Assessment of risk factors among type 2 diabetic populations in South Malabar region of Kerala

Muhammad Shihabudheen K, Prasanth NV, Dilip C, Danisha P, Zainul Abid and Seena

Al Shifa College of Pharmacy, Keezhattur, Perinthalmanna, India

ABSTRACT

Diabetes Mellitus (DM) is a heterogeneous metabolic disorders characterized by common feature of chronic hyperglycemia with disturbance of carbohydrate, fat and protein metabolism The incidence of diabetes mellitus is increasing day by day all over the world. DM is a leading cause of morbidity and mortality the world over. It is estimated that approximately 1% of population suffers from DM. This study is intended to access the various predisposing factor in type 2 diabetes mellitus in patients in South Malabar region. To the best of our knowledge this type of study was not conducted earlier. It can be therefore be interpreted that in the South Malabar region of Kerala the prevalence of diabetes can be mainly attributed to the food habits, reduced physical activity and family history. Sex and age also are relevant factors as they cover more than 50% of their significance. It is observed that male subjects are more susceptible for type 2 diabetes mellitus. Older people are at a greater risk of being diabetic. Primary standard of education and rural residence had shown clear association with incidence of diabetes. Patient awareness has a greater role in preventing the progression of the disease. Education therefore is a very important factor Dietary habits and body built of the patients are also significant factors in the leading to the development of diabetes. Dietary restrictions must be insisted for diabetic subjects and people must be informed of the importance of taking food rich in dietary fibers and antioxidants. This is because that people from the rural region mainly consumes carbohydrate and fat rich food due to its wide availability.

Key words: Diabetes mellitus, South Malabar.

INTRODUCTION

As per The World Health Organization, Diabetes Mellitus (DM) is a heterogeneous metabolic disorders characterized by common feature of chronic hyperglycemia with disturbance of carbohydrate, fat and protein metabolism The incidence of diabetes mellitus is increasing day by day all over the world[1]. DM is a leading cause of morbidity and mortality the world over. It is estimated that approximately 1% of population suffers from DM. the incidence is raising in developed countries mainly due to reduced activity and increased obesity levels. DM is expected to continue as a major health problem owing to serious complications [1]

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The epidemic of type 2 diabetes mellitus is ever increasing in developed and developing countries in spite of the enormous facilities available to control its growth. The goal of pharmaceutical care is to improve patient health outcomes by assuring effective, safe and cost-effective drug therapy. Before the commencement of any kind of management measures it is important to assess the various factors contributing to the occurrence of the disease so that by limiting these factors the progression of the disease in diabetic patients can be controlled. As well as the chance of occurrence of type 2 diabetes mellitus in susceptible individuals can be prevented by reducing the exposure to the specific pre disposing factor that has been ruled out. So this study is intended to access the various predisposing factor in type 2 diabetes mellitus in patients in South Malabar region. To the best of our knowledge this type of study was not conducted earlier.

The general objective is to study the various predisposing factors for type 2 Diabetes Mellitus in the South Malabar region of Kerala.

The specific objectives are to assess and compare the predisposing factors for type 2 Diabetes Mellitus among;

- Male and Female patients
- In three different age groups-18 - 30 years, 31 - 45years, 46 – 60, and 60 and above.
- In patients at different educational levels.
- In subjects with different body built
- In people with different food habits.
- In subjects with different physical activity levels.
- Different area of residence.
- Subjects with a family history of DM for their parents, identical twins or siblings.
- In subjects engaged in various occupations and different physical activity levels.

MATERIALS AND METHODS

Study design:
A prospective observational study was carried out in 206 subjects from either sex with a pre-hospital diagnosis of Diabetes Mellitus.

Study site and duration:
This study was conducted at various hospitals in and around the South Malabar region of Kerala in South India. Hospitals belonging to all categories like primary, secondary, tertiary and multi specialty hospitals were included for the study. Al Shifa hospital, Perinthalmanna, Ramadas clinic and nursing home, Perinthalmanna, EMS co operative hospital and research centre, Perinthalmanna, Malabar institute of medical sciences, Calicut, Malabar diabetic clinic, Calicut, Red Crescent hospital, Calicut were some of the hospitals that provided relevant data for the purpose of the study. The study was conducted for over a period of seven months commencing from September 2009 to March 2010.

The patients were enrolled in to the study on the basis of inclusion and exclusion criteria.

Inclusion criteria:
1.   Patients or subjects of either sex of age more than 18 years.
2.   Only those patients with a pre-hospital diagnosis of DM as reported by the patient,   general practitioners or the hospital notes provided that was recently reported.
3.   Those who were willing to participate in interview.

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Exclusion criteria:
1. Those patients who were unwilling for the interview.
2. Patients with type 1 diabetes.
3. Patients with gestational diabetes.

Procedure:
1. Patient enrollment.
All patients who met the inclusion criteria were enrolled into the study. Patients were informed about the study before the commencement of the interviews.

2. **Patient interview.**
All the subjects were interviewed to obtain the following information.
Age, Sex, Height, Weight, Body mass index, Obesity, Educational status, Religion, Occupation, Marital status, Number of children, Family history of DM, Social history, Co morbid condition, Food habits, Life style, Stress, Incidence of cancer, Lab reports.

For the convenience of the patients as well as for the ease of assessment of data a previously validated data collection form was prepared which included all of the above said parameters. The patient was asked to fill in the form and in cases where the patient were illiterate, bed ridden or unable to fill the form themselves due to any other reasons the form was filled by the care takers, health care professionals relatives or the interviewers.

3. Source of data:
The data required for the study were collected from the following sources:
•   Patients.
•   Patient caretakers.
•   Health care professionals.
•   Medical record department.
•   Other sources that could provide relevant data.

4.   Data analysis:
The data obtained were subjected for analysis to find out various findings and their percentage value
•   Incidence rate in male and female.
•   Incidence rate in different age group.
•   Incidence rate in different educational status.
•   Incidence rate in patient having family history.

5.   Statistical analysis:
The analyzed data were subjected for statistical analysis to find out significance.

RESULTS AND DISCUSSION

The demographical features analyzed from the study can be tabulated as follows.

Table 1: Demography of Patients

Demographic feature analyzed:		Frequency of distribution (%)	
Total no. of patients enrolled.		206(100%)	
Gender	MALE		53.3%
	FEMALE		46.6%
Age group	18-30		4.3%
	31-45		20.4%
	46-60		33.01%
	60 and above		42.23%
Average Body Mass Index(BMI)			22.2
Average waist to hip ratio(WHR)			0.94
Educational status	Post graduates		1.94%
	Graduates		18.45%
	Higher secondary		1796%
	Lower secondary		16.5%
	Primary		40.29%
	illiterate		4.85%
Body built	Obese		14.56%
	Lean		24.7%
	average		60.6%
Food habits	Vegetarians		4.85%
	Non vegetarians		95%
	Oil excess		13.106%
	Sugar excess		18.44%
	Oil and sugar excess		10.67%
	Smoking		10.19%
	Alcohol		3.9%
	Smoking and alcohol		7.76%
	Tobacco chewing		0.97%
Family history			69.4%
Level of activity	Highly active		26.6%
	Moderately active		38.83%
	Less active		34.46%

Influence of sex as a predisposing factor of type 2 diabetes mellitus can be represented as shown below. Out of the 206 patients enrolled in the study, 96 were female and 110 were male. The above graph shows the association of type 2 diabetes mellitus with sex. This shows that of all the subjects enrolled 46.6% were females while 53.3% were male.
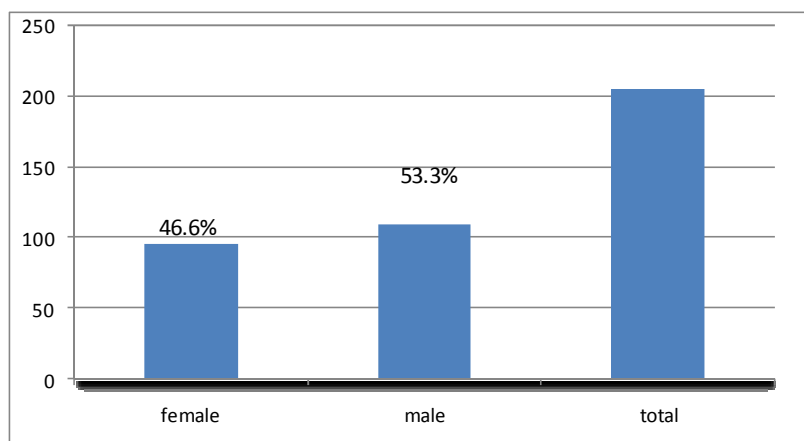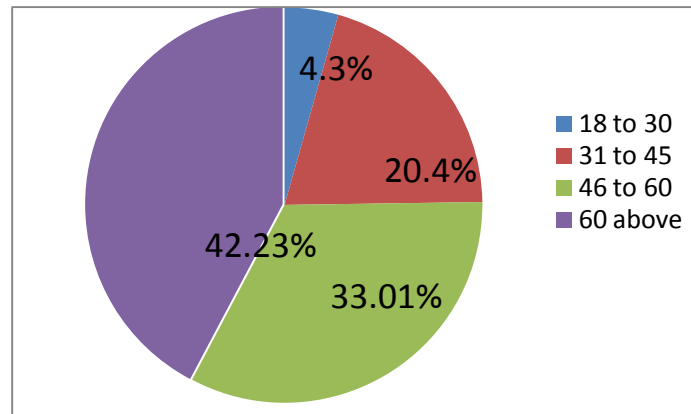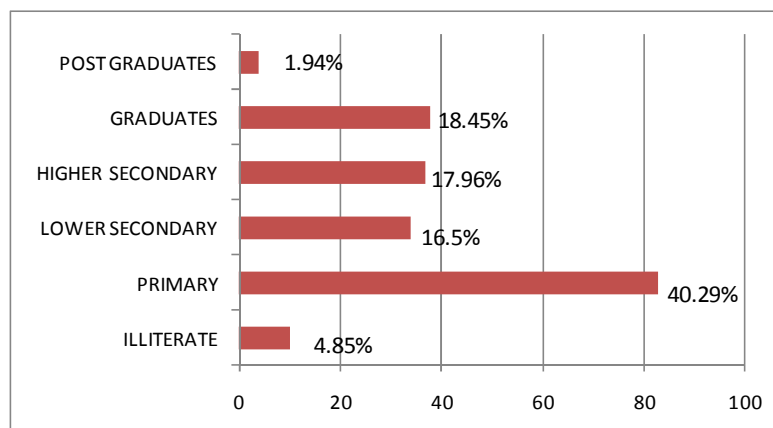
Figure.1: Gender Distribution

Table 2: Age Group Distribution

Age group distribution (%)			
18-30	31-45	46-60	60 and above.
4.3%	20.4%	33.01%	42.23%

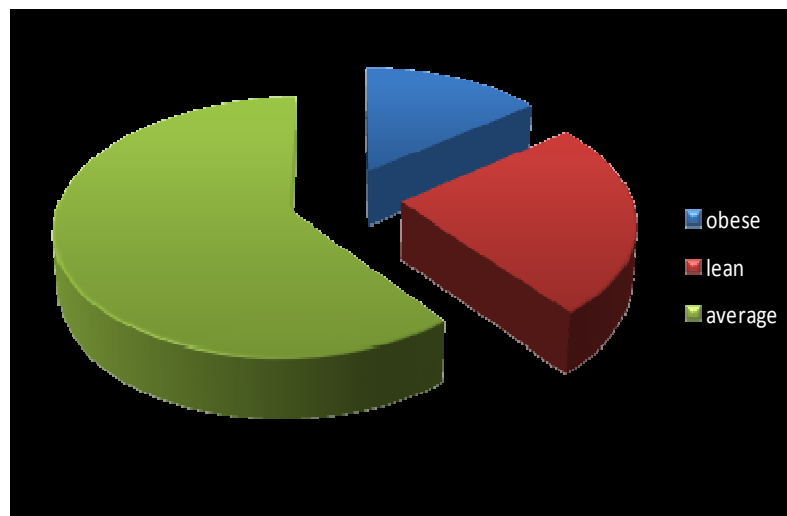**Figure 2: Age Group Distribution**

There were 9 patients lying in the age group 18 to 30, in the age group 31 to 45 there were 42 patients, in the age group 46 to 60 there were 68 subjects and majority of the subjects were 60 years or older which constituted 87 out of the total 206 patients.

Figure 3: Correlation of Education and Diabetes Mellitus

The association of educational status of patients with the occurrence of type 2 diabetes mellitus is shown in the graph. Out of the total subjects only 4 were post graduates. There were 38 graduates with diabetes. The number of subjects who had qualifications of higher and lower secondary education were 37 and 34 respectively. 10 of the patients were illiterate. Majority of the patients were holding a primary level of education that is there were 83 patients belonging to this category.
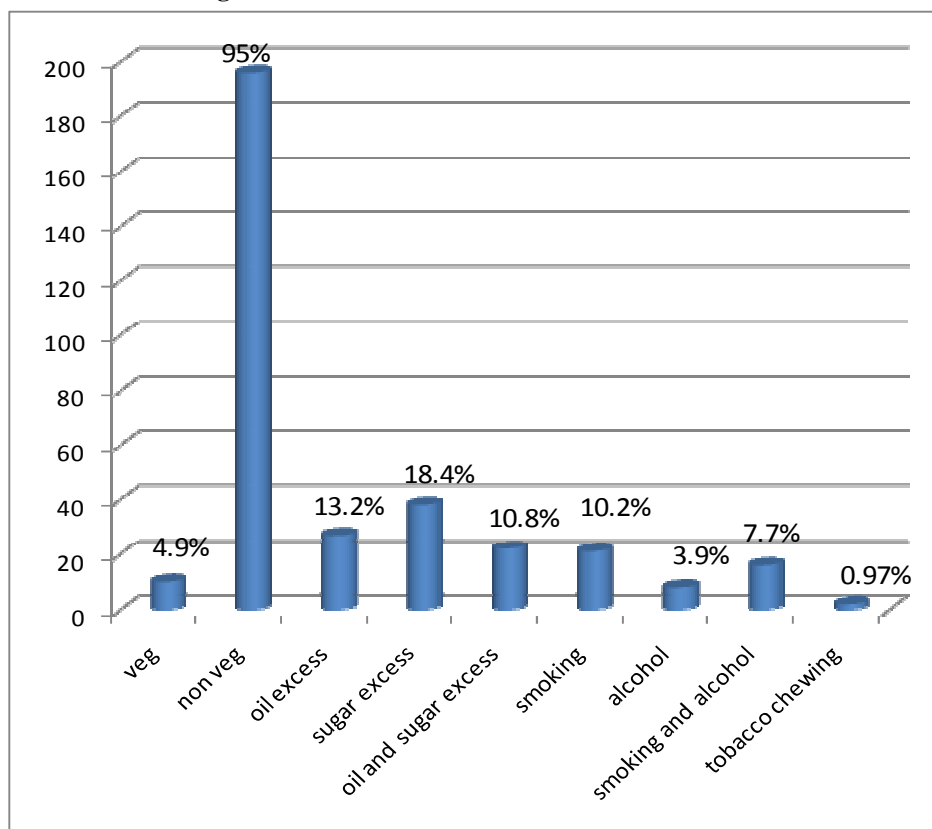
Post graduates comprised only 1.94%, graduates 18.45% higher and lower secondary 17.96% and 16.5%, illiterates constituted only 4.85% and primary education level comprised around 40.29% of the total sample size.

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Figure 4: Body Built and Diabetes

The prevalence of type 2 diabetes among subjects with carrying body built is summarized as follows. The obese people constituted only 14.56% of the sample size and the lean covered 24.7% while the subjects with an average body built comprised 60.6% of the entire sample size.
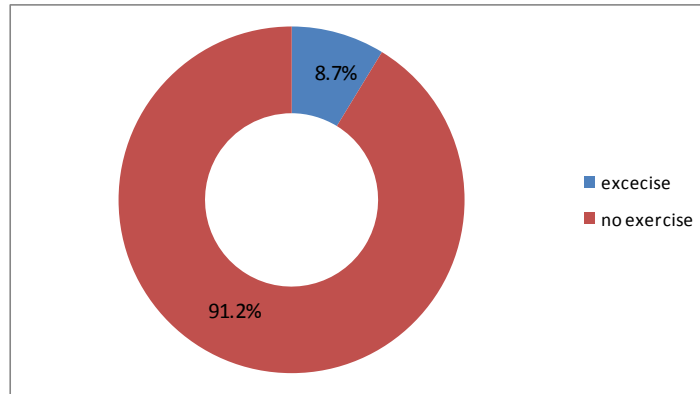
Figure 5: Association of Food Habits and Diabetes

The food habits of the subjects were that only 10 of the 206 patients were pure vegetarians. Remaining 196 subjects were non vegetarians. Also 27 patients were taking oily food in excess while 38 of them were having excess sugar intake. 22 patients were fond of both oily and sugar rich food. 119 of the sample size might be aware of the dietary restrictions that have to be followed in diabetic life and so they had no excess sugar or oil intake. Majority of the patients
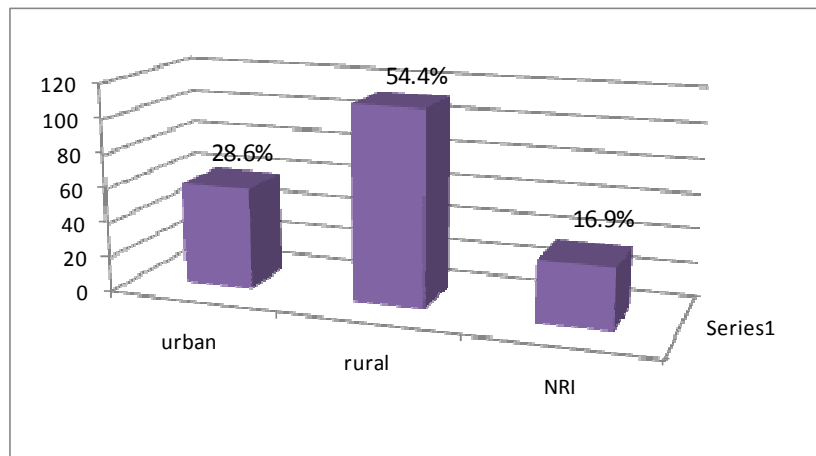
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kept away from social habits like alcohol, smoking etc. 159 patients did not have such habits. 21 subjects were following smoking and 8 were alcoholic.16 of them had both the habits while only 2 had the habit of tobacco chewing.

Figure 6: Exercising Habit of Patients

The most alarming among the results were that only 18 among the 206 worked out exercises on a regular basis. Remaining 188 subjects were not involved any sort of physical activity.

Figure 7: Area of Residence and Diabetes

The rural urban variations among the subjects were also studied. 112 subjects belonged to rural areas while 59 were from 7 urban areas, yet 35 members were NRIs.

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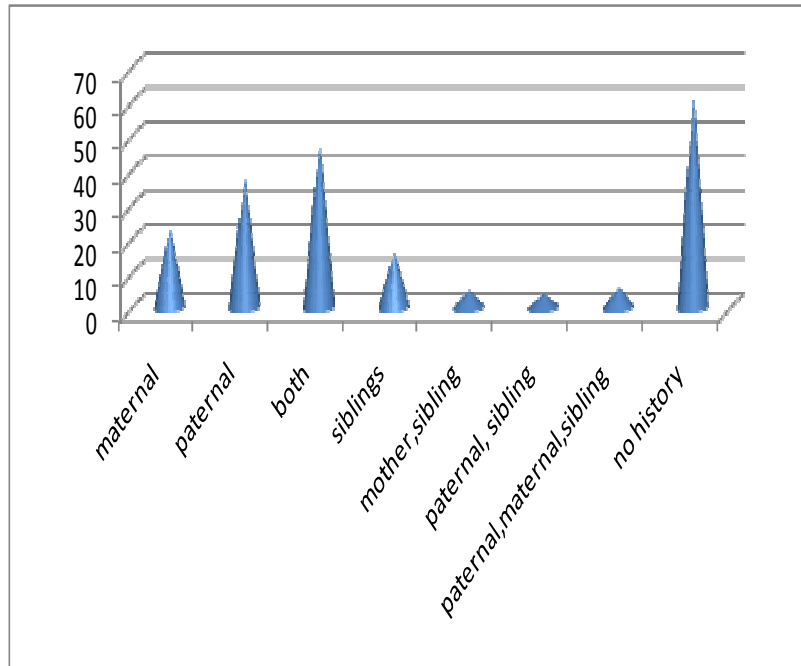**Figure 8: Genetic Distribution of Diabetes**

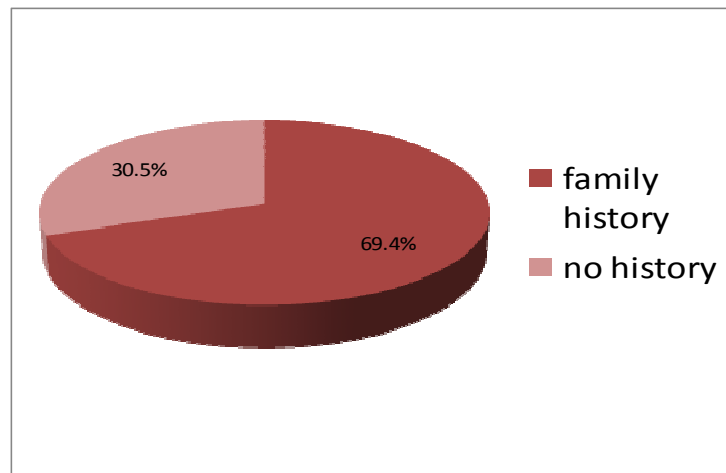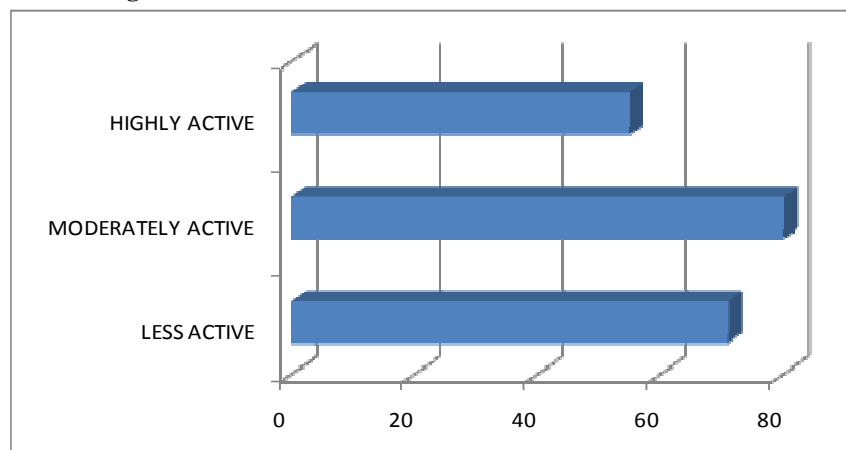**Figure 9: Genetic Association of Type 2 Diabetes Mellitus**

Figure 10: Correlation of Education and Diabetes Mellitus

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Family history of the subjects was analyzed and it was found that 69.4% of the subjects had a family history of diabetes either in father, mother, or in siblings or in all groups. Only 30.5% did not have a family history of diabetes.

The prevalence rates of diabetes among subjects belonging to different levels of physical activity is that the incidence was only 26.6% in highly active individuals who were mainly people who earned their living through daily wages. Moderately active subjects comprised 38.83% of the sample size while the least active people were 34.46% of the population assessed.

The average BMI calculated among the subjects were 22.2 and average WHR was 0.94. That is on an average, the BMI as well as WHR did not show the prevalence of obesity. This can be attributed to the primary symptoms of diabetes mellitus that there would be prominent weight loss in the patients.

Also only four of the subjects were leading a single life; other 202 patients were married and were living with family.

The bar graph below summarizes all the predisposing factor taken for the study and the most prevailing parameter of each specific objective of the study is considered and is represented in the graph.
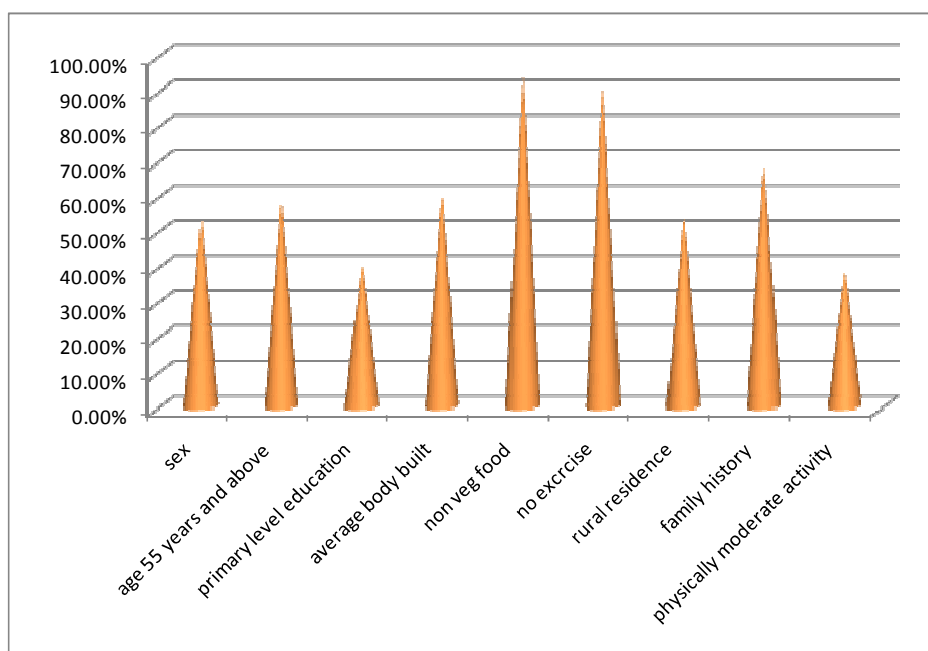

Figure 11: demography of patients

Of all the factors assessed the lack of physical exercise, non vegetarian food habits and family history of type 2 diabetes mellitus are the most highlighting parameters that could be analyzed.

In our study we have detected that majority of our subjects belonged to the age group of 60 and above. 59.22% of the sample size was comprised of the elderly people. This hardly correlates with the study[2] conducted by D Shobha Malini et al where they found out that majority of their patients belonged to age group 46 to 50 years of age. But they specified that there is increased onset of diabetes among younger age group in Indians. 24.75% of our subjects were of ages 18 to 45 years.

The distribution of diabetes among male and female patients was also different. There is an increased incidence among males. 53.3% of the subjects were male while female were only 46.6%. Sanjeev Mangrulkar and Pushkar S Khair [3] while comparing the surgical wounds among diabetic and non diabetic found out that males had 1.9 times more the risk of having affected wound than in females. But A. Fisch et al conducted a study in West Africa and there the situations were different. [4] The male to female ratio among the African rural population was 0.64 while in our study it is 1.15.

The educational status of patients also had its significance in the study. About 40.29% of the subjects had only primary level of education. Four patients were post graduates and this wide variation clearly shows the association of education in diabetes. D. A. Satpute et al [5] proposed that education of the patients is important in the management of the disease. They also said that various factors like understanding of the patients about the disease, socio economic factors, dietary regulation, self monitoring of blood glucose, are known to play a vital role in diabetes management. Alberto Barceló et al [6] found out in their study that diabetes particularly affects people from the lower socio economic classes, as evidenced by high prevalence rate in the people with lower educational levels in Bolivia and in Jamaica.
60.6% of our subjects were having an average body built. The average BMI of the sample size was 22.2 and the average WHR was 0.94. Obese population comprised only14.56% and lean subjects were about 24.7%. But our study shows that diabetes prevails in subjects with average body built in developing countries like India. The West African survey on diabetes [7] showed that BMI and obesity is a strong risk factor in the rural population of Mali in West Africa.

The dietary habits had its importance in the incidence of diabetes that 95.14% of the subjects were non vegetarians. Nihal Thomas et al [8] suggested that various food habits of patients have very significantly contributed in the development of diabetes. Carbohydrate and fat rich food has a strong association with the development of diabetes.

It was pathetic that only 8.8% of the subjects were practicing any sort of exercise or yoga on regular basis. This is a key factor for the development of diabetes. Also only 26.29% of the populations were engaged in physically well active occupation. 34.46% of the samples were least active.

The rural urban variations among the subjects studied showed that112 subjects belonged to rural areas while 59 were from urban areas, yet 35 members were NRIs. That is about a half of the sample size (54.2%) belonged to the rural population. This very much complies with studies conducted by A. Fisch [4] where they found out that the prevalence was about 92% in the West African rural subjects. This was explained on the basis that carbohydrate rich food and oil rich food were cheaper and easily available for the rural population than that of food rich in dietary fibers and antioxidants. [8]

Genetic association of diabetes is very relevant that the genetic locus is chromosome 6 even though the HLA association is not yet established. [1]. Our study ruled out that 69.4% of our subjects were having a clear association of family history of diabetes.

The J.A. Cantrill and J.Wood [9] quoted that if a parent has type 2 diabetes the relative risk of the child for developing type 2 diabetes mellitus was 5 to 10%. This data is much supported by the results from our study that 109 of the 206 patients were having inheritance of diabetes from their parents, father, mother or both.

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CONCLUSION

It can be therefore be interpreted that in the South Malabar region of Kerala the prevalence of diabetes can be mainly attributed to the food habits, reduced physical activity and family history. Sex and age also are relevant factors as they cover more than 50% of their significance. It is observed that male subjects are more susceptible for type 2 diabetes mellitus. Older people are at a greater risk of being diabetic. Primary standard of education and rural residence had shown clear association with incidence of diabetes. Patient awareness has a greater role in preventing the progression of the disease. Education therefore is a very important factor Dietary habits and body built of the patients are also significant factors in the leading to the development of diabetes. Dietary restrictions must be insisted for diabetic subjects and people must be informed of the importance of taking food rich in dietary fibers and antioxidants. This is because that people from the rural region mainly consumes carbohydrate and fat rich food due to its wide availability.

Recommendations

Patients must mandatorily stick on to regular physical activities or exercise and also must proceed with dietary restrictions. People who are at a high risk of developing diabetes like aged and those with genetic susceptibility should begin to control their food and activities at a very early stage of life since the onset of diabetes is getting earlier now a days. Measures must be taken to improve awareness among rural population and patient counseling and diabetic education programs can be conducted. Mass communication media could play an essential role in creating awareness among the public about the disease.

Future directions

A number of studies can be conducted on the basis of this survey. Some suggestions are;
1. Prevalence of early onset of type 2 diabetes in India
2. Influence of patient counseling on diabetes.
3. Co morbid conditions and diabetes
4. Management of diabetes.
5. Hypertensive crisis in diabetes.
6. Complications of diabetes.

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