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ORIGINAL ARTICLE

COMPARATIVE STUDY OF RISK FACTORS OF TYPE-II DIABETES IN RURAL AND URBAN POPULATION

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ABSTRACT: A study of effect of various risk factors on Type–II diabetes in Urban and rural population. Generally Indians seems to have great tendency to develop diabetes mellitus. In addition to this, unhealthy food habits, lack of physical activity, diabetic family history, age, obesity, smoking & alcoholism are the other causes for diabetes mellitus. **AIM:** To analyze the impact of different risk factors on Type – II diabetes in urban and rural population. **METHODS:** Total 160 subjects of urban and rural population were included in this study and their detailed histories were taken by the questionnaire. In this study we compared the blood glucose levels, unhealthy food habits, lack of physical activity, age, obesity, smoking & alcoholism in urban and rural population. **RESULT:** The study showed that the blood glucose levels, unhealthy food habits, lack of physical activity, diabetic family history, age, obesity, smoking & alcoholism were found higher in urban than in rural population. **CONCLUSION:** The results showed that the fond of Type – II diabetes is very less in rural population when compared to urban population. This is because of, the rural population had more physical activity, intake of moderate calorie food, less diabetic family history and less obese. So, these factors help to overcome the increased effect of age, smoking and alcoholism on Type – II diabetes in rural population.

KEYWORDS: C18.452.394.750.149, Physical activity, Obesity, Unhealthy food habits, Urban and Rural population, Age, Smoking & alcoholism.

INTRODUCTION: Diabetes mellitus is an endocrinal disorder affecting each and every cell of the body there by bringing about alterations in the metabolism of carbohydrate, protein and fat. These metabolic alterations finally lead to multiple organ failure. In diabetes mellitus especially Type – II diabetes is a major global health problem. More than 95% of Indian population with diabetes has Type – II diabetes. It accounts for between 85 to 90% of all diabetes. The vast majority of Type – II diabetes occurs in the middle or old age and at least 4% of people in their 60s have diabetes. Diabetes is a major source of morbidity, mortality and economic cost to society.

DEFINITION: Diabetes mellitus is a syndrome of impaired carbohydrate, protein and fat metabolism caused by either, lack of insulin secretion (or) decreased sensitivity of the tissues to insulin.

Metabolic Changes in Diabetes Mellitus:

1. Hyperglycemia and poor glucose tolerance:
    a. Poor glucose utilization due to,
        i. A decrease in glucose uptake by muscles and adipocytes.
        ii. An indirect decline in glucose diffusion into hepatocytes.
        iii. A lowered rate of glycolysis.
        iv. A decline in the aerobic metabolism of pyruvate.

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b. Enhanced release of glucose from the liver in to blood due to,
    i. Increased gluconeogenesis.
    ii. Increased glycogenolysis.

2. Glucosuria.

3. Lipidemia and ketosis: Changes in fat metabolism result from,
    a. Increased lipolysis of adipose tissue.
        i. A decline in its insulin – mediated dephosphorylation to its inactive form.
        ii. A rise in the glucocorticoid – induced synthesis of the lipase.
        iii. A rise in the phosphorylation of the lipase.
    b. Lipidemia, with high plasma levels of free fatty acids released by adipose tissue lipolysis, at times leading even to fatty liver.
    c. Increased β – oxidation in hepatic mitochondria brought about by:
        i. increased availability of FFA from adipose tissue lipolysis.
        ii. Enhanced transport of acyl – coA in to mitochondria.
    d. Increased ketogenesis.

4. Reduced lipogenesis due to,
    a. Decreased transfer of citrate from mitochondria to cytoplasm.
    b. Inhibition of acetyl – coA carboxylase.
    c. Decreased synthesis of,
        i. Insulin inducible enzymes of the path way, namely, acetyl – coA carboxylase, fatty acid synthase.
        ii. Insulin inducible enzymes generating NADPH for the pathway, namely, malic enzyme, glucose – 6 – phosphate dehydrogenase.
        iii. Insulin inducible ATP – Citrate lyase.

5. Hypercholesterolemia and arteriosclerosis.
6. Accelerated sorbitol formation.
7. Glycosylated hemoglobin.
8. Decreased protein anabolism.
9. K+ imbalance.

Type – II diabetes mellitus or Non-insulin dependent diabetes mellitus or Adult onset diabetes mellitus: It is caused by decreased sensitivity of target tissues to insulin. This reduced sensitivity of insulin is often referred to as insulin resistance. This is due to inadequate insulin receptors on the cell surfaces of the target tissues. This syndrome is often found in an obese person. This occurs at the age above 40 years and the disorder develops gradually.

Therefore, this syndrome is referred to as Adult onset diabetes mellitus. The symptoms are developed gradually, which are similar to that of Type – I diabetes mellitus (Polyuria, polydypsia, polyphagia, loss of body weight, weakness, tiredness, hyperglycemia with glycosuria), except ketoacidosis is usually not present in Type – II diabetes mellitus.

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Tests	Normal values
Fasting Blood Sugar (FBS)	70 - 110 mg/dl
Post prandial Blood Sugar (PPBS)	80 - 140 mg/dl
Random Blood Sugar (RBS)	70 - 140 mg/dl
Glucose Tolerance Test (GTT)	75 - 140 mg/dl
Glycated hemoglobin (HbA_1c)	4 - 6.5 %

Tests and normal values for diabetes mellitus

The risk factors for Type– II diabetes are unhealthy food habits, lack of physical activity, diabetic family history, age, obesity, smoking & alcoholism. So, we studied these factors in both Urban and rural population and the results were the urban people had more effect of Type – II diabetes due to their unhealthy food habits, lack of physical activity, diabetic family history, age, obesity, smoking & alcoholism.

But the Rural people were very less affected due to their food habits (moderate calorie food) and physical activity. In this study we found the age, smoking and alcoholism were high in rural population but, their blood glucose levels were lower than the urban population. So, depending upon these values we are expecting the age, smoking and alcoholism had been overcome by their food habits and physical activity.

AIMS AND OBJECTIVES:

1. To assess the blood glucose levels in urban and rural population.
2. To assess the various risk factors in urban and rural population.
3. Comparison of blood glucose levels and risk factors in urban and rural population.
4. To assess the effect of various risk factors on Type – II diabetes.

METHODOLOGY: This study was an observational follow – up study, designed in two sites. Rural and urban areas comprising of 160 populations in which 50% from rural area and 50% from urban area. The rural population were 80. Among these population 7 people were diabetic, 62 people were non diabetic and 11 people were in pre diabetic status.

The Urban population was also 80. Among these population 71 people were diabetic and 9 people were in pre diabetic status. The study was under taken in Tagarapuvalasa village at NRIGH and urban population study was under taken in Visakhapatnam at TRIMS and the study period was six months. The subjects were sent from the department of General Medicine. In this study we included the subject's age of 55 to 80 years.

The subject's history was taken individually by a pre-structured questionnaire which included personal details like name, age, gender, height, weight. Food habits and general habits like smoking, alcoholism etc. and State of health, Profession, Physical activity, Family history of diabetes. The physical activity and food habits of both urban and rural population were given in the tabular form.

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Sampling method used was convenient and their glycemic levels were observed by Glucose oxidase - peroxidase method in semi auto analyzer[1]. Along with this the risk factors like, lack of physical activity, obesity, unhealthy food habits, Family history of diabetes, age, smoking & alcoholics were observed through the questionnaire.

Depending upon the questionnaire we compared the physical activity in both groups, we observed 47 urban people were sedentary and the remaining were moderate workers. Where as in rural population 16 people were sedentary and the remaining were heavy workers. We compared their blood glucose levels and we found increased blood glucose levels in urban and decreased blood glucose levels in rural population. This is because of the urban people had less physical activity (sedentary) and rural people had increased physical activity (active).

Urban population	Rural population
Sedentary - 47	Moderate work - 16
Moderate work - 33 (Office work (or) Watching TV)	Active (or) Hard work - 64 (Agriculture work (or) Other work)
Physical activity	

We compared the BMI of both groups, and observed 43 urban people and 21 rural people had more BMI. (The BMI mainly depends on the food habits and physical activity). We compared their blood glucose levels and we found increased blood glucose levels in urban and decreased blood glucose levels in rural population. Based on this comparison more BMI means more blood glucose levels. The BMI is used to calculate the obesity.

OBESITY:

Definition: It is defined as an accumulation of excess fat in the body. This is a pathological state resulting from the consumption of excessive quantity of food over an extended period of time. The problem of obesity arises due to an imbalance of energy intake in relation to energy expenditure. The degree of obesity is commonly assessed by means of the body mass index (BMI).

$$BMI = \frac{\text{Body weight (kg)}}{\text{Height (m}^2\text{)}}$$

Value of BMI	Degree of obesity
20 - 25	Normal
25 - 30	Over weight (or) Grade - I
30 - 35	Over obesity (or) Grade - II
Above - 35	Gross obesity (or) Grade - III

The BMI of urban people undergoes degree of obesity grade – II and the BMI of rural people undergoes degree of obesity grade – I. This means the urban people had more BMI than the rural people. So, the urban people have more obese than rural people. This is because of their unhealthy food habits and lack of physical activity.

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	Urban	Rural
Morning	Idli, dosa, puri, upma, coffee, tea or milk.	Ragi jawa, curd rice, etc.
Afternoon	Rice with dhal, curry, fry, papad, curd, fruits, etc.	Un polished rice with un polished dhal, dry and salt fishes, crabs, pickles, butter milk, etc.
Evening	Tea, snacks like samosa, pakodi, sweets, fruits, etc.	Tea, traditional foods and natural foods like fruits.
Night	Chapathi with curry, curd, milk, etc.	Un polished rice with curry or pickle, butter milk, etc.
Animal food	more	Less

Food habits

Urban	Rural
Processed foods, Fast foods, Sweets, Stored foods, Potato chips, Pizzas,	Traditional foods, Fresh and natural foods.

Normally consumed foods

We compared the unhealthy food habits of urban and rural population. Then we found 25 of urban and 14 of rural people. So the unhealthy food habits of urban people were more significant than rural people.

In this study we included the subject's age of 55 to 80 years. When we comparing the age then we compared the age about 65 to 80 years between the two groups. We found 30members of age about 65 to 80 years in urban and 42 members in rural population. But we found the blood glucose levels of 30 urban people were more than 42 rural people blood glucose levels. Normally above 60 years the blood glucose levels will slightly increase.

In urban population the blood glucose levels were increased. But in rural population there was no change in blood glucose levels. This may be due to their increased physical activity and moderate food habits. So, we were expected that the blood glucose levels of rural population were overcome by their increased physical activity and moderate food habits.

Urban	Rural
30 members	42 members

Age about 65 to 80 years

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We compared the Smoking & Alcoholism between the two groups. We found 15 urban people of Smoking & Alcoholism and 16 members in rural population. We compared blood glucose levels of both groups. But we found decreased blood glucose levels in rural and increased blood glucose levels in urban population.

Normally the blood glucose levels will increase in smokers and alcoholics, but here because of their healthy food habits, increased physical activity, the blood glucose levels were not increased in rural population. Where as in urban population, because of their unhealthy food habits and less physical activity the blood glucose levels were increased.

Urban	Rural
Smokers & Alcoholics - 15	Smokers & Alcoholics - 16
Smoking daily five times	Smoking daily seven times
Alcohol consumption weekly three days	Alcohol consumption weekly five days
Smoking & Alcoholism	

We compared the Family history of diabetes in both groups, we observed 24 urban people and 19 rural people had family history of diabetes. We compared their blood glucose levels and we found increased blood glucose levels in urban and decreased blood glucose levels in rural population. This is because of the urban people had more family history of diabetes than the rural population.

Urban	Rural
24 - people had family history of diabetes	19 - people had family history of diabetes
Family history of diabetes	

RESULTS: The results of this study showed that the Random Blood Sugar (RBS**)** Mean ± SD values of urban population were 235 ± 98.9 increased than the rural population 106 ± 28.6 and the P - Value is significant (< 0.001). This indicates the Urban population had more prevalence of diabetes than the Rural population.

Lab Investigation For Type – II diabetes	Urban Population Mean ± SD	Rural Population Mean ± SD	P - Value
Random Blood Sugar (RBS**)** mg/dl	235 ± 98.9	106 ± 28.6	P - Value < 0.001

The risk factors like Physical activity, Unhealthy food habits, Smoking & Alcoholism, Family history of diabetes, Obesity, Age, we compared each risk factor in both Urban and rural population.

When we compared the physical activity we found 47 sedentary persons in urban and 16 moderate workers in rural population and their Random Blood Sugar (RBS) values were compared, then the Mean ± SD values of Urban population were 293±95.1 increased than the rural population 147 ± 37.7 and the P - Value is significant (<0.001).

We compared the unhealthy food habits we found 25 persons in urban and 14 persons in rural population and their Random Blood Sugar (RBS) values were compared, then the Mean ± SD values of Urban population were 328 ± 80.5 increased than the rural population 143 ± 19 and the P - Value is significant (<0.001).

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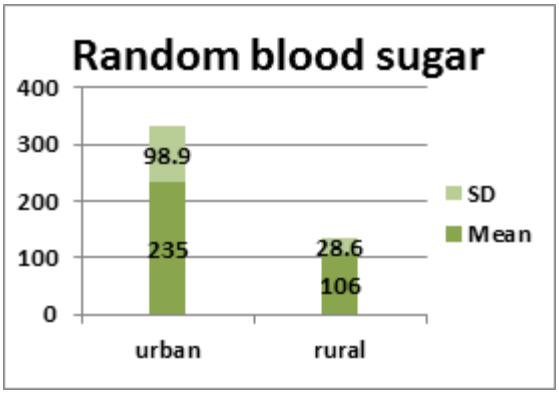
We compared the Smoking and alcoholism we found 15 persons in urban and 16 persons in rural population and their Random Blood Sugar (RBS) values were compared, then the Mean ± SD values of Urban population were 307 ± 65.6 increased than the rural population 135.9 ± 42.3 and the P - Value is significant (< 0.001).

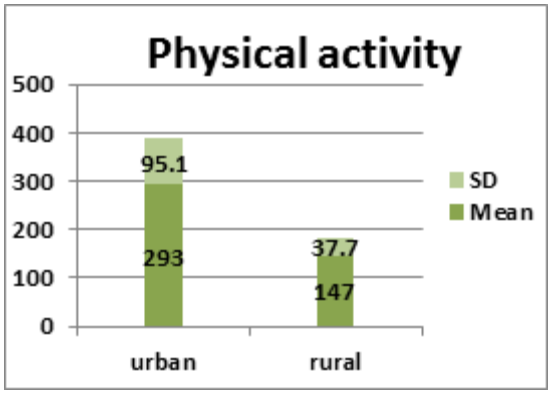
We compared the Family history of diabetes we found 24 persons in urban and 19 persons in rural population and their Random Blood Sugar (RBS) values were compared, then the Mean ± SD values of Urban population were 287 ± 89.5 increased than the rural population 120 ± 19.7 and the P - Value is significant (< 0.001).

We compared the Obesity we found 43 persons of Grade - II in urban and 21 persons of Grade - I in rural population and their Random Blood Sugar (RBS) values were compared, then the Mean ± SD values of Urban population were 294 ± 93.7 increased than the rural population 140 ± 34.8 and the P - Value is significant (< 0.001).

We compared the Age we found 30 persons in urban and 42 persons in rural population and their Random Blood Sugar (RBS) values were compared, then the Mean ± SD values of Urban population were 233 ± 114.7 increased than the rural population 109 ± 33 and the P - Value is significant (< 0.001). Comparison of these risk factors indicates the urban population had more prevalence of diabetes than the Rural population.

Risk Factors For Type – II diabetes	Urban Population Mean ± SD	Rural Population Mean ± SD	P - Value
Lack of Physical activity	293 ± 95.1	147 ± 37.7	P - Value < 0.001
Unhealthy food habits	328 ± 80.5	143 ± 19	P - Value < 0.001
Smoking & Alcoholism	307 ± 65.6	135.9 ± 42.3	P - Value < 0.001
Family history of diabetes	287 ± 89.5	120 ± 19.7	P - Value < 0.001
Obesity	294 ± 93.7	140 ± 34.8	P - Value < 0.001
Age	233 ± 114.7	109 ± 33	P - Value < 0.001





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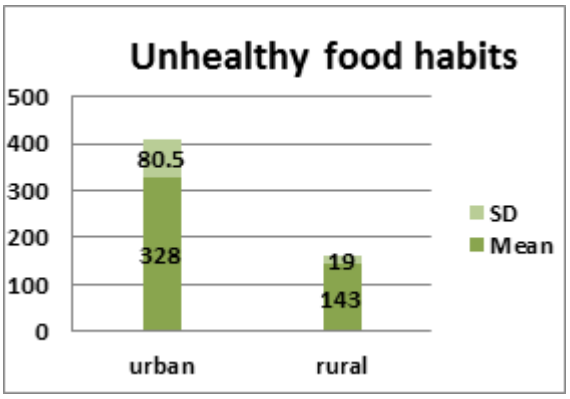

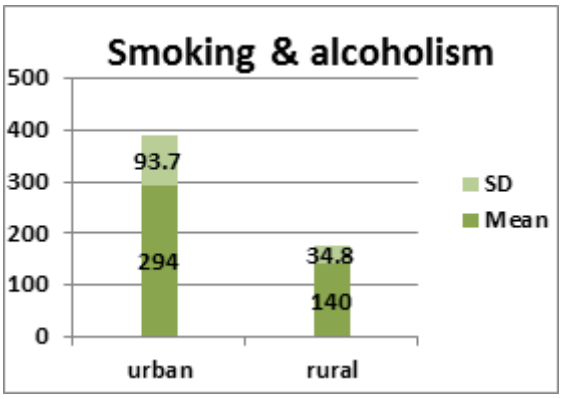

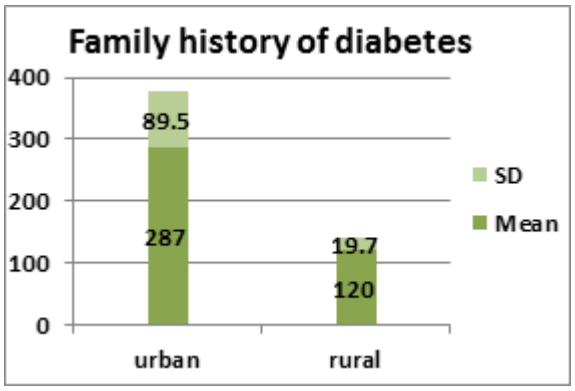

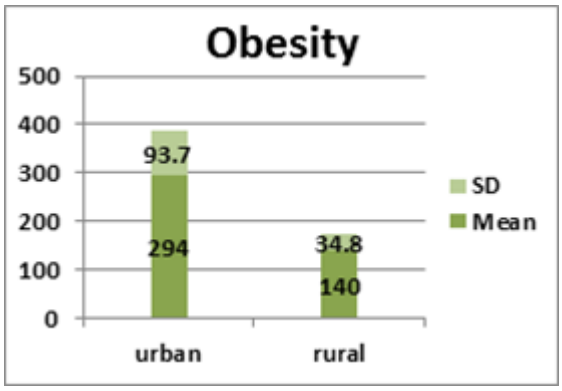

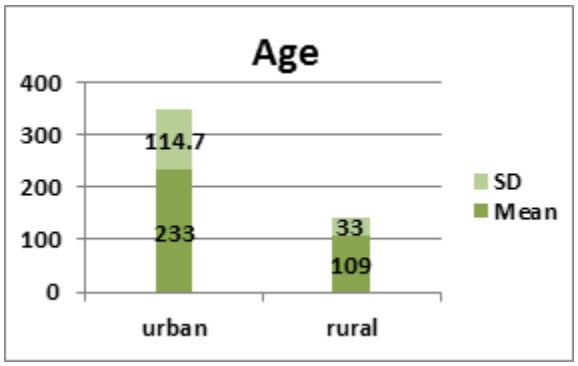

The statistical analysis of data was done by student "t" test.[2]

Depending upon the above results, the correlation between the risk factors for Type II diabetes and blood glucose levels were,

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Risk Factors For Type – II diabetes	Urban Population	Rural Population	RBS in Urban Population	RBS in Rural Population	P - Value
Lack of Physical activity	Increased	Decreased	Increased	Decreased	Significant < 0.001
Unhealthy food habits	Increased	Decreased	Increased	Decreased	Significant < 0.001
Smoking & Alcoholism	Decreased	Increased	Increased	Decreased	Significant < 0.001
Family history of diabetes	Increased	Decreased	Increased	Decreased	Significant < 0.001
Obesity	Increased	Decreased	Increased	Decreased	Significant < 0.001
Age	Decreased	Increased	Increased	Decreased	Significant < 0.001

DISCUSSION: Normally diabetes is caused by lack of insulin secretion or decreased sensitivity of the tissues to insulin and the risk factors like unhealthy food habits, lack of physical activity, age, and family history of diabetes, smoking and alcoholism.

Unhealthy food habits like taking more amount of oily foods, pizzas, samosas, pastries, cheese, butter, ghee and processed foods causes obesity and also increase lipid profile. Depending upon the reference, Comparative Study of Risk Factors of Cardiac Diseases among Urban and Rural Population, the lipid profile containing TC, TG, LDL, VLDL was increased and the good cholesterol HDL was decreased.[3]

I. The obesity is a main cause for diabetes and the increased lipid profile causes diabetes and cardiac diseases.[3]
II. The family history of diabetes had played an important role in cause of diabetes. If the parents, either mother or father had diabetes then there is a 30% of chances to transfer from them.[3,4,5]
III. Depending upon the age, the vast majority of Type – II diabetes occurs in the middle or old age and at least 4% of people in their 60s have diabetes. This is because, lack of insulin secretion and decreased sensitivity of the tissues to insulin.[6]
IV. Normally the food taken by the individuals was finally converted to glucose and the glucose is mainly used for energy. But the person with lack of physical activity, in that person's the glucose is not utilized by them and the increased glucose enters into the blood stream and the glucose concentration was increased in blood and causes diabetes.[7,8,9]
V. Smoking and alcoholism causes lipid peroxidation and increases the lipid profile this increased lipid profile will cause diabetes and cardiac diseases.[10,11,12]

From the above data it becomes clear that the urban population had more effect of Type – II diabetes than the rural population. This is because of the risk factors like, lack of physical activity, unhealthy food habits, and family history of diabetes, obesity, age, smoking & alcoholism. In rural population the effect of Type – II diabetes was less, because of their increased physical activity, healthy food habits, less family history of diabetes and less obesity.

In rural population age, smoking & alcoholism were increased, but the effect of Type – II diabetes was less. This is because of the age; smoking & alcoholism were overcome by their increased physical activity, food habits of less cholesterol diet and less family history of diabetes. Finally the urban populations were more prone to Type – II diabetes than the rural population.

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