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Unequal Risks: Ethnic and regional patterns in the association between meat intake and cardiovascular disease - A Mini Review

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Abstract

Cardiovascular disease (CVD) remains the leading global cause of mortality, with diet playing a critical role in its development. Among dietary factors, meat consumption, particularly red and processed meats, has been associated with increased CVD risk. However, most evidence comes from Western populations, limiting its applicability to diverse global communities. The aim of this mini review is to explore ethnic and regional differences in the relationship between meat intake and cardiovascular risk. Relevant peer-reviewed studies, cohort analyses, and systematic reviews were used to synthesise and summarise evidence from East Asia, South Asia, Sub-Saharan Africa, Latin America, and the Middle East and North Africa (MENA). Findings reveal significant variations in how meat consumption relates to CVD across populations. In some groups, such as South Asians, even modest meat intake correlates with heightened metabolic risk, while in traditional societies with high animal food consumption (e.g., Inuit populations), CVD rates remain low. These variations are influenced by genetics, socioeconomic status, access to healthcare, and the degree of food processing. Ethnic and regional differences strongly modify the diet–CVD relationship. Public health strategies should be tailored to cultural and metabolic contexts, and future research must include underrepresented populations to ensure equitable dietary guidance.

Keywords: meat consumption, cardiovascular disease, ethnical disparities, processed meat, red meat, dietary transitions

1. Introduction

The incidence of cardiovascular disease (CVD) continues to rise each year, making it one of the most critical global health threats and the leading cause of death in many countries(Chong et al., 2024; Petersen and Kris-Etherton, 2021; Rethemiotaki, 2024). In 2017, CVD accounted for approximately 17.8 million deaths, followed by cancer with 9.56 million deaths(Mohammadifard et al., 2022). Between 1990 and 2019, the number of CVD cases globally approximately doubled from 257 to 285 million to 523 million(Petersen and Kris-Etherton, 2021). CVD encompasses conditions such as coronary artery diseases (e.g., myocardial infarction), along with cardiovascular and cerebrovascular disorders including rheumatic heart disease, cardiomyopathy, myocarditis, ischemic heart disease, stroke, and hypertensive heart disease(Mangione et al., 2022; Rethemiotaki, 2024). Of the modifiable CVD risk factors (i.e., metabolic, environmental, and behavioral) contributing to CVD burden, dietary risks are the number one ranked behavioral risk factor(Petersen and Kris-Etherton, 2021). The Global Burden of Disease (GBD) Study assessed how 88 different risk factors contribute to disease burden. In their study, dietary risks accounted for 6.58 million (95% CI: 2.27-9.52 million) cardiovascular deaths and 8 million (95% CI: 3.03-11.8 million) deaths overall in 2021(Vaduganathan et al., 2022). The estimate accounted for both globally under consumed foods such as fruits, vegetables, legumes, whole grains, nuts and seeds, milk, dietary fibre, calcium, omega-3 fatty acids from seafood, and polyunsaturated fats, and those that are typically overconsumed, including red and processed meats, sugar-sweetened beverages, trans fats, and sodium(Dong et al., 2022; Vaduganathan et al., 2022). In 2021, dietary risks were linked to 2,340 disability-adjusted life years (DALYs) per 100,000 people (95% CI: 836–3,380 per 100,000). Another study also confirmed that high sodium intake is a key contributor to hypertension in many regions(Dong et al., 2022). These studies also suggested that reducing daily sodium consumption by just 3 grams could significantly lower the incidence of cardiovascular events and prevent deaths in a cost-effective way(Dong et al., 2022; Vaduganathan et al., 2022). From these reports, it is evident that diet has a major impact on the pathogenesis of most CVDs and subsequent mortality(Salehin et al., 2023). An unhealthy diet is the most significant potential behavioural and modifiable risk factor for CVDs(Salehin et al., 2023). Meat forms an integral part of the human diet, largely as a source of protein and due to taste preference(Ndlovu et al., 2025). Its consumption is not affected by nationality or seasonality, meat is generally always available especially in developed countries and is probably overconsumed since its introduction into fast foods(Grosso et al., 2022). Although

several studies have reported that excess intake of meat may be detrimental for cardiometabolic health(Larsson and Orsini, 2014) and certain cancers, there are disparities in these reports(Grosso et al., 2022), with some indicating no association of meat products with CVDs(Nagao et al., 2012). Most of these studies have been carried out in developing countries, especially in Europe; however, these results are not translatable to other populations and ethnic groups due to differences that exist with regards to different dietary habits, location and ethnicity. The aim of this review is to summarise emerging evidence from underrepresented regions and ethnic populations.

2. Summary of Current Evidence

The relationship between meat consumption and cardiovascular diseases (CVD) varies significantly across regions and ethnic groups, shaped by dietary patterns, food processing practices, and socio-cultural influences. Table 1 provides a regional comparison of key findings from recent studies.

In East Asia (China and Japan), cohort studies suggest that animal food patterns, particularly red meat consumption, are positively associated with increased risk of hypertension and stroke(Zheng et al., 2016). These findings contrast with earlier regional patterns characterized by high fish intake, which was traditionally protective against CVD(Cui et al., 2022; Zhao et al., 2019). The shift toward more meat-centred diets in urban populations reflects growing westernisation and may be contributing to the observed increase in CVD risk.

In South Asia, cross-sectional data from India show that even relatively low levels of meat consumption are associated with adverse cardiometabolic profiles. A 10 g increase in total meat intake per 1000 Kcal/day was significantly associated with higher diastolic blood pressure (DBP), body mass index (BMI), waist circumference (WC), total cholesterol, low-density lipoprotein cholesterol (LDL-C), and triglyceride levels(Mahajan et al., 2024). These findings suggest that South Asian populations may have a lower threshold for negative metabolic responses to meat intake compared to Western populations. Proposed mechanisms include the effects of saturated fats, haem iron, and nitrates on insulin resistance and lipid metabolism.

In Sub-Saharan Africa, the evidence remains limited and primarily descriptive. A cross-sectional study from Nigeria highlighted a shift toward more meat-heavy diets in urban settings, correlating with increased risks of hypertension, obesity, and metabolic syndrome(Helen et al., 2025). However, the lack of high-quality cohort studies or clinical trials

represents a major research gap. A study by Nel et al reported that the dietary patterns of countries in Sub-Saharan Africa resemble a Westernised diet(Nel and Steyn, 2022). It showed the highest median intake of total energy (around 2500 kcal/day), sugar/sweeteners, alcohol, meat, animal fats, eggs, and dairy(Nel and Steyn, 2022). Sub-Saharan African countries also had the lowest intake of starchy vegetables and pulses and fruit/vegetable intake below WHO recommendations(Nel and Steyn, 2022). While this suggests an increasing cardiometabolic burden linked to dietary transitions and higher meat consumption(Nel and Steyn, 2022), the current evidence base is notably limited. There is a striking scarcity of original research including prospective cohort studies, clinical trials, and detailed dietary assessments examining the specific impact of animal-based food intake on cardiovascular outcomes in SSA populations. This gap undermines the ability to generate evidence-based, culturally appropriate dietary guidelines for the region and emphasizes the urgent need for robust, context-specific research in African settings. Given the region's rapidly changing food environment due to urbanisation and globalisation, this absence of robust data hinders the development of context-specific dietary guidelines.

In Latin America, particularly in Mexico, a descriptive study reported a strong link between high consumption of red and processed meats and increased risk of ischemic heart disease and metabolic syndrome(Vázquez-Aguilar et al., 2024). These associations are likely exacerbated by high intakes of ultra-processed foods and dietary fats in urban populations, mirroring trends observed in other upper-middle-income countries.

In the Middle East and North Africa (MENA) region, a systematic review of studies from Iran and Lebanon revealed consistent associations between high red meat intake and elevated risks of coronary heart disease (CHD), stroke, and obesity(Aljefree and Ahmed, 2015). This aligns with growing concerns over the shift from traditional diets to more Westernized eating patterns in the region, often high in saturated fats and low in dietary fibre.

While a global pattern of increased CVD risk associated with red and processed meat intake is evident, the magnitude and nature of these associations vary across regions. Cultural dietary norms, levels of meat consumption, processing methods, and metabolic susceptibility all appear to play modifying roles. Notably, Sub-Saharan Africa stands out for its lack of original dietary–CVD research despite evidence of a growing cardiometabolic disease burden. This underscores the urgent need for high-quality, locally relevant studies to inform effective and culturally appropriate dietary guidelines.

Table 1: Summary of Evidence on Animal-Based Food Consumption and Cardiovascular Disease Risk Across Regions

Region	Population/Country Studied	Study Type	Animal-Based Food(s) Assessed	CVD Outcomes Measured	Key Findings	Reference
East Asia	China, Japan	Cohort study	Red meat	Stroke	Animal food patterns were associated with increased risk of hypertension	(Zheng et al., 2016)
South Asia	India	Cross-sectional	Ghee, red meat	Hypertension, lipid profile	10 g increase in total meat intake/1000 Kcal/day in males was positively associated with DBP, BMI, WC, total cholesterol, LDL-C, and triglycerides	(Mahajan et al., 2024)
Sub-Saharan Africa	Nigeria	Cross-sectional	-	Hypertension, obesity	Dietary shift toward meat in urban areas linked to rising metabolic syndrome risk	(Helen et al., 2025)
Latin America	Mexico	Cross-sectional descriptive study	Red and processed meat	Ischemic heart disease, metabolic syndrome	High processed meat intake associated with elevated CVD risk	(Vázquez-Aguilar et al., 2024)
Middle East/North Africa	Iran, Lebanon	Systematic review	Red meat	Obesity, heart disease	High red meat intake correlated with high risk of CHD and stroke	(Aljefree and Ahmed, 2015)

DBP- Diastolic blood pressure; BMI-Body mass index; WC-Waist circumference; LDL-C- Low density lipoprotein cholesterol; CVD- Cardiovascular disease; CHD- Coronary Heart disease

3. Factors Modifying the Diet–CVD Relationship

The etiology of CVD is complex, driven by polygenic and environmental factors(Lee and Voight, 2025). Diet is a modifiable and largely environmental risk factor for CVD(Lee and Voight, 2025). In addition to dietary factors, several other modifiable and non- modifiable risk factors contribute to the development of CVD, including hypertension, dyslipidaemia, obesity, tobacco use and physical inactivity(Nybacka et al., 2024). Racial and ethnic background plays a pivotal role in modifying the relationship between animal-based diets and cardiovascular disease (CVD). As highlighted by the American Heart association in their scientific statement, minority populations, including African American, Hispanic, Native American, and South Asian groups, exhibit a disproportionately higher burden of cardiometabolic risk factors such as insulin resistance, hypertension(Espejo et al., 2019), dyslipidemia, and arterial stiffness(Maahs et al., 2014). These disparities emerge early in life and are often independent of dietary intake alone, suggesting a complex interplay between genetic predisposition, cultural dietary norms, and social determinants of health. Importantly, individuals from these groups may experience greater physiological sensitivity to diets high in red and processed meats, saturated fats, and sodium, contributing to a more pronounced CVD risk profile. The combination of structural inequities such as limited access to preventive healthcare, nutrition counselling, and affordable healthy food options further exacerbates the impact of poor dietary patterns in these communities. Moreover, cultural practices, food preferences, and economic constraints often shape the reliance on animal-source foods differently across ethnic groups, influencing both quantity and quality of intake.

An important and often overlooked dimension in the discussion of diet and cardiovascular risk is the evolutionary perspective. Ethnographic data from the Paleolithic era reveal that most hunter-gatherer societies derived over 65% of their subsistence from animal-source foods, primarily through hunting and fishing, while plant-based foods contributed around 35% of dietary intake. Paradoxically, these populations exhibited low rates of cardiovascular disease, a stark contrast to modern Western societies where high animal food consumption is strongly associated with CVD(Zampelas and Magriplis, 2020). For example, traditional Greenland Eskimos, whose diets were rich in marine animal fat, maintained favourable lipid profiles, including lower LDL, VLDL, triglycerides, and total cholesterol, alongside elevated HDL when compared to their Danish counterparts(Zampelas and Magriplis, 2020). This paradox suggests that not all animal-based diets confer the same cardiometabolic risks, and that other

co-factors, such as total caloric intake, physical activity levels, food processing, and dietary fat composition (e.g., omega-3 fatty acids in fish) may mediate these outcomes. It emphasises the importance of distinguishing traditional, minimally processed animal foods from modern, industrially processed meats when evaluating their impact on cardiovascular health. This evolutionary lens challenges the uniform vilification of animal-source foods and reinforces the need for context-sensitive dietary guidance. These patterns underscore the necessity of developing culturally tailored dietary guidelines and public health strategies that recognise the unequal burden of CVD among racially and ethnically diverse populations, particularly in low-resource settings. Figure 1 below summarises a conceptual framework of the relationship between meat and CVDs across different populations.

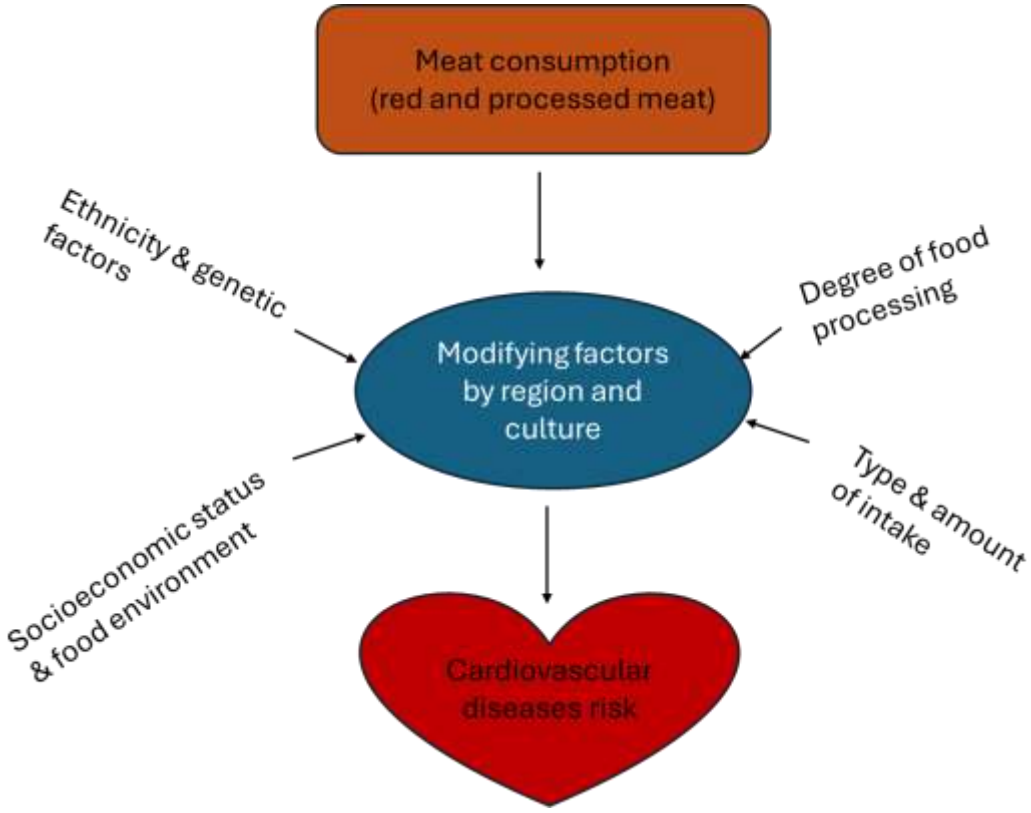

Fig 1: Conceptual Framework Illustrating the key modifiers of the Meat-CVD Relationship Across Populations

In summary, this conceptual framework illustrates how the relationship between meat consumption and cardiovascular disease (CVD) risk is modified by a range of interconnected factors. While high intake of red and processed meats is generally associated with increased CVD risk, the extent of this association varies across populations due to modifiers such as ethnicity and genetic predisposition, socioeconomic status, type and degree of meat processing, levels of physical activity, and the quantity and quality of meat consumed. These factors differ significantly by region and cultural context, influencing individual and population-level vulnerability to diet-related CVD. The figure underscores

the importance of context-sensitive public health strategies and dietary guidelines that reflect the lived realities of diverse populations.

4. Public Health Implications

Public health dietary recommendations must account for the growing recognition that the association between meat intake and cardiovascular disease (CVD) is not uniform across populations. Ethnic and regional differences in dietary patterns, food processing practices, metabolic profiles, and socioeconomic contexts all shape how meat consumption affects cardiovascular risk. Standardised global guidelines may therefore fail to capture local risk profiles or cultural nuances. There is a pressing need for culturally sensitive, population-specific interventions that reflect the diverse ways in which meat is consumed and processed globally. Moreover, the lack of high-quality data from regions such as Sub-Saharan Africa undermines efforts to design evidence-based dietary policies. Expanding original research in underrepresented populations and integrating insights from traditional diets, like those of hunter-gatherers or rural fishing communities, could help develop more inclusive, effective strategies for reducing CVD burden worldwide.

5. Conclusion

This mini review highlights that the relationship between meat consumption and cardiovascular disease is shaped by complex and interrelated factors, including ethnicity, geography, cultural practices, and metabolic predisposition. While red and processed meats are broadly linked to increased CVD risk, the magnitude and nature of these effects vary across global populations. Populations with higher baseline metabolic risk, such as South Asians and African Americans, may be more vulnerable to the adverse effects of meat-heavy diets. Meanwhile, traditional populations with high animal food intake but active lifestyles and unprocessed diets, such as the Inuit, show low rates of CVD, challenging simplistic interpretations. To inform dietary guidance and public health policy, future research must prioritise diverse ethnic and geographic contexts, particularly in low- and middle-income countries, where data gaps are most profound.

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Author contributions

NN is the sole author of the manuscript.

Conflict of interest

The author declares no conflict of interest

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