Original Article

Clinical characteristics and complications of patients with type 2 diabetes attending an urban hospital in Bangladesh

Sheikh Mohammed Shariful Islam [a,b,*], Dewan S. Alam [a], Mohammed Wahiduzzaman [c], Louis W. Niessen [d], Guenter Froeschl [b], Uta Ferrari [b], Jochen Seissler [b], H.M.A. Rouf [c], Andreas Lechner [b]

[a] Center for Control of Chronic Diseases (CCCD), Icddr,b, Dhaka, Bangladesh
[b] Center for International Health, Ludwig-Maximilians University, Munich, Germany
[c] Bangladesh Institute of Health Science (BIHS), Dhaka, Bangladesh
[d] Liverpool School of Tropical Medicine, Liverpool, UK

ARTICLE INFO

ABSTRACT

Aims: To investigate the clinical features of patients with type 2 diabetes on oral medication and determine the complications and risk factors in these patients.

Methods: A cross-sectional was conducted among 515 patients with type 2 diabetes at the outpatient clinics of Bangladesh Institute of Health Science (BIHS) hospital from September to December 2013. We collected data on socio-economic characteristics, clinical status, risk factors, complications, anthropometric measurements and blood tests. Univariate and multivariate logistic regression was performed to identify risk factors associated with diabetes complications.

Results: The mean($\pm$SD) age of the participants was 50.0($\pm$10.1) years and 15.3% were less than 40 years. The mean HbA1c was 8.3($\pm$2.1). Only 28.7% of the participants achieved targets for HbA1c. The overall prevalence of hypertension, obesity and dyslipidemia was 57.5%, 62.6% and 72.7%, respectively. Eye problems were the most common complication (68.9%) followed by chronic kidney diseases (21.3%) and cardiovascular diseases (11.8%). There were significant associations between the complications and age, duration of diabetes and duration of hypertension. In the multivariate analysis adjusting for other confounding variables, only systolic blood pressure was found to be significantly associated with complications [OR 0.809, 95% CI 0.666–0.981 (*p*-value 0.031)].

Conclusion: Results of the study confirm that even under best clinical settings a great majority Bangladeshi adults with type 2 diabetes have uncontrolled diabetes and a high prevalence of risk factors that might contribute to early development of complications. Early screening of high risk groups and proper management of diabetes is recommended to avoid early complications.

1. Introduction

Diabetes is a growing problem worldwide, particularly in developing countries where rates have skyrocketed. According to the International Diabetes Federation (IDF), of the 382 million people with diabetes (a number expected to be almost double by 2035), a staggering 80% live in developing countries, which are least equipped to deal with this emerging crisis [1,2]. The region most likely to experience the main brunt of the epidemic is South East Asia, where diabetes is expected to increase by 71% within the next 25 years. Bangladesh is among the top ten countries globally in terms of diabetes burden with increasing prevalence of diabetes in both urban and rural areas [2,3].

In South Asia the overwhelming majority of diabetes cases are type 2 diabetes (T2D). The South Asian population presents with a number of diverse risk factors for T2D due to a combination of several genetic and environmental factors [4]. A recent survey showed that diabetes has become epidemic among the adult Bangladeshi population and the prevalence of diabetes and prediabetes was 10% and 23% respectively [5]. The prevalence of diabetes was almost double in urban compared to rural areas (15.2% and 8.3%, respectively); diabetes patients were older, had significantly more hypertension and obesity compared to those without [5]. In Bangladesh, as in other countries, T2D is associated

with high body mass index (BMI), waist circumference (WC) and waist hip ratio (WHR), i.e. central obesity, which is a risk factor for both cardiovascular diseases (CVD) and diabetes [6,7].

The CVD risk that can be attributed to diabetes is even more prominent among South Asians than in other populations [8]. In particular hypertension and diabetes aggravate one another and in combination can dramatically increase the rate of complications [9]. Previous studies have shown that diabetes can increase the prevalence of dyslipidemia by at least two fold also leading to CVD [10]. Secondary complications of diabetes start early and progress rapidly among South Asians that can be reduced significantly through early detection and adequate management [11]. To the best of our knowledge, factors determining the clinical status and complications of patients with diabetes in Bangladesh have not been studied in detail. To address these issues we conducted a cross-sectional study at a tertiary diabetes hospital in Dhaka, Bangladesh. We focused on subjects with T2D on oral therapy and with a time since diagnosis of less than 10 years. In general this is the subgroup of T2D patients with the lowest rate of complications and which most easily reaches treatment targets. Data from this cohort allow to address the questions of whether diabetes is diagnosed early enough, whether care adequately reaches the patients and whether the escalation from oral therapy to insulin treatment occurs in a timely manner. The results of this study will help clinicians and policy makers to further develop management plans for diabetes in Bangladesh and other developing countries.

2. Subjects, materials and methods

2.1. Study population and settings

We conducted a cross-sectional study among 515 patients with T2D attending the outpatient department (OPD) of Bangladesh Institute of Health Science (BIHS) hospital in Dhaka from September to December 2013.

BIHS is a 250-bed tertiary central hospital affiliated with the Diabetes Association of Bangladesh (DAB). BIHS has 244374 registered patients with diabetes (up to June 2013) and 11170 newly registered patients in 2012–2013 [Annual Report 2013]. BIHS hospital serves a socio-economically diverse population of approximately 2 million residents in Dhaka city and nearby districts. BIHS physicians attending the OPD diabetes clinics are all certified diabetologists by the DAB. All consecutive patients meeting the inclusion criteria were referred to study personnel by a BIHS attending physician. Among 531 eligible participants, 515 completed the interviews and procedures. The inclusion criteria were adults diagnosed as T2D patients according to WHO criteria, taking oral medication, registered with the BIHS, attending the OPD, referred by attending BIHS physician, living in Dhaka city and providing written informed consent. The exclusion criteria included: patients with other types of diabetes, currently using insulin, other serious illness and refused to provide written informed consent.

2.2. Data collection process

The data collection team comprised of a physician, a research officer and three research assistants who were supervised by the principal investigator. The team was trained for two weeks by senior scientists and researchers at the Center for Control of Chronic Diseases, icddr,b on the study protocol, diabetes epidemiology, anthropometric measurements, research ethics and interview skills. We collected data through face-to-face interviews using structured questionnaires, physical measurements, laboratory investigations and review of medical records. We explained to each participants about the objectives and procedures in native language and that they were free to participate or not and if they declined, it would not affect their regular care. We obtained written informed consent from each participant. The ethical review committee of icddr,b approved the research protocol (PR#13068).

2.3. Variables and measurements

The variables included socio-demographic characteristics, family history of diabetes, co-morbidity, anthropometric and biochemical information. Physical examination included pulse rate, blood pressure (BP), height, weight, hip and waist circumference. Weight was taken twice to the nearest 0.1 kg with light clothing and without shoes by digital scales (Seca, Clara 803, Germany) placed on a flat surface and the average value was considered. Height was measured with standard clinical height scale with patient standing on supine position without shoes. Waist circumference (WC) was measured by placing a plastic tape horizontally midway between 12th rib and iliac crest on the mid-axillary line. Similarly, hip circumference (HC) was measured by taking the extreme end posteriorly and the symphysis pubis anteriorly. BP was measured twice using digital BP monitor (Omron, SEM-1, Omron Corp., USA) after the subjects rested for at least 10 min in sitting position and the average of two readings was taken. The total duration of diabetes, duration of hypertension and complications were recorded from the self-reported questionnaires supplemented by review of the patient medical records maintained by BIHS physician, patient's file and laboratory reports.

Laboratory results included fasting plasma glucose (FPG), postprandial plasma glucose, HbA1c, serum creatinine and lipid profile. We used serum creatinine levels to calculate estimated Glomerual Filtration Rate (eGFR) using the MDRD study equation which gives the best measure of kidney function [12]. Chronic Kidney diseases were considered by eGFR <60 mL/min/1.73 m^2. Cardiovascular disease (CVD) was recorded from the results of electrocardiography (ECG), exercise tolerance test (ETT), echocardiography, percutaneous trans-luminal coronary angiography (PTCA), self-reported questionnaire or diagnosis by a physician as evidenced in patient's record.

2.4. Case definitions

T2D was diagnosed by BIHS attending physician according to WHO guidelines which was validated by the study physician during recruitment through review of clinical and investigation records. Hypertension was defined as systolic blood pressure (SBP) of >140 mmHg or diastolic blood pressure (DBP) of >90 mmHg [13] or current use of antihypertensive drugs. Pre-hypertension was defined as SBP 120–139 mmHg or DBP 80–89 mmHg. Body mass index (BMI) was calculated as kg/m^2 and categorized according to World Health Organization BMI criteria as underweight (<18.5 kg/m^2), normal (18.5–24.9 kg/m^2), overweight (25–29.9 kg/m^2) and obesity (≥30 kg/m^2). Dyslipidemia was defined as having one or more of the following parameters: total cholesterol (TC) ≥200 mg/dL, low density lipoprotein (LDL) ≥130 mg/dL, triglyceride (TG) ≥150 mg/dL, high density lipoprotein (HDL) <40 mg/dL or ≥60 mg/dL as per ATP III guidelines [14]. WC obesity was defined as (WC) >90 cm for male, ≥80 cm for female and WHR definition of obesity was (WHR) ≥0.90 for Male, ≥0.80 for Female. Uncontrolled diabetes was defined as HbA1c $\geq7\%$ according to WHO guidelines.

2.5. Statistical analysis

Statistical analyses were performed using statistical packages for social sciences (SPSS) version 20 (SPSS Corporation Inc., IL,