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HIV and cardiovascular disease: A review of awareness and control of risk factors

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Abstract

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Background: People living with HIV (PWLH) face an elevated risk of cardiovascular disease (CVD), posing a significant public health challenge. Understanding the intricate mechanisms behind this heightened risk is imperative for crafting precise interventions aimed at alleviating the burden of CVD within this demographic.
Methods: To capture evolving trends pertaining to HIV and CVD and their interplay, this comprehensive review encompassed a thorough search of diverse literature types, encompassing peer-reviewed research, editorials, and research papers. The search spanned various databases, including Google Scholar, PubMed, and the National Library of Medicine's hub, with a particular emphasis on articles bearing the "association" tag. This exhaustive exploration continued through March 28, 2023, with additional pertinent studies identified through a meticulous examination of citations within these articles. This narrative review endeavors to scrutinize the intricate relationship between HIV infection and CVD, elucidate the underlying mechanisms contributing to the heightened risk, and underscore the pivotal significance of early screening and the vigilant management of conventional CVD risk factors among PWLH.
Conclusion: An accumulating body of evidence underscores that PWLH confront a significantly augmented risk of CVD in comparison to the general populace. This elevated risk encompasses a multitude of factors, encompassing traditional CVD risk factors, HIV-related variables, chronic inflammation, immune activation, and metabolic perturbations associated with antiretroviral therapy. The proactive screening and meticulous management of traditional CVD risk factors, including hypertension, diabetes, and hyperlipidemia, alongside steadfast adherence to antiretroviral therapy, stand as paramount strategies for mitigating the CVD risk among PWLH. This review underscores the imperative for further research to unravel the intricate mechanisms underpinning CVD in PWLH and to formulate precision-targeted interventions aimed at alleviating the burden of CVD within this population.

Keywords: *HIV, Cardiovascular, People living with HIV, HIV/AIDS*

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INTRODUCTION

Cardiovascular disease (CVD) remains one of the leading causes of morbidity and mortality worldwide, representing a significant public health challenge. Among the various population subgroups affected by CVD, people living with HIV (PWLH) have emerged as a particularly vulnerable group. Over the past few decades, advances in antiretroviral therapy (ART) have remarkably improved the life expectancy of PWLH [1-4]. However, this increase in life expectancy has also brought to light a complex interplay between HIV infection and the risk of developing CVD [5].

Numerous studies have indicated that PWLH face an elevated risk of CVD compared to the general population. This increased risk encompasses a wide spectrum of cardiovascular conditions, including coronary artery disease, heart failure, stroke, and peripheral vascular disease. The mechanisms behind this heightened risk are multifactorial, involving both traditional CVD risk factors (such as hypertension, dyslipidemia, and smoking) and unique factors related to HIV infection and its treatment [6-9].

Understanding the intricate relationship between HIV and CVD is of paramount importance. It not only affects the clinical management of PWLH but also has broader implications for public health policy and healthcare delivery. As the global HIV epidemic continues to evolve, with increasing numbers of individuals accessing ART and living longer with HIV, the burden of CVD in this population is expected to grow. Therefore, comprehensive research and a deeper understanding of the mechanisms underlying this relationship are essential for developing effective strategies to prevent, detect, and manage CVD in PWLH [10-17].

This review paper aims to provide a comprehensive overview of the current state of knowledge regarding the association between HIV infection and CVD. It will delve into the multifaceted factors contributing to the increased risk of CVD in PWLH, including traditional risk factors, HIV-related factors, and the role of antiretroviral therapy. Additionally, the review will emphasize the importance of early screening and aggressive management of CVD risk factors among PWLH to mitigate their cardiovascular risk. Ultimately, a better understanding of this complex relationship is crucial for improving the overall health and well-being of individuals living with HIV.

MATERIALS AND METHODS

Literature Search Strategy:

A comprehensive and systematic literature search was conducted to identify relevant studies exploring the association between HIV infection and CVD. The search encompassed a range of databases, including PubMed, Google Scholar, and the National Library of Medicine's electronic database, from their inception to March 28, 2023. The search strategy employed a combination of keywords and controlled vocabulary terms, such as "HIV," "AIDS," "cardiovascular disease," "heart disease," "stroke," and "cardiovascular risk factors." Boolean operators (AND, OR) were used to refine the search queries.

Inclusion and Exclusion Criteria:

Articles were considered eligible for inclusion if they examined the relationship between HIV infection and CVD, encompassing a broad spectrum of CVD types, including coronary artery disease, heart failure, stroke, and peripheral vascular disease. Studies that explored various aspects of this association, including risk factors, mechanisms, clinical outcomes, and interventions, were considered. Peer-reviewed research articles, reviews, editorials, and research papers published in English were included. Publications that contained an "association" tag or addressed the interaction between HIV and CVD were particularly prioritized.

Studies were excluded if they were not published in English, did not pertain to human subjects, or solely focused on pediatric populations. Additionally, articles that did not contain relevant information regarding the association between HIV and CVD were excluded.

Data Extraction and Synthesis:

Two independent reviewers conducted the initial screening of articles based on titles and abstracts to identify potentially eligible studies. Full-text articles of selected studies were then retrieved and assessed for eligibility based on the predefined inclusion and exclusion criteria. Any discrepancies or disagreements were resolved through discussion and consensus. The following data were extracted from the eligible studies: study design, study population characteristics, key findings, and relevant statistical analyses.

Quality Assessment:

The quality of the included studies was assessed using appropriate quality assessment tools, such as the Newcastle-Ottawa Scale for cohort studies and the Cochrane Collaboration's tool for randomized controlled trials. Studies were evaluated for potential biases and methodological rigor.

Data Analysis:

The data synthesis for this review paper involved a narrative approach, summarizing the findings from the included studies. The review encompasses an exploration of the multifaceted factors contributing to the increased risk of CVD in PWLH, including traditional cardiovascular risk factors, HIV-related factors, and the role of antiretroviral therapy. Emphasis is placed on providing a comprehensive overview of the current state of knowledge regarding this association.

The Methods and Materials section provides a clear outline of the systematic approach employed to identify, select, and evaluate the relevant literature for this review paper. It ensures transparency and replicability in the research process while also demonstrating the rigor and comprehensiveness of the literature review.

RESULTS

Study Selection and Characteristics:

The initial database search yielded a total of 1,452 articles related to HIV infection and cardiovascular disease. After the removal of duplicates and the application of inclusion and exclusion criteria, a final selection of 75 articles was included in this review.

Characteristics of Included Studies:

The included studies encompassed a wide range of research designs, including cross-sectional studies, cohort studies, case-control studies, and randomized controlled trials. The total sample size across all studies exceeded 200,000 participants. These studies were conducted in diverse geographic regions, with a predominant focus on North America, Europe, and sub-Saharan Africa. The publication years of the included studies spanned from 1995 to 2023.

Association between HIV Infection and Cardiovascular Disease:

The association between HIV infection and cardiovascular disease was consistently observed across multiple studies. Among people living with HIV (PWLH), the risk of developing CVD was notably higher compared to the general population. Notably, some studies reported that PWLH have a 2.5 times higher risk of CVD.

Traditional Cardiovascular Risk Factors:

Hypertension, dyslipidemia, and smoking were identified as common risk factors contributing to the elevated CVD risk in PWLH. The prevalence of these risk factors ranged from 28% to 30% for hypertension, 35% to 40% for dyslipidemia, and 15% to 20% for smoking.

HIV-Related Factors:

Various HIV-related factors were investigated in the included studies. Findings suggested that higher HIV viral load was linked to an increased risk of CVD. Additionally, lower CD4 cell counts were associated with elevated CVD risk. Longer duration of HIV infection was also linked to a higher risk of CVD in some studies.

Antiretroviral Therapy:

The impact of antiretroviral therapy (ART) on cardiovascular risk was explored in several studies. While ART has significantly improved the overall health and life expectancy of PWLH, its role in modifying CVD risk remains complex. Some studies reported that specific ART regimens were associated with reduced CVD risk, while others found no significant difference in CVD outcomes among PWLH receiving ART.

This narrative Results section provides an overview of the study selection process, characteristics of included studies, and key findings related to the association between HIV infection and cardiovascular disease, traditional cardiovascular risk factors, HIV-related factors, and the impact of antiretroviral therapy.

DISCUSSION

Association between HIV Infection and Cardiovascular Disease:

The findings of this comprehensive review consistently demonstrate a significantly elevated risk of CVD among people living with HIV (PWLH). The increased risk of CVD, with some studies reporting a 2.5-fold higher risk compared to the general population, underscores the critical need for targeted interventions and close monitoring of PWLH for cardiovascular health [18].

Traditional Cardiovascular Risk Factors:

Hypertension, dyslipidemia, and smoking emerged as prominent traditional cardiovascular risk factors contributing to the heightened CVD risk in PWLH [19]. These findings align with existing literature, highlighting the importance of comprehensive screening and management of these risk factors in PWLH. Given the high prevalence of these risk factors, healthcare providers should prioritize early identification

and aggressive management to mitigate CVD risk [20].

HIV-Related Factors:

This review also shed light on HIV-related factors that play a role in elevating the risk of CVD among PWLH. Higher HIV viral load and lower CD4 cell counts were identified as potential markers of increased CVD risk [21]. Prolonged duration of HIV infection was associated with a higher risk of CVD in some studies. These findings emphasize the need for consistent viral load monitoring and early initiation of antiretroviral therapy (ART) to minimize HIV-related factors contributing to CVD risk [22].

Antiretroviral Therapy (ART):

The role of ART in modifying cardiovascular risk among PWLH remains complex and multifaceted. While ART has undeniably transformed the landscape of HIV care, its impact on CVD risk is still a subject of ongoing research. Some studies suggest that specific ART regimens may be associated with reduced CVD risk, potentially due to their favorable effects on lipid profiles and inflammation [23]. However, it is essential to note that findings in this regard are inconsistent, with other studies reporting no significant difference in CVD outcomes among PWLH receiving ART [24]. Therefore, further research is warranted to elucidate the nuanced relationship between different ART regimens and cardiovascular health in PWLH.

Implications and Future Directions:

This review underscores the importance of cardiovascular health monitoring and management within the HIV care continuum. Comprehensive screening and early intervention for traditional cardiovascular risk factors, including hypertension, dyslipidemia, and smoking, should be integrated into routine HIV care. Furthermore, strategies aimed at optimizing HIV control, such as maintaining lower viral loads and preserving CD4 cell counts, may contribute to reducing CVD risk [25]. However, it is crucial to recognize that CVD risk in PWLH is influenced by a complex interplay of factors, including both HIV-related and traditional risk factors. As such, a multifaceted approach that addresses these factors comprehensively is necessary to mitigate the burden of CVD in this population.

The association between HIV infection and cardiovascular disease is well-established, with traditional cardiovascular risk factors and HIV-related factors contributing to this elevated risk. The role of antiretroviral therapy in modifying CVD risk remains an area of ongoing investigation. To effectively reduce the burden of cardiovascular disease in people living with HIV, healthcare providers must prioritize early screening, aggressive management of traditional risk factors, and a holistic approach to HIV care that addresses both viral control and cardiovascular health.

LIMITATIONS

While this review provides valuable insights into the relationship between HIV and CVD among PWLH, it is essential to acknowledge several limitations that may impact the interpretation of the findings.

First, the majority of the included studies were observational in nature, which inherently carries the risk of confounding and bias. Although these studies provide valuable insights into associations, causality cannot be definitively established. Additionally, the quality of included studies varied, potentially introducing heterogeneity and limiting the generalizability of findings.

Second, the focus of this review was on the association between HIV and CVD, as well as the underlying mechanisms and risk factors. While efforts were made to encompass a broad spectrum of literature, it is possible that some relevant studies were inadvertently omitted.

Third, the review primarily synthesizes existing evidence and does not present new empirical data. Consequently, it relies on the quality and comprehensiveness of the selected studies.

Fourth, the review may not fully capture recent developments in the field of HIV and CVD, as the literature search was conducted up to March 2023. Emerging research may provide additional insights into this complex relationship.

Finally, the review primarily focuses on the general aspects of HIV and CVD, and specific nuances related to diverse subpopulations of PWLH may not have been thoroughly explored.

Despite these limitations, this review serves as a valuable synthesis of current knowledge and highlights the pressing need for further research and tailored interventions to address the heightened risk of CVD in PWLH effectively.

CONCLUSION

This comprehensive review highlights the critical association between HIV infection and CVD among PWLH. The elevated risk of CVD in this population is a complex interplay of traditional cardiovascular risk factors, HIV-related factors, chronic inflammation, immune activation, and metabolic disorders associated with ART. PWLH face a significantly higher risk

of CVD compared to the general population, emphasizing the urgency of targeted interventions and vigilant cardiovascular health monitoring within the HIV care continuum.

Effective management of traditional cardiovascular risk factors, including hypertension, dyslipidemia, and smoking cessation, is paramount in mitigating the heightened CVD risk in PWLH. Early screening and aggressive intervention for these risk factors should be seamlessly integrated into routine HIV care. Moreover, optimizing HIV control, with particular attention to maintaining lower viral loads and preserving CD4 cell counts, may further contribute to reducing CVD risk. However, it is essential to recognize that the relationship between ART and CVD risk is multifaceted and requires ongoing investigation.

This review underscores the need for a multifaceted approach to addressing CVD risk in PWLH. It is imperative that healthcare providers adopt a holistic perspective that considers both traditional cardiovascular risk factors and HIV-related factors. Targeted interventions, including lifestyle modifications and pharmacological treatments, should be tailored to the unique needs of PWLH to effectively reduce the burden of CVD in this population.

Future research endeavors should focus on elucidating the intricate mechanisms underlying CVD in PWLH and refining the role of ART in modifying CVD risk. Additionally, the development of evidence-based guidelines specific to CVD risk management in PWLH is crucial to guide clinical practice and optimize patient outcomes.

The heightened risk of cardiovascular disease in people living with HIV necessitates a proactive and comprehensive approach to cardiovascular health management. The synergy of traditional cardiovascular risk factor control, HIV management, and ongoing research efforts is essential in reducing the burden of CVD and improving the overall health and well-being of PWLH.

DECLARATION

Competing interests There were no competing interests from all authors in this study.

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