

# Assessment of Dietary Habits on Risk Profiles among Type 2 Diabetic Patients at LLR Hospital, Kanpur District

Ruchi Singh<sup>1</sup>, Dr. Jyotsna Singh<sup>2</sup>, Dr. Richa Giri<sup>3</sup>

Ph.D Scholar, Dept. of Home Science, Nehru Gram Bharti Vishwavidyalaya, Allahabad, Uttar Pradesh, India<sup>1</sup>

Assistant Professor, Dept. of Home Science, Nehru Gram Bharti Vishwavidyalaya, Allahabad, Uttar Pradesh, India<sup>2</sup>

Associate Professor, Dept. of Medicine, GSVM Medical College, Kanpur, Uttar Pradesh, India<sup>3</sup>

**ABSTRACT:** Diabetes Mellitus has emerged as a major health issue in the world. The disease is affecting at an alarming rate to both rural and urban populations in India. Many factors are believed to play their parts in the pathogenesis of the disease. Genetic predispositions, faulty dietary patterns and sedentary lifestyle are indicated by researches as important factors leading to increase in prevalence. Dietary habits have long been associated with the management and prevention of various metabolic disorders such as insulin resistance, obesity, type 2 diabetes, as well as with the development of cardio – vascular diseases. **OBJECTIVE** Assessing the dietary habits on risk profiles among type 2 diabetic subjects. **MATERIALS & METHODS** An interviewer administered questionnaire based cross-sectional study was conducted among randomly selected 120 type2 diabetes mellitus subjects [Age =35-80 years, Mean Age = 56.08 ± 10.94, Males = 59, Females = 61]. **RESULT** Out of 120 subjects, 44% (count of 52) had Normal BMI i.e. 18.5 to 24.9. Rest 57% (count of 68) had their BMI level > 25 which is further divided into sub-groups as Pre Obese, Obese Class 1, Obese Class 2 and Obese Class 3. -The mean Caloric intake calculated for the subjects is 1918 KCal/day & for male it is 2408 KCal/day. -Dietary habits showed that 78 subjects were Vegetarian and 42 were Non-Vegetarian. -Waist-Hip Ratio (WHR) measurement showed that of the total subjects, count of 51 females (43%) had  $WHR \geq 0.85$  and 41 males (34%) had  $WHR \geq 1$ . **DISCUSSION** Waist-Hip Ratio of  $\geq 0.85$  among females and  $\geq 1$  in males reflects Central Obesity. Subjects having Central Obesity carry excess of body fat and higher blood sugar levels, resulting a high risk and complications in diabetes. **CONCLUSION** Dietary transition along with sedentary lifestyle, with junk food appears to have contributed a lot to the high prevalence rate of obesity in urban diabetic population which ultimately leads to further micro and macro vascular complications in diabetic subjects. By providing active and effective dietary education and knowledge about diabetes related signs, symptoms and self management of diabetes we can uplift the quality life of a diabetic patient.

**KEYWORDS:** Body Mass Index (BMI), Central Obesity, Type 2 Diabetes Mellitus (T2DM), Waist-Hip Ratio (WHR), Blood Sugar Levels.

## I. INTRODUCTION

Diabetes Mellitus has emerged as a major health problem in the world. The disease is affecting at an alarming rate to both rural and urban populations in India. Due to globalization, most of the urban population of India is leading a stressful, unhealthy and sedentary lifestyle mainly altering their dietary patterns which is among the leading cause for obesity and diabetes. Commonly DM referred as 'Non Insulin Dependent Diabetes' or 'Adult onset Diabetes' accounts for 90%-95% of all Diabetes (ADA). Globally, as of 2010, an estimated 285 million people had Diabetes. As per the reports of International Diabetes Federation (2013) an estimated 381 million people are suffering with Diabetes and prevalence is rapidly increasing in developing countries. According to International Diabetes Foundation, India has more diabetics than any other country in the world. Indian Heart Association, projected that India will have 109 million individuals with Diabetes by 2035.

# International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: [www.ijirset.com](http://www.ijirset.com)

Vol. 7, Issue 4, April 2018

Moreover, among the diabetes, Type-2 Diabetes Mellitus is more prevalent and exerts severe complications on early onset. Diabetes Mellitus is a clinical syndrome characterized by hyper glycemia, caused due to absolute or relative deficiency of insulin in human body. Type 2 Diabetes Mellitus is strongly associated with many complications including Hypertension, Cardio Vascular disease, Neuro and Nephropathy, Diabetic Foot, etc (ADA). Cumulative evidences suggested that diet plays an important role in the management of diabetes mellitus. Before the discovery of insulin, it was the only method of life support in diabetic patients. After introducing the drug, diet still remained a significant therapeutic strategy.

Dietary habits have long been associated with the management and prevention of various metabolic disorders, such as insulin resistance, obesity, type 2 diabetes, as well as with the development of cardiovascular disease. In particular, the adoption of a dietary pattern characterized by a high intake of red meat, besides other components, including refined grain products, snacks, sweets and fried foods is believed to contribute to the increased prevalence of type 2 diabetes worldwide. The modification of patients' nutrition habits should always be the first step in treatment of type 2 diabetes mellitus, before medical therapy is introduced. In recent years, several clinical and epidemiological studies have attempted to associate various food intakes with the risk of insulin resistance, type2 diabetes and cardiovascular disease. Dietary intake, obesity, sedentary life style and cigarette smoking potentiate insulin resistance, which also promote atherosclerosis and the vascular complications of DM, as well as of Type 2 Diabetes Mellitus itself.

Interestingly the relationship between dietary habits with type 2 diabetes mellitus progression is not clear, therefore the present study was designed to investigate the impact of dietary habits on type 2 diabetes mellitus.

## II. LITERATURE REVIEW

### Type 2 Diabetes Mellitus

Type 2 Diabetes Mellitus previously known as Adult Onset Diabetes or Non Insulin Dependent Diabetes Mellitus (NIDDM) is the most prevalent form of diabetes, accounting for 90% of all cases. Type 2 Diabetes Mellitus is characterized by varying degree of insulin resistance and deficiency. The cause of Type 2 Diabetes Mellitus is multi-factorial and includes both genetic and environmental elements that effects beta cell function and tissues (muscle, liver, adipose tissue, pancreas) insulin sensitivity. In 1997, the American Diabetes Association revised the nomenclature for the major types of Diabetes. The old terms Insulin Dependent Diabetes Mellitus (IDDM) & Non Insulin Dependent Diabetes Mellitus (NDDM) were eliminated. The new classification of Diabetes based on etiology is given as below:

- 1.) **Type 1 Diabetes:** Pancreatic beta islet cell destruction leading to absolute insulin deficiency.
- 2.) **Type 1b Diabetes:** presents like type 1 (with DKA), then behaves like type 2.
- 3.) **Type 2 Diabetes:** varying degree of insulin resistance and insulin deficiency
- 4.) **Gestational Diabetes**
- 5.) **Other Specific Types** (Maturity onset Diabetes of young, Genetic defects in insulin action, Disease of Exocrine Pancreas, Endocrinopathies etc.)

### Causes of Type 2 Diabetes Mellitus

- 1.) **Gene Susceptibility:** Genes play a significant part in susceptibility to Type 2 Diabetes Mellitus. Having certain genes or combination of genes may increase or decrease a persons risk for developing the disease.
- 2.) **Obesity & Physical Inactivity:** Type 2 Diabetes Mellitus is strongly associated with the development of Type 2 Diabetes Mellitus. People who are genetically susceptible to Type 2 DM are more vulnerable when these risk factors are present.
- 3.) **Insulin Resistance:** It is a common condition in people who are over-weight or obese, have excess abdominal fat and are not physically active. Muscle, fat and liver cells stop responding to insulin, forcing the pancreas to compensate by producing extra insulin. As long as beta cells are able to produce enough insulin, blood glucose levels stay in the normal range. But when insulin production falters because beta cell dysfunction, glucose levels rise leading to pre-diabetes or diabetes.
- 4.) **Abnormal Glucose Production by the Liver:** In some with Diabetes, an abnormal increase in glucose production by the liver also contributes to high blood glucose levels.
  - a.) **Metabolic Syndrome:** It is also called as insulin resistance syndrome, and refers to a group of conditions common in people with insulin resistance including: Abdominal Obesity, High Blood Pressure, Hypertriglyceridemia, Low HDL, High Fasting Glucose.

## International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: [www.ijirset.com](http://www.ijirset.com)

Vol. 7, Issue 4, April 2018

People with metabolic syndrome have an increased risk of developing type2 diabetes and CVD.

- 5.) **Beta Cell Dysfunction:** Scientists think that beta cell dysfunction is a key contributor to type2 diabetes. Beta cell impairment can cause inadequate or abnormal patterns of cells may be damaged by high blood glucose itself, a condition called glucose toxicity.
- 6.) **Cell Signaling & Regulation:** Cells communicate through a complex network of molecular signaling pathways. Problems in cell signal systems can set off a chain reaction that leads to diabetes or other diseases.

The pathophysiology of type 2 diabetes mellitus is characterized by peripheral insulin resistance, impaired regulation of hepatic glucose production and declining  $\beta$ -Cell function, leading to  $\beta$ -Cell failure.

**Diagnosis of Diabetes Mellitus :** The diagnosis of Diabetes Mellitus can be made in the following situations.

- 1.) Fasting Plasma Glycemia (FPG)  $\geq 126$  mg/dl  
(Fasting is defined as no caloric intake for atleast 8 hrs.)
- 2.) 2 Hr Plasma Glucose  $\geq 200$  mg/dl (11.1 mmol/l)  
During an OGTT, the test should be performed as described by WHO criteria (published in 1985), using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water.
- 3.) Random Plasma Glucose  $\geq 200$  mg/dl (11.1 mmol/l)  
(Obtained anytime during the day without regard to when the food was last ingested) with classic symptoms of hyper glycemia or hyper glyceemic crisis.
- 4.) HbA1C  $\geq 6.5\%$

The test should be performed in a laboratory using a method that is NGSP certified and standardized to the DCCT assay. (In the absence of unequivocal hyperglycemia criteria 2, 4 should be confirmed by repeat testing).

- Ramachandran et al and Mohan et al reported in their study that diabetes is affecting at an alarming rate to both rural and urban population in India. Food intake has been strongly linked with obesity, not only related to the volume of food but also in terms of the composition and quality of diet (17). In ATTICA study Panagiotakos et al stated that high intake of red meat, sweets and fried foods, contribute to the increased risk of insulin resistance and T2DM (10). Many studies also reported positive association between high intake of sugars and development of T2DM (14). Ludwig et al investigated 500 school children for 19 months. He found that for each additional serving of carbonated drinks consumed, frequency of obesity increased, after adjusting for different parameters such as dietary, demographic, anthropometric and lifestyle. Nseir et al also found a link between the intake of soft drinks with obesity and diabetes in his study. In contrast, Villegas et al found an inverse correlation between intake of vegetables and T2DM in their studies on Chinese women. It may be because vegetables and fruits are rich in nutrients, fiber and anti-oxidants which are considered as protective barrier against the disease.
- Ghafoarunissa observed that in Indian rural diet, fat intake, particularly intake of omega-3 fatty acid was low and intake of fat was directly proportional to income. Ornish had advocated that a low fat diet was beneficial for health but it had the disadvantage of low HDL level in blood. Raheja et al and Sanders et al also reported that diet, particularly carbohydrate had a profound role in the control of Insulin resistant syndrome. Carbohydrate intake has a direct effect on post prandial glucose levels in people with diabetes and is the principal macronutrient of worry in glyceemic management (25). Acquiring HbA1C target minimizes the risk for developing micro vascular complications and may also protect CVD, particularly in newly diagnosed patients (26).

### III. PROPOSED METHODOLOGY AND DISCUSSION

#### OBJECTIVE

The present study is designed to measure the effect of dietary habits on glyceemic levels of Type 2 Diabetes Mellitus subjects.

#### MATERIALS & METHODS

The present study was conducted at Department of Medicine, GSVM Medical College Kanpur from April 2014 to June 2014 at the patients of Type 2 Diabetes Mellitus selected randomly visiting the OPD. By using simple random method, 120 study subjects were taken who were suffering from type 2 diabetes mellitus.

#### Inclusion Criteria

# International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: [www.ijirset.com](http://www.ijirset.com)

Vol. 7, Issue 4, April 2018

- 1.) Individuals in the age group of 35 years and above suffering from type 2 diabetes mellitus, which is defined through fasting glucose concentration  $\geq 126$  mg/dl.
- 2.) Includes both men & women.
- 3.) Diagnosed type 2 diabetes mellitus patients taking oral hypoglycaemic medications or insulin for treatment.

### Exclusion Criteria

- 1.) Individuals having type 1 diabetes mellitus
- 2.) Those with acute complication of diabetes mellitus
- 3.) Those with a history of acute infections
- 4.) Other ailments like gross congestive heart failure, tuberculosis, rheumatoid arthritis, renal failure and skeletal muscle injury.
- 5.) Those who are suffering from malignancy or chemotherapeutic agents.

### The following information were collected from the subjects –

- 1.) Age; 2.) Sex; 3.) History about diabetes onset; 4.) Symptoms; 5.) History about diabetic complications;
- 6.) Habits including alcohol intake 7.) Smoking 8.) Diet & Caloric intake

### General physical examination including anthropometric measurement in the form of

- 1.) Height; 2.) Weight; 3.) Waist circumference measured as high point of right iliac crest in cm; 4.) Hip circumference measured as maximum extension of hips in standing position 5.) Waist-Hip ratio 6.) Body Mass Index (BMI) was calculated as weight in Kilograms divided by height in meters squared.

Patients were considered as type 2 diabetic as per American Diabetic Association (ADA) 2011, criteria 30 (based on consensus expert from National Data Diabetic Group & WHO).

Dyslipidemia was defined using National Cholesterol Education Program (NCEP) ATP (iii) guideline.

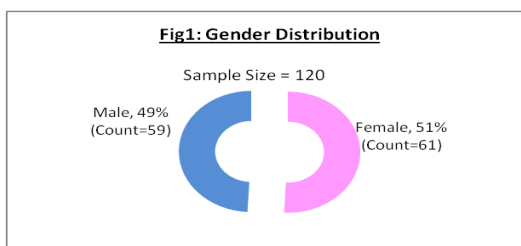
**Statistical Analysis:** SPSS 21 software was used to analyze the data. The mean and standard deviation was obtained for summarizing the quantitative variables, while the categorical variables were tabulated using frequencies and percentage. Chi square test was used for testing variables. P-value of less than 0.05 was considered significant. Likelihood Ratio is considered if count of value in a cell in a table is less than 5 else  $\chi^2$  (Chi- Square) test value is considered.

## IV. RESULTS

- The Mean age with Standard Deviation (in Years) is calculated for the male and female subjects as  $57.98 \pm 12.56$  and  $54.25 \pm 8.82$  respectively is shown in **Table1** below.

Parameter Mean $\pm$ SD	Diabetic (n = 120)		
	Female (n=61)	Male (n =59)	Total (n =120)
Age	54.25 $\pm$ 8.82	57.98 $\pm$ 12.56	56.08 $\pm$ 10.94

- Gender distribution of subjects is shown in **Fig1** below with males contributing as 49% (count = 59) of the sample and females as 51% (count =61) .



## International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: [www.ijirset.com](http://www.ijirset.com)

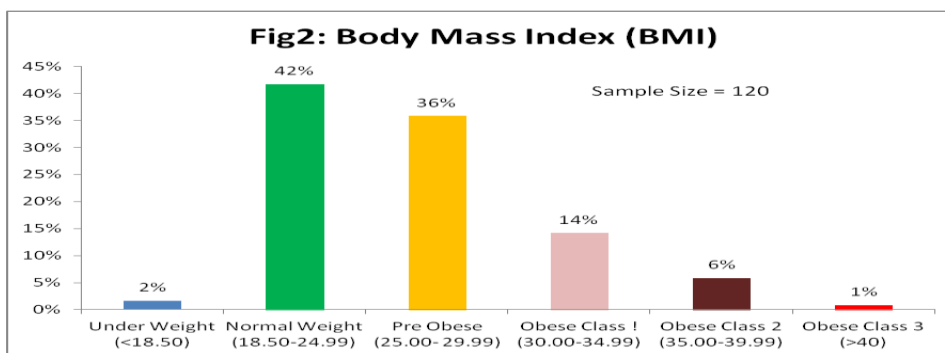
Vol. 7, Issue 4, April 2018

- The clinical and biochemical profile of the subjects calculated is shown in **Table 2** as below. The data of diabetic subjects had been further divided into female diabetic subjects and male diabetic subjects. Mean duration of diabetes was  $7.18 \pm 7.62$ , Mean Fasting Blood sugar was  $145.54 \pm 56.95$ , Mean After Breakfast sugar was  $218.42 \pm 77.95$ , Mean HbA1c was  $8.40 \pm 1.82$ .

Table 2: Clinical & Bio-Chemical Profiles

Parameter (Mean $\pm$ SD)	Diabetic (n=120)		
	Female (n=61)	Male (n=59)	Total (n=120)
Age (In Years)	54.25 $\pm$ 8.82	57.98 $\pm$ 12.56	56.08 $\pm$ 10.94
Duration of Diabetes (In Years)	6.69 $\pm$ 6.64	7.69 $\pm$ 8.55	7.18 $\pm$ 7.62
BMI	28.16 $\pm$ 5.23	24.72 $\pm$ 3.82	26.47 $\pm$ 4.89
W/H Ratio	0.98 $\pm$ 0.15	1.05 $\pm$ 0.10	1.01 $\pm$ 0.14
Fasting Blood Sugar (mg/dl)	150.74 $\pm$ 58.64	140.17 $\pm$ 55.13	145.54 $\pm$ 56.95
After Breakfast Sugar (PP) (mg/dl)	214.30 $\pm$ 73.45	222.67 $\pm$ 82.75	218.42 $\pm$ 77.95
HbA1c (%)	8.54 $\pm$ 1.77	8.25 $\pm$ 1.88	8.40 $\pm$ 1.82
Triglyceride (mg/dl)	173.20 $\pm$ 52.89	176.87 $\pm$ 58.96	175.01 $\pm$ 55.75
LDL -Cholesterol (mg/dl)	117.67 $\pm$ 33.65	130.19 $\pm$ 70.16	123.83 $\pm$ 54.86
HDL -Cholesterol (mg/dl)	40.73 $\pm$ 6.70	41.02 $\pm$ 7.96	40.87 $\pm$ 7.32
Systolic Blood Pressure (mmHg)	136.52 $\pm$ 17.85	134.66 $\pm$ 20.47	135.61 $\pm$ 19.04
Diastolic Blood Pressure (mmHg)	81.70 $\pm$ 9.30	77.75 $\pm$ 9.18	79.75 $\pm$ 9.37
Calorie / Day	1900.00 $\pm$ 175.55	2407.69 $\pm$ 193.77	2154.70 $\pm$ 310.27
Protein / Day	52.38 $\pm$ 5.17	59.59 $\pm$ 5.47	55.93 $\pm$ 6.42
Fast Food intake frequency in a week	1.87 $\pm$ 1.49	1.80 $\pm$ 1.58	1.83 $\pm$ 1.53
Fruits intake in a week	2.33 $\pm$ 1.34	2.46 $\pm$ 1.47	2.39 $\pm$ 1.40
Green Veggie intake in a week	3.51 $\pm$ 0.96	3.54 $\pm$ 1.04	3.53 $\pm$ 1.00

- Out of 120 subjects, 44% (count of 52) had Normal BMI i.e. between 18.5 to 24.9, rest 57% (count of 68) had their BMI level  $> 25$  which is further divided into sub groups as Pre-Obese, Obese Class 1, Obese Class 2 and Obese Class 3 shown in **Fig 2** below.



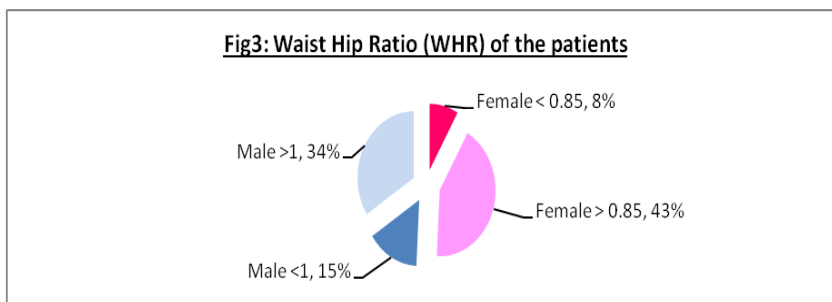
- Waist Hip Ratio (WHR) measurement showed that, of the total subjects, count of 51 females (43%) had WHR  $\geq 0.85$  and 41 males (34%) had WHR  $\geq 1$  shown in **Fig 3** below.

# International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: [www.ijirset.com](http://www.ijirset.com)

Vol. 7, Issue 4, April 2018



According to the 24 hr diet recall and data, the mean Caloric intake calculated for subjects is 1918 Kcal / day for female and 2408 Kcal/day for male. Daily Caloric intake data shows that out of 120 subjects, 34 had low caloric intake, 44 had Normal and 42 had high caloric intake in **Table 3** below. Daily calories intake had been calculated according to RDA, (ICMR). High caloric intake shows impact on HbA1c. Subjects having high caloric diet on a daily basis are more prone to high risk thus increasing their HbA1C and blood sugar levels ( $p = 0.005$ ) shown in the table. Likelihood Ratio is considered in the test as some values in the table counted less than 5 **Table 3** below.

Table 3: HbA1C with Calorie intake / day

HbA1C	Low Calorie	Normal Calorie	High Calorie	Grand Total	
< 6	1	2	0	3	$X^2 = 16.47$
6 - 7	11	19	4	34	p-Value = 0.01
7 - 8	8	5	10	23	LR = 18.77
> 8	14	18	28	60	p-Value = 0.005
<b>Grand Total</b>	<b>34</b>	<b>44</b>	<b>42</b>	<b>120</b>	

- Dietary habits showed that 78 subjects were vegetarian and 42 were Non – Vegetarian. As per the data, the dietary habits did not show much impact on blood sugar levels, thus making it Non-Significant.
- Subjects were asked to recall their daily fruit and green vegetable intake, which is divided into 2 sub-groups i.e.  $\leq 3$  intake/week and  $> 3$  intake/week. Result shows a positive impact on HbA1C blood sugar level. Out of 63 Subjects, 26 consumed  $> 3$  intake of green vegetables per week had normal HbA1C, whereas 39 subjects were in higher risk zone who consumed  $< 3$  intake of green veggies / week. This data is statistically significant, as shown in the **Table 4** below. Likelihood Ratio is considered in the test as some values in the table counted less than 5.

Table 4: HbA1C with Green Veggie intake / week

HbA1C	< 3 intake / week	> 3 intake / week	Grand Total	
< 6	0	3	3	$X^2 = 18.066$
6 - 7	8	26	34	p-Value = 0.000*
7 - 8	10	13	23	LR = 19.77
> 8	39	21	60	p-Value = 0.000*
<b>Grand Total</b>	<b>57</b>	<b>63</b>	<b>120</b>	

- 20 out of 41 Subjects who consumed  $> 3$  intake of fruits per week had their HbA1C as normal. Whereas 50 out of 79 subjects were in high risk zone as they consumed  $< 3$  fruits per week. **Table 5** shows the data which is also significant statistically. Likelihood Ratio is considered in the test as some values in the table counted less than 5.

# International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: [www.ijirset.com](http://www.ijirset.com)

Vol. 7, Issue 4, April 2018

HbA1C	< 3 intake / week	> 3 intake / week	Grand Total	
< 6	1	2	3	$X^2 = 19.02$
6 - 7	14	20	34	p-Value = 0.000*
7 - 8	14	9	23	LR = 19.37
> 8	50	10	60	p-Value = 0.000*
<b>Grand Total</b>	<b>79</b>	<b>41</b>	<b>120</b>	

- Fast food consumption per week also contributed in the levels of HbA1C thus impacting the blood sugar levels, as shown in the **Table 6** below. Out of 120 subjects 60 subjects had >8 HbA1c value. Out of 31, 27 subjects who consumed >3 intake fast food / week had high HbA1C (>8) . Likelihood Ratio is considered in the test as some values in the table counted less than 5.

HbA1C / Fast Food	< 3 Times	> 3 Times	Grand Total	
< 6	3	0	3	$X^2 = 25.25$
6 - 7	34	0	34	p-Value = 0.00
7 - 8	19	4	23	LR = 33.28
> 8	33	27	60	p-Value = 0.00
<b>Grand Total</b>	<b>89</b>	<b>31</b>	<b>120</b>	

- Lipid profile: detailed parameter is shown in the **Table 7** below. Mean Triglyceride level in subjects was 175, Mean HDL was 40.9 and Mean LDL was 161.67. 64 % subjects had abnormal Triglyceride level.

Parameter Studied	Normal Range	Mean Values in Patients	%ge of Patients having Normal Values	%ge of Patients having AbNormal Values
Triglyceride	<150 mg/dl	175	36%	64%
HDL	31-70 mg/dl	40.9	98%	3%
LDL	<130 mg/dl	161.67	60%	40%

**Table 7: Lipid Profile of the Patients (Diabetic Group)**

- Blood Pressure Status of Diabetic Subjects is shown in the **Table 8** below. Mean Systolic blood pressure was  $135.6 \pm 19.4$  and Mean Diastolic blood pressure was  $79.75 \pm 9.37$ . 51% subjects had abnormal Systolic blood pressure and 32% subjects had abnormal Diastolic blood pressure.

Blood Pressure Level	Level	Cut off Level	Count	Percent
Systolic Blood Pressure	Normal	$\leq 130$ mm/Hg	59	49%
	AbNormal	$>130$ mm/Hg	61	51%
<b>Mean <math>\pm</math> SD = 135.6 <math>\pm</math> 19.04</b>				
Diastolic Blood Pressure	Normal	$\leq 80$ mm/Hg	82	68%
	AbNormal	$>80$ mm/Hg	38	32%
<b>Mean <math>\pm</math> SD = 79.75 <math>\pm</math> 9.37</b>				

## V. DISCUSSION

Canadian Diabetes Association states that 80-90% of Diabetic Mellitus patients in the world are overweight or obese [21]. Obesity is a powerful predictor for development of type 2 diabetes (18)(19). Out of 120 subjects, 44% (count of 52) had Normal BMI i.e. between 18.5 to 24.9, rest 57% (count of 68) had their BMI level > 25. Nurses' health study suggested a lower risk of diabetes in subjects with BMI below 21 (20). Those with higher BMI have higher incidence

# International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: [www.ijirset.com](http://www.ijirset.com)

Vol. 7, Issue 4, April 2018

rate of type 2 diabetes at earlier age than those with lower BMI among whom the incidence raises in older age groups (19).

Waist-Hip Ratio  $\geq 0.85$  among females and  $\geq 1$  in males reflects Central Obesity. Waist Hip Ratio (WHR) measurement showed that, out of the total subjects, count of 51 females (43%) had  $\text{WHR} \geq 0.85$  and 41 males (34%) had  $\text{WHR} \geq 1$ . Subjects having Central Obesity carry excess of body fat and higher blood sugar levels, resulting in a high risk and complications in diabetes. The high mean of WHR in both the sexes was suggestive of central obesity in this population [22]. Some studies suggested that waist circumference or waist-hip ratio is a better predictor for the incidence of diabetes [23] and cardio-vascular risk factors at different age groups than BMI (24).

Carbohydrate intake has a direct affect on post-prandial glucose levels in people with diabetes and is principal macronutrient of worry in glycemic management (25). Daily Caloric intake data shows that out of 120 subjects, 34 had low caloric intake, 44 had Normal and 42 had high caloric intake. Subjects having high caloric diet on a daily basis are more prone to high risk thus increasing their HbA1C and blood sugar levels. Persistent high blood glucose levels leads to the formation of advanced glycated end products responsible for diabetes related macro-vascular and micro-vascular complications (26).

Out of 63 Subjects, 26 consumed  $> 3$  intake of green vegetables per week had normal HbA1C, whereas 39 subjects (57 count) were in higher risk zone who consumed,  $< 3$  intake of green veggies / week. Few studies revealed that an increase of one serving of green leafy vegetable consumption per day is associated with a modestly lower hazard of diabetes [27, 28]. 20 out of 41 Subjects who consumed  $> 3$  intake of fruits per week had their HbA1C as normal. Whereas 50 out of 79 subjects were in high risk zone as they consumed  $< 3$  fruits per week. It was reported that dietary fiber, particularly soluble fiber, improves the post-prandial glycemic response and insulin concentration through slowing down the digestion and absorption of food and creating a gel like substance in the stomach by several metabolic hormones [29]. Few subjects consuming complex carbohydrates through green vegetables and fruits which in long term improve their HbA1c level which is statistically significant. So, this study reveals that eating green leafy vegetables and fruits more than thrice a week will help to improve their HbA1c blood sugar level. However, more people were consuming refined carbohydrates through fast foods. This could be an evidence of a dietary transition and deviation from the traditional eating pattern to a more western style. Too much or too little may be deleterious to health.

Lipid profile data shows that 64% subjects had abnormal triglyceride value and 40% subjects had abnormal LDL values, but only 3% subjects had abnormal HDL levels. High cholesterol levels can lead to heart disease.

Blood pressure data shows that mean systolic BP was 135.6 mm/Hg and mean diastolic BP was 79.75 mm/Hg. The abnormal systolic BP and abnormal diastolic BP were found in 61 (51%) and 38 (32%) respectively of the study population. Several studies stated that obese and overweight patients have a higher risk of hypertension than ones with normal BMI (30). In addition, the coexistence of diabetes, hypertension and obesity increases the risk of cardiovascular complications and other morbidities (31).

## VI. CONCLUSION

Dietary transition along with sedentary lifestyle, with junk food appears to have contributed a lot to the high prevalence rate of Obesity in Urban Diabetic population which ultimately leads to further micro and macro vascular complications in diabetic subjects.

The overall purpose of treating type 2 diabetes mellitus is to help the patients from developing early end organ complications which can be achieved through proper dietary management. Active and effective dietary education may present the onset of diabetes and its complications.

Therefore, we should provide active and effective dietary education and knowledge about diabetes related signs, symptoms and self management of diabetes. This could uplift their quality of life. Since, this study was conducted at a single study center, the results do not reflect the diet patterns of the general population and further studies are required to prove the outcome.



# International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: [www.ijirset.com](http://www.ijirset.com)

Vol. 7, Issue 4, April 2018

## REFERENCES

1. Ramchandran A, Snehlata C, Kapur A, Vijay V, Mohan V, Das AK, Rao PV, Yajnik CS, Prasanna KKM, Nair DJ, High Prevalence of Diabetes and Impaired Glucose tolerance in India: National Urban Diabetes Survey, Diabetic Metabolism Review, 6:125-146, 1990.
2. Ramchandran A, Snehlata C, Kapur A, Vijay V, Mohan V, Das AK. For Diabetes Epidemiology study group in India (DESI). High prevalence of Diabetes and impaired glucose tolerance in India: National Urban Diabetes Survey, Diabetologia, 44:1094-1101, 2001.
3. Raheja BS, Talwalkar NG, Suttarwala SK, Ischaemic Heart Disease in Diabetes. Journal of Association of physicians in India, 18(2):261-7, 1970.
4. Sanders TAB, Oakley FR, Miller GJ, Miltropoulos KA, Influence of N-6 versus N-3 polyunsaturated fatty acids in diet low in saturated fatty acid decreases during long term compliance with a lipid lowering diet. Journal of Internal Medicine, 59:249-258, 1985.
5. Ghafoarunissa, Fats in Indian diets and their nutritional and health implication, lipids, Suppl 31:287-291, 1996.
6. Mohan V, Shanthiraman CS, Raj DPG, Sastry NG, Saroja R, Intra urban differences in the prevalence of the metabolic syndrome in southern india- the Chennai urban population study (CUPS No. 4) Diabetic Medicine 18(4): 280-287, 2001.
7. Ornish D. Program for reversing heart disease. New York: Ivy Books, 1996.
8. Ernest E, Pietsch L, Matrai A, Eisenberg J, Blood Rheology in vegetarians. British Journal of Nutrition, 56(3):555-560, 1986.
9. Fisher M, Levine PH, Weiner B, The effect of vegetarian diets on plasma lipid and platelet levels, Archives of Internal Medicine, 146:1193-1197, 1986.
10. Panagiotakos DB, Tzima N, Pitsavos C, Chrysohoou C, Papakonstantinou E, Zampelas A, et al. The relationship between dietary habits, blood glucose and insulin levels among people without cardiovascular disease and Type2 diabetes; the ATTICA study. Rev Diabet Stud. 208-15, 2005.
11. Villegas R, Shu XO, Gao YT, Yang G, Elasy T, Li H, et al. Vegetable but not fruit consumption reduces the risk of type 2 diabetes in Chinese women. J Nutr 138:574-80, 2008.
12. Holman RR, Paul SK, Bethel MA, Matthews DR, Neil HA. 10 – year follow –up of intensive glucose control in type 2 diabetes. N Engl J Med; 359:1577-89, 2008.
13. Franz MJ, Powers MA, Leontos C, Holzmeister LA, Kulkarni K, Monk A, et al. The evidence for medical nutrition therapy for type 1 and type 2 diabetes in adults. J Am Diet Assoc. 110:1852-89, 2010.
14. Khatib O, Non Communicable diseases: Risk factors and regional strategies for prevention and care. East Mediterr Health Jour; 10: 778-88, 2004.
15. Ludwig DS, Lambert J, Gerring S, Darling P, Carter RD, Jelfs R, et al. Sucrose in the diet of diabetic patients just another carbohydrate? Diabetologia;29:216-20, 1986.
16. Nseir W, Nassar F, Assy N. Soft drinks consumption and non alcoholic fatty liver disease. World J Gastroenterol; 16:2579-88; 2010.
17. Amin TT, AL-Sultan AI, Ali A. Overweight and Obesity and their association with dietary habits and socio-demographic characteristics among male primary school children in AL-Hassa, Kingdom of Saudia Arabia. Inian J Community Med; 33:172-81; 2008.
18. Steyn NP, Mann J, Bennet PH, Temple N, Zimmet P, Tnomilehto J, et al. Diet, Nutrition and the Prevention of Type 2 Diabetes Public Health Nutr.7(1A):147-67; 2004.
19. Knowler WC, Pettit DJ, Savage PJ, Bennet PH. Diabetes incidence in Pima Indians: Contribution of Obesity and Parental Diabetes. Am J Epidemiol, 113(2):144-56; 1981.
20. Colditz GA, Willet WC, Stampfer MJ, Manson JE, Hennekens CH, Arky RA, et al. Weight as a risk factor for clinical diabetes in women. Am J Epidemiol. 132(3):501-13; 1990.
21. Canadian Diabetes Association, Working Together to Achieve Healthy Weights: Addressing the Tsunami of Diabetes, 2011, <https://www.diabetes.ca/CDA/media/documents/about/cda-healthy-living-submission-english.pdf>
22. Gupta S, Kapse A. Lipid profile pattern in Diabetes from Central India. Int J Diabetes Dev Countries. 21:138-45; 2001.
23. Chan JM, Rimm EB, Colditz GA, Stampfer MJ, Willet WC. Obesity, Fat distribution and weight gain as risk factors for Clinical Diabetes in men. Diabetes Care. 17(9):961-9; 1994.
24. Shahraki T, Shahraki M, Rondbari M, Gargari BP. Determination of the leading central obesity index among cardio vascular risk factors in Iranian women. Food Nutr Bull. 29(1):43-8; 2008.
25. Holman RR, Paul SK, Bethel MA, Matthews DR, Neil HA. 10 – year follow-up of intensive glucose control in type 2 diabetes. N Engl J Med. 359:1577-89; 2008.
26. Franz MJ, Power MA, Leontos C, Holzmeister LA, Kulkarni K, Monk A et al. The evidence for medical nutrition therapy for type 1 and type 2 Diabetes in adults. J Am Diet Assoc. 110: 1852 – 89 ; 2010
27. Senadheera PAS, Ekanayake S, Wanigatunge C. Dietary habits of type 2 diabetes patients: Variety and frequency of food intake. Journal of Nutrition and Metabolism. 6 pages, <http://dx.doi.org/10.1155/2016/7987395>; 2016.
28. L.A. Bazzano, T.Y. Li, K.J. Josphipura and F.B. Hu. Intake of fruits, vegetables and fruit juices and risk of diabetes in women, Diabetes Care. vol 31(7);1311-17; 2008.
29. Meyer KA, Kushi LH, Jacobs DR Jr., Slavin J, Sellers TA, Folsom AR. Carbohydrates, dietary fiber and incidental type 2 diabetes in older women. Am J Clin Nutr. 71(4): 921-30; 2000.
30. Hiillier TA, Pedula KL. Characteristics of an adult population with newly diagnosed type 2 DM : the relation of obesity and age of onset . Diabetes Care , 24(9):1522-7 ; 2001
31. Brown CD, Higgins M, Donato KA, Rohde FC, Garrison R, Obarzanek E, Ernst ND, Horon M. Body mass index and the prevalence of hypertension and dyslipidemia . Obesity Research , 8(9):605-19 ; 2000