



Review

The dispersion of pediatric cancer biobanks in the Middle East: a global review of available resources

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Abstract

Background: Pediatric cancer biobanks play an important role in advancing cancer research efforts and developing effective treatments. However, the majority of these biobanks are located in developed countries, leaving a large portion of the world's population without access to these critical resources. This article focuses on the current dispersion of pediatric cancer biobanks in the Middle East.

Method: PubMed and Google Scholar databases were searched using the terms 'pediatric cancer biobank' or 'childhood cancer biobank' or 'children's cancer biobank', or 'pediatric cancer biorepository' or 'childhood cancer biorepository' or 'children's cancer biorepository', along with 'Jordan', 'the United Arab Emirates', 'Iran', 'Bahrain', 'Turkey', 'Syria', 'Iraq', 'Saudi Arabia', 'Oman', 'Qatar', 'Kuwait', 'Lebanon', 'Egypt', 'Yemen', 'Palestine' with English language restriction.

Results: Despite being a relatively recent development, some notable pediatric cancer biobanks have been established in the region, including the King Hussein Cancer Center Biobank in Jordan, the Children's Cancer Hospital Egypt Biorepository and Biospecimen Research Facility in Egypt, the Iranian Childhood Cancer Biobank in Iran, and national pediatric cancer biorepository in Qatar.

Conclusion: However, several challenges still hinder the establishment and maintenance of biobanks in the region, including insufficient funding, lack of infrastructure and resources, limited awareness, and regulatory hurdles. Overcoming these challenges will require targeted investments, building infrastructure and awareness, and efficient regulatory frameworks. Developing and maintaining high-quality pediatric cancer biobanks within the Middle East could lead to a better understanding of pediatric cancer patterns in the region, ultimately improving treatment outcomes and quality of life for pediatric cancer patients globally.

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1. Introduction

Childhood cancer is an umbrella term that encompasses various types of cancers, including leukemias, brain tumors, and bone cancers, among others. Currently, cancer biobanks serve as an essential resource for researchers and clinicians working towards finding

effective treatment options for pediatric cancers. Pediatric cancer biobanks are repositories of biological specimens collected from pediatric patients diagnosed with cancer as well as accompanying clinical data such as patient demographics, laboratory tests, treatment history, and outcomes. These samples include blood,

tissue biopsies, and bodily fluids, and they are collected at various stages of cancer diagnosis and treatment (1, 2).

Pediatric cancer biobanks are important tools for advancing cancer research in several ways. First, they allow researchers to study the genetics and molecular biology of different pediatric cancers, providing insight into the mechanisms driving tumor formation and growth. Second, biobanks provide a critical resource for the development of new diagnostic and prognostic tools, as well as new treatments. Third, by studying the clinical data accompanying the samples, researchers can identify patterns and risk factors that may impact patient outcomes. Fourth, pediatric cancer biobanks are increasingly being used to facilitate treatment decisions. For example, researchers can use genetic and genomic analysis of tumor tissue to determine the best course of treatment for individual patients. This approach is known as precision medicine, and it holds great promise for improving outcomes for pediatric cancer patients. Finally, pediatric cancer biobanks can facilitate collaborations between researchers, allowing data to be shared and analyzed more efficiently than would be possible with individual labs or institutions (3, 4).

At present, there are several pediatric cancer biobanks spread across the globe. These biobanks can be found in various countries including the United States, the United Kingdom, Canada, Australia, Germany, China, and others. While the number of biobanks has been increasing steadily over the past few years, the majority of these institutions are located in developed countries, leaving a large portion of the world's population without access to these important resources. In this article, we will discuss the number and dispersion of pediatric cancer biobanks in the Middle East (5).

2. Method and Materials

2.1. Eligible Studies for review

PubMed and Google Scholar databases were searched using the terms 'pediatric cancer biobank' or 'childhood cancer biobank' or 'children's cancer biobank', or 'pediatric cancer biorepository' or 'childhood cancer biorepository' or 'children's cancer biorepository', along with 'Jordan', 'the United Arab Emirates', 'Iran', 'Bahrain', 'Turkey', 'Syria', 'Iraq', 'Saudi Arabia', 'Oman', 'Qatar', 'Kuwait', 'Lebanon', 'Egypt', 'Yemen', 'Palestine' with English language restriction. In addition, the countries were searched in website biobanking.com.

3. Results

3.1. Dispersion of Pediatric Cancer Biobanks in the Middle East

The dispersion of pediatric cancer biobanks globally is skewed towards developed countries. Countries with a higher human development index or high-income countries have established more pediatric cancer biobanks compared to low and middle-income countries (LMICs). This imbalance is primarily due to limited resources and lack of funding in LMICs, which make it challenging to establish and maintain biobanks. Pediatric cancer biobanks in the Middle East are relatively recent developments, with only a few established in the past decade. Here we have reviewed the dedicated biobanks of pediatric cancer in the Middle East **Table 1** (6).

3.1.1. Jordan

One of the earliest and most successful efforts to establish a pediatric cancer biobank in the Middle East was launched in 2011 by the King Hussein Cancer Center (KHCC) with the support of Seventh Framework Programme (FP7) funding from the European Union. KHCC embarked on establishing the first ISO compliant cancer biobank in Jordan. The Biobank collects various types of samples such as tissue, blood, and bone marrow from both adult and pediatric patients to aid in cancer research and treatment. KHCC biobank was developed for the purpose of achieving an ISO accredited cancer biobank through the collection, processing, and preservation of high-quality, clinically annotated biospecimens from consenting cancer patients, making it the first cancer biobank of its kind in Jordan (7).

3.1.2. Egypt

Other notable pediatric cancer biobanks in the Middle East include the Egypt biobank, which stores biological specimens from children with cancer and their parents. It was established in 2014 by the Children's Cancer Hospital Egypt (CCHE). The CCHE Biorepository and Biospecimen Research Facility (CCHEBBR) contains biospecimens linked to accurate and reliable clinical, pathological, and epidemiological data (8).

3.1.3. Iran

Iranian Childhood Cancer Biobank (ICCB) is a national project in Tehran, Iran, aimed at collecting and preserving biospecimens (fresh tissue, plasma, peripheral blood mononuclear cells

Table 1. The dispersion of pediatric cancer biobanks in the Middle East.

Biobank name	Country	Establishment year	Stored samples
KHCC biobank	Jordan	2011	tissue, blood, and bone marrow, tumor tissue
CCHEBBR	Egypt	2014	blood derivatives, CSF, and malignant/normal tissue samples
ICCBB	Iran	2017	fresh tissue (malignant), plasma, peripheral blood mononuclear cells from blood and bone marrow, serum, urine, and hair
SPCB	Qatar	2021	blood, tissue, and fluid samples

(PBM) from blood and bone marrow, serum, urine, and hair) from children with cancer and their parents along with a database of clinical information. The biospecimens are collected from various hospitals and medical centers throughout the country. ICCBB is the first dedicated pediatric biobank center in Iran that collects a variety of samples and associated clinical data from patients in the age range of 0 to 18 years with a wide range of childhood cancers. It was established in 2017 and until July 2022, about 8,000 samples from 720 patients have been collected in the biobank (10).

3.1.4. Qatar

A multidisciplinary team of researchers and clinicians at Sidra Medicine, Doha, Qatar, has launched a national pediatric cancer biorepository pilot to develop personalized cancer therapies for patients. The Sidra Pediatric Cancer Biorepository (SPCB) is a facility that collects, stores, and manages biological samples, such as blood, tissue, and fluid, from pediatric cancer patients. The samples are used for research purposes, including understanding the biology of cancer, identifying new treatments, and developing personalized therapies (11).

4. Discussion

The Middle East, despite its relatively small population, harbors a wide diversity of ethnic and racial groups that may result in different genetic and environmental factors contributing to the incidence of pediatric cancer in the region. Therefore, the establishment of pediatric cancer biobanks in the Middle East could be immensely valuable in advancing the pediatric cancer research field and developing better treatment options that are more applicable to this specific population. The reason for the low number and high dispersion of biobanks in the Middle East can be found in the following factors, including: a) Lack of funding: Biobanks require significant financial resources to set up and maintain. The high cost of establishing and running a biobank may be a significant barrier for institutions in the

Middle East. The distribution of wealth in Middle East countries varies widely from country to country. Therefore, low-income countries do not have any kind of biobanking, while rich countries in the Middle East, such as Saudi Arabia, have invested heavily in biomedical research and collaborated with international institutions for data sharing and standardization. b) Lack of infrastructure and resources: Biobanks need specialized equipment, storage facilities, and trained staff to operate effectively. Some countries in the Middle East may not yet have the infrastructure or resources to support the establishment of a biobank. c) Limited awareness: Many people in the Middle East may not be aware of the importance of biobanking and its potential benefits. Increasing awareness through education and outreach could help to overcome this challenge. d) Regulatory hurdles: Establishing a biobank can involve complex ethical, legal, and regulatory considerations. The lack of transparent and efficient regulatory frameworks can pose hurdles in establishing biobanks in the region. Overall, addressing these challenges through targeted investments, building infrastructure and awareness, and efficient regulatory frameworks can support the development of pediatric cancer biobanks in the Middle East (9).

Additionally, in countries such as the United Arab Emirates, Saudi Arabia, Qatar, and Turkey, some biobanks have recently been established to collect and store biological samples related to various health conditions, including cancer. However, these biobanks are mostly restricted to adult cases. The rarity of childhood cancer, the small sample volume in children, and ethical problems in relation to children could be reasons for less attention has been paid to this area (4). In conclusion, the distribution of pediatric cancer biobanks in the Middle East is an important and urgent matter that could significantly advance the pediatric cancer research field and facilitate the development of better treatments. Cooperation between different

stakeholders, including hospitals, research institutions, and governments, and the development of the necessary technical and infrastructure capabilities, are among the essential steps to establishing and maintaining such biobanks. The availability of high-quality biobanks will lead to a better understanding of the pattern of pediatric cancer in the region and ultimately, improve the treatment outcomes and quality of life for pediatric cancer patients globally.

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None.

Conflict of Interest

The authors declare that they have no conflicts of interest.

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