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Radiation therapy in Nepal: Current status and future priorities

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► ***Short report***

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ABSTRACT

Radiation Therapy is a critical component of cancer treatment. During the course of their illness, at least half of cancer patients will require radiotherapy. It is primarily used as an adjuvant treatment after surgery, as a definitive treatment in inoperable tumors, and it also plays an important role in palliative care, such as pain management. Because establishing a radiation facility is a large undertaking, low-income countries such as Nepal have few radiation facilities. People must travel for hours to get to the closest Radiation Therapy Center, and hospitals are congested, so treatment takes months. Disease progression and untimely cancer mortality occur as a result of the delay in treatment and the paucity of standard radiation facilities. The purpose of this research is to determine the current state of radiation therapy infrastructures, human resources, and educational institutions, as well as to establish future development priorities.

INTRODUCTION

Cancer is the leading cause of death worldwide, with nearly 10 million deaths in 2020 [1]. In Nepal, the number of new cases, deaths, and prevalent cases (5-year) in 2020 are 20508, 13629, and 36909, respectively. Lung cancer (12.2%), cervix cancer (10.9%), and breast cancer (9.6 percent) are the three most common cancer sites [2]. Almost all patients with these cancers will need radiotherapy at some point during their treatment. Because Nepal's cancer registry system is not well developed, the data presented by WHO may be inaccurate. In 2018, the National Health Research Council launched a population-based cancer registry (PBCR), which covers roughly 20% of Nepal's total population. From 2003 to 2013, the incidence of cancer in both males and females increased, according to a study by Poudel *et al.* [3]. The increase in incidence will place additional strain on already overburdened radiation facilities, exacerbating the situation.

Cancer care delivery infrastructures

There are two publicly funded comprehensive cancer hospitals in Kathmandu, one in Bhaktapur (Bhaktapur Cancer Hospital) and one outside the valley in Bharatpur (B.P. Koirala Memorial Cancer Hospital). Bhaktapur Cancer Hospital (BCH) and B.P. Koirala Memorial Cancer Hospital (BPKMCH) are national-level cancer hospitals that offer chemotherapy, radiotherapy, surgery, and brachytherapy, as well as palliative care. BCH is run by the Nepal government, Rotary International, and members of the Bhaktapur community, while BPKMCH is run by the Nepal government. Thousands of cancer patients are treated there each year. In west Nepal, there is another publicly funded cancer hospital (Sushil Koirala Prakhar Cancer Hospital) that treats patients with surgeries and chemotherapy. This center will soon have a radiotherapy facility.

The National Academy of Medical Sciences (NAMS), another publicly funded institution in Kathmandu, offered all three cancer treatment modalities. The first radiotherapy unit was established here in 1991, but it has been inoperable for several years, and they are attempting to restore service with Tomotherapy and HDR brachytherapy machines.

Two private comprehensive cancer centers are available. The Nepal Cancer Hospital and Research Centre (NCHRC) in Kathmandu is one, and the Purbanachal Cancer Hospital (PCH) in Birtamode is another (outside Kathmandu). Both centers offer cancer patients surgery, chemotherapy, radiotherapy, brachytherapy, and palliative care. Several other private-sector centers, including Chitwan Medical College (CMC) in Bharatpur, are planning to establish oncology units. CMC offers surgical and medical

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oncology services, and radiation services will begin in the middle of 2022, making it a comprehensive cancer center with all other adjunct services required for cancer patients. Other multispecialty hospitals offer surgery and some basic chemotherapy services. Kanti Children's Hospital in Maharajgunj has been providing pediatric patients with surgical, medical, and hematological services. The Institute of Medicine (IOM) began offering services at its Suresh Wagle Memorial Cancer Centre on August 17, 2021. It has begun medical oncology, hematology, and surgical oncology services and plans to add radiotherapy services in the near future. The Civil Service Hospital in Kathmandu is the only cancer hospital that offers bone marrow transplants.

Radiation therapy delivery infrastructures

Radiation therapy is an important part of cancer treatment, with around half of all cancer patients receiving it at some point during their illness [4,5]. Radiation therapy has been shown to contribute 40% to curative treatment [6]. Without radiation therapy, a cancer treatment delivery system is incomplete. Since Nepal joined the International Atomic Energy Agency (IAEA) in 2008, the IAEA has been assisting the development of radiation facilities in Nepal by giving equipment to cancer hospitals such as BPKMCH. However, the development of radiation oncology in Nepal has been gradual and is still in its infancy. There are no legal standards for radiation in Nepal, and there is no Atomic Energy regulatory authority [7]. Nepal falls far short of the WHO recommendation of one megavoltage machine per million people. Nepal has a population of about 30 million people, so it should have at least 30 megavoltage machines. According to Karn A, there are only 9 megavoltages (4 tele cobalt and 5 LINAC) and 5 HDR brachytherapy machines, one of which is not operational at NAMS [8]. The study was published in 2017, and since then, PCH, Jhapa has added 1 LINAC and 1 HDR brachytherapy. BCH has one LINAC and one Cobalt, while BPKMCH has two LINAC and one tele cobalt. Brachytherapy is available at both facilities. In Kathmandu, there are two private hospitals with radiotherapy units: Nepal Cancer Hospital and Research Centre (NCHRC) and Kathmandu Cancer Center (KCC). Both Centers have LINAC and brachytherapy capabilities. Table 1 summarizes the institutions in Nepal that have radiation therapy units.

Human resources for radiation therapy

In Nepal, there are approximately 40 radiation oncologists and 16 designated medical physicists as of 2021 [7]. The total number of radiation therapy technologists could not be determined. The majority of radiation therapy personnel, including radiation oncologists, medical physicists, and radiation therapy technologists, are trained in other countries. Dr. Tara Manandhar, the first identified radiation oncologist, began radiotherapy with tele cobalt in Bir Hospital in 1990 [9]. Unfortunately, this machine is no longer operational.

Table 1. Institutions along with radiation therapy machines.

Institution	Place	Radiation Machines
NAMS, Bir Hospital	Kathmandu	1 tele cobalt (non-functional) 1 HDR brachytherapy
Bhaktapur Cancer Hospital	Bhaktapur	1 tele cobalt 1 LINAC 1 HDR brachytherapy
B.P. Koirala Memorial Cancer Hospital	Bharatpur	1 tele cobalt 2 LINAC 1 HDR brachytherapy
Manipal College of Medical Sciences	Pokhara	1 tele cobalt 1 LINAC
OM Hospital	Kathmandu	1 HDR brachytherapy
Nepal Cancer Hospital and Research Center	Lalitpur	1 LINAC 1 HDR brachytherapy
Kathmandu Cancer Center	Bhaktapur	1 LINAC
Purbanchal Cancer Hospital	Birtamode	1 LINAC 1 HDR brachytherapy

Educational institutions for radiation therapy

NAMS, Bir Hospital is the only hospital that offers Radiation Oncology as a medical subspecialty (MD Radiation Oncology). Medical graduates who have passed the Nepal Medical Council's licensing examination are eligible (NMC). MD Radiation Oncology began in 2002 with two seats per year [9]. No institution in Nepal offers training for medical physicists or radiation therapy technologists. The current trend is to hire MSc Physics graduates and train them as Medical Physicists. Radiation Protection officers do not need to be certified. Despite the fact that Nepal joined the IAEA in 2008, there is no regulatory body for atomic energy monitoring.

Future priorities for the development of radiation therapy

Table 2 summarizes the suggested strategic priorities for the development of radiation therapy in Nepal. In Nepal, the number of new cancer cases is increasing. This could be attributed to a more sophisticated diagnostic tool, improved case detection, and an increase in disease burden (due to the adoption of a sedentary lifestyle). The population-based cancer registry, as well as the hospital-based cancer registry, are both severely underdeveloped. Cancer registries should be made mandatory in all hospitals that provide cancer care. The collection and analysis of accurate data is critical. Because the cancer registry only covers 20% of the total population, current data on cancer incidence and prevalence are understated.

With the current radiation therapy infrastructure, it is impossible to provide radiation therapy to patients on time. The WHO recommends one megavoltage machine per one million people, but we

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are far short of that with only nine megavoltage machines. Policies should be developed to include radiation oncology as a medical subspecialty in medical schools that offer postgraduate training. The institutions should be well-equipped with radiation machines so that trainees can learn all aspects of radiation treatment planning and be trained as both medical physicists and radiation therapy technologists.

Because radiation is a double-edged sword, personal radiation monitoring services should be prioritized. TLD (Thermoluminescent Dosimeter) badges must be provided by the institute's employer to all radiation workers in order for them to record their occupational radiation exposure. It is past time to establish an organization to oversee all atomic energy and radiation-related activities. This can be accomplished in collaboration with an international organization such as the IAEA.

Table 2. Suggested Strategic Priorities for the development of radiation therapy facility in Nepal.

S. No	Strategic Priority
1	Create Cancer Registry – Population basesd as well as hospital-based to measure the accurate burden of disease
2	Formation of atomic energy regulatory body
3	Incorporate Radiation Oncology as a subspecialty in medical colleges providing post-graduate training
4	Create well-equipped Radiation therapy facilities along with competent manpower so that medical physicists and radiation therapy technologist training can be provided
5	Extend radiation therapy services to all provinces of Nepal

Finally, Nepal must develop a strategic plan for radiation therapy development that includes the creation of a robust cancer registry, the establishment of infrastructures in accordance with WHO recommendations, the inclusion of radiation oncology as a subspecialty in medical schools, and the establishment of an atomic energy law and a regulatory body.

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