Research Article

Blood Glucose Level among Patients Attending Rwanda Diabetes Association and Centre Medico-Social De Biryogo

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Citation: Nizeyimana, F., Ntigurirwa, M., Placide, M., Mukeshimana, J.A., Nderelimana, O., Nkurikiyintwali, J.M.V. Habiyaremye, M.(2023). Blood Glucose Level among Patients Attending Rwanda Diabetes Association and Centre Medico-Social De Biryogo. *Int J Diabetes Metab Disord, 8*(2), 317-321.

Abstract
Objective: To assess blood glucose level of individuals attending Rwanda Diabetes Association and Centre Medico-Social de Biryogo for blood glucose level screening.

Research Design: The study was cross-sectional

Setting: The study was quantitative and was conducted at Rwanda Diabetes Association (RDA) and Centre Medico-Social (CMS) Biryogo. Blood specimens were collected and tested for blood glucose level among patients screened for the first time. Specimens were collected following Standard Operating procedure (SOP) for blood collection.
Sample: All individuals who visited the study area seeking the screening of blood glucose level and who fulfilled the study criteria were tested. The study enrolled 143 at RDA and 274 at CMS-Biryogo. A total of 417 persons were recruited in the study.

Methods: Blood samples were collected in phlebotomy unit. Each preferred sample was tested in the biochemistry unit and blood glucose level was recorded after testing and confirming the results.

Results: The study depicts that among 417 screened patients, slightly more than half 223 (53.5%) were in normal range of glycaemia, 29 (7%) were in prediabetes range while 165 (39.5%) had untreated diabetes. For 268 (64.30%) females screened, 4.3% were in prediabetes range and 24% had untreated diabetes. Among 149 (35.7%) males screened, 2.6% were

in prediabetes range and 15.6% had untreated diabetes.

Conclusion: *Screening of blood glucose level take place when individuals have a medical condition of diabetes. It is importance for every individual to plans to be screened for blood glucose level periodically to prevent long-term hyperglycemia resulting in diabetes and the further serious clinical complications.*

1. Introduction
The number of people with diabetes is expected to rise from 382 million in 2013 to 592 million by 2035 [1]. According to diabetes education service (2009) many people are frightened to check their blood sugar or "blood glucose "levels because they do not want to see levels that are higher or lower than their target range. The government of Rwanda screen people for blood glucose level after public sport.

2. Background
Diabetes is a group of diseases characterized by high blood glucose [2]. According to Mandal (2014), diabetes mellitus is derived from the Greek word diabetes meaning siphon - to pass through and the Latin word mellitus meaning honeyed or sweet. This is because in diabetes, excess sugar is found in blood as well as the urine. It was known in the 17th century as the "pissing evil" [3]. It is a group of metabolic diseases in which a person has high blood sugar, either because the pancreas does not produce enough insulin, or because cells do not respond to the insulin that is produced [4].

This high blood sugar produces the classical symptoms of xerostomia, polyuria, polydipsia, and polyphagia [5]. Symptoms may develop rapidly (weeks or months) in type 1 diabetes, while they usually develop much more slowly and may be subtle or absent in type 2 diabetes [6]. Types of diabetes are type 1, type 2, gestation diabetes and other specific types for example, chronic pancreatitis and cystic fibrosis [7].

Diabetes increases the risk of disabling disorders, including cardiovascular disease, retinopathy, renal failure, and peripheral vascular diseases [8]. Diabetes mellitus is characterized by recurrent or persistent hyperglycemia, and is diagnosed by demonstrating any one of the following: Fasting plasma glucose level ≥ 7.0 mmol/l (126 mg/dl), Plasma glucose ≥ 11.1 mmol/l (200 mg/dl) two hours after a 75 g oral glucose load as in a glucose tolerance test, symptoms of hyperglycemia and casual plasma glucose ≥ 11.1 mmol/l (200 mg/dl) and glycated hemoglobin (Hb A1C) ≥ 6.5% [9].

Death rates for diabetics are two times higher than non-diabetics, and higher for both genders and for all ages and races [10]. According to U.S. department of health and human services (2002) diabetics are two to four times more likely to die from heart disease; those with pre-diabetes are twice as likely to die from heart disease. The number of people with diabetes is increasing due to population growth, aging, urbanization, and increasing prevalence of obesity and physical inactivity [11], knowledge on diabetes and lack of knowledge on the significance of high blood glucose levels [11,12].

Around 49% of people in Asia, 62% in Africa and 54% in Western-Pacific region, did not know that they were suffering from diabetes [13]. The prevalence of diabetes for all age-groups worldwide was estimated to be 2.8% in 2000 and 4.4% in 2030. The total number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030. The urban population in developing countries is projected to double between 2000 and 2030. The most important demographic change to diabetes prevalence across the world appears to be the increase in the proportion of people 65 years of age [11].

About 33% of U.S. adults have prediabetes [14], awareness of this risk condition is low. Less than 10% of U.S. adults with prediabetes report that they have ever been told that they have prediabetes [14,15]. More than 29 million Americans nearly one in 10 have diabetes [3]. According to IDF (International diabetes federation) data in 2013, South-East Asian countries had the highest number of diabetic patients in the world, with around 23 million people of the 381 million people across the globe. The data also forecasted that the region would see 39 million people with diabetes by 2035 [13]. In a study conducted by International diabetes association in 2015, the prevalence of diabetes in Rwanda was about 3.16% of the population with 1,918 diabetes related deaths per year [16].

3. Material & Method
3.1 Study Design and Period
The cross-sectional study design was applied to assess blood glucose level of individuals attending Rwanda Diabetes Association and Centre Medico-Sociale de Biryogo seeking blood glucose level screening. The study was conducted from March to August 2014.

3.2 Population
The study enrolled individuals who visited RDA and CMS-Biryogo seeking the service of screening for blood glucose level. The study participant were individual aged 20 years and above. Individuals who previously screened for diabetes and the results show high blood glucose (diabetes), and individual who were under treatment for diabetes were excluded in the study.

3.3 Sampling Methods
The study respondents were recruited by using a non-probability sampling technique. All persons aged 20 years and above who

visited RDA and CMS-Biryogo wanting to be screened for blood glucose level and who were under diabetes treatment or previously diagnosed for diabetes were enrolled in the research.

3.4 Sample Size

All individuals who visited the study area seeking the screening of blood glucose level and who fulfilled the study criteria were tested. The study enrolled 143 at RDA and 274 at CMS-Biryogo. A total of 417 persons were recruited in the study.

3.5 Study Tools

Samples were collected by the investigators. Venous blood samples were collected using blood collection tube. Lab request form was used and was labeled the same as on the sample tube for every individual. Samples were incubated in water bath at 37oc for 5 minutes before being introduced in biochemistry machine. Parallel balanced tubes were put in centrifuge machine to allow separation of serum with other components of blood in five minutes.

3.6 Statistical Analysis

Data were entered and exported into Statistical Package for Social Sciences (SPSS) version 16.0. Descriptive statistics such as frequencies and percentages were applied.

3.7 Ethical Consideration

Ethical clearance was obtained from ethical approval committee of INES Ruhengeri. Data were collected after getting approval letter of RDA and CMS-Biryogo. Written consent was obtained from each study participant after explaining the purpose of the study before collecting sample. The study participants were assured confidentiality of information. The study participants were informed that they are free to withdraw from the study from any time. The study was conducted in accordance with Helsinki declaration.

4. Results Presentation

The present results presentation reflected the presentation of blood glucose level based on the total sample size and gender.

	RDA		CMS-Biryogo		Total (n=417)	
	Frequency	%	Frequency	%	Frequency	%
Normal range	53	37.1	170	62	223	53.5
Pre-diabetes	13	9.1	16	5.8	29	7
Untreated diabetes	77	53.8	88	32.2	165	39.5

Table 1: Presentation of blood glucose level

The table 1 depicts the results of blood glucose level for the screening of the total sample size. For all screened persons, 223 (53.5%) were in normal range, 29 (7%) were in prediabetes range, 165 (39.5%) were in untreated diabetes. Among patients screened at RDA, 53 (37.1%) were in normal range, 13 (9.1%) were in pre-diabetes and 77 (53.8%) were in untreated diabetes. Of the screening conducted at CMS-Biryogo, 170 (62%) were in normal range, 16 (5.8%) were in prediabetes range while 88 (32.2%) were in untreated diabetes.

	Males (n=149)		Females (268)	
	Frequency	%	Frequency	%
Normal range	73	17.5	150	36
Pre-diabetes	11	2.6	18	4.3
Untreated diabetes	65	15.6	100	24

Table 2: Presentation of blood glucose level by gender

Comparing males and females; for the total of 268 (64.30%) females screened, 4.3% were in prediabetes range and 24% have untreated diabetes. Among 149 (35.70%) males screened, 2.6% were in prediabetes range and 15.6% have untreated diabetes. .

5. Discussion

According to the obtained results, the screening showed that in Rwanda Diabetes Association (RDA), 9.1% of individuals were in prediabetes; this is supported by figures in the study conducted by Heikes (2008) where 26.14% of U.S. people were found in prediabetes range. The study of Heikes found that 35% of the screened adult people in Omani population were in prediabetes range and 53.80% were found in untreated diabetes [17]. The study results found at RDA screening is comparable with the research conducted by Mohammed et al. (2018) which showed that 2% in a small township in south India, 8.2% in the urban of Chennai and 2.4% in the rural areas of Chennai were in prediabetes range [18].

At CMS-Biryogo, the results had shown that 5.8% were prediabetes; this is comparable with the results of division of diabetes translation (2019) which showed that 4.4% in Vermont and 10.2% in Tennessee were in prediabetes range [19]. Untreated diabetes was found in 32.2% of the total screened population. In the study carried out by Mohan (2007) untreated diabetes was found in 1.5 % in rural population and 2.1% in urban population of Indian [20]. For the total samples (CMS-Biryogo & RDA), 7% resulted in pre-

diabetes. The study conducted by the division of diabetes translation (2019) shown that about 33% of U.S. adults have prediabetes, 35% of U.S. adults aged 20 years or older had prediabetes in 2005–2008 [19], 9% of the adult population suspected to have diabetes in 2025 [17]. Untreated diabetes was 39.6% compare with the study findings of Heikes research (2008) which showed 4.16% of U.S. population in prediabetes range [17]. The study conducted by El-din (2008) revealed that between 6.5% and 6.9% of adults were in prediabetes range [21]. Another study by Chen et al. (2012) showed that 15.5% of the total population worldwide is in prediabetes range [22]. The results of the present study (CMS-Biryogo & RDA) were found high comparing with other researched findings. This is due the fact that the individual visiting the study area are suspecting themselves to have diabetes which pushes them to seek screening/diagnosis in diabetes related treatment center.

6. Conclusion

Although the study was conducted in population which is suspecting to have diabetes there is an abnormal range of blood glucose level in individuals of different area and in all sexes. Sensitization on diabetes screening for all target people is essential rather than waiting to develop symptoms of a diabetes suspect for deciding to visit screening service.

Recommendations

The following recommendations were given to the Ministry of Health:
- To enhance the focus on prevention and early detection of diabetes
- To organize the campaign of diabetes screening for every individual of country,
- To introduce the service of glycaemia test at community level for example at community health worker,
- To enhance community mobilization (Information Education Communication) on diabetes.

Conflict of Interests

There is no conflict of interests to declare.

Acknowledgement

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