

Evaluation of Diabetes Status in the Urban Population of Jaipur: A Community-Based Survey

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Abstract

Diabetes is a metabolic disorder rapidly rising all over the globe at an alarming rate. Since last 3 decades the status of diabetes has changed from being considered as a mild disorder of the elderly to one of the major causes of morbidity and mortality affecting the youth and middle aged people. It is important to note that the rise in prevalence is seen in all six inhabited continents of the globe. Diabetes mellitus is condition of glucose embolic disorders of carbohydrate metabolism. The Centre for Disease Control and prevention (CDC) estimated the prevalence of 7.9% in adults or about 16.7 million people in 2001. Due to the undiagnosed cases the number may raise above 22 million. The increased prevalence estimates that the diabetes will globally affect about 300 million peoples till 2025. The statistics shows that this disease is one of the main threatening diseases of 21st Century. The diabetes prevalence is associated with the age and approximately half of all cases occur in the age of 55 years.

The present study established the facts which already researched and written by the various scientists of the World. In addition to that the fact that BMI which is the determinant of the overweight and underweight in society, also have influenced by the type of oil consumption, television watch time and late sleeping time. This study suggests that a particular age group of 25-55 is more prone to the metabolic disease like diabetes and hypertension. The epidemiological survey also have outcome that the females of age group 25-45 having some % of underweight also. The underweight 25-45 age group have Hb% on lower side suggesting the occurrence of anemia.

Keywords: Body Mass Index; Diabetes; Blood Glucose; Epidemiology; Hb%; Hypertension.

Introduction

The diabetes is disease known to the mankind since 1500 before Christ (BC). The first described cases are believed to be of type 1 diabetes. Indian physicians detected around the same time the disease and classified it as madhumeha or honey urine noting that the urine would attract ants. The term "diabetes"

or "to pass through" was first used in 250 BCE by the Greek Apollonius of Memphis. Type 1 and type 2 diabetes were identified as separate conditions for the first time by the Indian physicians Sushruta and Charaka in 400-500 CE with type 1 associated with youth and type 2 with obesity. The term "mellitus" or "from honey" was added by Thomas Willis in the late 1600s to separate the condition from diabetes insipidus which is also associated with frequent urination.

Ancient Greek physician Aretaeus of Cappadocia provided the first complete clinical description of diabetes and described that the excessive amount of urine which passed through the kidneys." (Dallas,

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John,2011)

Aretaeus did attempt to treat diabetes but could not give a good prognosis; he commented that "life (with diabetes) is short, disgusting and painful." (Medvei, Victor Cornelius,1993)

In medieval Persia, Avicenna (980–1037) given a detailed account on diabetes mellitus in The Canon of Medicine, "describing the abnormal appetite and the collapse of sexual functions," and he documented the sweet taste of diabetic urine. In addition to it, he also described diabetic gangrene, and treated diabetes using a mixture of lupine, trigonella (fenugreek), and zedoary seed, which produces a considerable reduction in the excretion of sugar, a treatment which is still prescribed in modern times. Avicenna also described diabetes insipidus very precisely for the first time, though it was much later that Thomas Willis differentiated it from diabetes mellitus in a chapter of his book Pharmaceutice rationalis (1674).

The World Health organization describes the Diabetes as a chronic disease that occurs either when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces. Insulin is a hormone that regulates blood sugar. Hyperglycemia, or raised blood sugar, is a common effect of uncontrolled diabetes and over time leads to serious damage to many of the body's systems, especially the nerves and blood vessels.

The Common Facts about Diabetes Includes

- More than 220 million people worldwide have diabetes.
- In 2005, an estimated 1.1 million people died from diabetes.
- Almost 80% of diabetes deaths occur in low- and middle-income countries.
- Almost half of diabetes deaths occur in people under the age of 70 years; 55% of diabetes deaths are in women.
- WHO projects the diabetes deaths will double between 2005 and 2030.
- Healthy diet, regular physical activity, maintaining a normal body weight and avoiding tobacco use can prevent or delay the onset of diabetes (W.H.O,2009)

The Common Consequences of Diabetes Includes

Over time, diabetes can damage the heart, blood vessels, eyes, kidneys, and nerves.

- Diabetes increases the risk of *heart disease and*

stroke. 50% of people with diabetes die of cardiovascular disease (primarily heart disease and stroke).

- Combined with reduced blood flow, neuropathy in the feet increases the chance of *foot ulcers* and eventual *limb amputation*.
- *Diabetic retinopathy* is an important cause of blindness, and occurs as a result of long-term accumulated damage to the small blood vessels in the retina. After 15 years of diabetes, approximately 2% of people become blind, and about 10% develop severe visual impairment.
- Diabetes is among the leading causes of kidney failure. 10-20% of people with diabetes die of *kidney failure*.
- *Diabetic neuropathy* is damage to the nerves as a result of diabetes, and affects up to 50% of people with diabetes. Although many different problems can occur as a result of diabetic neuropathy, common symptoms are tingling, pain, numbness, or weakness in the feet and hands.
- The overall risk of dying among people with diabetes is at least double the risk of their peers without diabetes.

The diabetes is becoming prevalent in society. India in last many decades became diabetes hub. The diabetes mellitus is developing in society due to metabolic misbalance and due to genetic factors. The life style is so changed over the time that it harnessed the stress, disturbances in eating and sleeping habits is responsible for the development of metabolism misbalance and result in the genesis of diabetes mellitus and hypertension. The present study has the aim of Evaluation of diabetes status in the urban population of Jaipur. The aim can be achieved by the evaluation study.

Material and Method

Study Design

There are two main types of the epidemiological studies i.e observational study and experimental study. In observational studies, the researcher observes and systematically collects information, but does not try to change the people (or animals, or reagents) being observed. In an experimental studies, by contrast, the researcher intervenes to change something (e.g., gives some patients a drug) and then observes what happens. In an observational study there is *no* intervention.

The basis of the present study is observational.

The data analysis collected through survey were analyzed using Stastical software and the blood samples collected were analyzed by available method using quality control. The study so designed that the survey, blood pressure measurement, data analysis are performed for genesis of results and documenting it.

Cross-Sectional Surveys

These are type of observational study. For example, To know the prevalence of diabetes in this community? A random sample of people and record information about their health in a systematic manner can be obtained. Compare people with, and without, diabetes in terms of characteristics (such as being overweight) that may be associated with the disease.

Cohort, or "Longitudinal", or "Prospective" Studies

These are like surveys, but extend over time. This allows to study changes and to establish the time-sequence in which things occur. Therefore, one can use this to study causes. For example, one could draw a sample of people (normal healthy people), and collect information on the factor one have hypothesized to be a cause of the disease.

Population under study An official Census 2011 provided the details population of Jaipur, a district of Rajasthan. In 2011, Jaipur had population of 6,626,178 of which male and female were 3,468,507 and 3,157,671 respectively. In 2001 census, Jaipur had a population of 5,251,071 of which males were 2,768,203 and remaining 2,482,868 were females. Jaipur District population constituted 9.67 percent of total Maharashtra population. In 2001 census, this figure for Jaipur District was at 9.29 percent of Maharashtra population.

There was change of 26.19 percent in the population

compared to population as per 2001. In the previous census of India 2001, Jaipur District recorded increase of 32.40 percent to its population compared to 1991. (<http://www.census2011.co.in/>).

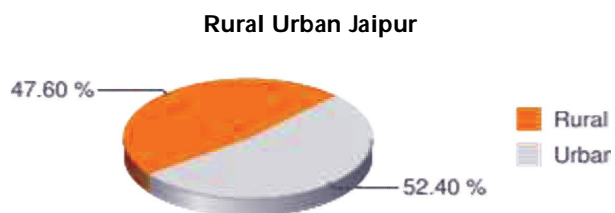


Fig. 1: Rural and Urban population in Jaipur District
Ref:- <http://www.census2011.co.in>

Methods Used on Samples Collected

The materials used in this study includes the question sets, syringes, kits for blood glucose tests, The glucose test principle is based on Glucose Oxidase abd Peroxidase method, the Hemoglobin estimation is based on Cyanmeth Hemoglobin estimation method, autoanalyzer, lap top for onsite record of results and various related materials.

The method used in the present study is based on the questionnaire prepared for the documentation, measurement of Height, Weight, Blood Pressure, Fasting and Post-meal Blood Sugar Level, Hemoglobin % level.

The data then analyzed by applying statistics principles using MS-Excel for comparative analysis among groups of population divided on basis of age.

The Body Mass Index (BMI) was calculated. The biochemical, Medical data were correlated with the diet habits, stress level, diet timings.

The Doctor/Medical Practitioner recorded the medical history and other measurements like Height, Weight, Blood Pressure and took sample for blood analysis.

Results

Table 1: Showing the Mean and SD of the Blood Sugar level, Blood pressure and Hemoglobin in different age groups

| Age Group | No of peoples | Blood Sugar(F) Mean±SD | Blood Sugar(PM) Mean±SD | Blood Pressure(Sys) Mean±SD | Blood Pressure(Dis) Mean±SD | Hemoglobin(%) Mean±SD |
|--------------|---------------|------------------------|-------------------------|-----------------------------|-----------------------------|-----------------------|
| 5-25 | 14 | 104.64±25.21 | 139±38 | 119.21±9.5 | 83.07±9.3 | 13.71±1.88 |
| 26-45 | 48 | 108.53±33.76 | 136.91±36.02 | 127.08±15.24 | 86.16±15.24 | 12.94±2.4 |
| 46-55 | 14 | 146.14±58.07 | 205±92.44 | 146.07±18.11 | 97.28±10.79 | 14.26±2.01 |
| 56-75 | 36 | 121.63±36.59 | 161.27±41.24 | 141.34±15 | 98.47±15.21 | 13.29±1.54 |
| 76-85 | 08 | 120.29±18.25 | 194±19.72 | 148.12±17 | 101.75±9.75 | 14.18±1.4 |
| Total | | | | 120 | | |

Table 2: Showing the Mean and SD of the Height, Weight and Body Mass Index (BMI) in different age groups

| Age Group | No of peoples | Height(in meter) Mean±SD | Weight(in Kgs) Mean±SD | BMI Mean±SD |
|-----------|---------------|--------------------------|------------------------|-------------|
| 5-25 | 14 | 1.52±0.52 | 48.64±11.62 | 20.71±2.8 |
| 26-45 | 48 | 1.59±0.065 | 86.16±15.24 | 22.95±4.34 |
| 46-55 | 14 | 1.62±0.039 | 68.07±11.74 | 25.71±4.24 |
| 56-75 | 36 | 1.60±0.26 | 64.22±9.06 | 24.90±3.15 |
| 76-85 | 08 | 1.63±3.72 | 61.12±11.77 | 22.90±3.5 |
| Total | | | 120 | |

Table 3: Showing the numbers of Males, females, and diet habits

| Age Group | No of peoples | Males | Females | Veg. 1 | Non Veg. 2 | Veg+Eggs 3 |
|-----------|---------------|-----------|-----------|-----------|------------|------------|
| 5-25 | 14 | 06 | 08 | 09 | 03 | 02 |
| 26-45 | 48 | 14 | 34 | 31 | 06 | 11 |
| 46-55 | 14 | 08 | 06 | 12 | ---- | 02 |
| 56-75 | 36 | 19 | 17 | 28 | ---- | 08 |
| 76-85 | 08 | 07 | 01 | 05 | ---- | 03 |
| Total | 120 | 54 | 66 | 85 | 09 | 26 |

Table 4: Showing BMI of the people as per age group

| Age Group In years | No of peoples | % of peoples having BMI Below 18 | % of peoples having BMI 18-22 | % of peoples having BMI 22.1-27 | % of peoples having BMI 27.1-32 |
|--------------------|---------------|----------------------------------|-------------------------------|---------------------------------|---------------------------------|
| 5-25 | 14 | ---- | 78.57 | 21.42 | ---- |
| 26-45 | 48 | 12.51 | 16.63 | 35.41 | 35.41 |
| 46-55 | 14 | --- | 21.42 | 57.16 | 21.42 |
| 56-75 | 36 | --- | 16.67 | 61.11 | 22.21 |
| 76-85 | 08 | --- | 37.5 | 50 | 12.5 |

Body Mass Index (BMI)

BMI is based on your height and weight.
Underweight: BMI is less than 18.5, Healthy weight:

BMI is 18.5 to 24.9 Overweight: BMI is 25 to 29.9(<http://www.webmd.com/men/weight-loss-bmi>, accessed on 23-04-2016)

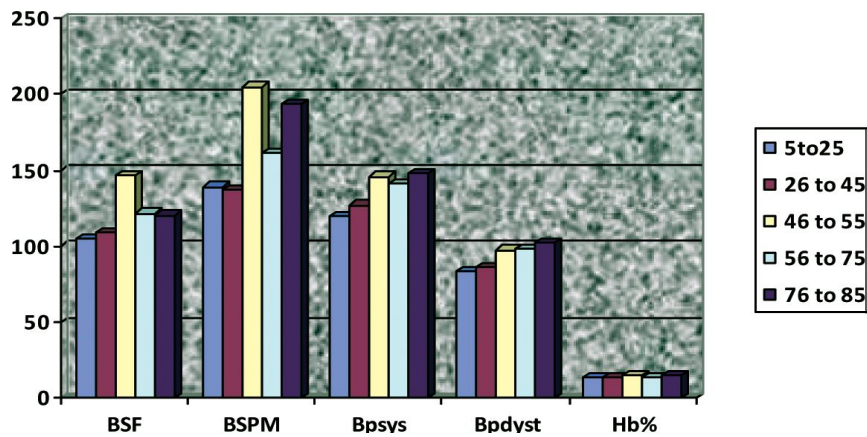
Table 5: Showing Average BMI, Television watch time, sleeping time and cooking oil type used

| Age Group | No of peoples | Average BMI | % of Underweight And Overweight | Television Watch time No and % of More than 3 hr daily viewer | Sleeping time No and % sleeping at 11pm or later | Cooking Oil Consumption Soybeans(Sy) Musturd(M) Sunflower(Sf) Rice bran (R) |
|-----------|---------------|-------------|--|---|--|---|
| 5-25 | 14 | 20.71 | 7.14% Overweight | 00 | 10(71.42%) | Sy 10 M 02 Sf 02 R 00 |
| 26-45 | 48 | 22.95 | Underweight 14.58% Overweight 27.0% | 6(12.5%) | 27(56.25%) | Sy 27 M 12 Sf 09 R 00 |
| 46-55 | 14 | 25.71 | Overweight 57.14% | 03(21.42%) | 07(50%) | Sy 4 M 4 Sf 5 R 1 |
| 56-75 | 36 | 24.90 | Overweight 41.66% | 8 (22.22%) | 07(19.44%) | Sy 25 M 04 Sf 07 R 00 |
| 76-85 | 08 | 22.90 | Overweight 7.14% | 00 | 00 | Sy 4 M 1 Sf 3 R 00 |

The results tabulated shows that the population of age group 46-55, 56-75 and 75+ under study is more vulnerable to the diabetes and hypertension. The high values in the Standard Deviation suggestive of the wide range of the readings. It also indicates that some people under the study have severe diabetes and hypertension. The body mass index is suggestive of the age group 46-55 is on border of overweight while the age group 5-25 is underweight. In the age group 5-25, 78.57% people underweight while in age group of 26-45, 46-55, 56-75, 75-85 the 35.41%, 21.42%, 22.21% and 12.5% people were found obese. This obesity is associated

with increased hypertension, increased blood sugar level and associated disorders. The various observations have also correlated with the daily routine, food habits also.

The results in Table 5 are suggestive of the increase in Body Mass Index is associated with the television watching time, sleeping time on regular basis and type of oil consumed. The more the person is seated while watching television at home more obesity will be observed. The type of oil is also play important role. Soybean oil and mustard oil was consumed by large population in the cases of high overweight age groups.



BSF—Blood Sugar fasting, BSPM— Blood Sugar Post Meal, Bpsys— Blood Pressure Systolic, Bpdvst— Blood Pressure Diastolic, Hb%— Hemoglobin %

Fig. 2: showing age groups (Y axis) and Blood sugar-Fasting and post meal, Blood Pressure-Systolic and Diastolic and Hb%(X axis).

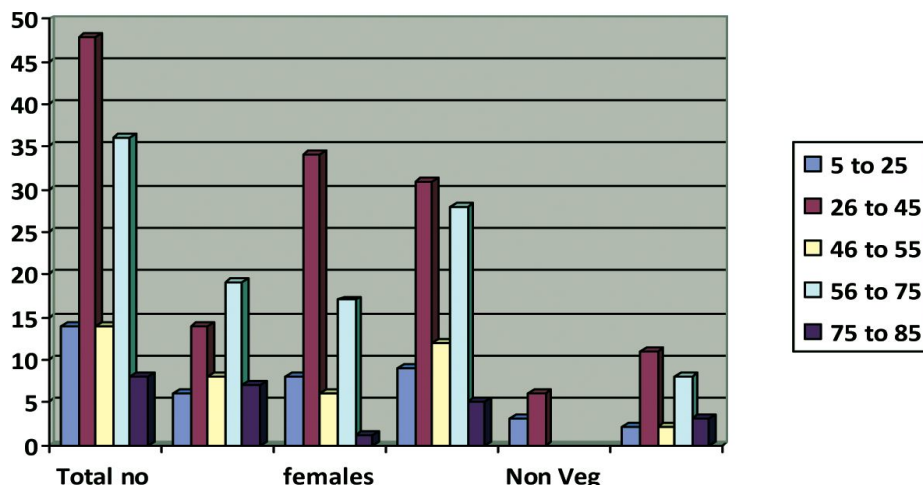


Fig. 3: Showing age groups (Y axis) and total numbers of people, males , females , veg, non-veg and veg+eggs (X axis).

Cooking Oil analysis % of SFA

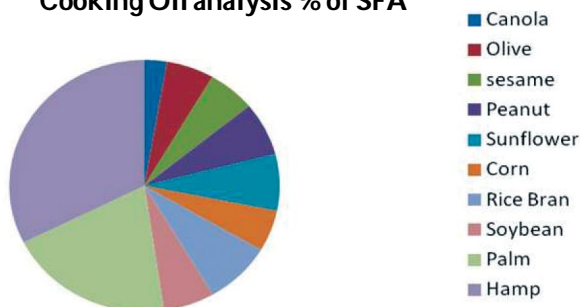


Fig. 4: Showing Saturated fatty acid % in various cooking oils

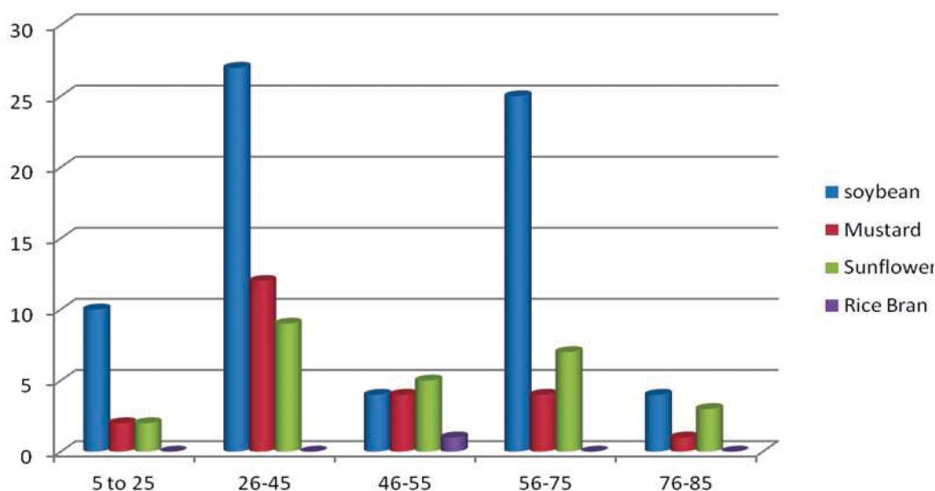


Fig. 5: Numbers of people taking different oils-analysis chart

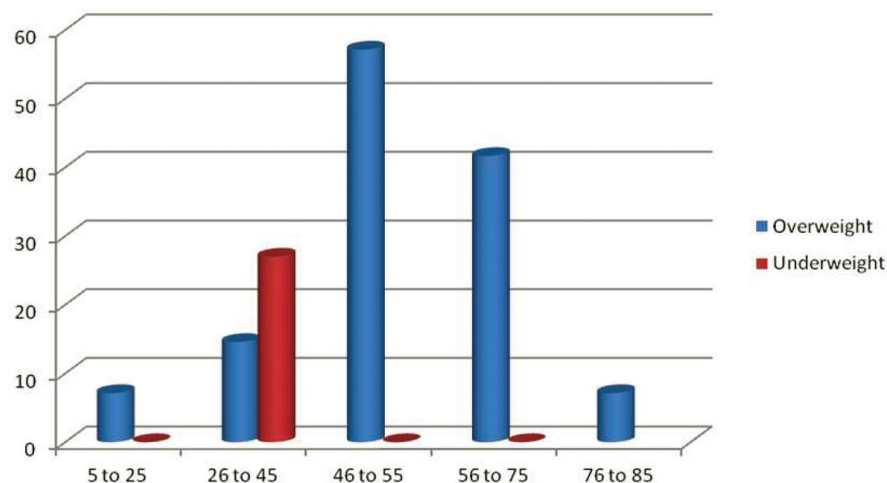


Fig. 6: Showing the Overweight and Underweight % among population under study

Discussion

In India the disease prevalence is growing fast so now India becoming a capital of diabetes. This situation is arising due to lack of active life and changes in life style of public. The causes of the development of diabetes are due to sedentary work,

lack of exercise, unbalanced diet intake and hereditary transfer. The various factors also play direct or indirect roles in the development of diabetes includes alcohol intake, stress level, diet habits, work, regular exercise, hereditary history, smoking and so on.

In the present study demographic profile of

community will be studied based on questionnaire survey. The questions were well designed to obtain the information for assessment of the prevalence of diabetes in the population. The prevalence of diabetes will be further classified depends on age, sex, marital status, literacy level, occupation, diet habits-like vegetarian, non vegetarian, vegetarian with eggs, food habits inclusion of milk in food, grains, meat type used, sanitation habits, health status based on questions, family history, physical examinations-height, weight, blood pressure, etiology of disease occurrence, laboratory investigations-hemoglobin, blood sugar-fasting and post meal.

The objective of the study includes assessment of prevalence of diabetes in population under study. Hemoglobin level, Body Mass Index and correlation between food habits, occupation and diabetes status in community were performed in the present study.

These data was collected for the sample size of 120 and statically evaluated for significance as well as for understanding the problem severity in the population under study.

India diabetes is coming up as an epidemic. In order to understand the true extent of the problem and its impact on diabetes care, there is a need to review the epidemiology of diabetes from different regions of India. The epidemiology of diabetes in India has an extensive history. The earliest national study reported an overall prevalence of 2.1 % in urban areas and 1.5% in rural areas. (V. mohan and R. pradeepa, 2009)

The study conducted by Gupta R *et al*, concluded that the in last two decades, there has been a marked increase in the prevalence of diabetes among both urban as well as the rural Indians. There is sharpest increase seen in the Southern India. Subsequent studies confirmed this high prevalence of diabetes in urban south India. Although in rural India the prevalence of diabetes is much lower than in the urban population, even here the prevalence rates are rapidly rising, though clearly more studies are needed. Variations in the prevalence rates of diabetes in different urban populations of India are expected because of the large variation in the prevalence of cardiovascular risk factors in different regions and states (Gupta R, 2005, Gupta R *et al*, 2006).

The study conducted by the Bandana Sachdev in 2011 concluded that the prevalence of pre-diabetes and diabetes in the tribal population was found to be higher than that in non-tribal population in Rajasthan. The relative independent contribution of excess adiposity, as indexed by measures of weight and square of height i.e. BMI known to be a modifier

risk factor for obesity related ill health. Advancing age and liquor consumption might play associated role in the development of Type 2 diabetes mellitus and hypertension. The prevalence rate of diabetes and its complications is increasing continuously among these communities due to lack of access to diabetes care and knowledge.

The question answer based survey study is very popular in social science. It gives a rough picture of the event happening among the society. The accuracy and correctness of the answers always remains under the doubt but may be correlated with the experimental facts. In the present study the questions asked and the answers replied correlates with the facts observed in the measurements. Those age groups who have hampered life style, more stress level have diabetes and hypertension. The severity of the disease is seen more in the age group of working age and hence indicating that the population at working age. As the maximum peoples examined were vegetarian hence it shows that the food type is not so importance rather diet time, stress level, diet consumption, exercise in daily routine are the main factor which plays role in development of diabetes.

The study is unique in its way as in this study it is tried to correlate the diet timings, television watch timings, use of cooking oils type, ghee type with the onset of diabetes among the society.

In his review article, S Ramnathan Iyer in 2002, he wrote about the sleeping time and clinical implications on Type 2 diabetes. Sleep is essential for life. Body systems require sleep of good quantity and quality for their proper functioning. Glucose metabolism can be affected adversely by many sleep disorders. Obstructive sleep apnea (OSA) is one of the most important disorders identified in the last 50 years which has systemic effects including glucose metabolism. Aging process also has its effects on glucose metabolism. There is a close relation between sleep, aging and metabolic syndrome. OSA and Type 2 Diabetes Mellitus (Type 2 DM) share several underlying factors in common. There are facts to show a close association between sleep deprivations, sleep disordered breathing-OSA, excessive sleepiness, insomnia, restless legs syndrome and Type 2 DM. The role of sleep deprivation, in the genesis of obesity needs to be recognized. The close association of OSA with insulin resistance demands the recognition of OSA in fatty liver and polycystic ovary syndrome. Treatment of OSA by continuous positive airway pressure has been shown to increase insulin sensitivity. It is important for primary care physicians to have a high degree of suspicion of an underlying sleep disorder in patients with diabetes.

Management of sleep disorder is highly rewarding.

The reduced sleep times on regular basis are associated with obesity (Haster G *et al.* 2004). Sleep deprivation induced stress has a role to play in the development of obesity. Sleep deprived persons have daytime sleepiness and have a tendency to overeat and eat fast. Intake of food in various forms, helps the sleep deprived persons to overcome daytime sleepiness. Chewing tobacco, smoking also drive away sleep but are risk factors for type 2 diabetes (Iyer SR, 2000). Chronic sleep restriction coupled with eating contributes separately to the development of obesity. It is not uncommon to find nap pod in commercial organizations where employees can take a power nap to boost their performances. (S Ramnathan Iyer, 2004)

The present study also suggests same by question answer analysis. The persons who sleep late in night have overweight and tend to develop hypertension and diabetes.

Healthy Cooking Oils

Cooking oils are made of three types of fat. Saturated fatty acids (SFA) cause oxidative stress: a process which leads to cancer cell damage and destruction, as well as being fundamental in the aging process. Monounsaturated fatty acids (MUFA), on the other hand, are the good fatty acids.

The American Heart Association say that our energy intake should consist of 10% SFA 15% MUFA and 10% (Polyunsaturated fatty Acids) PUFA. But ideally one should try to reduce our fat dependency to < 30%.

Body Mass Index (BMI)

BMI is a simple calculation using a person's height and weight. The formula is $BMI = \text{kg}/\text{m}^2$ where kg is a person's weight in kilograms and m^2 is their height in meters squared. A BMI of 25.0 or more is overweight while the healthy range is 18.5 to 24.9. BMI applies to most adults 18-65 years. BMI is not used for muscle builders, long distance athletes, pregnant women, the elderly or young children. This is because BMI does not take into account whether the weight is carried as muscle or fat, just the number. (www.diabetes.ca accessed on 01-05-2016)

BMI in present study compared with many parameters like television watch time, type of oil consumed, and sleeping time. The observation shows that the sybean oil consumer, late night sleeping persons and more than 3 hours television viewers have increased BMI. All these activities together

increase the weight of a person and thus increasing the BMI.

Age also plays important role as the increase in BMI is observed in the age group of 26-45 and 46-55. An underweight % of the 14.58% in the age group of the 26-45 indicates that the women have lesser BMI also, as in this age group out of 48 persons 34 were females. This is mixed picture of the group where some females were suffering from underweight and anemic situation too.

Type 2 diabetes is being observed in the young population of developing countries, which causes a large burden on individuals and the society. Therefore, prevention of diabetes should be considered as a priority as follows:

Development and evaluation of healthy lifestyle plans, focusing on the following aspects: Prevention and early treatment of overweight and obesity, especially in high risk groups. Consume a nutritious diet including low-fat content, especially saturated fat, no sugar and high nutritional supplementary proteins.

Follow active lifestyle including regular physical activity at least an hour a day, and vigorous activities necessary to reduce the risk of type 2 diabetes.

Summary and Conclusion

The study established the facts which already researched and written by the various scientists of the World. In addition to that the fact that BMI which is the determinant of the overweight and underweight in society, also have influenced by the type of oil consumption, television watch time and late sleeping time. This study suggests that a particular age group of 25-55 is more prone to the metabolic disease like diabetes and hypertension. The epidemiological survey also have outcome that the females of age group 25-45 having some % of underweight also. The underweight 25-45 age group have Hb% on lower side suggesting the occurrence of anemia. The more intense research with large population is the need for more concrete conclusion. The age group of 46-55 and 56-75 affects by the hypertension. The severity prevails with the age as per the results shown. The development of the disease diabetes and hypertension took place in early 25-45 years as in that age large numbers of the people generally avoid regular exercise and concentrate more on work. So impaired metabolism due to variation of time in eating, sleeping and stress tend to develop diabetes and hypertension. The regular exercise in form of Yoga and proper intake of water,

reduction in stress level, timely eating and sleeping habits are some actions need to be incorporate into the life style for 20,30,40 years of life so that in old age the metabolic disorders will be avoided.

Recommendations

The Diabetes mellitus develop when a person follow irregular life style in terms of sleeping, eating time, eating habits of junk foods, stress level, genetic factor, lack of daily exercise. The disease is connected with the hypertension and obesity. As it is well said that the "precaution is better than cure". Hence, there are some precautionary measures to prevent onset of Diabetes mellitus.

1. Always eat, sleep on time.
2. Avoid stress in daily life.
3. Do exercise daily.
4. Eat salad and dietary fibers more.
5. Choose best oil for cooking food.
6. Stop watching television 2 hours before going to bed.
7. After attaining 40 years of age yearly do medical checkup in good Hospital.
8. Avoid eating junk foods and fast foods.
9. Be active in work and in home.
10. Take food supplements, if required.

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