**THE GLOBAL RISE OF NON-COMMUNICABLE DISEASES: AN OVERVIEW**

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**ABSTRACT:**

Non-communicable diseases (NCDs) are a leading global public health challenge, responsible for the majority of deaths and disabilities worldwide. In 2005, NCDs caused an estimated 35 million deaths—60% of all global fatalities—with 80% occurring in low- and middle-income countries. Approximately 16 million of these deaths were among individuals under 70. The number of NCD-related deaths is projected to increase by 17% over the following decade. The most common NCDs—cardiovascular disease, cancer, diabetes, and chronic respiratory illnesses—are largely preventable. Nearly 80% of type 2 diabetes cases, 40% of cancers, and most early heart disease and strokes can be prevented through healthy behaviors. These include regular physical activity, a balanced diet, avoiding tobacco use, and limiting alcohol consumption. Within the next 20 years, NCDs are expected to account for over half of the total disease burden in developing nations. Key risk factors—tobacco use, unhealthy diets high in saturated and trans fats, salt, and sugar, physical inactivity, and harmful alcohol use—are consistent worldwide. Globalization, urbanization, and changing lifestyles have accelerated these risks, particularly in low- and middle-income countries. The rise in obesity and sedentary behavior further increases the incidence of high blood pressure, cholesterol, and blood sugar levels. Prevention strategies focused on healthy eating, active living, and public health policies such as non-smoking laws and access to functional foods are essential. These interventions offer the most effective approach to reducing the growing burden of NCDs globally.

**Keywords:** Non-communicable diseases, Diabetes, Cancer, Global Risk, Cardiovascular Disease.

**1. INTRODUCTION**

Non-communicable diseases (NCDs), including cardiovascular, diabetes, cancer, and chronic respiratory diseases, are the leading cause of morbidity and mortality worldwide. They pose a significant health and development challenge for humanity in the 21st century, causing socioeconomic damage in low- and middle-income countries (LMICs).

Non-communicable illnesses, which cause a significant amount of death and morbidity, remain significant global public health issues. Globally, non-communicable diseases (NCDs) constitute the primary cause of mortality and disability. According to estimates, NCDs were responsible for 35 million fatalities in 2005, or 60% of all deaths worldwide. Of these deaths, 80% occurred in low- and middle-income nations, and around 16 million occurred among those under the age of 70. Over the next ten years, there will likely be an additional 17% rise in the overall number of fatalities from NCDs. By being aware of the risk factors for chronic illnesses, one can prevent about 40% of malignancies, 80% of Type 2 diabetes, and premature heart disease and stroke (Pandey et al., 2013).

In the next 20 years, NCDs will be accountable for over half of the worldwide illness burden in emerging nations. NCDs will be responsible for virtually half of the global burden of disease in the developing countries. Risk factors, such as tobacco and alcohol use, improper nutrition and sedentary behaviour contribute substantially to the development of NCDs, which are sweeping the entire globe, with an increasing trend mostly in developing countries where, the transition imposes more constraints to deal with an increasing burden of overpopulation with existing communicable diseases overwhelmed with increasing NCDs in poorly maintained sanitation and environment. NCDs cause mortality at a younger age in low- and middle-income nations, with 29% of deaths occurring before the age of 60 compared to 13% in high-income countries (Kabir et al., n.d.).

According to Farmer et al. (2010), Ferlay et al. (2010), and WHO (2010a, 2010b), cancer incidence is expected to grow more in low- and lower-middle-income nations (80% and 70%, respectively) than in upper- and high-income countries (58 and 40%, respectively) by 2030. Similar trends exist for CVD and type 2 diabetes. Individual risk factors for NCDs have been widely recognized for decades and are consistent across nations. Tobacco use, unhealthy diets high in saturated and trans fats, salt, sugar (especially in sweetened drinks), physical inactivity, and alcohol consumption contribute to over two-thirds of new cases of NCDs and increase the risk of complications (Fairall et al., 2016).

A good diet, frequent physical exercise, and tobacco-free lifestyle can prevent 80% of heart disease, stroke, type 2 diabetes, and 40% of cancer. Foods heavy in saturated and industrially generated trans fats, salt, and sugar contribute to the deaths of at least 14 million people. Overconsumption of salt accounts for up to 30% of all hypertension cases. NCDs account for approximately 3 million, or 8%, of all deaths annually.(Fairall et al., 2016)  
Alcohol use causes 2.3 million deaths annually, with NCDs accounting for 60% of all deaths. It also has negative health, social, and economic consequences. Tobacco use causes over 6 million deaths annually, including those from direct use and second hand smoking. By 2020, this figure will rise to 7.5 million, representing 10% of all fatalities (Navya & Ajitha, 2024).  
Risk factors include high blood pressure, elevated cholesterol and glucose levels, obesity, and cancer-related infections. High blood pressure is thought to Cardiovascular disease is a leading cause of mortality, accounting for around 12.8% of all fatalities (7.5 million). Raised cholesterol is predicted to cause 2.6 million deaths per year (Barry et al., 2025).

Socio-economic development varies among nations, with different categories exhibiting distinct growth trajectories and rules. NCD fatalities may exhibit stratified heterogeneity due to their correlation with socioeconomic development. The trajectory of NCD fatalities varies by nation type and level of development, even if identical development laws exist. Multi-layered analysis of NCD fatalities yields more accurate results than worldwide research.   
Geotree is a multidimensional visualization approach that highlights layered heterogeneity.

Furthermore, the multilevel model (MLM) in Geotree delivers higher accuracy than standard global models as it is entirely reliant on stratified heterogeneity for model fitting and forecasting future changes in NCD fatalities. It is noteworthy to emphasize that Geotree provides both qualitative and quantitative analysis findings, allowing for a mechanical explanation of the shifting pattern in NCD fatalities (Hoffman et al., n.d.).  
Disease rates from these disorders are increasing internationally, affecting all areas and socioeconomic groups. The epidemic of NCDs continues to spread. In 2005, NCDs caused an estimated globally, 35 million fatalities account for 60% of all deaths, with 80% occurring in low- and middle-income nations and around 16 million in high-income countries.   
NCD fatalities are expected to increase by 17% during the next decade. (Owusu et al., 2024)  
Identifying risk factors for chronic diseases can prevent around 80% of premature heart disease and stroke, 80% of type II diabetes, and 40% of cancers. Within 20 years, NCDs will account for over half of the global illness burden in emerging and newly industrialized nations. Tobacco and alcohol use, poor nutrition, and sedentary behavior are all significant risk factors for the development of NCDs. These behaviors often begin in childhood and persist throughout maturity, with worsening repercussions as people mature. Economic, environmental, and political issues all have a substantial impact on NCDs and associated risk factors (Farzadfar et al., 2024).

**2. Types of Non-Communicable Diseases**

Due to their substantial death and morbidity rates, non-communicable diseases remain a major global public health concern. Globally, non-communicable diseases (NCDs) constitute the primary cause of mortality and disability. According to estimates, NCDs were responsible for 35 million fatalities in 2005, or 60% of all deaths worldwide. Of these deaths, 80% occurred in low- and middle-income nations, and around 16 million occurred among those under the age of 70. Over the next ten years, there will likely be an additional 17% rise in the overall number of fatalities from NCDs. About 80% of Type 2 diabetes, 40% of malignancies, and 80% of premature heart disease and stroke can be avoided if one is aware of the risk factors for chronic illness (Srivastava & Sureka, n.d.).

Nearly half of the worldwide illness burden in emerging nations will be attributable to NCDs over the course of the next 20 years. Risk factors like alcohol and tobacco use, poor diet, and sedentary lifestyles all play a significant role in the development of noncommunicable diseases (NCDs), which are on the rise globally and are particularly prevalent in developing nations where the transition results in greater pressure to manage an overpopulation of people with pre-existing communicable diseases combined with rising NCDs in environments and sanitation that are not adequately maintained (Owusu et al., 2024).

Seven out of ten fatalities in underdeveloped nations are expected to be attributable to these illnesses by 2020. Rapid urbanization and significant population changes from rural to urban regions are key characteristics of the developmental transition. Even rural residents are becoming more and more used to urban living. Atherosclerosis, cancer, stress, obesity, stroke, and other NCDs are caused by shifting lifestyle patterns (Factor et al., 2022).

We should stress the need of giving prevention and control of NCDs top priority, given the projected burden of these diseases and our current healthcare system. Our tactics ought to be focused on tracking the prevalence of NCDs and the risk factors associated with them (Amerzadeh et al., 2023).

Common risk factors for certain NCDs should be treated at the lowest possible cost while maximizing results. The strategy's three main pillars are management and health care, health promotion and primary prevention, and surveillance. The goal of managing noncommunicable diseases (NCDs) should be to raise public knowledge of the disease's symptoms and effects. In order to empower individuals to take individual and group action to avoid hazardous behaviour and to establish political, economic, and environmental circumstances that prevent NCDs and their hazards, health promotion policies that prioritize disease prevention are required. It is necessary to keep an eye on risk trends and assess intervention tactics in light of their anticipated results. Because they affect the incidence of NCDs and the effectiveness of therapies, issues including the rapidly aging population, gender and income disparity, chronic poverty, and the requirements of emerging nations must be carefully taken into account (Wang & Wang, 2020).

**2.1 Cardiovascular Diseases:**

In the US, the most common cause of sickness and mortality is cardiovascular disease, which includes stroke. This nation is expected to have 50 million individuals with hypertension and 62 million with cardiovascular disease. One Cardiovascular disease was responsible for almost 946,000 deaths in the United States in 2000, or 39% of all fatalities. There is strong evidence that coronary heart disease is mostly avoidable, according to epidemiologic research and randomized clinical trials. Nonetheless, there is also evidence to support the idea that the illness has a heritable component. Future genetic research will be applied to the treatment of cardiovascular disease patients (Navya & Ajitha, 2024).

The primary lipoprotein in plasma that carries cholesterol, low-density lipoprotein (LDL), is the cause of several types of coronary heart disease. By disrupting the function of hepatic LDL receptors, which typically remove LDL from the plasma, four monogenic disorders raise plasma levels of LDL. The first monogenic condition that was shown to result in increased plasma cholesterol levels was familial hypercholesterolemia. More than 600 mutations in the LDLR gene have been found in people with familial hypercholesterolemia, which is primarily caused by a deficiency of LDL receptors (Pandey et al., 2013).

With a frequency of more than 20% in the general population, hypertension is the most prevalent illness in developed countries. It increases the risk of myocardial infarction, stroke, heart failure, and renal failure; several clinical studies have demonstrated that lowering blood pressure lowers the risk of myocardial infarction and stroke. 10. The study of blood pressure fluctuations in the general population is complicated by a number of hereditary and environmental factors (Kabir et al., n.d.).

On the other hand, research on uncommon mendelian types of blood pressure variation, when single gene mutations result in noticeable blood pressure extremes, has proven highly instructive. These mutations offer a genetic foundation for comprehending the pathophysiology of hypertension by affecting renal salt handling (Pandey et al., 2013).

The most prevalent monogenic heart condition and the leading cause of sudden cardiac mortality in children and adolescents is hypertrophic cardiomyopathy. Based on the analysis of echocardiograms from a sizable youth population, the prevalence of hypertrophic cardiomyopathy has been calculated to be around 500 per 1,000. The transmission pattern of hypertrophic cardiomyopathy is autosomal dominant. The illness is brought on by mutations in the genes that code for the myocardial-contractile apparatus's proteins (Blackman et al., 2009).

**2.2 Cancers:**

According to the Sub-Saharan Africa region's 2002 cancer incidence estimates, there were around half a million (530,000) new cases of cancer each year, with 251,000 occurring in men and 279,000 in women. The top cancer types by sex and geography (including northern Africa). The main cancer kinds seen in Sub-Saharan Africa ,global standardized cancer rates were calculated to be 133 per 100,000 females and 136 per 100,000 men. Kaposi's sarcoma (15.9 percent), liver (13.3 percent), prostate (10.7 percent), esophageal (6.0 percent), non-Hodgkin's lymphoma (5.8 percent), and stomach (4.5 percent) were the top six malignancies among males (Herrick, 2022).

The most common malignancies in females were breast (17.4 percent) and cervix (25.4 percent). Non-Hodgkin's lymphoma (3.8 percent), stomach (3.8 percent), liver (5.5 percent), and Kaposi's sarcoma (6.2 percent). This chapter provides a brief overview of each of these malignancies. HIV-related cancers (except from Kaposi's sarcoma) and tobacco-related cancers (particularly lung cancer, which presently ranks seventh in men) are also covered since they are expected to rise as both of these epidemics develop (Herrick, 2022).

Cancer and other non-communicable illnesses are new health issues that must be properly addressed in order to maintain the progress made in public health. Future cancer patterns and incidence will be significantly impacted by the high prevalence of infectious agents linked to cancer, such as human papillomaviruses (HPV), hepatitis B viruses (HBV), and human herpesvirus-8 (HHV8); environmental exposure to toxins, such as aflatoxins; and increases in tobacco use and immunosuppression brought on by the human immunodeficiency virus (HIV), in addition to pre-existing risk factors for cancer, such as alcohol. Africans will continue to age despite the HIV epidemic's reduction in total life expectancy, which will raise the burden of cancer on health care in both relative terms (Farzadfar et al., 2024).

Cervical cancer is the most common malignancy among women in Sub-Saharan Africa; an estimated 70,700 new cases were reported in 2002 (78,900 cases were reported throughout the continent). It is unknown why the estimated rates of 30 to 60 per 100,000 in eastern and southern Africa are greater than those in the rest of Sub-Saharan Africa (20 to 35 per 100,000). Cervical cancer mortality decreased from the early 1900s to the 1960s in several industrialized nations, including the UK and Sweden. This trend continued when national screening programs were implemented (Habib & Saha, 2010).

In Sub-Saharan Africa, breast cancer accounts for 16.8% of all female cancers, making it the second most frequent disease among women. Compared to southern Africa, where incidence rates are estimated to be 33.4 per 100,000, central, west, and east Africa tend to have lower rates. In 2002, there were an estimated 48,600 cases in Sub-Saharan Africa (Srivastava & Sureka, n.d.).

In 2002, Sub-Saharan Africa was expected to have 10,700 female cases and 13,800 male cases of stomach cancer. From 3.4 in western Africa to 7.4 in eastern, 8.2 in southern, and 13.4 in central Africa, age-standardized incidence rates for men ranged by 100,000. Males predominate in all other regions, while the male-to-female ratio is 0.9 to 1 in western Africa, where stomach cancer incidence is lowest (Habib & Saha, 2010).

**2.3 Chronic Respiratory Diseases:**

Due in great part to the prevalence of harmful environmental, occupational, and behavioral inhalational exposures, chronic respiratory disorders rank among the most prevalent non-communicable diseases in the world. One Chronic respiratory conditions include interstitial lung disease, pulmonary sarcoidosis, and pneumoconioses like asbestosis and silicosis, in addition to asthma and chronic obstructive pulmonary disease (COPD). Unfortunately, compared to other disease categories like cardiovascular disease, cancer, stroke, diabetes, and Alzheimer's disease, chronic respiratory disorders have gotten a disproportionately lower amount of public attention and research money. Therefore, knowledge of the prevalence, morbidity, and mortality of chronic respiratory diseases—both globally and regionally—is essential to better inform preventive, screening, treatment, and research activities devoted to these conditions (Cesare, 2019).

Joan Soriano and associates estimate the incidence and attributable health burden of chronic respiratory disorders in The Lancet Respiratory Medicine by using data from the Global Burden of disorders, Injuries, and Risk Factors Study (GBD) 2017 . In 2017, they discovered that about 545 million individuals worldwide suffered from a chronic respiratory condition, a 39·8% rise since 1990. Unexpectedly, the lowest frequency of chronic respiratory disorders was found in sub-Saharan Africa and south Asia, whereas the greatest prevalence was found in the high-income super-region. The two most common chronic respiratory conditions were asthma (3·6%) and COPD (3·9% worldwide) (Nakatani, 2016).

Chronic respiratory disease-related mortality was lowest in sub-Saharan Africa and greatest in South Asia. In the high-income, Latin America and the Caribbean, central Europe, eastern Europe, and central Asia super-regions, interstitial lung disease and pulmonary sarcoidosis were the second leading causes of death, while COPD and asthma were the leading causes of chronic respiratory disease-related deaths globally. Although the absolute estimates of the prevalence and health burden of chronic respiratory diseases increased between 1990 and 2017, there were decreases in age-standardised estimates of prevalence (−14·3%), mortality (−42·6%), and DALYs (−38·2%) in the same period (Wang & Wang, 2020).

**2.4 Diabetes**

Diabetes is a significant side effect of cystic fibrosis (CF), a multisystem hereditary illness brought on by mutations in the gene that regulates the transmembrane conductance of CF (CFTR). About 25% of adolescents and 40–50% of people with cystic fibrosis are at increased risk for diabetes, which rises with age. Diabetes is currently the most frequent systemic consequence of cystic fibrosis (CF), second only to lung illness, as a result of CF patients living longer. Diabetes therapy improves lung function and nutritional health, but it is linked to a noticeably poorer prognosis for CF(Pandey et al., 2013).  
At around one-third the age, the prevalence of diabetes among CF patients is roughly 10 times higher than that of type 2 diabetes in the general population (Nakatani, 2016).

Both type 2 diabetes in the general population and diabetes in CF patients have a solid hereditary foundation and share many pathophysiological characteristics. This multicenter investigation shows that a type 2 diabetes susceptibility gene (TCF7L2) influences the risk for diabetes in people with cystic fibrosis (CF), with independent replication. Other type 2 diabetes susceptibility genes could potentially be involved, according on family history data. Lastly, systemic glucocorticoid therapy, a non-genetic factor, alters the risk that TCF7L2 confers. Similar to type 2 diabetes, the number of and genetic distance to afflicted relatives determined the CF patient's higher chance of developing diabetes in the first analysis (family history) (Nakatani, 2016).

This study shows that type 2 diabetes and diabetes in people with cystic fibrosis share at least one pathogenic cause. There is a chance to assess and improve gene-based testing or treatments that might affect people with type 2 diabetes because diabetes is more common.   
However, the clinical differences between the older, frequently overweight adult with type 2 diabetes and the underweight young adult with CF and diabetes can be used to examine how variations in genes like TCF7L2 cause diabetes in various inflammatory and nutritional contexts. Consequently, the description of genetic   
Modifiers of monogenic illnesses, such as cystic fibrosis, might provide insight into how common polymorphisms lead to prevalent conditions like type 2 diabetes(Khandelwal, 2018).

**2.5 Mental Health Disorders:**

Mental illness is becoming a more prevalent issue in contemporary life. According to estimates from the World Health Organization (WHO), there were over 300 million individuals worldwide who suffered from depression in 2015, and an equal number of persons who suffered from anxiety disorders. Anxiety disorders were the sixth most common cause of Years Lost due to Disability (YLD) worldwide in 2015, after depression. These mental illnesses are linked to decreased productivity and extended sick leave from work (Wang & Wang, 2020).

Numerous studies have demonstrated the psychological distress that physicians, nurses, and other healthcare workers face, including role conflict, emotional labor, worry about medical errors and lawsuits, and being verbally or physically abused by patients and caregivers or bullied by co-workers (Kim et al., 2018).

Nonetheless, self-reporting questionnaires were used in the majority of the previously described investigations to gauge psychological discomfort. This method has drawbacks since self-reporting surveys may not always provide an accurate picture of participants' mental health. Furthermore, because people differ from one another in terms of resilience, social support, and other factors, psychological discomfort may not necessarily result in a mental illness. Indeed, a previous study found a mismatch between clinical anxiety or depressive illnesses and high levels of suffering (Blackman et al., 2009).

In an example, nearly 2.5 million individuals have died from COVID-19 globally, and over 100 million people have contracted SARS-CoV-2. Due to incorrectly labeled dementia and cardiovascular or metabolic deaths, these figures most likely understate COVID-19 mortality by 50%. Individuals with mental health conditions can be more vulnerable to negative COVID-19 results. Multiple comorbidities, including diabetes, hypertension, chronic obstructive lung disease, and end-stage renal disease, have been found to be risk factors for severe COVID-19 in patients with mental health issues. Poor COVID-19 results are also linked to mental health issues, socioeconomic disadvantage, and limited access to care

(Kim et al., 2018).

**2.6 Other Emerging NCDs:**

In order to gather information on the prevalence of non-communicable diseases (NCDs) in Africa, the World Health Organization Regional Office for Africa (WHO AFRO) commissioned a research to gather and examine published papers on the subject. Anecdotally, there wasn't much literature or information on this topic. Using data from public sources, the study's goal was to determine the prevalence of NCDs in Africa. To find studies that reported on the prevalence rates of NCD risk variables, a literature search was conducted using Google and MEDLINE/PubMed (Verma et al., 2024).

The scarcity of information on NCDs in Africa was validated by the study. It was discovered that the prevalence of hypertension was rising quickly, rising from 3% in rural regions to over 30% in certain metropolitan settings (Verma et al., 2024).

The illness pattern is also influenced by sociocultural factors. People's lifestyles have changed significantly in recent years. As rural regions become more urbanized, lifestyles are changing, potentially increasing exposure to heart disease risk factors. Healthy eating habits and regular exercise are not prevalent. In Nepal, middle-class and upper-class families are increasingly exhibiting sedentary lifestyles, which is a major issue worldwide. The majority of people blame stress for their illness and are unaware of its cause.   
Some individuals believe that it only happens to older people. There are misunderstandings about diets. Some people believe that people are destined to have the illness as part of their religious beliefs (Hoffman et al., n.d.).

In another example is obesity where Geographically, culturally, and religiously, Nepal is a varied nation. A countrywide study conducted in 2006 found that 1.1% of Nepali women were obese and that 7.6% of the population was overweight. According to the first nationally representative research of both sexes conducted in 2007, the prevalence of obesity was 1.7% and overweight was 7.7%(Kim et al., 2018).  
However, since 2000, research on both urban and rural populations has revealed much greater rates of overweight (20–34%) and obese (0.4%–10%) individuals. These societal and demographic shifts have led to a rise in stroke, hypertension, and dyslipidemia in Nepal; research indicates that these conditions are significantly correlated with higher BMI. Obesity, poor fruit and vegetable intake, and high blood pressure are risk factors for acute myocardial infarction in the Nepalese population. Despite the fact that certain research from Nepal has indicated increased prevalence of non-communicable illnesses including diabetes and coronary heart disease (Demaio et al., 2014).

**3.** **Global Trends and Epidemiology**

Today, non-communicable diseases (NCDs) constitute the leading cause of death worldwide. NCDs account for almost 60% of all deaths, with low- and middle-income nations accounting for approximately 80% of these deaths. These nations also have the largest percentage of deaths from NCDs among those under 60. Reducing the primary metabolic risk factors (high blood pressure, elevated cholesterol, overweight, and obesity) and behavioral risk factors (tobacco, alcohol, poor nutrition, and physical inactivity) can avoid a significant portion of NCDs (Demaio et al., 2014).

**3.1 Global Prevalence and Mortality Rates:**

A recent research by *Luke et al.* said that the "risk of premature NCD death" and the relative burden of NCDs for each World Bank income category are calculated using the "WHO Global Health Estimates" mortality data, which is based on techniques in the WHO Global Status Report. All fatalities from cardiovascular disease, all types of cancer, respiratory conditions, and diabetes in individuals between the ages of 30 and 69 were included.

Despite having 82% of the world's population, developing nations account for 82% of all premature NCD deaths worldwide. According to an analysis of relative risk, persons in impoverished nations are 1.5 times more likely than those in high-income nations to die from NCDs before their time. Lower middle-income nations have the greatest incidence of premature NCD deaths (Rincón et al., 2021).

In another study of [***Ilha Niohuru***](https://link.springer.com/chapter/10.1007/978-3-031-19719-2_3#auth-Ilha-Niohuru)***et al*** Infectious infections have been a big problem in Africa in recent years. But today, the focus is gradually moving to non-communicable diseases (NCDs), which are becoming more prevalent in many African countries as a result of a number of factors, including pollution, Westernized diets, a decline in physical activity, urbanization, and rising rates of alcohol and tobacco use. As a nation grows, these increases are to be expected. This chapter examines the major variables that affect the disease burden as well as the changes in the mortality rate, incident rate, and prevalence of infectious diseases and noncommunicable diseases during the last ten years. More than 20% of the world's illness burden is found in Africa (Mahajan et al., n.d.).

Africa's healthcare systems face particular and difficult problems due to a lack of indigenous academic research and resources, frequent natural catastrophes, armed conflicts, and weak economic performance. In 2015, 629,603,271 disability-adjusted life years were lost due to illness in Africa. Approximately US$243 billion in lost income was caused by infectious, maternal, perinatal, and nutritional disorders, accounting for 59.1% (US$144 billion), non-communicable diseases (NCDs) for 30.7% (US$74.6 billion), and injuries for 10.2% (US$24.8 billion) (Verma et al., 2024).

In recent years, the composition of the illness burden in Africa has also evolved. As urbanization and Westernization swept the continent during the last 20 years, NCDs have surpassed infectious illness occurrences. The majority of malaria deaths worldwide (94%) occur in Africa, with 23% occurring in Nigeria, 11% in the Democratic Republic of the Congo, 5% in the United Republic of Tanzania, and 4% in Niger, Mozambique, and Burkina Faso combined. This is despite the fact that the number of malaria deaths in Africa has decreased by nearly 30% from 533,000 in 2010 to 384,000 in 2019 (roughly 10 per 100,000 at risk). Africa accounted for 84% of all malaria fatalities among children under five in 2000 and 67% in 2019 (Verma et al., 2024).

**3.2 Regional and Country-Level Differences**

A study of ***Jinyuan qi et al*** referred that in his study that among 183 countries. He successfully divided the change in premature non-communicable disease (NCD) deaths (occurring at ages 50–69) into demographic change (population growth and population aging) and epidemiological change using United Nations (UN) population data and Global Burden of Disease (GBD) cause-of-death data. This study examined the main factors influencing the differences in premature NCD mortality across 183 countries using fixed-effects models and country-level data from many sources, including the World Bank and the World Health Organization (WHO). Income, education, obesity, alcohol and tobacco use, physical activity, and public health spending are some of the factors. While epidemiological change demonstrated continuous progress on reducing premature NCD mortality, decomposition results showed that demographic variables, such as population expansion and aging, had dramatically increased premature NCD fatalities during the previous 20 years. Differences in NCD mortality between nations may be partially explained by fixed-effects models that take into account all significant factors (Cesare, 2019).

With the exception of smoking, every risk factor in the model exhibited a positive correlation with GDP per capita, indicating that risk factors were more common in higher-income nations. The relationship between the premature NCD mortality rate and socioeconomic development (wealth, educational attainment, and public health investments) is unclear when these risk factors are controlled for in order to predict premature NCD death rates as well as time-invariant and country-invariant variables. While lower-income countries had greater rates of premature NCD mortality and lower rates of decrease from 1990–1995 to 2010–2015, higher-income countries had lower rates of premature NCD mortality and higher rates of decline (Wang & Wang, 2020).

Consequently, throughout the past 20 years, the equity gap in terms of early NCD mortality has grown. A quicker dropping rate of premature NCD mortality death is necessary to counterbalance the NCD fatalities caused by population aging, and global resources must be repurposed to bridge the equity gap in order to fulfill the Sustainable Development Goal (SDG) (Khandelwal, 2018).

**3.3 Socioeconomic and Demographic Patterns:**

According to projections, the proportion of older adults in Ghana would rise from 5.3% of the total population in 2015 to 8.9% by 2050. To react to the health requirements of older persons and allocate resources for the health system, national and local governments will require information on non-communicable diseases (NCDs) in this group. A nationally representative sample of people over 50 years old participated in face-to-face interviews as part of Ghana's 2007–08 Study of Global AGEing and Adult Health (SAGE) Wave . Questions about common health risk factors, diagnosis of ten chronic non-communicable diseases, and general health were posed to each respondent (Herrick, 2022).

Every responder had many anthropometric and health measurements collected, including as height, weight, hip and waist circumferences, and blood pressure (BP). There are 4,724 people over 50 in this study, Osteoarthritis [13.8%, 95% CI 11.7–15.9) and hypertension [14.2%, 95% CI 12.8–15.6) had the greatest incidence of self-reported chronic diseases. When based on blood pressure measurements, the figure for hypertension was 51.1% (95% CI 48.9–53.4). 8.1% (95% CI 7.0–9.2) of the population were current smokers, 2.0 (95% CI 1.5–2.5) were heavy drinkers, 67.9% (95% CI 65.2–70.5) drank too little fruits and vegetables, and 25.7% (95% CI 23.1–28.3) were not physically active. A high-risk waist-to-hip ratio (WHR) was present in 77.6% (95% CI 76.0–79.2) of adults, and nearly 10% (95% CI 8.3–11.1) of people were obese (Nakatani, 2016).

Risks from tobacco and alcohol consumption continued into older age, while insufficient fruit and vegetable intake, low physical activity and obesity increased with increasing age. The patterns of risk factors varied by income quintile, with higher prevalence of obesity and low physical activity in wealthier respondents, and higher prevalence of insufficient fruit and vegetable intake and smoking in lower-income respondents. The multivariate analysis showed that only urban/rural residence and body mass index (BMI) were common determinates of both self-reported and measured hypertension, while all other determinants have differing patterns (Verma et al., 2024).

4. **Risk Factors and Determinants**

The main chronic non-communicable diseases (NCDs) are caused by a group of shared risk factors, the presence or lack of which influences treatment strategies in addition to determining the disease's prevalence and severity. The most economical strategy to control the growing epidemic of chronic NCDs is primary prevention, which is based on population-wide programs that mitigate these common risk factors (Barry et al., 2025).

The results showed that three or more risk factors for chronic NCDs were present in a significant percentage (>70%) of these primarily rural populations. Clustering of chronic NCD risk variables was linked to higher educational attainment, being male, and growing older. Disparities between and within the nation were seen among the various sites. Since the populations under study have a large clustering of risk factors for chronic NCDs, treatments must also be focused on a complete strategy rather than a single component in order to prevent the cumulative impact of these variables over time. The HDSS may be a very useful epidemiological tool in this attempt, and it can function most effectively if it is incorporated into the primary health care system (Srivastava & Sureka, n.d.).

**4.1 Lifestyle-Related Risk Factors:**

In a paper of ***Shashi et al,*** Adults in Nepal's Morang district participated in a cross-sectional survey. In order to gather data, the risk factors for obesity, smoking, alcohol use, consuming insufficient amounts of fruits and vegetables, engaging in insufficient physical activity, and elevated blood pressure were evaluated. Ethnical clearance was acquired. Obesity was the most common risk factor among the 240 individuals in the research (58.3%). 29.1% of individuals had elevated blood pressure, 31.2% had drank alcohol, 41.6% had consumed insufficient fruits and vegetables, 30.4% had engaged in insufficient physical exercise, and 41.6% had smoked. Likewise, there is a statistical correlation between lifestyle risk factors and schooling. It was discovered that current alcohol and tobacco use were statistically related with male participants who were older than 40 (Navya & Ajitha, 2024).

The Package of Essential Non-communicable Diseases (PEN), which was introduced by the Ministry of Health and Population (MoHP) in 2010, aims to detect and manage chronic diseases in the community early by screening, diagnosing, treating, and referring cardiovascular diseases, COPD, cancer, diabetes, and mental health at health posts, primary health care centers, and district hospitals. The initiative is now being implemented in eight districts in Nepal, and the government planned to expand it to 20 other districts in fiscal year 074/075 chosen districts (Pandey et al., 2013).

Another study of ***Hossain et al***, mentioned that the main cause of death globally is non-communicable diseases (NCDs), which, together with infectious illnesses, are increasingly seen as a major public health concern for developing nations like Bangladesh. The study aimed to ascertain the prevalence of NCDs, the distribution of risk variables for NCDs, and the population's awareness of risk factors. Participants in the study included 290 respondents who were at least 18 years old and came from various parts of Bangladesh's Narayanganj area. They answered a standardized questionnaire. Approximately 23.79% of the population had high blood pressure, 12.76% had diabetes, and 7.24% had asthma. According to the respondents' family history, diabetes mellitus (33.10%), hypertension (49.31%), smoking (57.93%), and smokeless tobacco use (58.62%) were all common (Wang & Wang, 2020).

The main worrying finding was that whereas 20.34% and 5.86% of the study population had stage 1 and stage 2 hypertension, respectively, 25.86% of the study population used tobacco products. About 20.62% of the population ate at least one meal outside of their house each day, while 34.83% of the population always added extra salt. Nearly half of the population was overweight based on BMI, while the majority of female respondents were obese based on their waist circumference (Navya & Ajitha, 2024).

Nearly 50% of the research participants did not meet the recommended level of physical exercise, which may have raised their risk of developing NCDs. Although they didn't follow the guidelines, the majority of respondents ate fruits and vegetables five or more days a week. Doctors encouraged a significant number of research participants to alter their lifestyles. However, it can be concluded from the study that although the respondents lacked appropriate practice, they were sufficiently aware of the link between health issues and these modifiable risk factors of NCDs. The prevention and management of risk factors should be the main goals of any reduction efforts. By raising people's knowledge of the ideal and healthful lifestyle, intervention at all societal levels is crucial for prevention (Niohuru, n.d.).

**4.2 Environmental and Occupational Determinants:**

In order to help guide research priorities, we sought to give a comprehensive overview of the state of knowledge regarding occupational exposures and related health effects across a variety of noncommunicable diseases (NCDs) as part of the Exposome Project for Health and Occupational Research on applying the exposome concept to working life health.

In order to find the determinants ***susan et al,*** reviewed that the occupational risk factors for six NCD groups—nonmalignant respiratory diseases, neurodegenerative diseases, cardiovascular/metabolic diseases, mental disorders, musculoskeletal diseases, and cancer—where there is either "limited/inadequate evidence for an association" or "consistent evidence for an association." Expert sessions were used to conduct the evaluation, which was mostly based on systematic reviews with additions from reports, narrative reviews, and original research. Knowledge gaps were then found, for example, due to incomplete data on gender disparities, exposure-response correlations, crucial time windows, interactions, and poor research quality (Kim et al., 2018).

In that reason the result that came forward are more than 200 occupational exposures that have been linked to one or more of the more than 60 NCDs, either consistently or with little to no evidence. Numerous exposures were shown to be potential risk factors for a number of outcomes. Examples include cadmium and diesel engine exhaust, which have a strong correlation with lung cancer but little to no correlation with other cancer locations, respiratory, neurological, and cardiovascular disorders. Additional examples include shift work, physically demanding jobs, and job control and decision freedom. New research is required to validate connections with little or no supporting data. Enhancements in research design, exposure assessment, and case definition may assist clarify the link and guide health-based threshold values for risk variables with consistent evidence (Blackman et al., 2009).

**4.3 Genetic and Biological Factors:**

Globally, the prevalence of non-communicable diseases (NCDs) is rising. Our hypothesis is that environmental influences, such as pollution, lack of physical activity, food, and social hardship, might become "embedded" in human biology. We further speculate that epigenetic modifications, or long-lasting shifts in gene expression patterns, may be partially responsible for the "embedding." We are worried that if these elements are rooted in human DNA, they may have long-term, generational effects on human health, including NCDs (Mahajan et al., n.d.).

In Vietnam, the share of non-communicable diseases (NCDs) in overall morbidity and mortality has increased over the past several decades, reaching around 63% of all fatalities in 2016. This rise may be somewhat attributable to better reporting, but in a nation that is rapidly urbanizing and industrializing, population aging and greater exposure to NCD risk factors are probably major contributors. According to recent studies, a number of modifiable risk factors, such as tobacco use, hazardous drinking, poor diets, and physical inactivity, are primarily responsible for NCDs. Blood pressure (BP), total cholesterol (TC), blood glucose (BG), and overweight and obesity can all rise as a result of these risk factors (Rincón et al., 2021).

As part of an all-encompassing plan to lower NCD morbidity and mortality, the World Health Organization (WHO) has advised that monitoring population levels of and changes in those four pathophysiological markers be prioritized. Research on the risk factors for NCDs in Vietnam has thus far been focused on the wealthy and metropolitan areas of Ha Noi, Ho Chi Minh City, and Can Tho. We examine the associations between overweight and obesity, high blood pressure, elevated blood glucose, and elevated TC, as well as with pertinent sociodemographic and lifestyle variables, using data from a nationally representative population-based survey (Fairall et al., 2016).

**4.4 Social Determinants of Health:**

The underlying social, cultural, political, and environmental circumstances that exist throughout a country like Canada are among the many interrelated elements that influence the incidence of NCDs (Public Health Agency of Canada 2011). While certain risk factors, like age and genetics, are beyond an individual's control, others, like an unhealthy diet, alcohol consumption, tobacco use, and physical inactivity, which are among the main causes of NCD morbidity and mortality globally, are under their control (Yusuf et al. 2004). Tobacco use contributes to almost 6 million fatalities annually and is a risk factor for 6 of the top 8 causes of death worldwide. There is evidence that social health determinants, such as gender, income level and distribution, education, employment, and access to health services, are also linked to an individual's risk of developing an NCD, in addition to the burden of NCDs being attributed to the presence of behavioral risk factors. Behavioral risk factors and other variables are linked to SDOH. For instance, wealth and educational attainment impact dietary quality, define general living circumstances, and have an impact on the degree of alcohol and tobacco use (Kabir et al., n.d.).  
Their stress levels and actions are influenced by their working environment. Each of these elements affects the risk of noncommunicable diseases. Over the last few decades, there has been a growing body of work that focuses. Numerous studies have been carried out worldwide on this SDOH. Since the middle of the 1970s, official policy documents in Canada have promoted the significance of living circumstances on people's health. The significance of SDOH is emphasized in recent studies from the Public Health Agency of Canada and Canada's Chief Public Health Office .These socioeconomic determinants, as opposed to medical care or lifestyle decisions, influence Canadians' health, contribute to the explanation of broader health disparities among Canadians, and influence whether or not they are at higher risk for NCDs. Whether adult-ons, cancer, and cardiovascular disease will affect Canadians. One of the most significant SDOH that influences people's experiences with NCDs is income. Overall living circumstances, dietary quality, and the degree of alcohol and tobacco use are all influenced by income. A person's housing, nutrition, and education are all influenced by their income, and these factors are all linked to NCDs. Adult-onset diabetes and cardiovascular disease are far more prevalent in Canada's low-income population (Kabir et al., n.d.).

**5. Economic and Social Impacts of NCDs:**

India has witnessed phenomenal growth in the frugality since the last decade, with protrusions of a nearly 7%-8% growth rate for the coming time. With a donation of one – sixth of the world population, developments in India touch upon global performance in a significant way. Besides encouraging developments on the overall profitable front, the demographic, epidemiological and social transitions potentially pose serious challenges not only at the ménage position but also at the health system and macroeconomic position. While on one hand, the demographic transition has led to an increase in the aged population has contributed to an increase in the burden of non-communicable conditions (Habib & Saha, 2018).

**5. 1. Burden on healthcare systems:**

Health care in India is largely privatized, both in terms of backing and delivery. Further than 80% of outpatient and 40% of inpatient care is sourced from private sector. India spends about 4.2% of its GDP on health care; with about 30 of this total health expenditure (THE) is contributed by the public sector. It only about 10 of the total populations under cover of any form of health insurance, nearly 90% of the total private health expenditure is born out-of-fund by the homes in 2000, which has reduced to 86.4% in 2009 and is still veritably high. The global rise of non-communicable diseases (NCDs)—including cardiovascular diseases, cancers, diabetes, and chronic respiratory illnesses—has placed an unprecedented burden on healthcare systems worldwide. According to the World Health Organization (2023), NCDs account for over 70% of global deaths, disproportionately affecting low- and middle-income countries. Studies published in The Lancet and BMJ Global Health highlight that the increasing prevalence of NCDs has overwhelmed primary healthcare facilities, strained financial resources, and diverted attention from communicable disease control. The long-term management of NCDs requires continuous access to medications, diagnostic tools, and trained personnel, which many healthcare systems are ill-equipped to sustain. Moreover, as reported in the Journal of the American Medical Association (JAMA), rising hospitalization rates and recurring complications from NCDs have significantly increased healthcare expenditures, forcing policymakers to rethink healthcare financing models. The chronic nature of these diseases means patients often require lifelong care, thereby exacerbating healthcare inequalities and creating long waiting times, especially in public health sectors. Thus, the global NCD epidemic not only challenges health infrastructure but also impacts economic productivity, social stability, and sustainable development objectives (Joshi et al,2006).

**5.2. Productivity and Workface Impacts:**

Productivity is a measure of the effectiveness is a person, the worldwide increase in non-communicable diseases (NCDs) like diabetes, cardiovascular disease, cancer, and chronic respiratory disease has had a staggering negative effect on the productivity of the workforce and economic well-being. NCDs cut labor force participation by inducing long-term disability, absenteeism, and premature death, particularly among working-age adults. For example, research in China and the UK has established that workers with NCDs earn significantly less due to shorter working hours and higher probabilities of unemployment. To compound that, countries like Saudi Arabia lose billions of dollars—both in direct health costs and lost productivity—equating to as much as 4.5% of its GDP. Employers equally take a massive hit, with increasing absenteeism and presenteeism resulting in massive financial losses each year. Severe obesity, cancer, and other NCDs are particularly linked with higher sick leave rates and sub-optimal work performance. These issues disproportionately affect women, who are likely to assume caregiving roles, as the overall societal burden increases due to broken family income and long-term health expenditure. Notably, the economic burden of NCDs is not only endured in high-income nations but increasingly burdening low- and middle-income nations, eroding their development objectives. This problem must be addressed through preventive healthcare, workplace wellness programs, and inter-sectoral action to stem the bulging tide of productivity losses and achieve a healthier, more resilient global workforce (Hoffman et al., n.d.).

Business or country in converting inputs into a useful out-puts. The productive age span of a person is from adult – hood to withdrawal and ranges from 18 times to around 65 times of age depending on, amongst other effects, profession and country. The dimension of productivity greatly relies on the affair and the profitable or social system environment. The focus in this report is macro economic measures related to the labor request include un employment loss in hours worked including full of part time work status change, presentism defined as bloodied performance while at work. Key macroeconomic outcomes are reduction in the able workforce, NCD related health and welfare expenditure and loss of income earned by the productive workface (Wagner & Brath, 2012).

**5.3 Costs to Individuals and Households:**

The growing burden of non-communicable diseases (NCDs) like diabetes, cardiovascular diseases, cancer, and chronic respiratory diseases presents huge challenges to global health systems and exacts huge economic burdens on families and households, especially in low- and middle-income countries (LMICs). Peer-reviewed literature research shows that direct and indirect costs of care for these chronic health conditions have a tendency to outstrip the financial resources of average households. For instance, out-of-pocket costs for patients for one year could reach as high as ₹7,387 for chronic obstructive pulmonary disease (COPD), ₹6,056 for cardiovascular disease, and ₹1,017 for diabetes. These costs not only include medical costs but also non-medical costs like transport, food needs, and care responsibilities. In countries like India, the situation is even worse; even those with some kind of health insurance have to face catastrophic health costs due to hospitalization and prolonged treatment costs. A study in Punjab, for instance, revealed that the cost of an individual inpatient treatment for cardiovascular disease could go up to ₹90,000, tending to force families to sell assets, go deep into debt, or cut back on essentials, including food and education (Amerzadeh et al., 2023).

Moreover, economic cost goes beyond direct expenditure. The majority of individuals with NCDs experience a decline in income and productivity due to disability, recurrent hospitalization, and the long-term nature of the disease. Argentine patients with lung cancer lost 55% of their income and had their daily functioning decline, with 37% of the households spending more than 10% of their income on care—considered catastrophic. For the majority of LMICs, the lack of universal health coverage further exacerbates these conditions, as people are unable to access continuous care or even purchase life-saving medicines. The psychosocial burden of chronic disease, along with poverty, tends to result in abandonment of treatment or delayed treatment, further developing poor health outcomes.The effect on individuals and families is direct and indirect, short-term and long-term. It drives families into poverty, creates financial uncertainty, and erodes social stability and health. In order to combat it, there is a need for integrated health financing strategies, improved access to cheaper drugs, and effective public health interventions in prevention and early detection. If not, the cost of NCDs will go up day by day, and the health of millions of people globally will be at stake (Owusu et al., 2024).

**6. Prevention and control strategies**

**6.1 Primary Prevention: Public Health and Education**

The paradigm of global health is quickly shifting. Disease-control groups are concerned about the sustainability of global initiatives that have significantly decreased the burden of major infections and maternal and child health. This examines the context of health strategies and plans, as well as lessons from the first 15 years of global health in the 21st century. The study discusses the need for a new approach to disease control in Japan, as well as its problems and potential. This study is based on a keynote lecture given at the 2015 Global Health Workshop of the Association of Pacific Rim Universities (APRU), held by Osaka University on October 30-31, 2015 in Osaka, Japan. PHC is based on many key ideas. These guidelines, originally intended for communicable disease prevention, can also serve as a basis for designing NCD policies. This is vital in combating chronic non-communicable diseases.   
Primary prevention should be prioritized, followed by secondary prevention at the appropriate period (Herrick, 2022).  
  
One such preventative strategy is primary care. In 2010, the WHO published a study presenting evidence-based strategies for non-communicable diseases in primary healthcare.

The report emphasized the necessity of integrating treatment within current healthcare systems rather than developing separate programs. This approach aligns with the key ideals of PHC and is increasingly represented in treatments.   
An international non-governmental organization in Cambodia provides combination HIV and diabetes treatment in chronic care clinics. Recognizing that these two chronic illnesses have comparable factors and the healthcare system requires regular monitoring, medication, and long-term follow-up. The organization used the advantages of an integrated strategy. Focusing on chronic diseases, rather than only HIV or diabetes, led to lower community stigma and increased medical compliance (Cesare, 2019).

**6.2 Early Detection and Screening**

In 2010, noncommunicable diseases (NCDs) were responsible for 34.5 million of the 52.8 million fatalities that occurred globally, or two thirds of all deaths. One In the same year, 8 million people died from cancer, 12.9 million from ischemic heart disease and stroke combined, and 1.3 million from diabetes, all of which had notable upward trends.   
In 2016, the Indian government introduced a revised NCD control program with the goal of screening women for breast and cervical cancers and men and women for diabetes, hypertension, and oral cancer (Habib & Saha, 2010).

In Mexico, the Carlos Slim Foundation launched the Integrated Measurement for Early Detection (MIDO) screening program for non-communicable diseases (NCDs) as a component of CASALUD, a suite of digital health services centered on NCD prevention and treatment and healthcare delivery. We examined the screened population's illness profile and assessed MIDO's role in the primary NCDs' continuum of care. The three main causes of mortality in Mexico are non-communicable diseases (NCDs), which include type 2 diabetes mellitus (T2DM), chronic renal disease, and ischemic heart disease. In 2019, 80% (67,535) of all fatalities in the nation were attributable to NCDs. The primary cause of years spent disabled is type 2 diabetes. One High blood pressure, high body mass index (BMI), high fasting plasma glucose, and an inadequate diet have been identified as the primary risk factors for noncommunicable diseases (NCDs), which are responsible for almost half of all deaths and disabilities modified life years (Wang & Wang, 2020).

**6.3 Treatment and Chronic Disease Management**

To effectively address non-communicable diseases (NCD), treatment approaches must involve pharmacological intervention, behavioral modification, patient empowerment, and application of digital health technology. Evidence exists to support the fact that dietary improvement, physical exercise, smoking abstinence, and regulation of metabolic processes are fundamental curative interventions that can lower the risk of NCD.Educative programs, behaviour support, and culturally adapted technologies might assist patients in better managing their own health, thus improving adherence and disease control in South Asia. However, overcoming social and cultural obstacles is the greatest snag to an efficient roll-out. Nurse-led and primary-care interventions, such as South Africa's PC101 intervention, demonstrate that task-shifting can occur by giving more prescribing and chronic care tasks to nurses. These interventions are effective in achieving marginally better gains in disease control but in making safety improved, which indicates that more fidelity in the interventions is necessary (Wagner & Brath, 2012).

In addition, these health technologies such as remote patient monitoring (rpm) and health apps are being widely accepted more and more. For instance, RPM helps in detecting potential complications early and hence decreases the hospitalization rate for illnesses such as heart failure or COPD. Further, healthcare platforms improve access, boost engagement, and decrease expenses. AI-driven treatment planning systems are able to provide precise recommendations for tailored care plans based on the trajectory of the patient's disease—acute or stable.

Overall, the combination of self-management, lifestyle modification, technology, and maximized multidisciplinary team-based care works in obtaining sustained outcomes with chronic treatment and management (Wagner & Brath, 2012).

**6.4 Health System Strengthening**

To address non-communicable diseases (NCDs), WHO health systems need to be reformed urgently in governance, financing, human resources, service delivery, medical supplies, and information technology. As discussed in Pandey's 2017 review, global commitments like the UN Political Declaration and WHO's "Best Buys" require good governance, intersectoral leadership, sustainable finance, equitable access to affordable NCD medicines, and strengthened primary healthcare systems.(Wagner & Brath, 2012)

Systematic reviews in Bangladesh point to wide gaps at the primary healthcare level, including low readiness in infrastructure, disjointed service provision, lack of worker training, and weak health information, which impede the delivery of NCD treatment. NCD service integration into primary health care rests on three enablers, including policy/governance framework and health system readiness, as per a 2023 rapid evaluation published in BMC Health Services Research (Cesare, 2019).

WHO regional discussions in South-East Asia recommend shifting health services to patient-centred chronic care, with a focus on interruptions in treatment continuity and decentralization to community and primary care levels. Health system changes in integrated health systems in Latin America, including preventive, self-care, community rehabilitation, and long-term care, have led to increased health resilience and aging. There is evidence that success in controlling NCD and achieving Universal Health Coverage depends on a patient-centred primary health care model with effective governance, sustainable financing, human resource development, robust information systems, and service integration (Cesare, 2019).

**7. Global and Regional Responses**

There have been vigorous regional and international efforts set in place to combat the spread of NCDs, with particular emphasis on environmental interventions, surveillance, and policy. In a 2025 Scientific Reports review, the burden of NCDs has increased 67% in the World Health Organization (WHO) African Region since 1990. This is a trend that has necessitated urgent investment in key areas such as integrated primary care, stock of key medicines, surveillance systems, and strengthening the health workforce for the achievement of the Sustainable Development Goals (Nakatani, 2016).

The FRESHAIR4 Life project is a case of collaborative implementation research that offers interventions for adolescents to decrease exposure to tobacco smoke and exposure to air pollution in resource-constrained global settings, and simultaneously integrate these activities into national health programs for increased scalability and equity. For this purpose, international policy frameworks are required to act on upstream determinants. On the other hand, global-issue-based evaluations promote the establishment of congruent international policy frameworks to regulate upstream determinants and highlight the value of inclus ive governance that takes into account urban environments, pollution, and nutrition in an effort to encourage a healthy lifestyle and make the prevention of non-communicable diseases (NCDs) easier. These efforts catalyze a paradigm shift: from disease-based to multispectral equity-based approaches that take into account adolescent participation, environmental change, and integration into primary health systems. For this purpose, these approaches, based on environmental policy, community participation, and strong surveillance, are increasingly becoming the standard for global NCD prevention (Beaglehole & Yach, 2003).

**7.1 WHO and UN Agency Role**

The United Nations (UN) and World Health Organization (WHO) agencies are central to global prevention of noncommunicable diseases (NCDs) through governance frameworks promotion, technical assistance, and intersectoral partnership development. WHO, as the coordinating authority for international health, has spearheaded the Global Action Plan for NCDs (2013–2030), which outlines evidence-based "Best Buys" and extended its strategic plan to 2030 through commitment to Sustainable Development Goal 3.4. In parallel, the UN's Inter-Agency Task Force on NCDs (UNIATF), created in 2013, mobilizes 46 UN agencies to support national governments through facilitation of financial arrangements, technical assistance, and promotion of comprehensive governmental and societal approaches to prevention and management of NCDs (Rincón et al., 2021).

Concurrently, initiatives such as FRESHAIR4Life (as published in npj Primary Care Respiratory Medicine) are a prime example of effective research translation to policy by championing leadership in the translation of adolescent-focused interventions to lower tobacco use and air pollution exposure to primary health care in resource-limited settings. In conjunction with disease-specific programs, Nature editorials have advocated global leadership by the World Health Organization (WHO) on the basis that root determinants such as environmental pollution, urbanization, and diet need to be addressed through WHO's unique normative and standard-setting roles. Together, these initiatives demonstrate the WHO and United Nations agencies' pivotal global stewardship in developing strategies, coordinating action, advocating equity, and advocating multisectoral responses to prevent non-communicable disease effectively worldwide (Navya & Ajitha, 2024).

**7.2 National Policy Frameworks**

To address the burden of NCDs, robust national policy platforms are imperative. Recent studies have defined some of the most important design elements, such as multi-sector governance, legislative action with an overall focus, fiscal control, and alignment with internationally agreed best practice. A recent study in Scientific Reports suggests that Iran's fast-declining NCD risk profiles could be effectively controlled by implementing certain fiscal interventions, such as tobacco taxes, sugar-sweetened beverage tariffs, and restrictions on trans fats, alongside community-based platforms and programs with a focus on improved health literacy. From 2001 to 2016, Iran witnessed alarming increases in rates of obesity (70%), physical inactivity (116.6%), hypertension (29%), and diabetes (26.1%). The national response to NCDs' action plan in Iran is aligned with the World Health Organization's targets to decrease premature deaths by 30% by 2030, emphasizing the necessity of fiscal actions, context-specific communication, and adaptive governance styles (Kabir et al., n.d.).

The foregoing research suggests that efficiency is sustained through ongoing adaptation to emerging challenges, such as economic sanctions and cultural resistance, and changes in population demographics. Regulation simply for the sake of regulation is not enough. Iran's regulatory control over nutrition, tracking trans-fat, sugar, and salt through a "red/amber/green" policy audit system, also shows that visionary governmental leadership and business sector participation make policies aimed at health more effective on public health (Kim et al., 2018).

A mixed-methods assessment of the WHO "Best Buys" indicators found Ghana scored between 5.0 and 9.0 out of 19 between 2015 and 2022, indicating gaps in alcohol taxation and unhealthy diet practice management. The Ghana data indicate serious challenges in implementation. Overriding hindrances identified are weak governance arrangements, weak enforcement strategies, and weak intersectoral coordination; these in turn imply that successful policies will have to be supported by effective governance combined with sufficient financial and human resource planning (Rincón et al., 2021).

Besides, integrated policy strategies such as Health in All Policies (HiAP), recognized in countries such as Finland, South Australia, Canada, and France, illustrate the success of multisectoral policy interventions in addressing health considerations across sectors such as urban planning, transport, agriculture, and education. An exemplary multisectoral, policy-based intervention is the Finnish North Karelia Project, which illustrated the success of policy-based, multisectoral interventions by recording an 82% reduction in cardiac deaths among men and an 84% reduction among women in 40 years through diet-related alterations at the community and public health intervention levels and at the national level. Strong evidence collectively illustrate that successful national non-communicable disease (NCD) systems employ financial levers (in the form of taxation and subsidies), enforceable regulations (such as sugar, tobacco, and marketing caps), intergovernmental coordination, and health system connectivity. It is essential to construct governance that is able to respond to evolving economic, social, and demographic threats. Consistency is provided when national programs comply with World Health Organization (WHO) principles, while effectiveness is provided through stringent accountability measures, continuous surveillance, and continuous improvement (Verma et al., 2024).

**7.3 Community and Non-Government Initiatives**

High-impact journals are now more aware of the contributions of community-based projects and non-governmental organizations (NGOs) to the battle against non-communicable diseases (NCDs), in particular in areas where official health care is overwhelmed. The FRESHAIR4Life initiative, featured in npj Primary Care Respiratory Medicine, prepares economically disadvantaged adolescents to minimize their exposure to tobacco smoke and air pollution through co-developed, locally applicable modules. The deployment of these interventions within established primary health care systems is promoting early adoption rates. A Scientific Reports report from Iran points to the critical role played by autonomous NGOs and community councils in the prevention of NCDs. Multicultural networks of local leaders, ranging from religious and sports personalities, reinforce health messages, including the claim that "social relationships greatly influence our behaviour" and a call for investment in social capital to boost public health interventions (Navya & Ajitha, 2024).

In Brazil, community outreach interventions for diabetes and hypertension control had clinically relevant impacts: after six months, about 16.9% of people with diabetes and 38.8% of people with hypertension reached control targets (BP < 140/90 mmHg; HbA1c < 7%). Qualitative findings also show the critical role of community health workers (CHWs) and non-governmental organizations (NGOs) in the implementation of over 300 "NCD corners" in Bangladesh, facilitating early screening, referral, education, and follow-up care. While few programs have been rigorously assessed, reviews in low- and middle-income contexts report that locally delivered, participatory interventions—integrating peer support, community engagement, and environmental strategies—enhance program outreach and sustainability. Among the leading examples of internationally scalable obesity prevention programs is the EPODE International Network, which reduced overweight in children by 22% in Belgium after municipality-led initiatives that brought together local governments, educational systems, and non-governmental organizations.In general, this collection of works presents the significance of community empowerment, context-specific interventions, multi-stakeholder collaborations, and evidence-based assessment incorporated into broader health systems in successful NCD prevention (Blackman et al., 2009).

**8. Challenges and Barriers**

There are a number of barriers to non-communicable disease (NCD) reduction ranging from those at the infrastructure, government, and societal awareness levels to those at the individual level. Iran's Scientific Reports qualitative study presents gaps in law, infrastructure, education, and health literacy and five main clusters of difficulty: dense policy environments, poor healthcare reform, and poor individual/community empowerment. System-level barriers to prompt NCD response in India are characterized by Nature India as being under-resourced monitoring systems, poor access to pharmacological and diagnostic services, and the lack of trained human resources. Poor surveillance systems and erratic clinical data collection converge to hinder evidence-based NCD care planning in sub-Saharan countries. Socio-behavioural determinants also exert a significant influence. Low- and middle-income environment studies show that chronic barriers are disorganized multisectoral collaboration, poor health literacy, poor illness knowledge, and poor feedback mechanisms.

Physical and economic barriers exist as well, including unsafe exercise areas, unstable transport, high out-of-pocket costs, shame in obtaining care, and top-down program designs that fail to engage the community. Low health spending and outdated primary care systems across Africa contribute to the NCD burden and result in premature mortality due to the limited availability of services. Overall, behavioural, systemic, structural, and economical barriers are interlinked to NCD prevention. Strategic investments in surveillance, equitable health care access, community engagement, multisectoral coordination, and adaptive policies backed by robust data systems will be required to bridge these barriers.

**8.1 Accessibility and Health Disparities**

The global response to non-communicable diseases (NCDs) is greatly undermined by health disparities because disadvantaged groups are more likely to be exposed to increased risk factors, as well as have less access to prevention, diagnosis, and treatment. Age-standardized death from diabetes mellitus, cancer, chronic respiratory diseases, and cardiovascular disease remains disproportionately high in the WHO African Region. The reason is that there is a lack of monitoring capacities and unequal access to required drugs in countries. Young adults in low- and middle-income countries (LMICs) are also characterized by complex socioeconomic profiles. For example, in Kenya, after controlling for alcohol and smoking, middle socioeconomic status (SES) groups had over double the risk of developing noncommunicable diseases (NCDs) compared to individuals in the lowest SES groups (OR 2.493). This indicates how the risk of NCDs may be limited within marginalized strata even in more general developing settings.

Qualitative information from Scientific Reports highlights that the implementation of equitable preventive actions in Iran is challenged by legislative disintegration, poor infrastructure, low social empowerment rates, and poorly funded health systems. Moreover, disparities in the European Economic Area (EEA) persist. Utilizing the Gini coefficient, a study reveals that the impact of non-communicable disease (NCD) on disability-adjusted life years (DALYs) is highly heterogeneous across countries with maximum inter-country differences observed in cardiovascular, respiratory, and diabetes disorders.

Structural and behavioral determinants such as low health literacy, social stigma, high out-of-pocket expenses, and environment-induced vulnerabilities—such as poor access to exercise facilities, poor diets, and urban planning that encourages sedentary behavior—form the determinants of these disparities. Disaster disruptions further escalate this condition. For example, in the Pacific Islands, where non-communicable diseases (NCDs) account for about 75% of preventable deaths, cyclone-induced dependence on imported processed foods has consolidated poor dietary habits, hence illustrating how environmental disruptions exacerbate disparities (theguardian.com). Although accountable for millions of preventable deaths every year, air pollution—a major cause of NCDs—is allocated less than 1% of global health expenditure, especially in low- and middle-income countries (LMICs). These research findings identify the expanding access disparities that have arisen as a result of the globalization and nutrition transition, particularly in low-income communities with problems related to the availability and accessibility of healthy food.(Beaglehole & Yach, 2003)

A multi-dimension strategy must be employed to address these inequalities, such as investment in diagnostics and surveillance, scaling up UHC in order to reduce the costs, improving health literacy and community capacity, and integrating socioeconomic and environmental policy programs—such as food system regulation and urban infrastructure. The world's health community can ensure that NCD prevention is accessible to the most at-risk and creates stronger and more equitable health systems by addressing inequalities between SES groups, between geographical areas, and along social gradients (Khandelwal, 2018).

**8.2 Policy and Funding Gaps**

Despite explicit international obligations to address non-communicable diseases (NCDs), successful policy action and sufficient funding have trailed well behind. Although WHO-endorsed "Best Buy" policies grew more popular through 2019, their implementation decelerated during the COVID-19 pandemic and was less than 50% globally in 2021, according to a review in Nature Medicine in 2023. This is especially true for interventions like alcohol control and physical activity promotion. Strong global leadership and sustained finance to address upstream determinants have long been advocated by Nature editorials, but budget prioritization is low, with less than a minor percentage of health aid going into activities associated with lifestyles or air pollution (Demaio et al., 2014).

According to an evaluation by 2021 Globalization & Health, 82% of global NCD aid in 2019 originated from private philanthropies and bilateral donors, and only 0.48% of U.S. and 1.66% of U.K. health aid reached NCDs. This suggests a key misalignment between global pledges and payments. In line with this, a Lancet estimate estimated that LMICs would need an additional US$18 billion annually between 2023 and 2030 to implement cost-effective packages of NCDs; however, in 2021, direct development assistance represented just 0.11% of total aid. To compound the issue, a BMJ Global Health analysis determined that the weakest component of WHO's Global Action Plan is research, the foundation of adaptive policy, putting evidence-based budgeting at risk. Analysis at the national level, including Ghana's implementation score (5–9 out of 19), reveals persistent gaps in multi-sector coordination, PHC decentralization, public education, and enforcement (Budreviciute et al., 2020).

**8.3 Stigmatisation and Cultural Barriers**

Prevention, diagnosis, and treatment of non-communicable diseases (NCDs) are severely undermined by stigma and cultural beliefs. People with NCDs are blamed, shamed, and feared, and this leads to enacted stigma (discrimination) and felt stigma (internalized shame). These result in interference with self-care activities, delays in seeking help, and worsening of mental health outcomes, as indicated by a systematic review of cancers, cardiovascular diseases, chronic respiratory diseases, and diabetes. Cultural beliefs exacerbate the situation. Findings from qualitative studies in sub-Saharan Africa indicate a preference for traditional healing over biomedical treatment, which is prompted by common beliefs in supernatural causes such as witchcraft or spiritual punishment. This not only causes delays in diagnosis but also continuity of care disruption.Individuals with type 1 diabetes and other diseases also share difficulty in coming to terms with their diagnosis and receiving psychological treatment. Furthermore, healthcare centers enable stigma through unprofessional interactions between providers and patients, long waiting times, and poor communication (Wang & Wang, 2020).

Structural stigma both at the government and societal levels, by means of discriminatory laws, uneven resource allocation, and deeply rooted negative attitudes, also undermines availability of effective preventive intervention and treatment. Language disparities in rural South Africa make it difficult for older adults with hypertension and diabetes to fully comprehend health-related messages, which results in misconceptions regarding the etiology and management of these conditions. Furthermore, long-standing stigma for mental illness that has been linked to other chronic illnesses worsens challenges like suboptimal integration into primary care, clinician incompetence, and avoidance behavior among adults, adolescents, and children (Nakatani, 2016).

**9. Future directions and Recommendations :**

In order to effectively control the global epidemic of non-communicable diseases (NCDs), future actions must be aimed at a multi-sectoral and preventive approach. Journals like The Lancet emphasize the urgent inclusion of NCD prevention into primary health care systems for early detection and long-term care. Policy actions like taxation of tobacco, alcohol, and beverages with added sugars must be given priority by governments, as recommended in WHO reports. Promoting health education, especially in school and workplaces, is crucial in order to enhance awareness for risk factors like unhealthy diet, physical inactivity, and substance use (Habib & Saha, 2010).

Digital health technologies like telemedicine and mobile health apps can be used for disease surveillance and patient empowerment, especially in low- and middle-income countries, as reported in the BMJ. Furthermore, appropriate data collection and global coordination are required to monitor NCD trends and evaluate interventions. Investments in research must also be given priority for region-specific risk factors and cost-effective treatment pathways. Overall, an integrated effort by governments, civil society, health professionals, and international agencies is required to arrest the tide of NCDs in the world. Adoption of the solid china procedure will effectively drive the implementation of measured and support assessment. China anticipation and control plans for behavioral chance elements of NCDs must be advance reinforced and supplemented to meet the request side (benefit clients); the present strategies and activities with solid congruity, wide scope, coordinate work, and self evident impact must be further progresses to ensure the realization of the goals of the healthy china methodology (Herrick, 2022).

All the relevant departments and districts should set up supervision and evaluation components, and incorporate the implementation of plans as an imperative thing subject to government supervision so as to drive the implementation and fulfillment of different plans, goals, and measured. The state ought to too frequently organize e valuations on the usage advance and effects of the plans. NCDs avoidance and control activities focusing on the different stages of the full life cycle ought to be advanced. Exterior of hereditary variables, NCD hazard factors show a slow collection handle. Exceedingly targeted strategies, measures, advances, strategies, and humanistic and mental care will be required throughout the life cycle, from the maternal nutrition And birth weight in early life, to the development of healthy ways of life in childhood and youth, the promotion of solid behaviors in occupational groups, and to the all round care for the elderly and patients with NCDs. China has lifted the life course health to the status of a national technique. The country shall proceed to effectively investigate and progress the establishment of a comprehensive health implementation framework covering the total life cycle, which not as it were reflects the top level plan, but also ensure judgment and coherence (Tian et al, 2020).

**9.1. Interegated approaches to health:**

Non-communicable diseases (NCDs) now account for about 74% of all deaths worldwide annually, as stated by the World Health Organization (2022), with a disproportionate impact in low- and middle-income nations. In response, integrated approaches to health are increasingly considered at the heart of addressing the multifactorial, complex nature of NCDs. Integrated approaches transcend isolated clinical interventions and encompass cross-sectoral interventions with health, education, environment, and finance. The Lancet Commission on NCDs and Injuries, 2020 highlighted that action in the future must, first and foremost, focus on integrating NCD prevention and care into primary health systems and addressing determinants in the uptake, such as urbanization, air pollution, and unhealthy diet. High priority is also given to taking a life-course approach, with early childhood interventions, school health promotion, and workplace wellness programs coordinated at the national policy level (Owusu et al., 2024).

Policy coherence across government departments, as championed by BMJ Global Health (2019), is at the heart, especially in coordinating trade, agriculture, and fiscal policies with public health priorities. Community-based care models, task-shifting to non-physician health workers, and mobile health platforms have been found to have high potential in enhancing access and continuity of care, particularly in resource-poor settings. WHO's Global Action Plan (2013–2030) also envisions universal health coverage with equitable access to NCD services, underpinned by strong data systems and stable financing arrangements. Integrated responses in the future must be equity-oriented, digitally empowered, and people-centered primary care anchored to ensure resilience against future health threats and minimize the global NCD burden.

**9.2. Technology and Innovations' Role:**

Technological innovation and medical science are taking a revolutionary leap in responding to the global surge of non-communicable diseases (NCDs) like cardiovascular diseases, diabetes, cancer, and chronic respiratory diseases. The Lancet and WHO reports mention digital health technologies like mobile health (mHealth) apps, wearable health devices, and telemedicine platforms that enable early diagnosis, personalized treatment, and ongoing monitoring of NCDs, particularly in low- and middle-income countries. Artificial intelligence (AI) is being applied in clinical decision support systems for predicting risk factors and optimizing treatment protocols (Budreviciute et al., 2020).

As an example, AI-powered retinal scanning can diagnose diabetic retinopathy at its early stages. The Journal of Medical Internet Research also mentions the way cloud-based data analytics and remote monitoring devices enable doctors to monitor patient health real time and react before complications set in. Along with this, electronic health records (EHRs) and big data enable public health professionals to track trends and adopt more effective NCD prevention strategies. Future interventions suggest scaling up such innovations with adequate regulatory frameworks, incorporating digital literacy into healthcare training, and providing equitable access to technology. Prioritizing community-based digital health training and partnerships between tech companies and healthcare systems will be the path forward to fill gaps and develop sustainable models to respond to the increasing burden of NCDs worldwide (Budreviciute et al., 2020).

**9.3. Strengthening global corporation:**

To effectively counter the increasing global burden of non-communicable diseases (NCDs), future directions need to give priority to increased international cooperation, particularly in low- and middle-income countries where the health systems are already strained. The WHO Bulletin reports that the WHO states that strengthening international partnerships between governments, NGOs, academia, and the private sector is key to accelerating prevention, early detection, and treatment interventions. The Lancet Global Health journal emphasizes the necessity for global surveillance systems and data platforms for monitoring risk factors like tobacco consumption, unhealthy diet, physical inactivity, and alcohol use. Additionally, policy convergence across borders—most notably in trade, food labelling, and taxation—can meaningfully curb the global rise of NCDs. Global Health Action encourages universal health coverage promotion, integrated with NCD services at the primary level of health care, to enable equitable access to care. Future directions need to incorporate capacity development, technology transfer, and sustainable funding mechanisms to enable countries to implement evidence-based interventions. Finally, the global response to NCDs needs to be grounded in a rights-based, equity-oriented framework that encourages shared responsibility and mutual accountability among countries (Kim et al., 2018).

**10. Conclusion:**

Non-communicable diseases (NCDs) have emerged as the leading global cause of death, disproportionately affecting low- and middle-income countries and threatening decades of health and development progress. Addressing this crisis requires an integrated, equity-driven approach focused on prevention, public health system reform, and social determinants of health. Key strategies include strengthening primary care, improving health literacy, expanding culturally responsive care, and addressing stigma. Multisectoral collaboration, increased domestic and international investment, and policy accountability through frameworks like UHC and the SDGs are essential. Without urgent, sustained action, NCDs will continue to deepen global health disparities and strain economies.

References:

Amerzadeh, M., Takian, A., Pouraram, H., Sari, A. A., & Ostovar, A. (2023). Policy analysis of nutrition stewardship for prevention and control of Non ‑ communicable diseases in Iran. *BMC Health Services Research*, 1–8. https://doi.org/10.1186/s12913-023-09087-2

Barry, A., Impouma, B., Wolfe, C. M., Campos, A., Richards, N. C., Kalu, A., Diallo, C. B., Barango, P., & Farham, B. (2025). *Non-communicable diseases in the WHO African region : analysis of risk factors , mortality , and responses based on WHO data*.

Beaglehole, R., & Yach, D. (2003). *Public health Globalisation and the prevention and control of non-communicable disease : the neglected chronic diseases of adults*. *362*, 903–908.

Blackman, S. M., Hsu, S., Ritter, S. E., Naughton, K. M., Wright, F. A., Drumm, M. L., Knowles, M. R., & Cutting, G. R. (2009). *A susceptibility gene for type 2 diabetes confers substantial risk for diabetes complicating cystic fibrosis*. 1858–1865. https://doi.org/10.1007/s00125-009-1436-2

Budreviciute, A., Damiati, S., Sabir, D. K., & Onder, K. (2020). *Management and Prevention Strategies for Non-communicable Diseases ( NCDs ) and Their Risk Factors*. *8*(November), 1–11. https://doi.org/10.3389/fpubh.2020.574111

Cesare, M. Di. (2019). *12th European Public Health Conference 2019–01: Parallel Programme 77*. 2019.

Demaio, A. R., Nielsen, K. K., Tersbøl, B. P., Kallestrup, P., Meyrowitsch, D. W., Demaio, A. R., Nielsen, K. K., & Tersbøl, B. P. (2014). *communicable disease*. *9716*. https://doi.org/10.3402/gha.v7.24504

Factor, S. I., Kumar, A., & Lalotra, A. (2022). *A REVIEW ARTICLE ON “ ROLE OF AYURVEDA BASED DIET & LIFESTYLE IN PREVENTION & MANAGEMENT OF COVID- 19 .”* *8*(1), 106–110.

Fairall, L. R., Folb, N., Timmerman, V., Lombard, C., Steyn, K., Bachmann, M. O., Bateman, E. D., Lund, C., Cornick, R., Faris, G., Gaziano, T., Georgeu-pepper, D., Zwarenstein, M., & Levitt, S. (2016). *Educational Outreach with an Integrated Clinical Tool for Nurse-Led Non- communicable Chronic Disease Management in Primary Care in South Africa : A Pragmatic Cluster Randomised Controlled Trial*. https://doi.org/10.1371/journal.pmed.1002178

Farzadfar, F., Yousefi, M., Khounigh, A. J., Khorrami, Z., Haghdoost, A., & Shadmani, F. K. (2024). Trend and projection of non ‑ communicable diseases risk factors in Iran from 2001 to 2030. *Scientific Reports*, 1–11. https://doi.org/10.1038/s41598-024-58629-z

Habib, S. H., & Saha, S. (2010). Diabetes & Metabolic Syndrome : Clinical Research & Reviews Burden of non-communicable disease : Global overview. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, *4*(1), 41–47. https://doi.org/10.1016/j.dsx.2008.04.005

Habib, S. H., & Saha, S. (2018). *Burden of non-communicable disease : Global overview Diabetes & Metabolic Syndrome : Clinical Research & Reviews Burden of non-communicable disease : Global overview*. *March 2010*. https://doi.org/10.1016/j.dsx.2008.04.005

Herrick, C. (2022). SSM - Qualitative Research in Health Clean problems : Simplicity , complexity and the contemporary history of global noncommunicable disease prioritisation. *SSM - Qualitative Research in Health*, *2*(March), 100068. https://doi.org/10.1016/j.ssmqr.2022.100068

Hoffman, C. M., Versluis, A., Chirila, S., Kirenga, B. J., Khan, A., Saeed, S., Sooronbaev, T., Tsiligianni, I., Arvind, D. K., Bauld, L. C., Brand, F. A. Van Den, Chavannes, N. H., & Pinnock, H. (n.d.). The FRESHAIR4Life study : Global implementation research on non-communicable disease prevention targeting adolescents ’ exposure to tobacco and air pollution in disadvantaged populations. *Npj Primary Care Respiratory Medicine*. https://doi.org/10.1038/s41533-024-00367-w

Kabir, A., Karim, N., & Billah, B. (n.d.). *Health system challenges and opportunities in organizing non-communicable diseases services delivery at primary healthcare level in Bangladesh : A qualitative study*.

Khandelwal, V. (2018). *NON-COMMUNICABLE DISEASES*. *January 2013*. https://doi.org/10.5455/ijmsph.2013.060720131

Kim, M., Kim, T., Lee, D., Yook, J., Hong, Y., Lee, S., & Yoon, J. (2018). *Mental disorders among workers in the healthcare industry : 2014 national health insurance data*. 1–8.

Mahajan, M., Naik, N., Jain, K., Patira, N., & Prasad, S. (n.d.). *Study of Knowledge , Attitudes , and Practices Toward Risk Factors and Early Detection of Noncommunicable Diseases Among Rural Women in India abstract*. https://doi.org/10.1200/JGO.18.00181

Nakatani, H. (2016). *Global Strategies for the Prevention and Control of Infectious Diseases and Non-Communicable Diseases*. *26*(4), 171–178. https://doi.org/10.2188/jea.JE20160010

Navya, M., & Ajitha, K. (2024). *International Journal of Ayurveda and Pharma Research*. *12*(11), 41–47.

Niohuru, I. (n.d.). *Healthcare and Disease Burden in Africa*.

Owusu, M. F., Adu, J., Gyamfi, S., Martin-yeboah, E., Dortey, B. A., & Martin-yeboah, E. (2024). *Perspectives Tackling the non-communicable disease epidemic : a framework for policy action in low- and middle- income countries*.

Pandey, M. M., Rastogi, S., & Rawat, A. K. S. (2013). *Indian Traditional Ayurvedic System of Medicine and Nutritional Supplementation*. *2013*.

Rincón, H. G.-, Montoya, A., Saucedo-, R., Martínez-, L. A., Rosales, R. M.-, Suárez-, L., Razo, C., Lozano, R., & Tapia-, R. (2021). *Integrated Measurement for Early Detection ( MIDO ) as a digital strategy for timely assessment of non- ­ communicable disease profiles and factors associated with unawareness and control : a retrospective observational study in primary healthcare facilit*. 1–10. https://doi.org/10.1136/bmjopen-2021-049836

Srivastava, S., & Sureka, R. K. (n.d.). *Efficacy of Ayurveda in the Prevention of Lifestyle Diseases or Non-Communicable Diseases ( NCDs )*. https://doi.org/10.21760/jaims.9.8.18

Verma, S. K., Pandey, M., Sharma, A., & Singh, D. (2024). Exploring Ayurveda : principles and their application in modern medicine. *Bulletin of the National Research Centre*. https://doi.org/10.1186/s42269-024-01231-0

Wagner, K., & Brath, H. (2012). A global view on the development of non communicable diseases. *Preventive Medicine*, *54*, S38–S41. https://doi.org/10.1016/j.ypmed.2011.11.012

Wang, Y., & Wang, J. (2020). *Modelling and prediction of global non- communicable diseases*. 1–13.