

Screening Of Blood Donors For Diabetes At A Tertiary Care Center In The Western Part Of Rajasthan

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ABSTRACT

Objective: To Study and Analyze the use of screening of blood donors for Diabetes Mellitus and the cost-effectiveness and use of blood glucose level among apparently healthy blood donors. **Material & Methods:** This study was conducted in the Department of Immunohematology and Transfusion Medicine, S.P. Medical College and Associated group of Hospitals, Bikaner (Rajasthan) as free diabetes screening program among apparently healthy blood donors reported to donate blood at the blood bank or in camps as a part of pre-donation medical check-up. Reported Blood Donors were interviewed, counseled and examined as per questionnaire and criteria for donor selection laid down in Drug and Cosmetic rules, Government of India during the period of May to July 2015. **Results:** The present study shows the out of total 2000 donors, 1817 (90.9%), 106 (5.3%) and 77 (3.9%) donors had their random blood sugar <140, 140-200 and >200 respectively and observe that male to female ratio 46.6:1. The results show the mean BMI in RBS <140 mg/dl group was 24.424.99 kg/m², in RBS group 140-200 mg/dl mean BMI was 24.024.75 kg/m² and in RBS >200 mg/dl group mean BMI was 24.785.84 kg/m². **Conclusion:** As a screening tool measurement of random plasma glucose by Glucometer is also cost-effective as it costs less than INR 15 per strip per donor screened and convenient as it can be performed along with a haemoglobin estimation of every donor. By providing Screening facility as a part of Pre-donation medial check-up it can be an aid-on medical facility for upcoming donors, which is cost-effective, convenient and by grabbing the interest of enthusiastic donors it will help to raise the donor pool, which would be safe and voluntary.

Key-words: Diabetes Mellitus, Blood Donation, Random Plasma Glucose Level, Screening.

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INTRODUCTION:

The Blood Transfusion Services should ensure that the act of blood donation is safe and causes no harm to the donor. The safety and availability of blood and blood products for transfusion require the recruitment and

selection of voluntary, non-remunerated blood donors, the quality-assured screening of all donated blood and the safe and rational clinical use of blood.¹ A blood bank is having an important role to ensure the supply of safe blood as and when required

and donor selection has vital importance in banking and transfusion of blood. For this, donor selection is necessary in addition to the screenings of blood bags for infectious diseases.²

The latest WHO Global Burden of Disease estimates the worldwide burden of Diabetes Mellitus in adults to be around 173 million in the year 2002³. The diabetes epidemic is accelerating in the developing world, with an increasing proportion of affected people in younger age groups. Recent reports describe type 2 diabetes being diagnosed in children and adolescents^{4,5,6}. This is likely to increase further the burden of chronic diabetic complications worldwide. Most of the consequences of Diabetes Mellitus result from its macrovascular and microvascular complications. (Some describe a third category—'neuropathic', whereas others classify the diabetic neuropathies as microvascular complications). The age-adjusted mortality, mostly due to coronary heart disease (CHD) in many, but not all populations, is 2-4 times higher than in the non-diabetic population⁷, and people with diabetes have a 2-fold increased risk of stroke.⁸ Diabetes Mellitus appears later in a person when any complication occurs due to a very long state of Hyperglycemia. Due to the vast presence of Pre Diabetes and Diabetes in the general population, the apparently fit persons coming to blood bank for blood donation who are not on any medication and not knowing about any medical illness in them, if screened at the blood bank for their plasma glucose may

get prevented from the complications of Hyperglycemia by prompt treatment on time⁹.

In the past, the commonest approach to diabetes mellitus screening was a preliminary, semi-quantitative test for glucose in a urine sample, followed by an oral glucose tolerance test for those found to have glycosuria. "Standard oral glucose test" remains the cornerstone of diagnosis of diabetes. Mass screening programmes have used glucose measurements of fasting, post-prandial or random blood sample.¹⁰ We have planned to Study the prevalence of Diabetes in otherwise healthy persons who randomly presented for Blood donation at Blood Bank of Sardar Patel Medical College & an Associated group of Hospitals, Bikaner. Glucose tolerance was defined as per American Diabetes Association (ADA) criteria with Random plasma glucose <140 mg/dl; impaired glucose tolerance (IGT) by 140–199; and High risk for diabetes (DM) by glucose ≥200 mg/dl.¹¹ The present study was aimed to study and analyze the use of screening of blood donors for Diabetes Mellitus and its cost effective.

MATERIAL & METHODS:

This study was conducted in the Department of Immunohematology and Transfusion Medicine, S.P. Medical College and Associated group of Hospitals, Bikaner (Rajasthan) as free diabetes screening program among apparently healthy blood donors reported to donate blood at the blood bank or in camps as a

part of pre-donation medical check-up. Reported Blood Donors were interviewed, counseled and examined as per questionnaire and criteria for donor selection laid down in Drug and Cosmetic rules, Government of India. A written consent was taken from the donor before the blood donation about the test for mandatory Transfusion Transmitted Infection's will be performed on his blood. During the period of May to July 2015, 2000 Blood Donors voluntarily taking initial interest in the study and appended to the recruitment database, person with random plasma glucose value more than 200 mg/dl were referred to Medical OPD for further Investigation and Treatment.

Protocol:

A prospective study carried out amongst persons reported for blood donation (both male and female) as a part of Pre-donation medical check-up. Random Plasma glucose was estimated using a certified Glucometer strip and an analyzer at the first visit of Blood Donor at Blood bank. Height measured with a stadiometer after shoe removal. Weight measured using digital scales with subjects in light clothing. Blood pressure measured with sphygmomanometers after subjects seated quietly for 5 minutes. Subjects also reported their Demographic information, Family History of diabetes, Educational Qualification, Socioeconomic Status and Occupation.

RESULTS:

The present study shows the out of

total 2000 donors, 1817(90.9%), 106(5.3%) and 77(3.9%) donors had their random blood sugar <140, 140-200 and >200 respectively (table 1) and observe that male to female ratio 46.6:1 (table 2). The results show the mean BMI in RBS <140 mg/dl group was 24.424.99 kg/m², in RBS group 140-200 mg/dl mean BMI was 24.024.75 kg/m² and in RBS >200 mg/dl group mean BMI was 24.785.84 kg/m². (Table 3) Most common occupation in the present study was labourer, where total 912 donors were found followed by farmer (n=781), self employed (n=182), skill worker (n=92), housewives (n=21), government office job employees (n=8), doctors (n=3) while least common occupation was student (n=1). (Table 4) In the present study, the majority of donors (n=769) were illiterate followed by Secondary level educated and minority of donors were Post Graduate. (Table 5).

DISCUSSION:

The results of study showed out of total 2000 donors, 1817(90.9%) were normoglycemic (RBG <140mg/dl), 106(5.3%) showed impaired glucose tolerance (RBG 140-200mg/dl) and 77(3.9%) donors found Hyperglycemic (RBG >200mg/dl). Our results are comparable to RamanKutty et al,¹² who studied 3899 subjects in Neyyattinkara Taluka, Kerala state and derived overall crude prevalence rate of type 2 diabetes was 5.9%. Ageing was associated with greater prevalence of type 2 diabetes in all regions and both sexes. The overall age-adjusted prevalence of type 2 diabetes in

30-64-year-olds in Neyyattinkara were 9.2% among men, 7.4% among women, and 8.2% for all persons.

Our results are comparable to Ziemer et al¹³ who observed that mean age was 48 years, and body mass index (BMI) was 30.4 kg/m²; 66% were women, and 52% were black; 5.1% had previously unrecognized diabetes, and 24.0% had any "high-risk" glucose intolerance (diabetes or IGT or IFG110). They concluded that RPG values should be considered by health care providers to be an opportunistic initial screening test and used to prompt further evaluation of patients at risk of glucose intolerance. Such "serendipitous screening" could help to identify unrecognized diabetes and pre-diabetes.

The present study showed out of total 2000 donors presented male predominance over females with male to female ratio 46.6:1. Our results shown are comparable as by RamanKutty et al¹² who observed ageing was associated with greater prevalence of type 2 diabetes in all regions and both sexes. Women showed a higher prevalence in the highland and coastal areas and men in the urban and midland areas. Ziemer et al,¹³ who evaluated the cutoffs of age >45 years + BMI >25 kg/m² carried a significant risk of both diabetes. In the present study, 4.8% Hyperglycemic were among BMI group ≥ 30 kg/m² (n=252 donors). Our results are similar to Ceesay et al¹⁴.

In present study Most common occupation was labourer while least common occupation was student (n=1)

(p<0.001). Among 77 Hyperglycemic donors (>200mg/dl) highest percentage of Hyperglycemia 5 (62.5%) shown by government office job employees (n=8), results showed a lack of physical activity in government sector employees and less number of government office job employees arrived for blood donation during the study period. Stahl et al¹⁵ observed that a low occupational class suggests a greater risk of Type 2 diabetes, independent of conventional risk factors and psychological stress. Agardh et al¹⁶ observed that the risk of getting type 2 diabetes was associated with low SEP in high, middle and low-income countries and overall. The strength of the associations was consistent in high-income countries, whereas there is a strong need for further investigation in middle- and low-income countries.

In our study, the Hyperglycemia was found more among postgraduate and graduate persons 9.2% and 5.9% respectively. Our results are contradictory to Maty et al¹⁷ who found that 3% incidence of Diabetes among total n=1966 of low or <12 education, 2.5% incidence of Diabetes among total n=1828 of 12 years education, 1.8% incidence of Diabetes among total n=2119 of >12 years education.

Comparison of various studies for IGT & Newly diagnosed Diabetes

Study	Yr	Test	Results	
			IGT	Newly diagnosed Diabetes
Ziemer et al ¹³	2008	RPG	24%	5.1%
Zhang et al ¹⁸	2010	OGT&FPG	5.2%	7.3%
Martin et al ¹⁹	2011	OGT	50.1 %	9.7%
Present Study	2015	RPG	5.3%	3.9%

CONCLUSION:

We concluded that the Blood Bank Set-up and Blood Donation Camps can be best place for screening among apparently healthy donors who report for blood donation. As a screening tool measurement of random plasma glucose by Glucometer is also cost-effective as it costs less than INR 15 per strip per donor screened and convenient as it can be performed along with a haemoglobin estimation of every donor. Detected High risk group donors for developing Diabetes Mellitus can be provided health care facilities well in time which will prevent short term and long term complications. By providing Screening facility as a part of Pre-donation medical check-up it can be an aid-on medical facility for upcoming donors, which is cost-effective, convenient and by grabbing the interest of enthusiastic donors it will help to raise the donor pool which would be safe and voluntary.

Conflict of Interest: None.

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Table 1: Distribution of subjects according to age group

Age Group (years)	Random Blood Sugar(mg/dl)						Total	
	<140		140-200		>200			
	No.	%	No.	%	No.	%	No.	%
18-20	78	96.3	3	3.7	0	-	81	100
21-40	1338	93.0	70	4.9	30	2.1	1438	100
41-60	401	83.4	33	6.9	47	9.8	481	100
Total	1817	90.9	106	5.3	77	3.9	2000	100
Mean	34.85		35.88		44.58			
SD	9.52		8.95		8.16			
F	50.021							
P	<0.001							

Table 2: Distribution of subjects according to sex

Sex	Random Blood Sugar(mg/dl)						Total	
	<140		140-200		>200			
	No.	%	No.	%	No.	%	No.	%
Female	38	90.5	2	4.8	2	4.8	42	100.0
Male	1779	90.9	104	5.3	75	3.8	1958	100.0
Total	1817	90.9	106	5.3	77	3.9	2000	100
χ^2	0.117							
P	0.943							

Table 3: Distribution of subjects according to BMI

BMI (kg/m ²)	Random Blood Sugar(mg/dl)						Total	
	<140		140-200		>200			
	No.	%	No.	%	No.	%	No.	%
<18.5	178	89.9	20	10.1	0	-	198	100.0
18.50-24.99	926	92.5	36	3.6	39	3.9	1001	100.0
25.00-29.99	485	88.3	38	6.9	26	4.7	549	100.0
≥30	228	90.5	12	4.8	12	4.8	252	100.0
Total	1817	90.9	106	5.3	77	3.9	2000	100.0
Mean	24.42		24.02		24.78			
SD	4.99		4.75		5.84			
F	1.163							
P	0.313							

Table 4: Distribution of subjects according to occupation

Occupation	Random Blood Sugar(mg/dl)						Total	
	<140		140-200		>200			
	No.	%	No.	%	No.	%	No.	%
Doctor	3	100.0	0	-	0	-	3	100.0
Farmer	716	91.7	34	4.4	31	4.0	781	100.0
Govt office Job	3	37.5	0	-	5	62.5	8	100.0
Housewives	18	85.7	1	4.8	2	9.5	21	100.0
Labourer	822	90.1	55	6.0	35	3.8	912	100.0
Self Employed	168	92.3	10	5.5	4	2.2	182	100.0
Student	1	100.0	0	-	0	-	1	100.0
Skill Worker	86	93.5	6	6.5	0	-	92	100.0
Total	1817	90.9	106	5.3	77	3.9	2000	100.0
χ^2	84.234							
P	<0.001							

Table 5: Distribution of subjects according to educational status

Educational Status	Random Blood Sugar(mg/dl)						Total	
	<140		140 - 200		>200			
	No.	%	No.	%	No.	%	No.	%
Illiterate or Primary	697	90.6	45	5.9	27	3.5	769	100.0
Secondary	445	92.3	26	5.4	11	2.3	482	100.0
Sr. Secondary	319	93.5	11	3.2	11	3.2	341	100.0
Graduate	256	88.6	16	5.5	17	5.9	289	100.0
Post Graduate	100	84.0	8	6.7	11	9.2	119	100.0
Total	1817	90.9	106	5.3	77	3.9	2000	100.0
χ^2	20.612							
P	0.008							