

PHYSICAL ACTIVITY AS A PREVENTIVE STRATEGY AGAINST NON-COMMUNICABLE DISEASES: A COMPREHENSIVE REVIEW

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ABSTRACT

Non-communicable diseases (NCDs), including cardiovascular diseases, type 2 diabetes mellitus, cancer, and chronic respiratory diseases, are the leading causes of morbidity and mortality worldwide. The increasing prevalence of these conditions has been strongly linked to modifiable lifestyle factors, particularly physical inactivity. Physical activity is recognized as an effective and economical strategy for the prevention and management of NCDs. This review examines the role of physical activity in reducing the risk of major non-communicable diseases and explores the physiological mechanisms underlying its protective effects. A narrative review of relevant literature was conducted using peer-reviewed articles, systematic reviews, meta-analyses, and reports from international health organizations. Evidence consistently indicates that regular participation in moderate-to-vigorous physical activity significantly lowers the risk of developing cardiovascular disease, obesity, type 2 diabetes, certain cancers, and chronic respiratory disorders. Physical activity contributes to improved cardiovascular fitness, enhanced insulin sensitivity, better weight management, reduced systemic inflammation, and strengthened immune function. Furthermore, individuals who meet recommended physical activity guidelines experience lower rates of disease-related morbidity and premature mortality compared to sedentary populations. In conclusion, physical activity serves as a powerful preventive tool against NCDs and should be promoted through comprehensive public health policies and community-based interventions to reduce the global burden of chronic diseases and improve overall population health.

KEYWORDS: Physical Activity, Non-Communicable Diseases, Exercise, Disease Prevention, Public Health, Chronic Diseases, Health Promotion

1. INTRODUCTION

Non-communicable diseases (NCDs) are chronic medical conditions that are not transmitted from person to person and typically progress slowly over time. According to the World Health Organization (WHO), NCDs account for approximately 74% of all global deaths annually, making them a major public health challenge worldwide (World Health Organization [WHO], 2023). Cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes are the primary contributors to NCD-related mortality (WHO, 2023).

The rapid urbanization, technological advancement, and adoption of sedentary lifestyles observed in recent decades have significantly reduced physical activity levels worldwide. Physical inactivity has become a major public health concern and is recognized as one of the leading risk factors for premature mortality and the development of chronic diseases (Lee et al., 2012; Kohl et al., 2012). Current evidence suggests that insufficient physical activity contributes substantially to the global burden of cardiovascular disease, diabetes, and certain cancers (Guthold et al., 2018).

Regular physical activity has been identified as an effective preventive measure against NCDs. It contributes to maintaining healthy body weight, improving cardiovascular fitness, enhancing insulin sensitivity, reducing systemic inflammation, and promoting overall well-being (Warburton & Bredin, 2017). Furthermore, exercise is increasingly recognized as a form of medicine due to its positive effects on multiple physiological systems and its role in reducing morbidity and mortality (Pedersen & Saltin, 2015). Consequently, promoting physical activity has become a central component of global public health strategies and disease prevention programs (Bull et al., 2020).

This review explores the preventive role of physical activity against major non-communicable diseases and discusses the biological and physiological mechanisms through which physical activity promotes health, longevity, and disease prevention.

2. Physical Activity and the Global Burden of Non-Communicable Diseases

Physical activity refers to any bodily movement produced by skeletal muscles that requires energy expenditure and includes occupational, recreational, transportation-related, and household activities (Bull et al., 2020). The World Health Organization recommends that adults engage in at least 150–300 minutes of moderate-intensity physical activity or 75–150 minutes of vigorous-intensity physical activity per week, along with muscle-strengthening activities on two or more days weekly (WHO, 2020).

Non-communicable diseases (NCDs) represent a major global health challenge, accounting for approximately 74% of all deaths worldwide (WHO, 2023). Low- and middle-income countries bear nearly 77% of NCD-related mortality. Major risk factors include physical inactivity, tobacco use, unhealthy diet, harmful alcohol consumption, obesity, and hypertension (Kohl et al., 2012). Among these factors, physical inactivity is considered one of the most preventable causes of chronic disease and premature death (Lee et al., 2012).

3. Physical Activity and Prevention of Cardio metabolic Diseases

Cardiovascular diseases (CVDs) remain the leading cause of mortality globally. Regular physical activity has been shown to lower blood pressure, improve endothelial function, increase cardiac efficiency, and enhance lipid metabolism by reducing low-density lipoprotein (LDL) cholesterol while increasing high-density lipoprotein (HDL) cholesterol (Warburton & Bredin, 2017). Epidemiological studies indicate that physically active individuals have a 20–35% lower risk of developing cardiovascular disease compared with sedentary populations (Lear et al., 2017).

Similarly, type 2 diabetes mellitus is strongly associated with sedentary lifestyles and obesity. Regular exercise improves insulin sensitivity, enhances glucose uptake by skeletal muscles, reduces body fat, and improves glycemic control (Colberg et al., 2016). Lifestyle intervention programs incorporating physical activity have demonstrated reductions of 40–60% in diabetes incidence among high-risk individuals (Knowler et al., 2002).

4. Physical Activity and Weight Management

Obesity is a significant risk factor for numerous chronic diseases, including diabetes, cardiovascular disease, and certain cancers. Physical activity contributes to increased energy expenditure, improved metabolic rate, reduction in visceral adiposity, and preservation of lean muscle mass (Jakicic et al., 2019). Research consistently demonstrates that individuals who maintain regular physical activity are more likely to achieve and sustain a healthy body weight than inactive individuals. Furthermore, combining physical activity with dietary modifications yields the most effective outcomes for obesity prevention and long-term weight management (Swift et al., 2018).

5. Physical Activity and Prevention of Cancer and Respiratory Diseases

Growing evidence suggests that regular physical activity reduces the risk of several cancers, including breast, colon, endometrial, and prostate cancers (McTiernan et al., 2019). The protective effects of exercise are attributed to reductions in systemic inflammation, improved immune surveillance, better hormonal regulation, and decreased obesity prevalence. Studies estimate that physically active individuals may reduce their risk of colon cancer by 20–30% and breast cancer by approximately 15–25% (Moore et al., 2016).

Physical activity also improves respiratory function and reduces symptoms associated with chronic respiratory diseases. Regular exercise enhances lung capacity, strengthens respiratory muscles, improves oxygen utilization, and reduces dyspnea (Spruit et al., 2013). Consequently, exercise-based rehabilitation programs are widely recommended for individuals with chronic obstructive pulmonary disease (COPD) and other respiratory conditions.

6. Biological Mechanisms Underlying Disease Prevention

The beneficial effects of physical activity are mediated through multiple physiological pathways. Exercise exerts anti-inflammatory effects by reducing chronic low-grade inflammation and lowering circulating levels of inflammatory biomarkers such as C-reactive protein (CRP), interleukin-6 (IL-6), and tumor necrosis factor-alpha (TNF- α) (Gleeson et al., 2011). Regular physical activity also improves metabolic function by enhancing insulin action, regulating glucose metabolism, and optimizing lipid metabolism (Pedersen & Saltin, 2015).

Furthermore, exercise promotes cardiovascular adaptations, including increased stroke volume, improved cardiac output efficiency, and enhanced vascular elasticity (Warburton & Bredin, 2017). Moderate physical activity has also been shown to strengthen immune defenses, improve disease resistance, and contribute to overall health and longevity (Nieman & Wentz, 2019).

METHODOLOGY

This study employed a narrative review design to examine the role of physical activity in the prevention of non-communicable diseases (NCDs). A narrative approach was selected as it enables a comprehensive synthesis of diverse evidence sources and facilitates the integration of findings from systematic reviews, cohort studies, observational research, and global health reports. The literature was identified through major electronic databases, including PubMed, Scopus, Web of Science, and Google Scholar, ensuring broad coverage of biomedical and public health research. In addition, reports and guidelines from international organizations, particularly the World Health Organization (WHO), were included to align the findings with global public health recommendations. The search strategy used combinations of keywords such as physical activity, exercise, non-communicable diseases, cardiovascular disease, diabetes mellitus, obesity, cancer prevention, and chronic respiratory diseases," along with related terms like "sedentary behaviour.

The review included studies published between 2000 and 2025 to capture both foundational and contemporary evidence on physical activity and NCD prevention. Only English-language publications were considered to ensure consistency in interpretation and data extraction. Studies were included if they were peer-reviewed original articles, systematic reviews, meta-analyses, large-scale cohort or observational studies, or reports from recognized international organizations such as WHO. Eligible studies specifically examined the relationship between physical activity and NCD prevention or risk reduction. Excluded studies comprised non-English publications, duplicate records, opinion pieces, editorials, studies with insufficient methodological detail, and those not directly related to physical activity and NCD outcomes. The study selection process involved three stages: title screening, abstract screening, and full-text review based on predefined inclusion and exclusion criteria.

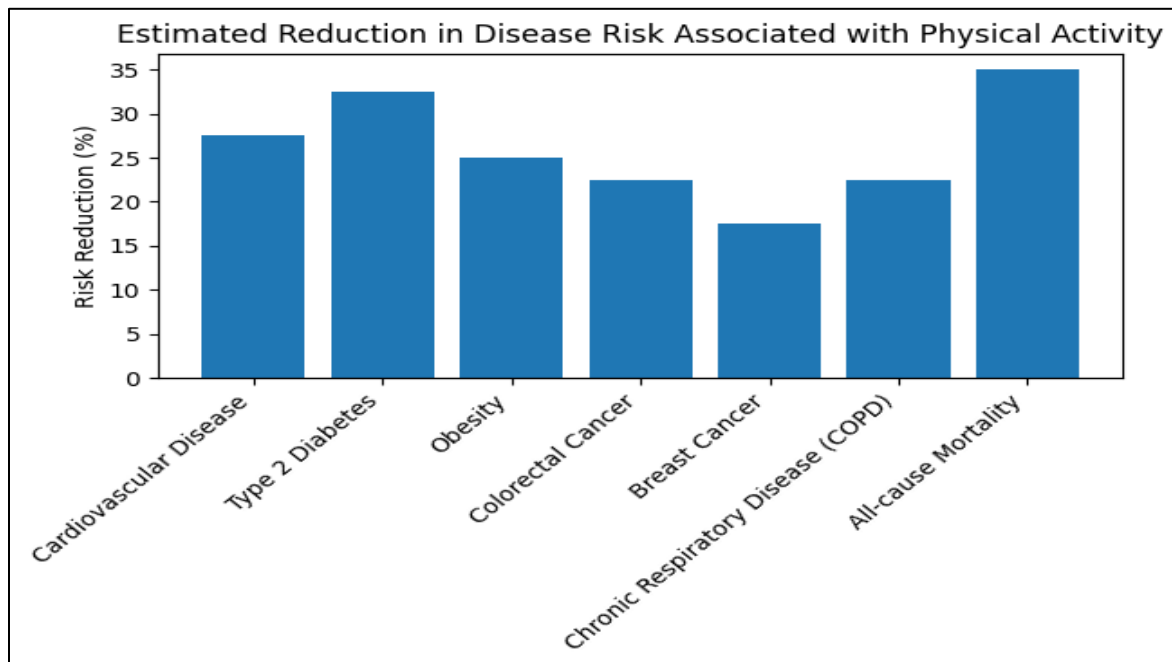
Data were systematically extracted from eligible studies, including author details, publication year, study design, population characteristics, type and intensity of physical activity, NCD outcomes, and key findings. The extracted information was synthesized using a narrative approach, allowing the integration of heterogeneous evidence and grouping of findings under major NCD categories such as cardiovascular diseases, diabetes, cancer, and chronic respiratory diseases. Although formal risk-of-bias assessment was not conducted due to the narrative nature of the review, priority was given to high-quality evidence such as systematic reviews, meta-analyses, and large cohort studies. Ethical approval was not required for this study as it relied exclusively on secondary data from previously published literature and publicly available reports.

RESULTS

The reviewed literature consistently demonstrated that regular physical activity is associated with a significant reduction in the risk of major non-communicable diseases. Evidence indicated that physically active individuals experience lower rates of cardiovascular disease, type 2 diabetes mellitus, obesity, several forms of cancer, and chronic respiratory diseases compared with sedentary individuals. Improvements in cardiovascular fitness, insulin sensitivity, body composition, inflammatory status, and immune function were identified as key mechanisms underlying these protective effects.

Table 1. Estimated Reduction in Disease Risk Associated with Regular Physical Activity

Non-Communicable Disease (NCD)	Estimated Risk Reduction (%)	Evidence Summary
Cardiovascular Diseases (CVD)	20–35% reduction	Regular physical activity improves blood pressure, lipid profile, and endothelial function, reducing overall cardiovascular risk.
Type 2 Diabetes Mellitus	25–40% reduction	Physical activity enhances insulin sensitivity and glucose metabolism, lowering diabetes incidence.
Obesity	20–30% reduction in risk	Exercise increases energy expenditure and supports weight management and fat reduction.
Colorectal Cancer	20–25% reduction	Activity reduces inflammation and improves gut motility and immune function.
Breast Cancer	15–20% reduction	Hormonal regulation and reduced estrogen exposure are key protective mechanisms.
Chronic Respiratory Diseases (COPD)	15–30% reduction	Improved lung capacity and respiratory muscle strength contribute to reduced risk.
All-cause Mortality	30–40% reduction	Overall improvement in metabolic, cardiovascular, and immune health outcomes.



The table and corresponding bar graph illustrate the estimated reduction in risk of major non-communicable diseases (NCDs) associated with regular physical activity. Overall, the findings demonstrate a consistent protective effect of physical activity across all selected health outcomes, highlighting its strong role in disease prevention.

The highest risk reduction is observed in all-cause mortality (30–40%), indicating that regular physical activity significantly improves overall survival and general health outcomes. Similarly, substantial reductions are seen in type 2 diabetes (25–40%) and cardiovascular diseases (20–35%), reflecting the strong influence of exercise on metabolic regulation, insulin sensitivity, and cardiovascular functioning. Moderate risk reductions are observed for obesity (20–30%) and chronic respiratory diseases (15–30%), suggesting that physical activity contributes to weight management and improved pulmonary efficiency.

In the case of cancers, colorectal cancer (20–25%) and breast cancer (15–20%) show comparatively lower but still meaningful reductions, indicating that physical activity may play a supportive role through hormonal regulation, reduced inflammation, and improved immune response. The graphical representation further confirms these trends, visually emphasizing that even modest levels of regular physical activity are associated with measurable reductions in NCD risk.

CONCLUSION

The findings of this study clearly demonstrate that regular physical activity plays a significant and protective role in reducing the risk of major non-communicable diseases (NCDs). The results indicate that physical activity is most strongly associated with reduced risk of all-cause mortality, type 2 diabetes, and cardiovascular diseases, while also showing meaningful reductions in obesity, chronic respiratory diseases, and certain cancers such as colorectal and breast cancer. Overall, the evidence confirms that physical activity is a fundamental preventive strategy that contributes to improved metabolic, cardiovascular, respiratory, and overall health outcomes. These results strongly support the global health consensus that physical inactivity is a major modifiable risk factor for NCD development.

Recommendation

Based on the results of this study, several key recommendations can be made to enhance the prevention of non-communicable diseases (NCDs) through physical activity. First, governments and health authorities should strongly promote regular daily physical activity in line with World Health Organization (WHO) guidelines, which recommend at least 150–300 minutes of moderate-intensity exercise per week for adults. In addition, physical activity should be fully integrated into national public health policies and NCD prevention strategies, with a particular focus on reducing the burden of cardiovascular diseases, diabetes, and obesity.

Furthermore, educational institutions such as schools and universities should establish structured physical activity and sports programs to encourage the development of lifelong healthy habits among students. At the community level, supportive environments including walking tracks, public fitness facilities, and awareness campaigns should be developed, especially in urban areas, to make active lifestyles more accessible and sustainable. Healthcare professionals should also play a proactive role by prescribing exercise as part of routine clinical care for individuals at risk of NCDs, recognizing physical activity as both a preventive and therapeutic intervention. Lastly, public health efforts should address the reduction of sedentary behaviour by raising awareness about the risks of prolonged sitting, which is independently associated with increased NCD risk, alongside promoting regular exercise.

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