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Diabetes Fact: Bangladesh Perspective

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Abstract

Bangladesh is a developing country where 75% of total population lives in rural area. Subsequently they have poor healthcare access as 26% of rural professionals remain vacant and nearly 40%, absent. Although official documents indicate that 80% of the population has access to affordable essential drugs, there is plenty of evidence of a scarcity of essential drugs in government healthcare facilities. Nearly 45% rural people take medical assessment from unqualified health workers including medical assistants, mid-wives, village doctors, community health workers in comparison to that by qualified medical graduates (only 10%-20%). More than 75% women having complications sought treatment from an unqualified provider. These are mostly because concern over medical costs, and pronounced socioeconomic disparities found for care-seeking behavior in both urban and rural Bangladesh. However, the government's expenditure on health is the third largest in the country, after education and defense. Diabetes is a complicated chronic disease; non-compliant patients are in a risk of moderate to severe complications, to much extent unexplored to maximum people of Bangladesh. Annually diabetes is responsible for 5% of all deaths globally, and its prevalence is increasing steadily. As reported by International Diabetes Federation (IDF), approximately 75–80% of people with diabetes die due to cardiovascular complications.

Keywords: Bangladesh; Diabetes; Prevalence; Glycemic Control; Obesity; Stroke

Introduction

Diabetes is one of the four major types of noncommunicable diseases (NCDs) that make the largest contribution to morbidity and mortality worldwide. According to WHO global health days 2016, about 422 million people globally had diabetes, with most living in the developing countries, and unfortunately, more than 80% of diabetes deaths occur in low - and middle-income countries. And 80% of people with diabetes live in low- and middle-income countries. The prevalence of diabetes is increasing in Bangladesh in both urban and rural areas. A recent scoping review (1994-2013) revealed that the prevalence of type 2 diabetes varied from 4.5% to 35.0% in Bangladesh. It increases healthcare use and expenditure and imposes a huge economic burden on the healthcare systems. The International Diabetes Federation estimated 7.1 million people with diabetes in Bangladesh and almost an equal number with undetected diabetes. This number is estimated to double by 2025. It may lead to stroke, heart attack, chronic kidney diseases, neuropathy, visual impairment and amputations. Although most of these complications can largely be prevented through inexpensive, easy-to-use and cost-effective interventions. During 90s, the country has a relatively low diabetes affected population. According to the International Diabetes Federation, the prevalence will be 13% by 2030. Bangladesh was ranked as the 8th highest diabetic populous country in the time period of 2010-2011. About 129,000 deaths were attributed to diabetes in Bangladesh in 2015, as reported by leading research organization ICDDR, B.

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Materials and Methods

A comprehensive review of literature search including books, journal, newsletters, newspaper, magazine column and many more. Some physicians, technical experts, industry high officials, hospital authority, journalists, nurses and employees of pharma companies stated their valuable observation. Projections were based on drug end users, providers, practical aspects of diabetic patient compliance, implication and types of different types of non-compliances by the in several institutions of Bangladesh. Medline, Embase and PubMed and manually checked references of all identified relevant publications that described the diabetes issues in Bangladesh.

Results and Discussion

Climate, Urbanization and Lifestyle

"A 1^0C rise in environmental temperature could account for more than 100,000 new diabetes cases per year in the USA alone." [1]. A similar study says Bangladesh will exceed 35^0C before the end of the century [2]. Bangladesh, a developing country with fast economic growth, has been experiencing rapid urbanization for the past several decades. This development and urbanization raise the concern that the chronic disease burden may show an increasing trend in future, especially due to altering food habit including increased access to and popularity of processed food, irregular meal times, less physical activity, etc [3]. Bangladeshi women more at health risk than men due to inactivity (WHO) [4]. Three big reason to diabetes among Bangladeshi people are Carbohydrate-dependent food pattern, Sedentary lifestyle and huge gap between the number of diabetic patients and doctors [5]. According to the WHO-Diabetes country profile of Bangladesh in 2016, the physical inactivity was prevailing among 25.1% of population [6].

10 Millio nBangladeshis Suffering from Diabetes

An estimated 10 million people in Bangladesh have diabetes [7]. A similar study reveals a more shocking fact, almost one in ten adults in Bangladesh was found to have diabetes [8]. WHO stated 83% population of age group 25-65 never checks for diabetes [9]. A different report says almost similar thing. For an effective control and prevention of diabetes; 87% of Bangladeshis were non-compliant, compared to 71% of Indians and 52% Europeans [10]. Interesting thing is status of compliance is not improved in the last 14 years. 33% people age over 35 are diabetic or pre-diabetic, only 12% of them have their condition under control [11]. Approximately 17% of men and 23% of women were identified to have impaired fasting glucose or impaired glucose tolerance, collectively termed intermediate hyperglycaemia [12-15]. Only 25% of diabetics were aware of their status, women with diabetes were 37% less likely than men to know that they were diabetic and, even among known diabetics, 75% had suboptimal control of the condition [16]. According to the latest WHO data published in 2017 Diabetes Mellitus Deaths in Bangladesh reached 40,142 or 5.09% of total deaths. The age adjusted Death Rate is 40.08 per 100,000 of population ranks Bangladesh 57 in the world [17].

Socio-Demographic Characteristics and Knowledge about Diabetes

Levels of knowledge and practices were analyzed by sociodemographic characteristics and diabetic status (Table 1 and Table 2).

Type 2 Diabetes Mellitus Patients' Compliance

A study in BIRDEM, Dhaka found nearly 15% type 2 diabatic patients take both insulin and oral medication and 60% take oral medications only. Insulin intake is high in urban area due to cost and availability of the drug in local market. Around 25% respondents found to take herbal medications [24]. In 96 villages in Faridpur district, 12140 randomly selected men and women aged ≥30. Around 80% of known diabetics (i.e., with a prior diagnosis) reported that they did not monitor their blood glucose levels on at least a monthly basis [25]. A DAB associated study shows About 60% patients attended diabetes education class at least once followed by 24% never attended. Non-adherence rate of diet was close to 90% and exercise was 25% -overall 90% [26].

Diabetes Complications

Most commonly reported health effect was vision impairments or blindness (more than 60%), followed by poor wound healing (nearly 30 %) and dizziness (nearly 30%). In examining comorbidities, hypertension was most commonly self-reported in 50% (approx.) out of 220 participants of diabetes clinics in Mirzapur, Bangladesh [27]. In BIRDEM 2010, 75% of the 130 patients suffered co-morbidity, including retinopathy (35%), CVD (20%), neuropathy (15%) and diabetic foot (4%).

Table 1: Demographic Characteristics and Knowledge of Respondents

Study Place	Study Period	Study Type	Study Base	Findings
BIRDEM	2014-2015	Random Sampling	Occupation	Among 1200 diabetic patients involved in services (36%) both government and non-governmental jobs, vast majority among women were housewife (25%) and in business (21%), 82% of them were married [18]
ZH Sikder Women's Medical College & Hospital, Dhaka	2015	Cross sectional	Literacy & knowledge about diabetes	40% were secondary, 30% were primary, 15% were illiterate out of 100-case. 57% had poor knowledge, 14% had good knowledge and 29% had no idea about the complexity of diabetes [19]
Rural Bangladesh	2015	Cluster Random Sampling	Knowledge about diabetes	Overall knowledge of DM was poor; only 16.3%, 17.8%, and 13.4% of those with UDM, IFG, and normal FG knew that diabetes causes eye disease, compared with 55.6% of those with known DM [20]
96 rural villages of Faridpur	2017-2018	Random Sampling	Knowledge about diabetes	Approximately 55% being aware of any symptoms of diabetes and approximately 27% able to report ways to prevent the disease. However, two-thirds of respondents were able to report at least one medical intervention to control diabetes [16]

Table 2: Patients' Belief about Diabetes

Study Place	Study Period	Study Type	Study Base	Findings
BIHS	February to March 2014	Purposively sampled	knowledge and Perception	All participants were familiar with the term "diabetes". Most considered diabetes as a serious chronic condition requiring lifelong treatment and medications. Several participants believe of too much sweets and rice as contributory factor for diabetes. A few participants blamed the growth of the fast food industry and the increasing use of chemicals in [21]
BIHS and DMCH outdoor	August 2014 to January 2015	Non-probability purposive sampling	knowledge and Perception	Highest number of patients (43%) believe genetic factors were responsible for diabetes while others mentioned obesity, physical inactivity and food habits. One-third (31%) of the respondents perceived that diabetes is a result of excessive intake of sugar and 14% could not mention anything. [22]
An urban tertiary care hospital in Bangladesh	2014 to 2015	Structured Interview	knowledge and Perception	A higher proportion of men perceived that diabetes can be managed by changes in physical activity and medications than women. More men perceived kidney and eye problems along with heart diseases as serious complications. More women considered lack of physical activity as the most important cause [23].

More than half (57%) of were hypertensive and on antihypertensive drugs [28].

Diabetes and Kidney Dysfunction

40-50% of patients with type 1 diabetes and 20-30% of patients with type 2 diabetes developed diabetic nephropathy [29]. In BIRDEM 2014, prevalence of nephropathy was 25%; male 27% and female 22% found among 400 type 2 diabetic patients [30]. +35A>C polymorphism possibly responsible for nephropathy in Bangladeshi Type 2 diabetic subjects which is predominant in male [31]. Microalbuminuria was found in 24% of type 1 diabetes, 27% of Fibrocalculous pancreatic diabetes, and nearly 70% of type 2 diabetes children and adolescent in Changing Diabetes in Children (CDiC) clinic, BIRDEM [32]. In Bangladesh, the causes of CKD G5 among 954 patients who were on HD in 2012–13 were chronic glomerulonephritis (25.5%), diabetic nephropathy (41%) and hypertensive renal disease (33%) [33].

Diabetes and Stroke

At least 65% of people with diabetes die from heart disease or stroke [34]. Approximately 20% of patients with DM die from stroke [35]. 8400 stroke patients from different hospitals in Bangladesh over a period of sixteen years, diabetic patients were nearly 25% [36]. A prospective study of 380 patients with cerebral infarction admitted into Rangpur Medical College Hospital over an 18-month period, 76 (20%) patients were diabetic [37]. In Bangladesh, which is ranked 84 in WHO's mortality rate index (out of 163 countries), stroke is the third leading cause of death. The majority of cases (83%) occur in individuals over the age of forty; hypertension (63%) was found to be the main risk factor for stroke, followed by heart disease (24%), and diabetes (21%) [38]. A rural study by Royal Society of public health reveals 37% of stroke patients had elevated blood glucose level [39]. An earlier study in 3 medical college hospitals (DMCH, MMCH, CMCH), diabetes was found to be 3rd major factor (21%) of stroke [40].

Diabetic Neuropathy

Diabetic distal sensorimotor neuropathy (DSPN) is the most frequent type of polyneuropathy and the most frequent complication of diabetes affecting up to 50% of patients, found in an investigation on 111 Bangladeshi immigrants [41]. In Bangladesh 20% patients with diabetes have been suffering from peripheral neuropathy [42]. Neuropathy symptoms reported 35% by OPD of Rajshahi diabetic hospital [43]. 1 in every 5 diabetes subjects are suffering from peripheral neuropathy which is more serious in rural area, in a study of Dhaka and Northern districts (Pabna, Sirajgonj, Bogra, Dinajpur and Thakurgaon) of Bangladesh, between July 2012 to June 2013, number of participant1200 (urban-640, rural-560) [44].

Diabetes and Depression

In Bangladesh, one in ten adults has diabetes and 4.6% of the population is suffering from depression, 31% of diabetic patients suffer from some symptoms of depression, while 11% of diabetic patients have a major depressive disorder. On the other hand, people with depressive disorders have a 65% greater risk of developing diabetes than the general population [45]. Depression was identified as a significant health problem among patients with type 2 diabetes mellitus. Both diabetes and depression should be considered simultaneously during treatment plan [46]. The prevalence of depression among T2DM patients n Bangladeshi patients were found to be 30% in rural Bangladesh [47]. A similar result found with other studies overall Bangladesh population, between 15.3–36% [48]. Depression is not generally listed as complications of diabetes; however, it can be one of the most common and dangerous complications. Mansour et. al., 2013 stated "one plus one equal more than 2 when we add depression and diabetes" [49].

Smoking and Diabetes

Tobacco kills more than seven million people a year worldwide and Tobacco responsible for 1 in 5 deaths in Bangladesh. According to WHO study in 2009, 41.3 million people use tobacco in Bangladesh, of whom 47.3% are smokers. According to the Directorate General of Health Services, the number of patients visiting the outdoor department of the National Institute of Cardiovascular Diseases increased by 41.3% between 2009 and 2016 [50]. A recent study further adds that smoking increases the risk of diabetic foot amputation [51]. The concentration of Chromium in smoked and smokeless tobacco ranged from 0.25-3 μg/g and 0.36-6.29 μg/g respectively. Chromium posed a much higher risk for both smoked and smokeless tobacco users [52]. A number of experimental and clinical studies suggest that smoking decreases insulin sensitivity, and consequently results in the disorders of glucose and lipid metabolism such as hyperglycemia and dyslipidemia including

low HDL cholesterol and postprandial lipid intolerance [53].

Diabetes and Pregnancy

At mid pregnancy, insulin sensitivity starts to decline progressively, and became worse during the rest of the pregnancy, being worst in the late third trimester. It rebounds with the delivery of the placenta. Therefore, GDM usually develops in the late second trimester and disappears, instantly, post-delivery [54]. Prevalence of GDM was found to be 9% to 10% (13% according to ADA criteria) in Bangladesh [55]. At least 15% of Bangladeshi expecting women are diagnosed with Gestational Diabetes Mellitus (GDM) and among these 60% contribute to permanent diabetes within 10 years. Unrecognized and untreated GDM increases the risk of giving birth to congenital abnormal babies [56]. Overweight, obesity, hormonal issues, and genetic factor might play a role for the higher rate of diabetes in women. Diabetes afflicts women more than it does men in Bangladesh, according to a study published in the British medical journal The Lancet. They found almost double the rate of diabetes in urban areas than the villages of Bangladesh [57]. If GDM is left untreated, it carries a risk for both the mother and child and will result in serious short and long-term consequences which include neonatal and obstetric complications during pregnancy and childbirth such as miscarriages, lengthened labor pain, cesarean section, macrosomia, shoulder dystocia, neonatal hypoglycemia, still birth and neonatal death. It also increases the risk of obesity and DM in the mother and offspring in later life [58].

Diabetes and Fast food

A study among students of 4 private universities of Dhaka, 22% of the respondents mentioned that they consumed fast food 4 days a week and more than one-fifth had the meal every day. 54% of the respondents skipped their breakfast and had fast food after finishing their classes. Though 98% of the students were well informed about the negative effects associated with excessive fast food consumption, they were still profoundly addicted to it [59]. A similar study shows 97.4% students consume fast food contain Monosodium Glutamate (MSG) which causes obesity, headache, asthma and other body discomforts [60]. ICDDR, B shows that 10% of children aged between 5-18 years old are overweight and 4% are obese in urban area [61].

Diabetes and Obesity

Obesity and overweight are considered both non-communicable diseases and risk factors. Obesity and overweight increase the risk of diabetes, cancer and cardio-vascular diseases (CVD) [6]. WHO investigated whether the following characteristics of individuals, their communities and their households were associated with the risk of diabetes or prediabetes: the respondent's age, sex, marital status, educational level, working status and body mass index [62]. WHO painted a dismal picture of Bangladeshis' health: Different studies reveal 25% rural and more than 20% people had overweight; 27% rural and 28% urban people had central obesity (by waist-hip ratio); nearly 47% rural and more than 52% urban participants were tobacco-users; and 12% rural and nearly 29% urban people did not perform any physical work [63-66].

Type 2 diabetes in Children

Obesity has been studied extensively in many developed countries, but in Bangladesh studies and data related to obesity in children and adolescents are relatively scarce. A positive association between obesity with higher socio-economic status, lack of physical activity and urban residence has been reported [67]. Moreover, the city neighborhoods are not conducive to safe outdoor activities due to the confluence of population density, traffic jams, and crime; other prohibitive factors include a hot and humid climate, unremitting construction work, and excessive dust [68]. A 2015 study shows the number of undersized children decreased from 41% to 36% and the percentage of underweight malnourished children came down to 14% from 16% in last three years [69]. According to some estimate, in 2004, children of South Asian origin were more than 13 times more likely to have type 2 diabetes than white children [70]. Children with type 2 diabetes, which is common in older people, is rising "alarmingly" in Bangladesh, hospital data shows. A 300% raise in the last five years, according to the Changing Diabetes in Children Program of the BIRDEM hospital [71]. Another 2016 study, titled "Characteristics of Children and Adolescents at Onset of Type 2 Diabetes in a Tertiary Hospital in Bangladesh," has found that 58% children with Type 2 diabetes were obese, and 94% had a positive family history of this lifestyle-oriented disease [7]. The adverse effect of obesity on glucose metabolism is evident early in childhood. Obese children are hyper-insulinemic and have approximately 40% lower insulin stimulated glucose metabolism compared with non-obese children [72]. Sustained

economic growth has enabled the new middle class to consume higher intakes of food and to choose higher-calorie and so-called "fast-food" options more frequently [9].

Diabetes and ED

Sexuality is still a covert issue in Bangladesh and people usually hesitate to start talk regarding sex. Exploration of misconception with educational qualification revealed that misconception was also found in the well-educated persons and even in masters holders [73]. Erectile dysfunction, a critical disease of man of all ages, due to ignorance all most 80% Patient takes wrong treatment from so called Ayurveda doctor (Kabiraj & Hekim i.e. folk healers) [74]. However, according to Prof. MA Salam, Uro-oncologist at Urology & Transplantation Foundation of Bangladesh "35-75% of all diabetics suffer from erectile dysfunction. Diabetes harms blood and nerves, both important prerequisites for an erection" (The Independent, 2017). Frequency of ED is very high among T2DM men in Bangladesh, around 54% reported in a study between 2013-2014, 3980 diabetic men aged 30-69 years were interviewed at the out-patient departments of BSMMU, BIRDEM and 4 other diabetes centers in Dhaka, Bangladesh [76].

Healthcare Expenditure for Diabetes in Bangladesh

DM had 2 times more days of inpatient treatment, 1.3 times more outpatient visits, and nearly 10 times more medications than non-DMs, as reported by BMJ Global Health 2017. The total annual per capita expenditure on medical care was 6.1 times higher for DMs than non-DMs (US$635 vs US$104, respectively). Among DMs, nearly 10% reported not taking any antidiabetic medications, 46.4% took metformin, 38.7% sulfonylurea, 40.8% insulin, 38.7% any antihypertensive medication, and 14.2% took anti-lipids over the preceding 3 months [77]. A recent study by World Bank found $160 per year in household expenses for diabetes care (2013 dollars) in Bangladesh. The annual cost of diabetes care per person in the outpatient department of a tertiary care facility was US$314. Based on this finding, it is estimated that the total annual burden of some 5.1 million diabetic patients will be US$1.5 billion, which is a large burden for a developing country like Bangladesh [78]. In 2016, approximately 55,703 diabetic individuals received in-hospital care, with an estimated 2 6,41,000 out patient visits. The total annual estimated cost of diagnosed diabetes was approximately US$217.71 million [79]. The median monthly cost of diabetes maintenance was close to USD 10, approximately 10% of the median monthly income [27].

Diabetic Forecast

Almost one in ten adults in Bangladesh was found to have diabetes, which has recently become a major public health issue. A recent meta-analysis showed that the prevalence of diabetes among adults had increased substantially, from 4% in 1995 to 2000 and 5% in 2001 to 2005 to 9% in 2006 to 2010. International Diabetes Federation stated the prevalence will be 13% by 2030 [8]. According to the WHO, at least 2.8% of the population worldwide suffer from diabetes. Considering the increasing rate of type 2 diabetes it is understood that, by the 2030 the prevalence of diabetes mellitus will be double [80].

Conclusion

Poor compliance, at any point of life creates serious mischiefs. Bangladesh is a country where poor literacy and carelessness never even gives opportunity to the general people to know the reasons behind their health complexities due to non-compliance and non-adherences. The most important thing is patient education, that the modern world is giving the highest priorities. Rich or poor, privileged or unprivileged all segment of population should be brought under the arena of compliance through patient education, at least by health campaign. Both government and profit taking medicine companies should take initiatives regard.

Compliance with The Ethical Issues

- *Availability of data and materials*

Data sharing: Data will be available on request.

- *Competing interests*

The author declares that he has no competing interests

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Abbreviations

Bangabandhu Sheikh Mujib Medical University (BSMMU), Bangladesh Institute of Research and Rehabilitation for Diabetes, Endocrine and Metabolic Disorders (BIRDEM); International Centre for Diarrheal Disease Research, Bangladesh (ICDDR, Bangladesh); Undiagnosed Diabetes Mellitus (UDM); Diabetes Mellitus (DM); Fasting Glucose (FG); Impaired fasting glucose (IFG); Bangladesh Institute of Health Science (BIHS); Dhaka Medical College Hospital (DMCH); Chittagong Medical College Hospital (CMCH); Mymensingh Medical College Hospital (MMCH); Changing Diabetes in Children (CDiC); Chronic Kidney Disease (CKD); American Diabetes Association (ADA); Erectile Dysfunction (ED)

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