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Community Medicine

# THE RELATIONSHIP BETWEEN TYPE 2 DIABETES AND OBESITY AMONG RURAL AND URBAN ADULT POPULATION OF KAMRUP DISTRICT, ASSAM.

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**ABSTRACT** **Background:** Diabetes represents a spectrum of metabolic disorders, clinically characterized by polyuria ,polyphagia, polydipsia, hyperglycemia and glycosuria due to absolute or relative deficiency of hormone insulin, which has become a major health challenge worldwide. World Health Organization (WHO) predicted that India would contribute nearly 57 million people to the global burden of diabetes by the year 2025.

**Aim and Objectives:** To study the relationship between type 2 diabetes and obesity among rural and urban adult population of Kamrup district, Assam

**Methodology:** A Community based cross sectional study was conducted **in the** villages of Rani Community Development Block and Municipal ward of Guwahati , Kamrup (ASSAM) from Aug 2016 to July 2017 on 450 adults >20 yrs of age comprising both rural and urban population.

**Results:** The prevalence of diabetes was found to be significantly higher among obese (according to WHR) in both rural and urban respondents.

**Conclusion:** Lifestyle measures like regular exercise, increased physical activity, regular intake of healthy diet to prevent the risk of diabetes at primordial level.

**KEYWORDS :** Obesity, Diabetes, Adult Population.

**Introduction:**

Diabetes represents a spectrum of metabolic disorders, clinically characterized by polyuria,polyphagia,polydipsia,hyperglycemia and glycosuria due to absolute or relative deficiency of hormone insulin(either by action or by secretion or both, resulting in type 1 or type 2 respectively) that controls the metabolism of carbohydrate, protein, fat and electrolytes, which has become a major health challenge worldwide. Diabetes is an "iceberg" disease. Although increases in both the prevalence and incidence of type2 diabetes have occurred globally, they have been especially dramatic in societies in economic transition, in newly industrialized countries and in developing countries[1].

World Health Organization(WHO) predicted that India would contribute nearly 57 million people to the global burden of diabetes by the year 2025. Approximately 85-90% of all cases of diabetes are type 2 diabete[2]. The increased number of diabetics in India is likely to be due to a significant increase in the incidence of type 2 diabetes which is caused by unprecedented rates of urbanization, results in environmental and lifestyle changes. Obesity is thought to contribute to the insulin resistance syndrome and as such is often linked to the development of diabetes. **O**besity has emerged as a major disorder associated with many metabolic diseases in both developed and developing countries. In India, obesity is emerging as an important health problem, paradoxically co-existing with significant under nutrition prevailing in different sections of the population. The major health consequences associated with overweight and obesity are type 2 diabetes, coronary heart diseases (CHD), hypertension, gall bladder disease, certain types of cancer, dyslipidaemia and insulin resistance. BMI is a simple measurement of overall adiposity. It is now recognized that rather than the degree of obesity, the distribution of body fat is a more important determinant of several disorders. A positive association between overweight and obesity and risk of type 2 diabetes has been established repeatedly in many cross-sectional and prospective studies. It was found that the risk conferred by obesity for developing diabetes was higher by over 40 times in obese women compared to those who remained slim; and the risk would be reduced significantly with weight loss.

**Aims and Objectives:**

To study the relationship between type 2 diabetes and obesity among rural and urban adult population of Kamrup district, Assam.

**Materials and methods**: The present community based cross-sectional study was conducted for a period of one year from 01-08-2016 to 31-07-17. The sample size was calculated by taking the prevalence of diabetes as 19.5%( study done in Ernakulam (2006) by V. Mohan,et al. Taking a power of 80% with 95% confidence interval and using the formula $N=4pq/L^2$ .The minimum sample size required for the study was calculated to be 412. Data of 900 respodents ( 450 from rural and 450 from urban) in the age group of 21 – 60 **(**The ICMR-India Diabetes (INDIAB) Study- phase I,2011**)** who were living in the selected villages and Municipal wards under the Rani Development Block and Guwahati City, respectively. Data were collected by using a pre-designed and pre-tested schedule containing both open and closed ended questions. Verbal informed consent was taken from each of the respondent explaining purpose and nature of the study. Privacy and confidentiality of the respondents were maintained while collecting data and results were presented in aggregate form without individual identification.

**Inclusion Criteria**: Adults aged 21-60 years who were permanent residents or those who have been living there for more than 6 months were interviewed after taking informed consent.

**Exclusion Criteria**: Adults with serious or acute medical illness other than diabetes, pregnant women, adults who were on drugs like corticosteroids, OCPs, Beta Blockers and respondents who were not willing to participate. Ethical clearance of the study was obtained from the Institutional Ethics Committee, Gauhati Medical College,Guwahati before the commencement of the study**.**

**Sampling design:**

There are 31 (Thirty one) wards under Guwahati Municipal Corporation. From these 31 wards, 15 wards were selected through simple random sampling. For each ward 30 households were selected at random and from each selected households the eldest adult available during home visit, irrespective of gender were taken to get the sample size of 450, i.e. 15x30=450.As per census 2011, Rani developmental block has 53 villages. From these 53 villages, 15 villages were selected through simple random sampling. For each village 30 households were selected at random and from each selected households the eldest adult available during home visit, irrespective of gender were taken to get the sample size of 450, i.e. 15x30=450. Hence, the total sample was taken as 900 (450 each from urban and rural).

**Operational Definitions**:

**1.Body Mass Index(BMI)**: Body Mass Index was calculated by the following formula.

BMI= Weight( in kg)/ Height in meter$^2$

Classification of participants according to BMI (WHO Classification).

Classification BMI

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|---|---|
| a) Underweight: | <18.5 |
| b) Normal | 18.5-24.99 |
| c) Overweight | 25-29.99 |
| d) Obese | ≥30 |

The cut of values are same for both the sexes (WHO TRS 894 2000)[64].

**2. Waist Hip Ratio (WHR):** The Waist Hip Ratio was calculated by

**WHR=** Waist circumference (in cm)/ Hip circumference (in cm)

Truncal obesity was defined as WHR > 1.0( in males), and > 0.85 ( in females)[63]

**Criteria used for diagnosis of Diabetes ( American Diabetes Association, 2003)**

**Fasting Blood Glucose (FBG)**

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| **< 100 mg/dl** | **Normal** |
| **100-<126 mg/ dl** | **Impaired Glucose Tolerence** |
| **≥ 126 mg/ dl** | **Diabetes.** |

A person was considered to having diabetes if he/ she were already diagnosed case of diabetes and or treatment or current fasting blood glucose ≥ 126 mg/dl.

**Results:**

In table 1 shows that among rural respondents prevalence of diabetes were more (38.46%) in obese whereas among urban respondents prevalence were more (32.61%) in over weightand the difference were statistically significant (P<0.0001) in both the groups.

In table 2 shows that among rural adult female respondents prevalence of diabetes were more( 26.67%) in obese and the difference was statistically significant(P<0.05) whereas among urban adult female respondents prevalence were more in normal female(22.41%) , but the difference was statistically not significant (P>0.05) :

In table 3 shows that prevalence of diabetes were more in obese among both rural and urban male respondents (24.07% and 27.25% respectively) and difference was statistically significant (p<0.05)in both the groups.

In table 4 shows that prevalence of diabetes were more in obese among rural and urban female respondents (33.33% and 33.76% respectively) and difference was statistically significant (p<0.05)in both the groups.

**Table1** showing the association of diabetes with BMI among rural and urban adult male respondents.

| BMI (Category) | Rural | | | Urban | | |
|---|---|---|---|---|---|---|
| | Diabetes absent (%) | Diabetes present (%) | Total (%) | Diabetes absent (%) | Diabetes present (%) | Total (%) |
| Underweight | 27 (96.43) | 1 (3.57) | 28 (100) | 14 (82.35) | 3 (17.65) | 17 (100) |
| Normal | 182 (95.79) | 8 (4.21) | 190 (100) | 104 (91.29) | 10 ( 8.77) | 114 (100) |
| Overweight | 13 (61.90) | 8 (38.1) | 21 (100) | 31 ( 67.39) | 15 (32.61) | 46 (100) |
| Obese | 8 (61.53) | 5 (38.46) | 13 (100) | 28 (82.35) | 6 (17.65) | 34 (100) |
| Total | 230 (91.26) | 22 (8.73) | 252 (100) | 177 (83.89) | 34 (16.11) | 211 (100) |
| $X^2$=42.955 , df=3, P value< 0.0001 | | | | $X^2$=13.894 , df=3, P value< 0.0001 | | |

**Table 2** showing the association of diabetes with BMI among rural and urban adult female respondents.

| BMI (Category) | Rural | | | Urban | | |
|---|---|---|---|---|---|---|
| | Diabetes absent (%) | Diabetes present (%) | Total (%) | Diabetes absent (%) | Diabetes present (%) | Total (%) |
| Underweight | 29 (96.67) | 1 (3.33) | 30 (100) | 18 (85.71) | 3 (14.29) | 21 (100) |
| Normal | 122 (94.57) | 7 (5.43) | 129 (100) | 90 (77.59) | 26 (22.41) | 116 (100) |
| Overweight | 19 (79.17) | 5 (20.83) | 24 (100) | 43 (79.63) | 11 (20.37) | 54 (100) |
| Obese | 11 (73.33) | 4 (26.67) | 15 (100) | 39 (81.25) | 9 (18.75) | 48(100) |
| Total | 181 (91.41) | 17(8.59) | 198 (100) | 188 (78.66) | 51 (21.34) | 239 (100) |
| $X^2$=13.530 ,df= 3, P value= 0.0036 . | | | | $X^2$=0.8490 ,df= 3, P value= 0.8377. | | |

**Table 3** showing the association of diabetes with WHR (waist hip ratio) among rural and urban adult male respondents.

| WHR | Rural | | | Urban | | |
|---|---|---|---|---|---|---|
| | Diabetes absent (%) | Diabetes present (%) | Total (%) | Diabetes absent (%) | Diabetes present (%) | Total (%) |
| Normal (≤ 1) | 189 (95.45) | 9 (4.54) | 198 (100) | 119 (90.84) | 12 (9.16) | 131 (100) |
| Obese (> 1) | 41 (75.93) | 13 (24.07) | 54 (100) | 58 (72.5) | 22 (27.5) | 80 (100) |
| Total | 230 (91.27) | 22 (8.73) | 252 (100) | 177 (83.89) | 34 (16.11) | 211 (100) |
| Fisher's Exact test, p value< 0.0001 | | | | p value< 0.0008 | | |

**Table 4** Showing the association of diabetes with WHR (waist hip ratio) among rural and urban adult female respondents.

| WHR | Rural | | | Urban | | |
|---|---|---|---|---|---|---|
| | Diabetes absent (%) | Diabetes present (%) | Total (%) | Diabetes absent (%) | Diabetes present (%) | Total (%) |
| Normal (≤0.85) | 165 (94.83) | 9 (5.17) | 174 (100) | 143 (85.12) | 25 (14.88) | 168 (100) |
| Obese (> 0.85) | 16 (66.67) | 8 (33.33) | 24 (100) | 51 (66.23) | 26 (33.76) | 77 (100) |
| Total | 181 (91.41) | 17 (8.59) | 198 (100) | 188 (78.66) | 51 (21.34) | 239 (100) |
| Fisher's exact test, p value=0.0002 | | | | p value=0.0012 | | |

**Discussion**

**In table 1** shows the association of diabetes with BMI among rural and urban adult male respondents .Out of 252 rural male respondents prevalence of diabetes were highest in obese (38.46%) followed by overweight (38.1%) , normal (4.21%) and underweight(3.57%) . This difference was statistically significant (p<0.0001). Among 211 urban male respondents prevalence of diabetes were highest in overweight (32.61%) followed by obese (17.65%) underweight(17.65%) and normal(4.21%). This difference was statistically significant (p<0.0001) **and in table** 2 showing the association of diabetes with BMI among rural and urban adult female respondents .Out of 198 rural female respondents prevalence of diabetes were highest in obese (26.67%) followed by overweight (20.83%) normal (5.43%) and underweight(3.33%).This difference was statistically significant (p<0.0001) whereas .Among 239 urban female respondents prevalence of diabetes were highest in normal (22.41%) followed by overweight (20.37%), obese (18.75%) and underweight(14.29%) . This difference was statistically not significant (p> 0.05). From above discussion it was found that prevalence of diabetes increases with increases in BMI(>25kg/m$^2$) except in female urban respondents. Study done by **RaoCR et al** (2010)[3], **Sanjay D Bhalerao et al**(2014)[4] and **Hetal K Rathod et al**(2014)[5] gives similar results with my current study

In **table 3** shows the association of diabetes with WHR among rural and urban adult male respondents.Both rural and urban male respondents prevalence of diabetes were highest (24.07% and 27.5%

respectively) among obese respondents and this difference were statistically significant ($p<0.05$) in both the groups **and in table 4** shows the association of diabetes with WHR among rural and urban adult female respondents. Both rural and urban female respondents prevalence of diabetes were highest (33.33% and 33.76% respectively) among obese respondents and this difference were statistically significant ($p<0.05$) in both the groups.From above discussion (both in table 3 and 4) it is found that prevalence of diabetes were highest among obese participants in both rural and urban population and the following study results reported similar with my study. Study done by **Hetal K Rathod et al**(2014)[5] and **IshratHussain Dar et al** (2015)[6] gives the similar results with my current study.

## Conclusions

The prevalence of diabetes was found to be significantly higher among obese rural male respondents whereas prevalence was significantly higher among overweight urban male respondents. Prevalence of diabetes was found to be significantly higher among rural obese female respondents whereas among urban adult female respondents prevalence were highest among normal female, but the difference was statistically not significant ($P>0.05$).The prevalence of diabetes was found to be significantly higher among obese (according to WHR) in both rural and urban respondents.

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