INCREASING AGE: A DETERMINANT FACTOR RESPONSIBLE FOR DIABETES AMONGST INDIAN POPULATION

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Abstract: Type-2 diabetes is a condition that affects people over the age of 40 poses a real danger to health as people age. Iincreasing age puts people at higher risk of developing type-2 diabetes. The highest prevalence is observed in 70 and 50-59 years of age groups i.e. 32.6% and 21.2% of total diabetics respectively. The lowest incidence rate (2.4%) is detected in 20-29 years of age group. The cumulative risk of disease is more in 40-49 years of age group (33.3%). and 30-39 years of age group (24.3%). In the total population 63.2% subjects belong to 39 years of age and 36.8% are of >40 years of age.

Key Words: Type 2 diabetes; Prevalence; Age; Age groups

Introduction: Age remains the single most significant risk factor for diabetes among all Indian population. It is very important to find out the prevalence of diabetes in different age groups because this parameter is further related with other factors involved in the onset of this disease. But it has been found from the literature that there are very few studies taking more than four or five age groups. However, in the present study eight different age groups have been taken in order to narrow down detection of most vulnerable age group.

Diabetes in middle aged population is the most common form of diabetes. The risk of type 2 diabetes increases specially after age 40s. People exercise less; lose muscle mass and gain weight as they age. Even if an elderly person is thin, still may be predisposed to getting diabetes. Pancreas ages right along with age doesn't pump insulin as efficiently as it did when we were younger. Also, as cells age, they become more resistant to insulin as well.Putting on weight in middle age raises the risk of type two diabetes, especially if it goes on around the stomach.

Whether diagnosed in infancy, adolescence or adulthood, type-2 diabetes is always a serious and potentially life-threatening condition if improperly managed. However, this study sheds light on the particular risks that will face early-onset diabetics when they reach middle age. After being hit by diabetes in middle age have to be very careful with their lifestyle. However, with some precautions and awareness one can easily detect it in early stages.

Materials And Methods: The present epidemiological and biochemical study has been undertaken in the district Sangrur, Punjab (India). The samples survey has been undertaken from the area covered and 1000 subjects were selected randomly for questioning regarding the different aspects of epidemiology. Out of these 1000 samples, 500 are from urban population and 500 from rural population. They were questioned personally, using a questionnaire which is designed for collection of data and also general information regarding age and various other epidemiological factors.

Results: Prevalence of diabetes mellitus in different age groups from the total population is shown in Table-1. The highest prevalence is observed in 70 and 50-59 years of age groups i.e. 32.6% and 21.2% of total diabetics respectively. The lowest incidence rate (2.4%) is detected in 20-29 years of age group. The cumulative risk of disease is more in 40-49 years of age group (33.3%). and 30-39 years of age group (24.3%). In the total population 63.2% subjects belong to 39 years of age and 36.8% are of >40 years of age. When comparison is made between these age groups in total population of 1000, the prevalence rates in different categories are as given below

	<39 years	>40 years
Borderline subjects	133 (13.3%)	108 (10.8%)
Newly detected (Diabetic subjects)	21 (2.1%)	34 (3.4%)
Known diabetic subjects	8 (0.8%)	30 (3.0%)
Total diabetic subjects	29 (2.9%)	64 (6.4%)

Out of the total borderline cases detected during study it becomes evident that the prevalence in this respect is more in <39 years and known diabetic subjects and newly detected diabetic subjects are more in the >40 years of age in total population. Hence the risk to develop this disease is higher in lower age groups as borderline cases are higher in lower age groups (Table 1).

Incidence rate for borderline, newly detected and known diabetic subjects in different age groups is highly significant ($p<0.01$) in all age groups (Table 2).

Discussion: In the present study the same value for diabetes from the total population has been found to be 4.9% which is almost similar to the earlier. Similarly, another work from Punjab is available that is of Sachdeva (1968) from Tripuri area of Patiala city where the prevalence was 0.32% in 20-46 years of age group and 1.53 in >40 year age group. In comparison to this work, the present study shows 1.9% and 6.4% prevalence in the same age groups respectively. Rao

et al. (1998) also found 1.17% of diabetes in age group of 25-44 years in rural India. He also found 2.8% and 5% of diabetes in >40 year of age in rural and urban population of India respectively.

But the prevalence of undiagnosed diabetes and risk factors for undiagnosed diabetes increase at the lower age group i.e. 30-39 years. Similar observations were made by Zimmet (1999).

The maximum incidence of onset of diabetes in the young subjects of 21-30 years was also reported by Chethy. (1986).

In the present study, the proportion of these subjects who are unaware regarding their status in relation to the disease found especially in young age group i.e. 30-39 years. Borderline cases are 24.3% in 30-39 years of age group and newly detected are 5.5% in the same age group (Table-5). But the prevalence of known diabetes mellitus cases is found to be high in age group >70 years i.e. 32.6%.

Prevalence of diabetes in Indians is usually thought to be low, partly due to the consideration of potentially misleading overall prevalence in a relatively youthful. Most of the these population studies were between 25 to 44 years of age groups and diabetes in these young age groups was about half of the overall crude prevalence. In rural India the prevalence of diabetes is 4.69% in 45-65 years of age group (Rao *et al.*, 1998).

By 65 years of age 18.7% of population still remained undiagnosed (Harris *et al.*, 1997). In the present study newly detected diabetics in >60 years age group are 17.2% in the total population studied. Borderline subjects are 16% in >60 years and 53.5% in 20-49 years of age groups. This observation becomes significant as it indicates that the risk of developing this disease is more at an early age and if it is diagnosed at an early stage then its onset can be delayed or prevented in later age groups.

According to Kochar and Gulyani (1997) mean age of diabetic patients was 41.75 years which was more than that of healthy subjects i.e. 26.3 years. This implies that age is an important criterion for the development of this disease.

According to the Ahren and Corrigan (1984) prevalence of diabetes was 2.9% in the population of aged >40 year and 4.9% in those aged <60 years. But in the present study the prevalence is 3.4% and 3.0% respectively in the same age groups. In the study of Oliveira *et al.* (1996) the age groups of 30-39, 40-49, 50-59, 60-69 years had a prevalence of diabetes 1.7%, 3.9%, 13.6%, 17.3% and in the present work this prevalence is enhanced to 7.7%, 8.3%, 21.2%, 16.13% respectively which is quite higher than the previous study. In the study of Ducorps *et al.* (1996) prevalence of diabetes in 30-64 years of age group was 2.84% but in the present study it is 6.3% in same age group. Similar to the study done there was an increase in the prevalence of diabetes in all age groups but it increases significantly in three decades of age that is 35-64 years (Ramachandran *et al.*, 1997). In present study out of total diabetics 67.7% subjects having diabetes represent in this age group i.e. 30-69 years. Elbagir *et al.*, 1996 found the crude prevalence of diabetes in ?25 years of age in different categories which as is under:

	Elbagir *et al.* (1996)	Present study
Total Cases	3.4%	8.3%
New cases	2.2%	4.7%
Known cases	1.3%	3.6%

Hence, comparison of both these studies indicates that prevalence of diabetes has been increased than previous studies. The major cause of such a higher prevalence seems to be the carbohydrate and fat rich diet of Indians than the Western people. Moreover, so far very few studies have been done from India. Less clear cut but still controversial, is the question of significance on the deterioration of glucose tolerance with age (Zimmet, 1982). There are two major schools of thought related to the reported decline in glucose tolerance with age noted in population studies (Zimmet *et al.*, 1981). The first view is that it is a natural phenomenon; part of ageing process. The other view states that a progressive decline in glucose tolerance with age is due to the general evolution of increasing number of true diabetics i.e. pathological change. However, DeFronzo (1981) had suggested that the age related decline in glucose tolerance results from tissue unresponsiveness to insulin that occurs with ageing.

In the presents study, about 63.2% of people are aged <40 years whereas 32.3% are aged >40 years and only 4.5% are >70 years of age. Prevalence of diabetes is 2.9% in the population aged <40 years, 3.4% in the aged <40 years and 3.0% in the population aged >60 years. Similarly Blanchard *et al.* (1996) found the prevalence of diabetes 1.6%, 2.9% and 4.9% in the same age groups respectively.

According to Banerjee *et al.* (1998), carbohydrate intolerance as seen with ageing was least due to altered hepatic glucose metabolism as fasting glucose got elevated insignificantly above 50 years (1mg/decade) of age but 2 hours after and blood sugar values increase by 5 mg/decade which reflects abnormal insulin sensitivity at post receptor level mainly in skeletal muscles and adipose tissue. Patients with NIDDM have deficiency of glucose transporter (GLUT-4) in insulin sensitive cells. Moreover, beta cells become defective in terms of quantitative and qualitative alteration in insulin

secretion. Amylin deposition in Islet cells may be a contributing factor. The abnormal glucose tolerance due to aging may be secondary to increased body fat mass, sedentary habit, reduced physical activity, impaired renal function, increased sympathetic activities and diabetogenic drugs.

S.No.	Status of subjects	Age Groups								
		<9 Yrs.	**10-19**	**20-29**	**30-39**	**40-49**	**50-59**	**60-69**	**71-70**	**Total**
I	Normal	38	152	153	121	66	59	47	17	**653**
		5.82%	23.27%	23.43%	18.53%	10.11%	9.03%	7.19%	2.60%	
II	Borderline	9	35	45	44	40	29	24	14	241
		3.73%	14.52%	18.67%	18.25%	1.59%	12.03%	10.37%	5.81%	
III	Newly detected diabetic	2	6	3	10	8	10	5	11	55
		3.63%	10.90%	5.45%	18.18%	14.54%	18.18%	9.09%	20.0%	
IV	Known diabetic	1	1	2	4	2	14	10	4	38
		2.63%	2.63%	5.26%	10.53%	5.26%	36.84%	26.31%	10.52%	
V	Hypogly-caemic	1	1	2	2	4	1	2	-	13
		7.69%	7.62%	15.38%	15.38%	30.77%	7.69%	15.38%		
	Total	51	195	205	181	120	113	89	46	1000
		5.1%	19.5%	20.5%	18%	12.0%	11.3%	8.9%	4.6%	

Parental diabetes, obesity, and metabolic syndrome traits effectively predict type 2 diabetes risk in a middle-aged white population (Peter et al 2007) Adiposity [body fat] is a well-recognized risk factor for type 2 diabetes among young and middle-aged adults (Mary et al, 2010).

In the Indian Council of Medical Research study, (Ahuja, 1979) on diabetes, prevalence of diabetes increased to 2.8% in rural and 5% in urban population after 40 years of age. In the present study known diabetics are 3.0%, newly detected diabetics 3.4%, and borderline cases 10.8% in total population after 40 years of age. Most of the previous studies were based on known diabetic subjects and it was present in more aged persons because the detection was delayed in lower age groups. As present study shows that borderline cases are more in lower age groups. Disease can be prevented if detected at proper time and its complications can be avoided.

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STATISTICAL ANALYSIS				
Status of subjects	**X^2**	**DF**	**P**	**NS/HS**
Normal	66.222	7	<0.001	HS
Borderline	12.134	7	0.01	HS
Newly detected diabetic	31.04	5	<0.1	HS
Known diabetic	45.645	2	<0.01	HS
Hypoglycaemic	1.300	1	>0.05	HS

TABLE 1

Random distribution of Normal, Borderline, Newly detected, Known diabetic and Hypoglycemic subjects from the general population district Sangrur, Punjab (India) based on 1000 subjects according to age groups (N=1000).

Status of Subjects		**<9 years**	**10-19 years**	**20-29 years**	**30-39 years**	**40-49 years**	**50-59 years**	**60-69 years**	**>70 years**
		n=51	**n=195**	**n=205**	**n=181**	**n=120**	**n=113**	**n=89**	**n=46**
Normal	n (%)	38 (74.50)	152 (77.94)	153 (74.63)	121 (66.85)	66 (55.0)	59 (52.21)	47 (52.80)	17 (36.95)
Subjects	BS (F)	77.02 ± 7.83	81.27 ± 9.85	80.47 ± 92.11	81.84 ± 8.51	83.62 ± 8.67	83.25 ± 8.67	81.29 ± 9.58	84.35 ± 8.63
(653)	BS (R)	108.66 ± 14.96	114.45 ± 17.82	115.90 ± 13.77	118.57 ± 12.22	117.71 ± 11.42	118.86 ± 13.55117	117.80 ± 15.54	123.41 ± 8.83
Borderline	n (%)	9 (17.64)	35 (17.94)	45 (21.95)	44 (24.30)	40 (33.33)	29 (25.66)	25 (28.08)	14 (30.43)
Subjects	BS (F)	95.77 ± 8.64	94.91 ± 11.48	99.08 ± 10.94	96.02 ± 9.86	97.82 ± 11.06	100.06 ± 9.89	96.76 ± 9.53	97.14 ± 9.75
(241)	BS (R)	160.77 ± 18.59	153.82 ± 16.15	159.04 ± 19.60	155.40 ± 13.90	164.85 ± 18.56	166.62 ± 15.04	160.32 ± 15.32	164.64 ± 15.60
Newly	n (%)	2 (3.92)	6 (3.07)	3 (1.46)	10 (5.54)	8 (6.66)	10 (8.84)	5. (5.61)	11 (23.91)
Detected	BS (F)	110.00 ± 5.00	126.50 ± 30.95	145.33 ± 37.86	136.50 ± 27.02	138.00 ± 9.70	147.00 ± 31.05	146.00 ± 37.42	144.90 ± 27.36
Diabetic	BS (R)	237.00 ± 35.00	209.00 ± 4.89	208.33 ± 31.03	233.50 ± 41.21	227.12 ± 42.33	244.40 ± 68.08	240.80 ± 22.74	240.54 ± 66.34
Subject(55) Known	n (%)	1 (1.96)	1. (0.51)	2 (0.97)	4 (2.20)	2. (1.66)	14 (12.38)	10 (11.23)	4 (8.69)
Diabetic	BS (F)	121.00	180.00	1454.00 ± 26.00	170.25 ± 33.95	160.00 ± 20.00	151.50 ± 40.24	152.40 ± 40.04	186.25 ± 67.02
subjects (38)	BS (R))	213.00	327.00	315.00 ± 35.00	296.00 ± 92.68	290.00 ± 10.00	255.42 ± 70.89	250.80 ± 63.57	234.75 ± 42.70
Hypoglycae	n (%)	1 (1.96)	1 (0.51)	2 (0.97)	2 (1.10)	4 (3.33)	1 (0.88)	2 (2.24)	
mic	BS (F)	60.00	40.00	55.00 ± 5.00	40.00 ± 0.00	53.50 ± 1.65	50.00	55.50 ± 0.50	
subjects (13)	BS (R)	71.00	89.00	81.00 ± 1.00	90.50 ± 20.50	104.50 ± 19.05	97.00	81.00 ± 0.00	
Total	n (%)	3 (5.88)	7 (3.58)	5 (2.43)	14 (7.73)	10 (8.33)	24 (21.23)	15 (16.85)	15 (32.60)
Diabetic	BS (F)	113.66. ± .60	134.14 ±34.22	148.80 ± 33.89	146.14 ± 32.91	142.40 ± 15.25	149.62 ± 36.76	150.26 ± 39.30	155.93 ± 45.61
Subjects	BS (R)	229.00 ± 30.73	225.85 ± 41.54	251.00 ± 61.63	251.42 ± 66.66	239.70 ± 45.67	250.83 ± 69.94	247.46 ± 53.74	239.00 ± 60.99
(ND+K) (93)									

BS : Blood sugar level, mg/dl F : Fasting, R : Random, ± : Standard Deviation

n : Number of subjects in each group ; N.D. : Newly detected diabetic subjects. K : Known diabetic subjects, N : Total Number of subject

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