THE INFLUENCE OF DEPRIVATION ON CARDIOVASCULAR DISEASE (CVD) IN RURAL INDIANS

by

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A Dissertation submitted in partial fulfilment of the requirements for the degree of Master of Science in Public Health and Social Care in Practice

The Institute of Inner-City Learning

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DECLARATION

I, Harsh Chauhan declare that this dissertation has been composed by myself, that the work contained herein is entirely my own except where explicitly stated otherwise in the text, and that this work has not been submitted for any other degree or qualification, in whole or in part, except as specified.

Signed: Harsh Chauhan

Date: 07/10/2025

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Thank you.

Abstract

Background

Cardiovascular disease (CVD) is a major cause of premature death in India, in which rural population experiences more vulnerability due to socio-economic absence, limited health literacy and poor access to healthcare. Despite the national prevention programs, intervals in service distribution and structural inequalities continue to diagnose late diagnosis and poor management of CVD in rural adults aged 40 and above.

Methods

A systematic literature review was performed after the Prisma guidelines to investigate the impact of CVD circulation, management and lack of prevention in rural India. Twenty peer-reviewed studies published between 2015 and 2025 were identified by database including PubMed, CINAHL, Scopus, and Google Scholar. The articles were evaluated using the CASP checklist, and thematic analysis was applied to the conjuncts synthesized on socio-economic barriers, service gaps and intervention effectiveness.

Findings/Results

Four main themes emerged: aging and low health literacy vulnerability; Socio-economic damage delay in diagnosis and obstruction of continuity of care; Infrastructure intervals, caste and gender inequalities restrict service access; And public health intervention makes less-pillars and poorly monitored. Poverty, dangerous work, weak primary care, and cultural obstacles were constantly associated with late CVDs.

Conclusion

CVD prevention in rural India requires equity-focused strategies, including improved health literacy, gender-sensitive outreach, better infrastructure, workforce strengthening, and rigorous monitoring of national programmes to reduce avoidable morbidity and mortality.

Keywords: Cardiovascular Disease (CVD), Rural India, Socio-economic Deprivation, Health Inequalities, Access to Healthcare, Health Literacy, Public Health Interventions, Policy Implications, Gender Disparities, Infrastructure Barriers, Non-communicable Diseases (NCDs), Prevention and Management.

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Chapter 1: Introduction

1.0 Introduction

According to the World Health Organisation (WHO, 2023a), cardiovascular disease (CVD) refers to a group of disorders affecting the heart and blood vessels. It includes conditions that involve narrowed or blocked blood vessels, which can lead to heart attacks, chest pain (angina), or stroke. Other forms of CVD affect the heart's muscles, valves, or rhythm. CVD is primarily caused by atherosclerosis and is often associated with behavioural risk factors such as unhealthy diet, physical inactivity, tobacco use, and harmful use of alcohol (WHO, 2023a). The types of CVD include:

- Coronary Artery Disease (CAD) – Also known as ischemic heart disease, it involves the narrowing of the coronary arteries supplying the heart muscle (Dhakal and Pokharel, 2024).
- Cerebrovascular Disease – Conditions like stroke, caused by impaired blood flow to the brain (Caplan, Simon and Hassani, 2023).
- Peripheral Arterial Disease – Affects blood vessels supplying the arms and legs (Aboyans et al., 2025).
- Rheumatic Heart Disease – Damage to heart valves caused by rheumatic fever, typically due to streptococcal infection (Auala et al., 2022).
- Congenital Heart Disease – Malformations of heart structure existing from birth (Houyel and Meilhac, 2021).
- Deep Vein Thrombosis and Pulmonary Embolism – Blood clots in the leg veins that can dislodge and move to the lungs (Karki, Manandhar and Shrestha, 2025).
- Heart Failure – A condition where the heart is unable to pump blood effectively. (Kundu et al., 2023)

CVD remains the leading cause of death globally. According to WHO (2023a) and the Global Burden of Disease Collaborative Network [GBD], (2024), as of 2024, an estimated 20.5 million deaths in 2021 were attributed to CVD, accounting for 32% of all global deaths. More than 4 out of 5 CVD deaths are due to heart attacks and strokes, and one-third of these deaths occur prematurely in people under 70 years of age. Further, the burden of CVD is rising in low- and middle-income countries due to rapid urbanization, poor diet, lack of physical activity, and tobacco use (Schutte et al., 2021).

Moreover, the GBD (2024) study continues to highlight CVD as the top contributor to global disability-adjusted life years (DALYs) and mortality. In 2021, ischemic heart disease and stroke were the first and second leading causes of DALYs globally. While high-income countries have seen a decline in CVD mortality due to improved healthcare and preventive measures, low- and middle-income countries are experiencing a disproportionate increase in disease burden (GBD, 2024).

The factors leading to the increasing burden are: poor access to primary healthcare services, poor early detection and management, metabolic risk factors (e.g. hypertension, diabetes, obesity) or persistent behavioural risks (Munzel et al., 2022).

It has been determined that one of the factors, which contribute critically to the increased rate of CVD, include psychological factors, environmental factors, and behavioural factors. As an example, after an unhealthy diet, an excessive consumption of tobacco, physical inactivity raises the risks of CVD, and deaths that are caused by CVD are high in people younger than 70 (Padhi et al., 2024). Also, some of these environmental factors such as exposure to air pollution, toxic metals, and repeated exposures to environmental toxins are found to be major risk factors of CVD (Munzel et al., 2022). Conversely, some underlying causes of CVD are behavioural e.g. elevated sugar levels in blood, elevated blood pressure, and obesity (Kotsis et al., 2018).

According to Samuel et al (2024), decreasing the consumption of tobacco, salt consumption in the food and ingestion of excess fruit and vegetables are some of the cures to prevent CVD and save lives of citizens (Samuel et al., 2024). Physical exercise also has many advantages that help harden the heart and improve the functionality of the whole body, which will lower the chances of getting cardiovascular diseases (Kundu and Kundu, 2022). At the same time, the adoption of efficient early prevention diagnosis techniques, effective health policies, and providing affordable healthcare access for all people can promote a quality lifestyle and reduce the death rate due to CVD (Kaminsky et al., 2021). Global initiatives such as the WHO's Global Hearts Initiative aim to strengthen CVD prevention and control by supporting evidence-based interventions in primary care settings (WHO, 2023b).

1.1 Literature Review

1.1.2 Symptoms and Recent CVD Cases in India

CVD represents a wide range of conditions, and the symptoms of CVD can vary from person to person. For example, CVD can be asymptomatic, which indicates that affected people do not experience any signs or symptoms for years. Sometimes, the issue is not easy to identify until the patient faces a serious issue caused by CVD (Sreeniwas Kumar and Sinha, 2020).

However, some common symptoms of CVD are chest pain, pain in the upper back or neck, heartburn, fatigue, dizziness, shortness of breath, and swelling. In India, it has been identified that CVD was responsible for 26.6% of total deaths and 13.6% of total DALYs (Singh et al., 2024). Early studies identified that the rate of CVD is increasing, and Indian people have a higher chance of CVD. The increasing rate of deaths in India due to CVD has created an extra burden for healthcare settings. For example, due to CVD, around 282 people out of 100000 die from CVD, which is higher than the global average of 233 deaths per 100000 every year. India contributed more than 14% to 23% of the global DALYs due to stroke and IHD, respectively, which is 1.76 times higher than the global average rate (World Heart Federation, 2023).

Ke et al. (2021) stated that South Asian people have a higher risk of CVD due to some factors such as socio-economic status, education, fatal programming, and early life injuries. The prevalence rate of CVD in Indian urban and rural areas is different. For example, the prevalence rate was 1.7% in urban areas in 2019, which increased to 14% in 2023. In contrast, the prevalence rate in rural areas increased to 7.4%. The reduction of CVD prevalence approach in rural areas significantly increases the burden for the Indian healthcare settings. Studies also reveal that a lack of proper healthcare service quality, adequate treatment, and less accessibility to healthcare solutions are increasing the rate of deaths of people due to CVD in India. Additionally, the increasing prevalence of hypertension and diabetes is the core reason for the risk of CVD for Indian people (Kumar et al., 2022).

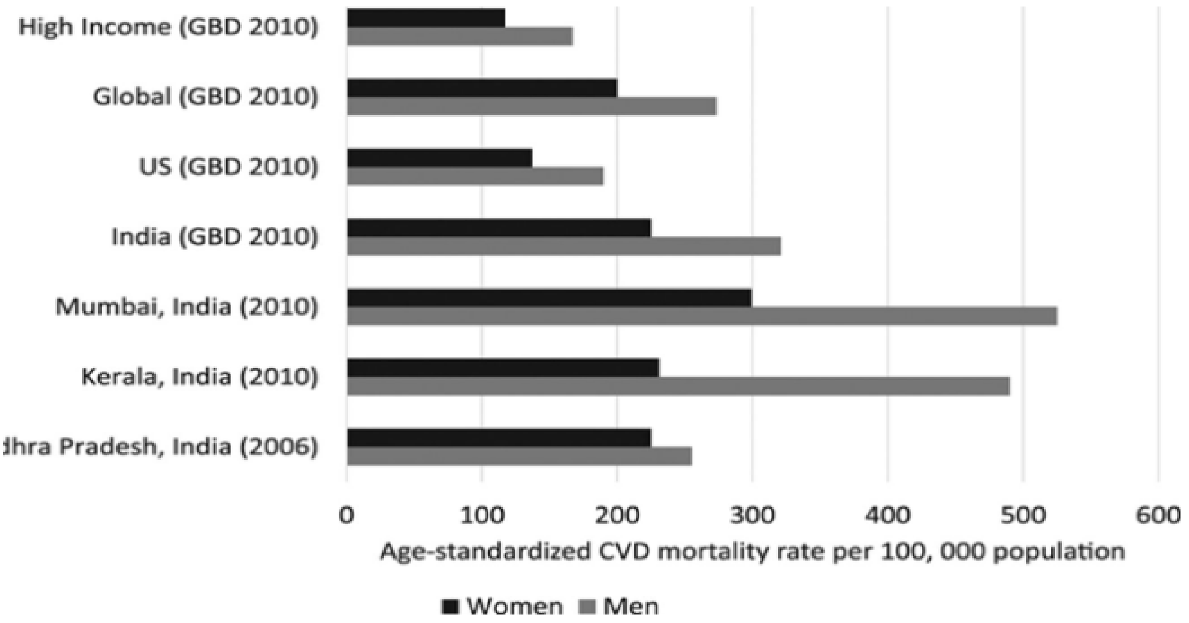

Figure 1.1: The rate of CVD in India compared to the global rate

(Source: Prabhakaran et al., 2021)

As depicted in Figure 1.1, the rate of CVD in India was approximately 220 per 100,000 for males and 330 per 100,000 for women. In Mumbai, Cases for women are high, with 530 per 100000 people, whereas CVD cases for men in Mumbai are considerably low, 300 per 100000 (Prabhakaran et al., 2021). Along with that, in Kerala, the CVD cases for males are low, 230 cases per, whereas 490 women per 100,000 people are suffering from CVD. This means that compared to other states of India, Mumbai and Kerala hold a leading position in the context of heart diseases and death because of IHD/stroke. Meanwhile, it has been determined that women are suffering from cardiovascular diseases as compared to men in India. Rehman et al. (2021) identified that high tension, lack of physical activity, and inconsistency in diet planning are some of the most significant causes of concern when it comes to CVD in India. According to the report by the World Health Organisation, one out of every five deaths all over the world is in India. Therefore, worsening prevalence of CVD is fatally affecting the quality of life of individuals and imposing a burden on the world (Who.int, 2022).

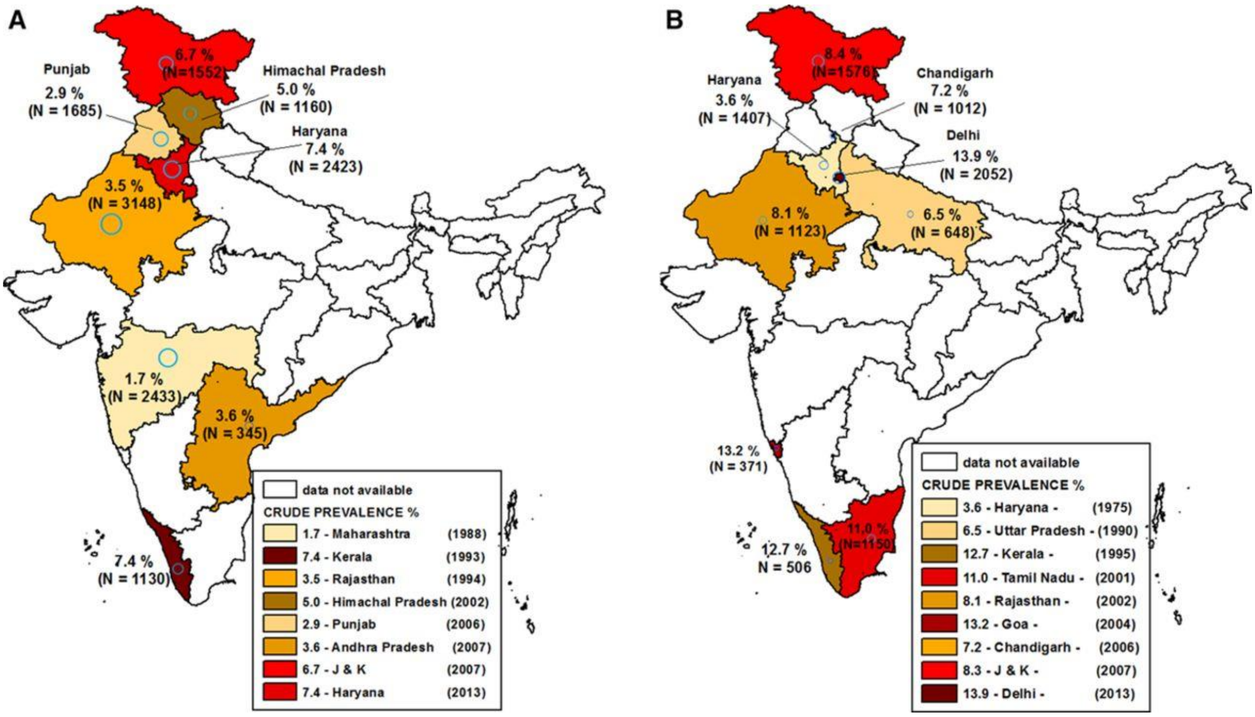
A
6.7 %
(N=1552)
Punjab
2.9 %
(N = 1685)
Himachal Pradesh
5.0 %
(N = 1160)
Haryana
7.4 %
(N = 2423)
3.5 %
(N = 3148)
1.7 %
(N = 2433)
3.6 %
(N = 345)
7.4 %
(N = 1130)
data not available
CRUDE PREVALENCE %
1.7 - Maharashtra (1988)
7.4 - Kerala (1993)
3.5 - Rajasthan (1994)
5.0 - Himachal Pradesh (2002)
2.9 - Punjab (2006)
3.6 - Andhra Pradesh (2007)
6.7 - J & K (2007)
7.4 - Haryana (2013)
B
8.4 %
(N=1576)
Haryana
3.6 %
(N = 1407)
Chandigarh
7.2 %
(N = 1012)
Delhi
13.9 %
(N = 2052)
8.1 %
(N = 1123)
6.5 %
(N = 648)
13.2 %
(N = 371)
11.0 %
(N=1150)
12.7 %
N = 506
data not available
CRUDE PREVALENCE %
3.6 - Haryana - (1975)
6.5 - Uttar Pradesh - (1990)
12.7 - Kerala - (1995)
11.0 - Tamil Nadu - (2001)
8.1 - Rajasthan - (2002)
13.2 - Goa - (2004)
7.2 - Chandigarh - (2006)
8.3 - J & K - (2007)
13.9 - Delhi - (2013)

Figure 1.2: State-wise CVD prevalence rates in India

(Source: Prabhakaran et al., 2021)

As shown in Figure 1.2, Haryana appears to have the highest prevalence of CVD in Rural India, contributing approximately 7.4% of the total CVD prevalence in India. After Haryana, Jammu and Kashmir took the second position, where a 6.7% CVD prevalence rate has been adopted to address the CVD rate and deaths. Along with these rural areas, it has been identified that in urban areas, such as Delhi, the CVD prevalence rate is high, at 13.9% (Prabhakaran et al., 2021). This indicates that in rural areas, the CVD prevalence rate is low compared to urban areas. However, it has been identified that Maharashtra and Kerala contribute more to CVD cases in India, where a 7.4% prevalence has been reported for Kerala, and in Maharashtra, the prevalence rate appears to be lower, at 1.7% (Prabhakaran et al., 2021). This analysis indicates discrimination in the adoption of CVD prevalence for rural areas as compared to urban areas in India. Lack of socio-economic status, low income rate, and inequalities are some significant factors contributing to this discrimination in rural areas in India.

1.1.3 The concept of Deprivation in Terms of Healthcare Solutions for CVD in Indian Rural Areas

As per Townsend’s theory of Deprivation, deprivation is the lack of resources to sustain a quality lifestyle, resulting in long-term poverty and discrimination (Maini et al., 2021). It indicates certain defects or deficiencies in the individual’s environment that critically influence a particular group of people or an individual in terms of maintaining a quality lifestyle (Kalra et al., 2023). In India, CVD has shown significant health inequalities for people of low socioeconomic status in society.

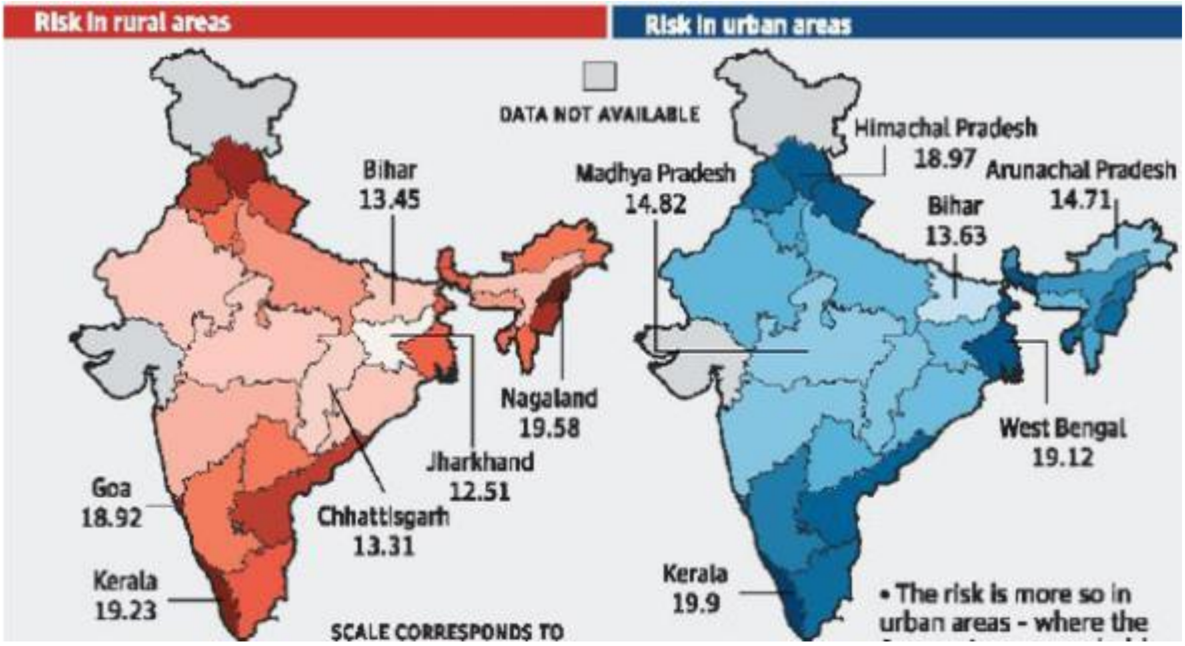
Risk in rural areas
Risk in urban areas
DATA NOT AVAILABLE
Bihar 13.45
Madhya Pradesh 14.82
Himachal Pradesh 18.97
Arunachal Pradesh 14.71
Bihar 13.63
Nagaland 19.58
Jharkhand 12.51
West Bengal 19.12
Goa 18.92
Chhattisgarh 13.31
Kerala 19.23
Kerala 19.9
SCALE CORRESPONDS TO
• The risk is more so in urban areas - where the

Figure 1.3: Indian Rural State-wise CVD Cases

(Source: The Hindu, 2021)

As shown in Figure 1.3, the rate of CVD cases in Kerala’s rural areas is higher (19.23%) compared to the urban areas of Kerala (19.9%). After Kerala, the rural areas of Goa took second place, where 18.92% of the population is affected by CVD cases (The Hindu, 2021). Along with the rural areas of Bihar, Nagaland, Jharkhand, and Chhattisgarh, there appears to be a high incidence of CVD cases in India. People from rural areas of India, like Kerala, are critically facing deprivation due to poverty, low social mobility, low level of education, illiteracy, and unemployment, as is the case in most societies. The acute practice of social discrimination and exclusion critically influences Indian society and raises discrimination for low-income category and backwards category people. Discrimination in providing quality healthcare solutions to the lower-income category is also high in India (Acharya, 2022). In recent times, CVD has become the leading cause of mortality in India. As per the recent national survey of nearly 800000 adults from India between 34 to 70 years old, it has been identified that the people from rural areas of Kerala face a high risk of cardiovascular diseases, and in Jharkhand, the rate of CVD risk is increasing with time. In Kerala, rural districts like Idukki and Wayanad have the highest rural population (95%), and they have less access to proper healthcare (Spb.kerala.gov.in, 2023).

Additionally, it has been identified that in rural areas of Kerala, the majority of the population comes from backward communities, such as Ezhava, Dheevara, and Chetties (Keralapsc.gov.in, 2024). This creates discrimination in accessing quality healthcare support for these backward communities. In other rural areas in India, non-communicable diseases (NCDs) accounted for 65% of all deaths, where more than 25% of deaths have been identified due to CVD and related factors like diabetes (Heartnet India, 2024). It has been determined that the rate of CVD in India ranges from 248.6 to 350.9 per 100000 individuals. Jacobsen (2022) argued that despite having 20% of the world's population, India is responsible for 60% of the total global health diseases, and creating a silent epidemic for people under age 50. It has been noted that healthcare services and facilities are being developed in most cities in India. There are around 707 District NCD Clinics, 5541 Community Health Centres, and 193 cardiac Care Units under NPCDCS (Heartnet India, 2024). However, social determinants like lack of awareness, low financial capability, and limited education about the symptoms of CVD in Indian rural areas limit the healthcare facilities for CVD patients from Indian rural areas (Padda et al., 2024).

Apart from this, due to discrimination, the lower social status category gets fewer opportunities to get quality healthcare solutions, which also increases the mortality rate due to CVD in Indian rural areas. Maini et al. (2021) stated that the deaths due to cardiovascular diseases in Indian rural India are high due to a lack of access to quality healthcare. According to a report published by the WHO, it has been found that in India, 58% of urban doctors hold a degree in cardiac medicine. In contrast, in rural areas, only 19% of doctors possess a cardiac medical degree (Mohandas et al., 2024). Moreover, it has been identified that in rural areas, more than 8% of primary healthcare centres run without a doctor (Livemint, 2022). Thus, the lack of proper diagnosis of cardiovascular diseases and the lack of quality access to experienced cardiac doctors have increased the CVD death rate in Indian rural areas. Apart from this, the behavioural factors also affect the incidence of CVD in Indian rural areas. For example, most CVD patients are not taking regular medications, which increases the risk of CVD deaths in Indian rural areas. It has been analysed that the combination of poverty, lack of access, and ignorance is driving the deaths due to CVD in Indian rural areas. Among most of the cities, Kerala, Punjab, and Tamil Nadu have higher rates of CVD deaths as compared to other cities in India (Menon et al., 2024). Thus, lower-income category states are facing a higher CVD death rate as compared to high-income category states in India.

1.1.4 Role of Environmental and Infrastructure Deprivation

Non-communicable diseases (NCDs) are fatal for more than 38 million people globally each year, and contribute 70% of the total mortality rate (Upadhyay, 2022). According to the recent study of GBD the global death rate for CVD has increased to 18.6 million, where environmental factors like air pollution and noise pollution played a vital role, along with socioeconomic factors and behavioural factors (World Heart Federation, 2023).

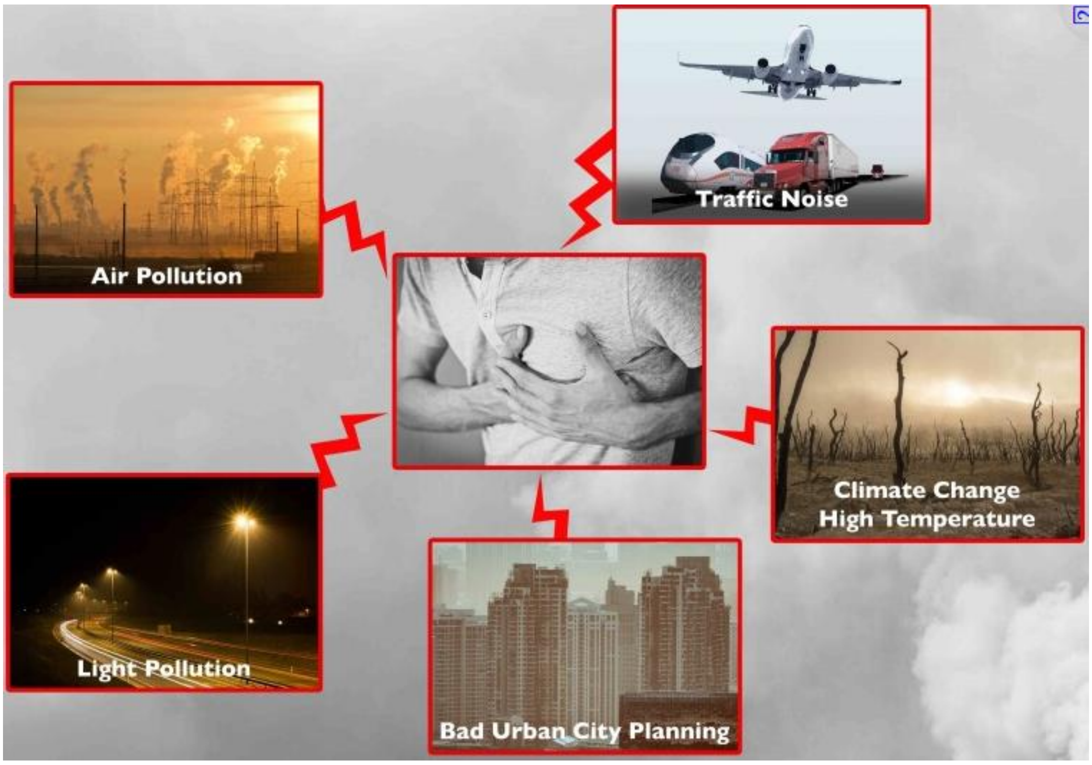

Figure 1.4: Environmental factors cause CVD death

(Source: Münzel et al., 2021)

As shown in Figure 1.4, the majority of deaths are caused by CVDs, and this risk has increased due to excessive exposure to environmental stressors such as noise exposure, air pollution, climate change, and artificial light at night (Münzel et al., 2021). Along with the traditional psychological risk factors for CVDs like hypercholesterolaemia, smoking, and hypertension, the environmental deprivation critically influences CVD death rates in the world, along with India. In terms of environmental factors, it has been analysed that, as compared to the rural areas, the people living in urban areas face more challenges due to high air pollution, noise pollution, and increasing CVD death rates (Upadhyay, 2024). Excessive exposure of the body to environmental risk factors leads to significant alterations in central biochemical pathways, thereby increasing the risk of health complications. As the noise pollution is increasing due to increasing traffic, the rate of IHD has increased, which is a significant factor contributing to cardiovascular diseases (Upadhyay, 2024). In India, where no proper research has been done focusing on environmental, IGD and CVD factors, the chances of CVD are going up. In addition, lack of consideration in order to decrease ecological pollution enlarges the mortality indicator of heart problems in India multiple times.

1.1.5 Treatments and Policies

WHO (World Health Organisation) assists governments to monitor and prevent cardiovascular diseases in nations, such as India (WHO, 2024). The WHO plans to combat CVDs in all countries including India, by coming up with international strategies like new standards of healthcare, controlling risk factors, strengthening of ability of health systems and also the patient care. Rehman et al. (2022) established that some risk factors that augment the CVD rate comprise unhealthy diet, the use of tobacco, excessive alcohol consumption, and poor physical activity. These have been significantly associated with ageing, increased blood sugar and elevation of glucose in the body of the human being, which poses the threat of cardiovascular diseases to individuals. In India, the government has introduced healthcare policies that encourages people to obtain an education on healthcare, collaborations with community organisations, and environmental policies to prevent CVD (Joseph et al., 2022).

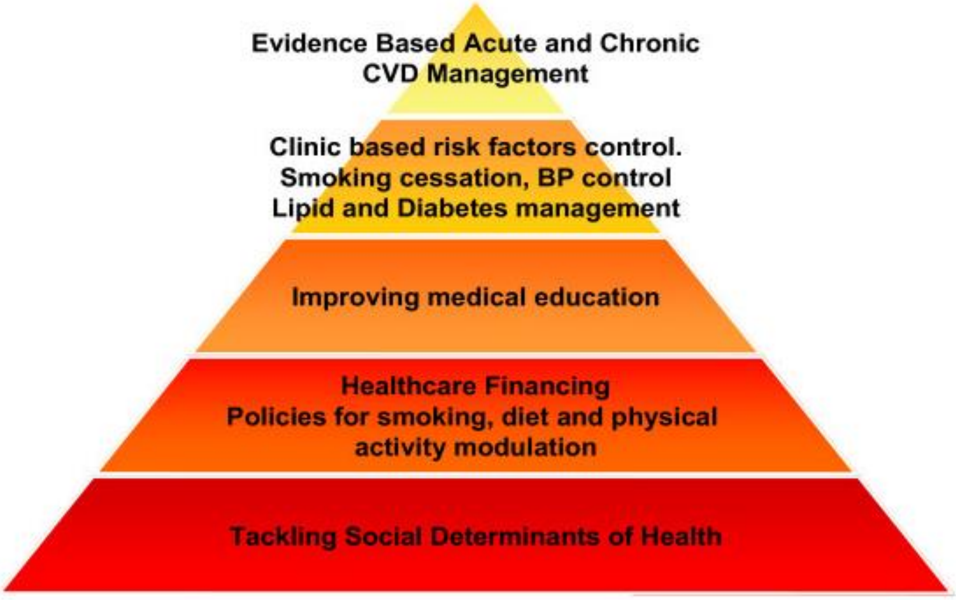
Evidence Based Acute and Chronic CVD Management
Clinic based risk factors control. Smoking cessation, BP control Lipid and Diabetes management
Improving medical education
Healthcare Financing Policies for smoking, diet and physical activity modulation
Tackling Social Determinants of Health

Figure 1.5: Cardiovascular prevention pyramid

(Source: Gupta et al., 2021)

Figure 1.5 depicts the Cardiovascular Prevention Pyramid that offers benefits to address CVD in India. Strategies such as addressing social health determinants, improving healthcare financing, enhancing healthcare education, implementing clinic-based risk factor control, and implementing evidence-based chronic CVD management can help reduce CVD (Gupta et al., 2021). For example, the ***"Healthy Life Trajectories Initiative"*** (HeLTI) is an effective collaboration effort to promote research funding for the major countries affected by CVD, including India (Kumaran et al., 2021). This program critically examines CVD prevention approaches and aims to reduce CVD in countries affected by the condition. Recently, the ***IndEcho study*** was conducted by the Indian government to identify the risk of CVD among individuals aged 43 to 50 years old (Vasan et al., 2023). This study analyses the cognitive function, cardio-metabolic disorders, and tries to find out the reasons associated with CVD in the young population in India.

1.1.6 Healthcare Policy Implications in Indian Rural Areas for CVD Prevention

In India, various policy initiatives have been proposed, but evidence of their efficacy has not been fully established. These initiatives cannot provide immediate impact on resolving the CVD death problem in Indian rural areas. The most recent policy implications and initiatives focus on improving rural people's education, enhancing socio-economic status, and increasing access to quality healthcare solutions (Kundu et al., 2023). Besides, government activities of financing the rural primary healthcare institutes and making accessible civic health insurance have been of a considerably capable use in decreasing the mortality rate among people in the countryside as a result of CVDs. Moreover, policy implications in control of smoking habits, control of Legislation, and alcohol intake control have enhanced the physical health condition and decreased the deaths dealing with CVD (Samuel et al., 2023). An efficient program of medical education in rural contexts was proposed to give training to primary care workers in the rural setting so that they could give initial aid to patients with CVD as well as make better health conditions of rural patients (Nath et al., 2021). On top of that, the CVD awareness sessions as instilled by the healthcare practitioners serve the purpose of educating people on the quality evidence pertaining to the severe consequences of smoking, alcohol drinking, unbalanced diet, and air and noise pollution exposure. Secondary CVD prevention was also adopted to ease access to human resource and deliver quality healthcare to the people affected with CVD in the Indian countryside (Garg et al., 2025). Thus, these initiatives indicate that Indian policymakers are creating several policies to modify rural healthcare systems, aiming to improve the quality of CVD preventive care delivery to the low-income category and for people with low socio-economic status (Ganatra et al., 2022).

It has been identified that the practical implications of these policies in urban areas reduced the risk of CVD death by 50 to 80% in higher-income countries in India. On the other hand, Ahmed et al. (2023) argued that in lower-income category areas of India, the absence of proper preventive approaches results in the rate of CVD still increasing and requires immediate action for prevention. This indicates the income deprivation in terms of the economic condition of different states in India. However, for lower-income states where it is not possible to create new healthcare infrastructure, the policy implemented to promote positive behaviour towards a healthy lifestyle is effective. Furthermore, training programs for primary healthcare staff in rural areas are also effective in providing primary treatment for CVD patients. However, it is not sufficient to address CVD death rates and provide CVD patients with a quality lifestyle. Gupta et al. (2021) suggested implementing a multi-factorial comprehensive approach focusing on effective CVD policies to prevent cardiovascular diseases in all states in India, specifically for low- and middle-income category states.

According to Rehman et al. (2021), cognitive changes in the prevention of CVD cases should be addressed in rural regions of India. Adopting political agendas such as strengthening the healthcare system for acute and chronic CVDs in rural areas and promoting public healthcare financing support can bring a new era of developing the healthcare infrastructure in rural areas for improving quality healthcare access. In addition, to address the risk factors tobacco control measures, food modification measures, and health promotion measures of physical activities are some of the policies that can be applied (Nath et al., 2021). Such policy implications will help to sensitize the rural CVD patients and people about the negative effects of heavy stimulation of tobacco and shortage of good wholesome food and lack of regular body exercises. Moreover, in order to obtain the goal of CVD prevention in Rural India, such policies are to be introduced as concerning the promotion of physical educational activity in branch facilities of health care in the countryside, the development of primary care with the focus on CVD and the intelligent approach to the population-based management of pharmaceutical risks on the population level (Gupta et al., 2021).

1.1.7 Theoretical Underpinning

The Health Belief Model (HBM)

As already established, CVD is a leading cause of mortality and morbidity in India, with rural populations experiencing unique challenges related to healthcare access, awareness, and behaviour change. Despite national efforts to control non-communicable diseases, the uptake of preventive health behaviours and treatment adherence remains suboptimal in rural regions. To understand these behavioural dimensions, this review draws upon HBM as a theoretical lens. The HBM suggests that individuals' health behaviours are influenced by their perceived susceptibility to disease, perceived severity of the condition, perceived benefits of taking action, perceived barriers to action, cues to action, and self-efficacy (Rosenstock, 1974; Yenew et al., 2023). Perceived susceptibility of the HBM model has been discovered whereby the rural people of India do not find CVD as a major health issue (Amdemariam et al., 2022).

Certain people fail to take medicinal drugs and attend regular health examinations for you to eliminate the cardiovascular sickness (cite) which is perceived excessive in HBM model. Additionally, rural humans of India do not comply with a proper food regimen, consume alcohol and tobacco, which critically have an effect on their fitness situation and boom the danger of CVD as they are now not aware of the benefits of these cations that come beneath perceived advantages of the HBM version (Riad et al., 2022). Applying the HBM affords a structured framework to take a look at how beliefs and perceptions effect the prevention, diagnosis, and control of CVD in rural Indian groups. This model helps identify the behavioural and psychosocial elements which can explain variations in fitness effects and inform culturally sensitive interventions.

Social Determinants of Health Framework

While man or woman fitness behaviours inclusive of weight loss plan, workout, and smoking are widely diagnosed contributors to CVD, these behaviours are often shaped by broader social and structural situations. Therefore, this systematic review is likewise underpinned via the Social Determinants of Health (SDH) framework, which recognizes that health is motivated by the situations wherein humans are born, develop, live, work, and age (World Health

Organization [WHO], 2008). The SDH framework highlights how financial and social elements like inclusive of profits, education, career, surroundings, and healthcare access, affect health outcomes (Powell-Wiley et al., 2022).

In rural India, these determinants, along gender norms and social exclusion, significantly form individuals' hazard of developing and managing CVD (Madavanakadu et al., 2020). Applying the SDH lens lets in for a comprehensive exploration of the way structural inequities make contributions to health disparities and tell strategies for prevention and intervention that move beyond individual-degree behaviour alternate. Therefore, the principle will assist policymakers, governmental groups, and healthcare practitioners to determine the underlying cause that makes CVD patients in rural areas more susceptible to dying and encourage informed choice-making because of which higher guidelines and much less hindrance to receiving properly first-class health offerings can be used within the destiny and higher fitness results will be realized (Jilani et al., 2021).

1.1.8 Literature Gap

Münzel et al. (2021) identify the socio-economic factors including life quality, income, and cost of living, accessibility of healthcare influence the risk of CVD. However, information related on how the socio-economic factors contribute to the variation of CVD rates in rural India is not available in this research article. Conversely, Gupta et al. (2021) implied that a series of policies, such as primary healthcare education policy, early CVD diagnosis policies, and financial funding policy, can be taken into consideration to promote socio-economic factors and advance the provision of quality CVD care in rural settings. The study however does not show clear ways through which such policies can be implemented in Indian rural areas. Considering these research gaps, this study aims to provide a strategic approach to implementing effective policies in Indian rural areas, promoting better health outcomes for CVD patients.

1.2 Rationale

The reason behind choosing this as a research is to determine the social economies influencing factors (like income obstacles, social rank, and employment), which influence availability of quality healthcare services to recuperate a CVD event in rural India. Ahmed et al. (2023) stated that a large number of rural people from Kerala, Jharkhand, Bihar, and Chhattisgarh are suffering from CVDs and facing high death rates due to a lack of quality healthcare solutions in rural areas. This study will be beneficial for policymakers, healthcare professionals, and government bodies to improve the decision-making approach and promote policy implications for the betterment of healthcare access for the rural Indian people suffering from CVD. Finding the social determinants that cause healthcare discrimination, this study critically identified reliable solutions to promote better healthcare quality in Indian rural areas and reduce the mortality rate due to CVD.

1.3 Research Question, Aim, and Objectives

1.3.1 Research Question

How does deprivation influence quality healthcare treatment for cardiovascular disease (CVD) patients in rural Indian, and what are the socio-economic factors that influence CVD among Indians aged 40 and above in rural areas?

1.3.2 Aim

This research aims to understand the impact of socio-economic factors on quality healthcare treatment for Rural Indians suffering from cardiovascular diseases (CVDs).

1.3.3 Objectives

- To investigate how socio-economic factors influence the prevalence of CVD in rural India, among those 40 and above
- To examine the influence of socio-economic factors on the management of CVD in those 40 and above in rural India
- To investigate disparities in access to and utilisation of CVD services in rural India
- To identify and examine the effectiveness of public health interventions for CVD management in rural India and highlight areas for improvement.

1.4 Dissertation Outline

Chapter	Description
Chapter 1: Introduction	Introduces research topic, finds background information, aims, objectives, and questions
Chapter 2: Research Method	Describe research designs, methods and data collection and analysis techniques
Chapter 3: Findings/Review	Identify the main findings from the analysis

Chapter 4: Discussion	Interprets the findings and links them with literature and theory
Chapter 5: Conclusion and Recommendations	Summarises the study, provides a conclusion and suggests better recommendations for future studies

Table 1.1: Dissertation Outline

(Source: Self-Created)

Table 1.1 depicts the dissertation outline, where it has been identified that the first chapter is Introduction, the second chapter is research methodology, chapter 3 is findings, chapter 4 is discussion, and chapter 5 is conclusion and recommendation. All these chapters are essential to identify the socio-economic factors that influence quality healthcare solutions for the rural Indians suffering from CVD.

Chapter 2: Research Methodology

2.1 Introduction

The relevant research design, search strategy will be used and critical appraisal will be undertaken to reveal sound data which will be relevant to the research topic in the chapter. A piece of systematic literature review will be used in this chapter to enumerate the specific details that surround the impact of deprivation on the rural areas of the Indian state, which is the concern of the CVD. Data screening, PRISMA, and critical appraisal skills were helpful in this study since they helped to acquire the data in a more correct manner and render the research data valid and reliable.

2.2 Study Design

There was a systematic literature review employed in this study to gather a credible and valid data to study the social-economic determinants and the community health measures towards CVD in India. According to Cabrera and Cabrera (2023), systematic literature review or SLR is an educational research method that is used quite frequently to obtain information in the literature on some particular research topic and subsequently focus on it in detail to analyze the findings and thus reach a suitable research finding. Conversely, Van Dinter et al. (2021) mentioned that SLR is very important in research as it helps to generate in-depth knowledge regarding the subject of study and follows a systematic procedure that involves gathering, identification, and analytical evaluation of available research studies, e.g., in the form of articles, books, journals, etc. In this research, the SLR was used to gather certain details on the deprivations that affect the prevalence of the CVD rate among rural lands in India. According to Rowley et al. (2021), deprivation is defined as the absence of necessitated resources to sustain a quality way of living among the people. Therefore, it will be necessary to employ the SLR methodology in establishing the socio-economic variables that affect the prevalence rates of CVD in India, and in this case, the rural setting among adults aged 40 years and over.

2.3 Search Strategy

The use of a comprehensive search strategy has enabled finding valid literature and comments regarding the topic of the research (Chigbu, Atiku and Du Plessis, 2023). According to Naresh and Kumari (2022), an extrusive search strategy uses keywords to locate reviewed articles, journals, books that are related to the subject of investigation. A believable method of the Bool was applied to access dependable keywords that concerned the deprivations of CVD in rural Indians. This is represented in Table 2.1.

2.3.1 Boolean Method

Keywords	Boolean Operator	Keywords	Boolean Operator	Keywords
"Cardiovascular Disease	**AND**	"Rural India"	**AND**	"Socioeconomic factors"
"Cardiovascular disorders"	**AND**	"Access to healthcare"	**AND**	"Health inequalities"
"CVD"	**OR**	"Rural villages"	**OR**	"Poverty"
"CVD management”	**OR**	"Health service utilisation"	**OR**	"Disparities
"Heart diseases"	**NOT**	Urban India	**NOT**	"Urban UK"

Table 2.1: Boolean Table

(Source: Self-Created)

The commonly used keywords like CVD treatment AND Access to healthcare OR rural Indian NOT Urban UK are derived on the basis of the Boolean table (Table 2.1). The boolean functions such as AND, OR, and NOT assist in the establishment of the similarly stable keywords with respect to the research objectives to identify superior articles, journals, and books offered in the secondary data sources like; PubMed, Google scholar, CINAHL, and Scopus".

2.3.2 Databases Used

To search for the identified keywords, selecting the relevant databases is essential to access peer-reviewed, author-reviewed research publications.

PubMed: PubMed is widely used to search biomedical literature, and it provides reliable information for the medical research field (Jin et al., 2024).

CINAHL: "Cumulative Index to Nursing and Allied Health" (CINAHL) is a popular database that offers medical research papers on various healthcare sectors, including CVD (Dhippayom et al., 2023).

Scopus: Scopus is a citation and abstract database that covers a wide range of medical, technology, and social science research projects, peer-reviewed journals, and articles (Kumpulainen and Seppänen, 2022).

Google Scholar: Google Scholar is a popular databases that provide relevant peer-reviewed articles, journals, and books relevant to the research topic (Zaelani and Budiana, 2024).

2.3.3 Inclusion and Exclusion Criteria

It is crucial to choose the inclusion-exclusion criteria in order to retrieve valid, reliable, and peer-reviewed articles or journals on the topic of research and thus enhancing validity of the research findings (Martinez et al., 2023).

Inclusion Criteria	Exclusion Criteria
Studies published between 2015 and 2025	Studies before 2015
Journal articles written in the English language	Articles or Journals written in languages other than English
Studies focusing on and including CVD in Rural India	Studies that did not include CVD in Rural Indians
Qualitative, Quantitative, Mixed-methods and Systematic Reviews WITH Meta-Analysis were considered	Non-reputable sources were not considered for validity and credibility purposes
Peer-reviewed studies	
Studies that were available in full-text and free to access	

Table 2.2: Inclusion-exclusion criteria

(Source: Self-Created)

Table 2.2, demonstration of inclusion-exclusion criteria, data during period of 2002 to 2025 recruited, before 2002 refused. Only English publications were considered and those which dealt with topics beyond CVD in Indian cities were excluded.

2.3.4 Study Selection/Extraction

The general strategy of the research search was made using the framework of the research, namely, the search of the Preferred Reporting Items according to Systematic Reviews and Meta-Analyses (PRISMA) (Parums, 2021). According to this framework, identification, screening, eligibility checks as well as final inclusion are among the critical stages concerning the selection of good and valid data (Rethlefsen et al., 2021).

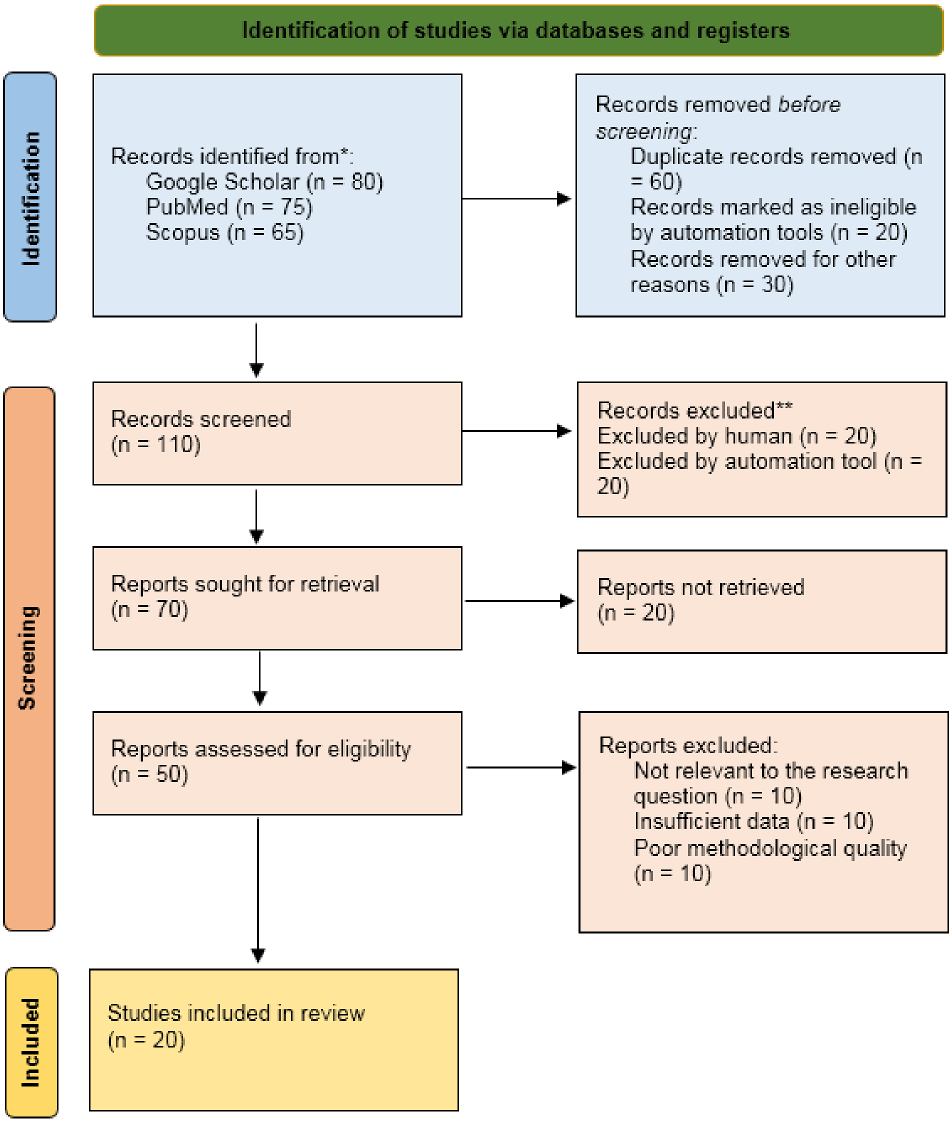
Identification of studies via databases and registers
Identification
Records identified from*:
Google Scholar (n = 80)
PubMed (n = 75)
Scopus (n = 65)
Records removed *before screening*:
Duplicate records removed (n = 60)
Records marked as ineligible by automation tools (n = 20)
Records removed for other reasons (n = 30)
Screening
Records screened (n = 110)
Records excluded**
Excluded by human (n = 20)
Excluded by automation tool (n = 20)
Reports sought for retrieval (n = 70)
Reports not retrieved (n = 20)
Reports assessed for eligibility (n = 50)
Reports excluded:
Not relevant to the research question (n = 10)
Insufficient data (n = 10)
Poor methodological quality (n = 10)
Included
Studies included in review (n = 20)

Figure 2.1: PRISMA Diagram

(Source: Self-Created)

Figure 2.1 demonstrates that originally 220 articles were found and 60 duplications, 20 unreadable articles, and 30 unrelated articles were filtered out during the initial search. In the screening stage, a total of 90 unauthentic and incomplete articles were removed to obtain the final 20 valid articles relevant to the research topic.

2.3.5 Data Extraction

Data extraction process has performed, which involved extracting information from 20 selected peer-reviewed articles to assess the impact on CVD and identify solutions to address CVD cases in rural India. ***[Refer to Appendix 1]***

2.4 Critical Appraisal

Critical quality appraisal is essential for understanding the quality of the data collected from the selected articles (Maeda et al., 2022). The CASP method has been critically utilized to assess the data quality and validity of the retrieved information, aiming to understand the socio-economic factors influencing CVD cases in rural adult populations in India. Based on 100 CASP criteria, the retrieved data have been analysed. ***[Refer to Appendix 2]***

The CASP criteria based on the data that was critically reviewed, which evaluates the quality of retrieved articles based on their research topic (Humayoun et al., 2024). Based on the CASP criteria, the 20 articles have been assigned a score (out of 10), with 12 articles scoring 10, 7 articles scoring 7, and one article scoring 8. ***[Refer to Appendix 3]***

2.5 Data Analysis

After data collection and analysis, the data is essential and can be analysed using various techniques, such as matrix data analysis and descriptive statistical analysis (Saldaña, 2021). The collected data were critically examined using the Thematic Data Analysis technique. **Braun and Clark's (2006**) data analysis process comprises relevant stages such as "data familiarisation", "code generation", "theme generation", "review themes", and "analysis of themes". Thus, effective use of the thematic data analysis technique helped to identify the core deprivations and socio-economic factors that affect the CVD rate in rural India. After selecting the peer-reviewed articles, the data extraction process was followed to extract the methodology, sample, objective, results, and findings from the articles. After that, codes have been generated from the findings, and from those codes, significant themes have been created which align with the research objectives. Then the analysis of the themes has been performed and reviewed the result and aligned it was been aligned with the research objectives.

Objectives	Themes	Sources
“To investigate how socio-economic factors influence the prevalence of CVD in rural India, among those 40 and above”	● Older adults ● Less/no formal education ● Occupational stress/hazardous working conditions ● Low socio-economic community development	Gayathri et al (2023) Padhi et al (2024) Kundu and Kundu (2022) Das et al (2022) Birhanu et al (2022)
"To examine the influence of socio-economic factors on the management of CVD in those 40 and above in rural India"	● Socio-economic disadvantages ● Limit early CVD diagnosis ● Effective management of CVD cases ● Indian rural areas	Paul and Singh (2017) Khan et al (2023) Hanif et al (2021) Kundu et al (2023) Singh et al (2024)
"To investigate disparities in access to and utilisation of CVD services in rural India"	● Significant disparities ● Facility gap, lack of trained healthcare workforce ● Underutilised rural clinics, and financial barriers ● Reducing access to CVD prevention treatment in rural India	Meena et al. (2022) Das et al. (2022) Kundu et al. (2023) Hanif et al. (2021) Kianoush et al (2023)
"To identify and examine the effectiveness of public health interventions for CVD management in rural India	● Public health interventions ● Inconsistently practical, under-	Marklund et al (2022) Rani et al (2021)

and highlight areas for improvement."	resourced ● Practical policy implications are required ● Prevent CVD cases among older adults in rural India	Rajdhan et al (2023) Ravindranath and Sundarakumar (2021)

Table 2.5: Thematic Table

(Source: Self-Created)

Chapter summary

The methodology chapter provides an in-depth overview of the selected search design (systematic literature review), data collection processes, and relevant findings based on data analysis. The findings reveal that promoting quality healthcare accessibility, training, and policy implications is crucial to addressing CVD cases for older adults in rural India.

Chapter 3: Results

3.1 Introduction

The results chapter will identify critical research results related to the research questions and come up with solutions to address the research objectives. The thematic data analysis process starts with the data extraction procedure to identify information available on the chosen peer-reviewed articles to determine the nature of the data gathered, the research design, the size of the sample, results, strengths, and the limitations of the selection as taken by the chosen sources. In addition to this, the six steps of thematic data analysis by Braun and Clark will be employed in establishing the new themes and providing quality solutions that determine the interventions that avoid the CVD cases among the rural Indians.

3.2 Systematic Search of Database

Relevant keywords have been generated, which include CVD cases in India, Rural Indian CVD cases, and Interventions of CVD, using the Boolean method when searching the databases. Scells et al. (2021) stated that the Boolean method used the AND, OR and NOT operators to identify authentic and reliable keywords. Some of the popularly used databases that have been relied upon to identify relevant articles as far as the research topic is concerned include PubMed, CINAHL, Scopus and Google Scholar. The vast majority of the peer-reviewed articles were gathered via Google Scholar because it comprises a significant amount of medical research articles and journals, which is consistent with the topic of the research. The first step involved retrieving 220 articles using the chosen databases, and according to the inclusion-exclusion criteria, the irrelevant and incomplete articles were excluded. At last, 20 peer-reviewed articles were found suitable to conduct the review in this research and find reliable results, which address the research objectives.

3.3 Characteristics of the Included Studies

Appendix 3 represents the characteristics of the included peer-reviewed studies through which the characteristics of the selected peer-reviewed articles have been identified to measure reliable solutions and interventions of CVD prevention in Indian rural regions. It has been noted that the gathered articles are peer-reviewed articles that follow the principles of the primary survey method. This aided in finding valid and reliable results of the articles chosen, promoting better solutions and interventions to reduce CVD cases in rural India.

3.4 Data Extraction and Synthesis

A critical approach has been placed on the extraction of data, which helps in the retrieval of the information contained in the article. The data extraction process is an important part of the thematic data analysis; the methodology employed, the sample used, the research objective, the findings, and the conclusion need to be found. Additionally, the article's strengths and weaknesses are also identified under the data extraction process, which helps to check the reliability and relevance of the research. Following the results attained, various themes are coming out across all 20 articles, which signifies the principal findings of the articles selected. Moreover, the chosen articles were measured critically on the basis of the critical use of methodology and implications of the interventions in the case of the resolution of CVD in rural India. Both articles contain objectives, and they will assist in determining the validity of the selected article to the research objectives in this study. The possible outcomes of a peer-reviewed article also serve the purpose of knowing the prevailing causative factor of CVD, the problem of prevention of CVD and identifying the ideal interventions in order to minimise the incidence of CVD in rural India. Based on the data extraction process, the retrieved information was further processed for conducting thematic coding and generating main themes addressing the research objectives.

3.5 Emerging Themes

Author	Codes	Sub-themes	Main themes
Gayathri et al (2023)	Risk factors, availability of CVD Cases	Delayed diagnosis, multi-morbidity in increasing CVD rate	“Theme 1: Ageing and cardiovascular vulnerability as socioeconomic factors which influence CVD prevention in rural India”
Padhi et al (2024)	Physical activity, CVD, and Indian rural people, delayed diagnosis“	Indian elderly populations have higher CVD risk	
Kundu and Kundu (2022)	Rural areas, improper medications, “multi-morbidity”	Rural older people face more difficulties than urban people in India	
Das et al (2022)	Rural older adults are at high risk of CVD, physiological decline, and traditional medications.	Lack of awareness, traditional modal reliance, and lack of formal education increase the delay of	

		CVD interventions for the older rural population.	
Birhanu et al (2022)	Lower socio-economic development, Underuse of preventive medications, low literacy, educational gaps	There are literacy gaps among the Indian elderly population, increasing CVD risks.	
Sundarakumar et al (2022)	Hypertension, CVD cases, occupational lifestyle, poor medication adherence,	Metabolic syndrome and occupational lifestyle elements influence CVD risk	“Theme 2: Socio-economic disadvantages as barriers to preventive care limit early CVD diagnosis and effective management of CVD cases in the Indian rural areas”
Ko et al (2023)	Socio-economic disadvantages in Indian rural areas, hazardous working conditions	Food insecurity, infrastructure gap, and poverty increase CVD risks in rural India.	
Birhanu et al (2024)	Smoking, Diabetes, and the Causes of CVD, limited medication uptake, and chronic stress	Treatment gap, limited medication uptake, poor-dry-patient ratio in rural areas, increasing CVD risk	
Meena et al (2022)	Premature death, CVD cases, Rural India, financial barriers, health	NPCDCS programs' effectiveness in resolving staff shortage, transportation issues,	

	workforce shortages, NPCDCS programs	and staff shortage in rural healthcare settings	
Unnikrishnan et al (2022)	CVD deaths and early CVD diagnosis, CVD risk factors,	Poor continuity of care after CVD diagnosis among CVD-affected elderly populations in India	
Paul and Singh (2017)	policy implications, lack of a trained healthcare workforce, Income levels, and gender disparities	Low health literacy, poor awareness programs, and low income level affect CVD risks	“Theme 3: Infrastructure and socio-economic disparities, gender and cultural influence exist in reducing access to CVD prevention treatment in rural India”
Khan et al (2023)	Preventive medications, underutilised rural clinics, regular screenings, continuity of care	Hypertension, diabetes, lack of awareness programs, delayed diagnosis, and increasing CVD rate in India.	
Hanif et al (2021)	ML interventions, financial barriers, and the prediction of CVD, poverty, and distance to health facilities	Poverty is the socioeconomic and cast-based disparities that are increasing CVD cases in rural areas.	
Kundu et al (2023)	Economic status, CVD prevention, gender disparities, and Socioeconomic inequality	Women are getting fewer diagnoses as compared to men in rural India.	

Singh et al (2024)	CVD causes, diabetes, and Indian rural people	Physical activity is required for CVD prevention	
Kianoush et al. (2023)	Public health intervention reduces CVD risk, Cultural norms, and gender bias, stigma, and health beliefs.	Rural program delivery gaps, poor long-term CVD carer access in rural India, and increasing CVD risk	“Theme 4: Public health interventions, practical policy implications in preventing CVD cases among older adults in rural India”
Marklund et al (2022)	Under-resourced, metabolic syndrome	Educational levels linked with CVD morbidity awareness	
Rani et al (2021)	WHO-operated diagnostic tools prevent CVD cases.	Income barriers, caste. Class and training adherence for CVD prevention	
Rajdhan et al (2023)	WHO guidelines, policy implications, NPCDCS programs, trained personnel,	Poor coordination, no structured follow-up, high risk among the adult population	
Ravindranath and Sundarakumar (2021)	National policy implications, CVD prevention, supply of medications, and health Service availability	National policy implications in CVD prevention	

Table 3.1: Thematic Coding

(Source: Self-created)

The thematic coding table represented in Table 3.1 helps in formulating the main themes that addressed the research objectives and provided solutions in attempting to redress the research problems. The selected peer-reviewed articles and the findings were also used to prepare the codes and sub-themes, which are useful in summarising and preparing the main themes that establish solutions to reduce the impact of CVD cases among elderly populations in Indian rural India through interventions.

3.6.1 Theme 1: Ageing and Cardiovascular Vulnerability as Socioeconomic Factors which Influence CVD Prevention in Rural India

Theme 3.6.1 examines the interplay between ageing and socio-economic factors in affecting cardiovascular vulnerability in rural India, drawing on a total of 11 studies across five sub-themes: ageing and cardiovascular vulnerability (n = 3), educational disadvantage and health literacy (n = 3), occupational and environmental stressors (n = 2), socioeconomic deprivation and structural inequities (n = 2), and health system barriers and service access (n = 2). Collectively, these studies demonstrate how biological ageing process overlap with social and systemic disadvantage to influence cardiovascular risk, access and outcome among rural populations.

3.6.1.1 Ageing and Cardiovascular Vulnerability

Ageing has been consistently identified as a central determinant of cardiovascular vulnerability in rural India, with evidence showing that advancing age both amplifies biological risk and interacts with socio-economic disadvantage to worsen outcomes. Kundu et al. (2023) demonstrate that the proportion of older adults within states is the strongest predictor of premature years of life lost (YLL) due to CVD, with correlations particularly marked among women (r = 0.50). Their analysis illustrates a J-shaped trajectory of YLL, which peaks in the oldest age groups, and highlights gender disparities as men experience greater premature mortality from the age of 50 onwards. However, the reliance on mortality data from the Medical Certification of Cause of Death system, which predominantly captures urban, hospital-based deaths, means that rural ageing populations may be under-represented, potentially masking the true extent of the burden.

At a more localised level, Kundu and Kundu (2022) reinforce the significance of ageing by showing that adults over 40 in rural South India face nearly three times the risk of developing metabolic syndrome compared to younger counterparts. Such a clustering of hypertension, obesity and dyslipidaemia with age indicates cumulative physiological burden of ageing as well as social and behavioural risk factors such as physical activities and change in diet. However, this study relied mainly on data from a Medical Certification of Cause of Death System, which captures most data from urban areas. This then means that rural ageing populations may remain under-represented, possibly under-reporting the real extent of the issue.

Moreover, Gayathri et al. (2023) note that ageing is the key factor predisposing to cardiovascular risks, and older adults, especially women, bear an excessive burden of premature mortality in rural India. However, the rural burden can be under-represented when based on hospital mortality data. According to Kundu and Kundu (2022), adults with age above 40 years are nearly three times at risk of having metabolic syndrome than younger patients, and hypertension, obesity, and dyslipidaemia become more associated with age. Kundu and Kundu (2022) observe that multimorbidity occurs especially common in rural populations of ageing and increases the risks of hypertension, diabetes, and dyslipidaemia. Combined, these studies reveal that ageing combines with poverty and gender to increase risk. The results emphasise the importance of age- and gender-specific intervention and enhanced rural surveillance to determine the real magnitude of cardiovascular ageing.

3.6.1.2 Educational Disadvantage and Health Literacy

Analysis of the studies (N=3) also found that educational disadvantage and low health literacy significantly shape the ability of rural populations in India to prevent, recognise, and manage CVD. Paul and Singh (2017) show that health literacy in rural adults is not only poor but strongly associated with education levels, particularly among women, and this lack of awareness contributes to delayed care-seeking and inadequate disease management. According to Gayathri et al. (2023), low literacy levels are linked to as well. Hypertension and worsening cardiovascular risk factors in India. Such results insinuate that illiteracy is an ailment to avert preventative behaviour, early treatment, and effective success. Treatment Older India does not marginalize education, but education is more crucial in reducing vulnerability; hence there needs to be culturally modified literacy-based interventions.

3.6.1.3 Occupational and Environmental Stressors

Occupational and environmental factors are significant socio-economic determinants that enhance cardiovascular weakness in rural India. These findings are highlighted in N=2 studies. For example, Kundu and Kundu (2022) highlight the role of work-related stress and physically demanding occupations, particularly in agricultural and informal labour, in increasing risk factors such as hypertension and metabolic syndrome. Birhanu et al. (2022) emphasize that the working environments of the farming communities, including heat stress, air pollution, and pesticide application, are all factors that increase the cardiovascular risk of the rural workers. Although it is very strong in the ability to connect objective environmental and clinical information, the causal strength is constrained by confounding socio-economic elements. When combined, these studies demonstrate the accumulating impact of ageing that is already placing a strain on biological resilience and the addition of unsafe working and environmental exposures. Therefore, the interventions should be based on incorporating the occupational health and environmental health in the rural CVD interventions.

3.6.1.4 Socioeconomic Deprivation and Structural Inequities

Cardiovascular vulnerability is directly increased by poverty and inequities. This sub-theme is informed by N = 2 studies, Ko et al. (2023) and Birhanu et al. (2022), which collectively examine how poverty, limited resources, and systemic barriers exacerbate the burden of CVD in disadvantaged populations. Birhanu et al. (2022) reveal that low income and low education are always associated with poor cardiovascular outcomes despite having access to healthcare services. The authors also emphasize that food insecurity, inadequate housing, and inadequate infrastructure lower the level of compliance with preventive measures, which support health risks. Both these studies are informative, but they are limited by self-reported information and geographically small samples. These results indicate that deprivation is not the background noise but a risk driver. In the case of ageing adults, poverty corresponds with the deteriorating health to transform previously avoidable conditions into lethal consequences, demonstrating the high urgency of structural interventions.

3.6.1.5 Health System Barriers and Service Access

Health system limitations and restricted access to services significantly influence cardiovascular vulnerability in rural India. N=2 studies from the analysis (Meena et al., 2022; Padhi et al., 2024), examined how structural gaps, resource constraints, and regional disparities hinder timely diagnosis, treatment, and ongoing management of CVD in rural populations. Padhi et al. (2024) extend this understanding by highlighting regional disparities in service delivery, noting that rural residents often face longer travel times, higher out-of-pocket costs, and reduced continuity of care compared with urban counterparts. Both studies demonstrate how structural inefficiencies and resource constraints amplify the impact of biological and socio-economic risk factors. These structural weaknesses slow down diagnosis and aggravate the course of the disease. Taken together, the studies emphasize the role of under-resourced health systems in exacerbating both biological and social risk factors and putting older adults in a disadvantaged position. As long as the infrastructure, workforce, and the even distribution of services are not enhanced, CVD prevention will not be effective in the rural context.

In sum, Theme 1 shows that cardiovascular susceptibility in rural Indians is made through the interaction of biological and socio-economic conditions. The risk increases with age, but poor literacy, hazardous jobs, poverty, and ineffective health systems make sure such risks are ill-attended. Limitations in methodology, i.e. cross-sectional designs, self-reporting, and regional biasness, imply that the burden is underestimated. Nevertheless, all the evidence points toward the same direction: ageing, and the lack of deprivation, render CVD prevention in rural India to be inseparable with larger-scale reforms in education, poverty alleviation, occupational safety, and equity of health systems.

3.6.2 Theme 2: Socio-economic Disadvantages as Barriers to Preventive Care Limit Early CVD Diagnosis and Effective Management of CVD Cases in Rural India

Theme 3.6.2 looks at how socio-economic disadvantages result in barriers to preventive care in rural India, drawing on 7 studies across 5 sub-themes: Access to Healthcare Services (n = 1), Health Literacy and Awareness (n = 2), Economic Constraints and Livelihood (n = 2), Availability of Preventive and Continuity of Care (n = 2). Collectively, the studies show that poverty, cultural values, and institutional inefficiencies contribute to inequalities, postponing their identification and aggravating the situation among rural people.

3.6.2.1 Access to Healthcare Services

The barriers to access greatly limit the chances of early detection of CVD in rural India. Kundu et al. (2023) identified that since primary health centres have limited diagnostic capacity, patients have to travel over long distances, which impact the elderly populations health condition (r = 0.42 for men and r = 0.50 for women). Findings suggest that distance, cost, and workforce gaps sabotage preventive care and women’s are suffering more as compared to men. The use of cross-sectional data restricts generalisability, but the results address the barriers to treatment in structures as delaying and contributing to cardiovascular outcomes.

3.6.2.2 Health Literacy and Awareness

Low cultural beliefs and health literacy have a significant impact on the outcomes of CVD. According to Sundarakumar et al. (2022), 42.2% rural adults do not always interpret the symptoms of chest pain or fatigue compared to the standard, which results in delays in seeking care. On the other hand, Unnikrishnan et al. (2022) stated that, lack of awareness the prevalence rate in rural area is less 40.3% as compared to urban are in India (45/1%). These results explain why awareness deficits and cultural orientations are barriers to early diagnosis and continuity of care. Although restricted due to lack of longitudinal studies, the fact of evidence confirms that preventive measures will never work unless health education is targeted and not generalized across different settings but rather specific to the rural environment.

However, the conclusions are limited as most of the studies used cross-sectional designs and rely on self-reported awareness levels, allowing prejudice to remember and assess by reducing true literacy intervals. There were also many regions and specifics, so the results cannot be normal for all rural Indian contexts. These boundaries means that the delays reported in Care-Mang can be even greater in low-study areas, which highlight the need for longitudinal and national level representative research to accurately inform the targeted health education programs.

3.6.2.3 Economic Constraints and Livelihood

Economic insecurity is a constant limiting factor to interaction with healthcare. Ko et al. (2023) demonstrate that low-income households place more importance on basic necessities than on medical costs, suffering from hypertension (n = 1715895), diabetes (n = 1807566), and obesity (n = 776023) postponing the time of diagnosis and taking medications. Similarly, Unnikrishnan et al. (2022) analysed (n = 5080) patients with cardiovascular diseases, and identified that 39.5% patients out that relying on agricultural has high risk and manual labour (60.5%) has very high risk and decreased in financial security and access to health care affect the healthcare assess most critically. Taken together, these findings suggest that money deprivation postpones or even bars treatment, which supports bad results. Self-report methodological dependence reduces accuracy, yet the data points to that poverty is a major predictor of cardiovascular vulnerable status.

These results are limited because most of the studies depend on self-reported income and health behavior, which can remember and report bias. In addition, cross-sectional design prevents understanding that poverty over time affects the progression of the disease or care-care. Samples were also area-specific, which means that the results cannot represent all rural states. These limitations suggest that the correct effect of economic insecurity on delayed diagnosis and treatment can be underestimated, strengthening the need for longitudinal, multi-field studies to direct financial assistance for rural homes and subsidy policies.

3.6.2.4 Gender and Household Decision-Making

Studies also found that gender limits the seeking of care particularly by women. The cross-sectional study by Paul and Singh (2017) demonstrate that women older than 40 tend to postpone the treatment because of the lower priority within the household, financial reliance, and mobility conditions. However, the overall prevalence has increased to 98 per 1000 which was 55 per 1000 in 2014. Unnikrishnan et al. (2022) disclose the priority of household decisions is usually based on the health of men (CVD suffering rate 12.2 - 10.1%), and women (15.3 - 12.3%) are exposed to late-stage CVD. These results indicate that domestic preferences delay women's timely access to CVD care, which increases the possibility of late phase presentation and poor results. The increase in circulation (from 55 to 98 per 1000) means that the burden of untreated CVD will increase, without making domestic decisions and improving women's autonomy. However, most of the studies were cross-sectional and field-specific, which limited generality, and they depended on self-reported domestic decision data, which could understand women's obstacles. Representative studies at more longitudinal and national level require designing policies that empower women to take care of first care and reduce gender inequalities in rural health systems.

3.6.2.5 Availability of Preventive and Continuity of Care

Prevention and follow-up are still poor in rural health systems. Unnikrishnan et al. (2022) discover that screening hypertension (42.1%), cholesterol (55.6%), and Smoking (21.2%) and chronic kidney disease (11.2%) increases CVD risk, whereas lifestyle habits (diet and tobacco consumption) are not addressed. The lack of patient-tracking (13.5%), follow-up (10%), and inconsistency in medication (21%) use are mentioned by Meena et al. (2022) as factors that adversely affect adherence to treatment. These findings, even though the cross-sectional design limits long-term generalisations, indicate that the absence of systematic screening and follow-up care supports late diagnosis and part-whole management, hindering patient outcomes.

In general, the Theme 2 demonstrates the systematic impact of socio-economic disadvantages on the prevention of care and the early CVD diagnosis in rural India. Mechanisms of exclusion, defiant health literacy, poor economic status, gender disparities, and poor continuity of care intersect to form a cycle of late diagnosis and ineffective management. Although the methodological shortcomings of the studies, including cross-sectional designs, regional focus, and reliance on self-report, could be underestimating the actual burden, the literature is clear that the prevention of CVD in rural India will not be possible without addressing the structural disadvantages that define healthcare access and utilisation.

3.6.3 Theme 3: Infrastructure and Socio-economic Disparities, Gender and Cultural Influence Exist in Reducing Access to CVD Prevention and Treatment in Rural India

Theme 3.6.3 examines at how access to cardiovascular disease (CVD) prevention and treatment in rural India is hampered by infrastructure, socio-economic and caste-based disparities, and gender and cultural influences, drawing on total 5 studies across 3 sub-themes: Geographic and Infrastructure Barriers (n = 2), Socio-economic and Caste-based Disparities (n = 2), and Gender and Cultural Influences on Health-seeking Behaviour (n = 1). It is based on evidence derived through 5 studies in three sub themes namely geographic and infrastructure barriers, socio-economic and caste-based disparities and gender and cultural influences on health-seeking behaviour. All these studies point at the interaction of physical deficits, social stratification and cultural norms to limit preventive behaviour and treatment outcomes in rural settings.

3.6.3.1 Geographic and Infrastructure Barriers

CVD care was found to be hindered by geographic isolation and poor infrastructure. According to Khan et al. (2023), maximum people (n=300) facing central obesity and (n = 300) facing from matched control without central obesity told that high distance, ineffective transport, and insufficient facilities increase the time of getting timely interventions. Hanif et al. (2021) conduct farther study with rural (n = 82) participants where more than 30% got high CVD risks and stating that the rural health centres are inadequately equipped with diagnostic equipment, experts, and access to quality medications, patients have to commute to urban medical facilities, which is expensive. These outcomes prove the effect of isolation and infrastructural differences on the delay of diagnosis and worsening of further treatment. Although they have cross-sectional and region-specific nature, the evidence confirms weak rural infrastructure as one of the factors leading to poor CVD outcomes.

3.6.3.2 Socio-economic and Caste-based Disparities

Socio-economic disadvantage and caste hierarchies restrict the absence of healthcare. Singh et al. (2024) note that 28935 of people aged 60 and above were living in low-income families and they have delays in consultations due to financial reasons. Paul and Singh (2017) (n = 120942) underline that the planned castes and tribes (both regarding the waiting time and provider focus) are of worse quality compared to the groups with higher castes. Such findings indicate that there are fewer hindrances in more well-endowed and upper-caste families. These inequalities result in the most disadvantaged becoming more susceptible to diagnosis and further treatment of the disease later, thus they are at risk of developing CVDs uncontrollably. Although restricted due to the absence of longitudinal data, the results indicate that disparities are so ingrained and need policy interventions so that everyone can access healthcare fairly.

These findings suggest that caste hierarchy and low income delays have increased late phase CVD and poor results, reducing the quality of care for consultations and disadvantaged groups. However, most of the evidence comes from cross-sectional, field-specific studies, which limit generality across India. Many people also rely on self-reported income and caste experiences, which can introduce bias and underpart discrimination. These limitations suggest that the actual effect of caste and poverty can be even greater, underlining the need for longitudinal, multi-state research and equity-focused policies to reduce systemic obstacles for marginalized communities.

3.6.3.3 Gender and Cultural Influences on Health-seeking Behaviour

CVD care access is also limited by gender roles and cultural beliefs. The wider rural data indicate that the health of women is usually given second priority thereby resulting in late diagnosis and less preventive measures. The use of herbal treatments and unqualified health workers postpones the use of formal treatment and impacted the age group 85+ aged people in rural Indian like Tamil Nadu, Madhya Pradesh and Chattishgarth (Kundu et al., 2023). Such trends decrease the utilization of healthcare by women and the under-diagnosis of CVD. Even though the evidence is context-dependent, it demonstrates how socio-economic disadvantages are further worsened due to gender inequities and cultural norms, limiting the effects of preventive programmes.

These findings sheds light on that delayed care in cultural criteria and gender roles, dependence on informal treatments and under diagnosis of CVD among rural women, especially in old age groups. However, most of the studies used cross-sectional and field-specific data, which limits the understanding of long-term behavioural changes and cannot occupy diverse cultural settings in India. Heavy dependence on self-reported practices also recalls prejudice and reduces the use of informal care. These limitations suggest that the correct effect of gender and cultural obstacles may be even stronger, supporting the requirement of longitudinal, culturally sensitive research and targeted interventions that challenge restrictive norms and improve women's access to formal health services.

All in all, the theme 3 brings together the lack of infrastructure, socio-economic and caste inequalities, and cultural factors that all come together to restrain CVD prevention and treatment in rural India. These distance and weak facilities slow access, discrimination and poverty limit the use of the services, and gendered norms limit women access to formal healthcare. Even though evidence is limited to cross-sectional designs, findings all indicate that prevention of CVD demands reforms that enhance infrastructure, resolve inequities, and inculcate culturally sensitive strategies. Rural populations will stay outnumbered without such interventions.

3.6.4 Theme 4: Public Health Interventions and Practical Policy Implications in Preventing CVD Cases among Older Adults in Rural India

Theme 3.6.4 explores the role of the policy measures and the intervention activities in the prevention of cardiovascular disease (CVD) in older adults in rural India, drawing on 7 studies across 4 sub-themes: Availability and Reach of Public Health Interventions (n = 2), Community Awareness and Health Education (n = 1), Accessibility and Equity in Service Delivery (n = 1), Monitoring, Evaluation, and Gaps in Implementation (n = 3). Together, the literature indicates that prevention programmes are available, but they are not as effective with rural populations due to issues of reach, awareness, equity, and monitoring.

3.6.4.1 Availability and Reach of Public Health Interventions

In rural India, national prevention programmes have not been evenly spread. According to Kianoush et al. (2023), analysed CVD patients (n = 17266) of mean age 66 years old, and identified that the CVD prevalence program NPCDCS is hindered by the lack of trained employees, diagnostic measures, and medicine supply. Marklund et al. (2022) also contribute to analyse (n = 214000) deaths due to the lack of non-communicable disease (NCD) care decreases systematic screening and postpones early detection. These results demonstrate that there are poor infrastructure and inadequate resource distribution in opportunities to intervene early. They are mostly cross-sectional, but they show that it is necessary to invest more in the workforce training, equipment, and medicine supply chains to render prevention efficient in rural settings.

3.6.4.2 Community Awareness and Health Education

One of the aspects of prevention is health literacy. Ravindranath and Sundarakumar (2021) discovered that at the points of successful deployment, NPCDCS education programs enhance early diagnosis and preventive behaviours and prevalence rate estimated at 0.8% (95% CI; 0.6-1.1% for aged 55 yels old). Most communities however do not have all the basic information on CVD risk factors like smoking, hypertension and diet. This ignorance will lead to late presentation and disease progression. It is indicated in the evidence that the gaps in education weaken public health programmes. In spite of scarce information on strategies to scale awareness campaign provided by studies, results indicate that rural households require culturally relevant education to participate in prevention and treatment.

3.6.4.3 Accessibility and Equity in Service Delivery

The inequity in service access is still present despite the programme. Kianoush et al. (2023) demonstrate that poorer households, women and lower-caste populations have less access to follow-up care than their wealthier or higher-caste counterparts. The geographic barriers and transport cost also limit the use of the services, which leaves marginalised groups underserved. These results indicate that the problem of inequalities is still a threat to the effectiveness of the prevention process, and thus, a two-level system is formed, the disadvantaged populations are at a greater risk of uncontrolled CVD. In spite of the fact that policy solutions are hardly ever articulated, there is evidence to support the idea that equity-oriented reforms, such as better transport, shorter distance, and caste- and gender-sensitive strategies are needed to address service gaps.

3.6.4.4 Monitoring, Evaluation, and Gaps in Implementation

Weak monitoring and low funds lower impact of programmes. Rajdhan et al. (2023) note that the lack of appropriate data management and evaluation systems with fragmentation are obstacles to effective interventions. Rani et al. (2021) would advise using health management information systems (HMIS) (80% training 20% test) to reinforce monitoring and patient tracking. Kianoush et al. (2023) also state that sustainability of prevention efforts is limited by funding deficits and ineffective workforce capacity which reduced CVD prevention by 1.86% for Indian rural populations. These results indicate that interventions do not provide long term benefits in the absence of systematic monitoring and stable resources. Although the cross-sectional designs limit evidence, they indicate clearly that investment in data systems, IT tools, and training of the workforce is essential to bolster implementation.

Comprehensively speaking, Theme 4 demonstrates that Indian rural CVD prevention interventions in the field of health are limited by uneven coverage, low awareness of the community, inequitable service provision, and poor monitoring. The generalisability is limited by methodological constraints including the use of cross-sectional data, but the results all lead to a one-point conclusion: effective prevention means policy changes that create infrastructure, increase education, promote equity, and improve evaluation frameworks. Unless these structural obstacles are addressed, the scope of the public health programmes in curbing the risk of cardiovascular disease in older adults in rural India will be narrow.

3.7 Summary of Main Findings

The increasing healthcare discrimination, in terms of gender, caste, and financial stability, increases complexities for the poor and vulnerable caste population in getting quality CVD prevention in India. Kundu et al. (2023) identified that in rural India, people aged 40 and above faced challenges in accessing quality healthcare solutions, and a lack of education and CVD risk factors delayed the CVD interventions. Additionally, multi-morbidity and occupational and environmental stressors also increase the risk of CVD among rural Indian people. Further, lack of local quality healthcare access, absence of regular follow-up and weak community engagement in promoting healthcare access amplify the health case challenges and increase the risk of CVD mortality (Padhi et al., 2024). Lack of a strong transportation system, due to a balance of healthcare providers and patient ratio, creates inconsistency in healthcare service delivery for the CVD-infected population. However, intervention implications indicate that strong CVD awareness programs, equity policy implications, and investment in healthcare infrastructure development in local areas may offer a better opportunity to enhance CVD prevention and interventions (Meena et al., 2022).

Further, the thematic findings critically identified the socioeconomic factors that influence the CVD rate among adults in rural India. Kundu and Kundu (2022) stated that the CVD prevalence rate is significantly higher among aged adults in the rural areas of India, those with no or low educational qualification. On the other hand, Ko et al. (2023) stated that smaller rural areas in India with lower socio-economic development have an increased rate of CVD patients. Lack of quality healthcare service facilities, lack of trained healthcare staff, and limited access to a quality healthcare system increase the mortality rate of people in rural areas in CVD cases (Meena et al., 2022). Marklund et al. (2022) suggested implementing CVD awareness programs, policy implications for early CVD diagnosis, and the use of AI/ML tools in CVD identification and prevention can reduce the increasing CVD death rates among older adults in rural India.

3.8 Chapter Summary

The result chapter significantly analysed the peer-reviewed articles' findings and interpreted the generated themes aligned with the research objectives. The findings are suitable for identifying the socio-economic challenges and disparities in rural India in providing quality solutions for the rural CVD-infected patients. The next chapter will describe the findings and critically align with the research objective, literature and theoretical insights, and additionally identify the strengths and limitations of the identified solutions.

Chapter 4: Discussion

1. Introduction

The previous chapter has identified the research findings from the selected peer-reviewed articles, which address the research objectives and questions. This chapter conducts a critical discussion of the thematic findings and performs an evaluation and comparison of the findings with the existing studies. Additionally, the generated findings critically align with the research objectives and find answers to the research questions. Further, by identifying the strengths and limitations of the findings, this study promotes a better understanding of future research requirements and achieves better research outcomes, which will identify better interventions to reduce CVD cases in rural India.

2. Discussion of the main findings

The thematic findings reveal that ageing and cardiovascular vulnerability are some socioeconomic factors that influence CVD prevention in rural India. It has been observed that Indian rural people above 40 have a high chance of facing disease related to CVD. Increasing mental stress, diabetes, smoking, hypertension and dyslipidaemia and other multimorbidity increase the CVD risk among the rural people aged above 40 (Kundu et al., 2023). Further, lack of proper access to CVD healthcare solutions, lack of awareness, and lack of financial strength increase the challenges for the rural Indian people to get quality CVD prevention healthcare solutions. This finding shows the evidence that the Indian rural people are struggling more to get quality healthcare access as compared to the urban areas.

Further, the findings reveal that the lack of primary healthcare settings and the lack of trained healthcare staff fail to provide the initial support to the rural people of India facing CVD. Lack of early CVD diagnosis leads to a delay in promoting required medications, which increases the mortality rate (Sundarakumar et al., 2022). However, the Indian government is trying to address CVD through NPCDCS and other programs and policies; there are gaps in strict adherence and implications. Such as Indian rural people have knowledge gaps, which create difficulties in identifying CVD cases at early stages. Strict implications of the CVD awareness program in rural India can help people to identify CVD symptoms like chest discomfort, weakness, and breathing problems, which can promote early interventions and reduce the mortality rate (Unnikrishnan et al., 2022).

In rural India, gender inequities highly influence the quality of health-care-seeking behaviour. The finding reveals that there are lower health priorities for women as compared to men. This incident increases the death rate of women in rural India due to CVD cases (Rowley et al., 2021). Additionally, it has been observed that rural people are not getting good behaviour from the urban healthcare staff, the power difference in Indian culture created significant barriers to seeking quality healthcare access for rural populations. The caste-based and income level disparities are common in India, which increases the complexities for the rural people in getting quality healthcare solutions to prevent CVD care (Ko et al., 2023). However, the findings suggest implementing some interventions such as equity in healthcare access, implementing early CVD detection camps in rural areas, boosting financial support to build new primary healthcare solutions and training the healthcare staff. To implement these interventions, the government and local committees of India need to play a strong role, unless the CVD prevention in Indian rural areas is not adequately addressed and remains a complex challenge to overcome.

3. Critical evaluation of your findings and comparison with other studies

Aligning and comparing theme 1 findings with existing studies

The thematic findings reveal that arterial stiffening, declining cardiac reserve, and endothelial dysfunction are some major issues which increase the CVD risk for the adult Indian rural populations. Along with the increasing populations, the rate of CVD cases and lack of prevention increase the CVD mortality rate (Rehman et al., 2021). It is evident from the literature findings that cardiac dysfunction, smoking, and mental pressure increase the rate of CVD among older adults in rural India, and more than 282 older adults 100000 die from CVD cases (World Heart Federation, 2023). Further, theme 1 findings stated that the lack of education and low level of awareness about CVD risk and prevention activities are increasing the CVD rates in rural India. As compared to urban areas, the prevalence rate of CVD is low in rural areas. For example, in 2023, the provenance rate of CVD in urban areas was 14%, which was 7.4% for rural Indians (Ke et al., 2021). The increasing discrimination, lack of quality healthcare solutions and prevention interventions are increasing the CVD cases and death rates in rural India.

Aligning and comparing theme 2 findings with existing studies

The theme 2 findings showed that lack of physical healthcare access, financial barriers remain a critical barrier for consulting CVD specialists and adopting CVD medications at early stages. Additionally, high transportation costs and long journeys to seek quality healthcare solutions remain a critical challenge for rural CVD patients (Riad et al., 2022). Aligning with the findings, Ahmed et al. (2023) stated that the absence of proper preventive approaches increases the complexities of seeking quality healthcare solutions for the rural Indians, who lack financial strength and education. As an intervention, the research findings suggest implementing new primary healthcare infrastructure in rural areas. However, Gupta et al. (2021) argued that for lower-income states, it is difficult to create new healthcare infrastructure, which remains a critical barrier to seeking quality healthcare solutions for the rural populations.

Additionally, thematic findings reveal that a lack of health literacy about CVD prevention creates a delay in getting medications, which increases the CVD risks among people. It is specifically noticed that aged people of rural India neglect the CVD warning symptoms like chest discomfort, fatigue, and weakness, which increases the complexities in the future. Additionally, the belief that men should be provided early medical care as compared to women remains a complex issue preventing CVD cases in rural India. The increasing death rate of women in India for CVD (330 women died per 100000) indicates the gender disparities (Prabhakaran et al., 2021). Thus, the findings, results, and literature insights stated the same things and indicate the validity and reliability of the thematic findings.

Aligning and comparing theme 3 findings with existing studies

The theme 3 findings reveal that the caste hierarchy and financial condition remain some critical barriers that influence the quality healthcare solution-seeking behaviour of the rural populations of India. Scheduled castes and tribes are facing more complexities in accessing quality healthcare, longer waiting times, and even separate discrimination (Upadhyay, 2024). Along with this, the lack of healthcare infrastructure creates other barriers that influence the quality of healthcare-seeking behaviour of the rural population of India. Long journey and lack of proper healthcare monitoring and preventive solutions hamper the regular health checkups and quality healthcare-seeking behaviour of CVD patients. Along with this, the literature insight reveals that the use of tobacco, alcohol, unhealthy diets, and poor physical activity significantly increases the CVD cases in rural India (Rehman et al., 2022). Overall, the combination of all challenges, such as case problems, infrastructure inefficiencies, lack of physical activity, alcohol and tobacco consumption, increases the CVD cases in rural India. However, the Indian Government has taken initiatives such as “Healthy Life Trajectories Initiative” (HeLTI), which intends to diagnose the rural aged population from 43 to 50 years old and identify CVD cases (Gupta et al., 2021). This program aims to locate the CVD patients and offer the pharmacological treatments without biasness on caste, income level, or other discriminating issues.

Aligning and comparing theme 4 findings with existing studies

The theme 4 findings focus on identifying the healthcare interventions, policy implications in preventing CVD cases, and the death rate in rural India. Findings identified that the national CVD prevention programs, such as NPCDCS, have been implemented, which promote CVD awareness and interventions. It is evident that the recent healthcare policy implications in rural India focus on improving education, socio-economic status, and increasing access to quality healthcare solutions (Kundu et al., 2023). The finding reveals that due to a lack of educational awareness about CVD risk factors such as hypertension, smoking, and dietary requirements, the CVD risks. Further literature highlights the requirements of policy implications for controlling smoking, alcohol consumption, and promoting physical activity, aiming to reduce CVD death rate in Indian rural areas and foster a better life quality.

4. Lining Findings with Research Objectives and Questions

Linking theme 1 findings with the research objective and the research question

The theme 1 findings have generated alignment with the research objective 1, which intends to investigate how socio-economic factors influence the prevalence of CVD in rural India, among those 40 and above. The findings reveal that ageing, educational disadvantages, occupational and environmental stressors are the socio-economic factors influencing the CVD prevalence in rural India. Findings identified that CVD risks are high for the aged rural population, specifically those above 40 years old. Lack of CVD awareness, knowledge, and health system barriers created significant challenges to get quality CVD prevention interventions for the rural Indians. These findings provided the answer to the research question and identified that socio-economic factors like educational disadvantages, occupational barriers, and financial complexities increase the challenges to seek quality CVD interventions in rural India.

Linking theme 2 findings with the research objective and the research question

The findings in theme 4 have aligned with the research objective 2, which seeks to examine the influence of socio-economic factors on the management of CVD in those 40 and above in rural India. Along with the research objective 2, the thematic findings align with the research question and identified that socio-economic disadvantages such as access to quality healthcare services, health literacy, gender disparities availability of preventive care influence CVD prevention. Lack of health literacy reduces the quality of healthcare-seeking behaviour of the rural Indians, leading to early CVD prevention and increasing the death rate.

Linking theme 3 findings with the research objective and the research question

Theme 3 has been generated, aligning with the research objective 3, which intends to investigate disparities in access to and utilisation of CVD services in rural India. The findings reveal that caste and gender disparities significantly influence quality healthcare-seeking behaviour for the rural aged populations. Additionally, financial disparities are also creating major challenges to seeking quality CVD solutions in rural India. This finding also aligns with the research question and identifies that deprivations, including caste disparities, gender and financial disparities, reduce the CVD diagnoses and early prevention rate for the Indian rural populations.

Linking theme 4 findings with the research objective and the research question

Theme 4 has been created in alignment with the research objective 4, which intends to identify and examine the effectiveness of public health interventions for CVD management in rural India and highlight areas for improvement. Aligning with the objective and questioning the findings reveals that policy interventions such as NPCDCS aim to promote better CVD healthcare accessibility, provide CVD awareness among the older adults. Additionally, with the help of policy implications

5. Implications and Future Research Needs

The findings identified the socio-economic deprivations, such as lack of access to quality healthcare solutions, educational CVD awareness, healthcare delay, and discrimination, which affect the healthcare-seeking behaviour for the rural Indian CVD patients. Future research should focus on conducting in-depth analysis to resolve each of these socio-economic deprivations to provide better solutions for CVD prevention and reduce mortality rates. Additionally, for seeking detailed personal information, future studies should conduct a mixed-method data collection, supported by a survey and secondary qualitative methods to promote better decision-making and intervention creation.

6. Strengths and Limitations

The thematic findings critically align with the research objectives and answer the research question effectively, which enhances the findings' validity and reliability. Further, evidence from the literature also strengthens the generalisability of the research findings.

However, the findings identified the interventions such as equity policy implication, educational awareness campaign, and promoting regular monitoring and enhancing accessibility of the quality CVD healthcare solution. Lack of proper evidence of real-life implications and a strategic approach for implications limited the generalisability and applicability of these interventions.

7. Chapter Summary

The discussion chapter discussed the main findings, and aligns with the research objective, question, and existing literature insights. The findings evidence the ongoing socio-economic discrimination for the rural Indian populations and the challenges in seeking quality healthcare solutions for the CVD patients, which can be resolved by policy implications and other reliable interventions. The chapter also gives the strengths, limitation and how interventions can be done to improve research outcomes and delivery of interventions that would clear up cases of CVD in rural India.

Chapter 5: Conclusion

5.1 Introduction

This dissertation studied the effect of deprivation on the treatment and management of cardiovascular disease (CVD) in rural India and its emphasis was on adults/people aged 40 years and above. The purpose of the study was to determine the influence of socio-economic barriers, cultural practices, and structural inequities in determining the prevalence, management, and outcomes of CVD. The study utilised systematic literature review to summarise the contents of twenty peer-reviewed studies and summarised them in four broad themes. These motifs focused on the consequences of ageing, socio-economic deprivation, accessibility of infrastructures and failures of the public health interventions. Using the Health Belief Model (HBM) and the Social Determinants of Health (SDH), the study resulted in a comprehensive knowledge of how deprivation interacts with health systems and individual behaviours in rural India.

5.2 Addressing the Research Question

The research question that would serve as a guiding measure in this dissertation was: How deprivation relates to healthcare provision to CVD patients in rural India, and what socio-economic factors are the predisposing factors to this disease amongst patients aged 40 years and above. The results prove the fact that deprivation is not related only to increased rates of disease but is also one of the main determinants of poor results. Poverty, lack of education and geographic isolation always impeded the diagnosis and adherence to the treatment. In older adults, the barriers overlapped with age-related susceptibility rates of high blood pressure, diabetes, and multimorbidity. It has been established that ischaemic heart disease is especially common among the aged populations in India because of lifestyle factors, insufficient medical screening, and due to the absence of follow-up treatments (Yellapantula et al., 2025). This fact concurs with the current observation which proves that ageing as a factor is not able to account the high burden of CVD in rural India without the inclusion of deprivation.

Systemic neglect of older adults also appears as deprivation. A single, large-scale overview identified that not only does the prevalence of CVD among Indian older adults increase but also access to treatment and continuity of care are poor (Jan et al., 2024). This supports the finding that institutional and policy failures do as much to shape healthcare inequity as do individual health risks. Cohort-based evidence in rural setting is also another key point of view. The combined impact of biological and socio-economic determinants was revealed in a prospective study showing that hypertension, diabetes, and poverty are simultaneous causes of cardiovascular events among rural populations (Birhanu et al., 2024). This is indicative of the observation of this dissertation that deprivation generates complex risks, beyond the individual variables. In addition, at the national level, it is observed that inequalities in the risks of CVD are growing across social and geographic categories. A major survey study has affirmed that smoking, hypertension and diabetes are growing more clustered in low-income and rural families, and wealthier households will enjoy better access to prevention and treatment (Wetzel et al., 2023). This trend illustrates that deprivation is an active determinant, which defines the pattern of cardiovascular health outcomes with time progression.

5.3 Reflection on the Research Approach

Effectiveness of the Approach: The systematic literature review was found to be successful in answering the research question. PRISMA framework facilitated the use of a transparent and reproducible search process, whereas the quality appraisal of CASP strengthened the validity of the chosen studies. The thematic analysis presented by Braun and Clarke, was a structured approach of uncovering common patterns and produce themes that would correspond well to the goals of the research. The identified methodology made sure that the findings did not rely on the single observations but on the combination of evidence provided by various situations. This gave an opportunity to have a balanced perspective of structural barriers as well as behavioural patterns in rural India.

Unexpected Insights: The paper revealed a number of facts that went beyond the original expectations. Women were always low on the agenda of healthcare in the home and this increased mortality rates of CVD. The aspect of cultural dependency on the conventional medicine slowed down the acceptance of biomedical care especially among the elderly. Such occupational exposures as agricultural work and heat stress became important yet frequently under-reported risk factors. Lastly, national interventions like NPCDCS were identified to be highly inadequately followed and unequally applied implying that gaps in governance were as resulting as financial obstacles.

Limitations: The approach, as effective as it was, was constrained. Use of secondary sources implied that we could not include the first-hand patient views. Majority of the studies reviewed were cross sectional and this restricted causal inferences. Limited longitudinal data were available to follow the longitudinal outcome of CVD or the long-term outcomes of interventions. However, the triangulation of the various studies enhanced the validity of the results.

5.4 Findings in Relation to Objectives

Objective 1 was to examine the role of socio-economic determinants in the prevalence of CVD in rural India. Results were that ageing, lack of education, and multimorbidity played a major role in prevalence. One cross-sectional study asserted that ischaemic heart disease was common among the elderly, especially when lifestyle risk was combined with poor health infrastructure (Yellapantula et al., 2025).

Objective 2 was concerned with CVD management in rural adults. The evidence has made it clear that the adherence to treatment was frequently disrupted by financial problems, lack of awareness, and cultural beliefs. An in-depth assessment confirmed that Indian elderly people tend to forgo treatment because of financial reasons and distrust of long-term biomedical drug use (Jan et al., 2024). This is in line with the results of this dissertation that found socio-economic disadvantage to be an important barrier to effective management.

Objective 3 analysed the differences in access and use of healthcare. Their results established that caste and gender inequality, in combination with geographical isolation, limited access to quality healthcare. The results of a prospective cohort in the Rishi Valley revealed that low income coupled with poor infrastructure further increased cardiovascular risk in rural households (Birhanu et al., 2024).

Objective 4 dealt with interventions to public health. It was found that even though national programs are in place, they are not equally applicable in rural situations. Survey studies with the rural poor have shown that the CVD risk gradient is increasing rapidly among the rural poor, which is an indication that interventions are not reducing disparities (Wetzel et al., 2023). This shows why there is a pressing need to make changes based on equity.

5.5 Practical Recommendations

For Policymakers:

Providing Rural Healthcare Infrastructure: Primary healthcare in the rural areas needs to be strengthened by opening more cardiac care units and evenly distributing the cardiologists (Mulure, Hewadmal and Khan, 2024). Such a strategy would decrease the number of traveling, increase the rate of diagnoses, and enable the management of cardiovascular cases in underserved areas in a timely manner.

Policy Reform and Financial Protection: Policies in health care need to be restructured to remove caste and gender discrimination in the provision of services (Monteiro, 2022). This needs to increase rural insurance schemes and subsidise essential CVD drugs to cover low-income groups. In conjunction with these, mass health literacy campaigns must be implemented with resources that are culturally competent and through community health workers.

For Practitioners:

Preventive Screening and Capacity Building: Routine screenings of hypertension and diabetes should be trained to frontline healthcare workers so that cardiovascular risks can be detected earlier. It is possible to strengthen preventive care at the community level in order to decrease the tertiary facilities.

Continuity of Care and patient-Centred Communication: Communication in health care must not violate cultural dependence on traditional systems, but there must be gradual integration of biomedical recommendations. In an effort to promote continuity of care, easy tracking systems of patients should be established in clinics in the rural areas such that follow ups are done on the patients and discontinuation of treatment is minimized.

5.6 Recommendations for Future Research

Longitudinal studies are needed in future to measure the disease trajectories and intervention outcomes with time. Mixed method designs that combine statistical survey with ethnographic investigations might be more useful in understanding patient experience. Strict assessments of national interventions like NPCDCS are required to see how effective they are in the rural setting. Intersectional research must be conducted to investigate the interactions of caste, gender and occupation to define CVD risks. Lastly, studies need to be conducted on how digital health technologies like telemedicine and AI-based diagnostics can eliminate rural-urban disparities.

5.7 Contribution to Knowledge

There are four significant contributions of this dissertation to knowledge. First, it synthesises varying results into a consistent overview that deprivation is the driver of CVD prevalence and outcomes in rural India. Second, it incorporates new research on elderly and rural population, such as recent research. Third, it uses both the HBM and SDH frameworks and provides a more complete picture of the intersection of individual behaviour and structural inequities. Fourth, it brings to the fore neglected determinants including occupational stress and cultural dependence on traditional medicine which are more to be considered in research and policy.

5.8 Closing Statement

The overall studies find that deprivation is not a background, but the primary determinant that influences cardiovascular health in rural India. Biological ageing plays out with poverty, low literacy, caste-based discrimination, and gender inequities to generate systemic disadvantages. These challenges need structural reform to an extent of medical intervention. This dissertation highlights the immediate need of equity-oriented policy and socially sensitive intervention by re-conceptualizing CVD in deprivation terms. Addressing rural CVD does not only concern the issue of enhancing treatment but the issue of the social justice gap in India that is the root cause of health disparities.

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Appendices

Appendix 1: Data Extraction Table

Author	**Study type**	**Research aim**	**Sample used**	**Limitations**	**Relevance to RQ**
Gayathri et al (2023)	Quantitative	Access CVD prevalence and risk factor identification to promote better CVD interventions in Indian rural adults	72250 older adults across India	Cross-section design used limits casualties	Highly relevant to identify perseverance and socio-economic factors for CVD in rural India
Padhi et al (2024)	Quantitative Survey	Analyse the Indian rural CVD epidemic and solutions	28935 Participants	The study lacks effective Interventions for CVD	Relevant to identify deprivation policy implications in rural Indian for CVD prevention
Kundu and Kundu (2022)	Quantitative	Identify CVD risk factors in Indian rural areas	Survey among 1800000 Indians	Fails to reflect local realities	Relevant as it helps to identify geographic disparities and risk factors for CVD in rural India
Das et al (2022)	Quantitative	CVD risk score evaluation	2179 rural adults from	Cross-sectional design, self-	Highly relevant as this study analysed the access to quality care and

		and medications for Rural Indians	India	employed data limits the validity of the result validity	management practices for CVD reduction in rural India
Birhanu et al (2022)	Primary Survey	CVD evidence and Indian rural adults	31,464 individuals	Potential publication bias	This study is relevant as it provides information about CVD prevalence, management, and disparities
Sundarakumar et al (2022)	Quantitative	Link between central obesity and CVD in India	400 participants	Regional Focus limits generalizability	Particularly relevant, as it focuses on obesity as a risk factor for CVD in rural Indians
Ko et al (2023)	Quantitative	Implementation of CVD programs in rural India	2123 Sample	Limited geographical coverage	Highly relevant to find public health interventions for CVD in rural India
Birhanu et al (2024)	Quantitative	Indian CVD mortality estimation and solution	17,266 participants	Lacks potential strategic implementation	Partially relevant as it identified environmental factors influencing CVD for rural adults in India
Meena et al (2022)	Quantitative	Gender difference in CVD mortality	2439 rural adults	More focus on gender, lacks data on socioecono	Relevant, it provides demographic disparities dimensions for CVD

		in India		mic deprivation	
Unnikrishnan et al (2022)	Quantitative	Estimate the health effect of salt substitutes on CVD	100000 adults	Hypothetical projections limit interventions	This study is relevant as it allows for prevention and interventions for CVD
Paul and Singh (2017)	Quantitative	CVD risk tools comparison and prevention for rural Indian adults	120,942 rural people	Limited to a single region	Highly relevant study, it shows tools to predict CVD cases in Indian rural areas
Khan et al (2023)	Quantitative	CVD score and medications in rural India	3454 sample	Limited to a single area of rural India	Particularly relevant, as it provides technological usage in CVD prevention
Hanif et al (2021)	Quantitative	Develop decision support for CVD prevention in rural India	303 participants	Lack of focus on socioeconomic factors	Limited relevance for its high technical focus on resolving CVD
Kundu et al (2023)	Quantitative	ML for predicting CVD cases in India	981 records	Fails to explore social determinants	Limited relevance as a highly technical focus

Singh et al (2024)	Quantitative	CVD risk in newly diagnosed aged groups	6099 records	Clinic-based sample limited generalizability	Relevant as it provides CVD management techniques
Kianoush et al. (2023)	Quantitative survey	Evidence summarisation of CVD cases in the Indian rural aged population	73,396 individuals	Overlaps with other reviews	The study is relevant to provide CVD management and prevention
Marklund et al (2022)	Quantitative	Compare the CVD case in rural vs. urban India	1514 rural Indian adults	Regional data	Relevant as it shows rural-urban disparities in India by CVD prevalence
Rani et al (2021)	Quantitative	10 years of CVD risk estimation in rural India	11029 populations	Limited research results for Indian rural adults	Limited relevance as it shows only predictions
Rajdhan et al (2023)	Quantitative	WHO guidelines for CVD prevention in India	1320 adults	Focus on dementia, along with CVD	Relevant as it provides details about the tools used in CVD prevention in rural India
Ravindranath and Sundaraku	Primary Survey	Discuss the CVD burden in	1073 adults	Lack of quality data	Highly relevant as it shows systematic and contextual CVD prevention strategies

mar (2021)		India			in rural India

Table: Data Extraction Table

(Source: Self-Created)

Appendix 2: CASP Criteria

CASP Criteria	Questions
1. Clear Aim	Does the research contain a quality aim?
2. Appropriate Methodology	Is the methodological selection appropriate?
3. Research Design	Is the research design suitable to address the research aim?
4. Recruitment Strategy	Does the recruitment strategy help to find valid data relevant to the study?
5. Data Collection	Did the research problems get critically addressed by data collection?
6. Reflexivity	Is there a reliable connection between the research context and selected participants?
7. Ethical Consideration	Were ethics maintained during data collection?
8. Data Analysis	Did the data analysis method identify a quality result?
9. Findings	Are the findings justified to address the research objectives and questions?
10. Research Value	Is this research valuable for future studies?

Table: CASP Criteria for data selection

(Source: Self-Created)

Author	**Clear Aim**	**Appropriate Methodology**	**Research Design**	**Recruitment Strategy**	**Data Collection**	**Reflexivity**	**Ethical Consideration**	**Data Analysis**	**Findings**	**Research Value**	**Score (Out of 10)**
Gayathri et al (2023)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	10
Padhi et al (2024)	Yes	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes	7
Kundu and Kundu (2022)	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	8
Das et al (2022)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	10
Birhanu et al (2022)	Yes	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes	7
Sundarakumar et al (2022)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	10
Ko et al (2023)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	10
Birhanu et al (2024)	Yes	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes	7

Meena et al (2022)	Yes	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes	7
Unnikrishnan et al (2022)	Yes	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes	7
Paul and Singh (2017)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	10
Khan et al (2023)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	10
Hanif et al (2021)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	10
Kundu et al (2023)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	10
Singh et al (2024)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	10
Kianoush et al. (2023)	Yes	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes	7
Marklund et al (2022)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	10
Rani et al	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	10

(2021)											
Rajdhan et al (2023)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	10
Ravindranath and Sundarakumar (2021)	Yes	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes	7

Table: Quality Appraisal Table

(Source: Self-created)

Appendix 3: Characteristics of the Included Studies

Study author name	Purpose/objective	Setting/sample	Methodology	Strengths	Weaknesses	Results/outcomes	Conclusion	Data extraction criteria 1	Data extraction criteria 2	Themes
Gayathri et al (2023)	To identify evidence summarisation of CVD cases in the Indian rural aged population	73,396 individuals	Quantitative survey method	Provide CVD management for ageing populations in India	Overlaps with other reviews	Physical inactivity and an unhealthy lifestyle increase CVD risk	Directly assessed the CVD risk factors, multi-morbidity and delayed diagnosis	CVD interventions identified	The causes and solutions of CVD are assessed	Delayed diagnosis, multi-morbidity in increasing CVD rate
Padhi et al (2024)	To identify CVD evidence in Indian rural adults	31,464 individuals	Primary Survey method	Inequalities in CVD among elderly Indians in rural areas	Potential publication bias	Found gender disparities, focus on older populations	Increased CVD cases for women	Quality results relevant to the research topic	Suitable methodology used to find the prevention	Indian elderly populations have higher CVD risk
Kundu and Kundu (2022)	To assess CVD prevalence and risk factor identification to promote better CVD interventions in Indian rural adults	72250 older adults across India	Quantitative method	Identify CVD and associated risk factors, multi-morbidity and rural-urban differences.	Cross-section design used to limit casualties	Notes diagnosis and treatment access disparities for older Indian populations	As compared to the urban population, rural Indian people have limited CVD cases.	Efficient research results	Core interpretation of CVD causes	Rural older people face more difficulties than urban people in India
Das et al (2022)	To access the WHO guidelines for CVD prevention in India	1320 adults	Quantitative method	Provides details about the WHO non-lab-based CVD risk assessment	Focus on dementia, along with CVD	Accessing the guidelines provided by the WHO on CVD	Poor CVD knowledge, lack, poor adherence,	Quality data and findings	Suitable solutions and interventions used	Lack of awareness, traditional medical reliance, and lack of formal education increase the delay of CVD interventions for the older rural population

Birhanu et al (2022)	To access the CVD score and medications in rural India	3454 sample	Quantitative method	It provides gaps in treatment in rural India, and disadvantages	Limited to a single area of rural India	Lack of literacy increases CVD risk among elderly populations	Need to develop healthcare access and medical centres	Quality data accessibility	Reliable research result	There are literacy gaps among the Indian elderly population, increasing CVD risks
Sundarakumar et al (2022)	To compare the CVD case in rural vs. urban India	1514 rural Indian adults	Quantitative method	Shows rural CVD cases as per occupational activity pattern	Regional data	Metabolic diseases increase CVD risk	Rural lifestyle and long hours of physical labour may impact CVD cases in rural India.	Use of interventions to reduce metabolic syndromes	A quality result that promotes a better lifestyle	Metabolic syndrome and occupational lifestyle elements influence CVD risk
Ko et al (2023)	To identify CVD risk factors in Indian rural areas	Survey among 1800000 Indians	Quantitative method	Helps to identify geographic disparities and risk factors for CVD in rural India	Fails to reflect local realities	Links infrastructure and poverty in rural India to increasing CVD cases	Identified geographic disparities in CVD risk factors	An efficient data collection method and performance	Quality findings appraisals	Food insecurity, infrastructure gap, and poverty increase CVD risks in rural India
Birhanu et al (2024)	To find the CVD risk score evaluation and medications for Rural Indians	2179 rural adults from India	Quantitative method	This study analysed the access to quality care and management practices for CVD reduction in rural India.	The cross-sectional design and self-employed data limit the validity of the results.	Addressed CVD treatments and screening gaps linked to socioeconomic disadvantages	Lack of prevention increased CVD cases	Identify the cause of CVD cases in Indian rural areas	Effective prevention results for CVD	Treatment gap, limited medication uptake, poor-dry-patient ratio in rural areas, increasing CVD risk
Meena et al (2022)	To the implementation of CVD programs in rural India	2123 Sample	Quantitative method	Highlight infrastructure gaps, staff shortage, transportation issues in increasing CVD cases	Limited geographical coverage	Identified interventions for CVD in the Indian rural population	Awareness programs and interventions reduce CVD cases	Quality review	Analyse relevant interventions data	NPCDCS programs' effectiveness in resolving staff shortage, transportation issues, and

				in rural indians						staff shortage in rural healthcare settings
Unnikrishnan et al (2022)	To find CVD risk in newly diagnosed age groups	6099 records	Quantitative method	Diagnostic delay identified CVD treatment gaps in rural India	Clinic-based sample limited generalizability	More than 50% of diabetes patient has CVD risk in Indian rural areas	CVD resolution should be a part of diabetes care	Reliable data related to CVD and its solutions	Authentic interventions for CVD	Poor continuity of care after CVD diagnosis among CVD-affected elderly populations in India
Paul and Singh (2017)	To assess the CVD risk tools comparison and prevention for rural Indian adults	2439 population	Quantitative method	It shows tools to predict CVD cases in Indian rural areas	Limited to a single region	Self-reported morbidity patterns influenced by education level and CVD awareness among elderly populations in India	Findings of suitable interventions for CVD	Quality results to access CVD tools for prevention	Relevant to the rural indians	Low health literacy, poor awareness programs, and low income levels affect CVD risks
Khan et al (2023)	To identify the link between central obesity and CVD in India	400 participants	Quantitative method	It focuses on occupation and lifestyle risks in CVD care and outcomes among elderly populations.	Regional Focus limits generalizability	Identified CVD risk factors in India	Risk factors increase CVD cases	Quality findings related to CVD	Efficient methodological interventions	Hypertension, diabetes, lack of awareness programs, delayed diagnosis, and increasing CVD rate in India
Hanif et al (2021)	To analyse the 10 years of CVD risk estimation in rural India	11029 populations	Quantitative method	shows the impact of poverty on CVD risk	Limited research results for	CVD preventive tools and access to quality	WHO-operated CVD prevention	The use of CVD prevention tools has	Suitable methodological use	Poverty is the socioeconomic and cast-based

				among older populations	Indian rural adults	healthcare treatment have been identified	tools are cost-effective	been identified		disparities that are increasing CVD cases in rural areas
Kundu et al (2023)	To identify gender differences in CVD mortality in India	2439 rural adults	Quantitative method	It provides demographic disparity dimensions for CVD	More focus on gender, lacks data on socioeconomic deprivation	Gender and caste differences in rural India affect CVD treatment among older adults in India	Indian women have lower risks for premenopausal death due to CVD	Identified gender disparities for CVD prevention	Quality appraisals and relevant findings	Women are getting fewer diagnoses as compared to men in rural India
Singh et al (2024)	To analyse the Indian rural CVD epidemic and solutions	28935 Participants	Quantitative Survey Method	Identify deprivation policy implications in rural Indian for CVD prevention	The study lacks effective Interventions for CVD	A physically inactive population has a higher CVD risk	CVD cases have increased for the physically inactive population	Reliable solutions	Relevant methodology selection	Physical activity is required for CVD prevention
Kianoush et al. (2023)	To access the Indian CVD mortality estimation and solution	17,266 participants	Quantitative method	It identified available service gaps, a lack of screening and quality treatment in rural areas.	Lacks potential strategic implementation	Among Indians, the risk of CVD is high	Increased complexities for the smokers and patients with diabetes	Quality and relevant article	Proper quality results and CVD interventions	Rural program delivery gaps, poor long-term CVD carer access in rural India, and increasing CVD risk
Marklund et al (2022)	To estimate the health effects of salt substitutes on CVD	100000 adults	Quantitative method	Lack of understanding about CVD risks, low educational level	Hypothetical projections limit interventions	Identified CVD preventions	Use of Potassium-enriched salt preventions to reduce CVD	Identify and implement CVD interventions	Reliable results based on interventions	Educational levels linked with CVD morbidity awareness
Rani et al (2021)	To promote and develop decision	303 participants	Quantitative method	High socio-economic and gender	Lack of focus on	ML algorithms help in CVD prevention	Technological adoption	Policy implications	Quality methodological selection	Income barriers, caste. Class

	support for CVD prevention in rural India			differences are increasing disparities in elderly CVD care	socioeconomic factors		in CVD reduction	for CVD cases	to find the result	and training adherence for CVD prevention
Rajdhan et al (2023)	To use advanced technologies like ML for predicting CVD cases in India	981 records	Quantitative method	Regional inequalities, systemic weakness and monitoring and follow-up.	Fails to explore social determinants	KNM shows over 90% accuracy, and SVM was also effective in CVD prevention	ML is a robust tool for CVD diagnosis	Efficient methodological selection	Wide range of primary data collection	Poor coordination, no structured follow-up, high risk among the adult population
Ravindranath and Sundarakumar (2021)	To discuss the CVD burden in India	1073 adults	Primary Survey method	Systematic and contextual CVD prevention strategies in rural India	Lack of quality data	India is facing increasing CVD cases	National policy integration is required in India	Effective policy implications	Suitable solutions for CVD in India	National policy implications in CVD prevention