

# From Burden to Balance: Understanding Lifestyle Diseases in India

Swarup K Chakrabarti<sup>1\*</sup> and Dhrubajyoti Chattopadhyay<sup>1,2</sup>

<sup>1</sup>HP Ghosh Research Center, New Town, Kolkata, India

<sup>2</sup>Sister Nivedita University, New Town, West Bengal 700156, India

ISSN: 2694-4391



**\*Corresponding author:** Swarup K Chakrabarti, HP Ghosh Research Center, HIDCO (II), EK Tower, New Town, Kolkata, West Bengal 700161, India

**Submission:**  May 03, 2024

**Published:**  May 28, 2024

Volume 4 - Issue 1

**How to cite this article:** Swarup K Chakrabarti\* and Dhrubajyoti Chattopadhyay. From Burden to Balance: Understanding Lifestyle Diseases in India. Int J Conf Proc. 4(1). ICP. 000576. 2024. DOI: [10.31031/ICP.2024.04.000576](https://doi.org/10.31031/ICP.2024.04.000576)

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## Abstract

Lifestyle diseases, also known as non-communicable diseases (NCDs), present a formidable global health problem precipitated by detrimental lifestyle selections. Though historically prevalent in industrialized nations, the surge of lifestyle diseases in developing regions due to urbanization adds layers of intricacy to the public health and economic milieu. Key drivers such as inadequate dietary habits, sedentary lifestyles, tobacco consumption, and excessive alcohol intake significantly exacerbate these maladies. The ensuing economic repercussions are profound, exerting considerable strain on healthcare infrastructures and societal welfare.

The COVID-19 pandemic has underscored the critical significance of maintaining a healthy lifestyle, particularly given the heightened vulnerability of individuals with pre-existing conditions such as obesity, diabetes, and cardiovascular diseases (CVDs). Addressing the multifaceted societal and economic dimensions of lifestyle diseases demands a comprehensive strategy that encompasses social determinants including socioeconomic status, cultural paradigms, and environmental influences.

In India, the escalating prevalence of lifestyle diseases presents a formidable challenge, with CVDs, diabetes, and obesity emerging as major focal points. Despite the implementation of various initiatives aimed at mitigating NCDs, intensified endeavors are imperative to foster healthy lifestyles and alleviate the burgeoning burden.

Strategic investments in preventive measures, the advocacy of health-conscious behaviors, and the rectification of healthcare disparities stand as pivotal endeavors in alleviating the impact of lifestyle diseases. Innovative methodologies, including telemedicine, wearable technologies, mobile health applications, artificial intelligence, and big data analytics, exhibit considerable potential in the management of these ailments. Collaborative efforts involving governmental bodies, healthcare practitioners, technology enterprises, and research entities are indispensable for the successful implementation of efficacious strategies and technological interventions aimed at enhancing health outcomes associated with lifestyle diseases.

## Introduction

### Lifestyle diseases: Beyond the wealthy

Chronic lifestyle diseases, often known as “Western diseases” or non-communicable diseases (NCDs), are primarily the result of poor lifestyle choices and have traditionally been linked to developed nations [1-3]. Many of these long-term conditions, including obesity, type 2 diabetes (T2D), cardiovascular diseases (CVDs), and certain cancers, typically progress slowly and can lead to premature death and disability [4-6]. They also place a considerable financial burden on healthcare systems [7,8].

These diseases are largely driven by unhealthy behaviors such as smoking, excessive alcohol consumption, poor dietary choices, and lack of physical activity. Tobacco use, especially smoking, increases the risk of CVDs, respiratory diseases, and specific types of cancer [9,10]. Similarly, heavy alcohol consumption is associated with various cancers, coronary disease, and liver disease [11]. Sedentary lifestyles and diets high in processed foods, sugar, salt, and unhealthy fats can further worsen obesity, T2D, and CVDs [12-14].

## Global perspective on lifestyle diseases

The rise of lifestyle diseases in developing countries, driven by urbanization, represents a complex interplay of factors affecting public health and economic well-being. Urbanization brings about changes in dietary patterns, often characterized by increased consumption of processed foods high in sugars, fats, and salt, and decreased intake of fresh fruits and vegetables [15,16]. This dietary shift, combined with a more sedentary lifestyle due to changes in transportation and work patterns, contributes to the prevalence of obesity, T2D, CVDs, and certain types of cancer [17,18].

Moreover, urbanization can lead to environmental changes that have health implications [19,20]. For instance, increased air pollution in urban areas can worsen respiratory conditions and elevate the risk of CVDs. These environmental factors, coupled with lifestyle choices, create a challenging scenario for public health [21,22].

In 2005, the World Health Organization (WHO) estimated that 61 percent of global deaths and 49 percent of the global burden of disease were due to chronic diseases [23]. According to a United Nations (UN) report, by 2030, the proportion of total global deaths from chronic diseases is projected to rise to 70 percent, with the global burden of disease increasing to 56 percent [24]. This trend is especially worrisome for developing countries, where the WHO predicts that by 2030, NCDs will surpass infectious diseases as the primary cause of death [25]. CVDs are the most common NCDs, causing around 17.9 million deaths annually, followed by cancers (9.3 million), respiratory diseases (4.1 million), and diabetes (1.5 million). These four groups of diseases, together account for over 80 percent of all premature NCD-related deaths [26,27].

Notably, approximately 77 percent of these deaths occur in low- and middle-income countries (LMICs), highlighting the urgent need for global health initiatives to address the growing burden of chronic diseases in these regions [28,29]. Furthermore, for example, approximately 15 million individuals in the 30 to 69-year-old working age group die each year from NCDs, with 85% of these deaths occurring in LMICs [30]. Although some developed countries are experiencing a compression of morbidity into a shorter period, many developing countries are facing an expansion of morbidity. Out of the 55 million fatalities worldwide in 2019, NCDs were responsible for approximately 41 million deaths, accounting for 71% of the total [31].

## Lifestyle diseases: Societal & economic Impact

Regrettably, a pervasive dearth of public consciousness persists regarding the intricate interplay between health outcomes and lifestyle decisions. A considerable portion of the populace remains uninformed that alterations in lifestyle behaviors possess the potential to profoundly affect the onset and progression of NCDs, thereby exerting a pivotal influence on morbidity and mortality rates. Although lifestyle choices are commonly perceived as individual matters, they gradually mold societal norms and practices, thereby sculpting distinct socioeconomic stratifications [32]. This has significant implications for health outcomes, as lifestyle choices can greatly affect the development and advancement of NCDs [33].

The management of NCDs invariably entails sustained care over extended durations, necessitating ongoing vigilance and adaptation of lifestyle practices. Complications arising from these conditions may precipitate protracted hospitalization, engendering financial burdens that impinge upon educational opportunities for children and hinder access to essential nutritional resources. Such circumstances perpetuate cycles of impoverishment and accentuate prevailing health disparities [34,35]. For instance, the economic impact of lifestyle diseases in India, as highlighted in the World Economic Forum report, is substantial, with a projected loss exceeding USD 200 billion [36,37]. This emphasizes the urgent need for interventions to address this burden, which extends beyond direct healthcare expenses to include productivity losses due to disability and premature mortality, as well as strains on social welfare systems.

## COVID-19 spotlight: Health equity & lifestyle

Additionally, the recent shift toward increasingly sedentary lifestyles, exacerbated by the prolonged COVID-19 pandemic, is resulting in a rise in lifestyle diseases among many people. Inactivity, unhealthy dietary patterns, and a lack of physical exercise are significant contributors to this phenomenon [38-40]. Consequently, the COVID-19 pandemic has underscored the significance of adopting a healthy lifestyle and the necessity for public health initiatives to encourage physical activity and nutritious eating habits. Preventive measures are vital, particularly since individuals with pre-existing conditions such as obesity, diabetes, and CVDs are more vulnerable to severe illness from COVID-19 [41,42].

Moreover, the pandemic has revealed inequalities in access to healthy food and opportunities for physical activity, especially in low-income areas. These disparities are often linked to social and economic issues, such as restricted access to affordable, nutritious food, safe places for physical activity, and healthcare services [43,44]. It is crucial to address these inequities to lessen the impact of lifestyle diseases on individuals and healthcare systems, and to enhance overall health outcomes.

## Escalating burden: Lifestyle diseases surge in India

As per the WHO, NCDs account for an estimated 63% of all deaths in India [45]. The incidence of these conditions is anticipated to rise, with projections suggesting that by 2030, NCDs will make up 70% of all deaths in the country [46]. Among these, CVDs are the leading cause of mortality, representing approximately 27% of all deaths [47]. Diabetes, another significant lifestyle disease, currently affects more than 77 million individuals in India and is expected to surpass 134 million by 2045, solidifying India's position as the diabetes capital of the world [48,49]. Interestingly, around 57% of these cases remain undiagnosed. According to the ICMR-INDIAB (Indian Council of Medical Research-India Diabetes) study, an estimated 101 million people had diabetes, while 136 million had prediabetes [48]. This trend in disease prevalence mirrors that of developed nations, where the majority of diabetes cases are linked to overweight and obesity [50]. A separate survey by Max Healthcare (Pan Max) in India highlighted a substantial increase in diabetes cases, from 2% in urban areas during the 1970s to 10-

20% in 2020 [48]. The prevalence was even higher (35-40%) in metro cities of India. In 2019, approximately 77 million individuals in India had diabetes, a figure projected to exceed 134 million by 2045.

According to the India state-level disease burden Study report by the ICMR titled "India: Health of the Nation's States," the estimated proportion of all deaths attributed to NCDs has risen from 37.09 percent in 1990 to 61.8 percent in 2016 [51]. Additionally, another report from the National Family Health Survey (NFHS) conducted in 2015-16 indicates that 11 percent of women (1 in 10) and 15 percent of men (1 in 7) between the ages of 15 and 49 are hypertensive [52].

As part of its 'Illness to Wellness' campaign, the country's apex trade association unveiled the "largest" primary healthcare survey report on India's NCD cases [53]. According to this report, the prevalence of NCDs in India is 116 per 1,000 populations, with a significant increase observed in individuals over 35 years of age. Hypertension, digestive diseases, and diabetes were identified as the top three most prevalent NCDs, while cancer had the lowest prevalence [53,54].

Recently, the Apollo Hospitals Group released the "Health of the Nation 2022 report," which assessed the prevalence and distribution of NCDs across India [55]. The study, conducted primarily in 2021 with some data from 2020, had a sample size ranging from 20,000 to 380,000 across various cohorts. Key findings from the report regarding Diabetes Mellitus indicate an increased prevalence in the southern and eastern regions of the country, with an average national prevalence of 6.96 percent. Urban areas showed a slightly higher prevalence at 7.01 percent compared to rural areas at 6.70 percent. The report also highlights the prevalence of obesity in women over 35 years, which leads to poor diabetes control and higher levels of HbA1c, a biomarker for diabetes development, increasing the risk of heart disease and other complications.

Regarding hypertension, the study found a national prevalence rate of 8.16%, with higher rates in North and East India. Adult males between 36 and 50 years had a 36% higher likelihood of developing hypertension compared to adult females in the same age group. Urban areas had a higher incidence (8.6%) compared to rural areas (7.58%). The report also noted that chronic obstructive pulmonary disease (COPD) and asthma had prevalence similar to the global rate (2%), with females between 36 and 50 years having a 1.3-fold higher chance of developing COPD compared to males.

### **The underlying causes of lifestyle diseases**

NCDs are multifaceted conditions that arise from a complex interplay of genetic, physiological, environmental, and behavioral factors [56-58]. While these diseases typically become evident in adulthood, their roots often trace back to behaviors established during childhood and adolescence. For example, the use of tobacco, physical inactivity, unhealthy dietary patterns, and excessive alcohol consumption significantly contribute to the prevalence and mortality risk of NCDs. These modifiable risk factors, when combined with non-modifiable factors such as age, gender, genetic predisposition, race, and ethnicity, amplify the burden of NCDs on

individuals and healthcare systems [59].

### **The role of epigenetics in lifestyle diseases**

Additionally, the complexity of NCDs is influenced by various biological factors. Conditions like obesity, dyslipidemia, hyperinsulinemia, and hypertension are not solely dependent on genetic factors; they can also be impacted by epigenetic mechanisms [60-62]. Epigenetics, which examines changes in gene expression without altering the DNA sequence, has illuminated the influence of environmental factors on health. Diet, stress, and exposure to toxins are among the factors that can affect epigenetic changes, altering gene activity and contributing to the development of NCDs [63]. For instance, studies suggest that a high-fat diet can lead to epigenetic modifications that increase the risk of obesity and related metabolic disorders [64]. Similarly, chronic stress can induce epigenetic changes that influence mental health and contribute to conditions such as depression and anxiety [65]. Understanding these complex interactions involving genetics, epigenetics, and the environment is crucial for designing effective strategies to prevent and manage NCDs [66].

Also, recent advancements in research have underscored the critical role of epigenetics in elucidating the mechanisms underlying NCDs. For instance, epigenetic modifications, including DNA methylation, have emerged as potent predictors of NCD risk [67]. Studies have demonstrated that specific DNA methylation patterns can serve as biomarkers for alcohol consumption and prenatal tobacco exposure, offering valuable insights into disease susceptibility and progression [68,69]. Furthermore, investigations into the relationship between NCDs and adiposity have revealed that these conditions can impact the epigenome, leading to alterations that may influence disease development and course [70,71]. These findings highlight the intricate interplay between epigenetic mechanisms and NCDs, emphasizing the importance of considering epigenetics in the prevention, diagnosis, and treatment of these diseases [72].

### **Impact of social determinants on lifestyle diseases**

On the other hand, social determinants of health (SDOH), such as socioeconomic status, cultural norms, and environmental conditions, significantly influence the prevalence of NCDs [73,74]. Individuals from disadvantaged backgrounds often encounter more obstacles in accessing healthcare and embracing healthy lifestyles, which increases their susceptibility to developing NCDs. For example, limited access to nutritious food options and safe spaces for physical activity can contribute to higher rates of obesity and related conditions. Additionally, cultural beliefs and practices may affect health-seeking behaviors and adherence to medical advice [75]. Addressing these social determinants is crucial for reducing health disparities and improving overall health outcomes.

### **Management of lifestyle diseases in India**

India's health challenges have evolved notably in recent decades, transitioning from predominantly infectious diseases to a growing prevalence of NCDs. Recognizing this shift, the ICMR established the National Center for Disease Informatics and Research (NCDIR) in Bengaluru in 2011. This institution plays

a crucial role in gathering, analyzing, and disseminating data on the etiology, clinical characteristics, epidemiology, and public health ramifications of NCDs, as well as related determinants and indicators [76].

ICMR, in collaboration with the Institute for Health Metrics & Evaluation (IHME) and the Public Health Foundation of India (PHFI), has published several reports on the burden of diseases at the state level for the years 1990-2016. These reports offer valuable insights into the regional distribution of NCDs across India [77].

India has initiated several programs aimed at addressing NCDs. These initiatives, overseen by the ministry of health and family welfare, Government of India, encompass various programs such as the National Iodine Deficiency Disorders Control Programme, the National Mental Health Programme, the National Programme for Control and Prevention of Deafness, the National Programme for Control of Blindness, and the National Programme for Healthcare of the Elderly [78,79].

### **Obesity in India: Undernutrition interplay**

The prevalence of overweight and obesity in India is alarmingly rising, especially in spite of initiatives to prevent NCDs [80]. This is worrying, especially considering the significant issue of undernutrition in many parts of the country. It's crucial to understand that undernutrition, often seen in marginalized communities, can paradoxically contribute to obesity and related metabolic conditions. When food is scarce, the body may adjust its metabolism to store fat and disrupt the regulation of hunger hormones [81,82]. This highlights the complex relationship among socioeconomic factors, nutrition, and the emergence of NCDs [83,84]. Non-pharmacological approaches, such as dietary changes and increased physical activity, are crucial for managing obesity. Promoting participation in sports and other physical activities is a practical and cost-effective strategy for preventing NCDs [85].

It is crucial for governmental and non-governmental organizations in India to collaborate in promoting healthy lifestyles and reducing the burden of lifestyle diseases, particularly metabolic syndrome. Past studies have demonstrated that lifestyle interventions can significantly impact the management and prevention of these diseases.

### **Holistic approaches to managing lifestyle disorders in India**

Traditional medicine systems in India, including Ayurveda, offer holistic approaches to managing lifestyle disorders [86]. Ayurveda, in particular, emphasizes the balance of physical, psychological, and spiritual elements to promote overall well-being. This ancient system of medicine considers lifestyle factors, such as diet and daily routine, along with herbal remedies, yoga, and meditation, to address the root causes of health issues. Incorporating Ayurvedic principles into healthcare practices could provide a complementary approach to managing lifestyle disorders, offering patients a broader range of treatment options and promoting a more holistic view of health [87].

### **Adapting healthcare models for diverse disease burdens: Lessons for India**

Moreover, it is crucial to prioritize increased funding allocations for primary healthcare systems to ensure equitable access to healthcare for all. Research institutes and institutions can significantly contribute to NCD prevention through research and program implementation. For example, studies in agricultural and food biotechnology can directly target NCD risk factors. Additionally, the development of point-of-care diagnostic tools that enable rapid and precise identification of NCD biomarkers can facilitate early intervention.

Tailoring management plans to fit specific needs and challenges is crucial for effective healthcare strategies. For example, Kenya's approach to early diagnosis of diabetes and hypertension by integrating screening into home visits for HIV showcases a cost-effective and innovative strategy [88]. This model could be particularly beneficial for India, which faces a diverse burden of infectious diseases. By adapting and implementing such tailored approaches, countries can address their unique healthcare challenges more effectively and efficiently.

### **The "Whole of Government and Whole of Society" approach to lifestyle diseases**

Moreover, it is essential to consider socioeconomic disparities between rural and urban areas when formulating public health management policies. For instance, interventions for the rural elderly, who typically have lower socioeconomic status and limited access to nutritious food, may need to differ from those for urban elderly, who may face social exclusion and chronic mental stress. Socioeconomic factors such as place of residence, education, caste, religion, and living arrangements should be taken into account when planning significant health interventions. NCD interventions should focus more on public health and preventive measures, rather than specialized clinical care in hospitals, as often seen in developed nations. Priority should be given to structural changes such as raising alcohol and tobacco prices, enforcing smoking bans in public places, and imposing taxes on sugar-sweetened beverages [89]. The UN emphasizes the need for a "whole of government and whole of society" approach to effectively tackle NCDs [90]. To elaborate, this approach is a comprehensive strategy that engages all segments of society in tackling complex issues. It underscores the need for coordinated actions among diverse government agencies (whole of government) and the active involvement of non-governmental organizations, community groups, businesses, and individuals (whole of society) to attain shared objectives. This approach acknowledges that collaborative and inclusive strategies are vital for effectively managing challenges like public health crises, environmental sustainability, and social inequality.

In summary, due to the complex nature of lifestyle diseases and their underlying causes, a holistic approach to prevention and management is essential. This approach involves not only addressing modifiable risk factors through lifestyle modifications but also recognizing the impact of social determinants and biological factors on disease progression. By gaining a comprehensive understanding

of the multifaceted factors influencing NCDs, healthcare providers can customize interventions and therapies more efficiently to enhance outcomes for individuals impacted by these conditions.

## Conclusion and Future Directions

The rise of lifestyle diseases in India, including diabetes, obesity, heart disease, and various cancers, is attributed to a combination of factors such as rapid urbanization, changing dietary patterns, sedentary lifestyles, and increasing stress levels. Both the healthcare system and individuals affected by these conditions face significant challenges.

Customized treatments tailored to the specific challenges faced by different segments of the Indian population are crucial. For instance, rural communities may benefit from programs that improve healthcare access and provide nutritional education, while urban populations may need interventions that promote physical activity and healthy eating in the context of fast-paced urban life [91,92].

Preventive healthcare practices, including early detection, screening, and lifestyle modifications, are key to preventing or delaying the onset of lifestyle diseases and reducing their impact. Public health programs emphasizing healthy lifestyle choices and regular medical check-ups can be highly effective.

Understanding the role of SDOH in the burden of lifestyle diseases is also important. Factors like access to healthcare, education, and income inequality can significantly affect disease risk. Addressing these social factors through policies that promote fairness and social justice is essential to reduce the burden of lifestyle diseases.

Addressing the underlying social, economic, and environmental determinants of health requires a comprehensive approach. By investing in preventive measures, promoting healthy behaviors, and addressing healthcare access disparities, India can reduce the burden of lifestyle diseases and improve the health of its population.

Innovative methods such as telemedicine, wearable devices, mobile health apps, artificial intelligence (AI), and big data analytics offer significant promise in addressing lifestyle diseases [93-95]. Telemedicine enables remote diagnosis and treatment, reducing the need for in-person visits and facilitating regular monitoring. Wearable devices track health metrics in real-time, aiding individuals in managing their conditions and providing data for personalized care. Mobile health apps offer guidance, motivation, and support, along with tools for self-monitoring and communication with healthcare providers. AI analyzes health data to personalize treatment plans and optimize interventions. Big data analytics processes large datasets to identify trends, inform prevention strategies, and improve health outcomes, ultimately reducing healthcare costs [96]. These technologies can revolutionize healthcare delivery, improve disease prediction, and personalize treatment plans.

Recognizing the impact of environmental factors on lifestyle diseases is crucial for public health [97]. For instance, air pollution is strongly linked to respiratory and cardiovascular disorders. By

addressing these environmental factors through legislation aimed at reducing pollution and promoting sustainable practices, we can significantly benefit public health. Such actions not only help prevent and reduce the incidence of lifestyle diseases but also contribute to overall environmental sustainability and well-being.

In concert, collaboration among governmental bodies, healthcare practitioners, technological enterprises, and researchers stands as a pivotal force in effectively implementing strategies and technologies aimed at combating lifestyle diseases. By directing investments towards innovative methodologies such as telemedicine, wearable technologies, mobile health applications, AI, and big data analytics, India possesses the potential to fortify its healthcare infrastructure, elevate health outcomes, and alleviate the burden of lifestyle diseases on its populace. Acknowledging the profound societal implications of these ailments and executing comprehensive interventions can propel India towards the noble endeavor of enhancing the health and well-being of its citizenry, thus charting a path towards a healthier and more prosperous future for all [98,99]. This collaborative effort can lead to the development of sustainable healthcare solutions tailored to the needs of the Indian population, ultimately benefiting individuals and society as a whole [100].

## Funding

The H. P. Ghosh Research Center in Kolkata, India, receives funding for this research from an intramural charitable grant provided by the Bandhan Group.

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