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Incidence and Factors Associated With Incident Hepatitis B Virus Infection in African Populations: A Systematic Review

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Systematic Review

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Abstract

Background

Hepatitis B virus (HBV) infection remains an important public health concern in Africa, where ongoing transmission contributes to the burden of chronic liver disease and related complications. Although HBV prevalence in African populations has been widely studied, evidence regarding incident HBV infection and factors associated with newly acquired infection is less consistently characterized. This systematic review aimed to synthesize the available evidence on the incidence of incident HBV infection and associated factors among populations in Africa.

Methods

A systematic literature search was conducted in PubMed using the search strategy: "("hepatitis B" OR HBV) AND (incident OR incidence OR seroconversion OR "new infection") AND (Africa OR African)". Studies were eligible if they were conducted in African populations and reported incident HBV infection, HBV seroconversion, or incidence based on longitudinal or repeated testing among adults. Studies were screened according to predefined eligibility criteria, and relevant data were extracted from eligible full-text studies. Risk of bias was assessed using the Newcastle–Ottawa Scale (NOS) for cohort studies.. Due to substantial heterogeneity In study populations, settings, study designs, follow-up periods, and outcome definitions, findings were synthesized narratively rather than through meta-analysis.

Results

Five studies conducted in the Democratic Republic of the Congo, Côte d'Ivoire, Burkina Faso, Botswana, and Malawi met the inclusion criteria. The studies included predominantly blood donors, while one study evaluated HIV-infected treatment-naïve adults. Reported HBV incidence varied considerably across settings. Incidence was 25.4 per 1000 person-years in the Democratic Republic of the Congo, 3.6 per 100 person-years in Botswana, and 13.7 per 1000 person-years in Malawi. In Côte d'Ivoire, HBV seroconversion incidence decreased from 7.3 per 100 person-years in 1992–1994 to 0.2 per 100 person-years in 2010–2012. The Burkina Faso study also reported incident HBV infection among repeat blood donors. Factors associated with incident infection varied between studies, with differences observed according to donor type, age, geographical setting, and population characteristics. However, findings were not sufficiently consistent to identify a single set of risk factors across African populations.

Conclusion

Incident HBV infection continues to occur among adults in several African settings, although incidence varies substantially across populations and study periods. The available evidence is limited and

heterogeneous, with a predominance of blood-donor populations and relatively limited representation of the general adult population. Further longitudinal studies using standardized definitions and broader population-based samples are needed to better characterize the incidence and determinants of newly acquired HBV infection in Africa.

1. Introduction

Hepatitis B virus (HBV) infection remains an important public health concern in Africa, particularly in sub-Saharan Africa, where HBV prevalence is among the highest worldwide. [1, 2]

Chronic HBV infection is associated with substantial long-term morbidity and mortality, including liver cirrhosis and hepatocellular carcinoma [1, 2]. The burden of HBV therefore extends beyond the number of individuals currently infected, as continued transmission can sustain the pool of chronic infection within populations [1–3].

HBV can be transmitted through several routes, including sexual contact, percutaneous exposure, and perinatal transmission [1–3]. In highly endemic African settings, transmission has traditionally been associated with infection acquired during childhood, including horizontal transmission through contact with infected bodily fluids [3]. Consequently, newly acquired HBV infection during adulthood has received comparatively less attention. However, longitudinal studies among adult populations have demonstrated that incident HBV infection continues to occur [4–8].

Evidence from African settings illustrates the persistence of incident HBV infection among adults. Studies among blood donors in the Democratic Republic of the Congo, Côte d'Ivoire, Burkina Faso, and Malawi have reported new HBV infections during follow-up [4–7]. In Côte d'Ivoire, for example, the incidence of HBsAg seroconversion among regular blood donors declined substantially over two decades, from 7.3 per 100 person-years in 1992–1994 to 0.2 per 100 person-years in 2010–2012, although transmission continued to occur [5]. Similarly, a retrospective cohort study in the Democratic Republic of the Congo reported 40 incident HBV cases and an incidence rate of 25.4 per 1000 person-years among blood donors. Family donors had a higher risk of HBsAg seroconversion than volunteer donors after adjustment for age, sex, and residence[5].

Other African studies have reported incident HBV infection in different populations and settings [6]. In Burkina Faso, HBV incidence among repeat blood donors was approximately 2.43 per 100 person-years, with differences observed according to age and geographical setting. In Botswana, incident HBV infection was investigated among HIV-infected, treatment-naïve adults, with an incidence of 3.6 per 100 person-years over a median follow-up of 2.75 years [8]. Although younger age and educational level showed differences between incident cases and uninfected participants, none of the evaluated risk factors demonstrated a statistically significant association with incident HBV infection in the regression analysis [8]. These findings suggest that the occurrence and determinants of newly acquired HBV infection may differ according to population characteristics and epidemiological context [4–8].

Despite evidence of ongoing adult HBV transmission, available studies are geographically and methodologically diverse. Much of the available longitudinal evidence comes from blood-donor populations, who are subject to eligibility criteria that may exclude individuals with characteristics associated with higher infection risk [9]. Other studies have focused on specific populations, such as adults living with HIV, limiting the extent to which their findings can be generalized to the broader adult population [8]. Furthermore, reported incidence estimates vary considerably across settings and study periods, making it difficult to draw a consistent picture of the burden and determinants of incident HBV infection in African adults [4–8].

A clearer synthesis of longitudinal evidence is therefore needed to characterize the occurrence of incident HBV infection and identify factors that may be associated with newly acquired infection among adults in Africa. Understanding these patterns may help identify populations and settings requiring strengthened prevention, vaccination, screening, and surveillance strategies [1, 10].

Objective

This systematic review aimed to synthesize the available evidence on the incidence of incident

HBV infection and factors associated with newly acquired HBV infection among adults in Africa.

2. Methods

2.1 Study Design

This study was conducted as a systematic review of observational longitudinal evidence on incident hepatitis B virus (HBV) infection among populations in Africa. The review was conducted according to predefined eligibility criteria and a structured process for literature searching, study selection, data extraction, risk-of-bias assessment, and evidence synthesis.

2.2 Eligibility Criteria

Studies were considered eligible if they met the following criteria:

Inclusion criteria

- Studies conducted in an African country.
- Studies involving adult participants.
- Observational studies providing longitudinal or repeated-testing data.
- Studies reporting incident HBV infection, HBV seroconversion, or an incidence measure based on new infection during follow-up.
- Studies reporting the incidence of incident HBV infection and/or factors associated with newly acquired HBV infection.

Exclusion criteria

Studies were excluded if they:

- Were conducted outside Africa.
- Did not involve an eligible adult population.
- Reported HBV prevalence without information allowing identification of incident infection.
- Did not provide relevant data on HBV incidence or newly acquired infection.
- Were reviews, editorials, commentaries, case reports, or other publication types that did not provide eligible primary longitudinal data.

2.3 Information Sources and Search Strategy

A systematic literature search was conducted in PubMed/MEDLINE to identify studies reporting incident hepatitis B virus (HBV) infection in African populations.

The search strategy combined terms related to HBV, incident infection, and Africa using relevant keywords and Boolean operators. Search terms included “hepatitis B,” “HBV,” “incident,” “incidence,” “seroconversion,” “new infection,” “Africa,” and “African.”

The search was conducted from database inception to 22 August 2026.

The retrieved records were screened systematically to identify studies relevant to the review question. Approximately 300 records identified as potentially relevant were initially screened based on their titles and abstracts. Fourteen studies were subsequently considered potentially eligible for full-text assessment, and five studies met the predefined eligibility criteria and were included in the final systematic review.

2.4 Study Selection

The retrieved records were screened systematically according to the predefined eligibility criteria. Initially, The PubMed/MEDLINE search identified 4,364 records. After an initial title and abstract screening process, approximately 300 records were considered potentially relevant. Following further screening, 14 reports were identified for full-text assessment. After application of the predefined eligibility criteria, five studies were included in the qualitative synthesis.

Study selection was conducted by a single reviewer. Titles and abstracts were screened for potential eligibility, followed by full-text assessment of potentially eligible studies.

The study selection process was documented using a PRISMA 2020 flow diagram [11].

2.5 Data Extraction

Data were extracted systematically from the included studies using a standardized extraction approach.

The extracted information included:

- First author and publication year
- Country and study setting
- Study design
- Study population
- Sample size
- Follow-up period
- Definition or method used to identify incident HBV infection
- Number of incident HBV cases
- Incidence estimates
- Reported factors associated with incident HBV infection
- Effect estimates and confidence intervals where available
- Main findings and relevant study limitations

The extracted data were compared across studies to identify similarities and differences in study populations, incidence estimates, and reported associated factors.

Data were extracted by a single reviewer using a structured data-extraction form.

2.6 Risk of Bias Assessment

The methodological quality and risk of bias of the included studies were assessed using the Newcastle–Ottawa Scale (NOS), an established tool for evaluating the quality of non-randomized cohort studies.

The assessment considered three main domains: selection of study participants, comparability of study groups, and ascertainment of outcomes. Each included study was assessed according to the relevant NOS criteria, including the representativeness of the study population, selection of comparison groups where applicable, assessment of outcomes, and adequacy of follow-up [12].

The results of the risk-of-bias assessment were used to inform the interpretation of the findings and were not used as the sole criterion for excluding otherwise eligible studies[12].

2.7 Data Synthesis

Because of substantial heterogeneity among the included studies in terms of study populations, settings, study designs, follow-up periods, HBV outcome definitions, and reported measures, a narrative synthesis was performed. Studies were summarized descriptively according to study population, geographical setting, follow-up period, outcome definition, incidence estimate, and reported factors associated with incident HBV infection. Findings were compared across studies to identify similarities, differences, and potential explanations for variation in reported incidence and associated factors.

The effect measures extracted included incidence rates, incidence rate estimates per person-years, relative risks, and 95% confidence intervals when reported by the original studies.

The synthesis focused on:

1. The occurrence of incident HBV infection across African settings.
2. Differences in reported incidence between populations and study periods.
3. Factors reported to be associated with incident infection.
4. Potential explanations for variation between study findings.
5. Implications for HBV prevention and surveillance.

And all five included studies were included in the narrative synthesis.

3. Results

3.1 Study Selection

The literature search identified a large number of records in PubMed/MEDLINE about 4,364 results. Approximately 300 records considered potentially relevant to the review topic were screened based on their titles and abstracts.

Following the initial screening process, 14 studies were identified as potentially relevant and were assessed further for eligibility. After applying the predefined inclusion and exclusion criteria and reviewing the full texts, five studies were considered eligible and included in the final systematic review.

The included studies were conducted in the Democratic Republic of the Congo, Côte d'Ivoire, Burkina Faso, Malawi, and Botswana.

3.2 Characteristics of Included Studies

Five observational longitudinal studies were included in this systematic review. The studies differed considerably in population, geographical setting, study period, and study design.

Four studies were conducted among blood donors or repeat blood donors, while one study focused on HIV-infected, treatment-naïve adults in Botswana. The blood-donor studies assessed HBV seroconversion through repeated donation or screening records, whereas the Botswana study assessed incident HBV infection through repeated HBsAg testing during follow-up.

The studies covered different periods, ranging from the early 1990s to 2021. Sample sizes also varied substantially, from a relatively small HIV cohort in Botswana to a large population-level blood-donor dataset in Malawi.

Table 1
Characteristics of the included studies

Study	Country	Design & population	Sample size	Follow-up period	Incident cases	Incidence rate
Namululi et al., ., 2018	Democratic Republic of the Congo	Retrospective cohort; blood donors	3,292	2001–2005	40	25.4/1,000 PY
Seri et al	Côte d'Ivoire	Longitudinal donor study; regular blood donors	129,256	1992–2012	2,443	7.3 → 0.2/100 PY 2013
Wongjarupong et al., 2021	Burkina Faso	Retrospective cohort; repeat blood donors	43,084	2009–2013	1,682	2.43/100 PY
Phinius et al., 2020	Botswana	Retrospective longitudinal; HIV-infected adults	442	~ 4 years	22	3.6/100 PY
Singogo et al., 2023	Malawi	Retrospective cohort; voluntary blood donors	204,920	2015–2021	809	13.7/1,000 PY

Note: PY = person-years.

3.3 Risk of Bias Assessment

The risk of bias of the included studies was assessed using the Newcastle–Ottawa Scale (NOS) for cohort studies. The assessment covered three main domains: selection of study participants (maximum 4 points), comparability of study groups (maximum 2 points), and ascertainment of the outcome (maximum 3 points), giving a maximum total score of 9 points. The assessment was used to evaluate the methodological quality of the included studies and to inform the interpretation of the findings rather than as a basis for excluding studies.

Table 2
Risk of bias assessment of the included studies using the Newcastle–Ottawa Scale:

Study	Selection /4	Comparability /2	Outcome /3	Total /9
Namululi et al., 2013	4	2	3	9
Seri et al., 2018	4	2	2	8
Wongjarupong et al., 2021	4	2	3	9
Phinius et al., 2020	3	2	2	7
Singogo et al., 2023	4	2	3	9

Overall, the included studies demonstrated generally good methodological quality, with NOS scores ranging from 7 to 9 out of 9. The main limitations identified were related to participant selection and outcome ascertainment in some studies. These limitations were considered when interpreting differences in incidence estimates and associated factors across studies.

3.3 Incidence of Incident HBV Infection

All five included studies reported evidence of newly acquired HBV infection during follow-up, although the reported incidence estimates varied substantially between settings.

In the DRC, Namululi et al. reported 40 incident HBV cases among blood donors, corresponding to an incidence of **25.4 per 1000 person-years** (95% CI, 17.6–33.4). Family donors experienced more HBsAg seroconversions than volunteer donors, with an adjusted relative risk of 4.03 (95% CI, 2.63–6.20) [4].

In Côte d'Ivoire, Seri et al. analyzed regular blood donors over a 20-year period. The incidence of HBsAg seroconversion decreased markedly over time, from **7.3 per 100 person-years in 1992–1994** to **0.2 per 100 person-years in 2010–2012**. Despite this decline, new HBV infections continued to occur throughout the study period[5].

In Burkina Faso, Wongjarupong et al. reported incident HBV infection among repeat blood donors. The incidence rate was approximately **2.43 per 100 person-years**. Incidence varied across age groups, with the highest reported rate occurring among donors aged 25–40 years. The study also reported geographical differences in HBV infection patterns[6].

In Botswana, Phinius et al. followed HIV-infected, treatment-naïve adults and identified **22 incident HBV infections** over approximately 620 person-years of observation. The resulting incidence was **3.6 per 100 person-years** (95% CI, 2.3–5.4). Although age differed significantly between participants who developed incident HBV infection and those who did not, none of the evaluated risk factors demonstrated a statistically significant association with acquisition of incident HBV infection in regression analysis[8].

In Malawi, Singogo et al. analyzed routine blood-donation data collected between 2015 and 2021. Of 213,626 donors, 204,920 were included in the final analysis. HBV incidence was **13.7 per 1000 person-years** (95% CI, 12.8–14.7). The study also identified geographical variation, with lower incidence observed in the northern region compared with the central and southern regions[7].

3.4 Factors Associated With Incident HBV Infection

The factors associated with incident HBV infection were not consistent across the included studies.

In the DRC, **type of blood donation** was associated with incident HBV infection, with family donors showing a substantially higher risk of HBsAg seroconversion than volunteer donors [4].

In Côte d'Ivoire, incidence changed substantially over calendar periods, indicating an important **temporal pattern** in HBV seroconversion. The incidence declined from 7.3 to 0.2 per 100 person-years between the

earliest and latest study periods[5].

In Burkina Faso, incidence differed according to **age group**, with the highest incidence reported among donors aged 25–40 years. Geographical differences were also observed among repeat donors[6].

In Botswana, incident cases differed significantly by **age**, and more incident cases were observed among participants with secondary education. However, the regression analysis did not identify any evaluated risk factor as statistically significant for incident HBV acquisition[8].

In Malawi, the study demonstrated **geographical variation in HBV incidence**, with lower rates in the northern region than in the central and southern regions. The study also evaluated demographic and other donor characteristics in relation to TTI outcomes[7].

Overall, the included studies did not demonstrate a consistent pattern of factors associated with incident HBV infection across African populations[4–8].

3.5 Overall Narrative Synthesis

The five included studies consistently demonstrated that incident HBV infection occurs among adults in multiple African settings. However, the reported incidence estimates varied substantially across studies and populations.

Among blood donors in the DRC, Namululi et al. reported an incidence of 25.4 per 1000 person-years, while Singogo et al. reported an incidence of 13.7 per 1000 person-years in Malawi. In Botswana, Phinius et al. reported an incidence of 3.6 per 100 person-years among HIV-infected treatment-naïve adults. Côte d'Ivoire demonstrated a pronounced temporal decline in incidence, from 7.3 to 0.2 per 100 person-years across the study periods. Burkina Faso reported an incidence of approximately 2.43 per 100 person-years among repeat blood donors. Direct comparison of incidence estimates should be interpreted cautiously because the studies differed in their populations, follow-up periods, study settings, and methods of measuring and reporting HBV incidence[4–8].

Differences were also observed in factors associated with incident infection, including donor type, age, geographical setting, and calendar period [4–8]. However, these associations were not sufficiently consistent across studies to support a single unified pattern of risk factors for incident HBV infection.

Given the substantial methodological and clinical heterogeneity among the included studies, the findings were synthesized narratively rather than quantitatively pooled.

4. Discussion

4.1 Principal Findings

This systematic review identified evidence of incident hepatitis B virus (HBV) infection among adults in several African settings. Across the five included studies, incident HBV infection was reported in the

Democratic Republic of the Congo (DRC), Côte d'Ivoire, Burkina Faso, Botswana, and Malawi. However, the reported incidence estimates varied considerably between studies, and the factors associated with incident infection were not consistent across populations[4–8].

The observed variation should be interpreted in the context of substantial differences between the included studies, including study population, geographical setting, study period, follow-up duration, study design, and methods used to identify incident HBV infection. These differences limit the direct comparability of the reported incidence estimates[4–8]. Therefore, the findings are better interpreted as evidence that HBV transmission continues to occur across diverse African settings, rather than as a single estimate of the risk of HBV acquisition across the continent.

4.2 Variation in HBV Incidence

The incidence of incident HBV infection varied substantially across the included studies. The highest reported incidence was observed among blood donors in the DRC, at 25.4 per 1000 person-years, while a lower incidence of 13.7 per 1000 person-years was reported among blood donors in Malawi. In Botswana, an incidence of 3.6 per 100 person-years was reported among HIV-infected, treatment-naïve adults[4, 7, 8].

These differences should be interpreted cautiously because the study populations differed substantially in their demographic and clinical characteristics[4, 7, 8]. Blood donors represent a selected population who meet specific donor eligibility criteria, whereas the Botswana cohort consisted specifically of HIV-infected adults who had not yet initiated treatment [8, 9]. Differences in study design, follow-up duration, geographical setting, and methods of detecting incident infection may also have contributed to the variation in reported incidence. Therefore, the estimates should not be considered directly comparable measures of HBV acquisition risk across these populations.

Temporal variation was also observed within the Côte d'Ivoire study, where HBsAg seroconversion incidence declined from 7.3 per 100 person-years during 1992–1994 to 0.2 per 100 person-years during 2010–2012 [5]. This decline indicates that the occurrence of newly acquired HBV infection may change over time within the same population. However, the available evidence does not allow the specific reasons for this temporal change to be determined.

4.3 Factors Associated With Incident HBV Infection

The evidence regarding factors associated with incident HBV infection was heterogeneous [4–8].

In the DRC, family blood donors had a substantially higher risk of HBsAg seroconversion than volunteer donors[4]. This finding suggests that characteristics related to the type of blood donation may be relevant to HBV transmission in blood-donor populations.

Age-related differences were reported in Burkina Faso and Botswana, but the findings were not consistent [6, 8]. In Burkina Faso, donors aged 25–40 years had the highest reported incidence, whereas the Botswana study found significant differences in age between participants who developed incident

HBV infection and those who did not [6, 8]. Nevertheless, the regression analysis in Botswana did not identify the evaluated risk factors as statistically significant predictors of incident HBV acquisition[8].

Geographical variation was also reported, particularly in Burkina Faso and Malawi [6, 7]. Such variation may reflect differences in local epidemiological conditions, population characteristics, healthcare access, or other contextual factors. However, because the included studies did not investigate these explanations uniformly, causal interpretations should be avoided.

Overall, the available evidence does not support a single consistent set of factors associated with incident HBV infection across African adult populations [4–7].

4.4 Blood Donor Populations and HBV Transmission

A notable finding of this review is the predominance of blood-donor populations among the available longitudinal evidence. Four of the five included studies involved blood donors or repeat blood donors [4–7].

Blood-donor studies provide an important opportunity to estimate HBV incidence because donors may undergo repeated screening over time, allowing new infections to be identified through seroconversion [4–7]. They also have important implications for blood safety because incident infections may contribute to transfusion-transmissible infection risk [9].

However, blood donors are not representative of the general population. Donor-selection procedures may exclude individuals with characteristics associated with increased infection risk. Therefore, incidence estimates derived from donor populations should be interpreted primarily within the context of blood safety and donor epidemiology rather than assumed to represent population-wide HBV incidence.

4.5 Implications for Public Health

The continued occurrence of incident HBV infection across multiple African settings indicates that prevention efforts should address not only existing chronic infection but also ongoing transmission [1, 2, 4–8].

The findings reinforce the importance of maintaining effective HBV prevention strategies, including vaccination, appropriate screening, and surveillance of newly acquired infection [1, 10]. In blood-donor settings, repeated screening and appropriate donor-selection procedures remain particularly relevant to reducing transfusion-transmitted HBV risk[9].

The substantial variation between study settings also highlights the importance of context-specific surveillance [4–8]. A single incidence estimate may not adequately represent the epidemiological situation across different African populations.

4.6 Strengths of the Review

This review has several strengths. First, it specifically focused on **incident HBV infection**, rather than combining incidence with prevalence, allowing attention to newly acquired infection. Second, the review included longitudinal and repeated-testing studies, which provide stronger evidence for identifying new infections than cross-sectional studies. Third, the review included evidence from several African countries and different adult populations, allowing comparison of incidence patterns across diverse settings.

Finally, the decision to use narrative synthesis rather than force quantitative pooling was appropriate given the substantial differences in populations, study designs, settings, and outcome measurements among the included studies.

4.7 Limitations

Several limitations should be considered when interpreting the findings. Only five studies met the eligibility criteria, limiting the breadth of available evidence. Furthermore, the geographical coverage was restricted to five African countries, and therefore the findings cannot be assumed to represent the entire continent.

A major limitation was the predominance of blood-donor populations. These populations are highly selected and may differ from the general adult population in health status and demographic characteristics. The inclusion of an HIV-infected treatment-naïve cohort in Botswana further increased population heterogeneity[8].

The included studies also differed in study period, follow-up duration, outcome definitions, and methods of identifying incident infection. These differences limited direct comparison of incidence estimates and prevented meaningful quantitative pooling[4–8].

Finally, the evidence concerning associated factors was inconsistent across studies. Some studies reported associations with age, donor type, or geographical setting, whereas others did not identify statistically significant predictors[4–8]. Therefore, the findings should be interpreted as evidence of variation in factors associated with incident HBV infection rather than as definitive evidence of causal risk factors.

4.8 Implications for Future Research

Further longitudinal research is needed to characterize incident HBV infection in the general adult population of African countries, particularly in settings where longitudinal evidence remains limited.

Future studies would benefit from standardized definitions of incident HBV infection, consistent follow-up procedures, and comprehensive assessment of potential demographic, behavioral, clinical, and geographical factors. Population-based longitudinal studies would also help determine whether incidence estimates observed among blood donors reflect patterns in the broader adult population.

Standardization of outcome definitions and reporting would additionally facilitate comparison between countries and may allow future systematic reviews to undertake quantitative synthesis where appropriate.

5. Conclusion

This systematic review found evidence of incident HBV infection among adults in several African settings, confirming that new HBV infections continue to occur despite substantial variation between populations and study periods [4–8]. Reported incidence estimates differed considerably across studies, and no consistent pattern of factors associated with incident infection was identified [4–8].

The predominance of evidence from blood-donor populations and the limited geographical coverage indicate important gaps in the current evidence base [4–8]. Further longitudinal, population-based studies are needed to characterize the incidence and determinants of newly acquired HBV infection among adults across Africa. Future research should use standardized definitions of incident infection, consistent follow-up procedures, and comprehensive assessment of relevant demographic, behavioral, clinical, and geographical factors.

These findings reinforce the importance of continued HBV prevention, vaccination, screening, and surveillance, particularly in settings where ongoing transmission is documented [1,10].

Declarations

Authors' Contributions

Israa Mohammed Ali: Conceptualization, literature search, study selection, data extraction, data synthesis, manuscript preparation, and final approval of the manuscript.

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Conflicts of Interest

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Ethical Approval

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