Research Journal of Pharmaceutical, Biological and Chemical Sciences

Awareness on Type II Diabetes and Its Complication among Vellore District Population in Tamilnadu

J Komathi[1]*, A Thaminum Ansari[2], and A Balasubramanian[3].

[1]Research Scholar, Bharathiar University, Research & Development Centre, Coimbatore.
[2]Assistant Professor, Muthurangam Government Arts & Science College, Vellore.
[3]Professor and Head, Thiruvalluvar Arts & Science College, Kurinjipadi, Cuddalore District.

ABSTRACT

Diabetes and its associated complication have been increasing dramatically worldwide. Prevalence of diabetes is higher in developed than in developing countries, however past two decades diabetes mellitus was reported higher in developing countries. Diabetes and its associated complication awareness are lacking, adequate baseline information is mandatory to the public to overcome this problem. Hence the present study was undertaken to assess the knowledge about the awareness of diabetes mellitus and its complication. We conducted a cross sectional and face to face survey on adult's age group (30-80) in Vellore District. The questionnaire includes general status, causes, family history, risk factors and alternative treatment practices. The study covered a sizable number of tannery workers (including office workers) in Vellore district (i.e.) 500 subjects which includes 284 males and 191 females and 25 of healthy controls (non-diabetes) of age between 25 - 65 years.

Keywords: Diabetes mellitus; associated complication; awareness.

*Corresponding author

INTRODUCTION

Health is a vital aspect of life. It is determined by the controlled way of life activities. This includes hygienic and balanced nutrition, good habits and holistic environment. Any disturbance(s) in any one of these factors may cause ill-health. Transition in life-style, environment and hereditary (or) genetic traits independently (or) jointly lead to a life threatening metabolic syndrome / disorder known as diabetes [3].

Diabetes mellitus is one of the most common chronic metabolic diseases, which determine a dramatic progression of the disease over the past decades. Diabetes is a long-term illness that occurs either because the pancreas does not produce enough insulin or because the body cannot effectively use the insulin it produces, or both, [5]. This causes high levels of blood glucose (hyperglycemia). Because our modern lifestyle goes a long way, that more and more people develop type 2 diabetes. Unusual tiredness, increased thirst, weight loss, frequent urination and headaches, food cravings, itching and blurred vision - that it can be for people in the middle years of evidence that the metabolism of sugar out of rhythm, and a type 2 diabetes develops, [5]. Diabetes can cause serious health complications including heart disease, stroke, peripheral vascular disease, blindness, kidney failure, [6] and lower-extremity amputations.

Diabetes is a complex group of diseases with a variety of causes. People with diabetes have high blood glucose, also called high blood sugar or hyperglycemia. Diabetes is the condition in which the body does not properly process food for use as energy. Most of the food we eat is turned into glucose, or sugar, for our bodies to use for energy. The pancreas, an organ that lies near the stomach, makes a hormone called insulin to help glucose get into the cells of our bodies.

Diabetes develops when the pancreas doesn't make enough insulin or is not able to produce insulin effectively, or both. As a result, glucose builds up in the blood instead of being absorbed by cells in the body. The body's cells are then starved of energy despite high blood glucose levels. This causes sugars to build up in your blood. This is why many people refer to diabetes as "sugar," [1].

MATERIAL AND METHODS

Study area

A survey has been carried out in five towns namely Vaniyambadi, Ambur, Pernambut, Vellore, and Ranipet of Vellore district, having more tanning industries during the period of January 2012 to December 2014. Our study was confined to Vaniyambadi, Ambur, Pernambattu, Vellore and Ranipet areas.

Study subjects

The present study of diabetes mellitus (T2) and diagnosis was carried out in department of pathology, ESI hospitals in Vaniyambadi, Ambur, Pernambut, Vellore and Ranipet of Vellore district. The blood samples were taken from the tannery workers and tenants (outdoor patients as well as admitted patients), who have been advised by clinicians for blood sugar investigations. Workers have been advised for blood sugar investigations on the basis of symptoms and signs.

The study covered a sizable number of tannery workers (including office workers) in Vellore district (i.e.) 500 subjects which includes 284 males and 191 females and 25 of healthy controls (non-diabetes) of age between 25 - 65 years. These subjects are residing in several villages of five taluk of Vellore district (Vaniyambadi, Ambur, Pernambut, Vellore and Ranipet) and survey covered a distance of approximately 100 Km (on road). ESI Hospital admission survey has been carried out to collect the data with a standard questionnaire during the period of January 2012 to December 2014. Before enrolling the clinical study, all the patients were validated properly by pre-clinical screening which includes signs a symptom of diabetes mellitus and laboratory investigation for diabetic screening and any complications of diabetes or other involvements such as cardiovascular, renal diseases. Standard methods are used for the various anthropometric measurements (blood grouping, blood glucose, blood cholesterol, [10] TLC, D LC, LDL- [4], urea creatinine, etc.,).

The diabetic group included 500 tannery workers of both genders, aged 25-65 years, who were chosen from patients with diabetes, attended the medical examinations in ESI hospitals during the period of the study. An aged matched control group included 25 apparently healthy subjects who were selected the workers from of the same centre. The present research work is carried out during the period of January 2012 to December 2014 and was approved by the Institutional Ethical Committee and conducted according to the ethical principles of the Declaration of Helsinki and WHO guide for ethics committees of investigations. After obtaining the informed consent, the workers were included in the study.

Data collection and classification

Around 500 datas were collected in the survey for the proposed work. The inputs designed for the system are age, gender, family background, period of working, taking medication for high blood pressure, found to have high blood glucose in a health examination during illness, smoking or using tobacco products, amount of vegetable and fruit intake, physical activity (30 minutes daily), body mass index, waist hip ratio, increased urination, hunger, thirst, poor wound healing, life style (labor class, sedentary work, retired persons and house wife's), gestational diabetes, frequent intake of non-vegetarian food, and itching all over the body. The input values have been assigned based on the comparison between two men where one has diabetes and the other a non-diabetic. Based on this comparison, a probability value has been assigned to each of these inputs and these values are fed into the system. These input values range between 0 and 3 based on the condition or physical appearance of that person. The inputs to the system have been designed on the basis of common symptoms of diabetes mellitus and some of the factors which could lead to diabetes like high blood pressure or food habits, etc.

Medical history

All of the recipient have no any other compliant apart from diabetic mellitus.

Drug history

50 % of the patients were on dianoile 1 x 3, 25% have in addition one tab. of Biguaniol (glucophage). 25% on dietary control only. All of the groups have taken sweetam tab on needs of themn [8].

Criteria for diagnosis

The criteria for the diagnosis of type 2 diabetes mellitus conclude that any one of the following is diagnostic; American Diabetes Association [9].

1. Classical symptoms of diabetes, polyurea, polydipsia, and fatigue, with plasma glucose concentration ≥ 200 mg/dl regardless of the time of the preceding meal.
2. Fasting plasma glucose ≥ 126 mg/dl without caloric intake for at least 8 hours.
3. 2-hours post load plasma glucose

Concentration ≥ 200 mg/dl during the Oral Glucose Tolerance Test.

Sample collection

About 10 mL of blood sample were collected from the ante-cubital vein of subjects using disposable needle and syringe. Samples were collected between 9.00-11.00 a.m. Each sample was taken in 5 mL plain specimen bottles and 5 mL fluoride-oxalate bottles after 12-14 hours overnight fast for analysis. The sample was centrifuged at 4000 rpm and the serum was separated and stored at -20° C until analysis.

Biochemical analysis

Determination of fasting plasma blood glucose (sugar) was measured by enzymatic colorimetric method using commercial kit (Biocon ® Diagnostic / Germany), at ESI hospitals of Ambur, Vaniyambadi, Pernambut, Vellore and Ranipet, Fischbach and Dunning, [11] (Table: 1).

Table: 1 Criterion for Diagnosis of Diabetes Mellitus

Normoglycemia	Impaired glucose fasting	Diabetes mellitus
FPG <110 mg/dL	FPG $\geq$ 110 mg/dL and < 126 mg/dL (IFG)	FPG $\geq$ 126 mg/dL 2 hrs. PG > 200 mg/dL
2 hrs. PG < 140 mg/dL	2 hrs. PG >140 mg/dL and $\leq$ 200 mg/dL (IGT)	Symptoms of diabetes and random PG $\geq$ 200 mg/dL

PG - Plasma Glucose;   IFG – Impaired fasting glucose;   IFG – Impaired fasting glucose; IGT - Impaired glucose tolerance; FPG – Fasting plasma glucose, fasting is defined as no calories intake for at least 8hrs.

Blood glucose tests are done to: Pagana, [10]; Chernecky, Berger, [12].

- ➢ Check for prediabetes and diabetes.
- ➢ Monitor treatment of diabetes.
- ➢ Check for diabetes that occurs during pregnancy (gestational diabetes).

The following three tests can be used to diagnose diabetes or identify pre-diabetes:

1. Fasting plasma glucose (FPG)
2. Oral glucose tolerance test (OGTT)
3. Hemoglobin A1C (Hb A1C)

RESULTS AND DISCUSSION

Fasting Plasma Glucose Test (FPG)

The fasting plasma glucose levels test was conducted before a meal and the values of the patients with FPG values 83mg/dL, 97mg/L and 99mg/dL respectively were in normal range indicating that 14 % of male workers and 15 % of female workers were without diabetes.

The results of FPG ranging from 110 mg/dl to122 mg/dl indicates that 46 % of male patients and 40 % of female patients have prediabetes indicating an increased risk in developing full-blown diabetes.

The results corresponding to the patients with FPG value ranging from 130mg/dl to 330mg/dl indicates that 40 % of male workers and 45 % of female workers are in the threshold at which diabetes is diagnosed

If the results are borderline, other tests might be done, including the oral glucose tolerance test or the postprandial plasma glucose test. Even if results are within the normal range, additional testing may be ordered to determine if a person has additional risk factors for diabetes, such as high body mass index, or if he or she exhibits other symptoms of diabetes.

Postprandial glucose test

The PP glucose levels test was conducted and results were obtained. We observed that, the patients with PP values from 157mg/dl to 198mg/dl had borderline diabetes level which corresponds to 33 % of male patient were as neither of the female patient fell under this category.

The patients with PP values ranging from 210 mg/dl to 340 mg/dl indicates that 67 % of male patients and 100 % of female patients were in threshold at which diabetes is diagnosed

The oral glucose tolerance test (OGTT)

Oral glucose tolerance level test was conducted and found that 40 % of male and 60% female patients have blood plasma glucose level between 140 mg/dL and 200 mg/dL. The results indicated that, they were in impaired glucose tolerance range and 60 % of male and 40% female patients have blood plasma glucose levels above 200 mg/dL. The results indicated that, they had diabetes diagnosed

Haemoglobin A1C (HbA1C) Test

The hemoglobin A1C (or) Glaciated hemoglobin (or) Glycohemoglobin test is an important blood test that shows how well your diabetes is being controlled. The A1C test is a blood test that provides information about a person's average levels of blood glucose, also called blood sugar, over the past 3 months. The A1C test is the primary test used for diabetes management and diabetes research. The A1C test is based on the attachment of glucose to hemoglobin, the protein in red blood cells that carries oxygen. In the body, red blood cells are constantly forming and dying, but typically they live for about 3 months. Thus, the A1C test reflects the average of a person's blood glucose levels over the past 3 months. The A1C test result is reported as a percentage. The higher the percentage, the higher a person's blood glucose levels have been. A normal A1C level is below 5.7%.

For people without diabetes, the normal range for the hemoglobin A1C test is between 4% and 5.6%. **(20-41 mmol/mol),** Hemoglobin A1C levels between 5.7% and 6.4% **(48 mmol/mol)** indicate increased risk of diabetes, and levels of 6.5**% (59 mmol/mol)** or higher indicate diabetes. Because studies have repeatedly shown that out-of-control diabetes results in complications from the disease, the goal for people with diabetes is a hemoglobin A1C less than 7%. The higher the hemoglobin A1C, the higher the risks of developing complications related to diabetes.

The hemoglobin A1C levels test was conducted and results were noted. The A1C values of patients corresponding to 5.6% to 6.4% indicates that 22.5% of the male patients and 77.5 % of female patients have increased risk of diabetes is diagnosed

The A1C values of patients corresponding to 6.5% to 9.8% respectively indicates that 22.5 % of male patients and 77.5 % of female patients have diabetes diagnosed

People with diabetes should have this test every 3 months to determine whether their blood sugars have reached the target level of control. Those who have their diabetes under good control may be able to wait longer between the blood tests, but experts recommend checking at least 2 times a year (Table:2).

Table: 2 Blood Test Levels for Diagnosis of Diabetes and Prediabetes

	A1C (percent)	Fasting Plasma Glucose (mg/dL)	Oral Glucose Tolerance Test (mg/dL)
Diabetes	6.5 or above	126 or above	200 or above
Prediabetes	5.7 to 6.4	100 to 125	140 to 199
Normal	About 5	99 or below	139 or below

Definitions: mg = milligram, dL = deciliter
For all three tests, within the prediabetes range, the higher the test result, the greater the risk of diabetes.

CONCLUSION

It can be concluded that the tannery workers diagnosed with diabetes and are found to be Type II diabetes which is used to be exclusively found among older workers and some of them are young adult workers due to obesity. Type II diabetes occurs when the pancreas still makes insulin, but the body develops resistance to insulin, so the fat cells don't absorb insulin as well as muscle cell do. They are unable to take up the sugar that is in the blood. Several reports showed that the pancreas has to work harder to pump increased levels of insulin into the blood to compensate for resistance, that the pancreas eventually wears itself out and can no longer keep up with the demand. Oral medications, combined with a low fat, high fiber diet and exercise is usually enough to control the symptoms of type 2 diabetes.

To prevent diabetes related morbidity and mortality, there is an immense need of dedicated self-care behaviors in multiple domains, including food choices (low fat and high fiber diet), physical activity (exercise), proper medications intake and blood glucose monitoring from the tannery workers who have diabetes. Though multiple demographic, socio-economic and social support factors can be considered as positive contributors in facilitating self-care activities in diabetic patients, role of clinicians in promoting self-care is vital and has to be emphasized. Realizing the multi-faceted nature of the problem, a systematic, multipronged and an integrated approach is required for promoting self-care practices among tannery workers having diabetes to avert any long-term complications.

ACKNOWLEDGMENTS

REFERENCES

[1]   Grandjean P, Nielsen GD, Jorgensen PJ, Horder M. Reference intervals for trace elements in blood: significance of the risk factors. Scand J Clin Lab Invest. 1992; Jun;52(4):321–37.
[2]   Jackson RF, Roche GC, Wisler K: Reduction in Cholesterol and Triglyceride Serum Levels Following Low-Level Laser Irradiation: A Noncontrolled, Nonrandomized Pilot Study. The American Journal of Cosmetic Surgery 2010; 27(4):177–184.
[3]   Roglic, G., N. Unwin, P.H. Bennett, C. Mathers, J. Tuomilehto S. Nag, *et al*., Diabetes Care 28, 2005; 2130–2135.
[4]   Tan KCB, Aiv VGH, Chow WS, Chau MT, Leong L, Lam KSL. Influence of low density lipoprotein (LDL) sub fraction profile and LDL oxidation on endothelium-dependent and independent vasodilation in patients with type-2 diabetes. J ClinEndocrinolMetab 1999; 84:3212–3216.
[5]   Van Leiden HA, Dekker JM, Moll AC, Nijpels G, Heine RJ, Bouter LM, et al. Blood pressure, lipids, and obesity are associated with retinopathy: the hoorn study. Diabetes Care 2002; 25:1320-5.
[6]   Yu CC, Lin JL, Lin-Tan DT: Environmental exposure to lead and progression of chronic renal diseases: a four-year prospective longitudinal study. J Am SocNephrol 2004; 15(4):1016–1022.
[7]   Zimmet, P., Alberti,K.G., and Shaw, J. Global and societal implications of the diabetes   epidemic, Nature 2001; 414 : 782 – 87.
[8]   *Eurich; McAlister, FA; Blackburn, DF; Majumdar, SR; Tsuyuki, RT; Varney, J; Johnson, JA. "Benefits and harms of antidiabetic agent in patients with diabetes and heart failure; system review. BMJ (Clinical research ed). 2007; 335 (7618): 497.*
[9]   American Diabetes Association. Standards of medical care in diabetes- Diabetes Care, 38, 2015; (Suppl 1): S1-S93.
[10]   Pagana KD, Pagana TJ. Mosby's Manual of Diagnostic and Laboratory Tests 2010; 4th ed. St. Louis: Mosby Elsevier.
[11]   Fischbach FT, Dunning MB III, eds.. Manual of Laboratory and Diagnostic Tests 2009; 8th ed. Philadelphia: Lippincott Williams and Wilkins.
[12]   Chernecky CC, Berger BJ. Laboratory Tests and Diagnostic Procedures 2013; 6th ed. St. Louis: Saunders.