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Incidence of Diabetes Mellitus with Association of the Body Mass Index

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Abstract
Objective*-To investigate the incidence of newly detected cases of diabetes mellitus, and correlation with the body mass index.* ***Research design****-The present study used in prospective observational cohort stud*
Method- P*ersons newly detected as a case of diabetes mellitus after health checkup. Age > 18 years and the persons known to have diabetes mellitus, coming for routine health checkup, age < 18 years and persons having impaired glucose tolerance were not placed in inclusion criteria.*
Sample and sampling technique*-A total of 158 persons were selected strictly according to the inclusion and exclusion criteria out of 597 persons who came who came for routine health checkup from 01.07.2009 to 31.12.2009 in the dept. of health checkup at Apollo Hospital, Bilaspur, Chhattisgarh.*
Result*-Incidence of newly detected diabetes mellitus= no. of newly detected diabetes mellitus/ total no. of persons underwent health checkup during 6 months × 100= 11/597×100Incidence of newly detected diabetes mellitus = 1.84%.*
Conclusion*- We are concluded that the prevalence rate of newly diagnosed diabetes mellitus disorder were high in Bilaspur Chhattisgarh India, and the high level of body mass index were significantly associated with prognosis in type 2 diabetes mellitus.*
Keyword: *Type 2 Diabetes Mellitus, Incidence Rate, Body Mass Index*

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I. Introduction

Diabetes mellitus refer to a group of common metabolic disorders that share the phenotype of hyperglycemia. Several distinct type of diabetes mellitus exist and are caused by a complex interaction of genetics and environmental factors. Depending on the etiology of the diabetes mellitus, factors contributing to hyperglycemia include reduced insulin secretion, decreased glucose utilization, and increased glucose production. The metabolic dysregulation associated with diabetes mellitus causes secondary pathophysiologic changes in multiple organ systems that impose a tremendous burden on the individual with diabetes and on the health care system. In the united states, diabetes mellitus is the leading cause of end-stage renal disease (ESRD), non-traumatic lower extremity amputations, and adult blindness. It also predisposes to cardiovascular disease. With an increasing incidence worldwide, diabetes mellitus will be a leading cause of morbidity and mortality for the foreseeable future.(1)

Rates of diabetes are increasing worldwide. At least 171 million people currently have diabetic, and this figure is likely to more than double to 366 million by 2030. The top 10 countries, in numbers of people with diabetes are currently India, China, The United States, Indonesia, Japan, Pakistan, Russia, Brazil, Italy and Bangladesh.(2)

Although the prevalence of both type-1and type-2 diabetes mellitus is increasing worldwide, the prevalence of type 2 diabetes mellitus is rising much more than rapidly because of increasing obesity and reduced activity level as countries become more industrialized. This is true in most countries and 6 of the top countries with the highest rates are in Asia. (1)

Studies have shown that Indians are inherently more insulin resistant compared to other world population groups, notably Caucasians, and develop diabetes mellitus at a younger age. Westernization of diets, adoption of more sedentary lifestyles and urbanization are all suggested co-factors in the epidemic of diabetes mellitus in India. The first data on incidence of diabetes mellitus from India reported and incidence rate of diabetes mellitus as 20.2 per 1000 person-years of follow-up of and of pre-diabetic as 13.1 per 1000 person-years of follow-up. This rate of incidence is extremely high in comparison to other ethnic group in the world.

There were an estimated 20-30 million people in India with diabetes in 2000 (estimate vary with study methodology) and projections suggest prevalence will rise to almost 80 million people by 2030. [3]

Body mass index (BMI) is a simple index of weight for height that is commonly used to classify underweight, overweight and obesity in adults. It is defined as the weight in kilograms divided by the square of the height in meters.[4]

The distribution of adipose tissue in different anatomic depots also has substantial implications for morbidity, specifically intra-abdominal and abdominal subcutaneous fats have more significant than subcutaneous fat present in the buttocks and lower extremities. This distinction is most easily made clinically by determining the waist to hip ratio, with a ratio >0.9 in women >1.0 in men being abnormal. Many of the most important complications of obesity, such as insulin resistance, diabetes, hypertension, hyperlipidemia, and hyperandrogenism in women, are linked more strongly to intra-abdominal and/or upper body fat than to overall adiposity. [5]

For Asian Indian adults, the cutoff values for waist to hip ratio for male and female are 0.88 and 0.81 respectively. [8]

Asian Indian have an increased susceptibility to type-2 diabetes and insulin resistance compared with Europeans. Recent studies indicate a rising prevalence of diabetes and insulin resistance in India. Although obesity is a major contributing factor to diabetes, Asian Indian are known to have lower BMIs than Europeans. However, for any given BMI, Asian Indians have greater waist to hip ratios and abdominal fat than Europeans.[6]

Objective-
To investigate the incidence of newly detected cases of diabetes mellitus, and correlation with the body mass index

Research design-The present study used in prospective observational cohort study
Method-
Inclusion criteria-persons newly detected as a case of diabetes mellitus after health checkup. Age > 18 years.
Exclusion criteria-persons known to have diabetes mellitus, coming for routine health checkup, age < 18 years and persons having impaired glucose tolerance were not placed in inclusion criteria.

Sample and sampling technique-

A total of 158 persons were selected strictly according to the inclusion and exclusion criteria out of 597 persons who came who came for routine health checkup from 01.07.2009 to 31.12.2009 in the dept. of health checkup at Apollo Hospital, Bilaspur, Chhattisgarh.

We measured various anthropological parameters of these selected persons like weight, height, body mass index.

Following this the venous blood samples of the subjects were sent to appropriate department for investigations.

Body mass index (BMI)- weight of the subject was measured (in kilograms) in light clothing without shoes after emptying bladder in standard weighing machine. Height was measured (in meters) from top of the head to the bottom of the feet without shoes by standard height scale. Body mass index was calculated by following formula:

BMI = Weight(Kg)/ Height (M^2)
Person were further categorized according to their BMI by following method as per WHO guidelines:

Table 1 the international classification of adult underweight, overweight and obesity according BMI (31).

Classification	BMI (kg/m^2)	
	Principal cut off points	**Additional cut off points**
underweight	**< 18.50**	**18.50**
Severe thinness	<16.00	<16.00
Moderate thinness	16.00-16.99	16.00-16.99
Mild thinness	17.00-18.49	17.00-18.49
Normal range	18.50-24.99	18.50-22.99 23.00-24.99
overweight	>25.00	>25.00
Pre-obese	25.00-29.99	25.00-27.49 27.50-29.99
Obese	>30.00	>30.00
Obese class 1	30.00-34.99	30.00-32.49 32.50-34.99
Obese class 2	35.00-39.99	35.00-37.49 37.50-39.99
Obese class 3	>40.00	>40.00

Table 2 simplification of the calculation we are categorized the body mass index of the subjects as follows:

Underweight	<18.5kg/m^2
Normal range	18.5-24.99 kg/m^2
Overweight	25-29.9 kg/m^2
Obese	BMI >30 kg/m^2

Statistical analyses-The present study used in descriptive analyses technique**.**

II. Result And Discussion

Diabetes mellitus are among the most common non-infectious epidemics of the world. Most of the population of developing countries including India has been suffering from metabolic syndrome.

The increasing of incidence of diabetes mellitus and obesity is a consequence of increasing urbanization, sedentary life style and lack of physical exercise, junk food habit in the population, most commonly the earning young and middle age group, which ultimately lead to a big financial and social burden over the country.

Finding of the result in current study presented in the below tables-

Incidence of newly detected diabetes mellitus

= no. of newly detected diabetes mellitus/ total no. of persons underwent health checkup during 6 months × 100

= 11/597×100

Incidence of newly detected diabetes mellitus = 1.84%

Table 3 sex wise distribution of the subject fulfilling the inclusion criteria

No. of persons fulfilling the inclusion criteria	Male	Female
158	101 (63.92%)	57 (36.08%)

Reveal that the table 2 the male to female ratio among these 158 subjects was 1.77: 1.

Table 4 age wise distribution of the total subject fulfilling the inclusion criteria

Age group	**Male**	**Female**	**Total**
18-25	08 (5.06%)	03 (1.89%)	11 (6.96%)
26-45	45 (28.48%)	25 (15.82%)	70 (44.30%)
46-65	44 (15.82%)	26 (16.45%)	70 (44.30%)
>65	04 (2.53%)	03 (1.89%)	07 (4.43%)
Total	101 (63.92%)	57 (36.08%)	158 (100%)

The maximum no. of subjects was in the age group of 26-65 years.

Table 5body mass index categories of the subject fulfilling inclusion criteria

BMI category	**Male**	**Female**	**Total**
Underwent (<18.5kg/m^2)	6 (3.79%)	6 (3.79%)	12 (7.59%)
Normal weight (18.5-24.9kg/m^2)	47 (29.74%)	22 (13.92%)	69 (43.67%)
Overweight 25-29.9 kg/m^2)	32 (20.25%)	15 (9.49%)	47 (29.74%)
Obese (≥30kg/m^2)	16 (10.12%)	14 (8.86%)	30 (18.98%)
Total	101 (63.92%)	57 (36.08%)	158 (100%)

Out of the total subjects fulfilling the inclusion criteria, 48.73(77 out of 158) subjects had BMI in the overweight or obese category.

Some studies have supported in our current study Thang S. Han, Ken Williams, Naveed Sattar et al (2002) [7] used standardized cut-offs of body mass index (BMI), waist hip ratio, and fasting insulin levels to predict the development of metabolic disorders and metabolic syndrome. High waist-hip-ratio and fasting insulin level were significant predictors of developing metabolic syndrome. High anthropometric indices remained significant predictors of metabolic syndrome after adjusting for fasting insulin. Of subjects who had a combination of high BMI (≥30kg/m^2) and high waist circumference (above “action level 2”), 32 % developed metabolic syndrome, compared with 10% of subjects with both low waist hip circumference.

In 2003, Chamukuttan Snehalatha, Vijay Viswanathan and Ambady Ramachandran [8]studied that Asian Indians have a high risk of developing glucose intolerance with small increments in their BMI. They generally have high upper-body adiposity, despite having a lean BMI. Therefore, this analyses were performed to find out the normal cutoff values for BMI and upper body adiposity (waist circumference or waist hip ratio) by computing their risk association with diabetes and their result showed that normal cutoff value for BMI was 23kg/m^2 for both sexes. Cutoff values for WC were 85 and 80 cm for men and women, respectively; the corresponding WHRs were 0.88 and 0.81 respectively. Optimum sensitivity and specificity obtained from the receiver operator characteristics curve corresponded to these cut off values. They concluded that the cutoff value for normal BMI for men and women was 23kg/m^2.

In 2004 L-Y Chin, Y-M Liou and J-J Chen [9] examine to the association of body mass index, waist hip ratio and waist circumference with fasting hyperglycemia after adjustment for age, cigarate smoking and alcohol use in Taiwan and their result showed that fasting hyperglycemia was found in 11.0% of men and 8.3% women. The factor significantly associated with fasting hyperglycemia in men were age and BMI.

In 2006, Christa Meisinger, Angela Doring, Barbara Thorand, et al[10] studied to examine the sex specific relevance of WC, WHT, and BMI to the development of type 2 diabetes and they concluded that both overall and abdominal adiposity were strongly related to the development of type 2 diabetes. Because there was an additive effect of overall and abdominal obesity on risk prediction, WC should be measured in addition to BMI to assess the risk of type to diabetes.

In 2009 A Shah, S Bhandary, SL Malik et al [11] investigated to find out WHR and WC as predictor of type 2 diabetes mellitus in the population of Kavre district of Nepal. Their result showed that the optimal cut off value for WHR, WC, BMI and age in female were 0.87, 0.85 cms, 21.40 kg/m^2 and 40 years respectively and for male the respective values were 0.96, 0.87cms, 32.63kg/m^2 and 44 years. In female age (82.9%) was the strongest predictor followed by WHR (78.1%), WC (70.2%) and least of BMI (55.0%) whereas for male WC (87.0%) was the strongest followed by WHR (81.6%), BMI (68.5%) and least for age (64.6%)using receiver operating characteristic (ROC) curve. The study showed that the WC and WHR were the best predictor of type 2 diabetes mellitus in Both male and female population of Karve district.

In 2009, Meredith F Mackay, Steven M Haffner, Lynne E Wagenknech et al, [12] studied the compare different anthropometric measures in their ability to predict type 2 diabetes and to determine whether predictive ability was modified by ethnicity, and their result was that waist hip ratio was the most predictive measure, followed by BMI. Result were similar in nHW and HA subjects, although in AA subjects, central adiposity measures appeared to best predict type 2 diabetes. Thus they concluded that measures of central and overall adiposity predicted type 2 diabetes to a similar degree, except in AA subjects, for whom results suggested that central measures were more predictive.

In 2010, Ambady Ramachandran and Chamukuttan Snehalatha [13]studied that overweight and obesity have reached epidemic proportion in many Asian Country. These countries also face a grave burden of obesity related disorders such as diabetes, hypertension and cardiovascular disease which develop at a younger age that in Western populations. They showed that India has the highest number of people with diabetes in the world and china occupied the second position. The highest rate of obesity in Asia is in Thailand and the lowest is in India followed by Philippins. Studies in India (overweight ≥25kg/m^2, obesity ≥30kg/m^2 using Cole’s criteria) Singapore, China, Malesia, (BMI≥95th percentile in both) and other Asian countries had shown a rising prevalence of obesity among children. The risks for diabetes and CVD are associated with a lower BMI among Asian population.

III. Conclusion

We are concluded that the prevalence rate of newly diagnosed diabetes mellitus disorder were high in Bilaspur Chhattisgarh India, and the high level of body mass index were significantly associated with prognosis in type 2 diabetes mellitus.

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