### **Original Research Article**

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# Opportunistic screening for random blood glucose level among adults attending a rural tertiary care centre in Haryana during world health day observation activity

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#### **ABSTRACT**

**Background:** Diabetes mellitus is one of the most common non-communicable diseases worldwide and major global risks for morbidity and mortality. The total burden of deaths from high blood glucose in 2012 has been estimated to 3.7 million which includes 1.5 million diabetes deaths, 2.2 million deaths from cardiovascular diseases, chronic kidney disease, and tuberculosis. Various studies reported that population-based screening of blood glucose level will result in low yield but higher cost. However, opportunity screening at earlier stage had good prognosis. Hence opportunistic screening for raised random blood glucose level was planned.

**Methods:** During observation of World Health Day 2016 activity based on theme, "Beat diabetes: Scale up prevention, strengthen care, and enhance surveillance" this present cross-sectional study was conducted. Attendants of the patients having age >30 years; visiting this institute on that day enrolled as study participants. Information gathered regarding their socio-demographic parameters and doing regular physical activity. A brief clinical examination regarding anthropometric measurements and random blood glucose was done using standard procedures by trained personnel.

**Results:** Out of 215 opportunistic screened participants, 14 (6.51%) participants were known diabetic and having random blood glucose level <200 mg%. However among rests 201 study participants whose diabetic status was unknown, 8 (4%) participants had random blood glucose level >200 mg%. BMI status of 48 (22%) and 103 (48%) study participants were recorded as pre-obese and obese respectively.

**Conclusions:** It was concluded that after every 7 cases of known diabetes mellitus there were 4 unknown cases identified as raised random blood glucose level. Hence in tertiary care settings, individuals more than 30 years should get priority for opportunistic screening of random blood glucose estimation. Health-care providers should be sensitized on practicing opportunistic screening in outpatient department.

Keywords: Opportunistic screening, Random blood glucose level, Rural tertiary care settings

#### **INTRODUCTION**

Diabetes is a chronic disease that occurs either when the pancreas does not produce enough insulin (a hormone that regulates blood sugar, or glucose), or when the body cannot effectively use the insulin it produces. It can lead to complications like heart attack, stroke, kidney failure,

leg amputation, vision loss and nerve damage and thereby increase the overall risk of dying prematurely. Hence diabetes is one of the most common non-communicable diseases (NCDs) worldwide and is one of the major global risks for morbidity and mortality. Globally, an estimated 422 million adults were living with diabetes in 2014 and this global prevalence has nearly doubled that is

rising from 4.7% to 8.5%, in the adult population since 1980. This sharply raised prevalence was faster in low and middle-income countries than in high-income countries and has reached to epidemic proportions, particularly in developing countries such as India.<sup>3</sup> The total burden of deaths from high blood glucose in 2012 has been estimated to 3.7 million which includes 1.5 million diabetes deaths and an additional 2.2 million deaths by increasing the risks of cardiovascular and other diseases. In India, as per the 2011 estimates reported by the Indian Council of Medical Research (ICMR), by the year 2030, almost 87 million people in India have been predicted to have diabetes mellitus.<sup>4</sup>

Diabetes mellitus is frequently not diagnosed until complications appear, and around 1/3<sup>rd</sup> of the individuals with diabetes mellitus are identified only after developing macro- or micro-vascular complications.<sup>5,6</sup> Individuals with diabetes mellitus who present earlier had fewer incidences of macro- and micro-vascular complications and mortality. Various studies had reported that population-based screening will result in low yield and hence resulting in a higher cost. 7,8 Moreover, populationbased screening would be difficult in middle- or lowincome countries where human workforce and logistics are far away from requirements to implement even their routine healthcare activities. 9 On the other aspect, people who are diagnosed by means of opportunity screening at the earlier stage had good prognosis as compared to those who are diagnosed after onset of clinical symptoms. So it's better to detect diabetes mellitus at the earliest by means of screening to prevent its complications. 10,11 One of the key strategies under the National Programme for Prevention and Control of Cancer. Diabetes. Cardiovascular Diseases, and Stroke (NPCDCS) in India is opportunistic screening of persons above 30 years of age at the point of primary contact in health facility.9 Hence taking the opportunity during observation of World Health Day 2016 campaign, screening for random blood glucose level and health education of persons attending rural tertiary care centre was planned.

#### **METHODS**

Based on theme "Beat diabetes: Scale up prevention, strengthen care, and enhance surveillance" health education and opportunistic screening for random blood glucose level was conducted during observation of World Health day to increase awareness about the rise in diabetes, and its staggering burden and consequences to trigger a set of specific, effective and affordable actions to tackle diabetes. Attendants of the patients having age >30 years; visiting the institute Bhagat Phool Singh Government Medical College for Women Khanpur Kalan Sonepat on 5th August 2016, enrolled as study participants for opportunistic screening. Informed consent was taken from each participant and Information gathered regarding their socio-demographic parameters and doing regular physical activity was recorded. A brief examination regarding anthropometric measurements

(height and weight) was done using standard techniques. Based on BMI cut-offs for Indians, BMI 18.5- 22.9 kg/m² was categorized as normal weight, BMI < 18.5 kg/m² as underweight, BMI  $\geq$  23- 24.9 kg/m² as overweight and BMI  $\geq$  25 kg/m² as obese.  $^{12,13}$  Random blood capillary glucose level was done by trained personnel and random plasma glucose level more than 200 mg% taken as increased risk for diabetes mellitus.  $^{14}$  The study participants who were found random blood glucose level >200 mg% were counseled for confirmation of diagnosis on next day.

#### Test measurement principle

The GLUCOCARD<sup>TM</sup>  $\Sigma$  glucometer and GLUCOCARD<sup>TM</sup>  $\Sigma$  test strips were used for quantitatively measuring the glucose level in fresh capillary whole blood. They are intended for use outside the body (in vitro diagnostic use) at home or in a clinical setting as an aid to monitor and control blood glucose levels. Glucose in the blood reacts with the reagent in the test strip and this produces a small electric current. The strength of this current is proportional to the concentration of glucose in the blood. The glucometer measures this current and calculate the glucose level. <sup>15</sup>

#### Statistical analysis

Data was entered in Microsoft Office Excel 2010 and statistical analysis done using SPSS version 22.0. Descriptive statistics were expressed as mean with standard deviation for continuous variables and frequency with percentage for categorical variables. P value <0.05 was used for statistical inference for this study.

#### **RESULTS**

This present cross sectional study was carried out among 215 adults who were attendants of the patients having age >30 years; visiting this institute during observation of World Health Day campaign. Out of 215 study participants, 143 (66.5%) were males and 72 (33.5%) were females. The mean age of study participants was 42  $\pm$  10.04 years, mean weight 67.81  $\pm$  14.32 Kg and mean height was  $1.64 \pm 0.09$  meter. BMI status of 48 (22%) and 103 (48%) study participants were recorded as preobese and obese respectively. 44 (20.5%) study participants described that they were doing regular physical activities while rests 171 (79.5%) were not (Table 1). Among 215 enrolled screened participants, 14 (6.51%) were known diabetics and having random blood glucose level <200 mg%. However among remaining 201screened study participants, whose diabetic status was unknown, 193 (96%) had random blood glucose level <200 mg% while 8 (4%) study subjects had random blood glucose level >200 mg% which is increased risk for developing diabetes mellitus (Figure 1).

In the present study it was found that the difference between the study participants' caste and occupation with their screening status of random blood glucose level was found to be statistically significant (p value <0.05) (Table 2)

Table 1: Profile of study participants enrolled during world health day activity (n=215).

Attribute		N (%)	
Sex	Male	143 (66.5)	
Sex	Female	72 (33.5)	
Locality	Rural	176 (82)	
Locality	Urban	39 (18)	
Caste	OBC	59 (27)	
Caste	SC/ST	43 (20)	
	Others	113 (53)	
Literacy status	Up-to primary level	74 (34)	
	Above primary level - senior secondary level	107 (50)	
	Above senior secondary level	34 (16)	
Occupation	Home maker	49 (23)	
	Labourer	12 (6)	
	Agriculture	41 (19)	
	Service	113 (52)	
Physical	Regularly	44 (20.5)	
activity	vity Not regularly		
	Under-nutrition	17 (8)	
BMI Status	Normal BMI	47 (22)	
	Pre-obese	48 (22)	
	Obese	103 (48)	

Figures in parenthesis indicate percentages.

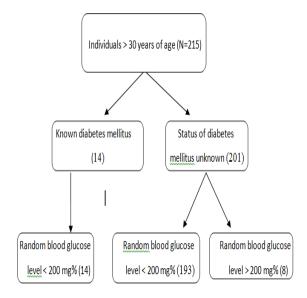


Figure 1: Flow diagram of study participants.

The present study revealed that the difference between the study participants' BMI status with their screening status of random blood glucose level was found to be statistically not significant (p value >0.05) (Table 3).

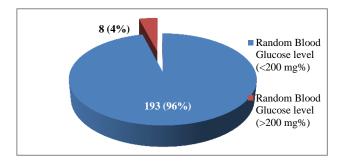


Figure 2: Distribution of study participants having unknown screening status (n=201).

#### **DISCUSSION**

In this study, about 4% subjects were newly diagnosed to random blood glucose level >200 mg%. If this opportunistic screening was not performed, these cases would have been left undetected or detected at the late stage of illness. Undiagnosed cases of hyperglycemia are at high risk of developing diabetes mellitus which in turn lead to a huge economic loss due to macro- and microvascular complications and premature mortality. Identifying people at increased risk for undiagnosed diabetes mellitus or glucose intolerance, followed by blood glucose testing to establish diagnosis, is considered to be an appropriate way of dealing with this problem.<sup>16</sup> These findings provided a rationale for opportunistic screening. Evidences from countries such as the United Kingdom has shown that opportunistic screening among people aged 40 years or more without any risk factors in every 5 years once, or yearly once for people with one of the risk factors for NCDs, will identify all missed cases in the community.<sup>17</sup> The proportion of undiagnosed high risk cases for diabetes mellitus (4%) is lower when compared to the Screening India's Twin Epidemic (SITE) study in 10 most populous states in India, which reported prevalence of undiagnosed diabetes mellitus to be 7.2%. 18 Similarly, a study on opportunistic screening for type 2 diabetes mellitus among pharmacy clients in Thailand by Dhippayom et al during 2012 showed the prevalence of undiagnosed diabetes mellitus as 12.7%. <sup>19</sup> The lower proportion of newly diagnosed high risk cases for diabetes mellitus in this study is probably due to selection of lower age criteria (>30 years), no any follow-up, and screening strategies (cutoff 200 mg% random capillary blood glucose used for initial screening). Diabetes mellitus risk prediction followed by target screening with blood sugar in other studies could have increased the proportion of diabetes mellitus among the screened individual. This study showed that the numbers need to screen to identify one undiagnosed high risk case for diabetes mellitus was 25 (status of 14 cases were known). This is less compared to other studies reported from developed countries, which had ranged from 52 to 164.<sup>20,21</sup> Hence it's an alarming situation for developing country like India. Screening among elderly (≥60 years)

persons, extremes of nutritional status (chronic energy deficiency and obese) had identified more number of new diabetics with lesser number of people screened. The prevalence of diabetes mellitus was less in the younger age group compared to older age group. Recently published operational guidelines on NPCDCS focused on opportunistic screening as main strategy for early detection of diabetes mellitus.<sup>22</sup> To facilitate this opportunistic screening nursing staff are planned to be trained and provided with basic equipments. Despite its importance, literature on this strategy, especially in tertiary care settings from developing countries, is scarce. This study regarding opportunistic screening was performed with existing human workforce available at rural tertiary care centre. It shows the feasibility on this strategy toward early diagnosis of diabetes mellitus. Hence, health-care providers at tertiary care settings should be sensitized on practicing opportunistic screening in outpatient management units. In resource-poor settings, individuals more than 30 years should get priority in screening for diabetes mellitus. Because this study was carried out on public health day observation activity, same-day-test strategies such as HbA1c were not feasible to confirm diabetic status in our study. As follow-up was not done in this study, we interpreted the results as random blood glucose level >200 mg% which is a risk factor for developing diabetes mellitus. However, the individuals with random blood glucose level >200 mg% were referred to confirm their diabetic status on next day. However, the fact remains that more number of new cases of diabetes mellitus could have been detected, if these cases were followed up.

Table 2: Distribution of socio-demographic attributes of study participants as per their screening status (n=201).

Socio-demog	raphic attribute	Random blood glucose (<200 mg%)	Random blood glucose (200 mg% or more)	Total
Sex	Male	128 (66.3)	6 (75)	134 (66.7)
	Female	65 (33.7)	2 (25)	67 (33.3)
	Total	193 (100)	8 (100)	201 (100)
				df = 1, P  value > 0.05
Locality	Rural	159 (82.4)	6 (75)	165 (82.1)
	Urban	34 (17.6)	2 (25)	36 (17.9)
	Total	193 (100)	8 (100)	201 (100)
				df = 1, P  value > 0.05
G 4	General	104 (53.9)	1 (12.5)	105 (52.2)
	OBC	49 (25.4)	5 (62.5)	54 (26.9)
Category	SC/ST	40 920.7)	2 (25)	42 (20.9)
	Total	193 (100)	8 (100)	201 (100)
				df = 2, P value $< 0.05$
	Up-to primary	62 (32.1)	4 (50)	66 (32.8)
Literacy status	Above primary to Sr Sec.	98 (50.8)	4 (50)	102 (50.7)
	Above senior secondary	33 (17.1)	0 (0)	33 (16.4)
	Total	193 (100)	8 (100)	201 (100)
				df = 2, P value > 0.05
Occupation	Home maker	44 (22.8)	1 (12.5)	45 (22.4)
	Labourer	7 (3.6)	3 (37.5)	10 (5)
	Agriculture	37 (19.2)	0 (0)	37 (18.4)
	Job	105 (54.4)	4 (50)	109 (54.2)
	Total	193 (100)	8 (100)	201 (100)
				df = 3, P value $< 0.05$

Figures in parenthesis indicate percentages.

Table 3: Distribution of study participants' BMI status according to screening status of random blood glucose level (n=201).

BMI status	Random blood glucose (<200 mg%)	Random blood glucose (200 mg% or more)	Total
Malnutrition	17 (8.8)	0 (0)	17 (8.5)
Normal BMI	45 (23.3)	0 (0)	45 (22.4)
Pre-obese	45 (23.3)	1 (12.5)	46 (22.9)
Obese	86 (44.6)	7 (87.5)	93 (46.3)
Total	193 (100)	8 (100)	201 (100)

df = 3, P value > 0.05.

#### **CONCLUSION**

Opportunistic screening for random blood glucose level performed during public health day observation activity concluded that 8 (4%) study participants had random blood glucose level > 200 mg% while 14 cases were found diabetics. Meaning thereby after every 7 cases of known diabetes mellitus there were 4 unknown cases identified as raised random blood glucose level which is increased risk for developing diabetes mellitus.

#### Recommendations

The study conducted with available existing resources also explored the feasibility of this strategy towards early identification of hyperglycemia cases and its subsequent timely management. Hence in resource-poor settings especially tertiary care institute in rural areas, individuals more than 30 years should get priority in screening for random blood glucose estimation. Health-care providers should be sensitized on practicing opportunistic screening in outpatient management units

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Institutional Ethics Committee

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