DIU Journal of Health and Life Sciences Volume 03, No. 01 & 02, 2016
https://doi.org/10.36481/diuhls.v03i1-2.h8v5bz40

PRICE OF IMAGING TESTS AND ACCESS OF PATIENTS TO MODERN HEALTH CARE FACILITIES ACROSS THE DEVELOPING AND BETTER-OFF COUNTRIES: A COMPARATIVE STUDY

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Abstract: *Modern health care facilities like radiography, Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) are important for early diagnosis and evaluation of musculoskeletal and central nervous system diseases. But due to high prices of modern diagnostic tests in the developing country the peoples of low-income group cannot access to the modern health care facilities. For illustration, a patient of a developing country (Bangladesh) has to pay for MRI and CT tests 100.43 and 60.70 dollars respectively whose per capita income is 958 dollars. A patient of better-off country (Japan) has to pay 39.62 and 15.17 dollars for MRI and CT of same tests whose per capita income is 38,634 dollars. Through this study the authors recommend effective health policy, research and telemedicine should bring in the mainstream of government health policy in the developing country, for the dissemination of specialist's advice in the rural area, in order to a greater access of the low-income peoples to health care facilities.*

Keywords: *Imaging cost, health care facilities, health policy, comparative research, Bangladesh*

Introduction

In the past two decades, Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) have become the most sophisticated modalities for evaluating the musculoskeletal system and the central nervous system[1]. Imaging technology plays a vital role to increase patient's level of functioning, increasing the quality of life through the use of an interdisciplinary team. By combining the latest advances in genomics, proteomics and functional imaging, diagnosis may become possible at an ultra early stage, thus leading to reductions in morbidity and mortality rates while improving the quality of life in a cost effective manner[2]. However, it remains beyond the capacity of the low-middle income population in the developing countries.

Bangladesh is a rural-prominent developing country in South Asia with high population density (1161 people per square kilometer). Less than 40% of the population has access to basic health care. Currently Bangladesh spends US$ 26.60 per capita for health expenditure[3]. However, communicable, non-communicable disease, diarrhoea, tuberculosis, maternal disorder, strokes, cardiovascular and circulatory disease, cancer, diabetes, road traffic accidents, malnutrition, mental and behavioral disorder are the common causes of mortality, morbidity and disability of Bangladesh[4-11]. In

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Bangladesh, due to hectic rise and inexpedient cost of diagnostic laboratory service especially sophisticated radiography, MRI, CT and inadequate health care system – the patients' access into health care is very limited. Though the cost of imaging and other modern medical diagnostic tests is expensive everywhere in the world, better-off countries such as United Kingdom, Japan, USA reduced medical expenditure due to their effective health policy.

To evaluate and rehabilitate the patient's different disease, dysfunction and disorders, specialist physician frequently advise the radiography and imaging technology. Nevertheless, the clinical usefulness of CT and MRI together with other medical investigations have been hampered for high cost due to limited facilities and underdeveloped health care policy in Bangladesh. Therefore, this paper aims to explore the imaging test expenses and access to health care facilities between two different economic level countries.

Materials and methods

Study design

The study was a comparative study between developing and better-off countries. Bangladesh was selected as a developing country and Japan was selected as better-off country for this study. In Asia, Japan has progressed enormously in medical technology and healthcare facilities in last few decades and become a role model of advanced healthcare facilities.

Data collection procedure

Data was collected from five diagnostic center in Dhaka city. Diagnostic laboratories was selected using non-probability sampling techniques. Convenience sampling was used in this study. We select those laboratories which are well equipped and have at least three imaging facilities like X-ray, CT and MRI. Diagnostic laboratory data in Japan was collected from different hospitals.

Data analysis

Descriptive statistical analysis was used to calculate the frequency and percentage. Data was presented in a graphical form. Microsoft excel was used to create graph and comparative analysis.

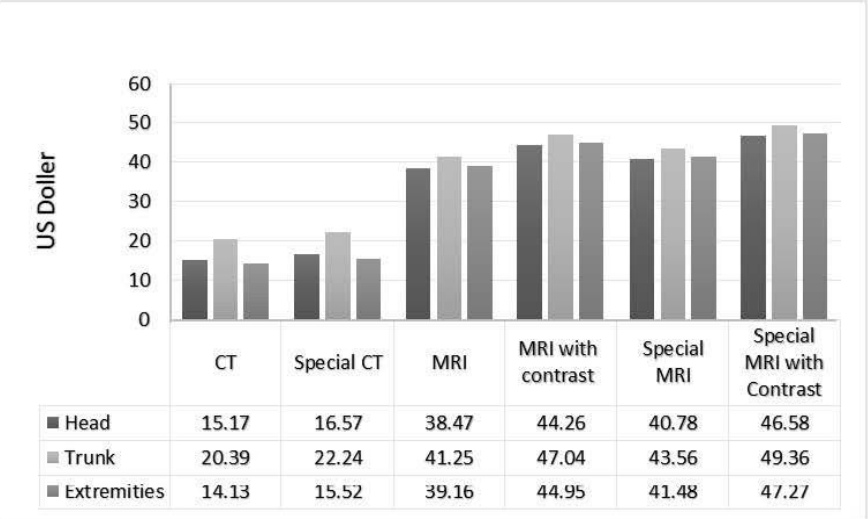
Results

Imaging test price was collected from five medical diagnostic laboratories in Bangladesh (Table 1). The mean price of X-ray was calculated US$ 1.78. The price of CT scan for head was relatively equal (US$ 62.00) whereas CT scan for trunk and extremities was varied to US$ 62.03 - 88.60 and US$ 79.75 – 88.62 respectively. MRI test in Bangladesh was also found remarkable difference (US$ 88.62 – 106.34) for head, trunk and extremities. MRI with contrast price was found highest (US$ 141.79) in Bangladesh.

Table 1: Imaging prices (US dollars) of five medical diagnostic laboratories in Bangladesh

Imaging	Specific body parts	1	2	3	4	5
X-ray	Single film	1.41	1.50	1.77	1.94	2.30
Computed Tomography (CT)	Head	62.03	56.71	62.03	62.03	-
	Trunk	62.03	79.75	88.62	88.62	-
	Extremities	79.75	79.75	88.62	88.62	-
Magnetic Resonance Imaging (MRI)	Head, Trunk & Extremities	88.62	106.34	106.34	-	-
	With Contrast	106.34	141.79	-	-	-

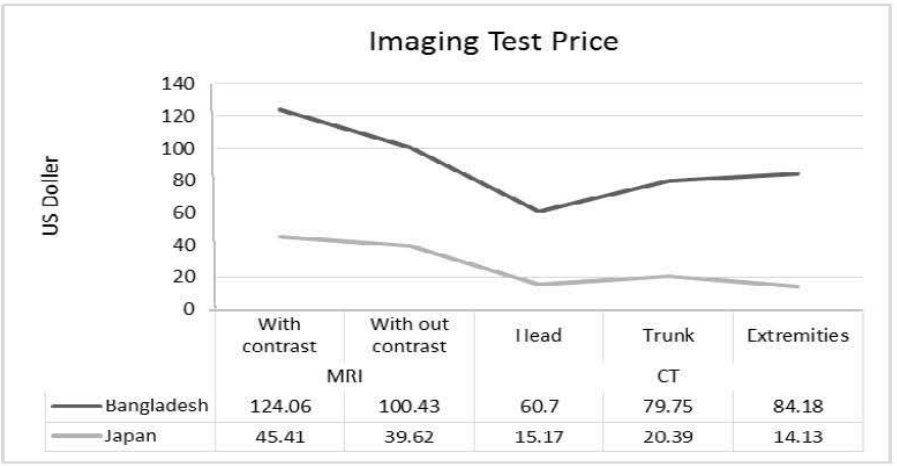
Better-off country like Japan's imaging tests price are shown in Figure 1. In Japan, imaging test price of head for CT found US$ 15.17, special CT was US$ 16.57, whereas MRI cost found US$ 44.26 for MRI with contrast and US$ 46.58 for special MRI with contrast. Highest cost for CT scan found US$ 22.24 in special CT for trunk in Japan. Price difference between MRI and Special MRI found very minimum in Japan. MRI with contrast and special MRI with contrast also found low price gap (US$ 40.78 – 49.36) in Japan.



	CT	Special CT	MRI	MRI with contrast	Special MRI	Special MRI with Contrast
Head	15.17	16.57	38.47	44.26	40.78	46.58
Trunk	20.39	22.24	41.25	47.04	43.56	49.36
Extremities	14.13	15.52	39.16	44.95	41.48	47.27

Figure 1: Imaging Prices (US Dollar) in Japan

In comparison of imaging test cost between Bangladesh and Japan shows that (Figure 2), for MRI test, a patient from Bangladesh has to pay 124.06 US dollar for MRI with contrast and 100.43 for MRI without contrast, whereas a patient from Japan has to pay less than US$ 50.00. Huge price gap of CT scan for head, trunk and extremities is also shown between Bangladesh and Japan. Bangladeshi patients' have to pay almost five times higher than Japanese patients. Minimum CT scan price is found for extremities is US$14.13, whereas in Bangladesh same CT test is about US$ 84.18.



	With contrast	With out contrast	Head	Trunk	Extremities
	MRI			CT	
Bangladesh	124.06	100.43	60.7	79.75	84.18
Japan	45.41	39.62	15.17	20.39	14.13

Figure 2: Comparisons of imaging cost between Bangladesh and Japan

Different level of health delivery networks of Bangladesh are mentioned in Table 2. There are four key actors that define the structure and functioning of the broader health system: Government, the private sector, NGOs and donor agencies. The Government, private sector and NGOs are engaged in service delivery, financing and employing health staff; donors play a key role in financing and planning health programs. Data indicates that, 13,336 community clinics are functioning in Bangladesh[3]. Besides community clinics, the primary level health care includes 467 upazila and union hospitals bad capacity of 18,780. Secondary hospitals comprise general hospitals and district level hospitals. Every district has at least secondary level hospitals. A national level medical college hospital, 21 specialized and 7 post graduate institutions provides 16,156 bed coverage. Private sector health delivery includes registered hospitals, clinics and diagnostic centers.

Table 2: Health delivery network of Bangladesh

Health Care	Type	Public Sector		Private Sector	
		No. of facilities	Bed	No. of facilities	Bed
Primary level	Upazila hospital	436	18,290	5,122	5,500
	Union hospital	31	490		
	Ward (Community Clinic)	13,336	-		
Secondary level	District hospital	53	7,850	2041	23,957
	General hospital	11	1,350		
Tertiary level	Medical college hospital	22	11,960	460	12,780
	Post graduate institutes and hospital	7	2,300		
	Specialized hospital	21	1,896		
	Total	13,917	44,106	7,623	42,237

In Bangladesh, around 7,623 registered private facilities provides 42,237 beds together with approximately in total 5,500 beds provided in primary level like clinic and diagnostic centers, 23,957 beds in secondary level private hospitals and 12,780 beds for private medical college hospitals and tertiary hospitals[12]. It is also mentioned that, there are more than 4000 NGOs running with 4500 number of beds in Bangladesh.

In Bangladesh, inpatient and emergency care is available in primary, secondary and tertiary facilities (Table 3). Bangladesh is now fulfilling 95% of pharmaceutical care demand from indigenous sources and public hospital is providing free medicine[3], but it is still district and urban centered. Pharmaceutical care is very limited in primary hospitals.

Table 3: Health Care Facilities in Public Hospitals of Bangladesh

Access to Health Care	Primary Level	Secondary Level	Tertiary Level
Inpatient care	Available	Available	Available
Emergency care	Available	Available	Available
Pharmaceutical care	Limited	Available	Available
Rehabilitation/intermediate care	Unavailable	Limited	Available
Long term care	Unavailable	Unavailable	Unavailable
Palliative care	Unavailable	Unavailable	Limited
Mental health care	Unavailable	Limited	Limited
Dental care	Unavailable	Available	Available

Rehabilitation care like recovery for injury like accidents, neurological stroke and substance abuse – is highly concentrated in metropolitan region. There is no long term care in Bangladesh as yet. In primary and secondary level government hospitals, palliative care and mental health care is almost unavailable, only tertiary hospital provides limited care. Whereas, dental care is available in district and tertiary level hospitals, but it is also unavailable in rural level facilities.

Discussion

In reality the costs (establishment cost) of imaging tests are high all over the world but in the developed country due to their effective health policy with health insurance system the price (selling price to the consumer) reduced. Nevertheless, the clinical usefulness of CT and MRI together with other medical investigations have been hampered for high cost because of throughput of limited patients due to limited facilities and underdeveloped health care policy in Bangladesh. This paper analyses the inequality of laboratory charges, for instance, charges for CT scan for head costs in one lab 56.71 dollars and in another 62.03 dollars, for trunk 62.03 and 88.62, for extremities 79.75 and 88.62, the difference of cost is 5.32, 26.59 and 8.87 dollars respectively. In case of MRI 88.62 and 106.34, MRI with contrast 106.34 and 141.79, the difference is 17.72 and 35.45 dollars respectively. Radiological (X-ray single film) fees also vary (.09 to 0.89dollar) but not as much as CT and MRI (Table 1). The purpose of this study is to evaluate the usefulness of radiology, CT and MRI diagnostic tests that are frequently used for the proper diagnosis of diseases. We found that, inadequate facilities of modern technology, high cost, lack of health policy in clinical evaluation, proper diagnosis of different types of diseases and disabilities are restrained grossly affect public health and national economy. The burden of diseases, less access to health care and absence of comprehensive national health plan may undermine the development of developing countries like Bangladesh. By increasing the standard of health it should be possible to increase the economic growth of a country, helping to break down the poverty trap[13]. This paper showed the dominance of private health care provision using modern technology with uncontrolled and incoherent prices. So the main challenge in Bangladesh is to improve the public health services and enable the poorest, disabled peoples to obtain the health care they need[14].

Conclusion and recommendations

All the measures of poverty, disability, epidemiology of disease, lack of access to health care facilities due to high cost and inadequate health policy which are inexorably linked to a better state of public health. The health system of Bangladesh is totally inadequate for a modern country. Therefore, authors would like to put following recommendations through this study for better public health practices.

1) Health policy and health insurance

In Bangladesh there is no such health policy and national health insurance as seen in the developed world. Hossain GM and Begum A, investigated that at a certain rural area of Bangladesh 14% of the elderly peoples were insured and thereby this has significantly increased their health care access[15]. So at first its need a meaningful adequate health policy that will provide the people quality health care services with the existing technology and resource. The policy makers will have to learn from the international experience of the developed country like Japan, USA, UK who have a satisfactory achievements about health care and insurance system though their medical cares have not been without problems. In recent years the healthcare spending in the US rose to $1.3 trillion, a 6.9 per cent increase over the previous year, 13.2 per sent of gross domestic product (GDP) according to a report by the centers for Medicare and Medicaid (the insurance program for 44 million low-income, elderly and disabled people of USA) services (news-web sites). The cost of more expensive medications was not the only factor. Consumers have demanded more freedom to choose doctors and receive MRI and other expensive tests, and hospitals have succeeded in winning higher fees from insurers and Medicare. Health policy specialists are worried that rising premiums, combined with the economic recession, eventually will leave more Americans without any health insurance at all. However, despite rising health costs from 1997 to 2001, more employers offered health benefits during that period. Total heath care expenditure in the UK National Health Service (NHS) rose to 67 billion in 2000 representing 7.1 per sent of GDP, in 1999 it was 6.8 per sent but still the UK remains one of the lowest spenders on health care among the major industrialized countries (The Office of Health Economics, www.ohe.org). Japan has a national health insurance system that covers the entire

population. The estimated total of National Health Care Expenditure (NHCE) in 1999 was 30 trillion that constitutes 7 per sent of GDP reasonable particularly in comparison with the US. The health Insurance system of Japan not only finances the health care but also serves as a policy implementation tool to enable the government to macro-manage the behavior of hospitals and clinics in the entire nation through the uniform fee schedule[16]. The developed countries have taken the measures of health care systems according to their ability, cultural, historical and social conditions. The purpose to quote this information is that the policy makers of developing countries such as Bangladesh would careful about the health care cost rising as an increasing share of GDP is not being loosed by the health care industry[17].

2) **Research and publication**

In Bangladesh, to date there are some research papers by national and international non-government organizations but the health outcome research are more limited that is important to take any big step concerning development and planning in health at national level. To focus the information or observation and research outcomes for the doctors, scientists and people all over the world, journal plays a vital role to make them knowledgeable. Therefore, to provide physicians and scientists in the developing world with contemptible access to research journal is advantageous[18].

3) **Telemedicine**

Telemedicine means treating patients in distance. The advancement of technology has allowed medical professionals to exchange medical information like audio (voice, heart sound by stethoscope) and video (conferencing) and transmit images, echocardiogram, ultrasonography, histopathological report and expert medical advice from one site to another, from city to rural areas, from one country to another. In perspective of developing country such as Bangladesh who has limited high tech they should implement the teleconsultation (clinical data through telephone or mobile), the health care professionals at upazila health complex with the specialist from the primary care level as the first stage of telemedicine. As we saw in table 4 at primary care level there is no imaging system and specialist services. The government has a plan of a 3.2 billion dollar five-year Health and Population Sector Program (HPSP) and under this program they have constructed 6000 community clinic at union level out of the total 13,500 to be constructed in phases. To further improve health care delivery, they decided to fully modernize, well equip and upgrade some of Thana and district level hospitals, aiming at establishing effective referral system so that patients do not rush to the capital unnecessarily. In this point of view the authors suggest that the dissemination of high- tech equipment beneficial to patients but may not be favorable in health economics viewpoint of Bangladesh. The government should establish a X-ray machine, a digital camera, an ECG monitor, a lap top with sufficient software with internet connection in the each unit of rural health care level that would establish a second and third stage of telemedicine net work in and outside the country that could be more beneficial for the peoples in a cost effective manner. Telemedicine has a greater impact from management to avoid transfer or travel from one place to another place in the various fields especially in radiology, orthopedics, neurology, dermatology and cardiology[19, 20]. Telemedicine might mitigate this pale background by making a bridge with the limited facilities and limited specialist in and out side the country. Victor Patterson a consultant neurologist of Tyrone County Hospital in Northern Ireland, 53 km from the regional neurological unit of Belfast has expressed his experience that of 230 consecutive patients seen by telemedicine, only seven had to be transferred to the regional unit and this system is effective and cost effective[21]. Nevertheless, Telemedicine is becoming an important means of providing specialty medical services in rural areas, earlier diagnosis and intervention, of saving lives and of avoiding unnecessary transfers from rural hospital emergency departments to urban hospitals[22, 23]. In agro base economy Bangladesh, peoples are living in rural areas with very limited health care facilities and the transport systems are inadequate and unplanned. Peoples have to go to the capital to achieve their health care frequently that is troublesome, time consuming and expensive that happened more disability and even death. For this reason telemedicine would play a vital role in health policy

issues to disseminate the facilities together with other systems from center to periphery that will secure easy access to health care and specialist, and enhance research and the education of local health personnel in a cost-effective manner. Dissemination of high tech like CT, MRI, SPECT, and PET is not possible in such a developing country now but dissemination of limited specialist's advice to the remote area is possible through telemedicine with some extra effort. In fact telemedicine may have a more profound impact on developing countries than on developed ones[24]. Telemedicine can improve health care in the developing countries by removing time and distance barrier, and optimize the use of limited health services in developing country[25]. Telemedicine should be implemented in the mainstream of government project for better and cost effective treatment and greater access of peoples in modern health care system with proper utilization of existing technology and establish an equal market price of health care facilities.

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