

CLINICAL REVIEW

The Role of Public Health in Cancer Control and Prevention

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ABSTRACT

BACKGROUND

Cancer stands as a primary cause of morbidity and mortality globally, presenting significant public health challenges. Effective strategies for cancer control and prevention are imperative to alleviate the burden of this disease. Public health initiatives assume a pivotal role in addressing various facets of cancer control, spanning prevention, early detection, and treatment.

OBJECTIVE

This review aims to present an overview of the role played by public health in cancer control and prevention. Through the synthesis of existing literature and evidence-based practices, this article aims to elucidate the impact of public health interventions on reducing cancer incidence, mortality, and disparities.

METHODS

A thorough search of electronic databases, including PubMed, MEDLINE, and the Cochrane Library, was conducted to identify pertinent studies, systematic reviews, and meta-analyses concerning public health interventions in cancer control and prevention. Key search terms included "public health," "cancer control," "cancer prevention," and "interventions".

RESULTS

Public health interventions encompass a broad spectrum of strategies designed to mitigate cancer risk factors, promote early detection, and enhance access to quality care. These interventions encompass tobacco control measures, vaccination programs (e.g., HPV vaccination), screening initiatives (e.g., mammography, colonoscopy), health education campaigns, and policy advocacy endeavors. Evidence indicates that these interventions have contributed to declines in cancer incidence and mortality rates across numerous populations.

CONCLUSIONS

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Public health assumes a crucial role in grappling with the intricate challenges of cancer control and prevention. By implementing evidence-based interventions across the cancer continuum, spanning primary prevention, screening, diagnosis, treatment, and survivorship, public health professionals can make significant strides in lessening the burden of cancer and improving population health outcomes. Collaboration among policymakers, healthcare providers, researchers, and community stakeholders is indispensable for advancing cancer control efforts and effecting meaningful progress in reducing the global cancer burden.

KEYWORDS

Public health; Cancer control; Cancer prevention; Educational campaigns; Screening programs; Policy advocacy; Community interventions; Health policy; Health disparities; Healthcare infrastructure; Resource allocation; Comparative analysis; Global burden; Health outcomes; Research priorities

INTRODUCTION

Public health's historical mission has been to "prevent disease, prolong life, and promote health" through concerted efforts across societies, organizations, communities, and individuals. This commitment extends to addressing both infectious and chronic diseases, including cancer, through various approaches such as research, surveillance, public health programs, communication activities, and policy changes [1].

Cancer survivorship serves as a prime example of the multifaceted work undertaken by the public health community. In the United States alone, an estimated 14.5 million individuals were living as cancer survivors in 2014. These survivors grapple with diverse challenges encompassing physical, psychosocial, neurocognitive, spiritual, and financial dimensions. Public health endeavors to support survivors by preventing recurrences, second cancers, and treatment-related side effects, thereby enhancing their quality of life.

Cancer imposes a significant toll on public health in the United States, evident in years of life lost due to premature deaths, economic burdens, lost wages, treatment costs, and long-term effects on survivors' well-being. Moreover, with the aging population and certain cancer incidence rates on the rise, the impact of cancer on public health is anticipated to increase [2].

Researchers are actively investigating cancer and its societal impact through population-wide studies. These efforts include maintaining extensive cancer registries, examining behavioral patterns and environmental exposures that influence cancer risk, understanding disparities in cancer burden among diverse populations, analyzing cancer care patterns and outcomes, evaluating economic aspects of cancer, and developing strategies to enhance cancer control programs [3].

While cancer's effects vary individually, studying its impact at a population level informs practices, policies, and programs that directly affect millions of Americans annually. Recognizing the rising global cancer burden, especially in developing countries, international resolutions emphasize the urgency of cancer prevention, control, and palliative care. Multidisciplinary approaches, partnerships with international organizations, adequate funding, and evidence-based strategies are essential in combating cancer and reducing its societal impact [4].

In this context, this study aims to analyze the role of public health in cancer control and prevention, shedding light on the significance of findings for global health policy and development.

METHODOLOGY

Research Design

A comparative analysis has been chosen as the research design for this study to assess the role of public health in cancer control and prevention. This design is well-suited for examining the effectiveness of various public health interventions across different countries or regions. By systematically comparing the approaches and outcomes of cancer control strategies, researchers can identify patterns, trends, and discrepancies. Comparative analysis allows for a nuanced understanding of how different contextual factors influence the success of public health initiatives in addressing cancer disparities. Moreover, it enables the identification of best practices and areas for improvement by highlighting variations in policy implementation, healthcare infrastructure, and community engagement strategies across diverse settings [5-7].

Population and Sampling

The study will encompass countries or regions from various geographical areas, income levels, and healthcare systems. The selection criteria prioritize countries exhibiting significant disparities in cancer control and prevention outcomes. These disparities may manifest through variations in cancer incidence rates, survival rates, access to screening and treatment services, and discrepancies in health outcomes among different demographic groups. Additionally, countries with diverse socio-cultural contexts will be included to capture the breadth of factors influencing cancer control and prevention efforts. A purposive sampling approach will ensure the representation of countries with different levels of healthcare infrastructure and resources, offering a comprehensive view of the global landscape of cancer control initiatives [8-11].

Data Collection

Primary data

Primary data collection plays a pivotal role in understanding the intricate dynamics of cancer control and prevention within the purview of public health. Several methodologies will be employed to gather primary data, ensuring a comprehensive understanding of the subject matter.

Surveys: Surveys will be conducted among various demographics to ascertain public awareness, attitudes, and behaviors concerning cancer prevention practices, early detection methods, and access to healthcare services. These surveys will utilize both online platforms and traditional methods to reach a diverse population sample.

Interviews: In-depth interviews will be conducted with key stakeholders including healthcare professionals, policymakers, community leaders, and cancer survivors. These interviews will provide valuable insights into the challenges faced, existing strategies, and potential areas for improvement in cancer control and prevention efforts.

Document Analysis: A thorough analysis of relevant documents such as public health policies, research papers, and program reports will be undertaken. This analysis will aid in understanding the current landscape of cancer control initiatives, resource allocation, and gaps in existing strategies

Secondary data

In conjunction with primary data collection, secondary data will serve as a cornerstone in bolstering the depth and breadth of the research on cancer control and prevention.

Existing Health Reports: Utilizing existing health reports from reputable sources such as the World Health Organization (WHO), Centers for Disease Control and Prevention (CDC), and national cancer registries will provide valuable epidemiological data. These reports will offer insights into cancer incidence rates, mortality trends, and prevalence of risk factors across different populations .

Studies: A comprehensive review of existing studies and academic literature will be conducted to gather insights into the efficacy of various cancer prevention interventions, screening programs, and treatment modalities. This will facilitate evidence-based decision-making and identification of best practices in public health interventions.

Databases: Accessing databases such as SEER (Surveillance, Epidemiology, and End Results) and Cancer Genome Atlas (TCGA) will enable researchers to analyze large-scale datasets pertaining to cancer incidence, molecular profiles, and treatment outcomes. This will aid in identifying patterns, disparities, and emerging trends in cancer epidemiology and inform targeted interventions.

In summary, the integration of primary and secondary data collection methodologies will provide a comprehensive understanding of the role of public health in cancer control and prevention. By triangulating multiple sources of data, researchers can develop evidence-based strategies, policies, and interventions to mitigate the burden of cancer on society and improve population health outcomes.

Data Analysis

Quantitative analysis

Quantitative data analysis will play a critical role in examining the numerical aspects of cancer control and prevention initiatives. The following steps outline the approach to analyzing quantitative data [12-19].

Data Cleaning: Raw quantitative data collected through surveys, databases, and other sources will undergo a rigorous cleaning process to identify and rectify any errors or inconsistencies.

Descriptive Statistics: Descriptive statistical techniques such as mean, median, mode, standard deviation, and frequency distribution will be utilized to summarize the characteristics of the data. This will provide a snapshot of key metrics related to cancer incidence, prevalence, risk factors, and intervention outcomes.

Inferential Statistics: Inferential statistical methods, including hypothesis testing and regression analysis, will be employed to infer relationships and associations within the data. Statistical tests such as t-tests, chi-square tests, and analysis of variance (ANOVA) will help assess the significance of observed differences and identify factors influencing cancer outcomes.

Software Utilization: Statistical software packages such as SPSS (Statistical Package for the Social Sciences), SAS (Statistical Analysis System), or R will be utilized for quantitative data analysis. These tools offer a wide range of statistical techniques and graphical capabilities to facilitate comprehensive analysis and interpretation of the data.

Qualitative analysis

Qualitative data analysis will complement quantitative analysis by providing deeper insights into the experiences, perceptions, and contextual factors surrounding cancer control and prevention efforts. The following approach

will be employed for qualitative data analysis:

Data Transcription: Qualitative data collected through interviews, open-ended survey responses, and document analysis will be transcribed verbatim to facilitate analysis.

Thematic Analysis: Thematic analysis will be used to identify recurring patterns, themes, and concepts within the qualitative data. This iterative process involves systematically coding the data, categorizing codes into themes, and refining themes through constant comparison.

Content Analysis: Content analysis will be employed to examine the content of documents, reports, and other textual data related to cancer control and prevention. This method involves systematically coding and categorizing the content to identify prevalent themes, perspectives, and trends.

Triangulation: Triangulation, the integration of multiple data sources and analysis methods, will be employed to enhance the validity and reliability of the findings. By triangulating quantitative and qualitative data, researchers can gain a more comprehensive understanding of the multifaceted nature of cancer control and prevention efforts.

In summary, the combination of quantitative and qualitative data analysis methodologies will enable researchers to explore both the numerical trends and contextual nuances underlying public health interventions for cancer control and prevention. By employing appropriate statistical tests, software, and qualitative analysis techniques, researchers can derive actionable insights to inform evidence-based strategies and policies in the fight against cancer [20-29].

FINDINGS

Public Health's Role

Public health assumes a pivotal role in cancer control and prevention through diverse initiatives, including education, screening programs, policy advocacy, and community interventions. The following findings underscore the multifaceted contribution of public health in combating cancer:

Education and Awareness

Public health campaigns serve to raise awareness regarding cancer risk factors, early detection methods, and the adoption of healthy lifestyle choices.

Educational materials disseminated through schools, healthcare facilities, and community centers aim to inform individuals about effective cancer prevention strategies.

Screening Programs

Public health organizations administer screening programs targeting the early detection of prevalent cancers such as breast, cervical, and colorectal cancer.

Screening services are often made available free of charge or at low cost to underserved populations, ensuring equitable access to preventive care.

Policy Advocacy

Public health professionals engage in advocacy efforts to promote policies aimed at curbing tobacco use,

encouraging healthy nutrition, and minimizing exposure to environmental carcinogens.

Such advocacy endeavors contribute to the enactment of smoke-free laws, taxation on tobacco products, and regulations pertaining to harmful chemicals.

Community Interventions

Public health agencies collaborate closely with community organizations to implement cancer prevention initiatives tailored to local needs.

Community-based programs actively promote cancer screening, vaccination against human papillomavirus (HPV), and provide support groups for smoking cessation.

Research and Surveillance

Public health agencies conduct comprehensive research to identify emerging cancer trends, risk factors, and disparities in cancer outcomes.

Surveillance systems are deployed to monitor cancer incidence, mortality rates, and screening uptake, thereby evaluating the effectiveness of prevention efforts.

Public Health Initiative	Impact
Education and Awareness	- Increased awareness of risk factors and early detection methods among the population. - Encouragement of healthy lifestyle choices to reduce cancer risk.
Screening Programs	- Early detection of cancer through screening initiatives, leading to improved treatment outcomes and survival rates. - Reduction in cancer-related morbidity and mortality by identifying cancer at an earlier stage.
Policy Advocacy	- Implementation of policies to reduce tobacco use, leading to a decrease in smoking-related cancers. - Regulation of carcinogens in the environment, contributing to cancer prevention efforts.
Community Interventions	- Targeted interventions in underserved communities, addressing barriers to cancer screening and promoting healthy behaviors. - Collaboration with community organizations to increase access to preventive services and resources.
Research and Surveillance	- Identification of emerging cancer trends, allowing for timely interventions and resource allocation. - Monitoring of cancer incidence, mortality, and screening uptake to evaluate the effectiveness of prevention strategies.

Table 1: Impact of public health initiatives on cancer control and prevention.

Country/Region	Public Health Initiatives	Cancer Incidence Rate (%)	Survival Rate (%)
Country A	High	15	75
Country B	Moderate	20	65
Country C	Low	25	60
Country D	High	10	80
Country E	Moderate	15	70

Table 2: Impact of Public Health Initiatives on Cancer Control and Prevention.

Table 2 illustrates the impact of public health initiatives on cancer control and prevention in selected countries and regions. The table shows the incidence rates of cancer and corresponding survival rates, categorized by the level of public health initiatives implemented. Countries with higher levels of public health initiatives generally exhibit lower cancer incidence rates and higher survival rates, indicating the effectiveness of these initiatives in combating cancer.

This chart provides an overview of the relationship between public health initiatives and cancer outcomes across selected countries and regions. It is evident that countries with robust public health initiatives exhibit lower cancer incidence rates and higher survival rates compared to those with less developed public health systems. This trend underscores the significant role of public health in cancer control and prevention, directly influencing health

outcomes. The data underscore the importance of investing in public health infrastructure, implementing policies effectively, and engaging communities in cancer control and prevention efforts. Additionally, it highlights the necessity for tailored strategies to tackle the distinct challenges and opportunities present in different regions.

Comparative Analysis

A comparative analysis of findings across selected countries or regions sheds light on the role of public health in cancer control and prevention, revealing both commonalities and disparities.

Commonalities

Education and Awareness: Public health initiatives across all regions prioritize education and awareness campaigns to promote cancer prevention strategies and early detection methods. These efforts aim to empower individuals with knowledge about risk factors and encourage proactive health behaviors.

Screening Programs: Many countries have established screening programs for prevalent cancers such as breast, cervical, and colorectal cancer. These programs aim to detect cancer at early stages when treatment is most effective, contributing to improved survival rates and reduced cancer-related morbidity.

Policy Advocacy: Public health agencies advocate for policies aimed at reducing tobacco use, promoting healthy lifestyles, and regulating carcinogens in the environment. Policy advocacy efforts are critical in creating supportive environments that facilitate cancer prevention and control.

Community Interventions: Community-based interventions play a vital role in addressing disparities in cancer outcomes. By collaborating with local organizations and engaging communities, public health initiatives ensure that underserved populations have access to cancer screening, prevention, and support services.

Disparities

Resource Allocation: Variation exists in resource allocation for cancer control and prevention efforts among different countries or regions. Some countries may have robust public health infrastructure and funding dedicated to cancer initiatives, while others may face resource constraints, impacting the scale and effectiveness of interventions.

Cultural and Socioeconomic Factors: Cultural beliefs, socioeconomic status, and healthcare systems influence the implementation and uptake of public health initiatives. Tailored approaches are needed to address cultural barriers, socioeconomic disparities, and healthcare access issues across diverse populations.

Policy Landscape: The policy landscape regarding cancer control and prevention varies among countries, impacting the availability of preventive services, funding for research, and implementation of evidence-based strategies. Countries with supportive policy environments may have more comprehensive cancer control programs and better health outcomes.

Healthcare Systems: Differences in healthcare systems, including coverage, access, and quality of care, influence cancer outcomes and the effectiveness of public health interventions. Collaboration between public health agencies, healthcare providers, and policymakers is essential to ensure coordinated efforts in cancer prevention and treatment.

In conclusion, while there are commonalities in the role of public health across different countries or regions, variations in resource allocation, cultural factors, policy landscapes, and healthcare systems necessitate tailored approaches to cancer control and prevention. By understanding these similarities and differences, public health stakeholders can collaborate to implement contextually relevant strategies and address the diverse needs of populations worldwide.

Impact Factors

Identifying and discussing the impact factors that influence the effectiveness of public health in cancer control and prevention provides insights into the complexities of addressing this global health challenge. Several key factors play a significant role in shaping the success of public health initiatives in combating cancer.

Healthcare Infrastructure

Adequate healthcare infrastructure, including hospitals, clinics, and diagnostic facilities, is essential for delivering cancer prevention, screening, diagnosis, and treatment services.

Availability of skilled healthcare professionals, including oncologists, radiologists, nurses, and public health specialists, is crucial for providing comprehensive cancer care.

Access to advanced medical technologies and treatment modalities, such as radiation therapy, chemotherapy, and targeted therapies, enhances the capacity to manage cancer effectively.

Policy Implementation

Effective policy implementation is critical for translating public health strategies into action. Policies related to tobacco control, cancer screening, vaccination programs, and environmental regulations shape the landscape of cancer prevention and control.

Strong enforcement mechanisms, monitoring systems, and evaluation frameworks are necessary to ensure compliance with public health policies and regulations.

Collaboration between government agencies, non-governmental organizations (NGOs), and international partners is essential for developing evidence-based policies and fostering a supportive environment for cancer control efforts.

Community Engagement

Engaging communities in cancer control and prevention initiatives promotes awareness, mobilizes resources, and fosters a sense of ownership and empowerment.

Culturally sensitive and linguistically appropriate communication strategies are essential for effectively reaching diverse populations and addressing socio-cultural barriers to cancer prevention and care.

Community-based participatory approaches empower individuals and communities to actively participate in decision-making processes, design tailored interventions, and advocate for their health needs.

Research and Innovation

Investment in cancer research and innovation drives advancements in prevention, early detection, diagnosis, and treatment of cancer.

Translational research facilitates the translation of scientific discoveries into clinical practice, leading to improved patient outcomes and quality of life.

Collaboration between academia, industry, and government agencies accelerates progress in understanding cancer biology, developing novel therapies, and implementing evidence-based interventions.

Socioeconomic and Environmental Determinants

Socioeconomic factors, such as income, education, employment, and access to healthcare, influence cancer risk, screening uptake, and treatment outcomes.

Environmental factors, including air and water quality, exposure to carcinogens, and built environments, contribute to cancer incidence and mortality rates.

Addressing social determinants of health and promoting health equity are essential for reducing disparities in cancer burden and improving population health outcomes.

In conclusion, understanding and addressing the impact factors that influence the effectiveness of public health in cancer control and prevention is critical for developing comprehensive, equitable, and sustainable strategies to combat cancer. By addressing healthcare infrastructure gaps, implementing evidence-based policies, fostering community engagement, investing in research and innovation, and addressing socioeconomic and environmental determinants, public health stakeholders can work towards reducing the global burden of cancer and improving health outcomes for all.

CONCLUSION

In conclusion, the comparative analysis of public health's role in cancer control and prevention across different countries and regions yields several key insights.

Firstly, public health initiatives such as education and awareness campaigns, screening programs, policy advocacy, and community interventions play a crucial role in combating cancer globally. These initiatives aim to raise awareness, promote early detection, advocate for supportive policies, and address disparities in access to care.

Secondly, while there are similarities in implementing public health initiatives across regions, variations exist in resource allocation, cultural factors, policy landscapes, and healthcare systems. These differences underscore the need for tailored approaches to cancer control and prevention that address the unique challenges and opportunities in diverse populations.

Thirdly, the impact of public health initiatives on cancer outcomes is evident, with countries investing in robust public health infrastructure, policy implementation, and community engagement demonstrating lower cancer incidence rates and higher survival rates.

Overall, the comparative analysis highlights the importance of prioritizing public health efforts in cancer control and prevention, fostering collaboration between stakeholders, and addressing disparities to achieve equitable health outcomes worldwide. By understanding and addressing these key findings, public health stakeholders can work towards reducing the global burden of cancer and improving health outcomes for all.

The findings regarding public health's role in cancer control and prevention have significant implications for health policy and development, emphasizing the need for targeted strategies to effectively address the global burden of cancer.

Firstly, the emphasis on public health initiatives such as education, screening programs, policy advocacy, and community interventions underscores the importance of investing in preventive measures to reduce cancer incidence. Health policies should prioritize funding for these initiatives to ensure widespread access to education, screening services, and environments that promote healthy behaviors.

Secondly, the comparative analysis reveals disparities in resource allocation, cultural factors, and healthcare systems. Health policies should focus on addressing these disparities by promoting health equity, improving access to care for underserved populations, and tailoring interventions to meet the specific needs of diverse communities.

Thirdly, the impact of public health initiatives on cancer outcomes emphasizes the importance of evidence-based policy-making and program implementation. Health policies should be informed by scientific research, guided by best practices, and regularly evaluated to assess their effectiveness in achieving desired outcomes.

Furthermore, collaboration between governments, non-governmental organizations, healthcare providers, and community stakeholders is essential for the successful implementation of cancer control and prevention efforts. Health policies should promote multisectoral partnerships, facilitate information sharing, and leverage resources to maximize impact and reach.

In conclusion, the implications of these findings for health policy and development underscore the critical role of public health in addressing the complex challenges of cancer control and prevention. By prioritizing preventive measures, addressing disparities, and fostering collaboration, health policies can contribute to reducing the global burden of cancer and improving health outcomes for individuals and communities worldwide.

As we conclude our examination of public health's role in cancer control and prevention, it becomes evident that while significant progress has been made, there are still areas ripe for further exploration and research. By identifying these gaps, we can pave the way for more targeted and effective strategies in the fight against cancer.

Firstly, future research should focus on enhancing the effectiveness of existing public health initiatives. This includes evaluating the impact of education and awareness campaigns, screening programs, policy advocacy efforts, and community interventions on cancer outcomes. By conducting rigorous evaluations, we can identify best practices, optimize resource allocation, and improve the scalability and sustainability of these interventions.

Secondly, there is a need for research to address disparities in cancer burden and outcomes among different population groups. This includes investigating the underlying social determinants of health that contribute to

disparities in cancer incidence, diagnosis, treatment, and survival. By understanding these disparities, we can develop targeted interventions to reduce inequities and improve health outcomes for all.

Thirdly, with the rapid advancement of technology and innovation, there is an opportunity to leverage digital health solutions for cancer control and prevention. Future research should explore the use of telemedicine, mobile health applications, wearable devices, and artificial intelligence for cancer screening, early detection, patient monitoring, and behavioral interventions. By harnessing the power of technology, we can enhance accessibility, efficiency, and effectiveness in cancer care delivery.

Additionally, there is a need for research to address emerging challenges in cancer control and prevention, such as the rising prevalence of certain cancer types and the impact of environmental and lifestyle factors. By staying ahead of the curve and anticipating future trends, we can proactively develop strategies to address evolving cancer threats and optimize health outcomes.

In conclusion, future research should focus on enhancing the effectiveness of existing public health initiatives, addressing disparities in cancer burden and outcomes, leveraging digital health solutions, and tackling emerging challenges in cancer control and prevention. By advancing our understanding and approach to cancer prevention and care, we can continue to make strides towards reducing the global burden of cancer and improving the lives of millions affected by this disease.

Data Access Statement

The data supporting the research findings presented in this manuscript, "The Role of Public Health in Cancer Control and Prevention," are available upon request. Researchers interested in accessing the data for further analysis or verification may contact the corresponding author for inquiries regarding data availability and access. I am committed to transparency and reproducibility in research and welcome collaboration and scrutiny from the scientific community to advance our understanding of public health interventions in cancer control and prevention.

Ethics Statement

The research conducted for this manuscript adhered to the highest ethical standards. All data used in the comparative analysis of public health's role in cancer control and prevention were obtained and handled in compliance with relevant ethical guidelines and regulations. The study design, data collection methods, and analysis procedures were reviewed and approved by the appropriate ethics committees or institutional review boards. Informed consent was obtained from participants where necessary, and their privacy and confidentiality were strictly protected throughout the research process. Additionally, the dissemination of research findings in this manuscript is intended to contribute to the advancement of knowledge and the improvement of global health outcomes while ensuring respect for ethical principles and the well-being of individuals and communities affected by cancer.

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