Bangladesh

Emily Sterbis, MD
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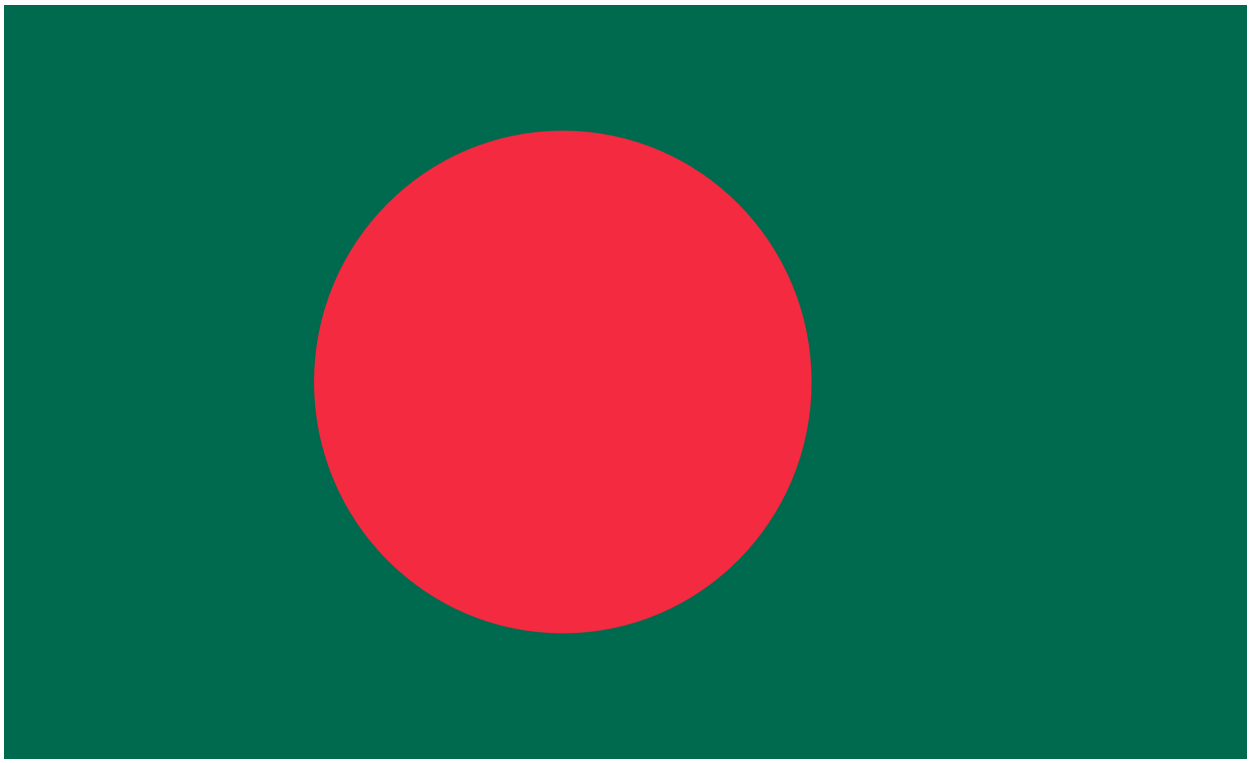
People’s Republic of Bangladesh (Bangladesh)



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Part I: General Country Profile

Geography and Population

Bangladesh is the 8th most populous country in the world, with a population of 164,098,818 people. The total area of the country is 148,460 sq km, consisting of 130,170 sq km of land and 18,290 sq km of water. Bangladesh has a total of 4,413 km of border, primarily shared with India and a small portion with Burma/Myanmar. With this proximity, Bangladesh accepts a relatively large number of Burmese refugees (approximately 884,041).[1]

Figure 1: Map of Bangladesh

Map showing the administrative boundaries of Bangladesh. From Wikimedia Commons.[2]

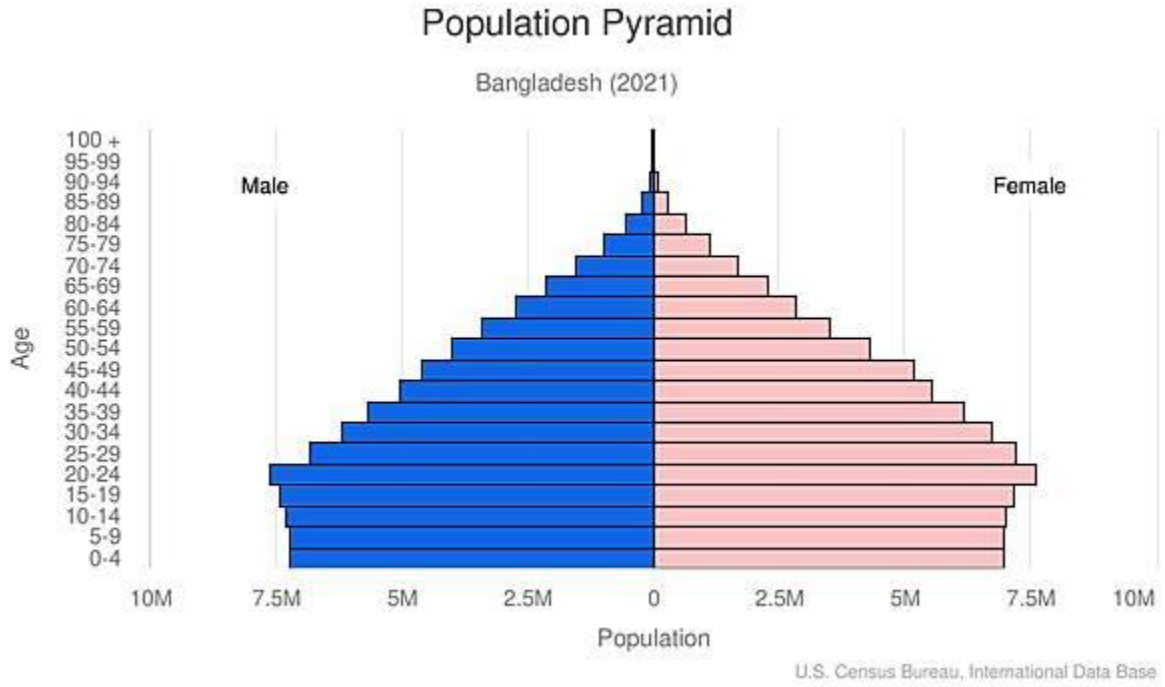
The terrain is primarily flat plains, with some hills in the southeast portion of the country. A large part of the country consists of deltas (low areas of land where a river splits and deposits sediment before entering another body of water), especially along the Ganges and the Jamuna rivers. Bangladesh has a tropical climate with hot humid summers and a monsoon season from June to October.[1] During monsoon season, Bangladesh often has flooding and cyclones which can cause damage and displace large portions of the population.[3]

Table 1: Bangladesh Fast Facts

Capital City and Largest City	Dhaka (population: 21.741 million)
Urban population	38.9%, 2.88% annual rate of increasing urbanization
Population Below the Poverty Line	24.3%
Average Life Expectancy	74.41 years
Current Population Growth Rate	0.95%, 17.88 births/1,000 population
Current Death Rate	5.44 deaths/1,000 population
Infant Mortality Rate	31.13 deaths/1,000 live births (56th in the world)
Current GDP	$329.545 billion
Unemployment Rate	4.4%

[a] Adapted from "Bangladesh" from the CIA World Factbook.[1]

Figure 2: Bangladesh 2021 Population Pyramid



Distribution of the Bangladesh population by patient age. From "Bangladesh" from the CIA World Factbook.[1]

History and Politics

Bangladesh was initially part of the Bengal region of India, both before and during British rule beginning in 1858. India gained its independence in 1947 with the end of British rule. Bangladesh became a part of Pakistan known as East Pakistan which was separated from West Pakistan by a portion of India. After years of military coups and martial law, the Awami League (one of the major political parties in Bangladesh) gained all of the East Pakistan parliamentary seats and declared their independence from West Pakistan.[4] Bangladesh Independence Day is considered to be March 26, 1971, when Sheikh Mujibur Rahman, the leader of the Awami League, declared independence from Pakistan. It took nine months of fighting and the help of the Indian armed forces for Bangladesh to gain independence on December 16, 1971.[4]

Bengali is the primary ethnic group in Bangladesh, making up almost 98% of the population.[1] There are 27 government-recognized indigenous ethnic groups in Bangladesh, though other estimates include almost 75 different ethnic groups in the country. The official language is Bangla/Bengali.[1] English and Urdu are also spoken throughout the country.[3] The major religion is Muslim (89.1%), followed by Hindu (10%).[1]

Government and Legal System

Bangladesh has a parliamentary republic government with eight administrative districts. The CIA World Factbook reports that constitutional amendments require a two-thirds majority in the House and the president's assent. The National Parliament, rather than the public, elects the president, then the president appoints the prime minister. Each presidential term lasts for five years. The current president, Abdul Hamid, has held this position since April 2013. He initially gained his post after President Zillur Rahman died. The current head of government is Prime Minister Sheikh Hasina, who has been in this position since January 2009.[1] Prime Minister Sheikh Hasina is the daughter of Bangladesh's first leader Sheikh Mujibur Rahman.[3] The two major political parties in Bangladesh are the Awami League and the Bangladesh Nationalist Party, of which the current president and prime minister are of the Awami League.[5]

The legislative branch consists of a unicameral House of the Nation (known as the Jatiya Sangsad) with 350 seats total. 300 of these seats are elected by a majority of the popular vote, and 50 seats are reserved for women. These terms last five years.[1]

Each year Transparency International ranks the perceived corruption of each nation's public sectors to create a Corruption Perceptions Index. In 2017, Bangladesh was ranked 143 out of 180 countries. However, this has recently been updated to 146 of 180 with a transparency score of 26 out of 100 as of 2020.[6] Factors that contribute to corruption in Bangladesh include the connection between politics and business within the country, a lack of oversight, inadequate access to information by the citizens of the country, nepotism, and the lack of punishment for corruption.[5] Other indicators of Bangladesh governance according to the World Bank are included in Table 2.

The legal system is a mix of English common law and Islamic law. According to the CIA World Factbook, the Supreme Court of Bangladesh consists of the Appellate Division with seven justices and the High Court Division with 99 justices. The justices are appointed by the president and serve until retirement at age 67. To become a citizen, at least one parent must be a citizen. One must be a resident for at least five years before becoming a naturalized citizen. All citizens are allowed to vote at the age of 18.[1]

The Bangladesh Defense Force is the Bangladesh military force with approximately 165,000 active personnel. China supplies most weapons in Bangladesh, with Russia as a close second. The country spends approximately 1.3% of its GDP on the military.[1]

Table 2: Bangladesh Worldwide Governance Indicators

Voice and Accountability	-0.72 (27.09 percentile)
Political Stability and Absence of Violence/Terrorism	-0.92 (15.24 percentile)
Government Effectiveness	-0.74 (23.56 percentile)
Regulatory Quality	-0.93 (15.38 percentile)
Rule of Law	-0.64 (27.88 percentile)
Control of Corruption	-0.99 (16.35 percentile)

[a] Adapted from "Worldwide Governance Indicators" from the World Bank.[7]

Economy and Employment

The primary natural resources of Bangladesh include natural gas, arable land, timber, and coal. Most of the land (70.1%) is used for agriculture. The current GDP is $329.545 billion. Industries which contribute the most to GDP include 14.2% from agriculture, 29.3% from industry, and 56.5% from services. Bangladesh has a budget deficit of 3.2%. There are issues with food insecurity which are exacerbated by the COVID-19 pandemic, primarily related to monsoons and the high price of rice (the main food staple).[1] Bangladesh has been growing economically and was set to graduate from the UN's Least Developed Countries list in 2026, though the COVID-19 pandemic has slowed GDP growth and increased poverty.[8]

Each year the World Bank assesses factors which affect the ability to open and run a business in a country to create an ease of doing business rating for each country. Bangladesh most recently has an ease of doing business rating of 45.0, ranked 168th in the world. This score has improved since 2020 with improved ease of starting a business, obtaining electricity, and accessing credit.[9] Some of Bangladesh's largest export partners are the United States, Germany, the UK, Spain, and France. Table 3 lists many of Bangladesh's important exports. Their largest import partners are China, India, and Singapore.[1]

Table 3: Important Bangladesh Products

Agricultural Products	Industries
Rice	Jute
Potatoes	Cotton
Maize	Garments
Sugar cane	Paper
Milk	Leather
Vegetables	Fertilizer
Jute (a fiber that can be spun into thread)	Iron and Steel
Mangoes	Cement
Guava	Petroleum Products
Wheat	Tobacco

Data from "Bangladesh" from the CIA World Factbook.[1]

Bangladesh spends 1.3% of its GDP on education. Approximately 73.9% of people over age 15 can read and write.[1]

A majority of the labor force is involved in agriculture (42.7%), with the remainder involved in services (36.9%) or industry (20.5%). The overall unemployment rate is 4.4%, but approximately 40% of the population is estimated to be underemployed. The unemployment rate for youth (15-24) is 12.8%. 24.3% of the population lives below the poverty line.[1]

Physical and Technological Infrastructure (telecommunication, electricity, transportation, water, and sanitation)

There are a total of 1,433,460 fixed telephone lines in the country, amounting to less than one subscription per 100 inhabitants. However, there are 163,559,380 cellular subscriptions amounting to 101.55 per 100 inhabitants. LTE and 5G infrastructures are expanding with increased funding, though less so during the pandemic. Approximately 15% of the population has access to the internet. Approximately 50 million people have access to TV channels, including the state-owned Bangladesh Television company.[1]

83% of the total population has access to electricity, reaching 93% in urban areas and 77% in rural areas. Most of Bangladesh's electricity (97%) comes from fossil fuels, while the other small percentage comes from hydroelectric plants and other renewable sources.[1]

There are six registered air carriers in Bangladesh with a total of 30 registered aircraft. The country has 18 airports and two heliports. There are a total of 2,460 km of railways across the country and 369,105 km of roadways, 110,311 km of which are paved. There are additionally 8,370 km of waterways. The country has 427 merchant marine boats.[1]

Improved drinking water is available for 98.9% of the urban population and 98.4% of the rural population. Sanitation facilities are available to 82.5% of the urban population but only 64.4% of the rural population.[1]

Part II: National Healthcare Profile

Healthcare Structure and Policy

Bangladesh is considered a pluralistic healthcare system, without many regulations and various organizations involved.[10] As a pluralistic system, there are four primary agencies involved in providing healthcare to the population: the government, the private sector, non-governmental organizations (NGO), and donor agencies. There have been concerns about low quality public government health services and largely unregulated private sector providers, which has led to increased NGO involvement in the Bangladesh healthcare system. There are currently over 4,000 NGOs active in Bangladesh, many of which have a good working relationship with the government. Despite these concerns, Bangladesh has made strides in improving maternal, infant, and under-five mortality rates as well as improving HIV, malaria, and TB treatment rates. For example, child mortality rates dropped by approximately 50% between 1990 and 2011. Even with these improvements, there remains a significant disparity in outcomes depending on socioeconomic status and rural versus urban settings. Rural areas and lower income individuals tend to have worse health outcomes.[11]

The primary governing body in charge of healthcare in Bangladesh is the Ministry of Health and Family Welfare, which holds a large amount of power and approves most decisions even at a local level. Under the Ministry are five Directorates: the Directorate of General Health Services, the Directorate General of Family Planning, the Directorate General of Drug Administration, the Directorate of Nursing Services, and the Health Engineering Department. The Ministry is responsible for managing national health care institutions and primary health care services in rural areas. The Ministry of Local Government, Rural Development, and Cooperatives is responsible for managing primary health care services in urban areas. In turn, local governments are primarily responsible for organizing these services. The government establishes Five Year Plans to guide its overarching goals.[11] Bangladesh recently was on its seventh Five Year Plan, which included goals such as increasing measles immunization for children under one year of age to 100%, increasing births attended by a skilled provider to 65%, and reducing maternal mortality to 105 per 100,00 live births.[12]

The private sector consists of the formal sector with qualified professionals (such as traditionally trained allopathic medical doctors) and the informal sector consisting of informally trained providers (such as untrained allopaths, homeopaths, and faith healers). The formal sector tends to be concentrated in urban areas with the informal sector more likely in rural areas.[11]

The neonatal mortality rate is 20.1 per 1,000 live births. There are 34.2 deaths before age five per every 1,000 live births. The maternal mortality ratio is 176 per 100,000 live births. A healthcare provider attends approximately 42.1% of births.[13] Since 1990, Bangladesh has seen a significant decrease in causes of death from communicable diseases; maternal, neonatal, and nutritional disorders; and injuries. There has been a relatively stable rate deaths from noncommunicable diseases overall. This is due to an increase in noncommunicable disease

deaths in males balanced by a decrease in noncommunicable deaths in females.[11] The current leading causes of death are listed in table 4.

Table 4: Top 10 Causes of Death in Bangladesh
Cancer (13%)- Lung and oral cancer in men, cervical and breast cancer in women
Lower Respiratory Infections (7%)
Chronic Obstructive Pulmonary Disease (COPD) (7%)
Coronary Artery Disease (6%)
Stroke (5%)
Preterm Birth Complications (4%)
Tuberculosis (3%)
Neonatal Encephalopathy (3%)
Diabetes (3%)
Cirrhosis (3%) – 92% of which are non-alcoholic

[a] Adapted from "The 10 Leading Causes of Death in Bangladesh" from Sawe.[14]

From the 2018 WHO data, approximately 572,600 deaths out of 856,000 total deaths (67%) were related to noncommunicable diseases. Overall, there is relatively little alcohol consumption throughout the country. Tobacco use is prevalent in approximately 44% of males. In contrast, only 1% of females currently smoke. Smoking rates have been decreasing since 2000 in men. An estimated 26% of the population is physically inactive. Hypertension is estimated to affect 21% of the population, and high blood sugars are estimated at 8%. Adult obesity is estimated at 3%, and adolescent obesity is estimated to be 2%.[15] Between 1990 and 2010, Bangladesh showed improvements in water and sanitation, household air pollution, and undernutrition as potential risk factors for health. Unfortunately, over this same period, ambient PM pollution, smoking, high blood sugar, high blood pressure, and dietary risk factors increased. There is no national cancer database, but it is estimated that there are 200,000 new cancer diagnoses a year. Cancer screening is unfortunately limited to only a few larger tertiary centers.[11]

Finances and Coverage

Bangladesh spends an estimated $2.3 billion on healthcare, amounting to $26.20 per person per year, though approximately 64% is financed by out-of-pocket costs. In 2011, healthcare expenditures were estimated to compose 3.7% of Bangladesh's GDP, the third lowest in the World Health Organization Southeast Asian region, ahead of only Indonesia and Myanmar. Historically, the government budget in Bangladesh has not allocated more than 7% of the budget to healthcare.[11] Recent estimates in 2021 show that healthcare expenditures have decreased to 2.3% of the GDP.[1]

One of the limits of Bangladesh's healthcare system is the high out-of-pocket costs which place a burden on the citizens of Bangladesh.[16] For private health facilities, the burden is worse as it is estimated that 92% of healthcare expenditures are from out-of-pocket payments. One of the main contributing factors is the lack of health insurance, either as a government-supported or

private option. This leads to many individuals taking on the financial burden of healthcare costs, either leading to poverty or requiring distress financing.[10] Sometimes, when hospitals are low on medical supplies, patients are asked to provide items such as intravenous fluids, syringes, or sutures.[11]

Also contributing to the high out-of-pocket costs are the increasing costs of nonessential medications. While 117 "essential" medications are price-regulated by the government and are sometimes provided for free, pharmaceutical companies have raised prices on other medications, citing the increased cost of raw materials. Due to this, a majority (an estimated 66% in 2007) of out-of-pocket medical costs go toward drug and medical goods retail outlets rather than hospitals or other medical facilities.[11]

An estimated 9% of healthcare expenditures come from NGOs to increase healthcare funding in the country. Starting in 2012, a Health Care Financing Strategy was developed to decrease out-of-pocket costs and move towards universal healthcare coverage, though implementation of this has been difficult to achieve. There are a few employer-sponsored health insurance plans, though this makes up a very small percentage of health care finances.[11]

Workforce and Infrastructure

Bangladesh currently has difficulties with the distribution of healthcare resources. There are approximately 0.267 nursing and midwifery personnel per 1,000 people as of 2015.[13] There are an estimated 7.7 physicians, dentists, and nurses per 10,000 people. Most of these workers are in urban areas, even though a majority of the population lives in rural areas.[11] Within rural areas, a majority of patients tend to see unqualified providers from the informal private sector due to lower costs and ease of availability.[11] Within the workforce, the proportion of providers is skewed towards doctors. Therefore, there is a need for more nurses and technologists within the health system.[1] Adding to the strain on the low number of physicians is many public physicians work a second job running a private clinic to supplement their income. Throughout the country, there are 23 government medical colleges, six post-graduate institutions, two institutes of health technology, and five medical assistant training schools to help train new providers. There are also 54 private sector medical colleges.[11]

It is estimated that one community clinic is available per 6,000 people. Additionally, there is one hospital bed available per 1,699 people. The government-run facility numbers are listed below in Table 5. There are additionally 2,983 private hospitals and clinics, which are more expensive and difficult for many to afford. While private medical centers tend to have state-of-the-art medical equipment, public facilities are often lacking in essential equipment. For example, about half of community clinics do not have thermometers or blood pressure monitoring tools.[11]

From 2017 WHO data, approximately five out of ten important noncommunicable disease medicines (aspirins, statins, angiotensin-converting enzyme inhibitors, thiazide diuretics, long-acting calcium channel blockers, beta-blockers, insulin, metformin, bronchodilators, and

steroid inhalers). Additionally, six out of six noncommunicable disease technologies (blood pressure measuring devices, weighing scales, height measuring scales, blood sugar and cholesterol measuring equipment, and urine strips to assess for albumin) are reported as "generally available."[15] Among the district and subdistrict hospitals, 41% and 52% respectively, have functioning x-ray machines, 61% and 52% have ultrasound machines, and 86% and 83% have ECG machines. Despite these shortages, telemedicine is expanding throughout the country as internet availability also expands.[11]

Table 5: Government Run Health Centers
53 Zila (district) Hospitals
425 Upazila (subdistrict) Health Complexes
1469 Union Health and Family Welfare Centers
12,248 community (ward) clinics

Data from "Bangladesh Health System Review" by Ahmed, et. al.[11]

Part III: National Radiology Profile

Radiology Workforce and Training and Professional Representation

A radiologist's training begins with a five-year MBBS medical degree after 12 years of schooling.[11] According to data from the 2013 Bangladesh Health Bulletin, there are approximately 87 medical colleges with 7,712 seats available and 33 post-graduate institutions with 2,260 seats available for physician training.[11] Following that, a radiology residency is available. Exact data on the numbers of radiologists in Bangladesh is difficult to determine without much literature available. The IAEA estimates that Bangladesh has 0-10 radiologists per million people, compared to more than 100 radiologists per million people in the US.[17] While the exact distribution of radiologists is unknown, the overall distribution of healthcare providers is concentrated toward urban secondary and tertiary centers despite 70% of the population residing in rural areas.[11]

There is an uncertain number of residency programs available in the country. Bangabandhu Sheikh Mujib Medical University (BSMMU) in Dhaka, Bangladesh, has one available program. The BSMMU radiology residency program consists of five years of training covering all radiology modalities from x-ray and ultrasound to CT, mammography, and MRI. Examination of residents includes a variety of oral, written, and clinical examinations.[18]

The Directorate General of Health Services (DGHS) offers three-year diploma courses for radiologic technologists, after which they are appointed as medical technologists and recruited by the DGHS.[11] Students who graduate from courses such as this usually leave with a Bachelor of Science in Radiology and Imaging Technology. Potential careers with this degree include radiologic technologist, MRI technologist, CT technologist, radiology assistant, medical advisor, or scientific officer.[19] According to 2013 data from the Bangladesh Health Bulletin, there are approximately 104 institutions with 14,075 seats available for medical technologist training available, noting that this data does not include specific information related to radiology technologists.[11]

From 2017 data, there are an estimated 60 medical physicists in radiation oncology and 19 medical physicists in nuclear medicine throughout the country.[20] Bangladesh has recently started a residency training program for nuclear medicine physicists, which is based on the International Atomic Energy Commission (IAEA) training guide book. The residency lasts for two years and requires completion of training modules; practical training on-site; and final written, oral, and practical examinations.[21]

The Bangladesh Society of Radiology and Imaging (BSRI) is the radiology professional society in Bangladesh, which was established in January 1981. BSRI lists having 360 life members and more than 200 general and associate members.[22]

RAD-AID Bangladesh was established in 2019 in collaboration with the M Abdur Rahim Medical College Hospital in Dinajpur, Bangladesh. RAD-AID Bangladesh works to implement

RIS/PACS systems with teleradiology abilities, expand educational opportunities for radiology personnel, and increase the number of radiologists and technologists in the country.[23] M Abdur Rahim Medical College Hospital, at the time of the Radiology Readiness Assessment in 2019, had three radiologists, one to four x-ray technologists, no sonographers, and no medical physicians. The hospital also had one mammography unit, one 64-slice CT scanner, one 1.5 Tesla MRI scanner, and four ultrasound machines.[24]

Equipment Inventory, Distribution, and Rules and Regulations

There are an estimated 0-5 CTs, 0-2.5 MRIs, 0-1 PET scanners, 0-2.5 SPECT scanners, and 0-5 mammography units per million people in the country of Bangladesh.[17] There are approximately 0.12 radiotherapy units per million people, consisting of 0.04 linear accelerators per million people and 0.08 telecobalt units per million people.[25] Throughout the country in 2017, there were an estimated 45 gamma camera/SPECT machines, five PET/CT machines, 19 linear accelerators, eight CT simulators, nine tele-cobalt machines, and 13 brachytherapy units for nuclear medicine imaging and radiation oncology treatment.[20]

There is no centralized inventory of medical imaging equipment available throughout the country of Bangladesh. Bangladesh additionally suffers from a lack of scheduled equipment maintenance, knowledge of equipment records (such as purchase cost, purchase date, or warranty expiration date), or readily accessible spare parts.[26] A study of three district hospitals in Bangladesh found that 46.9% of radiology and imaging equipment was functional, 40.6% was nonfunctional, and 12.5% was functional but not in use. One in four of the units were nonfunctional before 10 years, which is considered the minimum lifetime of imaging equipment. Within these hospitals, imaging equipment was underutilized in part due to space constrictions. For example, four to six radiography units were installed within one room, but only one unit could be used at a time while the other units were idle. Other factors that affected utilization included shortage of technologists to run the equipment, lack of an orientation course, lack of spare parts, and delayed maintenance.[27]

As an example institution, a larger hospital in Bangladesh, the United Hospital in Dhaka, Bangladesh, has a 128- and 64-slice CT scanner, 3.0 T and 1.5 T MRI, ultrasonography, x-ray, and digital mammography available.[28] The National Institute of Neurosciences and Hospital also offers MRI imaging, costing 3000-4000 Bangladeshi Taka (or $35.06-$46.75 US dollars) per scan. CT, ultrasound, and x-ray are also available at this hospital.[29] Other larger hospitals, such as the National Institute of Cardiovascular Diseases (NICVD) in Dhaka, have access to angiography, CT, x-ray, and color Doppler echo. Some smaller health complexes, such as Sarisha Bari Thana Health Complex in Jamalpur and the Damurhoda Upazila Health Complex in Kustia, only have access to x-ray.[26]

Conclusion

Bangladesh is a growing country economically which has seen strides in progression toward urbanization. This has led to improvements in health outcomes such as decreasing maternal, infant, and under-five mortality rates; improving HIV, malaria, and TB treatment rates; and decreasing morbidity and mortality from communicable diseases, maternal, neonatal, and nutritional disorders, and injuries. Despite these improvements, there remain disparities in healthcare outcomes between socioeconomic groups and urban versus rural areas. Low government spending on healthcare, a lack of health insurance, and an unregulated private sector contribute to high healthcare costs for the population. While there are radiology resources and staff available within Bangladesh, most of these resources are concentrated in urban areas. There is an overall need for more physicians, nurses, and technologists throughout the country to help meet the needs of this populous nation.

RAD-AID Bangladesh has been established since 2019 and is partnered with M Abdur Rahim Medical College Hospital in Dinajpur to help implement a RIS/PACS system, expand educational opportunities for radiology personnel, and increase the number of radiologists and technologists in the country.

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