The role of sustainable development strategies in reducing socioeconomic disparities in heart health: a biological approach

Kureysh Khamchiev[1,*], *Asylbek* Shandaulov[2], *Venus* Absatirova[3], *Nursulu* Mukhtar[4] , and *Marina* Chochaeva[2]

[1]Astana Medical University, Astana, Kazakhstan
[2]Medical Academy of Kabardino-Balkarian State University named after H.M. Berbekov, Nalchik, Russia

Abstract. This article explores the biological mechanisms through which socioeconomic factors impact heart health and examines how sustainable development interventions can mitigate these effects. Biological pathways linking socioeconomic status to cardiovascular health include stress response, inflammation, and metabolic dysregulation. Socioeconomic factors such as income, education, and access to healthcare interact with these pathways, influencing disease susceptibility and progression. Sustainable development strategies, encompassing policies aimed at promoting equitable access to education, healthcare, and economic opportunities, can positively impact cardiovascular health. By addressing social determinants of health, such interventions have the potential to mitigate the biological effects of socioeconomic disparities on heart health. This article reviews existing literature on the biological mechanisms linking socioeconomic status to cardiovascular health outcomes and explores the role of sustainable development strategies in reducing these disparities. It underscores the importance of interdisciplinary approaches that integrate biological, social, and economic perspectives to achieve cardiovascular health equity in the context of sustainable development.

1 Introduction

Over the past thirty years, significant progress in molecular and cellular biology has led to remarkable advancements in the discovery and functional characterization of biomarkers. These advancements have greatly enhanced our understanding of the mechanisms underlying left ventricular (LV) remodeling. A wealth of experimental data is now available in public databases, encompassing gene and protein expression, cellular responses, and tissue remodeling following myocardial infarction (MI). These data capture both temporal and spatial responses across infarcted and non-infarcted myocardial regions.
The recent emergence of genomics and proteomics datasets offers researchers the opportunity to investigate the entire biological system, moving beyond the study of

*Corresponding author: Kureysh2562@gmail.com

individual molecules. However, the analysis and extraction of meaningful information from these extensive datasets pose significant challenges.

Challenges in achieving SDG goals in cardiovascular health mirror those in other disease areas. Implementation failures, lack of proven treatments in certain areas, insufficient data to inform impact and progress, and the influence of social and commercial determinants of health necessitate cross-sectoral interventions. Research plays a crucial role in addressing these hurdles and informing policies and implementation strategies. Effective communication and robust research design are essential for generating convincing evidence to guide political decisions and achieve SDG targets.

2 Research methodology

Improving the translation of knowledge into health practice remains a challenge despite advancements in identifying measures and treatments [2]. Unhealthy behaviors contribute significantly to chronic diseases, including heart disease, stroke, type 2 diabetes, and cancer. Addressing adverse psychosocial influences such as negative outlook, social isolation, depression, and work stress is equally important and can impact health independently of unhealthy behaviors. Non-adherence to treatment regimens is a common issue leading to poorer health outcomes.

Bridging the gap between research and practice requires behavior change interventions and further investment in studying adverse behaviors and evaluating intervention efficacy. Initiatives involving families and communities in managing their health can be successful, as can programs targeting healthy lifestyles from a young age. Patients' adherence to treatment and adoption of healthier lifestyles can be supported by innovative devices and apps, but their value requires rigorous research evaluation.

Healthcare professionals also need to adopt different behaviors, but a lack of communication between practitioners and researchers hampers the adoption of research knowledge into practice. Limited research knowledge implementation, including prevention strategies, persists due to this disconnect. Professional attitudes resistant to change must be addressed through further study [3].

More attention on behavioral sciences in health measures implementation is necessary, including across the lifespan. While data to inform policies exist, translating them into action remains challenging due to communication barriers and short political mandates. Political action beyond health ministries is crucial, particularly in addressing social determinants of health and regulating industries that impact health outcomes.

Investing in a well-trained workforce is essential for advancing research and implementing health measures effectively. Interdisciplinary collaboration, evidence-based practice, and personalized medicine require new skills and training in digital data handling, patient-centered care, health economics, and cross-sectoral approaches. Mobility for training between countries is essential to address health workforce inequalities.

Research efforts should not neglect discovery research, even as implementation of relevant knowledge progresses. Integrated health research that considers other Sustainable Development Goals, like climate and environment, is necessary. Strategic investment in novel research areas should address changing health needs and involve people and patients in research design and execution [4]. Quality data and rigorous research practices, including open science and shared standards, are vital for impactful research and evidence-based policymaking. Additionally, research on research can improve data quality and support efficient interactions between researchers, policymakers, and society.

3 Results and Discussions

According to Engel (1977) the model illustrates the interaction of biological, psychological, and social factors in determining health outcomes. Other scholars, such as Nadir, Hamza, and Mehmood (2018), agree that the biopsychosocial model has been foundational in modern medical practice. Literature further indicates that Engel developed this model based on the work of Urie Bronfenbrenner, who emphasized the role of social factors in illness development and behavior (Biopsychosocial model, 2020). Engel proposed the biopsychosocial model as an alternative to the biomedical model, aiming to facilitate health professionals' understanding of patients' subjective experiences of illness and suffering (Borrell-Carrió, Suchman & Epstein, 2004).

The biopsychosocial model has been associated with various strengths, as evidenced in research. These strengths include improved patient satisfaction, enhanced adherence to prescriptions, sustained behavior change, better physical and psychological health, reduced likelihood of malpractice litigations, decreased need for multiple visits and hospital admissions, improved communication between healthcare staff and patients, development and implementation of psychosocial support for terminally ill patients and their families, as well as the creation of programs aimed at improving the quality of life for chronic patients, physically disabled individuals, and the elderly.

While the biopsychosocial model has faced criticism, many of these concerns have been addressed. One key criticism was its perceived lack of philosophical coherence. Additionally, critics have pointed out the complex relationships between biological, psychological, and social factors and their effects on health outcomes. However, scholars like Karunamuni, Imayama, and Goonetilleke (2020) have addressed this criticism by delineating pathways among these factors and their potential contributions to subjective well-being and objective physical health outcomes.

Other criticisms of the model include its perceived luxury status in resource-poor healthcare settings, its time-consuming and expensive application, the lack of straightforward treatment guidelines, limited psychosocial training for medical students compared to biomedical-oriented courses, and the insufficient support for multidisciplinary teams necessary for understanding patients' conditions comprehensively.

Enhancing global health requires leadership that transcends geographical boundaries. While direct competence for health under the EU treaty may be limited, there are numerous channels and mechanisms through which health policies can be influenced, both directly and indirectly. For instance, the EU's authority in research and innovation serves as a robust tool for generating the data and evidence necessary to inform better health and healthcare policies.

However, fragmentation at the EU level poses a significant challenge. A cohesive European-wide agenda for investment in health research is imperative, necessitating visionary leadership that can foster connections between Europe and the rest of the world. The upcoming EU research framework programme, Horizon Europe, offers a promising opportunity for joint steering of health initiatives between relevant directorates. Yet, there remains a need for a platform that facilitates science-led collaboration among stakeholders engaged in health research, enabling genuine co-creation of a people-centered and inclusive vision and strategy [6]. Moreover, a sustainable research strategy must be adaptable to evolving priorities and demands, requiring consistent leadership over time.

Neighborhood socioeconomic conditions, along with individual socioeconomic status (SES), have been linked to cardiovascular disease (CVD) risk factors, adverse events, and mortality. Studies like the Atherosclerosis Risk in Communities and the Jackson Heart Study found that living in disadvantaged areas is associated with a higher incidence of coronary heart disease (CHD) even after adjusting for individual income, education, and employment status. This association extends to cumulative biological risk, encompassing cardiovascular, metabolic, inflammatory, and neuroendocrine health markers.

The impact of neighborhoods on health outcomes stems from both physical and social factors [7]. Physical attributes such as the presence of sidewalks, recreational spaces, transportation access, and availability/cost of healthy foods, along with social factors like safety, deprivation, social support, and community cohesion, play significant roles. Socioeconomic disparities in neighborhood characteristics affect resource availability and can influence the promotion or maintenance of a healthy lifestyle. Favorable neighborhoods are associated with reduced cardiovascular risk factors, linked to long-term exposure to environments with better access to physical activity and healthy food, leading to lower diabetes incidence and lower rates of overweight or obesity.

4 Conclusions

In conclusion, the biopsychosocial model holds significant promise for enhancing various aspects of healthcare delivery. As demonstrated in this article, the model has the potential to improve patient satisfaction, promote better adherence to prescriptions, and enhance both physical and psychological well-being. Moreover, it can contribute to reducing the frequency of hospital visits and admissions while fostering improved communication between healthcare staff and patients.

Moving forward, further research should focus on supporting multidisciplinary teams composed of psychiatrists, clinical psychologists, mental health nurses, and social welfare workers. These teams play a crucial role in addressing the complex interplay of biological, psychological, and social factors affecting patients' conditions. One potential avenue for advancing this effort is to utilize the biopsychosocial model as a guiding framework during patient screening processes. By incorporating this model into clinical practice, healthcare professionals can better identify and address the diverse needs of patients, ultimately leading to more holistic and effective care.

References

1. Kh.M. Bataev, E.A. Akhmadova, Prevention and treatment of chronic cardiovascular failure, 64-66 (2011)
2. O. Bogaevsaya, A. Ibragimova, H. Bataev, Secondary prevention of cardiovascular diseases in patients who have suffered myocardial infarction: pharmacoepidemiological studies, 353-361 (2020)
3. V.V. Tupitsin, Z.A. Godina, Kh.M. Bataev, Features of the structure of risk factors for cardiovascular pathology in men under 60 years of age with myocardial infarction and chronic inflammatory pulmonary diseases, **22(7)**, 21-25 (2020)
4. I. Podkolzina, A. Tenishchev, Z. Gornostaeva, H. Tekeeva, O. Tandelova, Assessment of Threats to Environmental Security and Climate Change. BIO Web of Conferences, **63**, 04002 (2023)
5. I. Podkolzina, A. Tenishchev, Z. Gornostaeva, H. Tekeeva, O. Tandelova, Ecological and Food Security in the Conditions of the Geopolitical Situation in the Worldglobal Digital Transformation Trends in Real Sectors of the Economy. SHS Web of Conferences, **172**, 02041 (2023)
6. L. Agarkova, T. Gurnovich, S. Shmatko, I. Podkolzina, V. Filonich, Priority directions of development of the cluster of innovative education in the regional agro-industrial complex. International Journal of Monetary Economics and Finance, **6(2)**, 718 (2016)
7. A.S. Salamova, O. Dzhioeva, Green transformation of the global economy in the context of sustainable development, 152-159 (2023)

8. R.A. Gakaev, The world's forests are a stabilizing element of the climate system, **76**, 06003 (2023)
9. D.T. Dzhatdoeva, Study of the composition of medicinal plants in the prevention of infectious diseases based on biochemical mechanisms. Bulletin of the Kursk State Agricultural Academy, **9**, 88-93 (2022)
10. S.G. Shmatko, L.V. Agarkova, T.G. Gurnovich, I.M. Podkolzina, Problems of increasing the quality of raw material for wine in the stavropol region, **7(2)**, 725-730 (2016)