




## OCCURRENCE OF DIABETES AMONG RURAL WOMEN

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### ABSTRACT

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Diabetes has already been described as an epidemic, and health care system around the world is bearing its pressure. Globally, it has to be dealt with huge care. In the present study, 1001 rural women (Age 21-90 years; mean age:  $54 \pm 3.2$  years) from the northern region of Punjab were analyzed for the serum glucose levels, to estimations its occurrence/prevalence. The subjects were divided into different age groups. The study revealed a high percentage (46.2%) of subjects with serum glucose levels higher than the normal range of 70-110 mg/dl of blood. Age groups of 21-30 and 81-90 years showed a less prevalence of diabetes, whereas age groups between 31-40 and 41-50 years is most prone showing higher percentages (average 12.9 and 18.5%, respectively). The study is an indicative of a major crisis in the coming times. The data suggests that awareness drives and remedial measures should be enforced with immediate effect.

**Contribution/Originality:** This study contributes to the existing literature related to prevalence of diabetes in India. This study is one of very few studies which have investigated the prevalence and awareness of diabetes among women of rural areas of Punjab. The paper's primary contribution is finding that rural women in age groups between 31-50 are most prone to diabetes.

## 1. INTRODUCTION

Diabetes is a recognized as a global epidemic [1]. About 200 million diabetic people are present worldwide. The incidence of both cancer and diabetes is dramatically increasing worldwide, costing governments many millions of expenditures related to medical health systems [2]. Despite the high prevalence, serious long term complications and established evidence based guidelines for management of diabetes mellitus and the quality of care is still deficient in developed and developing countries [3]. The changing socio-economic scenario has affected the lifestyle of the people [4, 5]. Increased luxury, less strenuous life and modern facilities has resulted in decreased physical activities [6]. Greater food availability adds fuels to the fire, specially the fast and junk food [7]. All these conditions favor expression of diabetes in the population which may already have a racial and genetic susceptibility of the disease. A high prevalence of diabetes has been reported in various states of India including Chennai [3, 8, 9]. Subsequent studies from urban parts of Chennai reported age standardized prevalence of diabetes and impaired glucose tolerance to be 12.1% and 14.0% respectively [10]. Among 26,066 individuals of all ages 779 had known diabetes and 99.4% of them had type 2 diabetes. The prevalence of known diabetes was 2.9% for all ages and both sexes combined [9]. In another Chennai based study, the prevalence of hypertension and type 2 diabetes were reported to be 26.5% and 16.3%, respectively [11].

Diabetes, though caused by the malfunctioning of the insulin hormone, is greatly affected by the intake of carbohydrate and fat rich diet and various factors like stress [12, 13] environmental factors [14] and viruses [15]. Greater carbohydrate intakes require greater output of insulin from the pancreas to maintain optimum blood glucose level. This stresses the pancreas. Deficiency of insulin causes increased levels of glucose in the blood. Insulin resistance, diabetes mellitus, and metabolic syndrome in patients with human immunodeficiency virus (HIV) infection are increasingly being reported in the global medical literature [16].

Though the phenomenon is worldwide and symptom like excessive thirst may be obvious, generally people are unaware of this condition. The noticeable symptoms of diabetes may take years to appear. The patients are at an increased risk of cardiovascular disorders (both micro and macro) and associated diseases like retinopathy and hypertension. WHO-ISH reported that deaths and disabilities due to cardiovascular diseases are increasing rapidly in developing countries.

With modernization and changing demographic profile of the population, cardiovascular diseases are assuming importance [17, 18]. Elevated blood pressures are also found to be associated with cardiovascular disorders. The present study is focused on the estimation of the number of females in a sample population of south west region of Punjab with respect to the occurrence of diabetes among them.

## 2. MATERIAL AND METHODS

### 2.1. Subjects

Northern part of Punjab was selected as the area of survey and data collection. 1001 rural women (age 20-88 years; mean age  $54 \pm 3.2$  years) were selected for this study after taking their consent to participate in the study Table 1. The subjects were categorized with respect to their age into 7 age-groups (21-30, 31-40, 41-50, 51-60, 61-70, 71-80 and 81-90).

Table-1. Percentages of subjects with different serum glucose levels with respect to different age groups.

Age groups (yrs.)	Serum glucose level (mg/dl)			
	70-110	110-150	150-200	>200
21-30	80 (86.0%)	1 (1.1%)	5 (5.4%)	7 (7.5%)
31-40	124 (62.3%)	26 (13.1%)	23 (11.6%)	26 (13.1%)
41-50	111 (44.4%)	39 (15.6%)	41 (16.4%)	59 (23.6%)
51-60	106 (39.5%)	61 (22.8%)	62 (23.1%)	39 (14.6%)
61-70	58 (58.6%)	19 (19.2%)	11 (11.1%)	11 (11.1%)
71-80	22 (46.8%)	11 (23.4%)	6 (12.8%)	8 (17.0%)
81-90	38 (84.4%)	0 (0.00%)	0 (0.00%)	7 (15.6%)

## 3. DATA COLLECTION

The information regarding age and diet was recorded through a questionnaire.

### 3.1. Blood Sampling and Serum Separation

4ml of venous blood was collected from each subject in fresh and clean tubes. Blood samples were allowed to stand still and clot for half an hour. After clotting of the blood, the tubes were subjected to centrifugation at 3,000 rpm for 15 minutes. The clean supernatant was collected by micropipette and used for further analysis.

### 3.2. Serum Glucose Level Estimations

The collected serum samples were tested for the analysis of glucose. The random serum glucose was estimated using ENZOPAK glucose based on Glucose oxidase / peroxidase (GOD/POD) method as described by Trinder [19].

This method is based on the production of the final colored complex by the action of glucose oxidase on glucose and peroxidase on 4-aminoantipyrine, hydrogen peroxide and phenolic compound. The intensity of the color produced is measured photo-metrically at 505 nm. The glucose concentration is calculated by comparing the test and standard absorbance.

#### 4. RESULTS

This study involved 1001 rural Punjabi women of different age groups. Table 1 shows the number and mean age of the females in each age group. The results showed a high percentage (46.2%) of subjects with serum glucose levels higher than the normal range of 70-110 mg/dl of blood. 539 out of 1001 subjects had a normal range of serum glucose level. 462 subjects had abnormal values falling in different ranges of 110-150, 150-200 and >200 mg/dl Figure 1. The age groups of 21-30 years and 81-90 years showed a low percentage of diabetic patients as compared to the other age groups. The age group of 51-60 years showed the highest percentage of subjects with abnormal serum glucose levels as shown in Table 2.

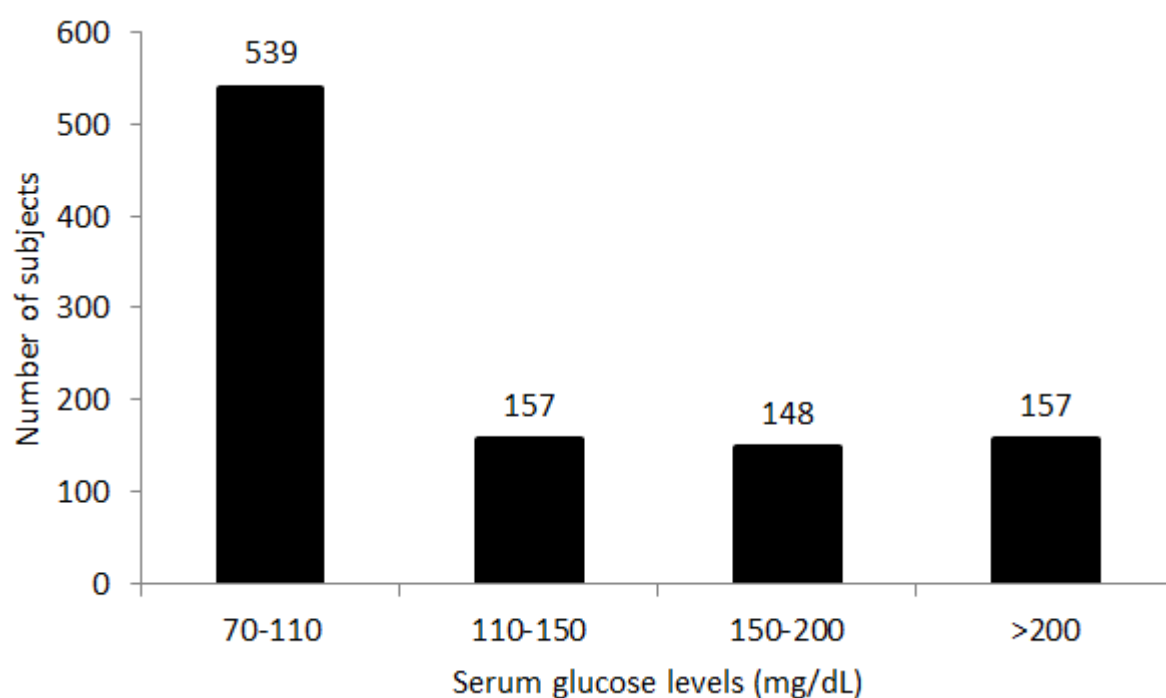


Figure-1. Number of subjects having different serum glucose levels (n=1001).

Table-2. Serum glucose levels in subjects of the different age groups (n=1001).

Subjects	Sex	Age groups (mean age)						
		21-30	31-40	41-50	51-60	61-70	71-80	81-90
N=1001	Female	93	199	250	268	99	47	45
		26.38yrs.	36.23yrs.	45.67 yrs.	57.02 yrs.	65.80 yrs.	73.53 yrs.	84.67 yrs.

#### 5. DISCUSSION

India had nearly 33 million diabetic patients in 2005 [20]. The ever increasing prevalence of diabetes is due to the rapidly changing socio-economic status and food habits. Indian population faces a high risk of diabetes and its associated complications. Diagnosis of the high risk group and lifestyle modifications may help in decreasing the prevalence of this disease.

In 2005, the percent prevalence (among all aged people) of diabetes mellitus in rural, industrial and urban habitats were found to be: 1.66 +/- 0.58 (male 1.99 +/- 0.88, female 1.3 +/- 0.75); 3.00 +/- 0.74 (male 3.17 +/-

1.04, female 2.80 +/- 1.04) and 4.8 +/- 0.98 (male 5.31 +/- 1.43, female 4.27 +/- 1.32) respectively Das, et al. [21]. Agrawal, et al. [22] analyzed the prevalence of diabetes in Raica community at Rajasthan, consuming camel milk (n=501). The prevalence was found to be 0%. Analysis also showed that consumption of camel milk was statistically highly significant as protective factor for diabetes Agrawal, et al. [22]. Ramachandran, et al. [23] compared prevalence of diabetes between a city, a town, and peri-urban villages (PUVs) in southern India and found that PUVs had a lower prevalence of diabetes (9.2 {95% CI 8.0-10.5}, P < 0.0001) than the city (18.6 [16.6-20.5]) and town (16.4 [14.1-18.6]).

Amarapurkar and Patel [24] analyzed 200 patients with hepatitis C virus infection for Type II diabetes mellitus and found 22% occurrence with mean duration of 6.1 ± 2.3 years. The percentage of young diabetic patients rose from 0.55% in 1992 to 2.5% in 2009 (trend chi square, 15.1, p<0.001) [25]. In the southern states of India, in 2009, the prevalence of diabetes among adults had reached approximately 20% in urban populations and approximately 10% in rural populations Ramachandran, et al. [23]. Anjana, et al. [26] reported that the prevalence of diabetes (both known and newly diagnosed) was 10.4% in Tamil Nadu, 8.4% in Maharashtra, 5.3% in Jharkhand, and 13.6% in Chandigarh.

Our results show a very high prevalence of diabetes (46.2%) among the rural Punjabi women. It may be attributed to a high caloric diet and stagnant life. Though the women kept working in their households yet their heavy diets comprising primarily of wheat may have affected the blood glucose levels. Junk food was also prevalent in some of the sections. Very few subjects (1.2%) went for a daily morning walk. It is an alarming situation where lethargic lifestyles and carbohydrate rich diet has shown its effects. It is estimated that in 2011, Maharashtra, Tamil Nadu, Jharkhand and Chandigarh will have 6 million, 4.8 million, 0.96 million and 0.12 million individuals respectively with diabetes. Estimations for the whole of India would be 62.4 million people with diabetes in 2011 [26].

## 6. CONCLUSION

The present study was focused on understanding the level of diabetes in the rural women of Punjab. Majority of the women surveyed were unaware of either the diabetic condition or about its consequential health impacts. The present study emphasizes a need of assessing the risk of a female becoming diabetic by taking the multiple physical health factors into consideration apart from the genetic constitution.

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**Competing Interests:** The authors declare that they have no competing interests.

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