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Роль здравоохранения в профилактике хронических неинфекционных заболеваний в аспекте развития телемедицины (пример Иордании)

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АННОТАЦИЯ

Актуальность. Здравоохранение способствует защите населения от хронических неинфекционных заболеваний путем борьбы с причинами и ранним выявлением и лечением заболеваний.

Цель. Изучить способы охраны здоровья общества посредством стратегии здравоохранения по защите от хронических неинфекционных заболеваний, основанной на системе телемедицины на примере Иордании.

Материалы и методы. Стратифицированная простая случайная выборка была сформирована на базе трех государственных больниц в провинции Амман в Иордании. Анкета была использована в качестве инструмента для сбора данных. Для анализа данных использовались SPSS 27 и AMOS 24.

Результаты. По мнению медицинского персонала, осведомленность о хронических неинфекционных заболеваниях была на второстепенных позициях, а осведомленность о причинах, связанных с внешними факторами, такими как загрязнение окружающей среды или рабочие места, была на первом месте.

Заключение. Предупреждение заболеваний на основе стратегий общественного здравоохранения должно включать все медицинские органы по предупреждению и выявлению хронических неинфекционных заболеваний, лечения на ранних стадиях. Телемедицина обеспечивает поддержку стратегий общественного здравоохранения в профилактике хронических неинфекционных заболеваний в современных условиях разных стран.

Ключевые слова: факторы здоровья; стратегии здравоохранения; хронические неинфекционные заболевания; телемедицина.

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The Role of Health in the Prevention of Chronic Non-Communicable Diseases in the Context of the Development of Telemedicine (on an Example of Jordan)

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ABSTRACT

INTRODUCTION: Public health helps protect populations from chronic non-communicable diseases by controlling the causes and early detection and treatment of diseases.

AIM: To explore ways to protect public health through a telemedicine-based health strategy of protection against chronic non-communicable diseases, on an example of Jordan.

MATERIALS AND METHODS: A stratified simple random sample was formed from three public hospitals in the province of Amman in Jordan. The questionnaire was used as a data collection tool. SPSS version 27 and AMOS version 24 were used for data analysis.

RESULTS: According to the medical staff, awareness of chronic non-communicable diseases was of secondary importance, while awareness of causes related to external factors, such as environmental pollution or workplaces was of primary importance.

CONCLUSION: Disease prevention based on public health strategies should involve all health authorities for the prevention and detection of chronic non-communicable diseases and early treatment. Telemedicine supports public health strategies for the prevention of chronic non-communicable diseases in modern settings around the world.

Keywords: health factors; health strategies; chronic non-communicable diseases; telemedicine.

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Introduction

Healthcare plays an important role in preventing disease, promoting health, communicating social determinants of health, and maintaining and improving well-being [1]. Public health efforts are undertaken by a variety of healthcare providers, engineers and mathematicians, and social scientists who work together to improve health and reduce the burden of disease, leading to improved health outcomes [2]. The role of public health includes identifying, tracking and responding to health threats, and preparing for disasters by addressing environmental and social factors that affect health [3]. Food-related issues, including production and related causes, are considered important in the production of health.

Chronic diseases are a major public health problem due to a variety of factors. Some diseases, such as cardiovascular diseases, diabetes and some types of cancer, are closely associated with obesity, which is a high public health risk factor [4]. In addition, chronic diseases may result from the convergence of communicable and non-communicable diseases, with bidirectional interactions between them, highlighting the need for a holistic approach in public health policy and practice. The excessive burden of chronic diseases is very closely related to the impact on quality of life through the impact on morbidity and mortality, as well as the impact on health care costs, especially in the developed countries as the United States [5]. Addressing the causal links between chronic diseases and economic, social and political factors will facilitate behavioral modifications to mitigate their social impacts.

Prevention, awareness and treatment form the basis of protecting people against chronic non-communicable diseases (CNCDs), which can be achieved through public health strategies [6]. New technologies related to digital health and artificial intelligence will support public health strategies and improve public health interventions to combat chronic non-communicable diseases [7]. Up-to-date, accurate public health data will contribute to the prevention of CNCDs, providing policy-makers and practitioners with a strategic roadmap leading to the reduction of CNCDs. Evidence-based strategies using research findings will improve public health outcomes and practice in public health [8]. Digitalization, awareness-raising and health promotion will effectively address the growing distribution of CNCDs and improve public health. A thorough understanding of the CNCDs will contribute to the application of public health policy approaches. This study examines the relationship between CNCDs and the effectiveness of public health standard procedures.

Causes of Chronic Non-Communicable Diseases

The leading causes of mortality and morbidity worldwide are the consequences of CNCDs such as cancer, diabetes, cardiovascular diseases and chronic respiratory diseases [9]. Several lifestyle factors associated with poor diet, low physical activity, excessive alcohol consumption, exposure to cigarette smoke and nicotine are considered factors in these diseases [10]. Li X. et al. [11] and Qi J. [12] showed that obesity plays a critical role in the prevalence of CNCDs among older adults and families with a history of such diseases. Determining the causes of CNCDs related to social, cultural and environmental factors will facilitate development of effective prevention and control strategies. A thorough understanding of the epidemiology and profound impact of CNCDs is considered critical for proper policy planning and management of programs to reduce the economic impact of CNCDs.

Understanding the lifestyle factors that cause CNCDs is important to protect public health by identifying the mechanisms of different effects and modifying these styles to improve protection [13]. Lifestyle changes are considered the beginning of the prevention of CNCDs in most societies and will mitigate the burden of lifestyle-related chronic diseases as well as improve the overall health of the population [14].

The spread of CNCDs among individuals at high-risk can be reduced by prevention and treatment through changes in the lifestyle

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[15]. Thus, a combination of understanding and lifestyle modification is essential to address the causes and prevent CNCDs.

Environmental factors have become a major concern when investigating the prevalence of CNCDs worldwide and planning public health interventions [16]. According to Y. Jiang et al. [17] and H. Zhao et al. [18], environmental stressors associated with climate change, anthropogenic environmental factors, and pollution affect the prevalence of CNCDs in rural China.

Effective intervention and mitigation strategies to reduce the prevalence and impact of CNCDs are reliable with a thorough understanding of the relationship between environmental factors and CNCDs.

Demographic factors significantly influence the prevalence and outcomes of CNCDs. In their study Du Y. et al. [19] and da Silva D.S.M. et al. [20] found that older age, lower education level, and female gender are positive factors for a higher incidence of CNCDs. Additionally, socioeconomic status and access to health services play a critical role in the occurrence of CNCDs, with individuals from low-income households facing a higher risk of multimorbidity [21]. Understanding these demographic determinants is essential for developing effective prevention and control strategies to address the burden of CNCDs.

Effectiveness of Public Health Strategy

The focus and goals of public health strategies can be used for different classifications. According to Surana R. [22], these classifications may be related to health promotion, health education, bioethical considerations, or disease prevention. Innovation in health policies and addressing social determinants are the responsibilities of public health leadership in a society. Public health strategies (PHS) are essential for emphasizing the need for interdisciplinary approaches to solving problems of preventing diseases and healthcare financing.

Successful PHS depends on systematic management and assessment using specific criteria [23]. Many factors influence the effectiveness of public health interventions, including factors related to people's willingness to participate, psychological aspects, ethical considerations, and other practical factors [24]. The implementation of PHS is associated with successful telemedicine (TM) communication, which facilitates the transfer of information to the public [25].

The **aim** of this study is to explore ways to protect public health through developing health strategy directed against chronic non-communicable diseases based on a telemedicine system on an example of Jordan.

Materials and Methods

Conditions. In this study, a qualitative descriptive approach was used based on the collection of data through a questionnaire and statistical procedures to achieve the results of this study. The study was conducted in the province of Amman in the Hashemite Kingdom of Jordan between January 1 and March 30, 2024, at the facilities of three major public hospitals.

Research problem. The spread of CNCDs in society threatens public health systems, increasing the burden and doubling the costs needed to provide services to sick people. Lack of awareness and knowledge about these diseases will contribute to their spread. PHS is considered to be a key factor for increasing awareness and reducing the prevalence of these diseases in society. If PHS is linked to the causes of CNCDs, it will contribute to the implementation of the strategy and reach the widest possible segments of society through awareness and TM. The parties that are included to minimize the spread of CNCDs depend on the health sector, people and community. This study examined the effect of PHS on raising the awareness of prevention of CNCDs through the use of TM.

Object and sample. The sample of this study included physicians in the public health sector. The total number of medical staff in the three target hospitals is 1,416. A random sample of medical personnel including 302 medical workers was taken from the three hospitals. The sample was distributed according to the proportion of medical personnel in the ratio of all hospitals, including 72.4% in Al

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Basheer Hospital, 18.43% in Prince Hamza Hospital and 9.2% in Tutanji Hospital. The sample was randomly formed.

Research variables. A questionnaire was used as a data collection tool. Closed-ended questions were used to determine demographic characteristics, while the Likert scale (1932) was used to measure trends in awareness, the role of SZ, and telemedicine in protecting against CNCDs.

In addition to the demographic characteristics of the sample, three variables were included in the study. Demographic characteristics included gender, age, medical experience, public sector experience, current status, and the effectiveness of primary care in protecting against CNCDs.

Public awareness of CNCDs (ACCs) included issues related to smoking, physical inactivity, pollution, depression, poor diet, age, and genetic factors. The health strategies to prevent CNCDs (PECs) rely on the involvement of the population and public health personnel, while the role of telemedicine in preventing CNCDs (TPCs) is to provide medical care accessibility, cost minimization and efficient distribution of services.

Validity and reliability. The prepared questionnaire was offered to a group of expert specialists and then tested on a group of medical personnel. The collected comments were taken into account in the final questionnaire. Validity was measured using Cronbach's alpha (1951), which shows the internal consistency of characteristics describing a single object but is not an indicator of the homogeneity of the object. Table 1 shows the results of the analysis reliability.

Table 1. Reliability analysis using Cronbach's Alpha

Variable	Cronbach's Alpha value
Awareness of chronic non-communicable diseases causes (ACC)	0.881
Public health strategies efficiency in protecting from chronic non-communicable diseases (PEC)	0.874
Telemedicine's role in protecting from chronic non-communicable diseases (TPC)	0.866

The results showed that the highest reliability was recorded for (ACC) (0.881), followed by (PEC) (0.874), and the lowest for TCP (0.866). The reliability values exceeded the threshold (0.6) accepted in such studies for three variables.

Ethical aspects. The Ministry of Health of the Kingdom of Jordan issued official consent to conduct the study in public hospitals in the province of Amman, at the same time obtaining the consent of medical personnel to participate in this study.

Results

The results of the demographic assessment of the respondents showed that men made up 62.3% of the sample, and women — 37.7%. Age limits vary from less than 30 years old (young employees) to 51 years old and older (specialists with very high experience in the medical field). The predominant age group is people aged 41–50 years (33.4%), followed by 30–40 years old (31.1%).

The results showed that the group of medical workers with high experience (11–15 years) prevailed — 60.3%. However, among the persons holding managerial positions, specialists with little experience in the medical sector prevailed (38.4%), which may indicate a predisposition of this category to experiment, introducing innovations in the management of a medical institution, and making constructive decisions.

As for the role of PHS in preventing CNCDs, opinions differed. The largest percentage (48.0%) believes that PHS will help protect against NCDs. Lower percentages of this effect reflected differences in beliefs.

Informing the Public about CNCDs

Medical staff considered their views on the causes of CNCDs according to their experience with patient behavior. The highest

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awareness was of poor nutrition as a source of chronic disease, followed by chronic stress, depression and isolation as the top-rank causes of chronic disease. Respondents believed that certain jobs in certain sectors were a source of chronic stress, followed by chronic infections. In addition, they believe that different types of pollution lead to CNCDs. Factors considered to be the main causes of CNCD associated with smoking and physical activity were found in the last rows (Figure 1).

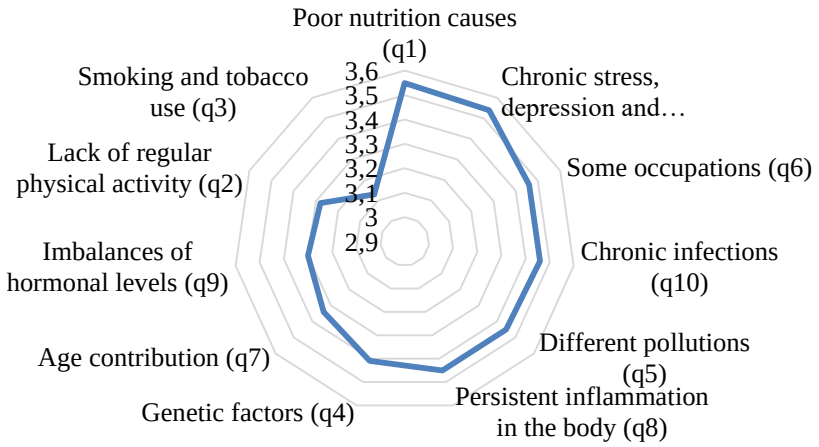

Fig. 1. Medical personnel's view of the population's awareness of the causes of chronic non-communicable disease.

The Role of PHS in Protecting against CNCDs

PHS is considered to be the nucleus for protection against NCDs. Cooperation of healthcare professionals with the community is most important to ensure that PHS fulfilled its role in preventing CNCDs (3.50±0.61). In addition, public health institutions, by providing information on CNCDs, can identify high-risk groups for appropriate actions (3.49±0.64). At the third level, cooperation between public health and health systems is very important to improve protection against CNCDs (3.48±0.67) (Table 2).

The study was found to be an important part of public health protection from CNCDs (3.48±0.67). Access to health facilities was considered important for protection against CNCDs (3.48±0.54). Emergency strategies to respond to any outbreak of chronic diseases are very important steps in protection (3.40±0.66). Promoting healthy lifestyles and sharing information with policymakers are very important elements of protecting against CNCDs. The lowest level of agreement was achieved on the provision of access to preventive services and educational programs that improve lifestyle (Table 2).

The Role of TM in Public Health Protection (PHP)

TM is a crucial part of PHP as it supports the health services for the population, which can be accessed all the time. The highest evaluation was for the role of TM in supporting the population's health through reaching a large number of individuals, followed by its role in the remote provision of health services and medical support. Remote consultation is considered very crucial to support healthy lifestyle (Figure 2).

The Effect of ACC on PEC under the Mediating Factor (TPC)

The high availability of health services through TM will allow the diagnosis of

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diseases including CNCDs in early stages which helps in its treatment and prevention. The TM platforms will enable the patients to have access to the medical information used as a part of prevention and will facilitate the improvement of lifestyle along with reducing the cost of medical services. Figure 3 shows that the PEC effect on ACC was 0.45, while this effect on TPC reached 0.79, and the effect of TPC on ACC was 0.33.

The effect of public health strategy and the role of TM in preventing CNCDs were tested using the Structural Equation Model (SEM). The results showed that the fit of the model (specificity of an application under given conditions) was very high, since the comparative fit index (CFI), incremental fit index (IFI), root mean square approximation error (RMSEA), minimum chi-square divergence divided by degrees of freedom (CMIN/df), and chi-square divided by degree of freedom (chi^2/df) were within the range.

Statistical estimates show that all effects were significant, CFI (0.922), IFI (0.923), RMSEA (0.068), CMIN/df (2.386), and chi^2/df (2.39) and the effect of physician's awareness (ACC) on the effectiveness of healthcare strategies (PEC) was improved by the indirect effect of TPC on improving physician's awareness (ACC), which reflects significance of TPC in the protection of public health.

Table 3 shows that all the effects were significant and the effect of PEC on ACC was improved through the indirect effect of TPC 0.792 to improve the ACC 0.452 reflecting that the TPC 0.326 is considered a significant factor as part of the public health protection.

Table 2. Healthcare staff perspectives on the role of public health strategies in protecting against chronic non-communicable diseases

The role of public health interventions	Average	Standard deviation
Public health agencies develop and implement health promotion campaigns to raise awareness about the risk factors associated with chronic diseases. (q12)	3.30	0.64
Educational programs provide information on healthy lifestyles, nutrition, physical activity, and the importance of regular health check-ups. (q13)	3.25	0.69
Public health systems often provide access to preventive services such as vaccinations, screenings, and early detection programs to identify and manage risk factors for chronic diseases. (q14)	3.28	0.67
Public health organizations work with policymakers to develop and implement regulations and policies that support healthy behaviors and environments, such as smoking bans, regulations on food labeling, and initiatives to promote physical activity. (q15)	3.30	0.61
Public health professionals cooperate with communities to implement interventions that address specific risk factors within populations, such as promoting access to affordable healthy food options and creating safe spaces for physical activity. (q16)	3.50	0.61
Public health agencies collect and analyze data on the prevalence and trends of chronic diseases. This information helps identify high-risk populations and informs on the development of targeted interventions. (q17)	3.49	0.64
Cooperation between public health and the healthcare system is essential. This includes efforts to improve healthcare delivery, enhance access to care, and integrate preventive measures into clinical practice. (q18)	3.48	0.67
Public health organizations participate in research to better understand the causes and determinants of chronic diseases. This research contributes to the development of evidence-based interventions and policies. (q19)	3.48	0.67
Public health systems develop strategies and plans to respond to emergencies or outbreaks of chronic diseases. This includes having mechanisms in place for rapid detection, response, and communication during health crises. (q20)	3.40	0.66
Public health initiatives aim to reduce health disparities by addressing social determinants of health and ensuring equitable access to resources and opportunities for health. (q21)	3.48	0.54

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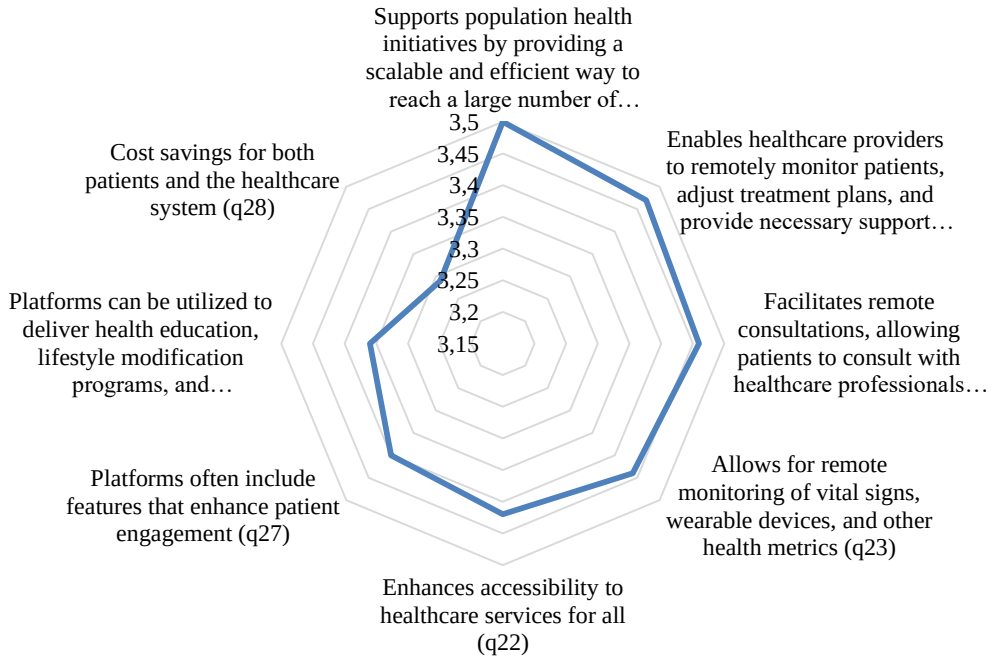

Fig. 2. The medical staff's views on the role of telemedicine in public health protection.

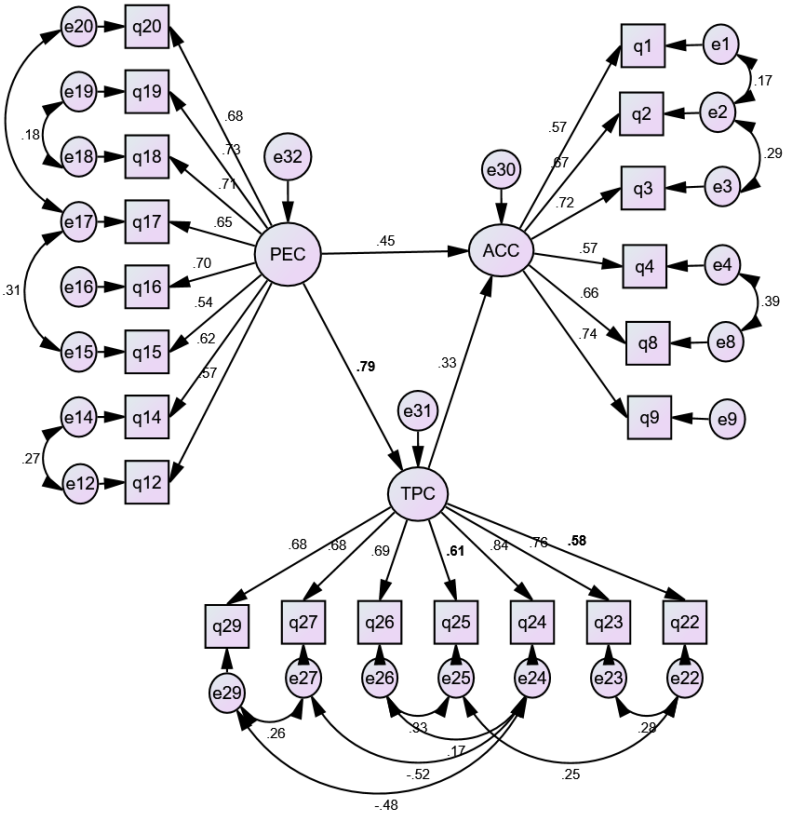

Fig. 3. The effect of ACC on PEC and the direct and indirect effect of TPC on PEC.

Table 3. Regression coefficient of healthcare strategy effectiveness (PEC) depending on physician's awareness (ACC) under mediating factor (TPC)

		Estimate	S.E.	C.R.	P	Total	Direct	Indirect
TPC	PEC	0.792	0.109	7.361	***	0.792	0.792	0.000
ACC	PEC	0.452	0.11	3.702	***	0.710	0.452	0.258
ACC	TPC	0.326	0.099	2.93	0.003	0.326	0.326	0.000

Discussion

Public health is essential to reduce the prevalence of CNCDs in the population. The effectiveness of PHS is based on the health system's ability to reach communities and communicate with the largest number of people to improve quality of life or help manage symptoms of chronic disease in their early stages. This study aimed to investigate the role of public health systems in protecting against CNCDs and mediating the use of telemedicine. The study addresses medical personnel of public hospitals and health systems of different countries.

The results showed a wide range of views on the efficacy of PHS for preventing CNCDs. These differences may result from the belief that external, uncontrollable environmental and work-related factors may contribute more significantly to the spread of CNCDs. The results showed that the majority of respondents believed that PHS could provide maximum 80% protection against CNCDs. The range of causes of chronic disease is very broad, including individually modifiable causes related to diet and lifestyle, and also uncontrollable factors associated with the environment and pollution.

The contribution of all health providers to PHS is considered very important for the formulation of a comprehensive public health strategy that promotes the control of chronic diseases. Schaefer I. et al. [26] explained the importance of including various medical organizations through their contributions to the spread of medical knowledge. Bridging the gap between different healthcare settings is considered very important to improve public health and the results of applied strategies in different countries.

Despite the fact that TM has existed for many years, some countries do not consider it an intrinsic part of the activities of the medical sector that contribute to the expansion of medical services. HMs should be regarded as an integral part of the public health system to ensure equitable distribution of health services and facilitate access to these services. In some countries, such as Jordan and Russia, despite the existence of TM laws, they are still not actively enforced due to different practical rules.

TM plays a critical role in public health by providing remote access to healthcare services, especially in distant areas, thereby expanding preventive care and improving long-term health outcomes [27]. This allows for proactive monitoring of public health hazards and diseases, facilitating early detection and prevention of health problems [28]. Additionally, TM played an important role during the COVID-19 pandemic by allowing patients to be safely treated at a distance and reducing unnecessary contact, thereby minimizing the spread of disease in healthcare settings [29]. However, the increased use of TM also poses challenges related to privacy and data security, highlighting the need for new regulations to protect personal health information. Overall, the cost-effectiveness and effectiveness of TM make it a valuable tool for strengthening primary healthcare systems, improving patient care, and improving public health in a variety of contexts.

The results showed that HMs can play a supporting role in providing PHS and, at the same time, a crucial role in protecting against CNCDs. These results call for the start of the search for effective tools to incorporate HMs into public health strategies and action plans of different countries.

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Conclusion

It has been recognized that public health strategy plays a very important role in preventing chronic non-communicable diseases through the adoption of adequate plans and monitoring all healthcare facilities. Public health strategies must address both the underlying risk factors for chronic non-communicable diseases associated with diet, physical fitness, and other lifestyle choices, as well as individual factors associated with environmental pollution. The use of telemedicine as part of a public health strategy will help prevent chronic non-communicable diseases by increasing the availability of health information and treating chronic diseases in the early stages. Based on the results of the study, the inclusion of telemedicine in the public health strategies of Jordan and other countries, including Russia, in the short and long-term.

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