

## Early Onset of Type 2 Diabetes in Pune

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**ABSTRACT** Inter-regional disparities of Type 2 Diabetes are quite predominant at a very early age. Therefore, this study was planned to highlight the epidemiology of early onset of diabetes in the Indian population. 750 diabetic patients were identified based on WHO criteria from various hospitals within Pune city. Age at onset was defined as the age at diagnosis of the disease among male and female patients. The results indicated that diabetes manifested significantly earlier in the study population with a large number of subjects who were below 40 years of age. It was also observed that male patients developed diabetes a decade earlier than the females. Thus, any such analysis needs to be treated gender wise instead of treating it as a cohort. All these may be due to various epidemiological, lifestyle factors coupled with socio-cultural, economic status of the people, acting jointly. Therefore, it is suggested to rule out the possibility of Type 2 Diabetes at the age of 20 through yearly check-ups of fasting blood sugar levels and urine analysis to detect the disease in younger population.

### INTRODUCTION

The global burden of Type 2 Diabetes Mellitus (T2DM) was estimated to be 285 million in 2010 which was projected to increase by 438 million in 2030. Similarly, for India this increase was estimated to be 58%, that is, from 51 million people in 2010 to 87 million in 2030 (Snehalatha et al. 2009). Type 2 Diabetes is the most common form of diabetes constituting 90% of the diabetic population. This is because of a marked increase in the incidence of Type 2 Diabetes in developing countries like India. Presently, India has a large number of diabetics in the world and there is a continuous increase in morbidity and premature mortality in subjects with undiagnosed diabetes. Epidemiological studies in migrant Asian Indians all over the world showed a high prevalence of Type 2 Diabetes in Indian population as compared to the other ethnic groups (Zimmet et al. 1981). On the contrary, the disease is less prevalent in countries like Japan, where they have retained their traditional lifestyles (Zimmet et al. 1981). Thus, India is and will be facing a big challenge of Type 2 Diabetes in future predominantly due to the rapid lifestyle changes.

In the last two decades, India has witnessed a rapidly exploding epidemic of Type 2 diabe-

tes. It was observed that within India, inter-regional disparities of Type 2 Diabetes were quite prominent at a very early age. This could be due to various demographic patterns, as epidemiology of diabetes differed not only across the rural-urban divide in India but also across different states and at different stages of demographic transition. Therefore, the study highlights the epidemiological investigation of early onset of the disease in an urban city of Pune, representing Indian population.

### METHODOLOGY

#### Study Population

The study population consisted of 750 diabetic patients who had clinical symptoms of Type 2 Diabetes. The patients belonged to different ethnic groups, had different cultural background and belonged to varied socio-economic status. They were grouped as Marathas, Brahmins, Backward Caste (BC) and Migrants (Marwaris, Gujaratis, Punjabis, Sindhis and Bengalis who were from different states of India but had settled in Pune). Since the data comprised of 750 diabetic patients, there were more males (N = 487) than females (N=263), whose age was above 30 years. The data collection was carried out during 2000 to 2004 that is for four consecutive years.

#### Methodology and Study Design

The diagnosis of the disease was based on 'WHO criteria' (WHO 1998) and was confirmed

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by a physician. The data was collected from K.E.M hospital (King Edward Memorial Hospital), AFMC (Armed Force Medical College), Sassoon Hospital, Poona Hospital and Nanda-deep Hospital within Pune city, India. A written informed consent was obtained from all the participants who had participated willingly in the study. Along with structured questionnaires, in-depth interviews were also performed. The statistical analysis were done using 'Software Stata 10 package'. Statistical analysis included mean, standard deviation, t-test and Chi-square test and the (p value less than 0.05) was considered to be statistically significant.

During data collection, each patient was interviewed individually and later with their family members. Since the focus of the present study was Type 2 Diabetes Mellitus which normally manifests itself in the middle age, data were collected from male and female subjects who were above the age of 30. Exclusion criteria were subjects with Type 1 diabetes, Impaired Glucose Tolerance (IGT), and diabetes due to any other disease category.

## RESULTS

### Age at Onset

As exact age at onset of diabetes could not be ascertained, age at onset was calculated by subtracting the number of years they were known to be suffering from diabetes from the age of the subject at the time of interview. Analysis of the data revealed that irrespective of sex, the diabetic patients under study became aware of their diabetic condition, approximately at the mean age of 51 years, that is, in the middle ages (Table 1). A comparison between male and female patients showed that male subjects developed the disease a decade earlier (47 years) than the females (59 years), ( $p < 0.01$ ).

For further analysis, data was categorized into three broad categories: young adults in the age group of 30 – 39 years, middle age group between 40 – 59 years and the senior patients above age of 60 (Table 2). The research revealed that the mean age at onset of the disease in the youngest age group (30 – 39 yrs) was 35 years among the male patients and 37 years among the female patients ( $p < 0.01$ ). For the middle age group, (between 40 – 59 yrs) the mean age at onset of diabetes was 45 years among the males

**Table 1: Mean age at onset of diabetes among patients under study**

<i>Patients</i>	<i>N</i>	<i>Mean age at onset</i>
Male	487	47.26 ± 11.56
Female	263	59.38 ± 9.91
Total	750	51.51 ± 12.43

*Note* – Since exact age at onset of diabetes could not be ascertained, age at diagnosis has been considered as age at onset of the disease in the patients under study. The onset of the disease was statistically significant ( $t = 14.38^*$ ).

and 56 years for the females ( $p < 0.01$ ). In the patients above the age of 60, the mean age at onset of the disease was 64 years in both the male and the female patients.

**Table 2: Mean age at onset of the male and female patients**

<i>Variables</i>	<i>Males</i>	<i>Females</i>	<i>Overall mean age at onset</i>
<i>Mean age (age group wise)</i>			
30-39 yrs	35.44 ± 2.42 (n = 98)	37.50 ± 1.77 (n = 14)	35.69 ± 2.44 (n = 112)
40-59 yrs	45.36 ± 4.20 (n = 324)	56.15 ± 2.76 (n = 120)	48.27 ± 6.15 (n = 444)
60+ yrs	64.78 ± 5.86 (n = 65)	64.54 ± 5.25 (n = 129)	64.62 ± 5.44 (n = 194)

The mean age at onset of the patients was found to be statistical significant among the male and female patients in the age group of 30 to 39 years ( $t = 3.16^*$ ) and 40 to 59 years ( $t = 26.12^*$ ), whereas 60+ years non-significant ( $t = 0.28$ ).

In order to find out at what age the patients (male and female) were more prone to developing diabetes, the data was further arranged in five year age groups. It was observed that maximum numbers of the male patients (approx 25%) had the onset of diabetes between the age group of 46 to 49 years (Fig. 1), that is, in the second half of the fifth decades whereas 12 percent had diabetes as early as 36 to 39 years. In case of female patients, nearly half (49%) of them had their onset of diabetes above the age of 60 (Fig. 1) whereas four percent of them had an early onset between 30 to 35 years (Table 3). Thus, the research highlighted that majority of the men were more prone to developing diabetes in the second half of the fifth decade while maximum females were vulnerable to the disease in later years of life. A conspicuous early onset of Type 2 Diabetes was observed in both male and female patients, that is, below 40 years ( $p < 0.001$ ).

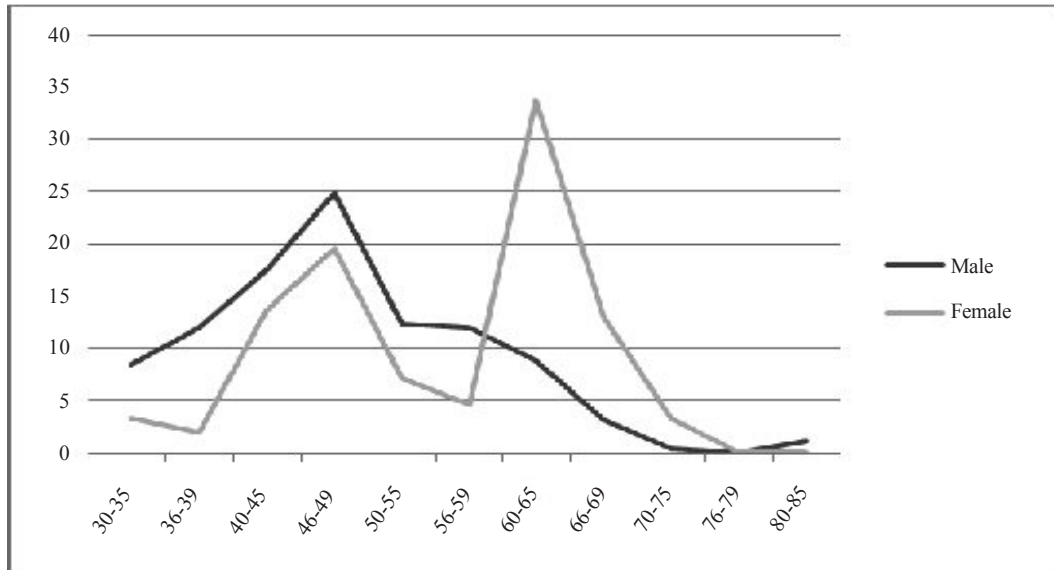


Fig. 1. Age at onset of diabetes in male and female patients: five years age group. Age at onset peak during 46 to 49 yrs in male patients; age at onset at peak during 60 to 65 yrs in female patients.

Table 3: Percent frequencies of male and female patients in five years gap age groups

Diabetic patients Years	Total				Total	
	Male		Female		No.	%
	No.	%	No.	%		
30-35	41	8.42	9	3.42	50	6.67
36-39	57	11.70	5	1.90	62	8.27
40-45	85	17.45	36	13.69	121	16.13
46-49	121	24.85	54	20.53	175	23.33
50-55	60	12.32	18	6.84	78	10.40
56-59	58	11.91	12	4.56	70	9.33
60+	65	13.35	129	49.05	194	25.87

The differences between the male and female patients were found to be statistically highly significant ( $\chi^2 = 128.06^{***}$  with d.f. to be 6).

Further, in order to identify the most vulnerable decade when the patients became diabetic the data was arranged in ten years age groups (Table 4). The analysis revealed that maximum number of male diabetic patients (42%) had an onset in the fifth decade (40 – 49 yrs) whereas majority of the female patients (49%) had an onset in the seventh decade (60+) of their lives. 15 percent of the total subjects (male and female) had their onset as early as 30 -39 years ( $p < 0.001$ ).

## DISCUSSION

The research highlights that irrespective of the gender, study patients became aware of their

diabetic condition approximately at the age of 51 years, that is, in their middle ages.

The study also indicated that men were more prone to developing diabetes in the second half of the fifth decade while females were more vulnerable in the later years of their life. The most distinguishing feature of the study was the marked difference in the onset of the disease between male and female patients where the male patients developed the disease a decade earlier than the females. Therefore, any such analysis needs to be treated gender wise instead of pooling as a cohort.

It was also interesting to note that age at onset of diabetes in Indian populations has reduced to below 40 years. This could be due to various

**Table 4: Percent frequencies of male and female patients in ten years gap age groups**

Age groups Years	Diabetic patients				Total	
	Male		Female (%)		(No.)	(%)
	(No.)	(%)	(No.)	(%)		
30-39	98	20.12	14	5.32	112	14.93
40-49	206	42.30	90	34.22	296	39.47
50-59	118	24.23	30	11.41	148	19.73
60+	65	13.35	129	49.05	194	25.87

The differences between the male and female patients were found to be statistically highly significant ( $\chi^2=126.25^{***}$  with d. f. to be 3).

influential epidemiological, lifestyle factors like industrialization, modernization, urbanization coupled with socio-cultural and economic status of the people, acting jointly. One of the most important factors could be due to the lack of refined medical facilities in some areas, along with other additive factors of large scale illiteracy and ignorance about the disease in the society. Only in case of some serious problems or complications, the patients are referred to expert medical specialists or diagnostic centres where they are diagnosed to be diabetics (Bagga 2003).

Earlier studies have reported that apart from the increasing prevalence of diabetes in the Asia-Pacific region, age at onset of the disease has decreased consecutively. In developed European countries with predominantly Caucasian populations, majority of the diabetics were found above the age of 65 years. In contrast, developing countries like India have reported maximum numbers of diabetes between the ages of 45 and 64 years. Thus, Indians have the highest prevalence of diabetes in the world and among the Asian countries. The DECODA group of study reported that the age at which peak prevalence of diabetes was reached in Indian population was 10 years younger compared to the Chinese and Japanese among the Asian population. The prevalence of diabetes peaked at 70–89 years in Chinese and Japanese subjects in comparison to 60–69 years seen amongst the Indian subjects (DECODA Group of Study 2003). A survey by the National Commission on Macroeconomics and Health revealed that the prevalence of diabetes predominantly among the urban population of India had increased by six percent in the 30-39 years age group, 13 percent in the 40-49 years age group and one-fifth of the population belonging 70 years and above. Further, the DECODA group of study also showed that majority of the diabetics were between the age of

45 to 64 years and to make matters worse the age at onset was further declining. The epidemiology of Type 2 diabetes had drastically worsened even in western developed nations where nearly a quarter (26.9%) of U.S. residents aged 65 years and 215,000 subjects below 20 years were diagnosed with Type 2 Diabetes (Centre for Disease Control and Prevention 2011). Thus overall, the trauma and risk for morbidity and mortality of people with Type 2 Diabetes is about twice that of people without diabetes.

## CONCLUSION

The study concluded that diabetes manifested significantly earlier with a large number below 40 years in the study population of Pune city. It was also seen that male patients developed diabetes a decade earlier than females and where further analysis needs to be treated gender wise without pooling it as a cohort. All these could be due to various influential epidemiological, lifestyle factors coupled with socio-cultural, economic status of the people, acting jointly. Thus, it is suggested to rule out the possibility of Type 2 Diabetes at the age of 20 through regular yearly check-up of fasting blood sugar levels and urine analysis to detect the disease in younger population.

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contributions, the work would not have been completed.

### NOTES

1. A caste may be defined as a collection of families or groups of families bearing a common name which usually denotes or is associated with specific occupation, claiming common descent from a mythical ancestor, human *or* divine, professing to follow the same professional callings and are regarded by those who are competent to give an opinion as forming a single homogeneous community Risley (1891).
2. An ethnic group is a group of human beings whose members identify with each other, usually on the basis of preferential endogamy and/or a presumed or real common ancestry Banks (1996).

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