

Review Article

Chronic Non-Communicable Diseases and the Healthcare System in Bangladesh: Current Status and Way Forward

Anwar Islam^{1*} and Tuhin Biswas²¹Centre for Control of Chronic Diseases, York University, Canada²Centre for Control of Chronic Diseases, International Centre for Diarrheal Disease Research, Bangladesh

***Corresponding author:** Anwar Islam, Adjunct Scientist and Consultant, Centre for Control of Chronic Diseases (CCCD), International Centre for Diarrheal Disease Research, Bangladesh (ICDDR,B), Dhaka, Bangladesh, and Adjunct Professor, School of Health Policy and Management, York University, Toronto, Canada

Received: September 15, 2014; **Accepted:** October 21, 2014; **Published:** October 29, 2014

Abstract

The rapidly increasing burden of chronic Non-Communicable Diseases (NCDs) constitutes a major public health challenge undermining the social and economic development throughout much of the developing world. NCDs accounted for 63% or 36 million of the estimated 57 million deaths that occurred globally in 2008 (WHO 2011). Resource poor developing countries like Bangladesh are faced with the most intractable challenge in this regard. Based on an extensive review of secondary data, the paper assesses the current burden and the future trend of NCDs in Bangladesh and at the same time examines the preparedness of the health system in responding to the challenges of chronic non-communicable diseases. The paper strongly argues that the NCDs pose an alarming issue for Bangladesh. However the health care system in Bangladesh needs to be further strengthened to effectively respond to this challenge. Bangladesh lacks a clearly articulated national NCD plan. Moreover, currently there is no routine surveillance of NCD related morbidity and mortality or of NCD risk factors. The health system seems to have limited human, technical and functional capacity to promote behavioral changes conducive to prevent NCDs. At the primary health care level, Bangladesh initiated limited number of poorly defined NCD-related health promotion activities. Clearly the health system in Bangladesh demands greater financial, human and technical resources to effectively address NCDs.

Keywords: Health System; Chronic non-communicable diseases

Introduction

It is unfortunate that the Millennium Development Goals, set around the turn of the century by the United Nations, failed to explicitly acknowledge and address the emerging challenges of chronic diseases. Perhaps, this failure by the world body made us ignore the threat of chronic diseases. However, the threat is too catastrophic to be ignored anymore. In the early 1990s many demographers and public health experts predicted that by the turn of the twenty-first century, developing countries would undergo a demographic and epidemiological transition and that chronic non-communicable diseases would emerge as major challenges for their health care systems [1]. According to the prediction of some of these scholars, communicable disease will account for only about 20 per cent of deaths in developing countries by 2015 as chronic diseases like cancer, cardiovascular complications, hypertension and diabetes start to take an increasing toll [2]. Due to numerous intervening factors, including the devastating effect of HIV/AIDS in many developing countries that was difficult to visualize even in the early 1990s, such predictions did not fully come true. However, it is undeniable that slowly but surely chronic diseases are emerging as the most critical challenge to the health systems in developing countries, especially in countries that did not experience the full brunt of HIV/AIDS. Bangladesh is no exception in this regard. Like many other developing nations Bangladesh, one of the poorest countries in the South Asian region, is also undergoing a demographic and epidemiological transition. Limited available evidence suggests that in Bangladesh NCDs are responsible for more than half of the annual mortality

[3]. The prevailing health system of Bangladesh is still generally poorly organized with inadequate fiscal and human resources, lack of good governance, highly centralized service delivery models and weak information systems. Determining how the health system can be better adapted or strengthened to cope with the soaring burden of NCDs requires an understanding of how the system and NCDs interact.

Cardio Vascular Diseases (CVD), diabetes, hypertension, cancer and Coronary Obstructive Pulmonary Diseases (COPD) are major NCDs responsible for a considerable portion of the mortality, morbidity and health services utilization in Bangladesh as well as in South-East Asia [4]. Determinants and risk factors associated with chronic diseases are well-recognized. A few powerful and yet modifiable risk factors associated with NCDs common across cultures and countries can easily be identified. These are: unhealthy diet, lack of physical activity, and tobacco use. Needless to say, these factors are all somehow tied up with the process of globalization.

Since independence, Bangladesh has made tremendous progress in health and development. In some cases, the country has made more impressive gains than most of its neighbors. Bangladeshis now live longer – the average life expectancy at birth increased from 40 years in 1960 to 64 years by 2005 [5]. The success in expanding immunization, improve maternal and child health, and in reducing malnutrition must be commended. Nevertheless the health system continues to face numerous problems. Perhaps the most critical challenge faced by the health system in Bangladesh is in the arena of human resources for health [6]. Aging population also presents significant challenges

to effectively tackling the growing burden of NCDs in Bangladesh. It is projected that in 2015 the percentage of older age people (aged 60 years or more) will increase from the current 4.6% to 6.6% [7]. Clearly along with a demographic transition Bangladesh is also faced with an epidemiological transition. This paper reviews the current disease burden of NCDs and its future trend in Bangladesh. It also provides an overview of the response of the government and the NGO sectors in preventing NCDs. In reviewing the epidemiology of NCDs, the paper is primarily focused on diabetes, CVD, hypertension, COPD and cancer as these five non-communicable diseases are the leading causes of morbidity and mortality in Bangladesh.

Methodology

The paper is based on a review of published and unpublished data/information. Online search was conducted for primary research articles on NCDs covering both rural and urban areas of Bangladesh. Most of the studies were focused on prevalence and risk factors of different NCDs such as diabetes, CVD, hypertension, COPD and cancer. The Bangladesh NCD Risk Factors Survey 2010 conducted by the Ministry of Health and Family Welfare was also reviewed. A three-year hospital-based cancer registry report (2005-07) produced by the National Institute of Cancer Research and Hospital, Dhaka provided valuable data. The study also reviewed NCD-related operational plan of the Ministry of Health and Family Welfare, Bangladesh as well as that of a few major NOGs. Two electronic databases (PubMed and Ovid Medline) were extensively searched for relevant data and information with special focus on South-East Asia in general and on Bangladesh in particular. However, the search was limited to English language studies, articles, reports and other materials only. In searching the data bases, the following key words were used: “non-communicable diseases”, “chronic disease”, “diabetes”, “hypertension”, “cardiovascular diseases”, “COPD”, “cancer”, “health system” and “Bangladesh”. Titles and/ or abstracts of selected articles were manually searched to identify materials relevant for inclusion in the study. Reference lists from studies were also searched to identify additional studies/information. An extensive grey literature search was also conducted by the authors.

Findings

Chronic non-communicable diseases in Bangladesh

NCDs (inclusive of injuries) account for 61 percent of the total disease burden in Bangladesh [4]. According to the World Health Organization (WHO 2010), CVD, hypertension, diabetes, COPD, and cancer are the major NCDs in Bangladesh. According to the NCDs risk factors survey conducted in 2010 by the Ministry of Health and Family Welfare 99% of the population had at least one NCD risk factor and 29% had three or more risk factors [8]. According to the WHO (2011) NCDs in Bangladesh are estimated to account for 52% of all deaths and among them 27% were due to CVDs alone. In a recent study it was projected that death rate from CVDs would increase 21 times by 2025 [8]. Mortality rates for heart attack, stroke, other CVDs were 2.4%, 3.6% and 6.55% respectively [9]. Higher the blood pressure, the greater the chances of heart attack, heart failure, stroke and kidney disease. The World Health Organization attributes hypertension, or high blood pressure, to be the leading cause of cardiovascular mortality. Prevalence rates of hypertension are 15.6% for women and 9.8% for men in Bangladesh. The study

findings showed that prevalence was significantly higher among urban population than their rural counterparts (23.6% vs. 10.8%; $p < 0.001$). The prevalence of hypertension tended to be higher in females than males but failed to reach statistical significance level (18.3 vs. 15.6%, $p = 0.109$) [10]. The study also found that age, urban residence, no-manual work, low physical activity, extra salt intake, low consumption of fruits and vegetables, overweight, abdominal obesity and family history of hypertension/stroke/heart attack were significantly associated with hypertension.

According to the International Diabetes Foundation (IDF) by 2030 Bangladesh will rank the 8th out of 10 countries with the largest number of people with DM [11]. In Bangladesh the prevalence of diabetes is 10% and 7% in urban and rural areas respectively although both males and females were equally susceptible in both settings. Pre-diabetes rate was also higher in the urban compared to the rural population [12]. It is estimated that each year cancer claims 150,000 lives in Bangladesh, while 200,000 new cancer patients are detected. According to the National Cancer Institute of Bangladesh (2007), the five most common cancers among Bangladeshi males are Lung (71.2%), lymphatic system (27.4%), esophagus (18.5%), stomach (15.6%) and liver (10.8%). On the other hand, for women the five most common cancers are breast (39.7%), cervix (26.9%), lymphatic system (7.6%), lung (7.5%), and esophagus (5.7%) [13].

In Bangladesh the overall prevalence of COPD in the general population is 3%. Studies suggest that among Bangladeshi adults co-morbidity of COPD and hypertension is quite high. About a third of COPD patients have both COPD and hypertension. Co-morbidity is higher among the elderly (age ≥ 60 years), males and smokers. The prevalence of co-morbidity was similar across rural and urban areas. On the other hand, while COPD is more prevalent among adult males, hypertension is more prevalent among adult females [14].

A survey conducted by the ICDDR,B among the elderly (60 years of age and older) in two rural settings in Bangladesh in 2002-05 found a very high prevalence of chronic diseases: 73 per cent in one area and 44 per cent in the other [1]. Bangladesh NCD risk factors survey (2010) showed that smoking rate in rural areas is slightly higher (23.6%) than in urban areas (21.3%). Around 27.2% (25.9 million) of the adult population currently use smokeless tobacco. Prevalence is similar in males (26.4%) and females (27.9%). Currently smokeless tobacco use is more prevalent in rural areas (28.8%) compared to urban areas (22.5) [15]. Among all persons engaged in indoor occupations, 63% (11.5 million) are exposed to second hand smoke in indoor areas of the workplace; among nonsmokers, 75.7% (5.1 million) are exposed to second hand smoke at these workplaces. Almost 96% of the populations do not consume adequate fruit or vegetables on an average day. Physical inactivity, particularly among females and urban dwellers is low. Sedentary lifestyle among the urban population is a major risk factor. Prevalence of low level of physical activity is quite high (27%) [16]. Several studies in Bangladesh have identified increased age, BMI/obesity, WHR, social class, hypertension, family history, and sedentary life style as major risk factors for diabetes [11].

Bangladesh health System and the prevention of chronic diseases

Despite being a resource poor country, the health sector in Bangladesh has made impressive progress in recent years in

preventing chronic diseases. The national survey on NCD risk factors that was carried out by the MOHFW from November 2009 to April 2010 used the WHO STEPS approach. This first nationally representative survey provides critical information on key indicators of NCD risk factors that could be used for developing effective policies and appropriate programmatic interventions. The *Health Nutrition and Population Sector Program* (HNPS), Bangladesh's five-year plan for health, identifies three NCDs -cancer, CVD, and diabetes - as major public health problems [17]. The current Strategic Investment Plan is notable for including prevention and control of major NCDs. The plan recommends that (i) the public sector shall focus on prevention and that (ii) investment in intensive care units and tertiary care services be left to the private sector. The plan proposes publicly financed insurance and health vouchers to protect the poor against the costs of emergency care and catastrophic illnesses. The main objective of this operational plan is to reduce NCD related mortality by 2% per annum in alignment with the global target set by the World Health Assembly. Policy initiatives were also undertaken to address environmental/climate change issues and related NCD threats. The Smoking and Tobacco Usage Act (2005) called for the removal of tobacco billboards and imposing restrictions on tobacco use/smoking in public places such as schools, hospitals and airports. This legislation also required that health warning labels on tobacco products cover at least 30 percent of the packaging [18].

Activities of non-government organization in preventing chronic diseases

A study conducted by Sara N. Bleich et al (2011) showed that there are only 11 major NCD programs in Bangladesh and that NGOs are involved in only 6 of them. Among them is the National Heart Foundation's program of campaigning in rural areas to make people aware of risk factors of heart diseases, and how to prevent such diseases [3]. An organization named Primary Prevention of Diabetes is involved in training doctors and community counselors in diabetes education and awareness. The Child Sponsorship Program in Bangladesh organizes Diabetes Awareness Camps in rural areas for the youth and their parents, providing information on risk factors of diabetes and regular monitoring of glycemic control of HbA1C. Due to the advancement in modern technology, the health system has added telemedicine services to better reach the population at large.

Role of development agencies in preventing NCDs

Development agencies/organizations play a vital role in Bangladesh. For example the World Bank, WHO and other UN agencies, the European Union, USAID, as well as multilateral and bilateral organizations take part in policy dialogue and in the development and implementation of innovative programs often involving public private partnership to control and prevent NCDs. By providing technical support many development agencies often help build the capacity of local public and private organizations and NGOs in designing, implementing and evaluating NCD programs and projects. For example, the Chronic Diseases Initiative of the NHLBI (USA) and the UnitedHealth are working together to establish a network of 11 Collaborating Centers of Excellence in low- and middle-income countries to generate and disseminate knowledge on chronic diseases and help develop policies and programs in controlling them.

In Bangladesh it established a centre titled "Centre for the

Control of Chronic Diseases" (CCCD) in ICDDR,B to conduct research and help build sustainable programs to combat chronic non communicable diseases [19]. It is important to note that NHLBI organizes an annual Steering Committee meeting in Bethesda, Maryland to share research findings and knowledge generated by all the Centers of Excellence established by the NHLBI around the world. The South Asia Network for Chronic Diseases (SANCD) in India is a collaborative venture between the Public Health Foundation of India (PHFI) and constituent colleges of the Wellcome Trust Bloomsbury Centre for Clinical Tropical Medicine. The network (SANCD) currently comprises of various research organizations based in Delhi, Mumbai, Goa, Chennai and Pondicherry in India; ICDDR,B in Dhaka, Bangladesh and the Aga Khan University in Karachi, Pakistan [20]. The network's aim is to build internationally recognized research capacity, harness scientific talent within the region, produce breakthroughs in research knowledge needed to make an impact on health policy and practice, and ultimately contribute to reducing chronic disease burdens in South Asia.

Chronic diseases research in Bangladesh

In 2009 the International Centre for Diarrheal Diseases Research, Bangladesh (ICDDR,B) established the Centre for the Control of Chronic Diseases (CCCD) for the generation, dissemination and utilization of knowledge on NCDs. The CCCD is involved in innovative research in partnership with numerous public as well as private sector institutions within and outside Bangladesh in analyzing the prevalence and risk factors of NCDs specially hypertension, diabetes, CVD, COPD and cancer. The CCCD and its partners are committed to science, knowledge and its application for public health especially focusing on chronic diseases.

In recent years, the CCCD at ICDDR, B has undertaken a vital research work entitled "Bangladesh: Risk of Acute Vascular Events" to close a very critical knowledge gap. The study was conducted in collaboration with the U.K. based Cambridge University and a number of Dhaka-based health institutions including the Bangladesh National Institute of Cardiovascular Diseases (NICVD) [21]. A number of NGOs also participated in this critically important study. The study is regarded as a milestone in not only filling a critical knowledge gap but also in developing evidence-informed policies and programs in combating NCDs in Bangladesh.

Creating health human resources

Bangladesh also has the presence of a large and growing not-for-profit private sector. Non-government organizations are involved in diverse activities - from provision of health services and education to environmental projects and to income generating activities. Along with the big two - Bangladesh Rural Advancement Committee (BRAC) and Gonoshasthya Kendra (GK) - the NGO sector includes thousands of other smaller ones. BRAC and GK not only provide health care services, but are also involved in creating health human resources. BRAC runs the internationally acclaimed James P Grant School of Public Health that produces a good number of Masters in Public Health (MPH) graduates each year. A number of other private sector universities also have robust MPH programs including the North South University (NSU), American International University Bangladesh (AIUB), Independent University Bangladesh (IUB) and the State University of Bangladesh (SUB). Some of these universities

(primarily BRAC and NSU) also cater to a growing number of foreign students mostly from low-income countries in Asia and Africa. Gonoshasthya Kendra, on the other hand, runs a full-fledged medical university as well as a world-class drug and other healthcare supplies factory. The NGO sector is also growing fast in its reach and depth and diversity of services, often in collaboration with the government run the National Institute of Preventive and Social Medicine (NIPSOM) and other health and social service organizations. It is interesting to note that since 2009, the Centre for the Control of Chronic Diseases (CCCD), ICDDR, B runs a small but in-depth 6-month training program leading to a Certificate in Advanced Research Methods (CARM) focusing on chronic diseases. The main aim of CARM is to produce valuable skilled human resources with expertise in research and program development in chronic diseases. From 2009 to 2014 CARM generated 36 well-trained and highly motivated chronic diseases experts. CARM graduates are currently engaged in chronic disease research and preventive programs in ICDDR, B, BRAC and other organizations in Bangladesh as well as in a number of other countries. Also, the National Institute of Cardiovascular Diseases offers postgraduate courses for cardiology and training in CVD for nurses and paramedics. Similarly the National Institute for Diseases of the Chest and Hospital offers postgraduate training on chest disease (medical and surgical). In other words, the health sector in Bangladesh is actively involved in producing appropriately trained and skilled human resources needed for combating chronic non-communicable diseases.

Challenges for the Health System in combating NCDs in Bangladesh

Despite all these recent initiatives challenges remain. The Bangladesh health system has its failures too. So far it has made little progress in reducing chronic diseases. As noted earlier, almost 40 per cent of the population lives on an income of less than a \$1 a day [22]. As the poor has less access to health care services, they share a disproportionate burden of diseases and deprivation. Moreover chronic diseases contribute to decreased quality of life which can impact on a person's family life as well as on the economy of the country as a whole. This becomes a significant concern in a country like Bangladesh where non-availability of health insurance system forces patients to bear the full cost of health care out of their own pocket. Perhaps the most critical challenge faced by the health system in Bangladesh is in the arena of human resources for health. Bangladesh has an acute shortage of physicians, nurses and other health care professionals. According to Bangladesh Health Watch Report 2011, the Bangladesh government has sanctioned 20,234 positions for physicians of which only 11,300 are currently filled. In other words, more than 44% of physician positions are currently vacant. Similarly, while a total 13,483 nurses are currently working in the public health facilities, the total numbers of positions sanctioned are 17,183. Moreover, the vacant nursing positions are primarily for senior nursing staff. The Bangladesh Health Watch Report (BHW 2011) also points out that the country has a shortage of almost 68,000 physicians and more than 200,000 nurses [23].

The shortfall is going to increase further as the population increases. Lack of appropriately trained and adequate number of human resources for health is perhaps the most critical challenge faced by the health system in addressing the challenges posed by chronic

diseases effectively. At the same time, human resource is unevenly distributed across the country with little resources in rural areas. Most Upazila Health Complexes suffer from inadequate number of human resources, especially physicians and nurses. Absenteeism of key health human resources (physicians) often make matters much worse.

Primary Health Care (PHC) service is the first point of health care across Bangladesh especially in remote areas [24]. Unfortunately, package of services provided by the PHC facilities - Community Clinics at the village level and Upazila Health Complexes at the sub-district level - do not include NCDs. Moreover, PHC facilities in Bangladesh provide little information or awareness programs on chronic diseases. Lack of essential drugs, supplies and other health products also plague the PHC services. As a result, studies show that the publicly funded health care system is used by only 25 per cent of the population [25]. As noted earlier, NCDs prevention and treatment are not included in the primary care essential services package. Currently, NCDs treatment is provided mostly by tertiary care facilities typically available in big cities. This creates a rural-urban divide in terms of access to tertiary level NCD treatment and care services. Although broader health equity issues are raised by a number of studies, there are few that looked at the grossly unequal distribution of NCD care facilities. Sadly there is hardly any systemic on-going monitoring of equity issues related to chronic diseases. At the same time there are few research studies related to high-risk groups for NCDs. Advocacy activities of different organizations were found to be limited to organizing seminars and workshops, without a specific coherent overall strategy. The health system so far failed to develop a coordinated policy response to NCDs. Clearly the challenges posed by the steadily growing chronic diseases cannot be effectively met without the development and careful implementation of a long-term, multi-sect oral action plan encompassing the public sector as well as the NGOs, the civil society and the private sector. A well-coordinated public-private partnership is critical in this regard. Sadly such a public-private partnership in combating the NCDs is yet to be materialized.

The health system in Bangladesh does not maintain a "registry" on NCDs with a view to better understand and address these diseases. Such a registry could also be valuable in developing primary prevention and early detection strategies. Nor is there any attempt to develop a "screen and treat" approach to look after women suffering from cervical and breast cancer. Needless to say, lack of knowledge and skills to manage chronic diseases and their risk factors among health care workers is an important barrier in Bangladesh. Clearly the electronic media could play a vital role in promoting early detection and primary prevention of chronic diseases in Bangladesh.

Discussion

Bangladesh is a South Asian developing country with a population of 160 million and growing. According to the World Bank the population of Bangladesh is expected to reach 218 million by 2030 [26]. Despite the burden of such a huge and growing population, Bangladesh is remarkably on target in achieving most of the MDGs including MDG 4 and MDG 5 by 2015 [27]. However desegregated data clearly shows that gross disparity across income, socio-economic status, urban-rural residency

and gender continues to haunt the health system in Bangladesh. Moreover, Bangladesh continues to suffer from a shortage of trained human resources for health. According to the Bangladesh Bureau of Statistics (BBS 2009) the population-physician ratio in Bangladesh stands at 2,860:1 and that the country spends only 3.5% of its GDP on health care. Moreover, it should be noted that government expenditure accounts for only about 34% of the total health expenditure (almost 66% of it is out-of-pocket expenses) [28]. It is clear that health care cost puts a heavy burden on the poor jeopardizing their access to the health system. Needless to say that equity is seriously compromised. With a view to improve accessibility, the government has recently adopted a policy of establishing 1 Community Clinic for every 6,000 population covering rural Bangladesh. However, it is yet to be fully implemented [29]. Community level health workers (based in Community Clinics and Upazila Health Complexes) work closely with communities and families but surprising point is that the community health workers are not trained in chronic non-communicable diseases – their risk factors, signs, symptoms and care and treatment modalities. In Bangladesh secondary level health care services are usually provided by district level hospitals. It seems that in rural areas due to absenteeism of human resources for health people do not get health care services on time. Tertiary level hospitals, mostly located in major cities, provide treatment and rehabilitation services for most chronic non-communicable diseases such as cardiovascular diseases and cancer. However, many public tertiary care hospitals are overloaded and lack adequate infrastructure to meet the service needs of patients especially those suffering from NCDs. Private hospitals, on the other hand, are so expensive that only the rich and the powerful are able to utilize their services. It must be emphasized that health insurance is almost non-existent in Bangladesh making the accessibility of health care services for the poor more problematic. Since care and treatment of NCDs are more expensive, the poor has less access to such services. According to the World Bank (World Bank, 2011), the government's essential drug list does not cover NCDs. The study also found that the Strategic Plan for the Surveillance and Prevention of Non-Communicable Diseases fails to identify strategies to engage multiple stakeholders [30]. Chronic diseases are emerging as key health hazards for the people of Bangladesh. It is clear that as the country is fast undergoing a demographic and epidemiological transition, chronic diseases in Bangladesh would emerge as an overwhelming burden on its health care system. Surely the prediction made long ago by scholars like Dean T Jamison, W Henry Mosley, Anthony R Measham and Jose Luis Bobadilla, in their pioneering work entitled Disease Control Priorities in Developing Countries is fast coming true [31].

Yet the health system in Bangladesh, like in many other developing countries, rarely takes this into account while planning for service delivery. While a massive information, education and communication drive is needed to make people aware of the dangers of chronic diseases and how to prevent them, it is sad to note that at the Upazila or sub-district level there is hardly any information or health education programs addressing chronic diseases. It is deplorable that the Millennium Development Goals, set around the turn of the century by the United Nations, failed to explicitly acknowledge and address the emerging challenges of chronic diseases. Perhaps, this failure by the world body made health systems

in many developing countries including that of Bangladesh ignore the threat of chronic diseases. However, the threat is too catastrophic to be ignored anymore. The health system must be prepared to face the challenges of chronic diseases. As 80 per cent of chronic diseases can be avoided through proper diet, physical exercise and cessation of tobacco use, our health system must focus on prevention of NCDs through behavior change. At the same time, a wide spectrum of services must be made available at all levels. Most importantly, health policy makers and planners must fully acknowledge and address the challenges of chronic diseases while developing the new national health policy. The operational plan for prevention of NCDs could be updated regularly, perhaps every two or three years, to assess progress made and identify areas where more efforts are required. Hopefully the stewards of the health system in Bangladesh would rise up to the challenges of chronic non-communicable diseases before it is too late.

Conclusion

It seems that the Bangladesh health system is focused primarily on maternal and child health and communicable diseases. It clearly lacks attention to the growing burden of chronic non-communicable diseases. There is an urgent need to further strengthen the health system so as to enable it to effectively face the challenges posed by NCDs. The Bangladesh health system must be enhanced to maintain a strong surveillance data on the prevalence and risk factors of NCDs that could be used for policy development and strategic planning to combat NCDs. Priority emphasis must be given on further expanding and enhancing the pool of appropriately trained and adequate number of human resources for health focusing on NCDs. The health system must also introduce and maintain proper monitoring and evaluation of policies and programs related to NCDs. Most importantly, it must maintain a continued focus to equity in terms of accessibility to and use of health care services focusing on chronic non-communicable diseases. However, as a developing country with limited resources its needs a coordinated multi-sectoral approach, strong public-private partnership focusing primarily on prevention of NCDs through effective and massive awareness program reaching the population at large.

References

1. Islam A. Bangladesh health system in transition: selected articles. James P. Grant School of Public Health, BRAC University. 2009.
2. Mathers C, DM Fat, J Boerma. The global burden of disease. World Health Organization. 2004 update. 2008.
3. Bleich SN, Koehlmoos TL, Rashid M, Peters DH, Anderson G. Noncommunicable chronic disease in Bangladesh: overview of existing programs and priorities going forward. *Health Policy*. 2011; 100: 282-289.
4. Engलगau MM. Capitalizing on the demographic transition: tackling non communicable diseases in South Asia. World Bank Publications. 2011.
5. Bloom DE, JE Finlay. Demographic change and economic growth in Asia. *Asian Economic Policy Review*. 2009; 4: 45-64.
6. Islam A, Biswas T. Health System Bottlenecks in Achieving Maternal and Child Health-Related Millennium Development Goals: Major Findings from District Level in Bangladesh.
7. Non-Communicable Diseases (NCDs)¹-Bangladesh's Next major Health Challenge. 2011.
8. WHO/SEARO/Country Office for Bangladesh and Ministry of Health & Family Welfare. Non-Communicable Disease Risk Factor Survey Bangladesh. 2010.

9. Ahsan Karar Z, Alam N, Kim Streatfield P. Epidemiological transition in rural Bangladesh, 1986-2006. *Glob Health Action*. 2009; 2.
10. Islam AK, Majumder AA. Coronary artery disease in Bangladesh: a review. *Indian Heart J*. 2013; 65: 424-435.
11. Bhowmik B, Sanjida Binte Munir, Akhtar Hussain. Prevalence of type 2 diabetes and impaired glucose regulation with associated cardiometabolic risk factors and depression in an urbanizing rural community in Bangladesh: a population-based cross-sectional study. *Diabetes & metabolism journal*. 2012; 36: 422-432.
12. International Centre for Diarrheal Disease Research, Bangladesh (ICDDR,B). *Chronic Diseases News*. 2012.
13. WHO/SEARO/Country Office for Bangladesh and Ministry of Health & Family Welfare B. *Cancer Registry Report National Institute of Cancer Research and Hospital*. 2005-2007.
14. ASCODD VII held in Dhaka. *Glimpse*. 1994; 16: 1-2.
15. Bangladesh. *Risk Factor Survey 2010*. WHO, Dhaka. 2011.
16. Sheikh Mohammed Shariful Islam, Serajul Islam. *Non-Communicable Chronic Disease in Bangladesh: Where Do We Stand?* 2011.
17. Director general of Health Services, M.o.H.a.f.w., World Health organization, *Strategic Plan for Surveillance and Prevention of Non-Communicable Diseases in Bangladesh*. 2007-2010.
18. Pampel FC. *Tobacco industry and smoking*. Infobase Publishing. 2009.
19. ASCODD VII held in Dhaka. *Glimpse*. 1994; 16: 1-2.
20. South Asia Network for Chronic disease.
21. International Centre for Diarrheal Disease Research, Bangladesh (ICDDR,B). *BRAVE study Press Brief*. 2014.
22. Hill RV, Ahmed Akhter U, Smith Lisa C, Wiesmann Doris M, Frankenberger Tim, Gulati Kajal, et al. The world's most deprived: Characteristics and causes of extreme poverty and hunger. *Intl Food Policy Res Inst*. 2007; 43.
23. Sabina N, Barkat A. *Dynamics of Health Sector Policy and Reforms*. Bangladesh Health Watch Report. 2011: 17.
24. Perry HB. *Health for all in Bangladesh: lessons in primary health care for the twenty-first century*. University Press. 2000.
25. Akin JS, N Birdsall, DM De Ferranti. *Financing health services in developing countries: an agenda for reform*. World Bank Publications. 1987; 34.
26. The World Bank, SAHD. *Health Nutrition, and Population, NCDS Policy Brief-Bangladesh*. 2011.
27. Chowdhury S, Banu LA, Chowdhury TA, Rubayet S, Khatoon S. *Achieving Millennium Development Goals 4 and 5 in Bangladesh*. *BJOG*. 2011; 118: 36-46.
28. Alam J, Z Wadud, J. Polak. *Energy demand and economic consequences of transport policy*. *International Journal of Environmental Science and Technology*. 2013; 10: 1075-1082.
29. Rahman S-U, D. Smith, *Deployment of rural health facilities in a developing country*. *Journal of the Operational Research Society*. 1999; 892-902.
30. Tool EE, SSS. *Africa*, Authored by: Beverly Msambichaka, Honorathy Urassa, Jeje William, Aloisia Shemdoe, Abdallah Mkopi Angel Dillip & Zoe Hildon with inputs from Smart Daniel 2 & Leonard Ndamungoba 2.
31. W Henry Mosley, Anthony R Measham, Jose Luis Bobadilla, editors. *Disease Conol Priorities in Developing Countries, 2nd edn*. Washington DC. World Bank. 2006.