

## Research Article

# The Changing Trends in the Prevalence of Type 2 Diabetes Mellitus Among the Persons with Type 2 Diabetes Mellitus

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### ABSTRACT:

**Background-** Diabetes mellitus is global health problem & prevalence is increasing worldwide. In recent years, age of onset of Type 2 Diabetes Mellitus (T2DM) is decreased which has been seen in several studies. Thus, prevalence of T2DM among young population has increased. In India, there are less studies regarding age of onset of T2DM.

In our study we studied age of onset of T2DM and its correlation with present age of persons with T2DM.

**Materials & Methods-** All the persons with T2DM who visited our hospital satisfying inclusion criteria were enrolled after taking proper consent. Total 1000 individuals where included, age of onset of T2DM was noted and correlated with various epidemiological variables.

**Results-** Among 1000 cases, 43.8% were males, while 56.2% females with mean age of onset of T2DM 47.61±9.54 years. In our study, 244 cases (24.4%) have self-reported age of onset ≤40 years of T2DM of which 172 cases (70.5%) are ≤40 years at present. The total cases of self-reported age of onset ≤40 years of T2DM were 244 (24.4%) ; among them, 68 cases (27.86%) had Hypertension, 198 cases (81.14%) had Body mass index >23 kg/m<sup>2</sup>, 207 cases (84.83%) had family history of T2DM and 169 cases (69.26%) were engaged in physical activity <150 min/week.

**Conclusions-** The prevalence of T2DM has increased drastically in recent past. The various risk factors play a significant role throughout the spectrum of all ages of onset of T2DM and must be addressed to delay the onset of T2DM.

**KEY WORDS:** prevalence, young diabetes, T2DM, age of onset of T2DM.

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### INTRODUCTION:

Diabetes mellitus (DM) is a chronic metabolic disease, characterized by hyperglycemia, which can be attributed to either impaired secretion of insulin or defective insulin action or both. DM is a major health problem in the world leading to considerable morbidity and mortality. Prevalence of diabetes is expected to rise exponentially, currently 77 million people in India and 463 million people are living with diabetes across the

world, and this number is expected to rise to 101 million in India and 578 million globally by 2030 which could mostly be attributed to unhealthy lifestyle, increasing life expectancy, illiteracy, lack of awareness and low socioeconomic status.<sup>[1,2,3]</sup>

This rise in prevalence of DM may be because of increase in life expectancy of people living with diabetes and its early age of onset. In recent years few studies have suggested that the age of onset of Type 2 Diabetes Mellitus (T2DM) has declined and is detected

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in early ages, which was initially considered classically the disease of old age.<sup>[4]</sup> DM is associated with certain risk factors, which can be non-modifiable or modifiable. Non modifiable risk factors include advancing age and family history, whereas modifiable risk factors include obesity, hypertension, dyslipidemia, decreased physical activity, unhealthy diet etc.<sup>[5,6]</sup> Early-onset T2DM is usually considered as occurring below the age of 40 years. This can be further separated into child and adolescent (less than 18 years) and young adult (18 to 25 years). Early-onset T2DM has been reported in countries with different ethnic and cultural backgrounds.<sup>[4]</sup> Early onset of diabetes is associated with prolonged course of illness, which could lead to higher rate and early onset of diabetes related complications. As DM not only affects the health of an individual, it also has significant impact on functional capacities as well as quality of life of an affected individual. It is one of the major contributors of premature mortality as more than one third of diabetes related deaths have been documented in individuals below 60 years of age.<sup>[7,8]</sup> With an increasing incidence worldwide, DM will be a leading cause of morbidity and mortality for the foreseeable future. Although T2DM is a disease related to aging, the prevalence of early-onset has increased globally.<sup>[7-10]</sup>

In India, there are not many studies regarding age of onset of T2DM. We aimed to study the age of onset of T2DM in persons with T2DM and its correlation with their present age.

## MATERIALS & METHODS:

This was an observational cross-sectional study conducted at our Medicine and Endocrine Outpatient Department (OPD). The study was approved by Institutional ethical committee. A total of 1000 individuals known to have T2DM were recruited consecutively for the study. An informed consent was obtained from the participants. Inclusion criteria included (1) all adult with previously diagnosed with T2DM on treatment, and (2) willing to participate in the study. Exclusion criteria included (1) persons with gestational DM, (2) secondary DM, (3) Type 1 DM, (4) Latent Autoimmune Diabetes in Adults (5) Maturity-onset diabetes of the Young and (6) not willing to give consent to participate in the study.

Detailed clinical examination and clinical records were noted of individuals. Statistical analysis (by using chi-square test) was performed on all eligible subjects enrolled in the study. The prevalence of all changes has been summarized as counts and percentages.

## RESULTS:

1000 individuals with T2DM with mean age of  $51.12 \pm 10.92$  years were included in the study. The male-to-female ratio was 0.78:1. Among the 1000 cases, 244 cases (24.4%) have self-reported age of onset  $\leq 40$  years of T2DM of which 172 cases (70.5%) were  $\leq 40$  years at present, this suggests that the prevalence of T2DM has increased among young in recent past.

Details of self-reported age of onset of T2DM is described in table 2. The prevalence of T2DM increased from 0.4% in 1991-1995 to 57.4% after 2020, also prevalence of T2DM in cases with self-reported age of onset  $\leq 40$  years was none in 1991-1995 which increased to 25.43 % after 2020, as depicted in table 1. In our 244 cases reported, age of onset of T2DM  $\leq 40$  years, 68 cases (27.86%) had hypertension 198 cases (81.14%) had body mass index  $> 23$  kg/m<sup>2</sup>, 207 cases (84.83%) had family history of T2DM and 169 cases (69.26%) were engaged in physical activity  $< 150$  min/week.

## DISCUSSION:

In India, the cases of diabetes are increasing significantly and it is one of the major public health problems. Though previously, T2DM was considered as disease of elderly, early onset diabetes i.e. occurrence of diabetes before 40 years of age is also not uncommon.<sup>[6]</sup> Literature suggests that Indians present with T2DM at younger age as compared to Western population. Indians also differ in body composition, though the BMI may be same, but they have higher fat content and low lean body proportions.<sup>[11]</sup> Advancing age is a non-modifiable risk factor for diabetes and age at presentation depends upon various factors such as health seeking behaviour of patients, presence of symptoms etc. In our study population, mean age of participants was  $51.12 \pm 10.92$  years and 653 (65.3%) cases belonged to 41 to 60 years of age whereas, 172 (17.2%) cases belonged to  $\leq 40$  years of age. The mean age of patients in ICMR INDIAB-17 (2023) was 43.0 years, indicating early age of onset of diabetes in India.<sup>[12]</sup>

In our study, majority of cases enrolled with diabetes were females (56.2%, n=562), as compared to males (43.8%, n=438). Our study findings were concordant with the findings of ICMR INDIAB-17 (2023), in which the prevalence of diabetes was found to be 53.5% in females and 46.5% in males in India.<sup>[12]</sup> In our study, the mean age of onset of diabetes among males was found to be slightly higher ( $51.76 \pm 11.54$  years) as compared to females ( $50.62 \pm 10.39$  years). The findings of present study were concordant with the

**Table 1:** Prevalence of T2DM over last few years in patients having self-reported age of onset  $\leq 40$  years with T2DM

Year of diagnosis	No. of patients (n = 1000)		Age at onset		Patients having self-reported age of onset = 40 years with T2DM	
		%	Mean	SD		%
1991 -1995	4	0.4	45.00	11.343	0	0
1996 -2000	14	1.4	46.79	8.496	4	28.57
2001 -2005	26	2.6	45.46	10.670	10	38.46
2006 -2010	57	5.7	48.37	8.719	15	26.31
2011 -2015	73	7.3	50.56	10.327	10	13.69
2016 -2020	252	25.2	48.09	10.105	60	23.80
>2020	574	57.4	47.08	9.170	145	25.43

**Table 2:** Association of self-reported age of onset of T2DM with age

Age (years)	Self-reported age of onset of T2DM (years)					
	=40 (n=244)		41 -60 (n=669)		>60 (n=87)	
	n	%	n	%	n	%
<40	172	70.5	0	0.0	0	0.0
41 -60	69	28.3	584	87.3	0	0.0
>60	3	1.2	85	12.7	87	100.0
Mean±SD	39.05±7.64		53.19±7.21		69.02±6.86	
χ <sup>2</sup>	1074.56					
p -value	0.001					

findings of ICMR INDIAB-17 (2023), the mean age of male cases was significantly higher as compared to the female cases (44.0 $\pm$ 0.11 years vs. 42.1 $\pm$ 0.09 years;  $p < 0.05$ ).<sup>[12]</sup> Our study findings were concordant with findings of Amed S et al (2018) documented increase in incidence of early onset diabetes among females during over the decade from 4.4 cases per 100000 per year in 2002 to 2003 to 7.21 cases per 100000 per year in 2012-13, but the change in incidence among males could not be observed.<sup>[13]</sup>

In our study, mean self-reported age at diagnosis of diabetes was 47.61 $\pm$ 9.54 years and age of onset of diabetes was  $\leq 40$  years in about 24.4% (n=244) cases of them. Among 244 self-reported cases, in 24.4%, age of onset was  $\leq 40$  years of T2DM of which 172 cases (70.5%) are of age  $\leq 40$  years at present, this suggests that the prevalence of T2DM increased in recent past amongst younger population. We found that, mean self-reported age of onset in patients belonging to less than 40 years of age was 34.44 $\pm$ 5.07 years, whereas mean age at onset was 48.07 $\pm$ 5.94 years and 68.81 $\pm$ 8.16 years in patients belonging to 41 to 60

and elderly age group respectively. Our study findings were concordant with findings of Siddiqui MK et al (2022), the mean age of patients diagnosed before 40 years of age was 34.1 year whereas the mean age of patients diagnosed after 40 years of age was 52.6 years.<sup>[14]</sup>

We enquired about year of onset of diabetes to assess the change in age at diagnosis over past few decades. In our study, prevalence of T2DM increased from 0.4% (n=4) in 1991-1995 to 57.4% (n=574) in after 2020, also prevalence of T2DM in cases with self-reported age of onset  $< 40$  years was none in 1991-1995, which increased to 25.43 % (n=146) after 2020. According to a study conducted by Patel B et al (2020), the mean age of onset of diabetes was 48.53 years during 1991 to 1995, which decreased to 42.70, 41.98, 39.5 and 35.79 years in 1996-2000, 2001-2005, 2006-2010 and 2011-2015 respectively, with slight increase to 36.14 in 2016-2018.<sup>[15]</sup> There are various epidemiological variables which lead to early age of onset of T2DM. We found that, out of the total cases of self-reported age of onset  $\leq 40$  years of T2DM, 68 cases

I(27.86%) had HTN, 198 cases (81.14%) had BMI >23 kg/m<sup>2</sup>, 207 cases (84.83%) had family history of T2DM and 169 cases (69.26%) engaged in physical activity <150 min/week. In the study of ICMR INDIAB-17 (2023), about 28.6% were found to be obese and about 35.5% were found to have hypertension in India.<sup>[12]</sup> In the study of Panikar VK et al (2008), they reported a significant decline in mean age at onset of diabetes from first generation to second generation i.e. from 55.95 years to 38.4 years.<sup>[16]</sup> Our study finding were consistent with the study of Hao Z et al (2022), the mean age at onset of DM was significantly younger in patients with positive family history in both parents (47.5±11.0), and in father (47.9±11.1) and mother (51.1 ± 10.5 years) as compared to patients with no family history of diabetes (54.1 ± 10.5 years).<sup>[17]</sup>

## CONCLUSION:

The prevalence of T2DM has increased drastically in recent past. The age of onset of T2DM is declining over decades. There were no cases of T2DM with age of onset ≤40 years in year 1991 to 1995, which increased to 25.43 % cases 2020 onwards. Thus, the prevalence of T2DM has been increasing in the young population. The risk factors may be family history, compromised physical activity, increased body mass index and co-morbidities like hypertension. These risk factors play a significant role throughout the spectrum of all ages of onset of T2DM and must be addressed to delay the onset of T2DM.

**Limitation of study:** - The possibility of sample bias cannot be ruled out, as study was done on basis of people's recall.

**Conflict of interest:** - Declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of the research reported.

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