Prevalence of Diabetes in an Urban Hospital Emergency Room Serving Predominantly Indigenous Population

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Objectives: The purpose of this study was to examine the rate of diabetes and pre-diabetes in previously undiagnosed individuals who came to the Detroit Receiving Hospital-Ambulatory Rapid Center (DRH-ARC), which is part of the emergency room. This region has a high minority population with over 83 % being African- Americans (AAs). Diabetes screening is especially important for this population because AAs are more prone to develop complications.

Methods: Free diabetes screening was done for all patients coming to the walk in unit of the DRH-ARC. This program was supported by the "Healthy Detroit-Diabetes Initiative". The initiative was developed by the Detroit Receiving Hospital and Wayne State University Physicians Group (WSUPG) administration.

Results: A total of 15,971 patients, who did not have a history of diabetes, consented for screening during the period of March 2010 through March 2014. A total of 6,149 (38.5%) patients were found to have HbA1c values in the range of pre-diabetes or diabetes. The prevalence of diabetes increased with age in both men and women. The data showed high prevalence of undiagnosed pre-diabetes and diabetes in this population approaching 31% and 8%, respectively. Among patients with elevated blood pressure 41.2% had abnormal HbA1c values. In contrast, 32% of patients with normal blood pressure had abnormal HbA1c values.

Conclusion: Continued screening of population at risk for diabetes is essential. Public health awareness programs, such as the Healthy Detroit-Diabetes Initiative should be initiated in similar areas where minority populations are prevalent.

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BACKGROUND

Type 2 diabetes mellitus (T2DM) is a complex metabolic disorder and a costly public health problem that is increasing all over the world, in some areas in an epidemic proportions. In the US, it has affected more than 25.8 million people.[1] T2DM is commonly associated with obesity. Epidemiologic data indicate that the increase in diabetes prevalence has paralleled the dramatic rise in obesity. Currently, over 80% of patients with T2DM in the US are overweight or obese. T2DM is closely linked with a complex disorder called the "metabolic syndrome", a cluster of abnormalities including obesity (abdominal/visceral), glucose intolerance, hypertension, high triglycerides, and low HDL-cholesterol. In observational studies, people with both diabetes and hypertension have approximately twice the risk of cardiovascular disease as non-diabetic people with hypertension. A characteristic feature of the metabolic syndrome and T2DM is insulin resistance in tissues such as liver, muscle and fat; this leads to hypersecretion of insulin by the pancreatic β-cells. Fasting glucose levels and the glycemic response to oral glucose tolerance test (OGTT) may remain normal at the expense of a compensatory increase in insulin secretion by pancreatic β-cells.[2] The progressive decline in insulin secretion leads to impaired glucose tolerance (impaired glycemic response to OGTT), impaired fasting glucose and eventually to full-blown diabetes mellitus.[3]

Diabetes is continuing to become a major health care problem within the 30 plus million African Americans (AAs) living in the United States. It is increasing at an alarming rate. Currently, there are 3.7 million AAs with diabetes, which is three-fold higher than the number in 1993. According to the 2004–2006 National Survey, 11.8% of AAs had diabetes, which is much higher than the national average (7%).[4] One in four AA women age 55 or older and men between ages of 65 to 74 have diabetes.[5] Once diagnosed with diabetes, AAs are more prone to develop complications of diabetes than their Caucasian counterparts.[5] The problem is further compounded by the lack of awareness and lack of access to health care in AA communities, especially in places like Detroit where the standard of living is far below average.

The Detroit Receiving Hospital in collaboration with Wayne State University Physicians Group (WSUPG) has initiated a diabetes screening program called, *Healthy Detroit - Diabetes Initiative*, whereby any patient showing up at the Detroit Receiving Hospital Ambulatory Rapid Care (DRH-ARC), for any kind of problem which does not require hospitalization was offered free diabetes screening using HbA1c. DRH is located in the downtown Detroit area. It serves a largely indigent urban population that is more than 82% African Americans.

The major objective of the *Healthy Detroit - Diabetes Initiative* program is to identify patients with diabetes and pre-diabetes among previously undiagnosed patients who are unaware of their diabetes status. Those patients who were found to have pre-diabetes or diabetes were offered education and counseling through the Diabetes Education and Lifestyle Modification program designed by the Division of Endocrinology, Wayne State University School of Medicine. Furthermore, appropriate drug

treatment program was initiated in those found to have full-blown diabetes.

In this preliminary communication, we report the alarmingly high rate of pre-diabetes and diabetes that was revealed by the *Healthy Detroit - Diabetes Initiative* program amongst patients presented to the DRH-ARC who were unaware of their diabetes status.

PATIENTS AND METHODS

Participation in this screening program was voluntary. The screening test was offered to all patients who visited the ARC from March 8, 2010 through March 31, 2014, with the exception of patients who were prisoners, had psychiatric disorders, those who refuse to give consent, and patients whose was previously determined within the last 90 days. We also excluded participants who had self-reported diabetes or used diabetic medication.

HbA1c is now accepted as the standard diagnostic method by the American Diabetes Association and the international expert committee.[6,7] Two volunteer physicians and the emergency room nurses conducted the screening test. It was done while patients were waiting to be seen or after the emergency physician evaluated the patients. The Emergency physicians were responsible for telling the patients who were found to have abnormal HbA1c regarding their blood test. Patients who were found to have very high blood sugar, (>300mg/dL) and in a catabolic state, were re-triaged for better emergency care. All other patients with abnormal HbA1c were assigned to attend the next Diabetes Education and Lifestyle Modification (DEALM) program.

Hemoglobin A1c (HbA1c) Assay: We used latex agglutination inhibition immunoassay methodology for determination of HbA1c. This method recognizes the glycated c-terminal residue of the ß hemoglobin chain. It is NGSP (National Glycohemoglobin Standardization Program) certified and is traceable to the International Federation of Clinical Chemistry. The assay is not affected by the sickle cell disease or trait, commonly found in AA patients. It also does not recognize the glycated hemoglobin of patients with thalassemia (DCA vantage - Siemens Medical Solutions Diagnostics, Tarrytown, NY) 8. Thus, this method is reliable to determine the HbA1c and diagnose diabetes according to the ADA guidelines. The test is based on capillary blood samples and results are read within 6 min. The intra-assay and inter-assay variations were 1.25% and 1.57%, respectively. To validate the immunoassay results we measured HbA1c levels in 77 patient samples by both immunoassay and the classical gold standard HPLC method. The results showed a strong and significant correlation (r=0.98).

Diagnostic Criteria: The following diagnostic criteria were used to classify patients according to their test results: value <5.7% was normal, 5.7–6.4% was pre-diabetes, and ≥6.5% was diabetes.[9] Compared with fasting glucose, glycosylated hemoglobin has several advantages as a diagnostic test: it has higher repeatability, can be assessed in the non-fasting state, and is the preferred test for monitoring glucose control. The blood samples for testing were obtained via finger stick. Verbal consent was given prior to finger stick.

RESULTS

Of those patients eligible for screening, a total of 15,971 patients (7,129 men, 8,842 women) were included in this analysis. Prevalence estimates for diabetes and pre-diabetes were calculated for the overall population tested and for subgroups according to age and sex. Of the 15,971 patients tested, 6,149(38.5%) patients were found to have pre-diabetes or diabetes. When patients were categorized by sex, 2782(39%) men and 3275(37%) women were found to have pre-diabetes or diabetes. There was no statistically significant relationship between sex and diabetes (P=0.3) (Figure 1).

The age of the patients tested range from 14 to 93 years old. The prevalence of diabetes and pre-diabetes were observed to increase with increasing age. Pre-diabetes and

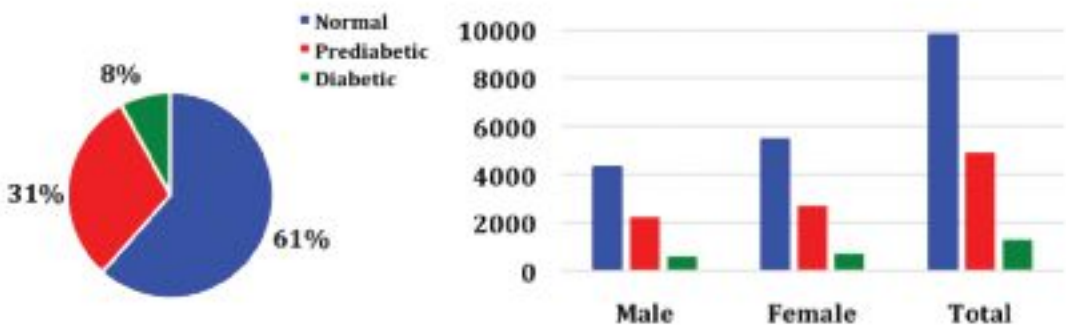

Figure 1. Distribution of normal, pre-diabetes and diabetes