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# An Epidemiological study of Diabetes Mellitus in professional workers of urban areas of Jhansi City.

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**Abstract**

**Background-** Diabetes mellitus is characterized by recurrent or persistent hyperglycemia, and is diagnosed by demonstrating any one of the following (WHO, 1999): Fasting plasma glucose level at or above 126 mg/dL (7.0mmol/l). plasma glucose at or above 200 mg/dL or 11.1 mmol/l two hours after a 75 g oral glucose load as in a glucose tolerance test.

**Objectives-** To find the actual prevalence of diabetes mellitus in various professionals in Jhansi city. To study the various epidemiological factors associated with Diabetes mellitus.

**Methods-** It is a cross sectional study (prevalence) which was conducted in urban area of Jhansi city. The study was conducted in University and Degree College (teachers), Banks (bank employee), Court (lawyers), and various other professional groups (businessmen). We took 100 members in each professional group. We took 100 bank workers in different banks, 100 teachers of Degree College or university, 100 lawyers and 100 different kinds of businessmen.

**Results-** Prevalence of Diabetes mellitus in all four groups was 18.0%. If we see the number of diabetic candidate separately than we find that the prevalence of diabetes mellitus was highest (22.0%) in Lawyers and least (12.0%) in Businessmen. However, these differences in prevalence of Diabetes mellitus and Impaired Glucose Tolerance among various professional groups were not found statistically significant. Overall prevalence of Diabetes mellitus in age group 30-40 years was lowest (15.0%).

**Conclusion**- Average prevalence of Diabetes mellitus in all four groups was 18.0%. Prevalence of diabetes mellitus was highest in Lawyers (22.0%) and least in Businessmen (12.0%). It was 20.0% in Bank workers and 18.0% in Professors. Highest prevalence of Diabetes mellitus was in 50-60 yeas age group (20.6%) and least (15.0%) prevalence was in 30-40 years age group.

**Keywords-** Metabolic disorders, Diabetes mellitus, Prevalence, Obesity, Oral Glucose tolerance test.

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**Introduction-**

Diabetes mellitus is a metabolic disorder characterized by hyperglycemia (high blood sugar) and other signs and symptoms, as distinct from a single disease or condition. The World Health Organization recognizes three main forms of diabetes: type 1, type 2, and gestational diabetes (occurring during pregnancy), which have similar signs, symptoms, and consequences, but different causes and population distributions.[1,2] By current definition, two fasting glucose measurements above 126 mg/dL or 7.0mmol/l are considered diagnostic for diabetes mellitus. Patients with fasting sugars between 6.1 and 7.0 mmol/l (ie, 110 and 125 mg/dL) are considered to have "impaired fasting glucose" and patients with plasma glucose at or above 140mg/dL or 7.8 mmol/l two hours after a 75 g oral glucose load are considered to have "impaired glucose tolerance".[3] "Prediabetes" is either impaired fasting glucose or impaired glucose tolerance; the latter in particular is a major risk factor for progression to full-blown diabetes mellitus as well as cardiovascular disease. Prevalence of diabetes mellitus is continuously increasing in India.[4,5] The rationale behind the study was to find the actual magnitude (prevalence) of Diabetes Mellitus in various Professionals in Jhansi city epidemiological factors associated with Diabetes mellitus.

**Materials and Methods-**

It is a cross sectional study (prevalence) which was conducted in urban area of Jhansi city. The study was conducted in University and Degree College (teachers), Banks (bank employee), Court (lawyers), and various other professional groups (businessmen). We took 100 members in each professional group. We took 100 bank workers in different banks, 100 teachers of Degree College or university, 100 lawyers and 100 different kinds of businessmen. Departmental visit was made for conducting our study. We went to various departments many times and filled a common Performa and conducted general, systemic, anthropometric and laboratory examination of the available individuals.

A common Performa was made for inquiry about Biosocial characteristics [name, age, sex, occupation, address, dietary habits (veg or non-veg), smokers or not, alcoholics or not and various classical signs and symptoms of diabetes mellitus]. Information was noted down in pre designed and pre tested schedule.

Positive findings from any two of the following tests on different days[5]:

Symptoms of diabetes mellitus plus casual plasma glucose concentration □200 mg per dL (11.1 mmol per L)

Impaired glucose homeostasis :

Impaired fasting glucose: FPG from 110 to <126 (6.1 to 7.0 mmol / L). Impaired glucose tolerance: 2hr PPG from 140 to <200 (7.75 to <11.1 mmol / L)

Normal :

FPG <110 mg per dL (6.1 mmol per L)

2hrPPG <140 mg per dL (7.75 mmol per L)

**Sample Size**

For calculating the sample size, following formula was used-

$$= 4pq/d^2$$

Where ‘n’ is the no. of subject required to conduct the study.

‘p’ is prevalence from previous study (20%)

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'q' is (100-p) = 100-20=80

'd' is maximum allowable error and it is 20% of Positive character. (20% of p comes to be 4) Prevalence of diabetes mellitus from previous studies is one in seven patients that is 20%.[6] Value of 'q' will be (100-p) that is 100-20=80. 'd' is maximum allowable error and it is 10-20% of the value of 'p'. On putting it 20% of the value of 'p', the value of'd' comes to be 4. So sample size in the present study is 400.

**Statistical Analysis-**

Data so obtained were subjected to statistical analysis. Results were evaluated for the best modality through which benign and malignant lesions can be differentiated. Data analysis was done by SPSS software ® version 22.0. Descriptive statistical analysis, which included frequency and percentages, was used to characterize the data. Chi-square test was used for association between factors and $p < 0.05$ was considered statistically significant.

**Results-**

**Table1- Profession wise Distribution of Diabetic and Impaired Glucose Tolerance Individuals**

| Profession | Total number of sample | Diabetic Individuals | Impaired Glucose Tolerance | Normal Individuals |
|---|---|---|---|---|
| Bank workers | 100 | 20 (20.0%) | 5 (5.0%) | 75 (75.0%) |
| Lawyers | 100 | 22 (22.0%) | 8 (8.0%) | 70 (70.0%) |
| Professors | 100 | 18 (18.0%) | 4 (4.0%) | 78 (78.0%) |
| Businessmen | 100 | 12 (12.0%) | 10 (10.0%) | 78 (78.0%) |
| Total (%) | 400 | 72 (18.0%) | 27 (6.7%) | 301 (75.0%) |

$\chi^2 = 1.81$; d f = 3; $p > 0.50$

As per table1 average prevalence of Diabetes mellitus in all four groups was 18.0%. If we see the number of diabetic candidate separately than we find that the prevalence of diabetes mellitus was highest (22.0%) in Lawyers and least (12.0%) in Businessmen. It was 20.0% in Bank workers and 18.0% in Professors. Impaired glucose tolerance was highest (10.0%) in businessmen and lowest (4.0%) in university professors. However, these differences in prevalence of Diabetes mellitus and Impaired Glucose Tolerance among various professional groups were not found statistically significant.

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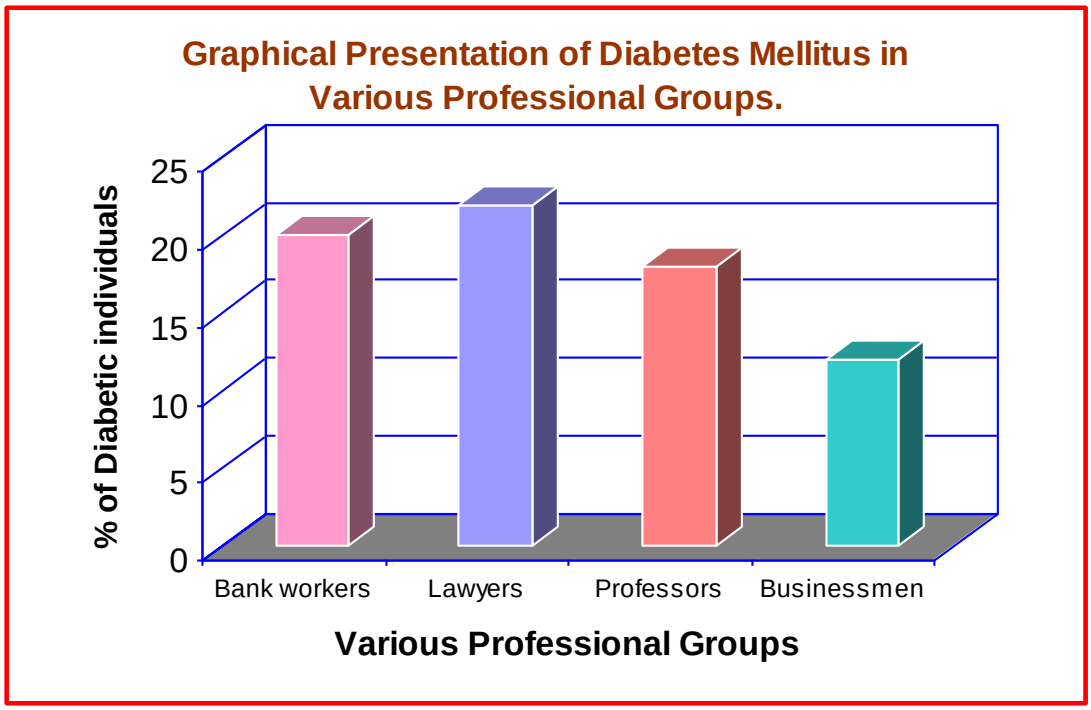


**Table 2- Age wise Prevalence of Diabetes mellitus in Various Professional Groups**

| Profession | Age groups (years) | | | | | | Overall total | |
|---|---|---|---|---|---|---|---|---|
| | 30-40 | | 40-50 | | 50-60 | | | |
| | No. examined | Prevalence no. (%) | No. examined | Prevalence no. (%) | No. examined | Prevalence no. (%) | Total No. examined | Prevalence No. (%) |
| Bank workers | 10 | 5 (50.0) | 45 | 8 (17.8) | 45 | 7 (15.6) | 100 | 20 (20.0) |
| Lawyers | 20 | 2 (10.0) | 30 | 10 (33.3) | 50 | 10 (20.0) | 100 | 22 (22.0) |
| Professors | 20 | 1 (5.0) | 30 | 3 (10.0) | 50 | 14 (28.0) | 100 | 18 (18.0) |
| Businessmen | 30 | 4 (13.3) | 45 | 4 (8.9) | 25 | 4 (16.0) | 100 | 12 (12.0) |
| Total (%) | 80 | 12 (15.0) | 150 | 25 (16.7) | 170 | 35 (20.6) | 400 | 72 (18.0) |

$\chi^2$=13.68; d.f = 2; P<0.001

Prevalence of Diabetes mellitus increases with increasing age. Overall prevalence of Diabetes mellitus in age group 30-40 years was lowest (15.0%). It was 16.7% in 40-50 years age group. It was highest 20.6% in age group 50-60 years. Difference in Prevalence of Diabetes mellitus in all three age group was statistically significant. In Bank workers group, it was highest in comparatively younger age group 30-40 years (50.0%). Prevalence was highest (33.3%) in age group 40-50 years in Lawyers group. In Professors, it was highest (28.0%) in 50-60 years age group. In businessmen, it was also highest (16.0%) in 50-60 years age group.

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**Table 3- Body Mass Index wise Prevalence of Diabetes mellitus in Various Professional Groups**

| Profession | Body mass Index (kg/m$^2$) | | | | | | | | | | Total No. examined | Prevalence no. (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Up to 24.99 | | 25-30 | | 30-35 | | 35-40 | | >40 | | | |
| | No. | Prevalence no. (%) | No. | Prevalence no. (%) | No. | Prevalence no. (%) | No. | Prevalence no. (%) | No. | Prevalence no. (%) | | |
| Bank workers | 40 | 6 (15.0) | 35 | 6 (17.1) | 20 | 6 (30.0) | - | - | 5 | 2 (40.0) | 100 | 20 (20.0) |
| Lawyers | 30 | 8 (26.7) | 20 | 2 (10.0) | 30 | 9 (30.0) | 20 | 3 (15.0) | - | - | 100 | 22 (22.0) |
| Professors | 60 | 8 (13.3) | 10 | 4 (40.0) | 20 | 5 (25.0) | 10 | 1 (10.0) | - | - | 100 | 18 (18.0) |
| Businessmen | 65 | 5 (7.7) | 10 | 2(20.0) | 10 | 1 (10.0) | 10 | 2 (20.0) | 5 | 2 (40.0) | 100 | 12 (12.0) |
| Total (%) | 195 | 27 (13.3) | 75 | 14 (18.7) | 80 | 21 (26.3) | 40 | 6 (15.0) | 10 | 4 (40.0) | 400 | 72 (18.0) |

$\chi^2$=8.94; d.f. = 2; P<0.05

As per table 3 Prevalence of Diabetes mellitus in persons with normal BMI was lowest (13.3%). Prevalence of Diabetes mellitus in preobese persons (BMI range 25- 30) was 18.7%. It was 26.3% with grade-1 obese individuals (BMI range 30-35). It was 15.0% with grade-2 obese individuals (BMI range 35-40). It was highest (40.0%) with grade-3 obese individuals (BMI above 40). These differences in the prevalence of diabetic individuals in different BMI levels were statistically significant. In normal BMI individuals, prevalence was highest (26.7%) in Lawyers group. Preobese person's prevalence was highest (40.0%) in Professors. Among Grade-1 obese persons, prevalence of Diabetes was highest (30.0%) in Lawyers and Bank workers. Among Grade-2 obese persons, prevalence of Diabetes was highest (20.0%) in businessmen. Among morbid obese persons, prevalence of diabetes was highest (40.0%) in Bank workers and Businessmen.

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**Table 4- Life Style wise Prevalence of Diabetes mellitus in Various Professional Groups**

| Profession | Life style | | | | | | Total No. examined | Prevalence No. (%) |
|---|---|---|---|---|---|---|---|---|
| | Mild workers | | Moderate workers | | Heavy Workers | | | |
| | No. examined | Prevalence No. (%) | No. examined | Prevalence No. (%) | No. examined | Prevalence No. (%) | | |
| Bank workers | 40 | 12 (30.0) | 60 | 8(13.3%) | - | - | 100 | 20 (20.0) |
| Lawyers | 20 | 15 (75.0) | 80 | 7 (8.8%) | - | - | 100 | 22 (22.0) |
| Professors | 100 | 18 (18.0) | - | - | - | - | 100 | 18 (18.0) |
| Businessmen | 40 | 5 (12.5) | 10 | 5 (50.0) | 50 | 2 (4.0) | 100 | 12 (12.0) |
| Total (%) | 200 | 50 (25.0) | 150 | 20 (13.3) | 50 | 2 (4.0) | 400 | 72 (18.0) |

As per table 4 prevalence of Diabetes mellitus in mild workers was highest (25.0%). It was followed by 13.3% in moderate workers. Prevalence was least (4.0%) in heavy workers. This difference in the prevalence of Diabetes mellitus in different kind of workers in various professional groups was statistically significant. In Bank workers, prevalence of Diabetes in mild workers was highest (30.0%) and in moderate workers, it was 13.3%. In Lawyers, prevalence of Diabetes in mild workers was highest (75.0%) and in moderate workers, it was 8.8%. All Professors were mild workers and prevalence was 18.0%. In Businessmen, prevalence of Diabetes in mild workers was 12.5%, in moderate workers, it was highest (50.0%) and in heavy workers, it was 4.0%.

**Table 5- Waist circumference wise Prevalence of Diabetes mellitus in Various Professional Groups**

| Profession | Waist Circumference | | | | Total No. examined | Prevalence No. (%) |
|---|---|---|---|---|---|---|
| | More (males ≥102cms, females ≥88cms) | | Less (males <102cms, females <88cms) | | | |
| | No. examined | Prevalence No. (%) | No. examined | Prevalence No. (%) | | |
| Bank workers | 50 | 12 (24.0) | 50 | 8 (16.0) | 100 | 20 (20.0) |
| Lawyers | 80 | 12 (15.0) | 20 | 10 (50.0) | 100 | 22 (22.0) |
| Professors | 60 | 13 (21.7) | 40 | 5 (12.5) | 100 | 18 (18.0) |
| Businessmen | 30 | 8 (26.7) | 70 | 4 (5.7) | 100 | 12 (12.0) |
| Total (%) | 220 | 45 (20.5) | 180 | 27 (15.0) | 400 | 72 (18.0) |

$\chi^2$= 16.7; d.f = 1 P<0.001

As per table 5 prevalence of Diabetes mellitus in individuals having more waist circumference was 20.5 % and in individuals having less waist circumference was 15%. Difference in the prevalence of Diabetes in between two groups was statistically significant. This trend was present in all professional groups except Lawyers. Prevalence of Diabetes with more waist circumference was highest (26.7%) in Businessmen and lowest (15%) in Lawyers. In Bank workers, prevalence of diabetes with more waist circumference was 24% and with less waist circumference, it was 16%. In Professors, prevalence of Diabetes with more waist circumference was 21.7% and with less waist circumference, it was 12.5%.

**Table 6- Profession wise Distribution of Various complications of Diabetes Mellitus**

| | Renal | Ocular | CVS | CNS | PNS | No complications | Total (%) |
|---|---|---|---|---|---|---|---|
| Bank workers | 3(15.0%) | 2(10.0%) | 10(50.0%) | - | 2(10.0%) | 5 (25.0%) | 20 (28.0) |
| Lawyers | 3(13.6%) | 2 (9.1%) | 9 (40.9%) | - | 2 (9.1%) | 7 (31.8%) | 22 (31.0) |
| Professors | 2(11.1%) | 3(16.7%) | 2 (11.1%) | 1(5.6%) | 1 (5.6%) | 10 (55.6%) | 18 (25.0) |
| Businessmen | - | 1(8.3%) | 6 (50.0%) | 1(8.3%) | 3(25.0%) | 2 (16.7%) | 12 (17.0) |
| Total (%) | 8(11.1) | 8(11.1) | 27(37.5) | 2 (2.8) | 8(11.1) | 24 (33.3) | 72(100.0) |

As per table 6 Diabetic individuals with renal, Ocular and PNS complications were 11.1% each. CVS complications were highest (37.5%) in Diabetic individuals. CNS complications were least (2.8%) in Diabetic individuals. In our study numbers of Diabetic individuals with various complications were 73.6%. Diabetic individuals without any complications were 33.3%. Renal complications were highest (15.0%) in Bank workers. Ocular complications were highest (16.7%) in Professors. CVS complications were highest in Bank workers and Businessmen (50% each). CNS complications were highest (8.3%) in Businessmen. PNS complications were also highest (25%) in Businessmen. Numbers of individuals without complications were highest (55.6%) in Professors.

**Discussion-**

Ramchandran et al reported that the prevalence of Diabetes rages from 9% to 16.6% in 6 major cities of India.[6] Finding of our study is in line with this survey. A study conducted by Dr. Amir Khan Maroof in his study conducted among Bank workers in Lucknow city found the prevalence of Diabetes to be 20%.[7]Colagiuri S et al conducted in the kingdom of Tonga, one of the many Pacific islands.[8] They found that increasing age was significantly associated with undiagnosed type 2 diabetes using multiple logistic regression model. Baechler R et al in their study on prevalence of diabetes mellitus in the seventh region of Chile found that the calculated prevalence in subjects between 20-44 years was 1.88% between 45-64 years 10.75% 65 years or older 11.30%.[9] Gokcel A et al in their study on the prevalence of diabetes in Adana, a southern province of Turkey found that increases in age had a significant association with diabetes prevalence. In regression analyses age was independently

associated with diabetes prevalence.[10] Dunstan DW et al in their study on the rising prevalence of diabetes and IGT in Australia found that BMI was a significant predictor of diabetes status by logistic regression analysis.[11]

Satman I et al in their population based study of diabetes mellitus in Turkey, found that Body Mass Index was independently and significantly associated with diabetes.[12]

Nadeem et al in a study conducted in a district of northern India observed that prevalence of diabetes was maximum (19.74%) in obese followed by amongst overweight (8.18%) and least (1.62%) amongst those with normal BMI.[13] The overall prevalence of retinopathy was 34.2% in a study carried out in Chennai by Rema et al.[14] Lower ocular complications in the present study may be due to lower sensitivity of clinical examination. Mohan V et al reported prevalence of ischemic heart diseases and peripheral vascular diseases at diagnosis of type-2 diabetes to be 7.9% of which 6.0% have ischemia and 1.9% patients had infraction. Prevalence of peripheral vascular diseases was 0.71% in the same study.[15] Diabetes carries 2-3 time's higher risk of heart attacks and an even higher risk for stroke.[14,15]

**Conclusions-**

Average prevalence of Diabetes mellitus in all four groups was 18.0%. Prevalence of diabetes mellitus was highest in Lawyers (22.0%) and least in Businessmen (12.0%). It was 20.0% in Bank workers and 18.0% in Professors. Highest prevalence of Diabetes mellitus was in 50-60 yeas age group (20.6%) and least (15.0%) prevalence was in 30-40 years age group. We found that with increase in obesity, prevalence of Diabetes mellitus also increased. It was highest in morbid obese individuals (40.0%). Prevalence was least (13.3%) in normal BMI individuals. Most common chronic complications were CVS complications (37.5%). Renal, Ocular and PNS complications were present in 11.1% of Diabetic individuals in each category. Least common complications were CNS complications and it was present in 2.8% of Diabetic individuals.

**Conflict of Interest**- None declared

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