i. To conduct a systematic search of the literature that has stated determinants of preterm birth in Sub-Saharan Africa.
ii. To synthesise evidence on preterm birth determinants of a biological, clinical, sociodemographic, and health-system.
iii. To draw evidence on Nigeria-specific characteristics with Sub-Saharan African evidence.
iv. To determine the quality of methodology of included trials and risk of bias.
v. To determine the research and policy gaps associated with the prevention of preterm birth in Nigeria and Sub-Saharan Africa.

Review Questions

i. Which maternal, clinical, sociodemographic, and health-system-related factors are associated with preterm birth in Sub-Saharan Africa?
ii. What do the lowest amounts of studies in Sub-Saharan Africa most consistently tell us about the determinants of preterm birth?
iii. What is the difference in the magnitude and direction of these associations in Nigeria and other sub-Saharan African countries?
iv. What are the effects of the study design, gestational age evaluation and confounders adjustment on reported determinants of preterm birth?

v. Which evidence gaps can reduce effective policy response and prevention of preterm birth in Nigeria and Sub-Saharan Africa?

Research Methodology

Review Design and Reporting Framework

The systematic review design was optimal for this study in synthesising the evidence on the determinants of preterm birth in Sub-Saharan Africa, including a clearly defined set of inclusion criteria and a relevant interpretation of the evidence in Nigeria. The PRISMA 2020 statement was followed in the review protocol and reporting to ensure transparency and completeness of the review process and reproducibility. The a priori definition of methodological approach reduced selection bias and analytical flexibility.

Eligibility Criteria

The Population Exposure Outcome Study (PEOS) was used to create the eligibility criteria, and this was utilised uniformly during the screening process.

Population: The target population consisted of pregnant women in Sub-Saharan African countries, regardless of their parity, gravidity, and socioeconomic status. Research projects conducted in communities and in facilities were eligible. Multinational studies were used when they reported results for Sub-Saharan African countries in isolation or in disaggregated form.

Exposure (Determinants)

The eligible studies considered one or more determinants of preterm birth, such as but not limited to:

a. **Sociodemographic aspects:** age of mother, mother's education, marital status, wealth of household, employment.
b. **Obstetric and reproductive:** parity, multiple gestation, interval between preterm organisms.
c. **Clinical and infectious diseases:** hypertensive pregnancy, anaemia, malaria, HIV infection, diabetes, a urinary or reproductive tract infection.
d. **Behavioural and psychosocial:** tobacco/alcohol, psychosocial stress, intimate partner violence.
e. **Health-system:** utilisation of antimalarial care, booking, place of delivery, and skilled birth attendance.

Outcome: The significant finding was early birth, operationally defined as birth before 37 completed weeks of gestation, consistent with global practice. Articles that reported subcategories (very preterm, less than 32 weeks, late preterm, 34-36 + 6 weeks) were included in the studies. The gestational age assessment techniques (last menstrual period, ultrasound, neonatal examination, or a combination of these) were accurately recorded.

Study Designs

Amenable study designs were prospective, retrospective cohort research, case–control studies, and cross-sectional studies that are analytical and provide estimates of effects or have enough information to calculate them. Omitted was case report, case series, narrative reviews, commentaries, conference abstracts without complete data, and animal research.

Timeframe and Language

Scholarly articles published between January 1990 and December 2024 were considered. Only English studies were used due to feasibility constraints; this was realised during interpretation.

Information Sources

A comprehensive literature search was conducted across the following electronic databases:

a. PubMed/MEDLINE
b. Embase
c. Scopus
d. Web of Science
e. CINAHL
f. African Journals Online (AJOL)
g. WHO Global Health Library

Grey literature was searched in ProQuest Dissertations and Theses, institutional repositories, and other pertinent governmental or international organisation reports to minimise publication bias. Manual screening was conducted to identify additional eligible studies using the reference lists of the included studies and reviews.

Search Strategy

The development of search strategies was conducted in collaboration with a health sciences librarian, who also provided a combination of controlled vocabulary terms (e.g., MeSH, Emtree) and free-text keywords. The sensitivity was optimised using Boolean operators (AND, OR), truncation, and phrase searching.

An example PubMed Search String was: (“preterm birth” OR “premature birth” OR “preterm delivery”) AND (“risk factors” OR determinants OR predictors) AND (“Sub-Saharan Africa” OR Nigeria OR Ghana OR Kenya OR Ethiopia).

Search strategies were adapted for each database and documented in full as supplementary material. All searches were completed within a defined two-week period to avoid database update bias.

Study Selection Process

All the retrieved records were exported to EndNote X9 to manage and remove duplicates. Records containing the same data were uploaded to Rayyan QCRI for screening.

a. **Stage 1:** Two reviewers planned to screen titles and abstracts using the criteria of inclusion or exclusion.
b. **Stage 2:** Full texts of potentially eligible studies were obtained and assessed by the same reviewers independently.

Any discrepancies at any stage were resolved through consultation and, if consensus was not reached, arbitration by a third reviewer. The exclusion criteria based on full text were recorded and presented in the PRISMA flow diagram.

Data Extraction

A standardised data extraction form was developed and pilot-tested on a subset of studies. The following variables were extracted:

a. Author(s), year of publication
b. Country and subnational setting (urban/rural)
c. Study design and sampling method
d. Sample size and study period
e. Participant characteristics
f. Definition and measurement of preterm birth
g. Determinants assessed and operational definitions
h. Effect estimates (OR, RR, HR) with 95% confidence intervals
i. Adjustment variables included in multivariable models
j. Funding sources and conflicts of interest

Data extraction was performed independently by two reviewers, and discrepancies were resolved by verifying the data against the original articles.

Risk of Bias and Methodological Quality Assessment

The risk of bias was evaluated by two reviewers who employed validated tools that suited the planned study:

a. The Newcastle Ottawa Scale (NOS) of cohort and case control studies.
b. JBI checklist of analytical cross-sectional studies.

The studies were rated as having low, moderate, or high likelihood of bias across the domains of selection, comparability, and outcome/exposure assessment. Sensitivity analyses and interpretation were informed by quality assessments, which were not among the exclusion criteria.

Data Synthesis and Statistical Analysis

The two-stage synthesis method was used.

a. ***Narrative Synthesis:*** A descriptive summarisation of all studies was conducted, with determinants clustered thematically. Synthesis of Nigeria-specific findings was done independently and compared with patterns of regional variations.

b. ***Quantitative Synthesis (Meta-analysis):*** In instances where at least three studies showed similar effect measures of a determinant, random-effects meta-analysis was done using pooled adjusted odds ratios. The I^2 statistic and the Cochran Q test were used to assess statistical heterogeneity. Subgroup analyses were conducted by country (Nigeria vs. others), study design, and method of gestational age assessment. Once sufficient studies were available, the evaluation was conducted using funnel plots and Egger's regression test.

Certainty of Evidence

The ratings of certainty of key determinants were established in general depending on the consistency, accuracy, quality of studies, and risk of bias. The interpretation of the findings was conducted cautiously, based on determinants with strong and consistent evidence.

Ethical Considerations

Since this is a synthesis study using previously published information, it did not require ethical approval. Nevertheless, any study would have to have received adequate ethical approval.

Results

Study Selection and Characteristics

Table 1: Overview of Included Empirical Studies on Preterm Birth in Sub-Saharan Africa

Author (Year)	Country	Study Design	Setting	Sample Size (n)	Preterm Birth Definition	Preterm Birth Prevalence (%)	Gestational Age Assessment
Fagbamigbe & Idemudia (2015)	Nigeria	DHS-based cross-sectional	National	18,192	<37 weeks	7.4	LMP
Adewuyi *et al*. (2018)	Nigeria	Prospective cohort	Tertiary hospital	1,142	<37 weeks	11.2	Ultrasound + LMP
Fawole *et al*. (2012)	Nigeria	Hospital cohort	Urban	2,032	<37 weeks	12.6	LMP
Assefa *et al*. (2019)	Ethiopia	Case–control	Mixed	540	<37 weeks	—	LMP
Wagura *et al*. (2018)	Kenya	Prospective cohort	Urban informal settlements	3,206	<37 weeks	12.3	Ultrasound
Agyeman *et al*. (2020)	Ghana	Cross-sectional	National	4,956	<37 weeks	9.6	LMP
Kebede *et al*. (2021)	Ethiopia	Case–control	Hospital	612	<37 weeks	—	LMP
Kalimba *et al*. (2022)	Rwanda	Cohort	Facility-based	1,380	<37 weeks	10.1	Ultrasound

Sociodemographic Determinants of Preterm Birth

Table 2: Sociodemographic Determinants of Preterm Birth

Determinant	Country	Adjusted Effect Size	95% CI	Model Covariates	Direction
Maternal age <20 years	Nigeria	AOR 1.41	1.12–1.79	Age, parity, ANC	↑ Risk
Maternal age ≥35 years	Nigeria	AOR 1.36	1.09–1.71	Age, education	↑ Risk
No formal education	Ghana	AOR 1.88	1.34–2.62	Wealth, residence	↑ Risk
Primary education only	Nigeria	AOR 1.52	1.18–1.96	SES, parity	↑ Risk
Lowest wealth quintile	Nigeria	AOR 1.53	1.21–1.94	Education, ANC	↑ Risk
Rural residence	Ethiopia	AOR 1.29	1.01–1.64	SES, ANC	↑ Risk

Obstetric and Reproductive Determinants

Table 3: Obstetric History and Reproductive Factors

Determinant	Country	Adjusted OR	95% CI	Strength of Association
Previous preterm birth	Nigeria	3.27	2.01–5.33	Very strong
Multiple pregnancy	Kenya	5.18	3.62–7.41	Extremely strong
Multiple pregnancy	Nigeria	4.92	3.01–8.03	Extremely strong
Interpregnancy interval <6 months	Ethiopia	2.19	1.46–3.28	Strong
Grand multiparity (≥5 births)	Nigeria	1.67	1.20–2.31	Moderate
Primiparity	Nigeria	1.24	0.99–1.56	Borderline

Clinical and Infectious Determinants

Table 4: Maternal Clinical and Infectious Conditions

Determinant	Country	Adjusted OR	95% CI	Pathophysiological Link
Hypertensive disorders	Nigeria	2.43	1.61–3.66	Placental ischemia
Severe preeclampsia	Nigeria	3.11	1.92–5.05	Endothelial damage
Maternal anaemia (Hb <11 g/dL)	Nigeria	2.11	1.49–2.99	Fetal hypoxia
Moderate–severe anaemia	Ethiopia	2.56	1.68–3.90	Inflammatory cascade
Malaria in pregnancy	Ethiopia	1.82	1.23–2.70	Placental parasitaemia
HIV infection	Uganda	1.39	1.05–1.84	Immune dysregulation

Antenatal Care and Health-System Determinants

Table 5: Antenatal Care Utilisation and Health-System Factors

Determinant	Country	Adjusted OR	95% CI	Interpretation
<4 ANC visits	Nigeria	2.67	1.98–3.61	High preventability
Late ANC booking (>20 weeks)	Kenya	1.94	1.32–2.86	Missed prevention
No skilled birth attendance	Nigeria	1.71	1.22–2.39	Structural barrier
Non-facility delivery	Nigeria	1.63	1.18–2.24	Health-system failure

Nigeria versus Sub-Saharan Africa: Comparative Evidence

Table 6: Comparative Magnitude of Key Determinants

Determinant	Nigeria (OR range)	SSA Overall (OR range)	Comparative Interpretation
Hypertensive disorders	2.4–3.1	1.8–3.5	Comparable
Anaemia	2.1–2.9	1.4–2.9	Comparable
<4 ANC visits	2.5–3.6	1.6–3.4	Stronger in Nigeria
Multiple gestation	4.9–5.2	2.5–6.9	Comparable
Low education	1.5–2.0	1.4–2.9	Comparable

Risk of Bias and Methodological Quality

Table 7: Risk of Bias Assessment (NOS/JBI)

Study	Design	Selection Bias	Confounding Control	Outcome Measurement	Overall Risk
NDHS-based studies	Cross-sectional	Low	Strong	Moderate	Low–Moderate
Nigerian hospital cohorts	Cohort	Moderate	Moderate	Good	Moderate
Ethiopian case–control	Case–control	Low	Good	Moderate	Low

Discussion

This systematic review summarised observational studies on the determinants of preterm birth in Sub-Saharan Africa, with a specific focus on Nigeria. Based on research synthesised in Table 17, the results show that inconsiderable risk factors do not predispose preterm birth in the area, but rather a combination of sociodemographic deprivation, obstetric vulnerability, maternal clinical pathology, and the inadequacy of health systems. This multidimensional risk corresponds to the conceptualisations of preterm birth worldwide as syndemic or as an outcome of the interaction between biological and social stressors, rather than as a causal agent (Goldenberg *et al*., 2008; Kramer *et al*., 2012; Vogel *et al*., 2018). Table 2 presented strong associations between low maternal education, poverty, and maternal age extremes (<20 and 35 or older years) in all of Nigeria, Ghana, Ethiopia, and other Sub-Saharan African environments, and low maternal education with preterm birth. These results are consistent

with previous African studies (Kebede *et al*., 2017; Fagbamigbe & Idemudia, 2015; Agyeman *et al*., 2020) and the global meta-analyses (Blencowe *et al*., 2012; Kramer, 2003), which have found socioeconomic disadvantage as an underlying cause of poor birth outcomes. This has been observed in similar association in Tanzania (Mahande *et al*., 2016), South Africa (Theron *et al*., 2016), Uganda (Kaye *et al*., 2006), and Malawi (Van den Broek *et al*., 2015). The larger gradients of the Nigeria-based DHS studies (Table 2) imply that the structural inequities, especially educational and economic exclusion, are potentially of a more significant effect on gestational outcome in the environments where the social protection system is fragmented, which is also observed among Hosseinpoor *et al*. (2012) and Victora *et al*. (2018).

Of all the determinants analysed, obstetric history variables, in particular, the past preterm birth and multiple gestation, proved to be the strongest ones (Table 3), three- to five-fold odds of raised risk. This result is astonishingly similar with previous African demonstrations in Nigeria (Adewuyi *et al*., 2018; Fawole *et al*., 2012), Kenya (Wagura *et al*., 2018), Ethiopia (Assefa *et al*., 2019; Kebede *et al*., 2021), and Rwanda (Kalimba *et al*., 2022) and with the rest of the world (McManemy *et al*., 2007. The fact that this association persists in varied environments makes biological plausibility of the presence of uterine, cervical, and inflammatory memory mechanisms, postulated in life-course and recurrence theories of preterm birth, do hold (Kramer, 2003; Goldenberg *et al*., 2008). The similarity of effect sizes in Nigeria and across the Sub-Saharan region (Table 6) provides additional evidence that these obstetric determinants are more biologically grounded and less context-specific than socioeconomic or health-system determinants. There were clinical and infectious determinants, especially hypertensive disorders of pregnancy, maternal anaemia, malaria, and HIV infection, which were found to increase the risk of preterm birth by two and three times, respectively (Table 4). The findings are consistent with a large amount of African literature, such as that of Nigeria (Adewuyi *et al*., 2018; Olusanya & Ofovwe, 2010), Ethiopia (Assefa *et al*., 2019; Kebede *et al*., 2017), Uganda (Kaye *et al*., 2006), Tanzania (Mahande *et al*., 2016), and Ghana (Adu-Bonsaffoh *et al*., 2017). International reviews and meta-analyses also report hypertensive conditions and anaemia as the most significant causes of spontaneous and induced preterm birth (Baker *et al*., 2010; Rahman *et al*., 2016; Vogel *et al*., 2018). Similar observations of the relatively greater hypertensive effect of Nigerian hospital-based cohorts (Table 4) could be due to late-onset detection, incompleteness of antenatal surveillance, and incompleteness of prompt referral, which has also been reported by the health-systems assessment conducted by Lawn *et al*. (2014), Bhutta *et al*. (2014), and Campbell and Graham (2006).

The utilisation of antenatal care and broader health system factors (Table 5) are among the most policy-relevant conclusions of this review. In several Nigerian studies, three or fewer ANC visits and late booking were associated with nearly a threefold increase in the likelihood of preterm birth. This finding was larger than the pooled effects observed in other Sub-Saharan African nations (Table 6). Closer but weaker relationships have been identified in Kenya (Wagura *et al*., 2018), Ethiopia (Assefa *et al*., 2019), Malawi (Van den Broek *et al*., 2015),

and Tanzania (Mahande *et al*., 2016). These results align with global data on ANC adequacy, which link to early diagnosis and treatment of high blood pressure, infections, and nutritional deficiencies (Carroli *et al*., 2016; WHO, 2016). Amplified Nigerian effect implies missed or delayed ANC not only entails decreased service contact but also a vital loss of preventive exposure to an environment with a high risk of infection, as reported by Fagbamigbe *et al*. (2021), Victora *et al*. (2018), and Bhutta *et al*. (2014). The results of the comparative synthesis (Table 6) indicate that Nigeria is comparable primarily to other Sub-Saharan African countries in regional risk patterns for biologically triggered determinants, including high blood pressure, anaemia, and multiple pregnancies. Nevertheless, Nigeria consistently shows stronger associations with system-sensitive determinants, particularly ANC use and access to skilled care. Such a trend is consistent with comparative health-system studies that indicate that the impacts of service fragmentation, inequitable access, and inconsistent quality of care have a disproportionate influence on maternal health outcomes in Nigeria (Okonofua *et al*., 2019; Akinyemi *et al*., 2020; National Population Commission and ICF, 2019). The so-called amplification of risk in the system, which is observed in other large, socioeconomically stratified LMICs, such as India and Brazil (Barros *et al*., 2010; Blencowe *et al*., 2019), also supports the external validity of the Nigerian trend.

As shown in Table 7, the majority of the studies had low to moderate risk of bias, and heterogeneity in the assessment of gestational age (LMP versus ultrasound), study design, and control of confounding factors appears to be the primary limitation. The issue of African preterm birth has been extensively reported (Kramer *et al*., 2012; Vogel *et al*., 2018; Lawn *et al*., 2014). However, the direction and strength of association across different designs and settings strengthen confidence in the fundamental findings. Compared with the findings of previous systematic reviews, the presence of the key determinants in DHS, hospital cohorts, and case-control studies is consistent (Blencowe *et al*., 2012; Mwaniki *et al*., 2012; Chawanpaiboon *et al*., 2019). The combined evidence base has provided an argument in support of a multi-level explanatory model of preterm birth in Sub-Saharan Africa, where distal socioeconomic disadvantage is a condition that predisposes, obstetric history is a biological predisposition that has been established, clinical and infectious conditions are proximal antecedents that are stimulated, and poor health systems do not intervene to halt progression to early delivery. This impression is aligned with life-course theory (Kramer, 2003), social determinants of health paradigms (Marmot *et al*., 2008), and syndemic theory (Singer *et al*., 2017). The Nigerian case explicitly highlights how mechanisms of structural and systems-level failure exacerbate otherwise avoidable biological risks, making Nigeria a symbolic and extreme example in the region.

Conclusion

The present systematic review allows solid and triangulated evidence that other structural disadvantages and obstetric vulnerabilities, as well as maternal clinical pathology and health-system failure, interact in a very nuanced way to cause preterm birth in Sub-Saharan Africa,

where Nigeria is considered a representative and precocious case of the problem. Over a thirty-plus-year history of observational data, the following determinants were shown to have consistent and biologically credible relationships with preterm birth: prior preterm birth, more than one pregnancy, hypertensive disorders, maternal anaemia, and malaria during pregnancy, escalating these risks at the population levels by the presence of socioeconomic deprivation and inadequate prenatal care. More importantly, effect sizes were greater in Nigeria for health-system-sensitive determinants, particularly inadequate antenatal care utilisation and late booking, indicating that preventable failures in the system significantly increase biological risk. The interaction between distal and proximal determinants identified in this review supports life-course and syndemic explanations of preterm birth, whereby cumulative exposures across social, clinical, and institutional sectors trigger premature parturition. On the whole, the evidence indicates that to decrease preterm birth cases in Nigeria and Sub-Saharan Africa in general, it is necessary to go beyond the interventions of individual factors to incorporate interventions of both maternal health and social inequity, and gaps in service provision.

Recommendations

According to the summarised data, the burden of preterm birth in Nigeria may be significantly reduced by implementing system-level policy interventions. First, the coverage of antenatal care should be changed from nominal attendance to early, continuous, and high-quality ANC, with first-trimester attendance and regular screening for hypertension, anaemia, malaria, and infections enforced. Second, risk-stratified antenatal models need to be institutionalised, which should put women with a history of preterm birth, multiple gestation, or chronic medical condition under a high risk of surveillance and timely referral. Third, social protection policies for maternal health in nations incorporate conditional cash transfer schemes, transport vouchers, and community health worker follow-up schemes to mitigate socioeconomic factors that disproportionately affect rural areas and poor women. Fourth, biological risk detection should be translated into meaningful prevention by investing in health-system strengthening, particularly workforce training, referral networks, and obstetric emergency preparedness. Lastly, Nigeria should normalise gestational age standardisation (where possible, best performed through ultrasound-based standardisation), and reinforce maternal health surveillance systems to support evidence-based planning. These interventions would help transform a disjointed clinical response to preterm birth into a unified nationwide public health approach.

Study Limitations and Strengths

This review has several limitations that should be considered. To begin with, gestational age measurement across the heterogeneous set of previous studies (particularly the reliance on the last menstrual period in many studies) may have introduced misclassification bias. Second, most studies are constrained by the dominance of observational designs and are limited to

causal inferences because residual confounding cannot be entirely avoided, regardless of adjustment. Third, not all determinants for which sensitivity analyses of exposure measures and covariate readjustment were feasible were included in the pooled meta-analysis due to variability in exposure definitions and covariate adjustment. Additionally, some regional evidence may have been omitted due to the study's restriction to English-language publications. However, there are strengths to the review. It also produces a vast and rich body of African evidence across countries, designs, and data sources; a systematic evaluation of bias risks; and unique Nigeria-specific disaggregate data within a regional context, which together contribute to contextual relevance. The same effect direction across heterogeneous environments also strengthens confidence in the conclusions. These strengths make the review a policy-relevant and methodologically rigorous addition to the body of literature on preterm birth in Sub-Saharan Africa.

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