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Steady Progress and Significant Challenges in the Field of Tumor and Cancer Research in Bangladesh: An Overview

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ABSTRACT

Tumor and cancer research in Bangladesh is an evolving field with both steady progresses recently and significant challenges. The 2013 Series Bangladesh: Innovation for Universal Health Coverage, published in The Lancet, reported on Bangladesh's health achievements and challenges particularly on exceptional health advances at low cost than other countries in Asia. Additionally, several national and subnational studies have reported the burden of different diseases and risk factors in Bangladesh at different points during the past three decades i.e. from 1990 to 2019 in Bangladesh. Cancer is a leading cause of death of children and adolescent worldwide and it represents one of the most significant public health problem and challenges of the century with a particularly devastating impact on developing nations. Several studies have been reported evaluating qualitatively and quantitively documenting research progress on tumors and cancers situation from Bangladesh. In the present article, we have made an overview of this field with background to burden of diseases and risk factors, some reported studies from Bangladesh on tumors and cancers and steady research progress on tumors and cancers and significant challenges to it in Bangladesh. Further continued research affords along these fronts are therefore warranted and vitally important.

Keywords: Disease burden, Cancer research, Cancer treatment.

BACKGROUND TO DISEASES BURDEN AND THEIR RISK FACTORS

Bangladesh is the eighth most densely populated country globally with a population of about 173 million (1328 people pre km^2). Despite attaining notable progress on most health indicators for the sustainable development goals (SDGs), Bangladesh has high prevalence of Diarrhoea, tuberculosis, dengue and other infectious diseases. The 2013 Series *Bangladesh: Innovation for Universal Health Coverage*, published in *The Lancet*, reported on Bangladesh's health achievements and challenges. Additionally, several national and subnational studies have reported the burden of different diseases and risk factors in Bangladesh at different points during the past three decades (1). Bangladesh has a pluralistic health-care system that involves multiple stakeholders—including government, private sectors, donor agencies and non-governmental organizations-implementing targeted programmes for immunization, maternal and child care, and family planning, among others (2). The Ministry of Health and Family Welfare provides primary, secondary, and tertiary care services at the community and national levels, whereas non-governmental organization's support community health workers in providing priority services to households. Private hospitals in Bangladesh provide modern facilities and specialized care, but are expensive, therefore limiting access for individuals with low incomes. The Bangladesh Government's Health, Population, and Nutrition Sector Development Program 2017–2022 has contributed to reduced mortality, morbidity, and malnutrition; improved immunization; and reduced neonatal deaths and infectious diseases. Bangladesh is also one of the first nations in Asia to implement digital health strategies, including an electronic immunization register, text messaging for patient communication, mobile health applications, electronic prescriptions and remote diagnostic services (3,4). However, the country had a low overall score of 52 out of 100 on the 2017 Healthcare Access and Quality Index (5,6). Bangladesh faces several health system challenges, including poor government coordination, shortage of skilled health workers, low health budget, high out-of-pocket health expenditure and inequitable access to health services (7). However, to our knowledge, there are no studies on the burden and trends of diseases in Bangladesh that enable global comparisons. To prepare the health system, understanding the prevalence and trends of the burden of diseases and their risk factors is necessary.

The study result reported by 'The Lancet Global Health' was the first to systematically analyze the trends in the burden of diseases and risk factors from 1990 to 2019 in Bangladesh. They used standardized and globally comparable metrics, adjusting for variability in data sources and removing potential biases, to generate results comparable with those of other countries. They analyzed 286 causes of death, 369 diseases and injuries, and 87 behavioral, metabolic, environmental and occupational risks among the Bangladeshi population with a comprehensive analysis of changes in population health from 1990 to 2000, 2000 to 2010, and 2010 to 2019. Their results provide important information for assessing health progress and for attaining the goals and targets set by the Health, Population, and Nutrition Sector Development Program of the Bangladesh Government and the UN's SDGs. Additionally, they compared the performance of Bangladesh's health system with that of health systems in other countries for the Global Burden of Diseases, Injuries and Risk Factors. The study attempted to identify crucial areas of improvement and challenges faced by Bangladesh's health sector. Both communicable and non-communicable disease risk factors contribute to mortality and morbidity in the Bangladeshi population. Therefore, a multisectoral, coordinated approach targeting prevention, care, and rehabilitation is needed to ensure the sustainability of the country's health-care system (1).

Bangladesh has made substantial health advances over the past 30 years despite spending less on health care than other countries in south Asia (2). Several studies have analyzed the burden of specific diseases and risks in Bangladesh (6,8,9,10,11). The Global Burden of Diseases, Injuries, and Risk Factors Study (GBD) 2019 produced globally comparable estimates of disease burden and risk factors in 204 countries and territories over time. They analyzed the burden and trends of diseases and their risk factors in Bangladesh from 1990 to 2019 and compared the results with those from the other countries in the GBD south Asia region—hereafter referred to as south Asia—using the comprehensive GBD methodology. Their study provided information for measuring progress and attaining goals set by the government of Bangladesh and other stakeholders. The National Institute of Cancer Research and Hospital (NICRH), Dhaka, Bangladesh is the only tertiary–level center dedicated to multidisciplinary cancer patient management, education and research (1,12). In a recent overview of the burden of diseases and risk factors, Ali et al suggested that evidence-based policies focused on socioeconomic and disease-specific factors are essential to improve health outcomes in Bangladesh (13,14). In the present overview article, we have therefore attempted to document notable steady progress and significant challenges, particularly in the field of tumors and cancers research in Bangladesh.

RESEARCH PROGRESS AND SOME STUDIES REPORTED ON TUMORS AND CANCERS FROM BANGLADESH

Cancer is a leading cause of death for children adolescent worldwide. The cure rats in low middle-income countries are very much discouraging (20%) in comparison to high-income countries (80%). Akter et al in 2023 reported a prospective observational study done at Dhaka Medical College Hospital (DMCH), a tertiary care hospital in Bangladesh, over a period of 1 year (March 2014 to February 2015 (15). After fulfilling the inclusion criteria, a total of 200 children aged between 0-15 years were included following the International Classification of Childhood Cancer (ICCC). According to four groups of patients i.e. 0-3 years, 3-6 years, 6-9 years and 9-12 years, most the patients fell in 6-9 years group (29%) followed by 3-6 years group (25%). Majority of cases were males (67%) with male to female ratio of 1.55:1. Among the 200 cases, Leukemia (49%) was the most common malignancy followed by Lymphoma, CNS Tumor, Neuroblastoma, Retinoblastoma, Wilms tumor and malignant bone tumors. Acute lymphoblastic Leukemia (ALL) comprised majority (98/200) of Leukemia. This study results provided vital information on the pattern and trend with high quality data of pediatric malignancies in Bangladesh, which is important in the planning and evaluation of health strategies for this small but distinguished group of patients (15).

Cancer represents one of the most significant public health challenges of the 21st century, with a particularly devastating impact on developing nations. In Bangladesh, the burden of cancer has been steadily rising, attributed to factors including population growth, aging demographics and increasing exposure to environmental risk factors (16,17). The World Health Organization (WHO) estimates that cancer accounts for approximately 13% of all deaths in Bangladesh, making it the sixth leading cause of mortality in the country (18). Tertiary hospitals in Bangladesh serve as crucial centers for cancer diagnosis and treatment, often representing the first point of contact for many patients seeking specialized oncological care (19). These institutions, particularly those in Dhaka, the nation's capital, provide valuable insights into cancer patterns and healthcare-seeking behaviors among the Bangladeshi population (20). Understanding the incidence patterns of cancer in these settings is essential for healthcare

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planning, resource allocation, and the development of targeted prevention strategies. Previous studies have demonstrated significant variations in cancer patterns across different regions of Bangladesh (21,22). However, comprehensive data from tertiary care centers, especially in urban settings like Dhaka, remain limited (23). The demographic transition, coupled with rapid urbanization and lifestyle changes in metropolitan areas, may be contributing to evolving patterns of cancer incidence that differ from historical trends (24).

Arman et al conducted a hospital based retrospective study at Ahsania Mission Cancer and General Hospital, Dhaka, Bangladesh analyzing patient records from January to December 2020 (25). This institution serves as a major referral center for cancer diagnosis and treatment, receiving patients from both urban and rural areas across Bangladesh. During the study period, a total of 2,847 cancer cases were diagnosed at this institution. The mean age at diagnosis was 56.3 ± 14.7 years (range: 4-89 years). Women constituted 54.8% (n=1,560) of the cases, while men accounted for 45.2% (n=1,287). The majority of patients (63.5%) were from urban areas, with 36.5% from rural regions. Quality control measures, data analysis by SPSS and ethical considerations were strictly followed to ensure research standard. They reported that breast cancer was predominant (31.2%) among females, followed by cervical cancer (22.4%) and ovarian cancer (12.8%). In males, lung cancer was most frequent (28.5%) followed by colorectal cancer (15.3%) and gastric cancer (13.2%). They also reported that majority of patients presented at advance stages, with overall 68.4% of cases were diagnosed at either stage III or IV. Among the documented risk factors, smoking history was present in 45.3% of male patients and 5.2% of female patients. Family history of cancer was reported in 18.7% of cases, while occupational exposure to known carcinogens was documented in 12.4% of cases. This comprehensive analysis of cancer patterns at a tertiary care hospital in Dhaka provided crucial insights into the current cancer burden in urban Bangladesh. Their findings highlighted several critical patterns: the predominance of breast cancer among females and lung cancer among males, a concerning trend of late-stage presentations and a steady annual increase in cancer diagnoses, particularly in breast cancer cases. The younger age at diagnosis compared to developed nations and the significant urban-rural disparity in healthcare access emphasize the unique challenges facing cancer care in Bangladesh. The study underscores the urgent need for strengthening preventive measures and early detection programmes, particularly for common cancers such as breast, lung, and cervical cancer. The high proportion of advanced-stage diagnoses calls for immediate attention to barriers in healthcare access and cancer awareness. These findings can serve as a valuable reference for healthcare policymakers and administrators in developing targeted cancer control programmes and improving healthcare delivery systems. The results also emphasize the critical need for establishing comprehensive cancer registries and surveillance systems across Bangladesh to better monitor and respond to evolving cancer patterns. This study contributed significantly to the understanding of cancer patterns in Bangladesh and provides an evidence base for future strategic healthcare planning, resource allocation, capacity building and policy development in cancer prevention and control (25).

Childhood cancers are the ninth most common cause of childhood illnesses and 200,000 children are newly diagnosed with cancer worldwide each year (26). Among them, 80% belong to low- and middle-income countries (LMICs), where resources and drugs (or pharmaceuticals) are scarce for the treatment of cancer or providing pain relief. The survival rate of children is also significantly skewed towards the high-income countries (HICs), where 80% of children

with cancer survive, as opposed to only 20% in LMICs. Despite resource constraints, some initiatives may still be effective in improving the survival and quality of life of childhood cancer patients in LMICs. For example, generic drugs and relatively simple treatment procedures can be used within the existing healthcare systems (26,27).

The largest centre for treating children with cancer in Bangladesh is the government-funded but self-governed institute called Bangladesh Medical University (BMU Formerly BSMMU) in Dhaka. It diagnosed 350 children between September 2012 and August 2013 and strives to collaborate with other government-funded hospitals (28). However, the number of new cases has increased over the years. An estimated 9,000 to 12,000 children are diagnosed with cancer annually in Bangladesh, yet only one-third of them receive proper treatment (29). It is estimated that at most 1,000 children with cancer (12–24% of all suspected cases) can receive some supportive care and even less curative care. The average survival rate for a child diagnosed at BMU (Formerly BSMMU) is 48% for 1-year event-free survival. Survival rates at district hospitals are probably no more than 20%. The WHO has introduced a public health strategy to ensure that palliative care knowledge is accessible to all children facing life threatening or life-limiting conditions (30). Unfortunately, Bangladesh has a limited number of PC services, most of which are customized to specifically address the needs of adult cancer patients (31).

To improve the situation, World Child Cancer-UK (WCC-UK) has been working in Bangladesh since January 2012 at the BMU (Formerly BSMMU) in Dhaka. WCC-UK has facilitated an international twinning partnership between the BMU (Formerly BSMMU) and two hospitals in Canada and the UK, respectively— British Columbia Children's Hospital (BCCH) and University College Hospital London (UCHL) (32). The project worked to improve the outcomes for children with cancer by increasing the collection of statistical data, providing training for doctors and nurses, and assisting with the provision of medicines. The project involved capacity awareness campaigns, the development of shared care protocols, and the creation of support groups to foster community engagement and sustainability. WCC-UK provided strategic oversight, and fundraising, and facilitated international partnerships, while the satellite centers worked to improve local diagnosis, treatment, and care for children with cancer (33,34).

Considering these background, Joarder et al in 2024 reported results of their qualitative evaluation of childhood cancer in Bangladesh (35). Despite facing challenges such as an unclear management structure, ambiguous patient eligibility criteria, personnel issues, and communication gaps, their study made strides in several areas. BMU (Formerly BSMMU) provided essential space and leadership, while Satellite Centers supported the project with continuing medical education and data entry. The project offered subsidies to poor patients and improved cancer awareness among healthcare providers and service seekers. Despite some parents receiving health and nutrition education during their hospital stays, developing a long-lasting system to educate them about long-term cancer care for their children was found to be formidable. The analysis also highlighted staffing shortages, a hierarchical gap between physicians and nurses, and a predominantly male leadership structure (35).

RECENT DEVELOPMENTS IN CANCER TREATMENTS IN BANGLADESH

Nuclear Medicine, Radiation oncology and Drug treatments have got major uplift for tumor and cancer treatments in Bangladesh. Thanks to a nuclear imaging machine now available and

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operating in Bangladesh through International Atomic Energy Agency (IAEA) support i.e. Positron Emission Tomography/Computed Tomography (PET-CT) machine. The NICHR and National Institute of Nuclear Medicine and Allied Sciences (NINMAS) are the two main centers for cancer treatments at Dhaka, Bangladesh, But the demand far exceeds the capacity. All the standard facilities required for the diagnosis and treatment of cancer with multi-disciplinary approach are available at these centers (36,37,38,39). At present, most of the chemotherapy drugs required to treat cancer are available in the country, including the common monoclonal antibodies used as targeted therapy. Recently, two local pharmaceutical companies (Beacon Pharmaceuticals Limited and Techno Drugs Ltd) started manufacturing chemotherapy drugs within Bangladesh and have brought the cost of chemotherapy within the reach of the general population. Financial barriers also pose a significant challenge. Many patients cannot afford the high costs associated with cancer treatment, including travel and accommodation in Dhaka, leading to high rates of treatment abandonment. Nearly 43% of households facing cancer treatment costs fall below the poverty line due to the heavy financial burden (39). The high cost of treatment, lack of adequate radiation facilities, dearth of trained manpower, late diagnosis, poor funding from the government, and lack of awareness within the community are the main challenges impeding cancer care in Bangladesh. The unavailability of trained medical physicists is a significant barrier to the development of radiation treatment facilities in the country (38,40).

SUMMARY AND CONCLUSION

In Bangladesh there has been an increasing focus on awareness and early detection campaigns to reduce the high mortality rates associated with late-stage diagnoses; Several hospitals in Bangladesh offer modern oncology services, including chemotherapy, radiation therapy and surgery. The NICRH and NINMAS are the two tertiary-level centers only dedicated to multidisciplinary cancer patient management, education and research. A significant advancement has been the local manufacturing of chemotherapy drugs in Bangladesh by companies like Beacon Pharmaceuticals and Techno Drugs Ltd. This has made cancer treatment more affordable and accessible to the general population. Bangladesh has become a rising power in the global oncology market, exporting high-quality generic and biosimilar drugs to many countries. The Medical Oncology Society at BMU (Formerly BSMMU) is also committed to fostering research and innovation, organizing conferences for knowledge exchange. The introduction of advanced diagnostic tools like PET-CT machines has improved the ability to diagnose diseases and monitor treatment progress. However, there are some challenges and areas for improvements in the field of tumors and cancers in Bangladesh. One of the most significant challenges is the absence of a comprehensive national cancer registry. This hinders the ability to accurately track cancer incidence, prevalence, and mortality rates across the country, which is crucial for effective policy-making and resource allocation. The high cost of cancer treatment (diagnostic procedures, surgeries, chemotherapy, radiotherapy and supportive care) causes a heavy burden on patients and their families, often leading to treatment abandonment. There is a notable deficit of trained healthcare professionals, particularly medical physicists for radiation therapy, which is a significant barrier affecting the quality and availability of treatment. Limited government funding for cancer care and research further exacerbates these challenges. The principal methods of treatment are surgery, radiotherapy, and chemotherapy. Appropriate combination and sequencing of these modalities can be adapted for specific cancers. Mechanisms should be set up to decide on guidelines for

integrating treatment resources with early diagnosis and screening programmes, and for providing best practicing guidelines for the most important cancers in Bangladesh.

In conclusion, Bangladesh is making steady progress in tumor and cancer treatment and research, particularly with the availability of PET-CT scan facilities through the establishment of dedicated oncology centers and the growth of its pharmaceutical industry. However, significant challenges remain in terms of data collection (national registry), early detection, equitable access to care, and funding for research and comprehensive treatment. Addressing these systemic issues is crucial to elevating the level of tumor and cancer research and care in Bangladesh. It is important and necessary to prepare the health system understanding the prevalence and trends of the burden of diseases and their risk factors. Therefore, continued research efforts along these fronts are warranted and vitally important. In recent years there are many other research articles published on tumors and cancers from Bangladesh, which we shall try to review in our next articles in the near future.

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