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Original Research

Variability between self-reported diabetes and measured glucose among health screening participants in South Central Kentucky



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ABSTRACT

Aims: To assess self-reported diabetes and random glucose among health screening participants and examine factors associated with these two diabetes outcomes.

Methods: Study subjects were adults aged ≥ 18 years who participated in diabetes screenings via a mobile health clinic operated by the Institute for Rural Health at Western Kentucky University from 2006 to 2011. Data on self-reported diabetes were based on physicians' past diagnosis. Random plasma glucose was obtained during the screenings. Non-fasting plasma glucose levels of ≥ 180 mg/dl and ≥ 140 mg/dl were used as cutoffs to determine diabetes and diabetes or pre-diabetes, respectively. Logistic regression was used to examine factors associated with self-reported diabetes and elevated non-fasting glucose levels controlling for comorbidities and sociodemographic factors.

Results: The proportion of self-reported diabetes was 9.6%. The proportion of participants with ≥ 180 mg/dl was 3.2% and that with ≥ 140 mg/dl was 7.4%. Odds ratios indicated that self-reported diabetes was higher in older and obese groups and those who had hypertension and hypercholesterolemia and family history of diabetes, while elevated non-fasting glucose levels were higher among participants without health insurance and those who reported they had diabetes.

Conclusions: Variability in risks between self-reported diabetes and measured glucose should be incorporated in diabetes self-care.

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1. Introduction

Diabetes is a growing public health concern. In the United States, 25.8 million people were estimated to have diabetes in 2010 which accounted for 8.3% of the total population [1]. The most common form of diabetes is type 2 diabetes, accounting for approximately 95% of all diagnosed cases of diabetes, where the body does not produce enough insulin among adults of various ages [2]. Risk factors associated with type 2 diabetes include increasing age, non-white minority groups, obesity, physical inactivity, smoking, lower income, genetics, and residing in rural areas [3-5].

Self-reported diabetes is derived from physicians' past diagnosis in health surveys [6]. Increasing age, family history of diabetes, obesity, and comorbidities such as dyslipidemia and hypertension are important factors associated with self-reported diabetes [7,8]. People with diabetes are advised to undergo various lifestyle behavior changes, such as shifting to healthier diet and more exercise, in order to prevent or delay diabetes-related complications [9]. Diabetes patients who follow recommended self-care behaviors may attain appropriate glycemic control, but many fail and continue to suffer health problems [10]. Thus, people living with diabetes may have differing glucose levels because of their varying levels of adherence to self-care behaviors and practice [11].

There are several tests that clinically determine diabetes status. According to the American Diabetes Association (ADA), people are considered diabetic if the hemoglobin A1c (HbA1c) is $\geq 6.5\%$, fasting plasma glucose is ≥ 126 mg/dl, or oral glucose tolerance is ≥ 200 mg/dl [12]. Pre-diabetes may be also determined based on how close the glycemic reading is to the normal levels. The ADA also sets the standard for non-fasting glucose (1-2 h after a meal) of ≥ 180 mg/dl as diabetic. Other clinical research utilizes alternative glucose cutoff points to examine diabetes and pre-diabetes for specific research purposes [13-15]. Research that uses clinically measured glucose is useful to objectively assess the level of glycemic control among diabetes patients, and identify factors associated with poor glycemic control and previously undiagnosed cases [16,17].

Health screenings for diabetes via a mobile clinic provide opportunities for both general populations and people with diabetes to monitor their glucose levels and diabetes-related measures [18,19]. The community-based approach to diabetes screenings is crucial for rural and health professional shortage areas because diabetes prevalence is higher in these areas, and rural residents are less likely to comply with diabetes care guidelines than urban residents [20]. Rural residents are less likely to be covered by health insurance, [21] and generally face greater financial barriers to care [22]. In addition, long distance to health care providers reduces health care utilization among the rural elderly [23,24]. Therefore, rural and socioeconomically disadvantaged people may greatly benefit from diabetes screenings via mobile clinics that travel to medically underserved communities [25,26].

The Institute for Rural Health (IRH) at Western Kentucky University (WKU) is a university-based multidisciplinary organization that collaborates with several departments across the university. Health screenings for diabetes, which consist of

a random glucose testing, are provided at no cost to adults through the Mobile Health Unit that travels to selected local communities. Currently, the prevalence of diabetes in Kentucky is higher than the national average for both men and women and all age groups [27], thus, this type of free health service plays an important role in the local area. With federal funding and a budget from WKU's College of Health and Human Services, the IRH has been providing diabetes screenings since its inception of the program.

This research reports on a pooled cross-sectional analysis of diabetes using data from the IRH. We examined self-reported diabetes and clinically measured blood glucose levels among adults aged 18 years and over who participated in health screenings from October 2006 to November 2011. We investigated the factors associated with self-reported diabetes as well as elevated glucose levels by linking clinically measured blood glucose levels to self-reported diabetes and sociodemographic characteristics. We hypothesize that there is variability in risk factors between self-reported and clinically measured diabetes because of the differing level of adherence to diabetes self-care.

2. Methods

The IRH staff consisted of a full-time registered nurse and a nurse practitioner during the study period. Senior undergraduate students enrolled in the WKU Nursing Program were supervised by the IRH staff and assisted with screening procedures as part of their community health rotation requirements.

2.1. Event location

The event locations were mapped to show the general service area covered by the IRH (Fig. 1). Events took place in 46 different locations. 21 locations (45.7%) were in Warren and Edmonson Counties which comprised the Bowling Green Metropolitan Statistical Area defined by the Office of Management and Budget (OMB) [28]. Metropolitan areas (urban) are characterized by a core urban county and/or adjacent counties containing a population of at least 50,000 and have a high degree of social and economic integration measured by commuting ties. Warren County contains the City of Bowling Green and Edmonson County has a strong social and economic tie to Warren County.

In contrast, 25 locations (54.3%) were located outside the metropolitan area or nonmetropolitan (rural) areas lacking major population centers. Nonmetropolitan areas have neither core urban population nor strong social and economic connections to core urban centers in other counties. Thus, they are considered remote rural areas. The majority of events (97.8%) took place in the Barren River Area Development District (BRADD), a group of 10 counties encompassing South Central Kentucky.

2.2. Participant recruitment

The IRH participants were recruited by advertisements distributed to coordinators of local community centers, such as churches, senior centers, and housing authorities. The

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