

# A STUDY TO FINDOUT THE CLINICAL PROFILE OF THE T2DM IN GWALIOR, A HISTORICAL CITY OF NORTH INDIA

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### Abstract:

**Background-** In India more than 50% of people are unaware of their status which increases the risk of development of diabetes and its complication in them. Hence, it is necessary to detect the large pool of undiagnosed diabetic subjects in India and offer early therapy to these individuals. Keeping this aspect in mind, a community based cross sectional observational study with prime objective to find out the clinical profile of T2DM in Gwalior city was done.

**Aims And Objectives-** To findout the clinical profile of the T2DM in Gwalior, a Historical city of North India.

**Materials And Methods-** Gwalior is a major historical city in Indian state of Madhya Pradesh. It is located 319 kms from south Delhi, the capital city of entire India. As of 2011's India census Gwalior has a population of 10,69,276 in 66 wards.

**Results-** Face to face interview during house survey was conducted by predesigned questionnaire (schedule), on 615 subjects. Majority of participants were females. Most of the study participants were less than 35 years of age. Most of the participants were literate and majority of them being graduated and above. Most (54%) of participants belonged to middle class (class II and III) and 23.6% in lower and lower middle class. In this study 28% study participants have BMI  $\geq$  25. About 93 % participants do not have family history of diabetes. In this study majority of females have waist circumference of 80-89 cm, and majority of males have  $<$ 90 cm. In this present study about 47.5% of participants belonged to moderate physical activity level. In this study about 93% participants do not have family history of diabetes. This study brought out limited association with family history of diabetes. Family history is often not correctly available. Diabetes also often remains undiagnosed.

**Conclusion-**Chronic non-communicable diseases are assuming increasing importance among the adult population in both developed and developing countries. The life-styles and behavioral patterns of people are changing rapidly, these being favorable to the onset of chronic diseases like diabetes. The prevalence of chronic disease like diabetes is showing an upward trend in most countries. Developing countries are now warned to take appropriate steps to avoid the "epidemics" of non-communicable diseases likely to come with socio-economic and health developments. India has become the capital of diabetes. Early identification of at risk individuals and appropriate lifestyle intervention would greatly help in preventing or postponing the complications and reducing the global economic cost of diabetes.

**Key words –** T2DM, clinical profile, screening, Gwalior city.

## Introduction

Socioeconomic development, technological advancements and changes in lifestyles, behavioural patterns, demographic profile transition (aging population) lead to major health transition leading to rapid increase in burden of non communicable diseases and their burden overweight the burden of communicable diseases. Noncommunicable diseases are on rise in India, and there is significant burden of morbidity and mortality, with potential loss of productive years of life<sup>1</sup>. Chronic non-communicable diseases are assuming increasing importance among the adult population in both developed and developing countries. The life-styles and behavioural patterns of people are changing rapidly, these being favourable to the onset of chronic diseases like diabetes. The prevalence of chronic disease like diabetes is showing an upward trend in most countries. Developing countries are now warned to take appropriate steps to avoid the “epidemics” of non-communicable diseases likely to come with socio-economic and health developments. The global prevalence of diabetes among adults over 18 years of age has risen from 4.7% in 1980 to 8.5% in 2014<sup>(2)</sup>. As of 2014, an estimated 387 million people with prevalence of 8.3% have diabetes Worldwide, and the figure is expected to rise by 592 million by 2035<sup>(3)</sup>. According to WHO, Globally, an estimated 422 million adults were living with diabetes in 2014, compared to 108 million in 1980<sup>(2)</sup>. About 15 lakhs of death, was due to direct effect of T2DM In 2012 mainly in India like countries. About 3 to 4 % of total deaths are due to this entity. And it will be the seventh leading cause of death as per WHO<sup>2</sup>

The global economic cost of diabetes in 2014 was estimated to be 612 billion dollars<sup>(3)</sup>. The Prevalence of Diabetes Mellitus is growing rapidly worldwide and India has earned the dubious distinction of being the diabetic capital of the world. Data released on the occasion of World Health Day 2016, April 7, *India* had 69.2 million people living with diabetes (8.7%) *as per* the 2015 data, about the rise in diabetes, and its staggering *burden* and consequences, People with *type 2 diabetes*, the form that comprises some 90% of these cases<sup>4</sup>.

According to National Family Health Survey-4 (NFHS-4, 2015-16) in Our Madhya Pradesh about 9.2 urban females and 6.3 rural females (of age group 15-49 year) have high blood sugar level >140 similarly among male, about 12 % urban and 8.4% rural males (of age group 15-49 year) have reported to have high blood sugar >140<sup>6</sup>. National Family

Health Survey-4 2015 -16). In view of the above global situation WHO issues a call for action on diabetes, drawing attention to the need to step up prevention and treatment of the disease. The theme for the WHD 2016 was based on diabetes i.e. ‘Beat Diabetes’. The most disturbing trend is the shift in the age of onset of diabetes to a younger age in the recent years; Indians succumb to diabetes 5-10 years earlier than their western counterparts, this leads to considerable loss of productive years, adversely affecting nation’s health and economy<sup>5,6</sup>. In India more than 50% of people are unaware of their status which increases the risk of development of diabetes and its complication in them<sup>7,8</sup>. Hence, it is necessary to detect the large pool of undiagnosed diabetic subjects in India and offer early therapy to these individuals<sup>9</sup>. Keeping this aspect in mind, a community based cross sectional observational study with prime objective to find out the clinical profile of T2DM in Gwalior city was done.

## Aims And Objectives

To find out the clinical profile of the T2DM in Gwalior, a Historical city of North India.

## Materials And Methods

Gwalior is a major historical city in Indian state of Madhya Pradesh. It is located 319 kms from south Delhi, the capital city of entire India. As of 2011’s India census Gwalior has a population of 10,69,276<sup>10</sup> in 66 wards.

## Study population

The study was community based cross sectional study. It was conducted in the three wards numbered - 55,58 and 47. Those were randomly selected which includes, Amkho, Shivajinagar, Guda Gudi Ka Naka, and Lakkad Khana areas respectively in the catchment area of Department of Community Medicine, G. R. Medical College, Gwalior (M.P.). The sample size included in this study was 615 subjects. The population of study area is 11200,<sup>11</sup> and the reference population consisted of age above 20 years. The proportion of population above 20 years of age is approximately 61%<sup>12</sup> of total population that was 6832.

The sample size is calculated by taking 9%<sup>13</sup>. (of reference

population above 20 years of age. The 9% sample size has been drawn from population above 20 years of age i.e. 6832, hence the approximate sample size came out to be approximate 614 and we were taken 615 in round figure. The selection of households was done by proper sampling interval. The total approximate house was around 2000 and used sampling interval was every 3<sup>rd</sup> house. First house selected randomly and then one subject from each house, till the desired sample size was achieved. We took all the measure to avoid duplication in study.

### Study design

The study was community based cross sectional study. It was conducted in the three wards numbered- 55,58 and 47. Those were randomly selected which includes, Amkho, Guda Gudi Ka Naka, and Lkkad Khana areas respectively in catchment area of Department of Community Medicine, G. R. Medical College, Gwalior (M.P.) because MBBS Final Proff. I students going there regularly under their community posting. The study period was 15 Months, March 2015- June 2016. The sample size included in the study was of 350 subjects.

### Duration of study

15 Months, March 2015- June 2016.

### Inclusion criteria

1. The subject included in study will be adult aged 20 years and above.
2. Who has given consent to take part in study.
3. Who is not a known diabetic case.
4. Who is not taking diabetic diet.
5. Who has not taken diabetic medication in their lifetime.

### Exclusion criteria

1. Known case of diabetes.
2. Who has not given consent.
3. Subject below 20 years of age.

### Data collection and measurement

There were three components of the study for the data collection and measurement.

1. Questionnaire based survey
2. Anthropometric measurement and physical examination
3. Investigation based survey

### Questionnaire based survey

Pre-designed and pre-tested questionnaire was prepared for collecting data, By interviewing the study participants using these pre-designed Questionnaire. Questionnaire were contain all questions addressing detailed history of demographic data, anthropometric measurements, life style risk factors, food habits and physical activity.

### Anthropometric measurements and physical examination

Standard instruments and procedure were used for anthropometric measurements. Height, weight, waist circumference and blood pressure were measured after explaining the purpose of study, explaining the procedures and gaining their consent. By using appropriate and standard instruments, as per their protocols.

### Investigation based survey

After obtaining proper consent from the participants, blood sample was taken to measure Post Prandial Blood Sugar and fasting blood sugar measurement.

Post prandial blood glucose test -plasma glucose is measured after two hour of meal.  $\geq 11.1$ mmol/L (200mg/dl)<sup>14</sup>. Fasting blood glucose measurement- done, if fasted overnight for at least 8 hours.  $\geq 7.0$ mmol/L(126mg/dl)<sup>14</sup>.

Institutional ethical committee of the Gajra Raja Medical College, Gwalior, has given the ethical approval for the study. All the study subjects who came out to be positive for risk of diabetes on the basis of screening, were referred to Medicine Department of our hospital for further management.

## Parameters used

Age, Sex, Waist circumference, Height, Weight, BMI

## Statistical analysis

Analysis will be done by tabulations of data with frequency distribution by percentage and proportions and applying statistics wherever necessary, using the software Epi-info 7.2.

## Socioeconomic status

For assessing the socioeconomic status of the participants, modified B.G. Prasad Classification was used.

## Results

**Table 1**  
**Age wise distribution of study participants**

Age (Year)	Number of participants	Percentage (n=615)
<35	263	42.8
35-49	201	32.7
≥50	151	24.5
Total	615	100

Most of the study participants were less than 35 years of age, reflecting that young adults constitute main proportion of Indian population in present time. The group at highest risk i.e. > 50 years constituted one-fourth of the study participants.

**Table 2**  
**Gender wise distribution of study subjects**

Gender	Number of participants	Percentage (n=615)
Female	325	52.8%
Male	290	47.1%
Total	615	100

This table shows that proportion of female participants were more (52.8%) than the male, because in morning hours, females were more available at their homes as compared to males.

**Table 3.**  
**Religion wise distribution of study participants**

Religion	Number of participants	Percentage (n=615)
Hindu	542	88.2
Muslim	55	8.9
Others	18	2.9
Total	615	100

In our study, most of the participants belonged to Hindu religion, reflecting that population of Gwalior city is mainly constituted by Hindu religion followers.

**Table 4.**  
**Marital status of study participants**

Marital status	Number of participants (%), (n=615)	Number of Diabetics (%)
Unmarried	110(18)	2 (1.8)
Widow/divorced	7 (1.1)	None (0)
Married	498 (81)	53 (10.6)
Total	615	55

Majority of participants (i.e. 81%) are married and most of them were diabetic. This table is representing, generalized distribution of population of Gwalior city.

**Table 5.**  
**Distribution of Participants by Educational status and their Diabetic status**

Level of education	Number of participants (%), (n=615)	Number of Diabetics (%)
Graduate and above	253 (41.14)	26 (10.3)
Middle and higher Secondary	198 (32.20)	16 (8.08)
Primary and below	72 (11.71)	4 (5.6)
Illiterates	92 (14.96)	9 (9.8)
Total	615	55 (8.94)

In this study, most of the participants were literate, majority of them being graduated and above. Percentage of Diabetic is highest (10.3%) among graduated and above followed by percentage of Diabetic among illiterates suggesting that the Diabetes is also common in lower and poorly educated groups of people, now days, as previously it was more prevalent in higher educational group. These finding reflects the literacy rate of Gwalior city according to census 2011<sup>12</sup>.

**Table 6.**  
**Distribution of participants on the basis of Socio-economic status and their Diabetic status:**

Socio-economic Classes	Number of participants (%),(n=615)	Number of Diabetic (%)
I	138 (22.44)	16 (11.6)
II	198 (32.20)	16 (8.0)
III	134 (21.79)	6 (4.5)
IV	84 (13.66)	8 (9.5)
V	61(9.92)	9 (14.8)
Total	615	55 (8.94)

Our study sample had representation from all socioeconomic classes. Most (54%) of participants belonged to middle class (class II and III) and 23.6% in lower and lower middle class according to Modified B.G. Prasad Classification. Most of Diabetic were find in lower class (class-V) followed by upper class (class-I). This distribution also reflects the urban setting of the study population and showing the shifting trends of diabetic in lower economic classes from higher economic classes.

**Table 7.**  
**Age wise distribution of participants and percentage of diabetic among them**

Age (years)	Number of participants (%),(n=615)	Number of Diabetics (%)
20-34	263 ( 42.76)	6 (2.3)
35-49	201 (32.68)	23 (11.4)
≥50	151 (24.55)	26 (17.2)
Total	615	55 (8.9)

In this table as the age is increasing, the proportion of Type 2 DM is also increasing. This finding supports that the age act as a risk factor for development of Type 2 DM. Maximum proportion of Type 2 diabetic is found in age group of ≥ 50 years i.e. 17.2%.

**Table 8.**  
**Distribution of participants according to parental history of Type 2 DM and percentage of diabetic among them**

History of Type 2 DM	Number of participants (%), (n=615)	Number of diabetics (%)
In both parents	2 (0.33)	1 (50)
In Father/Mother	38 (6.2)	3 (7.8)
None	575 (93.5)	51 (8.8)
Total	615	55 (8.9)

In this study about 93% participants do not have family history of diabetes. This study brought out limited

association with family history of diabetes. Information about family history is often not correctly available. Diabetes also often remains undiagnosed. A study with a larger sample size may show an association with family history.

**Table 12.**  
**Waist circumference wise distribution of study participants**

Waist circumference (cm)	Number of participants (%), (n=615)	
<b>Female</b>		
<80 cm	66 (10.73)	2 (0.3)
80-89 cm	129 (20.98)	7 (5.4)
>90 cm	129 (21.00)	27 (21)
<b>Male</b>		
<90 cm	183 (29.8)	0 (0)
90-99cm	76 (12.4)	14 (18.4)
>100cm	32 (5.2)	5 (15.6)
Total	615	55

In this study majority of females have waist circumference of 80-89 cm, and majority of males have <90 cm. 21% of females have > 90 cm waist circumference and 21% of these were found to be diabetic, which is significantly higher than males i.e. 5% have waist circumference >100 cm, of these only 15% were found to be diabetic. This table shows that in females the proportion of Type 2 DM is increasing with increase in waist circumference, reflecting high waist circumference as a risk factor for Type 2 DM. According to others studies, among males waist circumference above 90 cm is also associated with diabetes but in present study it is not showing an increasing trend with increase in waist circumference.

**Table 9.**  
**Level of activity and percentage of diabetics**

Level of Activity	Number of participants (%), (n=615)	Number of Diabetics (%)
Sedentary	32(5.2)	4 (12.5)
Mild	106(17.2)	13 (12.3)
Moderate	296 (47.5)	34 (11.5)
Vigorous	151(24.6)	4 (2.6)
Total	615	55

In this present study about 47.5% of participants belonged to moderate physical activity level. As the level of physical activity is increasing the proportion of diabetics is decreasing. Thus the finding in this table supports the well known protective role of physical activity in prevention of Type 2 DM

**Table 10.**  
**Distribution of study participants according to knowledge of risk factor of TYPE 2 DM**

Knowledge about risk factors of Type 2 Diabetes Mellitus	Number of participants	Percentage (n=615)
About Increasing age	162	26.3
About Inheritance	179	29.1
About Obesity	264	42.9
About Lack of physical exercise	183	29.8

Most of participants 43% know that obesity is a risk factor of Type 2 DM. Very few i.e. 29% know that Type 2 DM is inherited from parents to their offsprings.

## Discussion

In the present study most (42.8%) of the study participants were below 35 years of age, reflecting that young adults constitute main proportion of Indian population in present time. The group at highest risk i.e. > 50 years constituted one-fourth of the study participants. In a study conducted by Gupta S.K. et al<sup>15</sup>. 50% participants were below 35 years of age, but in the study conducted by Mani G. et al<sup>16</sup>. Only 14% of the participants were less than 35 year of age. This difference may be due to that our study has been done in city population, whereas study by Gupta S.K. et al<sup>15</sup> and Mani G. et al<sup>16</sup> were done in Rural area of Tamil Nadu. In our study proportion of female participants was more than the males i.e. 52.8%, this result was similar with result of study conducted by Gupta S.K. et al<sup>15</sup> where 60.27% were females and 39.73% were males, Gupta N. et.al<sup>17</sup> and Mani G. et.al.<sup>16</sup>. Our finding were not similar to the study conducted by Gupta R.K. et al<sup>18</sup>. In the present study, about 88% of the participants belonged to Hindu religion, reflecting that population of Gwalior city is mainly constituted by Hindu religion followers. These finding were similar with the results of study conducted by Gupta S.K. et. al<sup>15</sup>, where, 62.50% were Hindus and study conducted by Mani G. et al<sup>16</sup>.

In this study 81% of participants were married and among married, 10.6 were found to be diabetic against Post-Prandial and Fasting blood sugar test. These finding do not resembles with the finding of a study conducted at *Harvard School of Public Health in Boston Massachusetts*<sup>19</sup>, this study shows that-

- Married men have 16% lower risk in comparison to

unmarried personal.

- Divorced and separated men had about the same risk as married men, while
- Widowers had a 29 percent higher risk, and
- Never married men had a 17 percent higher risk.

In the present study, most of the participants were literate, 41% of participants were educated up to graduation and above and 32% were up to higher secondary and above. These results were similar with study conducted by Gupta S.K. et al<sup>15</sup>, where 63% had studied up to higher secondary and however our finding were not similar with study conducted by Mani G. et al<sup>16</sup>, where 8% participants were having education more than 10 years of schooling. In our study most of participants (54%) belonged to middle class and 23.6% in lower and lower middle class according to Modified B.G. Prasad Classification. These finding were not similar with result of study conducted by Gupta S. et al<sup>15</sup>, where 62%, were belonging to lower and lower-middle socio-economic status. In this present study about 93% participants do not have family history of diabetes this finding resembles with observation of a study conducted by Gupta S. et al<sup>15</sup>, 87.91% had no family history of diabetes. In this study, those subjects, whose both the parents have history of diabetes, such 50% subjects were diabetic, however, when there was only one parents diabetic, only 7.8% subjects were found to be diabetic, in other words, overall only 10% of the participants, who had diabetes had a positive family history of diabetes. According to the study conducted by Ramachandran *et al*<sup>20</sup> in an urban area of south India, 47% of the people who had diabetes had a positive family history. In a other study conducted by Gupta S. et al<sup>20</sup>, in urban area of Pondicherry, 31.50% had positive family history while in another study conducted by Gupta et al<sup>15</sup>, only 12% of the respondents gave a positive family history. This difference may be due to different life-styles and socio-economic status of the respondents. Information about family history is often not correctly available. Diabetes also often remains undiagnosed. A study with a larger sample size may show an association with family history.

In this study Majority of females have waist circumference of 80-89 cm, and majority of males have <90 cm. 21% of females have > 90 cm waist circumference and 21% of these were found to be diabetic, which is significantly higher than males i.e. 5% have waist circumference >100 cm, of these only 15% were found to be diabetic. In a similar study conducted by Gupta S. et al<sup>15</sup>, majority of

males 64.50% had waist circumference of <90 cm. 24.8% females with high risk score had waist circumference of >90 cm which is significantly higher than males 8.84% with waist circumference of >100 cm. The finding in this study has shown that in females the proportion of Type 2 DM is increasing with increase in waist circumference, reflecting high waist circumference as a risk factor for Type 2 DM. According to others studies, among males waist circumference above 90 cm is also associated with diabetes but in present study it is not showing an increasing trend with increase in waist circumference. In this present study 64.7% of participants belonged to mild to moderate physical activity level, this finding is similar with results of study conducted by Gupta S. et al<sup>15</sup>, where 73% belonged to mild to moderate physical activity. As the level of physical activity is increasing the proportion of diabetics is decreasing. Thus the findings support the well known protective role of physical activity in prevention of Type 2 DM. In our study 43% participants know that obesity is a risk factor of Type 2 DM. Very few i.e. 29% know that Type 2 DM is inherited from parents to their offsprings.

### Conclusion

After doing in-depth analysis of the data collected for the study, we can reach at the following conclusion. In modern era, Socioeconomic development, technological advancements and changes in lifestyles, behavioral patterns, demographic profile transition (aging population) lead to major health transition leading to rapid increase in burden of non communicable diseases like diabetes and their burden overweight the burden of communicable diseases. The most disturbing trend is the shift in the age of onset of diabetes to a younger age in the recent years; Indians succumb to diabetes 5-10 years earlier than their western countries, during their productive years. In India more than 50% of people are unaware of their status of diabetes in them [submerged portion of the iceberg represents the hidden mass of disease (e.g., sub clinical cases, carriers, and undiagnosed cases)]. which increases the risk of development of diabetes and its complication in them. This hidden part of the iceberg (mass of unrecognized disease in the community), and its detection and control is a challenge to modern techniques in preventive medicine<sup>69</sup>. By early indication and taking appropriate and proper intervention would greatly help in favorable, alternation of the natural history of the disease, preventing or postponing the onset and burden of Diabetes and its complications,

and also would help in reducing the global economic cost of diabetes. This advantage gained by early screening, can be stated in terms of Lead Time i.e., the period between diagnosis by early detection and diagnosis by other means. The benefits of the programme must be seen in terms of its outcomes. It is also necessary for the complexities and costs of any detection programme to be viewed against the benefits accruing there from<sup>50</sup>.

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