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Navigating Gender Disparities on the Management of Chronic Disease: A Narrative Review

V. Nikhila Priya[1], Sarvapriya Pandey[2]

[1,2]Masters Graduate of Public Health, IIPHH, India

ABSTRACT

Chronic diseases globally expose significant gender disparities in management and outcomes. Women often experience delays and inadequate treatment due to biological, psychosocial, and systemic biases, compounded by societal norms hindering self-care and health-seeking behaviours. Similarly, the LGBTQIA+ community faces discrimination and lacks culturally competent healthcare. This review addresses these issues collectively, aiming to uncover root causes and propose strategies for equitable healthcare outcomes. A literature review (2016-2024) using PubMed, Google Scholar, and Wiley Online identified peer-reviewed studies on gender, health determinants, and chronic diseases, focusing on socioeconomic, biological, and psychological factors. Socio-ecological models and culturally sensitive healthcare strategies are crucial for enhancing treatment adherence and reducing gender bias. Community-level interventions and policy changes are essential for equitable healthcare access. Integrating gender-inclusive practices into medical education is pivotal to achieving global health goals by 2030.

KEYWORDS: Gender disparity, Chronic disease management, Treatment adherence, Self-care Management LGBTQIA+, Health disparities, Inclusive healthcare, women Health, SDG 3 (Good Health and Well-being), SDG 5 (Gender Equality), SDG 10 (Reduced Inequalities).

INTRODUCTION

The world is undergoing a rapid epidemiological transition, marked by an increase in the prevalence of chronic diseases. This shift presents an indomitable challenge to global health systems and threatens to overwhelm global resources. The management of chronic diseases is profoundly influenced by a range of contextual, biological, socio-economic, and political determinants. These factors contribute to disparities in healthcare access, quality of care, and health outcomes across different populations. Over the past 10 to 20 years, there has been a growing body of research examining the connections between sex and health, particularly focusing on gender differences in healthcare access, disease vulnerability, and the impact on disease conditions McKay et al. (2022);Venditte et al. (2023, 1087) and Carrero et al. (2017, 296-308) . Ideally, gender considerations should be incorporated into the development and implementation of biomedical research and health policies. Recognizing that gender is a social construct, much of the gender analysis in health has been undertaken by social scientists. These researchers have emphasized that biological differences alone cannot fully explain health behaviours. Key social determinants influencing health outcomes include sex, socioeconomic status, sociocultural factors, and political factors, among others Howren and Gonzalez (2016); Hyvert et al. (2023) and Bagherzadeh et al. (2024). The differences

are influenced by societal norms, expectations, and roles assigned to individuals based on their gender identity.

Differences in access to resources, status and well-being, which usually favour one gender over the other and are often institutionalised through the law, justice and social norms is termed gender disparity (EEGE,2020). Gender disparities significantly influence the management of chronic disease care (**Reference Fig 1:** Determinants of gender disparities global context (specially women and LGBTQ+). These disparities create varied challenges and outcomes for individuals of different genders in chronic disease management. These gender disparities are pervasive, collectively affecting overall health outcomes.

This narrative review reflects on health disparities where we can see men and women often face distinct challenges in accessing healthcare services, adhering to treatment regimens, and adopting self-management behaviours. Moreover, LGBTQIA+ individuals may encounter additional barriers related to healthcare discrimination, access to affirming care, and unique health needs that are often overlooked. This review has provided a conceptual framework which addresses multiple stressors and the strategies to tackle gender disparity in chronic disease management which will aid the global world to progress towards achieving the SDGs in an integrated way.

Gender and the Link to Chronic Disease (Reference in Fig 2: Conceptual framework)

Gender disparities in chronic diseases are significant and multifaceted, influenced by biological, social, and environmental factors. Understanding these differences is crucial for developing targeted strategies to mitigate health inequalities.

Gender Differences in Chronic Disease Epidemiology and Presentation

Existing research has highlighted various gender-specific differences in the epidemiology and clinical presentation of chronic diseases. For example, studies have shown that women are more likely to experience atypical symptoms during a heart attack, such as back pain, dizziness, or nausea, rather than the classic chest pain experienced by men (Temkin et al., 2023). Similarly, women with inflammatory bowel disease (IBD) may present with different symptoms and disease severities compared to their male counterparts (Greuter et al., 2020).

Also, cardiovascular diseases may manifest differently in men and women due to variations in hormonal profiles and physiological responses. Men generally have a higher prevalence of cardiovascular diseases (CVDs) at younger ages, attributed in part to hormonal and physiological differences affecting heart health (Mauvais-Jarvis, 2020, Greuter et al., 2020 and McKay et al. (2022 and Siddiqui, etal,2024). Women, on the other hand, face unique challenges such as higher rates of autoimmune disorders like lupus and multiple sclerosis, conditions influenced by genetic predispositions and hormonal fluctuations. Similarly, chronic kidney disease (CKD) presents differently in men and women, with hormonal factors like oestrogen potentially offering some protection against CKD progression in women (Carrero, etal, 2017). These gender differences in disease presentation can lead to delayed diagnoses and suboptimal management, as healthcare providers may not recognize the atypical symptoms as indicative of a serious underlying condition (Venditti, etal 2024, Azizi, etal, 2024). Furthermore, sociocultural factors, such as gender-based biases in healthcare settings, can contribute to the dismissal or minimization of symptoms, further intensifying these disparities.

Social factors:

Socio-cultural disparities further exacerbate the challenges in managing chronic diseases. Access to healthcare, socio-economic status, cultural norms, and health behaviours differs between men and women, which impacts their vulnerability to chronic conditions. Societal expectations and roles assigned to different genders influence health behaviours and access to chronic disease management. For example, women may prioritize family health over their own, delaying or neglecting their chronic disease care. Traditional beliefs and practices perpetuate gender inequalities in managing chronic diseases, such as the stigmatization of seeking care or adhering to prescribed treatments (Suresh, etal, 2019, Mauvais Jarvis etal, 2020 and Venditti etal, 2023).

Educational disparities further complicate chronic disease management. Differences in access to quality education affect health literacy, which is essential for managing chronic diseases effectively. Women and gender minorities with limited access to quality education may struggle to understand and adhere to complex treatment regimens. Girls and transgender may experience lower enrolment rates or higher dropout rates compared to their male peers in certain regions. These cultural norms and systemic biases contribute to unequal access to educational opportunities and resources, ultimately affecting long-term health management. Differences in access to healthcare services, including preventive care and treatments, significantly impact the management of chronic diseases (WHO, 2020, NIMH, 2020, Siddique, etal, 2024).

Women face limited access to healthcare and they often experience higher exposure to NCD risk factors due to gender norms and other intersecting determinants like poverty, education or even marketing. Research indicates that access to Chronic Kidney Disease (CKD) care varies by region, often showing significant gender disparities. In many low- and middle-income countries, women have less access to care compared to men (Global Health Action "Economic Barriers to Women's Health, 2020").

Socioeconomic status, cultural norms, and healthcare infrastructure play a crucial role in these disparities, as women often face more barriers to accessing healthcare, including lower socioeconomic status and cultural biases favouring men's health. Men are more likely to receive dialysis and kidney transplants, a disparity influenced by both biological factors and gender biases in healthcare delivery (Carrero etal, 2017, Mauvais Jarvis etal, 2020).

Empirical studies demonstrate that children who witness domestic violence often show similar emotional and behavioural issues as those who have been sexually or physically abused, such as poor school performance and physical health problems (Bagherzadeh, etal,2024 and Siddique etal, 2024).These children are also more likely to become abusive adults. This perpetuates a vicious cycle of poverty, gender violence, poor health, and limited economic opportunities across generations. Gender norms and resulting inequalities, compounded by various intersecting factors, place women and girls at heightened risk of non-communicable diseases (NCDs), particularly in low- and middle-income countries (LMICs). Similarly, transgender individuals often face increased vulnerability to mental health issues, cardiovascular diseases, and other chronic condition (Scheim, etal, 2024 and Aggarwal, et al, 2024). These disparities are driven by systemic issues including healthcare discrimination, limited access to appropriate medical services, and broader social determinants such as unstable housing and employment.

Economic factors:

Income disparity between genders impacts individuals' ability to afford essential elements of chronic disease management, such as drugs, treatments, and regular healthcare visits. Additionally, gender-based

occupational segregation often results in women being overrepresented in lower-paying sectors. This segregation limits their access to employer-sponsored health insurance and other health benefits crucial for managing chronic diseases. These challenges are intensified for transgender individuals, who face heightened risks of chronic conditions due to limited healthcare access and disparities in insurance coverage. (Sudharsanan etal, 2019, Hughes, Lauren, et al. 2021 and Siddique etal, 2024).

Environmental factors:

Environmental influences, including exposure to pollutants, toxins, and occupational hazards, contribute to gender-specific health risks. In urban settings, air pollution has been linked to respiratory diseases such as asthma and chronic obstructive pulmonary disease (COPD), affecting men and women differently. For instance, a study by WHO found that women exposed to high levels of indoor air pollution from cooking with solid fuels were at an increased risk of respiratory illnesses compared to men (WHO, 2019).

Not only this, variations in gender (sociocultural constructs) and sex (biological factors) can influence the occupational health and safety of men and women differently. Firstly, men and women generally exhibit certain biological differences, such as body size and shape, muscle anatomy and function, metabolism of toxic compounds, hormones, and immunological responses. Women often face reproductive hazards from workplace chemicals and physical strain leading to musculoskeletal disorders like carpal tunnel syndrome and lower back pain. They also endure psychosocial stress from job demands and caregiving responsibilities, alongside a heightened risk of workplace violence.

Research has shown that men are typically exposed to noise, vibration, radiation, physically demanding tasks, solar radiation, falls, biomechanical risks, chemical hazards, and blood contamination. Women, on the other hand, are more often exposed to wet work, bullying, discrimination, work stress, and biological agents. Within the same job roles, men face more physical hazards, except in healthcare settings where women experience prolonged standing. Women are more likely to encounter harassment, while men report higher work stress and greater exposure to hazardous chemicals (Biswas etal, 2021). Meanwhile, transgender individuals encounter discrimination, challenges accessing gender-affirming healthcare, and safety concerns related to workplace facilities that may not align with their gender identity (Puckett etal, 2018). These disparities underscore the need for inclusive workplace policies and healthcare practices that prioritize the health and safety of all employees, regardless of gender or gender identity. In the workplace, women and transgender individuals often encounter barriers to career advancement, which can limit their access to health insurance and employer-provided health benefits essential for managing chronic diseases (Hughes, Lauren etal, 2021)**.** Discrimination and lack of inclusive policies hinder professional growth and job opportunities, impacting their ability to afford and access chronic disease care. In healthcare settings, both women and transgender individuals may experience delays in diagnosis or treatment due to gender bias in medical research and healthcare provider practices.

Cultural and Behavioural Factors:

Cultural norms and gender roles influence health behaviours and disease management strategies. In rural contexts, traditional gender roles may limit women's autonomy in healthcare decision-making and access to reproductive health services. Conversely, cultural beliefs about masculinity in urban areas can deter men from seeking mental health support, contributing to higher rates of undiagnosed depression and substance abuse disorders (NIMH, 2020). Studies have highlighted that in many developing countries, there is a positive link between mothers' education, household autonomy, and their children's nutritional

status. In many developing countries like Zimbabwe, women receive nutritional education but often lack access to nutritious food due to men controlling production and purchasing decisions. Engaging both genders is crucial for improving food choices. Research in rural Mexico found no nutritional differences between girls and boys in infancy or preschool, but school-going girls consumed less energy than boys. This was explained by the fact that girls are engaged in less physical activity as a result of culturally prescribed sex roles rather than by sex bias in food allocation.

For example, in rural Haiti, educating men on nutrition, health, and childcare had positive community-wide effects. In developed countries, gender influences eating disorders like anorexia nervosa and bulimia nervosa, driven by biological, psychological, and socio-cultural factors such as societal body ideals. Adolescents often consume fewer fruits and vegetables due to body image concerns. Dieting and bingeing behaviours vary among different groups, with higher rates observed among heterosexuals.

Healthcare Access and Utilisation:

Women and gender minorities often face barriers to accessing necessary care due to cost, availability, and discriminatory practices within healthcare settings. For instance, women experience chronic conditions like autoimmune diseases differently than men, affecting their management strategies and outcomes (Greuter etal, 2020).

In rural areas, the limited availability of healthcare facilities and transportation challenges hinder timely diagnosis and treatment. Conversely, in urban settings, disparities in healthcare quality and insurance coverage affect treatment outcomes for chronic conditions such as diabetes and hypertension. A study published in JAMA highlighted that urban women from marginalised communities had higher rates of uncontrolled diabetes due to inadequate access to specialised care (JAMA, 2021). Additionally, in developing countries, men often use formal health services, while women self-treat or use alternative therapies due to their domestic roles and limited clinic hours. Traditional healers are more accessible and offer flexible payment options and understandable explanations. Women face inferior treatment and blame at health services, discouraging them from seeking care. This issue also exists in industrialized countries, but women there have more options for addressing it. Women often experience delayed or suboptimal treatment due to a combination of biological, psychological, and systemic factors, with gender bias in clinical decision-making playing a significant role. So, social vulnerabilities exacerbate gender disparities in chronic disease management (JAMA, 2021 and Restar etal, 2023)

Research indicates that transgender individuals often experience higher rates of mental health disorders, substance use, and HIV/AIDS compared to cisgender populations, underscoring the urgent need for inclusive healthcare policies and practices. Studies have demonstrated that transphobia in healthcare settings leads to negative interactions, reluctance to seek care, and poorer health outcomes. Studies have found that the level of internalized homo-phobia and stigma of self-identified lesbians was linked to not disclosing their sexual orientation to health care providers. Research focusing exclusively on transgender men revealed that they delayed their medication use and experienced verbal and physical violence during medical examinations. Transgender individuals (both men and women) who utilized hormone therapy or underwent gender reassignment surgery reported higher levels of discrimination compared to those who did not pursue these medical options.

A study conducted with a transgender population found that discrimination was most frequently encountered in healthcare settings, particularly from hospital staff and doctors. Disclosure of identities in healthcare settings is restrained due to inherent stigmatization and prejudice, particularly among sexual

minorities. Discrimination in social and work environments adds to chronic stress. Studies have also found the link between substance use and coping with stigmatization in transgender men.

Addressing these disparities requires healthcare systems to implement training programs for providers, ensure respectful and affirming care environments, and advocate for policies that protect the rights of transgender individuals to equitable healthcare access. The variances in health outcomes and disease prevalence, influenced by gender-specific biological factors, healthcare utilization patterns, and social determinants of health, necessitate tailored management strategies for chronic diseases (Reisner etal, 2016, Streed etal, 2021 and Restar etal, 2023).

Unhealthy industries targeting women:

Certain industries target women to sell harmful products. The baby food industry aggressively markets formula milk as a necessary alternative to breastfeeding, despite breastfeeding's numerous health benefits. Despite minimal increases in global breastfeeding rates over the past two decades, formula milk sales have more than doubled.

The tobacco and alcohol industries also target women. After reducing the consumption gap in higher-income countries, Big Tobacco now focuses on girls and young women in low- and middle-income countries. As a result, girls in many countries are recording higher tobacco consumption levels than both adult women and boys (NCD Alliance).

Political disparities:

In politics, women and transgender individuals are often underrepresented in legislative bodies and leadership roles, limiting their ability to advocate for policies that address gender-specific needs in chronic disease management. This lack of representation results in insufficient funding and support for research and services tailored to their needs. Gender disparities in political representation can lead to a lack of advocacy for policies addressing chronic disease management needs specific to women and gender minorities. Inadequate political participation and engagement can result in insufficient funding and support for chronic disease research and services that consider gender-specific needs.

This lack of representation in political decision-making processes can hinder the development and implementation of effective chronic disease management policies. Differences in legal rights and protections can impact access to chronic disease care. For example, gender-based legal disparities in property ownership can affect women’s financial stability and their ability to afford long-term disease management. Legal discrimination leads to unequal treatment based on gender, resulting in disparities in opportunities, resources, and outcomes in chronic disease management.

Overall, the intersection of these determinants creates a complex landscape of inequities in chronic disease management. Addressing these disparities requires a multifaceted approach that considers the socio-economic, political, and gender contexts of each population. Only through targeted efforts can we ensure equitable access to chronic disease care and improve health outcomes for all individuals, regardless of gender.

Role of gender in self-management and treatment adherence in chronic care:

Gender differences profoundly influence how individuals manage chronic diseases and engage in self-care practices, reflecting broader societal norms and expectations associated with gender roles. These norms

dictate behaviours related to health-seeking, treatment adherence, and self-management strategies, which can significantly impact health outcomes.

Self-management behaviours, essential for effective chronic disease management, also demonstrate gender-specific variations. These behaviours are influenced by individual health beliefs, the availability of social support networks, and caregiving responsibilities. Transgender individuals confront distinct challenges in accessing healthcare that align with their gender identity. They frequently encounter discrimination within healthcare settings, leading to delayed diagnoses and poorer health outcomes. Discrimination, lack of provider knowledge, and limited availability of gender-affirming care are pervasive issues that hinder their ability to manage chronic conditions effectively (Howren etal, 2016, Gonzales etal, 2017 and Puckett etal, 2018).

Similarly, studies demonstrate that women may face pressures related to caregiving responsibilities, influencing their ability to prioritise their own health needs amidst familial or professional demands. Also, women from disadvantaged backgrounds face greater barriers to healthcare access and treatment adherence. There are studies which revealed that intimate partner violence (IPV) significantly impacts treatment adherence among women, further exacerbating health disparities and resulting in adverse health outcomes. Intimate partner violence (IPV) has been demonstrated to adversely impact women's physical health outcomes. These effects include exacerbating menopausal symptoms, increasing the risk of diabetes, sexually transmitted infections (STIs), and engaging in risky behaviors such as substance abuse. (Stubbs etal, 2022). Thus, it has highlighted that both biological and sociocultural factors influence disease progression and treatment responses.

Despite higher adherence to preventive health measures among women, men encounter barriers related to societal norms surrounding masculinity. Men are often socialised to prioritise strength and independence, which may discourage them from seeking regular healthcare check-ups or adhering to prescribed treatment plans. These norms negatively impact men's willingness to seek medical help and adhere to treatment regimens. Consequently, men exhibit lower adherence rates and less proactive health behaviours, as societal expectations often discourage healthcare utilisation and self-care practices (Howren etal, 2016 Johnson etal, 2020 and Venditti etal, 2023).

Addressing these disparities necessitates a comprehensive understanding of gender dynamics and the implementation of gender-sensitive and inclusive healthcare practices. For women, it is crucial to address social determinants of health that impede access to healthcare and adherence to treatment plans *(Fig.1,2 and 3)*. For men, enhancing health literacy and encouraging proactive health behaviours can significantly improve chronic disease management. For transgender and non-binary individuals, the provision of inclusive and affirming care is vital for improving health outcomes. These gendered expectations can create barriers to effective chronic disease management, highlighting the importance of gender-sensitive approaches in healthcare delivery.

In addition, socioeconomic status (SES) plays a critical role in shaping gender disparities in chronic disease management. SES disparities affect access to healthcare resources, affordability of drugs and opportunities for preventive care, disproportionately impacting women and transgender individuals from marginalised communities. Additionally, in urban areas, women face higher rates of mental health problems such as depression and anxiety due to stressors related to career expectations, caregiving responsibilities and social pressures. A study conducted in an urban setting found that women in high-stress jobs were more likely to develop hypertension and coronary heart disease compared to men (Johnson et al., 2020).

Intersectionality and Policy Implications:

Intersectionality, which considers how multiple identities (such as gender, race, and socioeconomic status) intersect to shape health outcomes, underscores the complexity of chronic disease disparities. Effective policy interventions must address these intersecting factors to achieve equitable health outcomes for all populations. This approach provides a more nuanced understanding of health disparities among marginalized populations (Homan etal, 2021). The WHO advocates for gender-responsive policies that integrate intersectional approaches to address health disparities in both urban and rural contexts. Economic restructuring policies are increasingly affecting the poor's access to health services, especially poor women and those in female-headed households, due to their lower socioeconomic status. Health-sector reforms focus on increasing private financing, decentralizing services, and improving private service delivery. A key concern is whether these reforms will shift costs from the paid economy to the unpaid economy, which is largely managed by women (WHO, 2020).

DISCUSSION

The review revealed notable gender differences in the management and outcomes of chronic diseases. These differences are influenced by a variety of factors, including biological, psychosocial, and systemic elements. This review underscores the critical need to distinguish and evaluate the intertwined nature of sex and gender in health research and clinical practice. While biological sex differences are well-documented, understanding how gender intersects with socio-economic status, age, ethnicity, and race is paramount for comprehensive health assessments. The social distribution of gender roles within communities and institutions significantly impacts health behaviours, healthcare access, and outcomes independent of biological sex. Gender constructs provide valuable insights into health-related behaviours, access to healthcare, usage patterns, and outcomes, underscoring the importance of gender-sensitive approaches in healthcare delivery and research.

Disease specific disparities:

1. Chronic Lung Diseases Management

Chronic lung diseases are the third leading cause of death worldwide and are increasing in prevalence over time. It has key sex- and gender-based differences which are critical to consider and incorporate into clinical and research approaches.

A short review article by Zysman et.al, discussed the increasing prevalence of COPD in women, often experiencing more severe symptoms and higher rates of exacerbations despite lower smoking rates compared to men. Psychological factors like anxiety and depression, more prevalent in women with COPD, significantly impact disease management and quality of life. Therefore, a gender-specific approach in COPD management is essential for improving outcomes for female patients. The European Respiratory Society review highlights the underdiagnoses of chronic obstructive pulmonary disease (COPD) in women, noting diagnostic biases. It reveals that women often experience more severe symptoms and a lower quality of life than men. The review also considers biological differences, such as the impact of sex hormones, as contributing factors. Similarly, in their study, Somayaji and Chalmers examine the influence of sex and gender on chronic lung diseases. They point out that men and women have different levels of susceptibility, disease progression, and outcomes for conditions like asthma, chronic obstructive pulmonary disease (COPD), and bronchiectasis. The authors explain that these disparities are due to biological differences, such as hormonal effects and immune responses, as well as gender-specific factors

like occupational hazards and smoking habits. They advocate for a more nuanced understanding of how sex and gender impact chronic lung disease to improve diagnosis, treatment, and management strategies, ultimately enhancing patient care and outcomes.

2. Hypertension/CVD Management

Gender is a multidimensional concept that incorporates identity (i.e. an inner sense of masculinity, femininity and gender non-conforming), role (i.e. societal and environmental expectations), relations (i.e., interpersonal interactions and dynamics), and institutionalized gender (i.e., distribution of power in political, educational, social institutions in society). Gender may significantly influence health-related behaviors and interact with CV risk factors (Connelly etal, 2021).The European Heart Journal review identifies significant gaps in understanding how biological sex and sociocultural gender dimensions contribute to ischemic heart disease (IHD) and heart failure outcomes. While sex-based genetic and hormonal mechanisms are increasingly understood, the interplay with gender factors remains unclear. Studies like GENESIS-PRAXY, which implement gender scores, reveal strong associations between gender, CVD risk factors, and clinical outcomes, underscoring the need for nuanced research and personalized preventive strategies. Additionally, research indicates that cisgender women typically exhibit higher plasma HDL levels and lower plasma VLDL and LDL levels compared to cisgender men. These sex-related differences are absent in prepubertal children, and notably, Trans women (assigned male at birth) undergoing cross-sex hormone therapy experience a significant increase in HDL levels. This underscores the regulatory role of sex hormones, rather than gender, in lipid metabolism in vivo. Carl et al. highlight the excess cardiovascular morbidity and mortality among transgender and gender-diverse individuals, is influenced by psychosocial stressors and structural discrimination. Streed et al. highlight the specific needs of transgender and gender diverse individuals, urging healthcare providers to adopt inclusive practices to address cardiovascular risks effectively. Meanwhile, Connelly et al. explore how biological, social, and behavioral factors contribute to different disease patterns and outcomes between men and women. They stress the broader implications of gender in cardiovascular disease research and clinical care, advocating for tailored approaches that account for diverse biological and social factors to enhance health outcomes across genders. Study by Regitz-Zagrosek and Gebhard emphasize the importance of integrating sex and gender considerations into clinical practice and research to improve diagnostic accuracy, treatment efficacy, and overall cardiovascular health outcomes for all individuals. Their work underscores the necessity of personalized and gender-specific approaches in addressing cardiovascular health disparities. The American Heart Association calls for comprehensive cardiovascular care and research tailored to this population, emphasizing resilience-promoting strategies.

Cancer Management

Vera and colleagues delve into the complexities of sex differences in cancer, emphasizing the need for personalized approaches in diagnosis, treatment, and prognosis. Their study underscores the varied biological and socio-cultural factors influencing cancer outcomes between sexes. Recognizing these differences allows for optimized care strategies and improved patient outcomes. Incidence and survival rates for various cancers differ by sex and age, influenced by behavioural, environmental, and biological factors. For instance, males generally have higher incidence and poorer survival rates for many cancers, partly due to higher tobacco use and exposure to oncogenic agents. The review by Leone et al. (2024) explores the potential cancer risks associated with gender-affirming hormone therapy (GAHT) for

transgender and gender-diverse individuals. It highlights the need for tailored cancer screening and ongoing monitoring to address hormone-sensitive cancer risks in this population.

Diabetes Management

Diabetes stands as a critical global health challenge of the 21st century, ranking as the seventh leading cause of death worldwide in 2020. It is more prevalent in men, yet women are typically diagnosed at a younger age. Gender disparities in social structures contribute to variations in lifestyle modifications and self-care behaviours among those with type 2 diabetes. Women often encounter greater obstacles than men in accessing diabetes care due to personal, socio-cultural, economic, psychological, and geographic barriers. Research indicates that women with diabetes perceive more barriers to physical activity (PA) and engage in less PA compared to men. Factors such as hypoglycaemic risk and weather conditions are identified as significant barriers to PA for both genders, with women reporting higher barriers.

Studies also underscore significant disparities between genders in the prevalence and severity of diabetes-related complications. It highlights that women with type 2 diabetes tend to experience more severe complications compared to men, which can be attributed to biological differences, socio-economic factors, and disparities in healthcare access (Mokhtarpour et al. (2024). The study emphasizes the need for gender-sensitive approaches in diabetes management to address these disparities effectively, advocating for tailored interventions that account for gender-specific risk factors and healthcare needs.

HIV Treatment Outcomes

HIV/AIDS remains a leading cause of death worldwide, particularly in low- and middle-income countries. Studies indicate disparity stems from socio-economic barriers, healthcare access issues, and gender biases. The study by Sia et al. explores the relationship between gender inequality and HIV incidence in Sub-Saharan Africa. It argues that gender disparities significantly impact the spread of HIV in the region. The authors analyse data across various countries to highlight how unequal gender norms and practices contribute to higher HIV rates among women and girls. Key factors identified include limited access to education, economic dependency, and social norms that diminish women's negotiating power in sexual relationships. The study by Menza et al. (2021) examines how social determinants of health impact care outcomes for individuals with HIV in the United States. It identifies socioeconomic status, access to healthcare, housing stability, and social support as key factors influencing health outcomes and treatment adherence among HIV-positive individuals. Addressing these social factors alongside medical care is crucial for improving overall health and quality of life for people living with HIV. A meta-analysis in the U.S. shows HIV prevalence rates of 14.1% among Transwomen and 3.2% among Transmen. Transgender individuals also experience a high burden of HIV and face substantial barriers to healthcare. Comprehensive health practices and targeted interventions are necessary to address these disparities and improve HIV prevention and treatment in transgender populations.

Research gap due to biological influences

Gender significantly impacts health, yet there are substantial gaps in the evidence for preventing, diagnosing, and treating chronic diseases in women. The presentation, prevalence, and long-term effects of chronic conditions and multimorbidity in women differ from those in men. A clinical framework was established to assess the NIH's research investment related to chronic conditions in women. It was found that NIH research has not adequately addressed the burden of chronic conditions in women. There is

potential to develop clinical research questions and endpoints focused on women, create clinical trials with expanded eligibility criteria, and use data science to understand the effects of multiple morbidities on women's health. Aligning NIH research priorities to address the specific needs of women with chronic diseases is crucial for improving women's health from a life course perspective.

The assumption that women's health is mainly linked to reproductive health has limited research on sex-specific conditions beyond reproduction. Consequently, sex differences in conditions like cardiovascular, metabolic, and neurologic diseases affecting women have been underexplored. Evidence shows significant sex differences influence many disease courses. Chronic disease risk in women rises with age and accelerates post-menopause due to declining reproductive hormones, yet the impact of these hormonal transitions on chronic conditions is poorly understood. The assumption that women's health is primarily linked to reproductive health has limited research on sex-specific conditions beyond reproduction. Consequently, conditions like cardiovascular and neurologic diseases affecting women are underexplored. Chronic disease risk in women increases with age and accelerates post-menopause due to hormonal decline, yet this impact is poorly understood.

Gender differences in patient-provider interactions can lead to women's symptoms being dismissed, causing diagnostic delays in diseases like cancer and cardiovascular disease. Women's symptoms are often labelled "atypical," contributing to these delays. Post-diagnosis, women may face delays in referrals or receive less frequent care, impacting outcomes.

Some chronic conditions, like HIV and Post traumatic stress disorder (PTSD), are more frequently studied in men, despite also affecting women. Conditions such as urinary incontinence, impacting nearly half of older women, are infrequently included in women's health research. Bhupinder Singh reviewed transgender healthcare, addressing the prevention, diagnosis, and treatment of physical and mental illnesses, along with sex reassignment procedures. The review covers gender variation, health risks, particularly related to violence and mental health, and global healthcare access for transgender people. Despite policy changes, barriers to transition-related care persist due to fear of discrimination. Ensuring meaningful access to such care is crucial. In India, legislation protects transgender individuals' rights and welfare, prohibiting discrimination in education, employment, and healthcare, aiming to improve their quality of life.

Socio-cultural disparities:

Stigma surrounding menstrual disorders and other high-burden female genital tract diseases contributes to inadequate treatment and limited research investment, undermining SDG 3: Good Health and Well-being. Women constitute nearly 80% of the population affected by autoimmune diseases and experience disproportionately high morbidity from these conditions. Additionally, disorders such as depression are disproportionately high among women due to hormonal fluctuations and social factors, including high rates of intimate partner violence.

Further, Kcomt et.al discussed the various barriers to healthcare faced by transgender individuals, including discrimination, lack of provider knowledge, and systemic biases. They propose strategies such as increasing provider education on transgender health issues, implementing anti-discrimination policies, and creating inclusive healthcare environments. Socio-cultural barriers critically impact the treatment of chronic diseases in both developing countries and LMICs. Cultural norms and gender roles often dictate women's health-seeking behaviors and access to healthcare. Women in these regions are less likely to seek

treatment due to societal expectations prioritizing family care over personal health (Sudharsanan et al., 2019).

Anqi Wang's 2022 research at Drexel University examines the interconnectedness of LGB (Lesbian, Gay, and Bisexual) identity, minority stress, and chronic inflammatory diseases. Wang explores how stressors unique to LGB individuals, such as discrimination and the need to conceal sexual orientation, contribute to chronic inflammatory conditions. Through a review of existing literature, Wang aims to clarify the complex mechanisms through which minority stress impacts health outcomes, focusing on conditions like cardiovascular disease and autoimmune disorders. Transgender individuals face additional barriers, including widespread stigma and discrimination within healthcare settings, deterring them from seeking medical care and leading to poor health outcomes.

Overcoming these barriers is essential for advancing health by adopting strategies which align with SDG 3: Good health and wellbeing, SDG 5: Gender equality, SDG 10: Reduced Inequalities and SDG 16: Peace, Justice, and Strong Institutions, ensuring that marginalized communities receive equitable care.

Self-Care Management of NCDs: Challenges in Urban and Rural Contexts

Self-management of non-communicable diseases (NCDs) poses unique challenges for women and transgender people in both urban and rural settings. Despite improved access to health facilities in urban areas, women often face time pressures due to work and family responsibilities, limiting their ability to maintain good self-care practices. For transgender people, discrimination and stigma in urban healthcare systems can delay diagnosis and treatment and worsen their condition. Conversely, rural areas face additional barriers, such as limited healthcare infrastructure, impacting the availability and continuity of healthcare.

Women in rural areas may lack access to educational resources critical to effective self-management of NCDs, and transgender people often face complex challenges due to social stigma and lack of trained health care providers.

Self-management in South Asian contexts is influenced by a complex interaction of structural and intermediary social determinants. To enhance self-management in these areas, comprehensive, multi-faceted approaches are needed. Important focus areas include empowering and educating both patients and the broader community, creating and implementing tailored behavioural interventions, and increasing support for self-management within healthcare systems (*Fig-3)*. Addressing non-communicable diseases (NCDs) requires a comprehensive strategy, with self-management as a critical component. This involves activities such as regular exercise, dietary regulation, drug adherence, risk reduction, and effective coping strategies, often supported by healthcare providers. Overcoming the limitations of an under-resourced and overburdened health system necessitates a paradigm shift. To improve self-management within a community, it is essential to have context-specific knowledge.

This is particularly relevant for South Asian settings and populations, characterized by inefficient and poorly resourced health systems, deep-rooted socio-cultural practices and traditions, as well as culturally ingrained beliefs and practices around health. Existing evidence shows that self-management of NCDs in South Asian and wider LMIC populations is sub-optimal. The association between self-management and treatment complexity, defined as the use of multiple medications or combination treatment, was inconclusive—better self-management was observed in individuals with hypertension, while inverse associations were observed in individuals with diabetes.

Smoking was identified as a factor associated with poorer self-management in three out of four studies, the exception being a lower-quality study focusing on asthmatic individuals. Other less commonly observed correlations included a lower BMI and a positive family history of illness, which were linked to better self-management outcomes. Socioeconomic status significantly impacted outcomes, while intermediary factors such as psychosocial aspects and healthcare system variables received comparatively less focus. Moreover, there remains a substantial lack of data on broader socioeconomic and political factors—such as policies, governance, cultural values, and societal norms—that likely exhibit consistency across diverse geographic regions.

Improving self-care management for transgender individuals requires targeted interventions that address both structural and socio-cultural barriers. These include increasing healthcare accessibility, providing comprehensive education on disease management, and fostering an inclusive environment. Such measures are essential for supporting the health and well-being of transgender individuals across diverse geographic locations. Additionally, empirical studies that examine the role of geography and gender especially in the case of understanding stigma toward people with mental health disorders will result in improved treatment outcomes due to increased and focused educational efforts. Addressing these gaps requires targeted interventions such as improving access to health care, providing comprehensive disease management education, and creating inclusive health care environments that support both women and transgender people across geographic regions.

Treatment adherence in case of Chronic Diseases in Global Context:

In developing countries, the treatment of chronic diseases for women and transgender individuals is fraught with numerous challenges. The healthcare infrastructure in many developing nations is often under-resourced and overburdened, making it difficult to provide comprehensive care for chronic conditions. Women, in particular, face significant barriers due to gender inequality and limited access to healthcare services. For instance, a study by Venditti .et.al highlighted that women in developing countries often have limited access to preventive care and face significant delays in receiving treatment for chronic diseases such as cardiovascular diseases and diabetes due to cultural and socio-economic factors. Transgender individuals in these regions encounter even greater challenges, including discrimination, stigma, and a lack of healthcare providers trained in gender-affirming care, which exacerbates their vulnerability to chronic diseases (Mac-Kay, etal, 2022 and Aggarwal, etal, 2024).

Low- and middle-income countries (LMICs) face significant disparities between urban and rural healthcare services (WHO). Sudharsanan et al.2019 conclude that significant gender disparities in health exist in LMICs, with women experiencing higher morbidity but lower mortality rates compared to men. Socio-economic barriers and cultural norms often limit women's access to healthcare, prioritizing men's health over women. This deter women from seeking treatment for chronic diseases due to societal expectations and responsibilities that prioritize family care over personal health.

Transgender people in these regions often encounter obstacles and disparities due to limited resources, fewer protections against discrimination, and weaker healthcare infrastructures. Studies underscores the compounded difficulties faced by transgender individuals in LMICs, where social stigma and legal challenges can be more pronounced, and access to gender-affirming healthcare and other essential services is often severely restricted. (Winter et al., 2016).

The 2020 article "Economic Barriers to Women's Health," published in Global Health Action, examines the economic challenges that impede women's access to healthcare worldwide. The study highlights

several economic obstacles, including high out-of-pocket costs, insufficient health insurance, and income inequality, which disproportionately affect women, especially in low- and middle-income countries (LMICs) where healthcare systems often lack adequate funding and women have limited financial independence. These economic barriers not only hinder access to essential health services but also exacerbate existing health disparities. This indicates how such factors can result in a lack of adherence to treatment. The authors emphasised for global attention and action to address these disparities, emphasizing the need for international collaboration to improve the health and human rights of transgender individuals in all regions, including LMICs. There is a need for gender-sensitive policies and training programs for healthcare providers.

Policy and Health System Gaps

Gaps in policy and health systems in developing countries and LMICs further exacerbate the challenges faced by women and transgender individuals in managing chronic diseases. The lack of inclusive health policies that address the specific needs of these populations is a significant issue. Sudharsanan et al. (2019) in their study, examines the lack of financial resources and political will to implement comprehensive healthcare programs hinders effective management of chronic diseases in these regions. The knowledge and biases within the medical workforce regarding transgender medical care, coupled with the adequacy of providers, pose significant challenges. These issues are compounded by larger social structural barriers and the lack of a robust framework to fund appropriate care. A review by the Global Health Workforce Alliance (GHWA) emphasized the need for gender-sensitive policies and training programs for healthcare providers to improve the quality of care for women and transgender individuals. Economic barriers significantly impact women's health, necessitating the development of inclusive policies that address their specific health challenges (Global Health Action, 2020). Similarly, the National Institute of Mental Health (NIMH) (2020) underscores the importance of gender-sensitive approaches in healthcare to address behavioral disparities. Together, these insights highlight the critical need for comprehensive and inclusive health policies that cater to the unique needs of all individuals. Addressing the structural inequalities requires policy interventions that promote equitable distribution of resources, expand access to healthcare coverage, and improve socioeconomic conditions that contribute to health disparities. This strategy aligns with numerous Sustainable Development Goals (SDGs), including aiding in the achievement of SDG 3 and 5, while supporting SDG 1, 2 and 4. Additionally, it contributes to the realization of SDG 10 and 16.

CONCLUSION

The intersection of gender identity and chronic disease highlights the need for bottom-up approach and the relevance of inclusive healthcare policies that address the specific needs of individuals belonging to all genders. The narrative review has provided a framework adapted from CDC Health impacted Pyramid to demonstrate the potential impact of different interventions. Adopting a life-course approach in the strategic planning of health systems will help tailor the particular interventions in preventing the onset and exacerbation of chronic conditions throughout the life course. Incorporating the elements of the socio-ecological model and working incrementally at all the socio-ecological levels, we can create a more supportive environment for all individuals managing chronic diseases. To improve treatment adherence and self-management across all genders, healthcare providers should adopt culturally sensitive approaches.

This includes behaviour communication strategies (BCC and SBCC) that address gender-specific barriers and involve support networks in the treatment process. Interpersonally, involving family members and social support networks can bolster treatment adherence and self-management efforts. Additionally, reducing gender bias in clinical decision-making through capacity-building sessions periodically and promoting diversity in healthcare settings can ensure more equitable and patient-centred care. Community-level interventions could include public health campaigns aimed at reducing stigma and encouraging health-seeking behaviours among men, women and LGBTQIA+ individuals. Finally, policy-level changes are essential to address broader systemic issues such as healthcare access, affordability, and social determinants of health. Providing inclusive and affirming care for transgender and non-binary individuals is critical for better health outcomes. Additionally, gender-based research should be promoted.

The study of gender theories and gender-based biases in medical and healthcare education curricula will foster a more inclusive and equitable healthcare system. By adopting a multi-disciplinary model to chronic disease management, we can work to mitigate the disparities that have long plagued the management of these conditions, ultimately to achieve the last mile of achieving gender equity in all spheres. These strategies are essential for improving health outcomes and are aligned with the Universal Health Coverage and Sustainable Development Goals, 2030.

LIMITATIONS

This narrative review has some limitations. All the studies reviewed were conducted in English. Some of the articles meeting the search criteria offer low-level evidence. The review does not cover information pertaining to intersex and asexual individuals. Few studies have explored issues relevant to sexual minorities. There are few validated scales for assessing healthcare staff attitudes towards sexual and gender minorities. Furthermore, the frameworks discussed in the review could have better illustrated the role of a multidisciplinary approach and specialized care needs for diverse genders.

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Figures

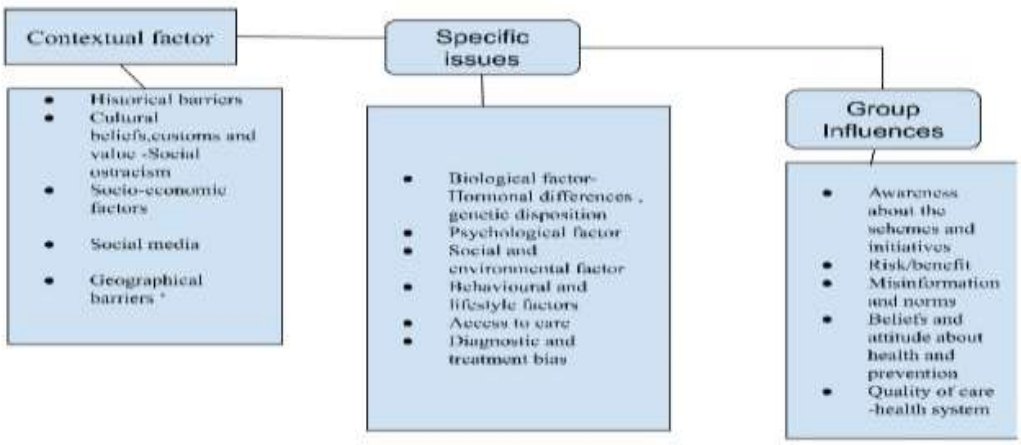

Fig 1: Determinants of gender disparities global context (specially women and LGBTQ+)

The Figure 1 flowchart presents a structured overview of factors influencing a broader issue, breaking down into key categories for targeted analysis and intervention. It begins with Contextual Factors, including Historical Barriers (long-standing challenges), Cultural Beliefs, Customs, and Values (social ostracism), Socio-economic Factors (economic impacts), Social Media (its influence), and Geographical Barriers (location-specific challenges). Next, it addresses Specific Issues, such as Biological Factors (hormonal and genetic influences), Psychological Factors (mental health issues), Social and Environmental Factors (effects of social settings and environments), Behavioural and Lifestyle Factors (personal choices), Access to Care (availability of healthcare services), and Diagnostic and Treatment Bias (disparities in medical care). The flowchart also explores Group Influences, including Awareness about Schemes and Initiatives (knowledge of programs), Risk/Benefit (perceived advantages and disadvantages), Misinformation and Norms (spread of false information and societal norms), Beliefs and Attitudes about Health and Prevention (public perceptions), and Quality of Care - Health System (standard of healthcare services). This comprehensive structure aids in identifying areas for potential improvement and intervention.

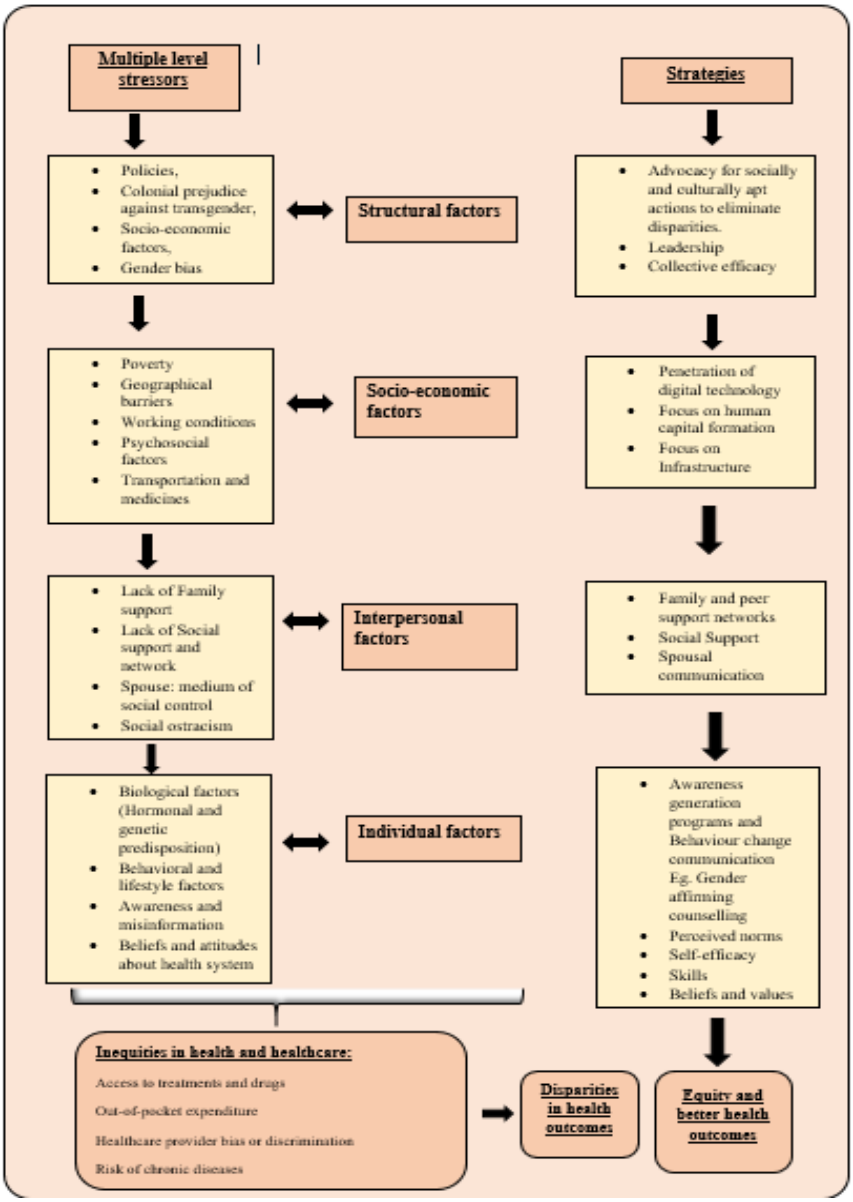

Fig2: Conceptual Framework addressing gender disparities in chronic disease management

The flowchart delineates the pathways through which gender disparities manifest and influence chronic disease management outcomes. Key components include socioeconomic factors, highlighting how differences in income, education, and occupation between genders affect access to healthcare resources; healthcare access and quality, showing the impact of gender on the availability and quality of medical services received; health behaviors, outlining variances in lifestyle choices and preventive practices between men and women; biological differences, depicting inherent physiological variations that influence disease progression and treatment responses; psychosocial factors, detailing the role of social support, mental health, and stress in managing chronic conditions differently across genders; and policy and intervention strategies, suggesting targeted approaches to mitigate gender disparities in chronic disease management, including tailored healthcare policies and community-based interventions. Each pathway is interconnected, demonstrating the complex interplay of factors contributing to gender disparities in healthcare. This framework aims to provide a comprehensive understanding for researchers and policymakers to develop strategies that promote equitable healthcare outcomes for all genders.

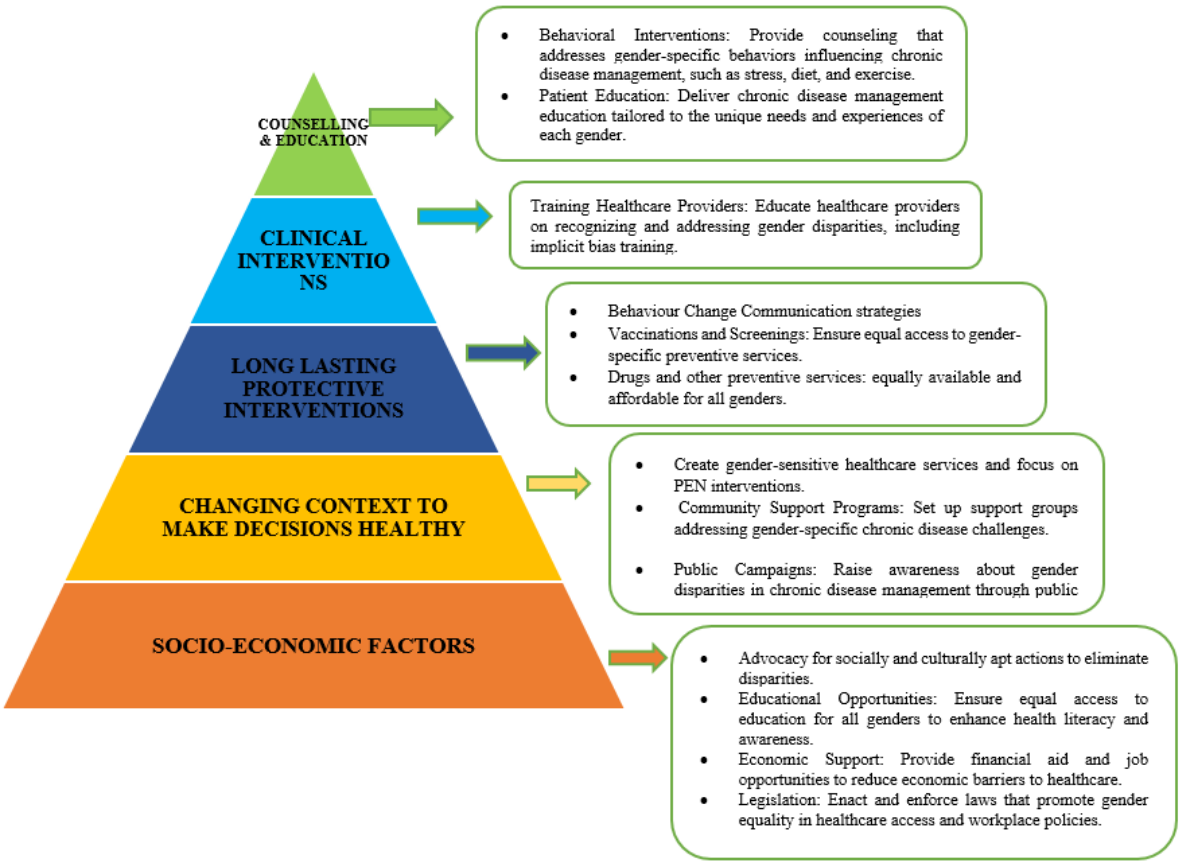

Fig 3: Adapted from CDC Health Impact Pyramid

Figure 3 illustrates a framework prioritizing public health interventions based on their impact on population health. At the base are Social and Environmental Conditions, which address foundational factors like socioeconomic status and living conditions. The next level, Changing the Context, involves modifying environments to facilitate healthier choices, such as implementing smoke-free policies. Long-Lasting Protective Interventions include measures like immunizations and screenings that provide enduring benefits. Clinical Interventions focus on direct healthcare services for managing chronic

diseases. At the top, Counseling and Education offers personalized guidance to support individual behavior change. The pyramid underscores that interventions at the lower levels, with broader systemic impacts, generally lead to greater improvements in public health compared to those targeting individuals at the higher levels.

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