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Epidemiology; risk factors and prevention strategies for cardiovascular disease and obesity in Pakistan

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Abstract: Cardiovascular diseases (CVDs) and obesity are leading causes of morbidity and mortality worldwide. Over the past several decades, while CVD-related deaths have declined in high-income countries, they have significantly increased in low- and middle-income countries, including Pakistan, which bears

nearly 80% of the global burden. Obesity, a key modifiable risk factor for CVDs, has emerged as a serious public health challenge in Pakistan due to sedentary lifestyles, unhealthy diets, and lack of awareness. Despite the growing prevalence of obesity and its strong association with cardiovascular diseases, minimal attention has been given to preventive strategies in South Asia, particularly in Pakistan. Additionally, economic and political instability further exacerbates the rising trends of CVDs and obesity in the country. Practical efforts are required to enhance the understanding of risk factors such as poor diet, physical inactivity, and tobacco use while promoting obesity prevention through targeted interventions. This paper reviews the major modifiable risk factors in Pakistan, highlights available preventive services, and discusses evidence-based strategies for reducing the burden of both cardiovascular diseases and obesity at the population level.

Keywords: Epidemiology, Cardiovascular Disease (CVD), Risk Factors, Obesity, Pakistan, Recommendations.

Introduction: The latest evidence has revealed that globally, cardiovascular disease (CVD) is the leading cause of death, and around 80% to 86% of these deaths occur in low- and middle-income countries (LMICs). From around 16 million deaths that occur due to non-communicable diseases (NCDs), 82% are in LMICs and 37% of these deaths are related to CVD. [1]

However, there is a substantial variation in the mortality rates, according to sex, age, ethnicity, socio-economic status (SES), and geographical location. The worldwide CVD-related death rates for men (age less than 70 years) are three times higher than for women and double in low socio-economical areas than in affluent areas. [2]

Almost all South Asian countries, namely Pakistan, Sri Lanka, Bangladesh, India, and Nepal, constitute more than a quarter of the LMICs and are considered to be at a higher risk of coronary heart diseases (CHD) and any other part of the globe. A large population-based cohort study verified the comparatively less incidence of CVD in South Asian patients than in Chinese and Canadian patients. [3] Various factors such as social, biological, and psychological issues raise the CVD burden of LMICs. The INTERHEART study-case-control study conducted in 52 countries worldwide across various regions including Europe, Asia, Middle East, Australasia, Africa, and North and South America has identified nine such modifiable candidates for triggering acute myocardial infarction (AMI), which

leads to CVD. These modifiable risk factors include blood pressure, diabetes, cigarette smoking, abdominal obesity, psychosocial index, physical inactivity, high intake of fruits and vegetables, Apolipoprotein B/Apolipoprotein A1 (ApoB/ApoA1) metabolism, and high intake of alcohol. Figure 1.[4]

Numerous research discussing the risk factors of CVD have been done, however, there is lack of literature in Pakistani setting. The Pakistan health research council in 2016 found that in Pakistan, the risk factors for NCDs is growing. [3] Therefore, this study shows the epidemiologic transition of CVD in Pakistan; it evaluates the primary contributors in Pakistan; it focusses on the contemporary anticipatory services accessible in the nation. The last portion of the study emphasises the best feasible approaches of encouraging the adjustments of risk-factors in the Pakistani population.

METHODOLOGY

Literature was searched from PubMed, Medline and Google Scholar. Only English language articles from the 2010-2023 period were considered. We included only published articles with adequate sample size, sampling technique and relevance to CVD-related risk factors. Various keywords were used to extract the required information from the databases, like cardiovascular disease, cardiac disease, causes, CVD risk factors, obesity, hypertension, diabetes, and preventive strategies and recommendations. Overall, 200 abstracts were read and 46 references were included in the final review as these were directly related to CVD risk factors.

CVD in Pakistan: An Epidemiologic Transition

Pakistan has been facing a heaving burden of both communicable and non-communicable diseases. According to a 2013 report on the global burden of disease, it is estimated that 30% of worldwide deaths are due directly to CVD.[5] In this particular disease changing paradigm, it bears several implications for capacity and resource allocation for health service instituted. Some of the estimates about common illness among the Pakistani adult population consist of 41 percent hypertension, 21 percent tobacco use, 17.3 percent high cholesterol, 21 percent obesity, 10 percent diabetes mellitus (DM), and dyslipidemia (males, 34%; females, 49%), and 2.8 percent stroke. [6] Due to rising estimates, this can be said to be increasing in the country, where the rates of NCDs and communicable diseases approximate each other. The distribution of modifiable risk factors for CVD in Pakistan is changing due to this epidemiologic transition increases levels of stress, unhealthy eating habits, sedentary lifestyles, and increases in smoking rates. [4]

Limited Epidemiological Data on Cardiovascular Disease Risk Factors in Pakistan

In Pakistan, data on heart disease prevalence is limited. Two population studies conducted in 2013 and 2019 estimated the prevalence of heart disease to range between 0% and 3.7% in rural and urban areas. The 2019 National Health Survey of Pakistan (NHSP) highlighted a high incidence of cardiovascular disease (CVD) risk factors in both rural and urban populations.[7] Other small-scale studies have also reported a high prevalence of CVD risk factors; however, these studies are constrained by limited sample sizes and reliance on self-reported data. A cross-sectional study conducted in a Karachi hospital identified key CVD risk factors, including a family history of ischemic heart disease (IHD), age, body mass index (BMI), smoking, sedentary lifestyle, total cholesterol, diabetes mellitus (DM), low-density lipoprotein (LDL), high-density lipoprotein (HDL), and triglycerides.[8] The study found significant associations between coronary artery disease (CAD) and high cholesterol [odds ratio (OR) = 1.6 (1.04, 2.24)], age over 40 years [OR = 4.4 (2.32, 8.5)], BMI over 29.9 kg/m² [OR = 1.7 (1.01, 2.71)], diabetes [OR = 2.03 (1.24, 3.3)], and a positive family history of IHD. However, due to the cross-sectional design and convenient sampling methods used, these findings may not be generalizable to rural populations in Pakistan.

Gender Differences in Cardiovascular Disease Risk and Management

Cardiovascular disease for men and women differs in the states of risk factors, presenting symptoms, diagnosis, and management. While the timeline for development of cardiovascular disease (CVD) is affected in women through other risk factors, such as pregnancy complications, menopause, and polycystic ovary syndrome (PCOS), men are generally affected by CVDs at younger age due to inherently high levels of blood pressure and cholesterol.[9] Women, traditionally subjected to atypical heart attack symptoms of nausea, fatigue, and dizziness, have in these instances found themselves misdiagnosed and inappropriately treated. Furthermore, research shows that women are offered fewer interventions and medications with equal or greater benefits when compared to men.[10] Similar challenges are faced in the case of Pakistani women, who contend with multifactorial cultural and socioeconomic limitations in

obtaining timely healthcare.

Correcting these imbalances would require gender-sensitive healthcare policies, better awareness, and equal access to early diagnosis and treatment. Identification of gender-specific clinical manifestations and risk factors of CVD may improve these challenges to prevention strategies and eventually lead to a reduction in death. [7]

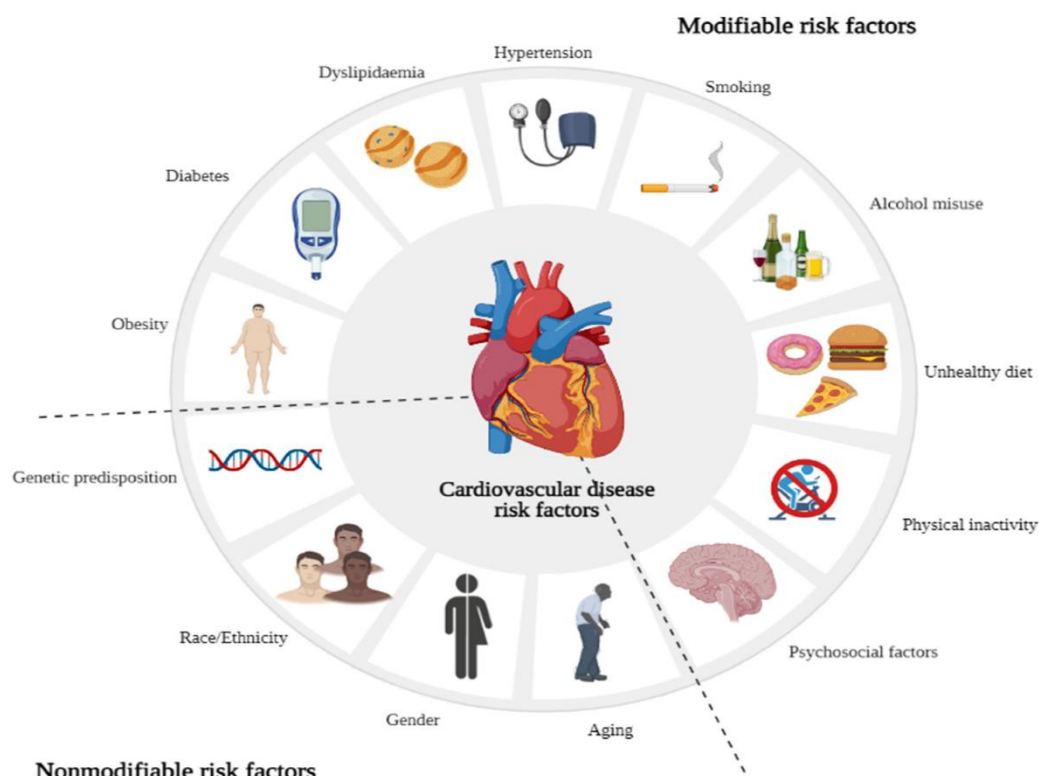
Economic Disparities and Illiteracy: Overcoming the Twin Barriers of Poverty

Pakistan faces significant challenges in alleviating poverty and bridging the socio-economic divide between different segments of society. The Multidimensional Poverty Index indicates that the country's poverty rate declined from 55% in 2004 to 39% in 2015. The literacy rate varies widely, ranging from 97% in Islamabad to as low as 20% in District Kohlu.[11] A majority of the population (60%-65%) resides in rural areas, but there is a growing trend of migration to urban centers. According to a national vision report, urbanization is expected to accelerate, making Pakistan predominantly urban by 2030.[12] This shift will place considerable pressure on essential resources, leading to challenges such as inadequate access to clean drinking water, food insecurity, and a lack of affordable, quality primary healthcare services. Additionally, weak social protection systems, infrastructure deficits particularly in transportation, energy, and irrigation—and inefficiencies in social service delivery further exacerbate these issues. Moreover, ongoing structural adjustments and policy changes in the healthcare system have contributed to social inequalities and negatively impacted health outcomes on a global scale.[13]

Burden of Risk factors in Pakistan

Examination of the risk factors to reduce the CVD burden and mortality is important to prioritise the CVD prevention and reduction efforts in countries like Pakistan, where the CVD burden is increasing. Data shows that excessive alcohol use, poor diet, physical inactivity, tobacco use, and psychosocial issues are the main determinants for CVD. The next section briefly discusses the burden of the major risk factors for CVD in the Pakistani context.[14]

Figure 1. Cardiovascular disease risk factors



Smoking: A Major Risk

The association of smoking with CVD is unequivocal; it is the major health risk in the world today. In the 2015 report by the World Health Organization (WHO), 22.2% of males and 2.1% of females in Pakistan smoke.[15] During the 20th century, 100 million individuals died globally from diseases brought about by the consumption of excessive tobacco, and it is estimated that by 2030, one in every six persons will die because of the fatal impacts of smoking. 50% of these deaths will occur among the middle-age population (35-69 years). Studies like INTERHEART and others performed in Pakistan indicated a linear relationship between cigarette number smoked and CVD. 40 or more cigarettes day smokers are at nine times risk of having cardiac issues compared to non-smokers.[16]

Impact of Socioeconomic Status on Education

Thus, socioeconomic status (SES) and illiteracy are generally recognized as being directly consistent with risk behaviors and an unhealthy lifestyle. As reported by Teo et al., 'from the estimated 1.3 billion smokers in the world, 82% live in LIMCs.' People did not spend money on education and healthy food but rather on alcohol and smoking, causing adverse effects on the cardiovascular system.[17] A study conducted in Rawalpindi, Pakistan, showed there is a significant association of literacy with tobacco use, and the widening gap of tobacco consumption keeps increasing between the "no formal education" and the

"graduation level of education" groups.

Role of Mental Health in Cardiovascular Disease

Mental health is important in the development and advancement of cardiovascular disease (CVD). Psychological disorders like stress, anxiety, and depression have been associated with heightened CVD risk through physiological and behavioral pathways. Chronic stress initiates the overactivation of the hypothalamic-pituitary-adrenal (HPA) axis, which results in elevated cortisol levels, heightened blood pressure, inflammation, and metabolic disturbances, all of which lead to heart disease.[18]

Depression is specifically linked with unfavorable cardiovascular outcomes. Patients with depression have a higher chance of following unhealthy lifestyles like smoking, lack of physical exercise, unhealthy diets, and poor adherence to medications, putting them at risk of developing hypertension, obesity, and diabetes (WHO). Anxiety disorders are also linked to increased heart rate, vascular pathology, and increased inflammatory markers, further contributing to cardiovascular risk.[19]

In Pakistan, mental health conditions are underdiagnosed and undertreated because of stigma, ignorance, and poor access to psychological services. The inclusion of mental health screening as part of standard cardiovascular care, the encouragement of stress management programs, and the promotion of mindfulness-based interventions like meditation and relaxation can decrease the risk of CVD. Public health

programs must also aim to raise awareness of the close link between mental health and heart health, so that CVD prevention and management are addressed in a comprehensive manner.[20]

Alternative Forms of Tobacco Use in Pakistan

Various forms of tobacco use in Pakistan-these include cigarettes, beedis, chewing tobacco (paan), and hookah/shisha (water-pipe smoking)-are right now on the rise. The place where smokeless use of tobacco is culturally accepted would be Pakistan and Indian cultures.[17] In the prevalence of tobacco use, differences exist among the districts of Pakistan, and various studies conducted in various locations in Pakistan have reported that concerning 33% of Pakistani men and 4.7% of females are reported to be tobacco users. The generalized view among the population is that tobacco consumption is complementary to smoking, though studies have shown that tobacco is harmful. The prevalence rate of smokeless tobacco use was identified at 40% in a survey conducted in squatter settlements of Karachi.[21]

There is very little awareness of the dangers of tobacco in very general terms; for instance, the AMI patients do not consider water pipe use to be harmful concerning AMI recurrence. A cross-sectional study documented the water pipe smoking practice in students, showing that 60% of students regard it as less dangerous than cigarette smoking. The other source that the tobacco industry has supported Pakistan with is Rs27.5 billion per annum.[22] In 2010-2011 more than 65.40 billion cigarettes in production, and of these the government of Pakistan generated Rs55 billion from the tobacco industry within this same financial year. The tobacco use is persistently increasing; tobacco sales show an upward trend in the first nine months of 2008 showing an increase of 17% compared to 2007 levels. Out of this figure, 9.3% increase is attributable to sales increase while the rest is on account of price rise.[23] Though Pakistan has an antismoking legislation since 2003, it is hardly enforced. Nationwide campaigns against the dangers of tobacco, a ban on cigarette advertising, and discouragement of tobacco cultivation became the major strategic interventions. However, these government-supported strategies have partially succeeded in implementation due to many political impediments.[20]

Dietary Patterns and Nutritional Challenges in Pakistan

Pakistani cooking generally involves curries, and therein is lot of saturated fat along with it. The foods mainly consumed by people living below the poverty line comprise carbohydrates and more saturated fats.

It was found from a cross-sectional descriptive study in Pakistan that carbohydrate consumption among the urban population of Pakistan is 51.5% and fat is 36.3%. This population eats unhealthy food for many reasons: rising costs of fresh fruits and vegetables, a scarcity of agricultural opportunities, and cheap availability of very saturated commercial products (oils and ghee).[24]

This fact has resulted in the subsequent increase of risk for CVD. A great challenge for the health care system of Pakistan is, however, changing people from the less affordable, commercially produced oils to healthier oils. This then would require a complete revolution of the agricultural and food policy in the country. Such a drastic change in the overall systems in Pakistan should follow very careful consideration regarding people's reaction in terms of living below the poverty line.[25]

Physical Inactivity and Sedentary Lifestyle

Physical inactivity and a sedentary lifestyle are significant contributors to the rising burden of cardiovascular disease (CVD) in Pakistan. Rapid urbanization, increased reliance on technology, and evolving work environments have led to reduced physical activity among the population. Prolonged sitting, excessive screen time, and a lack of regular exercise are associated with obesity, high blood pressure, dyslipidemia, and insulin resistance, all of which heighten the risk of CVD.[26]

Regular physical exercise has a critical role in preserving cardiovascular health by boosting blood circulation, strengthening metabolic function, and lowering inflammation. Studies show that individuals who engage in at least 150 minutes of moderate-intensity exercise per week have a significantly lower risk of heart disease compared to those who remain inactive (AHA). However, in Pakistan, limited awareness, a shortage of recreational spaces, and cultural constraints often discourage people from adopting an active lifestyle.[27]

Encouraging physical activity by implementing national policies for health, community programs, and occupational wellness programs can play an instrumental role in minimizing the risk of CVD. Encouragement of walking, cycling, and sports, as well as the inclusion of physical education in the curriculum, can counteract the impact of the sedentary lifestyle on public health. Physical inactivity should be handled as a modifiable cardiovascular disease risk factor in order to minimize the cardiovascular disease burden of Pakistan.[28]

High Blood Pressure

The strong relationship linking CVD and high BP has long been established. Each year, about 7.6 million people die globally, accounting for some 13.5% of total deaths

associated with high blood pressure. Over the years, the rate of hypertension has been on the rise in South Asian populations.[29] Though not clearly defined, some putative causes for primary hypertension such as obesity, sodium intake, and lack of access to health care for treatment are major risk factors for causing high blood pressure. As a study observed, raised blood pressure is considered one of the classical risk factors for other CVDs in South Asian as well as Caucasian, Chinese, and African populations. In Pakistan, the prevalence of hypertension is on the rise as well. A 2006 health survey in Pakistan¹⁰ found that 22% of adults (aged 15 years and older) and 33% of adults (aged 45 years and older) were hypertensive (blood pressure >140 and diastolic >90 mm of Hg), while in 2016, age-standardized prevalence was 17.3%-25.3% in males and 9.9%-41.4% in females of different ethnic backgrounds.[30]

Obesity as a Risk Factor for Cardiovascular Disease

Obesity is a substantial risk factor for cardiovascular disease (CVD), contributing to its development through different physiological and metabolic pathways. Excess body weight, particularly central obesity, is directly associated to illnesses such as hypertension, dyslipidemia, insulin resistance, and chronic inflammation, all of which raise the probability of developing heart disease.[28]

One of the major ways that fats are involved in CVD is with hypertension (high blood pressure). Excess body fat leads to increased vascular resistance and cardiac output, placing an added burden on the heart. Obesity is also associated with dyslipidemia, characterized by rising levels of low-density lipoprotein (LDL) cholesterol and triglycerides, with declining high-density lipoprotein (HDL) cholesterol, which promotes atherosclerosis.[31]

In addition, obesity induces a state of chronic low-grade inflammation, in which adipose tissue releases pro-inflammatory cytokines including tumor necrosis factor- α (TNF- α) and interleukin-6 (IL-6). Such inflammatory markers promote endothelial dysfunction and vascular damage, further compounding cardiovascular risk. Insulin resistance, commonly described in obese individuals, also contributes to CVD through the enhancement of hyperglycemia and metabolic derangements that impair vascular function.[32]

The connection between CVD and obesity highlights the imminent need for risk-lowering strategies for obesity. Lifestyle modification, dietary refinement, and regular exercise can all significantly enhance cardiovascular outcomes. Treatment of obesity on an individual and community level continues to remain a

key intervention in the avoidance and control of CVD.[33]

Limited Awareness and Challenges in Blood Pressure Control in Pakistan

The research indicates that Pakistani general practitioners (GPs) do not identify hypertension appropriately according to guidelines of the Pakistan Hypertension League. One of the Pakistan studies has indicated that 28.5% of the GPs lack understanding of disease and 76.47% of them do not adhere to guidelines recommended to control hypertensive patients. It was also revealed in a study in Australia that 61.5% GPs failed to initiate treatment for hypertension because they have knowledge gap, unfamiliarity with recommended guidelines, and unawareness of the drug therapy.[34] The main reasons for not controlling blood pressure are the insufficient knowledge of the healthcare professionals, and non-adherence to treatment by patients. This issue is truly careful for geriatric population, which is indeed mounting the prevalence of diseases concerning hypertension.[35] One of the research in Pakistan revealed that 28.5% of the GPs lack understanding regarding disease and 76.47% are not adhering to recommended guidelines to treat hypertensive patients. In a study in Australia, it has also been found that 61.5% GPs failed to initiate treatment for hypertension because they have knowledge gap, unfamiliarity with recommended guidelines, and unawareness regarding drug therapy. The major reasons for failure to control the blood pressure are healthcare professionals' poor knowledge and non-compliance with the treatment of patients. This problem is truly diligent for the aging population, which is eventually piling up the load of diseases associated with hypertension.[33]

Challenges in Blood Glucose Regulation and Diabetes Management

The magnitude of diabetes increases rapidly as unhealthy diets, sedentary lifestyle, aging of population, and smoking grow in importance. An assessment of the situation revealed that 5.1% of individuals were newly diagnosed to have DM in Pakistan: 5.1% male and 6.8% female in urban areas, and 5% male and 4.8% female in rural areas; it was 5.2 million in 2000, with an estimate of 13.9 million by 2020 and 14.5 million by 2025. According to the NHSP, around 25% of all DMs occur in those aged 45 years and above. In addition, during this study, DM was found to be present in 5.4% of the population aged above 15 years (95% CI; 4.9-5.9), with considerable ethnic diversity.[36]

Poor control over blood glucose levels and diagnosis enhances the prevalence of diabetes. As per NHSP, about 2.7 million people suffer from diabetes; of these,

only 0.8 million diagnosed come to know of their status. Sugar levels are controlled in only 3% of them. This has worsened with regard to rural areas and women. This demonstrates the need to have age-specific data, at both regional and national levels, regarding blood sugar levels, so that necessary preventive interventions may be initiated.[37]

Physical activity in LMICs is also declining because of urbanization and lifestyle changes. This shift has resulted from the gradual transition of the population from the rural to urban setup, in which the changes of diets and often parallel an increased sedentary lifestyle. For example, in these areas, 40% of women are inactive in physical activity Swaziland, Namibia, and South Africa.[38] In China, during urbanization, the adults' physical activity decreased by 32%, while sedentary lifestyle activities such as prolonged television watching surged. A similar situation is witnessed in Pakistan. A study conducted in Pakistan on obesity prevalence in persons 15 years or older reported that 25% of that population consists of overweight or obese individuals (95% CI 21.8%-28.2%). Such projections for the health system of Pakistan are alarming since a large population remains underweight, mostly in school-aged years. Parallely, there has been an exponential increase in obesity and overweight in school-aged children residing in urban areas in Pakistan.[35]

In summary, the proportion of the risk factors mentioned above is increasing in Pakistan; on the other hand, there are limited data available on the prevalence of CAD and none on the incidence of CAD. The subsequent section will discuss some of the active health structures and the available services at primary and secondary preventive levels in Pakistan.

Healthcare System and Infrastructure in Pakistan

Pakistan comprise a highly hierarchical health system having both public and private facilities. According to the National Institute of Population Studies (2006-2009), around 70% of the total population of the country has access to private sector health facilities which are mainly fee for service based.[39] The service-engineered health care system in Pakistan is inefficient to cover the demands of a mushrooming kind of populace and is therefore ill-equipped to deal with the impending illness-associated epidemiological transitions. Private healthcare has a very critical role in the provision of health care services, including those for the armed forces, NGOs, and social security institutions, which provide their own suppliers and collect and generate funds for their own use. In most cases, there would not be a framework of governance in place, either within the public or private and semi-

private healthcare sector, to monitor clinical practice and the quality of service. This is how Pakistan continues to perform poorly on health indicators.[40]

Advanced Technological Approaches in Cardiovascular Disease Management

Little consideration has been afforded to the area of prevention against CVD in Pakistan. Most health resources are utilized to deal with infectious/communicable and reproductive health issues, and therefore the health system is unable to grapple with the increasing burden of chronic diseases. There has, therefore, been development for high-tech tertiary care facilities for CVD.¹⁸ Patients usually present themselves for medical attention after a cardiovascular event has occurred. Whether or not the emphasis is on the importance of tertiary health care, human resources and technology services are in a bare minimum state in Pakistan. For the majority of the rural population, these services remain inaccessible due to transportation barriers and financial burden. Very few private institutions have been engaged in developing CVD prevention programs for the Pakistani population.[28]

Innovative Prevention Strategies and Health Programs in Pakistan

Some of the private organizations work together with international organizations in preventing CVD and promoting health. Due to the fact that modifiable contributory factors constitute most of the non-communicable diseases, CVD prevention can be looked into as NCD prevention. A good health care system must exist in the country in which prevention programmes at both primary and secondary levels operate and an effective coordination of both public and private health care is undertaken.[35] The prevention and control of CVDs in Pakistan have essentially been sidelined at health care discuss. This justifies a multifaceted approach for the population and high-risk ones. Without the involvement of several stakeholders, such as the health and finance ministry, department of education, and agricultural and other regulatory bodies, uncoordinated efforts will be insufficient for CVD prevention and control in the country. A multi-sector action framework such as that proposed by Fuster and Kelly may be useful to guide further actions so that contextually based interventions can be applied in the country and taking into consideration a full range of complex determinants of CVD.[41] The integrative nature of the framework also promotes equal participation by public and private organizations in Pakistan focusing on the CVD risk reduction programme. In this context, the following proposals are made to address the emergent necessities pertaining to CVD in

Pakistan.

Preventing Obesity to Reduce Cardiovascular Risk

Preventing obesity is vital for minimizing the risk of cardiovascular disease (CVD). Effective solutions include lifestyle modifications, dietary improvements, frequent physical exercise, and public health interventions. Adopting a heart-healthy lifestyle, such as keeping a balanced diet, engaging in regular exercise, getting appropriate sleep, managing stress, and avoiding tobacco use, helps to weight control and better cardiovascular health. Emphasizing a diet rich in fruits, vegetables, whole grains, lean meats, and healthy fats optimizes weight control and decreases obesity-related CVD risks.[42] Regular physical exercise has a critical role in weight management and cardiovascular health by lowering obesity-related problems and promoting general well-being. Additionally, public health initiatives, such as regulations supporting access to nutritional meals, safe venues for physical exercise, and educational programs about healthy behaviors, aid in avoiding obesity on a bigger scale. Behavioral counseling programs have also demonstrated minor but substantial advantages in encouraging better lives among those without established CVD risks. Implementing these methods needs a collective effort from individuals, healthcare providers, governments, and community groups.[43] By tackling obesity via comprehensive lifestyle and public health initiatives, the incidence of CVD can be considerably lowered.

Recommendations

Prioritizing Chronic Diseases as a National Health Imperative

It is important that the Pakistani health system adds chronic illness to its health care agenda. Integrating existing programmes for the prevention of communicable diseases with programmes for the prevention of chronic diseases is a major health goal for many LMICs. Pakistan can also apply this model to address the common risk factors, such as smoking, unhealthy diet, lack of physical activity, high blood pressure, and obesity.[44]The plan focuses on identifying risk behaviours and their modification, which requires change in legislation and policy; for example, changes in agricultural policies to increase access to and demand for healthy food, the development of strategies to utilize open spaces for physical activity, and the involvement of religious and community leaders to endorse the participation.

Enhancing Population Data on CVD Risk Factors in Pakistan

The recent surveillance of Pakistan surveillance is

outdated and fragmented. A national system gathers records from private and public segment that is not fully programmed; in addition, the health information management system is also outdated and may be unreliable in the present context. At the local and population level a quality surveillance system is needed in order to determine the effects of these risk factors on CVD; it is recommended that the attention on causes of mortality and morbidity should be provided, primary determinants of CVD should be identified in the local context, money should be properly allocated for long-run, sustainable system of chronic disease-related surveillance. In low- and middle-income countries, the surveillance system could be initiated with the presence of contextual factors.[45]

Contextual Analysis of Risk Factors

To integrate the prevention of CVD in national health plan, a contextual approach is required. A large number of patients who attend secondary prevention programmes do not achieve lifestyle changes such as smoking cessation, improved eating habits, and more physical activity. Culturally relevant and context-specific policies are needed while taking into account the infrastructure capacity and financial actuality. Moreover, it is also crucial to include a system that comprises of satisfactory communication, proper planning, flexible decision making, and committed people.[40]

BP Control Awareness

Public-communication interventions concerning health-related messages are cost-effective and useful in changing behaviours at the population level. For instance, the messages associated with the hazards of smoking, high level of fat and salt consumption can be communicated via newspapers and pamphlets and replicated in other settings where people have access to newspapers and are literate.[27] However, 70% of Pakistanis are not able to read newspapers or lack of access to newspapers, television programmes or radios that can be broadcasted regularly. The educational programmes for health should also be included in health policies.

Society-Based Initiatives

Implementing small community-based programs and adopting population-based approaches are effective strategies to raise awareness about the need to address risk factors. Many health-related community programs are currently being implemented in urban areas across various LMICs. These integrated and targeted initiatives, addressing multiple risk factors, can be incorporated into healthcare systems and provide access to individuals in familiar community settings such as schools, workplaces, mosques, and other community

organizations. This approach is both feasible and cost-effective in Pakistan.[46] However, it is crucial to remain practical when executing community-based programs and to be cautious about investing in initiatives that do not primarily aim to reduce the burden of cardiovascular disease (CVD). Furthermore, regardless of the chosen intervention strategy, considering the local context is essential, as it plays a significant role in the effectiveness of CVD prevention and control efforts.

Implementation of Prevention Programmes

According to the research, cardiovascular risks were first acquired and increased early in life. Unhealthy habits in childhood and teen enhance the risk which includes tobacco use, high fat and high-calorie diet, and lack of physical exercise; as a consequence, implementation of cardiovascular health promotion initiatives throughout pregnancy and the early days of life is of tremendous significance. The efforts for its prevention should be continued throughout the course of life.[41] The description of the epidemiological shift highlights the diverse illness patterns, from communicable to NCDs, with the large burden of CVD risk in Pakistan. It is a huge task to decrease these dangers in Pakistani population. The existing dispersed and fragmented project requires effective planning and supervision. The possible cost-effective strategies of altering these high-risk habits have been identified, including health promotion campaigns, enhanced surveillance and exchange activities in the local environment. Reviewing the dynamics of health systems and health habits helps to gain important understanding.[38] Understanding the social and economical constraints and modifying in the culture, the unique setting-related capacities and resources would be needed for population-based interventions for reaching the aim of CVD risk reduction in Pakistan

Enhancing Economic Well-Being

Income-generating programs for the poor, such as microfinance or microcredit, require relevant and transparent institutional support for economic development projects which are directed towards the impoverished vulnerable population.[44] Additionally, there must be a significant change made to the way funds are allocated, used, and the accuracy of the amounts allotted.

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