

# Identifying Priorities and Needs to Improve Oncology Research in the Gaza Strip, Palestine

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**Purpose:** The purpose of this study was to (1) identify the priorities of oncology research in the Gaza Strip; (2) explore the needs for improving oncology research in the Gaza Strip, Palestine.

**Participants and Methods:** A qualitative approach for data collection was used in this study. After obtaining the ethical approvals to conduct this study, a sample of 42 health-care providers who are involved in providing oncology care and research in the Gaza Strip were included in this study. Data were collected by the researchers through seven focus groups. Thematic coding was used for data analysis. Two main themes and several sub-themes were extracted during the data analysis.

**Results:** The two main themes extracted from data analysis were research priorities and research needs. Participants identified several priorities in relation to oncology research that are assessing for cancer awareness, cancer prevention, exploring and finding new molecular biomarkers, screening for germ-line mutations related to the most common cancers, determining genetic and environmental risk factors for developing cancer, and exploring and testing new cancer therapies. Concerning research needs, participants identified several needs to enhance oncology research, which are financial needs, need for training, availability of data, creation of interdisciplinary research teams, and transforming in vitro studies to in vivo.

**Conclusion:** Well-designed studies will certainly help to identify the priorities and needs to improve oncology research in the Gaza Strip, which is considered one of the most important steps to help push these priorities onto the agenda of health policymakers. Therefore, they will work to set goals and design policies and programs aiming to reduce incidence and prevalence rates of cancer in the Gaza Strip, promote early detection of cancer, improve prognosis, and reduce mortality related to cancer.

**Keywords:** research needs, research priorities, oncology care, focus group, gaza strip

## Introduction

Cancer is a general term for several diseases that can affect any part of the body. Cancer is characterized by rapid creation and uncontrolled proliferation of abnormal cells that grow rapidly, which can invade adjacent organs and/or metastasize to other organs. Widespread metastases are the primary cause of death from cancer.<sup>1,2</sup>

Cancer is one of the leading causes of death at the global level as it was responsible for about 10 million deaths in the year 2020 which accounts for about one in six deaths.<sup>1</sup> The number of newly diagnosed cancer cases is at an increase. It is expected that by 2040, the number of cancer patients will increase by 47% compared to 2020. The predicted increase in cancer cases is expected to be higher in developing countries, such as Palestine, as it is expected to increase by 64–95% in low- and middle-income countries (LMICs) compared to 32.0% to 56.0% in high-income countries (HICs).<sup>3</sup> Along with the expected increase in cancer cases, that the number of cancer-related deaths is expected to increase, especially in LMICs. By 2030, it is estimated that cancer-related deaths in LMICs will increase by 75.0%.<sup>4</sup>

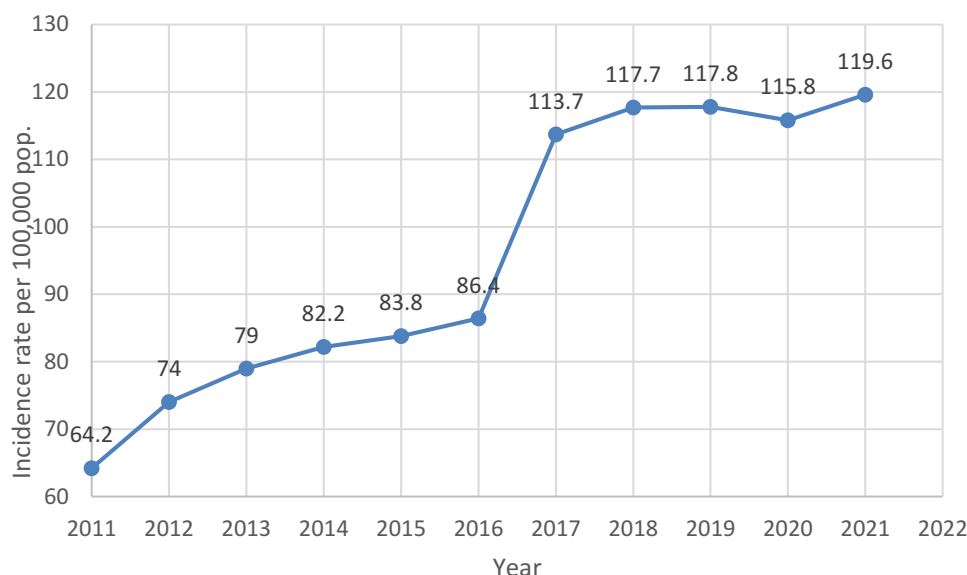
Literature identified several factors that can contribute to increasing incidence and mortality rates of cancer in LMICs. These factors include prolonged time to seek medical help, and therefore, late diagnosis of cancer cases, inadequate screening programs for several types of cancer, lack of educational resources in these countries, poor control of risk factors, lack of trained medical staff and lack of cancer therapies in LMICs compared to HICs.<sup>5,6</sup> This is besides changes in lifestyle behaviors, expanding urbanization and increased life expectancy.<sup>7</sup>

In Palestine, there was a remarkable increase in cancer cases in the last few years, it increased from 4667 cases in the year of 2017 to 5320 cases in 2021. According to the latest annual report of the Ministry of Health,<sup>8</sup> the crude incidence rate increased from 64.2 per 100,000 of the population in the year 2011 to 119.6 in the year 2021 (Figure 1).<sup>8</sup> The good news is that many types of cancers can be cured if detected in their early stages and if they were managed effectively.<sup>1</sup>

Scientific research has contributed greatly to the treatment and prevention of cancer. Scientific research involves studies that are well planned and include systematic collection, interpretation, and evaluation of data. Results obtained from scientific studies are shared with other scientists as new information is revealed that contribute to diagnosis, treatment, and reliability of its application<sup>9</sup> to several diseases, including cancer. In the Declaration of Helsinki, it clarified that “the primary purpose of medical research” on volunteers is to understand the reasons, development, and effects of diseases and develop protective, diagnostic, and therapeutic interventions (method, operation, and therapies). Even the best proven interventions should be evaluated continuously by investigations with regard to reliability, effectiveness, efficiency, accessibility, and quality.<sup>10</sup>

According to the American Association for Cancer Research,<sup>11</sup> the major goal of studying cancer is “to develop safe and effective methods to prevent, detect, diagnose, treat, and, ultimately, cure the collections of diseases” that are called cancer. They added that the better these diseases are understood, the more progress toward reducing the tremendous human and economic toll of cancer will be. Cancer research also helps in identifying the causes and risk factors of cancer and will help survivors to live longer and enjoy a better quality of life.<sup>12</sup>

Cancer research is mostly conducted in HICs, especially those studies focusing on clinical trials; on the other hand, there is less attention toward cancer research in LMICs.<sup>13,14</sup> Between the years of 2014 to 2017, the great majority of Phase 3 trials of anti-cancer therapies were conducted in HICs with only 8% of these studies being conducted in LMICs,<sup>14</sup> despite the fact that results from clinical trials do not necessarily need to be generalized across other populations and country contexts.<sup>14–16</sup>



**Figure 1** Incidence rates of reported cancer cases in Palestine per 100,000.

**Note:** Data from Ministry of Health, 2022.<sup>8</sup>

## Problem Statement and Purpose

Cancer research utilizes many resources including huge budgets, well-prepared laboratories, and well-trained researchers. Consequently, most of these studies, especially those that focus on discovering new therapies and new diagnostic methods, are conducted in HICs.<sup>14</sup> In fact, only 8% of all phase 3 trials of anti-cancer therapies were conducted in LMICs between the years 2014–2017, despite knowing that results of trial studies conducted in HICs are not necessarily generalized across different populations and countries including LMICs.<sup>14–16</sup> Therefore, Pramesh<sup>7</sup> and colleagues advise researchers from LMICs to conduct their own studies that are tailored to meet the local concerns of their population and try to find effective, feasible, acceptable, and implementable solutions for the issues prevailing in their own countries. In LMICs, such as Palestine, where financial and human resources are very limited, there is a scarcity of studies related to cancer, especially those focusing on finding new modalities of treatment and discovering new methods for early diagnosis of cancer. The available studies in Palestine related to cancer are mostly cross-sectional, descriptive studies that focus on assessing population knowledge about signs and symptoms, risk factors and protective factors of some types of cancer.<sup>17–19</sup> With the escalating numbers of newly diagnosed cancer cases, which almost doubled in the last 10 years,<sup>8</sup> and the lack of funds available to conduct well-controlled cancer-related studies in Palestine, there is a need to set priorities and to identify needs to improve quality of cancer research and to utilize the available resources in the best possible manner. Therefore, this study aimed to (1) identify the priorities of oncology research in the Gaza Strip; (2) explore the needs for improving oncology research in the Gaza Strip.

## Methods and Materials

### Design

A qualitative approach for data collection was used in this study. Qualitative research provides the basis by which one can gain an in-depth understanding of how researchers and policymakers identify and prioritize the needs of research studies related to different health-related issues.<sup>20</sup>

### Participants and Settings

In the Gaza Strip, there is only one hospital that specializes in providing oncology care, which was established 3 years ago. It does not have all specialties and treatment and diagnostic modalities needed for cancer patients. In many cases, when further diagnostic or treatment measures are needed, patients are referred to another part of Palestine, the West Bank, which is geographically separated from the Gaza Strip. Patients will need special permissions from the Israelites to get to hospitals in the West Bank, which is not always affordable.

Unlike quantitative research (who decide about the number of participants to be included in their studies), the sampling decision in qualitative studies is guided by the data themselves. Data collection stops when researchers feel that they have reached data saturation.<sup>21</sup> In this study, we used a purposive sampling to obtain relevant and high-quality data. Participants consisted of 42 health-care providers who are involved in oncology care in the Gaza Strip. Participants should have at least 2 years of experience in providing oncology care in order to be included in the study. Participants were from different medical disciplines that are available in the Gaza Strip including oncology doctors, oncology surgeons, oncology nurses, internal medicine doctors, histopathologists, bio-medical scientists, and other health-care educators who are involved in oncology research. Unfortunately, there were some disciplines that are not available in the Gaza Strip such as radio-therapists, palliative therapists; therefore, no participants from these disciplines were involved in this study. Data were collected by the researchers through seven focus groups. Each group consisted of 5–7 participants. The interviews were audiotaped after obtaining the consent of the participants. The purpose of these interviews was to obtain rich information to help identify and prioritize the needs for research studies related to oncology care in the Gaza Strip.

The questions to be asked through the focus group were prepared and agreed upon by the researchers of this study. Then, they were reviewed by a panel of seven experts in the field of oncology and qualitative research to ensure relevance. Slight modifications were made in response to the comments of the reviewers. The interview questions evolved around answering two main questions:

What do you think are the most important topics that need to be investigated in relation to cancer in Gaza?

What do you think is needed to improve the quality of research in Gaza?

After throwing these two main questions, the moderators of the sessions elaborate on the interviewees answers and allow them to discuss the topic in more detail. Interviewees were actively engaged in the discussion and gave thorough answers to the questions.

## Ethical Considerations

Prior to conducting this study, a complete proposal was submitted to the Research Ethics Committee at the Islamic University of Gaza (approval no. 24–2022) who approved this study and a permission from the Ministry of Health was also obtained to interview health-care professionals. At the beginning of each focus group, the purpose of the study was explained to the participants, and they were assured about the confidentiality of the information they would provide and about the anonymity of reporting the data. Furthermore, they were asked to sign a consent form indicating agreement to participate in the study and to record the meetings and that their data will be used for publication.

## Data Analysis

The researchers listened to the audiotaped interviews several times and data were transcribed into verbatim. This was followed by reading the transcribed data several times. This helped the researchers to ensure that interviews were transcribed correctly. While reading the transcribed data, codes were developed through a process of open coding. Coding in qualitative research is a word or a group of words used as titles for themes and sub-themes generated during analysis process. There were two main themes and several sub-themes extracted during the data analysis. The two main themes were research priorities and research needs. Under research priorities, came the following sub-themes: assessing cancer awareness, cancer prevention, exploring and finding new molecular biomarkers, screening for germ-line mutations related to the most common cancers, determining genetic and environmental risk factors for developing cancer, and exploring and testing new cancer therapies. Concerning research needs, participants identified several needs to enhance oncology research that are financial needs, need for training, availability of data, creation of interdisciplinary research teams, and transforming in vitro studies to in vivo.

To ensure rigor and to validate the results of data analysis, all researchers participated in the data analysis and reviewed the final draft of analysis. After that, the transcribed verbatim along with the data analysis were sent to five of the participants who have experience on qualitative research besides their experience in conducting studies and/or providing oncology care to review the analysis. A very few comments were made, and revisions were made accordingly. According Polit and Beck, going back to participants and sharing the results of analysis with them is a method of confirmatory activity to evaluate whether the researcher's thematic analysis is consistent with their experiences.<sup>21</sup>

## Results

The results of this study are categorized into two main themes: research priorities and research needs, and each theme has several subthemes.

### Research Priorities

Participants identified several priorities in relation to oncology research that are presented (in a descending order) below according to their importance.

#### Assessing for Cancer Awareness

Assessing cancer awareness among the public came as the most important priority for oncology research in the Gaza Strip. This priority was supported by 38 (90.48%) participants. Participants argued that there is a need to assess the level of knowledge and awareness among the public about the risk factors and early signs and symptoms of certain types of cancer. This will help to perform cancer awareness initiatives and campaigns and to tailor special health education programs to increase public awareness about risk factors and early signs and symptoms of cancer, which will help and encourage them to avoid exposure to risk factors and to seek medical advice in the early stages of the disease. This, in return, will help to early diagnoses of cancer, which will improve the prognosis for these patients, and they will enjoy

a better quality of life. Moreover, participants argued that this will reduce the financial burden of the disease by reducing the number of hospital-stays and cost of treatment. This is very important because of the limited budget of the ministry of health, which suffers from financial constraints. Participants also believed that this type of research is not costly as there will be no interventions; which will encourage researchers to engage in such studies, especially with the lack of financial support for research in the Gaza Strip. One oncologist said: “Most of the cases of breast cancer we see seek medical advice after the disease has developed to advanced stages. This will reduce their survival rate. Should we investigate women’s awareness about early signs and symptoms of breast cancer, risk factors for breast cancer, and why they delay seeking medical advice, will help us to make educational campaigns increase awareness about risk factors and early signs and symptoms. This will help women to seek medical advice early, which will help to improve their prognosis”.

### Cancer Prevention

Cancer prevention research was also on the list of priorities identified by our participants as it came as the second priority. It was supported by 35 (83.33%) participants. Participants mentioned that some changes in the individual's lifestyle can prevent or delay the occurrence of some types of cancer. Some examples were mentioned by participants about these preventive measures including practicing exercise, increasing fiber in the diet, smoking cessation, and decreasing fats and red meat in the diet, which play major roles in preventing or delaying development of some types of cancer such as colon cancer and lung cancer. Participants showed high interest in conducting research to investigate how some changes in lifestyle behaviors can prevent or delay cancer development. Moreover, some participants focused on research related to secondary prevention of some cancer, especially breast cancer. One participant said: “Breast cancer is the most common cancer in Palestine. We notice that the number of new cases is increasing each year and, unfortunately, in most cases it is diagnosed in the late stages. This should motivate us to take some action. I think that we need to study the percentage of women who practice monthly breast self-examination and how many do yearly mammograms. We need to know why they don’t do the self-exam and the mammogram”.

This encouraged some participants about giving examples about the importance of studying other topics related to testicular self-examination, yearly testing for prostate cancer (digital rectal examination and prostate-specific antigen), prevalence of smoking and obesity among the public and other studies related to risk factors of the most common types of cancer in the Gaza Strip.

### Exploring and Finding New Molecular Biomarkers

Participants in this study identified the topic related to exploring new molecular biomarkers as one of the top priorities ( $n=26$ , 61.91%). They argued that exploring new biomarkers will help in early diagnosis for several types of cancers, which in turn will improve the prognosis of the patients and increase their life expectancy and their quality of life. “Some of the older biomarkers are now of no benefit”, one participant said. Another participant added, “we need to find out new biomarkers to help us attack cancer cells.” Another participant gave an example: “I am currently working on a biomarker called “TPX 3.” This protein is not present in the blood of normal people, but it was present in the fetus. We found that this protein is activated in case of breast cancer. Therefore, I am trying to conclude that it has a role of mutation of normal cells to cancerous cells in breast cancer. Detecting this protein early in someone's blood can lead us to early diagnosis of breast cancer. Moreover, the value of this biomarker can be used to determine the prognosis of certain types of cancer, and some can also be used for therapeutic purposes”.

### Screening for Germ-Line Mutations Related to the Most Common Types of Cancer

Another priority identified by participants ( $n = 21$ , 50.00%) was screening for germ-line mutations that occur in cancer cells, especially those related to the most common cancers such as breast, lung, and colorectal cancers. A histopathologist mentioned that: “Oncology patients in Gaza Strip have different mutations than those occurring in other countries. Knowing these mutations, especially the basic mutations, for some types of cancer will help identifying the specific biomarkers and will help in early detection and identifying proper treatment and will improve prognosis of patients diagnosed with these cancers”.

## Determining Genetic and Environmental Risk Factors for Cancer

Another priority for oncology research mentioned by the participants (n=17, 40.48%) was determining genetic and environmental risk factors related to cancer, especially, the common types of cancer prevailing in the Gaza Strip such as breast, lung, colorectal, and prostate cancers. Identifying risk factors will help to identify those who are at risk of developing certain types of cancer and will help to take precautionary actions to prevent it or to diagnose it at its early stages, which in turn will improve the prognosis for these cancers and reduce the cost of the treatment. Several participants gave examples about a famous international actress who had gone for a precautionary mastectomy because they discovered that they were at high risk to develop breast cancer.

## Developing and Testing New Cancer Therapies

Participants (n=15, 35.71%) also recommended conducting research studies that aim to develop and test new promising cancer therapies. Several (n=9, 21.43%) participants believed that this kind of research is costly and needs highly trained staff, but they think it is necessary to be done. With the development of resistance to available drugs, research should focus on finding new alternatives. Moreover, research should focus on finding new drugs with fewer side effects and fewer complications as many patients suffer from severe drug-related complications such as bleeding (which could be fatal on many occasions), infections, and anemia. One participant described:

We work on to develop and test new drugs. We collaborate with chemists in this regard. There are some already known biomarkers for some types of drugs. Existing drugs are no longer effective at killing these cancer cells due to developing drug resistance for these drugs. We work to design new drugs to target these biomarkers and kill cancer cells. For example, we design new protein molecules to target specific biomarkers, then we test it on cancer cells and after that we test them on mice.

Another participant added:

We also look for repurposing of already existing drugs. By doing this, we try to find out if there are some of the already present drugs that can work to kill cancer cells. Remember, with COVID, they used a very old drug that was used to treat Malaria to kill the virus. Now, we are working to find out the effect of Metformin (a drug used to control blood sugar in type 2 diabetes mellitus) on the treatment and prevention of some types of cancer. The primary results are promising. We aim to introduce our results in the protocol of cancer treatment.

## Research Needs

In order to be able to conduct high-quality research related to oncology care, participants identified several needs, which are summarized as the following:

### Financial Resources

All participants (100%) ranked financial resources as the highest priority need to conduct research studies related to cancer. Oncology research is costly and requires several equipment, laboratories, chemicals, raw materials, laboratory animals, machines, and other expensive facilities. This is besides the need for well-equipped laboratories that will enable researchers to conduct their studies. Usually having well-equipped laboratories is costly.

Participants identified the need to buy some equipment, which are required for the diagnosis of cancer. An example of missing equipment is a machine called “sequencer” which is used for gene screening, which increases the knowledge about the genome of the cancer cells. Although there are three generations of this equipment, none of them has ever entered the Gaza Strip. Moreover, participants claimed that the lack of financial resource is one of the major causes for migration of Palestinian scientists; as many well-educated and well-trained scientists who received training in developed countries come back to the Gaza Strip to work and benefit their country, but when they are faced with the inability of the institutes to buy needed equipment and equip laboratories with needed tools to conduct their research studies, they give up and leave to work in other Western countries. One participant gave an example: “one of my colleagues who received his education and training in Germany came back after sending 15 years working in that country. He intended to stay in Gaza, but when saw the poorly equipped laboratories, he decided to go back to Germany”.



### Need for Training

Moreover, participants (n=36, 85.71%) added that along with financial needs, there is a need for training staff to use some related machines and how to conduct robust research studies that produce reliable results. One participant said: “It is not only the machine we need, along with the machine, we need some training on how to use it.” Another participant commented on this issue by saying: “we have so many machines donated to us. They are locked in the stores because nobody knows how to use them.” “What a waste of resources”, he added.

### Availability of Data

Participants (n=28, 55.67%) identified the need to create a repository/gate that makes it easier for scholars to access data and statistics related to oncology. This will help scholars for easy access to data and will help them to think about new topics for new cancer-related studies. One participant mentioned that: “although we have a registry for cancer in Palestine, but in order to get some statistics for one of my studies, I needed to write several letters to people in charge of the data. It took me more than 10 days to get the data I need. What a waste of time”, he added.

### Creating Interdisciplinary Research Teams

Another need that was identified by more than half of the participants (n = 26, 61.90%) was to create interdisciplinary research teams that include experts from different related disciplines to work together. This also includes organizing seminars with researchers from various medical and scientific sectors to exchange experiences and ideas. Participants added that communication among researchers from different research entities is missing. For example, an academic researcher mentioned that: “there is no communication between us (academic researchers) and others from the Ministry of Health who are involved in oncology research. They don’t know what we are doing, neither do we know what they are doing”.

More coordination is required between practitioners from the Ministry of Health and researchers from educational institutions. This would include oncologists, oncology surgeons, molecular pathologists, biostatisticians, chemists along with academic researchers who are involved in oncology research and others who are involved in spiritual and palliative care.

### Transform in vitro Studies to in vivo

Many studies are conducted in vitro. In order to move to the next step, these studies should be conducted in vivo. Some participants (n=19, 45.24%) emphasized the need to move tests out of the laboratory to real cells. One participant added that “the behavior of some drugs differs when it is tested on real cells.” He gave an example of a drug called “cisplatin” which is used to treat testicular cancer, but when this drug is injected into the body, it prefers to attack the nephrons of the kidney, increasing the chance for developing renal failure. To be able to move from in vitro to in vivo studies, there will be a need to buy several equipment and animals to conduct such research. After successfully conducting these studies on laboratory animals, these drugs can be tested on human beings. A participant added: “after testing the drug on animals, we need to test it on patients. Therefore, there is a need to recruit patients to test the new drugs or new diagnostic measures”.

## Discussion

Conducting research related to cancer and oncology care is very important to enhance knowledge generation, discover new diagnostic procedures, and find out new therapeutic modalities. This would be of greater importance in LMICs. This is because the incidence and cancer-related deaths are higher in LMICs and more cancer-related deaths are expected to occur in these countries as it is projected to reach 75% in the year 2030,<sup>4</sup> and the number of expected new cases in these countries is much higher than those projected in HICs (64–95% vs 32–56%, respectively) in the year 2040.<sup>3</sup>

Priorities related to oncology research differ from one country to another depending on several factors such as types and prevalence of cancers, sociodemographic factors including availability of financial and human resources, attitudes, beliefs, culture, and economic situation, which affects the health system to provide early diagnosis and treatment to decrease the impact of the disease on the affected people.<sup>7</sup> Therefore, this study aimed to identify priorities and needs to improve oncology research in the Gaza Strip, Palestine. Results of this study identified several priorities in relation to oncology research, which are assessing for cancer awareness, cancer prevention, exploring and finding new molecular biomarkers, screening for germ-line mutations related to the most common cancers, determining genetic and

environmental risk factors for developing cancer, and exploring and testing new cancer therapies. In addition, our results identified several needs to enhance oncology research, which are financial needs, need for training, availability of data, creation of interdisciplinary research teams, and transforming in vitro studies to in vivo.

## Priorities for Oncology Research

A study carried out by Pramesh and others<sup>7</sup> found that the top priorities in cancer research in LMICs include reducing the burden on patients with advanced disease; improving access and affordability, and outcomes of cancer treatment; value-based care and health economics; quality improvement and implementation research; and leveraging technology to improve cancer control. These themes reflect the needs for research to develop effective screening programs, improve public awareness, and facilitate early diagnosis and treatment. This is congruent with our results as the top two priorities reported by our participants were studies related to assessing cancer awareness and cancer prevention. Adopting these priorities for cancer research will lead to increasing awareness of the public about risk factors and early signs and symptoms of several types of cancer, which will be reflected in reducing the incidence of new cases, early seeking medical advice and early diagnosis of cancer. This, in return, will lead to improve patients' outcomes and quality of life, better prognosis, and reduce the economic burden of cancer treatment.

In another study, seven themes emerged; health promotion, National Health Service processes, new tests, population characteristics, screening (including risk stratification), symptom awareness, and symptom investigation.<sup>22</sup> Moreover, Molassiotis and Fraser<sup>23</sup> reported that key priority categories in cancer research were related to the development and evaluation of new interventions; symptom management interventions; healthcare system issues; treatment-related research (immunotherapy; targeted therapies); persistent/late effects management (fatigue; pulmonary toxicity); risk reduction, and screening research. The specific topic with the highest endorsement was the development of interventions to improve quality of life. The study of Kalager and Adami<sup>24</sup> identified similar priorities to our results in cancer research including primary prevention; early detection screening; treatment and new therapeutic interventions; and quality-of-life assessment. This is besides the establishment of an infrastructure that facilitates high-quality research.

It is evidenced that the results of this study are supported by the results of different previous studies conducted in other geographical areas. For example, a study conducted in Africa by Jedy-Agba and colleagues<sup>25</sup> identified the need for increased research on cancer prevention, screening, and treatment. Similarly, a study by Morhason-Bello and colleagues<sup>26</sup> found that cancer prevention and early detection were top priorities in oncology research in African countries. Another study from Uganda reported that there is an enormous number of unmet needs for services related to cancer prevention and early diagnosis that should be investigated.<sup>27</sup> Furthermore, Sharma and colleagues<sup>28</sup> recommended increasing cancer awareness, adopting preventive (primary and secondary) measures, timely diagnosis, and treatment, reducing risk factors, and improving capacity building and infrastructure to reduce cancer mortality in African countries.

These priorities are important to be addressed by Palestinian researchers and health policymakers. This is because most studies conducted in HICs failed to adequately address specific types of cancers that are common in LMICs.<sup>7</sup> Moreover, results coming from clinical trials conducted in HICs do not necessarily need to be generalized across other populations and other countries.<sup>14–16</sup> Since each country has its own unique situation, researchers should focus on discovering factors contributing to the development of each type of cancer in their own countries and try to find proper preventive measures and treatment for these types of cancers.

Our results along with results from the literature emphasize the importance of focusing on oncology research, especially in LMICs, to improve patients' outcomes and to reduce the burden of the disease through increasing public awareness regarding risk factors and early signs and symptoms of the most common types of cancer in the country, cancer prevention, early detection, and decrease the economic impact on the health system. Efforts for cancer prevention and control in LMICs should focus on reducing exposure to the most common modifiable risk factors prevailing in each country such as obesity, some infections, alcohol and tobacco use, changes in lifestyle, improved access to health-care facilities, and improved diagnostic measures<sup>29</sup> to facilitate early detection of new cases. Pramesh and colleagues argued that in many countries, efforts are made to expand and discover new treatment modalities, while fewer efforts are paid to producing measures that are specific to the needs of these countries. They added that LMICs should focus on areas



related to early detection and prevention, improving access and survival rates, palliative care, and a special emphasis should be paid to quality and value.<sup>7</sup>

## Needs to Improve Oncology Research

The results of our study revealed several needs to improve oncology research. Coming on top of these needs are the needs for financial resources, need for training, and availability of data. Lack of financial support was ranked as the most important need to improve cancer research. Gaza Strip passes through a difficult economic situation. The poverty rate in Gaza has reached 59.3% in 2021, while unemployment rate reached 44% during the second quarter of 2022.<sup>30</sup> This impacted the ability of students to pay their tuition; as a result, most of the researchers working at local universities receive around half of their monthly salaries. Inadequate salaries forced many good researchers to immigrate to other countries. Similarly, health-care workers employed by the Ministry of Health receive only 60% of their salaries for many years now.

This has negatively impacted the ability of the Ministry of Health and local universities to retain researchers and to secure enough funds to support research in general, including research related to cancer. Therefore, most produced studies are those that have low cost as researchers pay from their own money to complete these studies. These studies are usually cross-sectional studies that have low cost to conduct. The focus of most of these studies was to assess awareness of the public about risk factors,<sup>18,31,32</sup> awareness of signs and symptoms of some cancers,<sup>17,19,33,34</sup> barriers for early seeking medical advice,<sup>35</sup> and other studies aimed to measure quality of life of cancer survivors.<sup>36–38</sup> Lack of financial resources, along with inadequate training of staff, explains the scarcity of interventional and clinical trials research conducted in LMICs,<sup>14</sup> including Palestine. The paucity of such studies in LMICs, which has the greatest number of cancer cases, contributes to a lack of context-specific high-quality evidence on which to base treatment decisions, clinical guidelines, and resource allocation, especially that the results of clinical trials conducted in HICs does not necessarily be applicable in other settings due to differences in population, health systems, and geographies.<sup>7</sup>

Training staff to conduct robust studies was reported as one of the most important needs to improve cancer research. Pramesh and colleagues<sup>7</sup> argued that strengthening research capacity is a pivotal issue in improving quality of cancer research. Along with providing the required infrastructure, this includes training staff and biostatisticians in conducting well-controlled research and establishing clinical trial units. Unfortunately, such things are lacking in most LMICs,<sup>39</sup> including Palestine. Pramesh and colleagues<sup>7</sup> advised that strengthening research capacity should involve individuals, organizations and research institutions, along with policy-makers in an attempt to achieve long-term benefits and sustainability.

Data availability is one of the most important needs to conduct studies related to cancer. Although there is a registry for cancer cases in Palestine, data is not immediately available for researchers. Some requests should be made to get the needed data on specific topics. According to Pramesh<sup>7</sup> and colleagues, national cancer registries are required to assess the magnitude of cancer burden and to evaluate efficacy of interventions at the primary, secondary, and tertiary levels of cancer care. Palestine is not unique in this need as many relevant data such as site-specific cancer incidence, stage of cancer and mortality are absent or poorly registered in many LMICs.<sup>40,41</sup> Moreover, information about stages of cancer at the time of diagnosis and follow-up data on outcomes and survival following diagnosis with cancer are less likely to be captured or reported in LMICs in a reliable manner.<sup>14</sup>

Another need reported by our participants is the need to create interdisciplinary research teams. This seems to be an important approach in an era of information generation, especially with the rapid advancement in medicine and artificial intelligence<sup>42</sup> and the use of e-health. Therefore, it is important for multiple players from different disciplines in the health-care system to include others from other disciplines such as biostatistics, engineering, and computer sciences. The Institute of Medicine from the USA published several reports to emphasize the importance of patient-centered for providing cancer care and pointed out the importance of multidisciplinary collaboration among different health-care professionals.<sup>43</sup> Since then, research on cancer care has increasingly called for the formation of interdisciplinary teams and interprofessional collaborations to reach the best patient-centered cancer care.<sup>44</sup> Such collaboration will not only benefit cancer patients but also benefit professionals from different disciplines. This will be reflected in the continuity of care for patient and providing

holistic care, improved clinical processes, multimodal treatment, collaborative decision-making, and reduction in time for referral follow-ups<sup>44</sup> and of course reduction of hospital stay and total cost of provided health-care services.

Considering multidisciplinary teams as “the gold standard of cancer care”, Prades et al<sup>45</sup> reported in their literature review that collaboration through multidisciplinary teams resulted in improving patients’ outcomes for cancer patients, with evidence of enhanced survival rates among patients diagnosed with some types of cancer such as head and neck, esophageal, breast, lung, and colorectal cancers. They advocated for adopting organized multidisciplinary teams in cancer care and sharing of best practices as they will result in good repercussions for patient care management in numerous dimensions.

## Conclusion and Implications for Practice

Results of this study identified several priorities in relation to oncology research. Coming on top of these priorities are studies related to assessing public awareness about risk factors and signs and symptoms of the most common cancers prevailing in Palestine, along with studies related to cancer prevention. The most important needs identified by our participants to improve cancer research in Palestine were the needs for financial support and training of researchers along with having accessibility to data. Studies should focus on the most prevalent types of cancer such as breast, lung, and colorectal cancers, which are the most common types of cancer in Palestine.<sup>8</sup>

It is very important to identify and prioritize the needs related to oncology research and invest in areas that address those identified needs of each country or geographic region. There should be a planned strategy to strengthen research capacity in this area. Capacity strengthening should be implemented at the individual, organizational, and policy levels.<sup>7</sup>

Capacity strengthening at the individual level can be reached through training researchers to conduct well-controlled studies, especially in the areas of clinical and translational cancer research. This could be reached through continued mentoring by experienced researchers from their own countries or through on line mentoring by external experts to give novice and early-career researchers the skills needed to carry out their own independent studies.<sup>7</sup> Another approach to training researchers is through collaboration with other international institutions such as the Fogarty International Center of the National Institutes of Health, which offers good opportunities for training researchers from LMICs.<sup>46</sup>

At the organizational level, organizations should have adequate infrastructure to support production of well-controlled studies. Examples coming from India showed that creating the right infrastructure at Tata Memorial Centre produced high-quality research including several high-quality clinical trials.<sup>47</sup> Moreover, institutions should have a robust ethics and regulatory bodies to ensure high-quality conduct and good clinical practice.<sup>7</sup>

At the policy level, governments should collaborate with national and international research institutions to promote cancer research. Governments should provide enough funding and provide incentives to produce high-quality research. Although funding opportunities are limited in Palestine, the Ministry of Health has several channels with donating countries, which support health in Palestine. The International Collaboration Department at the Ministry of Health should exert more efforts to secure training opportunities and to secure enough funding to produce high-quality cancer studies; especially that there are several countries providing financial aids for Palestine along with several international organizations that support cancer research in LMICs such as the US National Cancer Institute (NCI), the National Institute for Health Research, and the Global Alliance for Chronic Diseases.<sup>7</sup> By securing enough funds for cancer research, in the long run, the cost of cancer treatment will be reduced. For example, in the USA, every dollar spent on cancer research is estimated to produce a value of 28 dollars in the next coming 50 years.<sup>48</sup> Therefore, this investment will pay off in the future by reducing the incidence of some cancer cases, detecting some cases at early stages, and improving the prognosis, outcome, and quality of life for cancer patients, which will be reflected on the long run on the cost of expenditure for cancer care. Another approach to be included in cancer research is measuring the impact of e-health on increasing awareness of the public about risk factors and early signs and symptoms of several types of cancer. A study conducted in Gaza that aimed to measure the impact of using mobile phone on adherence of hypertensive patients to hypertensive regimen revealed positive results.<sup>49</sup> This could pave the road for researchers to focus on the use of e-health in cancer research, especially since mobile applications are relatively inexpensive and are accessible by most of the population.

## Ethics Approval

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Research Ethics Committee of the Islamic University of Gaza (approval no. 24-2022).

## Consent to Participate

Informed consent was obtained from all individual participants included in the study.

## Consent for Publication

Our manuscript does not contain any individual person's data in any form (including any individual details, images, or videos).

## Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis, and interpretation, or in all these areas; took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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