*Corresponding author: Qin Han Carrie, Department of Immunogenetics and Cardiology, Institute of Tropical Medicine (NEKKEN), Nagasakiya University, Ethiopia, Email: qin.hancarrie@gmail.com

1), signi cantly reduced recurrent cardiovascular events in patients with previous heart attacks. is nding opened new avenues for exploring anti-in ammatory therapies, such as colchicine and methotrexate, which are currently under investigation for their role in reducing atherosclerotic in ammation and improving cardiovascular outcomes [3].

Lipid-Lowering erapies Beyond LDL-C In addition to targeting LDL-C, therapies that address other lipid components, such as high-density lipoprotein (HDL) and triglycerides, have shown promise. Agents like pema brate, which selectively modulates peroxisome proliferator-activated receptor (PPAR), are designed to reduce triglyceride levels and enhance cardiovascular protection. Similarly, therapies targeting lipoprotein(a), an independent risk factor for cardiovascular disease, such as antisense oligonucleotides like pelacarsen, are being explored to address residual cardiovascular risk in patients with elevated levels of lipoprotein(a).

RNA-Based erapies RNA-based therapies, including siRNA and antisense oligonucleotides, o er novel approaches to treating atherosclerosis at the genetic level. Inclisiran's success highlights the potential for these therapies to provide long-lasting and potent e ects with fewer doses, enhancing compliance. Beyond inclisiran, gene-editing technologies such as CRISPR are being investigated for their potential to provide permanent therapeutic solutions by targeting and modifying the genes involved in lipid metabolism and in ammation.

Combination therapies

Given the complex nature of atherosclerosis, a combination approach targeting multiple pathways may provide the most comprehensive protection against disease progression. Combining lipid-lowering therapies like statins or PCSK9 inhibitors with anti-in ammatory agents or drugs targeting other lipid components could address both the cholesterol-driven and in ammatory aspects of atherosclerosis. Ongoing trials are exploring these combinations, with early results showing promise in reducing cardiovascular events in high-risk populations [4].

Challenges and future directions

Despite the promise of these innovative therapies, several challenges remain in their clinical implementation. e high cost of novel agents like PCSK9 inhibitors and inclisiran can limit access for many patients, raising concerns about cost-e ectiveness in routine practice. Additionally, long-term safety data is still needed for many of these therapies, particularly those targeting in ammation, to ensure their bene ts outweigh potential risks. Finally, patient adherence to treatment regimens, especially those requiring frequent dosing, remains a key barrier to the success of these therapies in real-world settings.

Looking ahead, personalized medicine approaches, informed by genetic and biomarker testing, may optimize treatment selection and improve outcomes by tailoring therapy to individual patient pro les. As research continues to uncover the underlying mechanisms driving atherosclerosis, the development of even more targeted therapies will likely emerge, o ering new hope for patients at risk of cardiovascular disease. Innovative pharmacological approaches to atherosclerosis are transforming the landscape of cardiovascular disease management. With the advent of PCSK9 inhibitors, RNA-based therapies, and anti-in ammatory agents, patients now have access to more targeted and potent treatment options [5]. While challenges such as cost, long-term safety, and patient adherence remain, ongoing research and clinical trials continue to re ne these therapies, potentially ushering in a new era of atherosclerosis treatment. By addressing both lipid and in ammatory pathways, these emerging treatments o er the promise of reducing residual cardiovascular risk and improving long-term outcomes for patients with atherosclerosis.

Results and Discussion

Results

Emerging pharmacological therapies for atherosclerosis demonstrate signi cant advancements over traditional treatments, with promising outcomes in lipid-lowering, in ammation control,

pharmacological management of atherosclerosis. e success of PCSK9 inhibitors, bempedoic acid, inclisiran, and anti-in ammatory agents o ers patients new, more e ective options for reducing LDL-C levels and combating the in ammatory processes that drive atherosclerosis progression. ese therapies have particular relevance for patients who cannot tolerate statins or do not achieve adequate results from existing therapies, addressing gaps in traditional treatments.

PCSK9 Inhibitors and Bempedoic Acid: Expanding the Lipid-Lowering Toolbox PCSK9 inhibitors and bempedoic acid provide alternatives or adjuncts to statins, o ering signi cant LDL-C reductions with favorable safety pro les. PCSK9 inhibitors, though potent, come at a high cost, limiting accessibility for many patients. Bempedoic acid, a less expensive oral option, o ers a middle ground for those who cannot tolerate statins but still require LDL-C management. ese treatments can be integrated into the standard of care for patients who need more aggressive lipid-lowering beyond what statins can achieve [8].

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