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An Assessment of Knowledge and Evaluation of Risk on Developing Type II Diabetes Mellitus- a Prospective Study

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ABSTRACT

Background: As per WHO definition Diabetes is 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. Recent study estimates that there were 171 million people in the world with diabetes in the year 2000 and this is projected to increase to 366 million by 2030. WHO projects that diabetes will be the 7th leading cause of death in 2030. **Aim:** To identify and improve the level of knowledge in type II Diabetes and to evaluate risk of developing type II DM among non-diabetics attending tertiary care hospital. **Methods:** A qualitative observational interview based method was conducted out in a 450 bedded tertiary care hospital for a period of 6 months. Patient data was collected through structured form and evaluated using standard validated scales DKQ – 24 item questionnaire form and Type II Diabetes Risk Assessment form. All patients admitted with Type II DM with/ without co-morbidities in the age range of 18-70years will be selected. The patients with increased risk of developing Type II DM will also be evaluated. The patients who are not interested to participate in study or due to serious illness or impairment are excluded. **Results:** 150 patients enrolled for study of both having diabetic and non-diabetics. They were also carried out the post survey for assessment diabetic knowledge after patient counseling. Patient counseling along with leaflets were provided to patients with poor knowledge. Patient improved from (SD +/-8.63) average pre-score of knowledge to post-score

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(SD +/-2.505) with $P < 0.05$. Risk was estimated and found to slightly elevated risk in majority of respondents. Conclusion: In conclusion this study revealed the need for pharmacist intervention in improving knowledge about Type II Diabetes Mellitus and risk assessment of developing diabetes mellitus. Also statistical significant difference was observed between pre and post survey.

Keywords: Diabetes Mellitus, World Health Organization, Diabetes Knowledge Questionnaire, Standard Deviation.

INTRODUCTION

Definition

Diabetes mellitus is a chronic disease caused by inherited and/or acquired deficiency in production of insulin by the pancreas, or by the ineffectiveness of the insulin produced. Such a deficiency results in increased concentrations of glucose in the blood, which in turn damage many of the body's systems, in particular the blood vessels and nerves.¹

Diabetes Mellitus are commonly classified into three groups:

- Type I diabetes (referred to as insulin dependent diabetes mellitus IDDM)
- Type II diabetes (referred to as non-insulin dependent diabetes mellitus or NIDDM)
- Gestational Diabetes

WHO estimation:

- In 2014 the global prevalence of diabetes was estimated to be 9% among adults aged 18+ years
- In 2012, an estimated 1.5 million deaths were directly caused by diabetes.
- More than 80% of diabetes deaths occur in low- and middle-income countries.
- WHO projects that diabetes will be the 7th leading cause of death in 2030.

Rising Prevalence of Diabetes in India:

- During the period 1971–2000, studies from different parts of India reported a 10-fold increase in the incidence of diabetes in urban India.
- In 2003–2005, a national survey was conducted, in which self-reported prevalence of diabetes was 7.3% in the urban areas and 3.2% in peri-urban slum areas. The prevalence in rural areas was significantly lower (3.1%).
- In another 20 years nearly one-fifth of the world's diabetic population will be in India.

RISK FACTORS

There are several risk factors that can be directly linked for developing type II DM and are:

- **Weight:** Being overweight is a primary risk factor for type II diabetes. The more fatty tissue you have, the more resistant your cells become to insulin
- **Fat distribution:** If your body stores fat primarily in your abdomen, your risk of type II diabetes is greater than if your body stores fat elsewhere, such as your hips and thighs.
- **Inactivity:** The less active you are, the greater your risk of type II diabetes. Physical activity helps you control your weight, uses up glucose as energy and makes your cells more sensitive to insulin.
- **Family history:** The risk of type II diabetes increases if your parent or sibling has type II diabetes.
- **Race:** Although it's unclear why, people of certain races — including blacks, Hispanics, American Indians and Asian-Americans — are more likely to develop type II diabetes than whites are.
- **Age:** The risk of type II diabetes increases as you get older, especially after age 45. That's probably because people tend to exercise less, lose muscle mass and gain weight as they age. But type II diabetes is also increasing dramatically among children, adolescents and younger adults.
- **Prediabetes:** Prediabetes is a condition in which your blood sugar level is higher than normal, but not high enough to be classified

as diabetes. Left untreated, Prediabetes often progresses to type II diabetes.

- **Gestational diabetes:** If you developed gestational diabetes when you were pregnant, your risk of developing type II diabetes increases. If you gave birth to a baby weighing more than 9 pounds (4 kilograms), you're also at risk of type II diabetes.
- **Polycystic ovarian syndrome:** For women, having polycystic ovarian syndrome - a common condition characterized by irregular menstrual periods, excess hair growth and obesity - increases the risk of diabetes.

COMPLICATIONS

Type II diabetes can be easy to ignore, especially in the early stages when you're feeling fine. But diabetes affects many major organs, including your heart, blood vessels, nerves, eyes and kidneys. Controlling your blood sugar levels can help prevent these complications.

Although long-term complications of diabetes develop gradually, they can eventually be disabling or even life-threatening. Some of the potential complications of diabetes include:

Cardiovascular disease

Diabetes dramatically increases the risk of various cardiovascular problems including: Coronary artery disease with chest pain (angina), Heart attack, Stroke, narrowing of arteries (atherosclerosis) & hypertension.

Stroke

A stroke happens when the blood supply to the part of the brain is suddenly interrupted. Then brain tissue is damaged. Most strokes happen because a blood clot blocks a blood vessel in the brain or neck. If you have diabetes, your chances of having a stroke are 1.5 times higher than in people who don't have diabetes.

Neuropathy

Excess sugar can injure the walls of the tiny blood vessels (capillaries) that nourish your nerves, especially in the legs. This can cause tingling, numbness, burning or pain that usually begins at the tips of the toes or fingers and gradually spreads upward. Damage to the nerves

that control digestion can cause problems with nausea, vomiting, diarrhoea or constipation. For men, erectile dysfunction may be an issue.

Kidney diseases

The kidneys contain millions of tiny blood vessel clusters that filter waste from your blood. Diabetes can damage this system. High levels of blood sugar make the kidneys filter too much blood. After many years, they start to leak and useful protein is lost in the urine. Having small amounts of protein in the urine is called microalbuminuria. Severe damage can lead to kidney failure or irreversible end-stage kidney disease, which often eventually requires dialysis or a kidney transplant.

Retinopathy

Diabetes can damage the blood vessels of the retina (diabetic retinopathy), potentially leading to blindness. Diabetes also increases the risk of other serious vision conditions, such as cataracts and glaucoma.

Glaucoma

People with diabetes are 40% more likely to suffer from glaucoma than people without diabetes. Glaucoma occurs when pressure builds up in the eye. In most cases, the pressure causes drainage of the aqueous humour to slow down so that it builds up in the anterior chamber. Vision is gradually lost because the retina and nerve are damaged.

Cataracts

Many people without diabetes get cataracts, but people with diabetes are 60% more likely to develop this eye condition. People with diabetes also tend to get cataracts at a younger age and have them progress faster. With cataracts, the eye's clear lens clouds, blocking light. For cataracts that interfere greatly with vision, the patient gets a new transplanted lens.

Foot Complications

People with diabetes can develop many different foot problems. Even ordinary problems can get worse and lead to serious complications.

Foot problems most often happen when there is nerve damage, also called neuropathy. This

can cause tingling, pain (burning or stinging), or weakness in the foot. It can also cause loss of feeling in the foot, so you can injure it and not know it. Poor blood flow or changes in the shape of your feet or toes may also cause problems.

Hearing impairment: Hearing problems are more common in people with diabetes.

Skin Complications

Diabetes can affect every part of the body, including the skin. Luckily, most skin conditions can be prevented or easily treated if caught early. These include bacterial infections, fungal infections, and itching. Other skin problems happen mostly or only to people with diabetes. These include diabetic dermopathy, necrobiosis lipoidica diabetorum, diabetic blisters, and eruptive xanthomatosis.

DKA (Ketoacidosis) & Ketones

Diabetic ketoacidosis (DKA) is a serious condition that can lead to diabetic coma (passing out for a long time) or even death. When your cells don't get the glucose they need for energy, your body begins to burn fat for energy, which produces ketones. When ketones build up in the blood, they make it more acidic. High levels of ketones can poison the body. DKA may happen to anyone with diabetes, though it is rare in people with type II DM.

Peripheral Arterial Disease (PAD)

Peripheral arterial disease, also called PAD, occurs when blood vessels in the legs are narrowed or blocked by fatty deposits and blood flow to your feet and legs decreases.

If you have PAD, you have an increased risk for heart attack and stroke. An estimated 1 out of every 3 people with diabetes over the age of 50 have this condition. However, many of those with warning signs don't realize that they have PAD and therefore don't get treatment.

Alzheimer's disease

Type II diabetes may increase the risk of Alzheimer's disease. The poorer your blood sugar control, the greater the risk appears to be. The exact connection between these two conditions still remains unclear.

Fungal Infections

The culprit in fungal infections of people with diabetes is often *Candida albicans*. This yeast-like fungus can create itchy rashes of moist, red areas surrounded by tiny blisters and scales. These infections often occur in warm, moist folds of the skin. Problem areas are under the breasts, around the nails, between fingers and toes, in the corners of the mouth, under the foreskin (in uncircumcised men), and in the armpits and groin.

Gastroparesis

Gastroparesis is a disorder affecting people with both type 1 and type 2 diabetes in which the stomach takes too long to empty its contents (delayed gastric emptying). The vagus nerve controls the movement of food through the digestive tract. If the vagus nerve is damaged or stops working, the muscles of the stomach and intestines do not work normally, and the movement of food is slowed or stopped.

KNOWLEDGE

The greatest weapon in the fight against diabetes mellitus is knowledge. Information can help people assess their risk of diabetes, motivate them to seek proper treatment and care, and inspire them to take charge of their disease for their lifetime. Differences in knowledge level have been described depending on level of education, gender and social classes. Assessment of the level of knowledge on diabetes among persons with diabetes can assist in targeting public health efforts to reduce diabetes related complications.⁵

Factors affecting Knowledge

- **Age:** Knowledge of diabetes mellitus and hypoglycemic symptoms and adherence to medical advice declined with age and time since last education class attended. Elderly diabetic patients should receive a continuing programme of education. The older a person is, the greater their risk of diabetes.
- **Sex:** The risk for heart disease is six times higher for women with diabetes than those without than it is in men with the disease and this is due to lack of knowledge about the diseases. Gestational diabetes and PCOS both raise the risk that a woman will develop type II diabetes, as well as other health problems.

- **Education:** Individuals with diabetes who are well-educated about how to manage their condition are more likely to have a lower blood glucose level, which is associated with fewer long term complications. Diabetes self-management training can help improve the effectiveness of care and reduce morbidity.

Measurement of knowledge:

Various methods mentioned in the literature are discussed below, yet there is no gold standard for measuring knowledge:

- **Self-Report:** It involves questionnaire or interviews directly to patient about disease, drug and life style habits. Merits of self-report are that it is cheaper, reliable and easier to perform.

- **Feedback Method:** Oral instructions are provided and reflective type questions are asked at the end to the participants. Feedback may be given either orally or in a written form. Merits of this method are that it helps assessing knowledge of patient in the instructions provided, identifying weaknesses which must be overcome through follow-up actions and not the fault-finding technique for criticism.

- **Survey Method:** It involves the process of systematically acquiring and recording information about the population under study. Merits of this method are that it helps assessing a big population and the need of follow-up actions to be proceeded.⁴

RISK

Indians seem to be at higher risk for diabetes. Apart from the conventional risk factors propelled by urbanization, industrialization, globalization and aging, other factors may also contribute. It has been proposed that obesity, regional adiposity, higher percentage body fat, early life influences including fetal programming and genetic factors contribute to increased risk. The variables independently associated with diabetes in adults include age, BMI, WHR, income and family history of diabetes. Indians tend to have more body fat and a higher risk of diabetes for the same BMI as compared to Western populations. In view of this, the WHO recommends that for public health action, BMI of 23–27.5 kg/m² be considered at increased risk for type II diabetes and cardiovascular disease; and 27.5 kg/m²

or higher be considered as high risk. Changing diets and declining physical activity levels, especially in urban India, have also contributed to the rising prevalence of obesity and diabetes. While Indians share several high risk alleles for diabetes with Caucasians, a recent Genome Wide Association Study (GWAS), has reported a new susceptibility locus at 2q21. It is however clear that in a complex disorder such as diabetes, the known genetic loci contribute approximately 10% to the risk of disease development.

Influences in early life, including the intra-uterine period, may also predispose to diabetes. In the New Delhi Birth Cohort, dysglycaemia in later life inversely related to BMI and weight at 1 year of age. After 2 years of age, increase in BMI was associated with increased risk of diabetes. The highest prevalence of diabetes and dysglycaemia was in subjects who were in the lowest third of the group with respect to BMI at 2 years and highest at age 12 years. Thus low birth weight and accelerated weight gain after 48 months are risk factors for adult glucose intolerance.²

Study Estimations

Patient's risk about diabetes was suboptimal. 31% of the patients had low risk, 33% had slightly elevated and 20% had moderate risk and 16% had high risk. Risk in terms of gender was same for males and females. The risk about diabetes was high in patients those with positive family history of diabetes, those with long length of co-morbid diseases like hypertension, dyslipidaemia etc. and those with have social history of alcoholic and smoker.

Factors affecting risk

Issues related to awareness: There is poor awareness about diabetes in the Indian population. 25% of an urban population was unaware of a medical condition called DM, Similarly, only 22% of the general population and 41% of known diabetics felt that diabetes could be prevented. Only 12% were aware of the risk factors for diabetes. Even among people with diabetes, only 40% were aware that it could result in organ damage.

In the ICMR INDIAB study 43.2% subjects were aware of a condition called diabetes. Overall, urban residents had higher awareness rates (58.4%) compared to rural residents (36.8%).

56.3 % of the population knew that diabetes can be prevented and 51.5% understood that diabetes can affect other organs.

Measurement of risk

In line with poor awareness, glycaemic control in Indian patients is also poor. In the ICMR IN-DIAB study approximately 30 % subjects had glycosylated haemoglobin (HbA1C) levels below 7%. Only 22.4% of urban and 15.4% of rural subjects had reported having checked their HbA1c in the past year. Thus, there is a rapid increase in diabetes prevalence across the country, predominantly in urban areas, but with rural areas in some parts of India also reporting nearly 10% prevalence. There is a need to address issues of awareness, education; evidence based clinical care and policy in the country.

A set of assessment methodologies, from the simple checking list to several risk score models, was developed in recent years, such as the Finnish Risk Score, Danish Diabetes Risk Score, ADA, Cambridge Risk Score, NHANESIII, DRC, Thailand Risk Score, Spanish Diabetes Risk Score and so on. All these tools are helpful in the assessment of high risk and of persons with diabetes all over the world but only a few are developed in China.⁶

Pharmacist role

Patient counseling is a process that improves patients' ability to cope with their disease and make informed decisions regarding management and medication. It helps motivate patients to change any harmful dietary and lifestyle habits. Pharmacists are in a unique position to play a vital role in helping patients to cope with their disease.

Studies have shown that pharmacist interventions positively influence health outcomes and patient satisfaction, which are crucial indicators for quality of health care and a key factor for medication adherence.⁸

- Support of self-blood glucose monitoring (SBGM)
- Monitoring and promoting patient adherence with medication and other components of self-management
- Identifying and resolving drug-related problems

- Providing targeted education
- Monitoring blood pressure, weight and lipids
- Reminding patients of the importance of regular examinations for the presence of diabetic complications, for example, eye and feet examinations or drug therapy management.
- Assist in the detection, education and referral of individuals at risk of diabetes.
- Increased patients' satisfaction with their care
- Pharmacists' role was mainly to specify all drug-related problems including poor drug compliance and side effects and communicating these to the physician.
- Be able to contribute to promoting good diabetes control and avoiding unplanned hospitalizations.

METHODOLOGY

Study design

Qualitative observational interview based method.

Study site

450 bedded tertiary care hospital

Study duration

For a period of 6 months

Study approval

The protocol of study submitted to Institutional Human Ethics Committee of Hospital (IHEC). The protocol was approved by committee with the approval number SJPCEC/P25/PP/2014/032 and the hospital approval number SJCP/DIR/A.18/2015-2016.

Disease selection

- Type II DM patient with / without co-morbidities.
- Patients with increased risk of developing type II DM.

Inclusion criteria

- Age: 18-70years

- Gender: both females and males.
- Type II DM patient with / without co-morbidities.
- Patients with increased risk of developing type II DM.

Exclusion criteria

- Seriously ill patients.
- Physical or cognitive impairment.
- Not interested to participate in study.
- Pregnant women

Sample size

150 diabetic patients and 150 non-diabetic patients.

Study tool

- DKQ – 24 item questionnaire form
- Type II Diabetes Risk Assessment form

Statistical analysis

Statistical Package for Social Sciences (SPSS) version 17 for windows was used for analysis. Knowledge of Type II Diabetes Mellitus was assessed using DKQ-24 item questionnaire. The DKQ-24 item used, a mark of two (2) was awarded for Yes, and one (1) for No and a mark of zero (0) was awarded for no response. The knowledge items were aggregated to create the knowledge scale on a 48-point scale. Participants that scored (0) were considered neutral; 1-24 need improvement; and 25-48 as good. T-test for finding significant difference between pre and post survey. Risk assessment was done using Finnish Type II Diabetes Risk Assessment form. The rating was as: Low risk, Slightly elevated risk, Moderate risk, High risk according to the scoring criteria.

RESULTS

DEMOGRAPHIC CHARACTERISTICS

AGE OF RESPONDENTS (n=150)

Knowledge

The respondents age were grouped into 5 categories for analysis. The majority of the respon-

dents 63(42%) fell in the category 61-70yrs. Followed by 45 (30%) in the category of 51-60yrs, 28 (18.7%) in the category 41-50yrs and 14 (9.3%) in the category 31-40yrs. Altogether about 90.7% of respondents were above 40yrs of age and only 9.3% were below 40yrs of age.

Risk

The respondent's age were grouped into 5 categories for analysis. The majority of the respondents 42 (28%) fell in the category 41-60yrs. Followed by 41 (29.3%) in the category of 61-70yrs, 22 (14.7%) in the category 31-40yrs, Altogether about 85.3% of respondents were above 40yrs, while only 14.7% were below 40yrs of age.

GENDER OF RESPONDENTS (n=150)

Knowledge

The sample consisted of 54 (36%) females and 96 (64%) males. The majority of the respondents were males.

Risk

The sample consisted of 80 (53.3%) males and 70 (46.7%) females. The majority of the respondents were males.

MARITAL STATUS (n=150)

Knowledge

The majority of respondents mainly 148 (98.7%) were married, 2 (1.3%) were single. Most of the respondents were in the research were married.

Risk

The majority of respondents mainly 142 (94.7%) were married, 8 (5.3%) were single. Most of the respondents were in the research were married.

EDUCATIONAL STATUS (n=150)

Knowledge

The majority of respondents namely 94 (62.7%) had school level education, 33 (22%) were illiterate and 23 (15.3%) were found to be university level. The results suggest that the majority of respondents had their formal education.

Risk

The majority of respondents namely 90 (60%)

had school level education, 44 (29.4%) were found to be university level and 16 (10.7%) were illiterate. The results suggest that the majority of respondents had their formal education.

EMPLOYMENT STATUS (n=150)

Knowledge

Majority of the respondents, namely 81 (54%) were employed, followed by 69 (46%) were unemployed. These results shows that majority of the respondents were employed.

Risk

Majority of the respondents, namely 83 (55.3%) were employed, followed by 65 (43.3%) were unemployed. These results shows that majority of the respondents were employed.

FAMILY HISTORY OF DIABETES MELLITUS (n=150)

Knowledge

Out of 150 respondents only 83 (55.3%) reported present, 67 (44.7%) reported absent. Thus it is clear that majority of the respondents were from the family history of Diabetes Mellitus.

Risk

Out of 150 respondents only 76 (50.7%) reported present, 72 (48%) reported absent. Thus it is clear that majority of the respondents were from the family history of Diabetes Mellitus.

HABITANTS (n=150)

Knowledge

Out of 150 respondents 136 (90.7%) reported as non-vegetarians and 14 (9.3%) reported as vegetarians. Thus it is clear that majority of the respondents were non- vegetarians.

Risk

Out of 150 respondents 132 (88%) reported as non-vegetarians and 18 (12%) reported as vegetarians. Thus it is clear that majority of the respondents were non- vegetarians.

CO-MORBIDITIES (n=150)

Knowledge

Out of 150 respondents only 10% reported no

co-morbid disease state, 22% reported single co-morbid disease state and 68% reported multiple co-morbid disease condition. Commonly observed co-morbid disease conditions are obesity, dyslipidaemia, hypertension, cardiovascular diseases, etc.

Risk

Out of 150 respondents only 32.7% reported no co-morbid disease state, 27.7% reported single co-morbid disease state and 72.2% reported multiple co-morbid disease condition. Commonly observed co-morbid disease conditions are obesity, dyslipidaemia, hypertension, cardiovascular diseases, etc.

SMOKER (n=150)

Knowledge

Majority of the respondents, namely 119 (79.3%) were non-smokers, followed by 31 (20.7%) were smokers. These results shows that majority of the respondents were non-smokers.

Risk

Majority of the respondents, namely 122 (81.3%) were non-smokers, followed by 28 (18.7%) were smokers. These results shows that majority of the respondents were non-smokers.

ALCOHOLIC (n=150)

Knowledge

Out of 150 respondents only 40 (26.7%) reported alcoholic and 110 (73.3%) were reported non-alcoholic. Most of the respondents in the research were non-alcoholic.

Risk

Out of 150 respondents only 49 (32.7%) reported alcoholic and 101 (67.3%) were reported non-alcoholic. Most of the respondents in the research were non-alcoholic.

PHYSICAL ACTIVITY (n=150)

Knowledge

The majority of the respondents namely, 77 (51%) had physical activity, 73 (49%) had no physical activity. The results suggest that the majority of the respondents had their physical activity.

Risk

The majority of the respondents namely, 110 (73.3%) had physical activity, 40 (26.7%) had no physical activity. The results suggest that the majority of the respondents had their physical activity.

SOCIO-ECONOMIC STATUS (n=150)

Knowledge

The majority of the respondents namely, 107 (71.35) fell under middle class, followed by 35 (23.3%) under high economic status and 8 (5.3%) under low class

Risk

The majority of the respondents namely, 91 (60.7%) fell under middle class, followed by 43 (28.7%) under high economic status and 16 (10.7%) under low class

PATIENT KNOWLEDGE LEVEL

Baseline Intervention

Knowledge Level (n= 150)

Knowledge level in Type II diabetes mellitus assessed through DKQ-24 item questionnaire. The respondents were categorized as Good, Need Improvement and Neutral. Majority of the respondents 85 (57.23%) had good knowledge level, only 62 (41.77%) need improvement in knowledge and 2 (1%) in neutral position. Thus the need for educating patients about Type II Diabetes Mellitus is highly demanded.

Final Intervention

Level of Knowledge (n=150)

Baseline line information was carried out in 150 patients. Out of which 139 (92.96%) were found to be good in knowledge level, followed by 11 (7.04%) still need improvement and none (0%) found to be neutral. This shows improvement in level of knowledge after pharmacist intervention.

Level of Risk (n= 150)

Baseline intervention was carried in 150 patients. Out of which 49 (33%) were slightly elevated, followed by 46 (31%) low risk, 30 (20%) were having moderate risk and 25 (16%) have high risk of developing Type II diabetes mellitus

ASSOCIATED DEMOGRAPHIC CHARACTERISTICS

Statistical Package for Social Sciences (SPSS) version 17.0 for windows was used for analysis. The statistical analysis used for the purpose was: Pearson Chi-square test, $p < 0.05$ for finding association between demographic variables with knowledge and risk.

Knowledge

Note: The value of asymptomatic significance (DKQ- 24 item) for Pearson Chi-Square should be less than 0.05 ($p < 0.05$) so that there will be association between the variable. Thus Age, Education, Marital status, Smoking, Alcoholism, Physical Activity, Socio-economic status was found to be associated with knowledge.

RISK

Note: The percentage of risk of developing Type II Diabetes Mellitus was assessed using the Finnish Type II Diabetes Risk Assessment form. Thus most of the respondents were found to be have slightly elevated risk.

Interpretation between Pre and Post Survey

Statistical Package for Social Sciences (SPSS) version 17.0 for windows was used for analysis. The statistical analysis used for the purpose was: T-test, Significance and $P < 0.05$ for finding significant difference between pre and post survey. It was that there is significant difference in knowledge of Type II Diabetes Mellitus between pre and post survey.

Note: Significance (DKQ-24 item) should be less than 0.05 to be significant (i.e. $p < 0.05$).

DISCUSSION

A qualitative observational interview based method was carried out for a period of 6 months in a multi-speciality hospital to evaluate 2 main objectives: Knowledge and Risk in Type 2 Diabetes Mellitus population with/without co-morbid disease conditions.

A total of 150 data were collected from respondents. Structured and validated interview form (DKQ-24 form) consisting of 3 (A, B and C) sections was developed for interview purpose. Part A deals with Demographic characteristics, Part-B

Diabetes Knowledge Questionnaire in Type 2 Diabetes patients, Part-C Post study. Structured and validated interview form (Finnish Diabetes Association Risk Assessment Form) consisting of 2 (A and B) sections was developed for interview purpose. Part-A deals with Demographic characteristics, Part-B deals with Risk Assessment Form.

The study was purposed to assess knowledge and risk with Type 2 diabetes. Furthermore, possible relationships between knowledge with variables obtained from research were explored using statistical method.

The statistical analysis used for the purpose was: Percentage calculation, Pearson Chi-square test, $P < 0.05$ for finding association between demographic variables with knowledge. Whereas T- test was used for finding the significant difference in patient knowledge between pre and post survey.

Data analysis presented in result section is based on the interview schedule used for the study. Complementary information from the form was also included, were appropriate. In all cases, clarity of data is invigorated with the use of charts and tables. The analysis of data was conducted in 2 phases: Baseline intervention and Final intervention. In the first phase analysis of all variables in the interview schedule was performed. In the second phase, variables associated with the final intervention and statistical association between the variables was performed.

Demographic Characteristics

This section presents data pertaining to the respondents' demographical data such as age, gender, employment status, marital status, education status, social habits and socio-economic status.

A total of 150 patients were enrolled for study and their data were collected. Among the respondents, 90.7% were above 40 years of age and 9.3% were below 40yrs of age. This result was coincided with the study "Management of Type 2 Diabetes Mellitus in Older Adults" by Kyung Soo Kim, Kyung Mi Sung²⁹. The risk was assessed in a total of 150 patients and their data were collected. Among the respondents, 85.3% above 40 years of age and 14.7% below 40 years of age and this result was coincided with the study 'Di-

agnosis of Type 2 Diabetes at an Older Age' by Hwee H. Tan, Ritchie R. McAlpine.²⁹

A total of 150 patients were enrolled for study and their data were collected. Among the respondents, 64% was males and 34% was females. This result was coincided with the study "Diabetes and gender" by Gale³¹. The risk was assessed in a total of 150 patients and their data were collected. Among the respondents, 80 (53.3%) was males and 70 was (46.7%) females. This result was coincided with the study "Gender aspects in Type 2 Diabetes mellitus and cardio metabolic risk" by Naveed Sattar.³⁰

The results suggest that the majority of respondents mainly 148 (98.7%) were married, 2 (1.3%) were single. This result was coincided with the study. "The Marital Relationship and Psychosocial Adaptation and Glycemic Control of Individuals with Diabetes" by Paula M. Trief, Christine L. Himes³³. The risk assessment was conducted in a total of 150 patients and their data were collected. Among them 142 (94.7%) were married, 8 (5.3%) were single. This result was coincided with the study "Marital status and Risk of type 2 Diabetes in the Health Professionals Follow-up Study" by Marilyn C Cornelis, Maria Glymour³³

The results suggests that the majority of respondents 94 (62.7%) had school level education, 33 (22%) were illiterate and 23 (15.3%) were found to be university level. This result was coincided with the study "The influence of socioeconomic status on future risk for developing Type 2 diabetes in the Canadian population between 2011 and 2022: differential associations by sex" by Laura A. Rivera, Michael Lebenbaum³⁵. The risk assessment was made in a total of 150 patients. Among the respondents, 90 (60%) had school level education, 40 (26.7%) were found to be university level and 20 (13.4%) were illiterate. This result was coincided with the study "Assessment of Risk of Type 2 Diabetes Mellitus Among Rural Population in Tamilnadu by Using Indian Diabetic Risk Score" by Raja Subramani, Uma Devi.³⁵

On considering the employment status, Majority of the respondents, namely 81 (54%) were employed, followed by 69 (46%) were unemployed. This result was coincided with the study "The Impact of Diabetes on Employment and Work Productivity" by Kaan Tunceli, Cathy J. Bradley³⁷.

. Upon the risk assessment, majority of the respondents, namely 83 (55.3%) were employed, followed by 65 (43.3%) were unemployed. This result was coincided with the study 'Prospective Study of Social and Other Risk Factors for Incidence of Type 2 Diabetes in the Whitehall II Study' by Meena Kumari, Michael Marmot.³⁷

Majority of the respondents, namely 119 (79.3%) were non-smokers, followed by 31 (20.7%) were smokers. These results shows that majority of the respondents were non-smokers. This result was coincided with the study "Does increased knowledge of risk and complication of smoking on diabetes affect quit rate? Findings from a randomized controlled trial in kerala, India" by Mini, Nichter, Thankappan.³⁹ and in risk assessment, majority of respondents, namely 122 (81.3%) were non-smokers, followed by 28 (18.7%) were smokers and this result was coincided with the study 'Active Smoking and the Risk of Type 2 Diabetes, A Systematic Review and Meta-analysis' by Carole Willi, Patrick Bodenmann³⁹

Out of 150 respondents only 40 (26.7%) reported alcoholic and 110 (73.3%) were reported non-alcoholic and result was coincided with the study. "Diabetes related health knowledge, attitude and practice among diabetic patients in Nepal" by Anju Gautam, Dharma Nand Bhatta⁴¹ and in risk assessment, Out of 150 respondents only 49 (32.7%) reported alcoholic and 101 (67.3%) were reported non-alcoholic and the result was coincided with the study 'Alcohol Consumption and the Incidence of Type 2 Diabetes' by Sofia Carlsson, Niklas Hammar⁴¹

The majority of the respondents namely, 110 (73.3%) had physical activity, 40 (26.7%) had no physical activity and the result was coincided with the study 'Diabetes related health knowledge, attitude and practice among diabetic patients in Nepal' by Anju Gautam, Dharma Nand Bhatta⁴¹ and the risk was assessed and 110 (73.3%) had physical activity, 40 (26.7%) had no physical activity and the result was coincided with the study 'Physical Activity of Moderate Intensity and Risk of Type 2 Diabetes' by Christie Y. Jeon, BA1, R. Peter Lokken.⁴²

The majority of the respondents namely, 107 (71.35) fell under middle class, followed by 35 (23.3%) under high economic status and 8 (5.3%) under low class and the result was coin-

cidated with the study "The influence of socioeconomic status on future risk for developing Type 2 diabetes in the Canadian population between 2011 and 2022: differential associations by sex" by Laura A. Rivera, Michael Lebenbaum⁴⁴ and the risk assessment was made in a majority of the respondents namely, 91 (60.7%) fell under middle class, followed by 43 (28.7%) under high economic status and 16 (10.7%) under low class and this result was coincided with the study 'Assessment of Risk of Type 2 Diabetes Mellitus Among Rural Population in Tamilnadu by Using Indian Diabetic Risk Score' by Raja Subramani, Uma Devi.³⁵

Disease Characteristics

This section presents data pertaining to the respondents' disease condition such as co-morbidities and family history.

Out of 150 respondents only 10% reported no co-morbid disease state, 22% reported single co-morbid disease state and 68% reported multiple co-morbid disease condition. This result was coincided with the study 'Prevalence and co-prevalence of co-morbidities among patients with type 2 diabetes mellitus' by Iglay, Hannachi and the risk was assessed and 32.7% reported no co-morbid disease state, 27.7% reported single co-morbid disease state and 72.2% reported multiple co-morbid disease condition and this result was coincided with the study 'Prevalence and co-prevalence of co-morbidities among patients with type 2 diabetes mellitus' by Iglay, Hannachi⁴⁵

As family history was considered, Out of 150 respondents only 83 (55.3%) reported present, 67 (44.7%) reported absent and the result was coincided with the study 'The link between family history and risk of type 2 diabetes is not explained by anthropometric, lifestyle or genetic risk factors: the EPIC- InterAct study' by Scott RA, Langenberg C⁵⁰ and the risk was assessed among 150 respondents only 76 (50.7%) reported present, 72 (48%) reported absent and this result was coincided with the study 'Family history of type 2 diabetes and prevalence of metabolic syndrome in adult Asian Indians by Mithun Das, Susil Pal⁴⁶

Knowledge Level in Respondents:

Out of 150 respondents, Majority of the respondents 51.23% have good knowledge, only

47.77% need improvement and 1% in neutral position. This result was coincided with study conducted by Yadav SB et al.⁵³ The need for pharmacist intervention was clearly shown here.

Risk in Respondents:

Out of 150 respondents, majority of the respondents were have slightly elevated risk 33%, 31% low risk, 20% moderate risk and 16% high risk. This result was coincided with the study "Risk Assessment Tools for Identifying Individuals at Risk of Developing Type 2 Diabetes" conducted by Brian Buijsse et al.²⁶ The need for pharmacist intervention was clearly drawn from report of this research.

Final Interventions:

Knowledge Level in Respondents:

Final intervention carried out in 150 patients. 7.04% still in need of improvement in knowledge. This was because of illiteracy, lack of concentration during counselling, and age. 92.96% were found to be good in knowledge and none in neutral. This shows improvement in knowledge of patients due to pharmacist intervention. This result was coincided with study "Diabetes Knowledge in Predominantly Latino Patients and Family Caregivers in an Urban Emergency Department" conducted by Sanjay Arora et al.⁵⁰

Associated Demographic Characteristics

Knowledge

Knowledge was found to be associated with Age, Education, Marital Status, Smoking, Alcoholism, Physical Activity and Socio- Economic Status. This might be due to following reasons:

Age:

There was association between age and knowledge (Table: 1); this might be due to fewer number of people below 40 yrs. suffering from Type II Diabetes Mellitus when compared with the larger number of respondents above 40yrs. The study in "Management of Type 2 Diabetes Mellitus in Older Adults" conducted by Kyung Soo Kim et al supports these findings.²⁸

Education:

There is association between education and knowledge, on the basis of education level, a

highly literate population is associated with better understanding of Type II Diabetes Mellitus (Table: 1). This research population was mainly school level and capable of compromising with knowledge. This study conducted by Al-Qazaz HKh et al supports these findings.

Marital Status:

There shows association between marital status and knowledge (Table: 1). Most married respondents had good knowledge than the singles. Marital status might influence patients' knowledge with disease positively. The study conducted by Paula M. Trief et al supports these findings. The help and support from a spouse in different aspects could be the reason why married patients had good knowledge than single patients.³²

Smoking:

There shows association between smoking and knowledge (Table: 1). A huge number of non- smokers had knowledge about the Type II Diabetes Mellitus than the smokers. The study conducted by Mark Nichter et al supports these findings.³⁸

Alcoholism:

There shows association between alcoholism and knowledge (Table: 1). There is significant difference between the knowledge within non-alcoholics than alcoholic respondents. The study conducted by Anju Gautam et al supports these findings.⁴⁰

Physical Activity:

There shows association between physical activity and knowledge (Table: 1). Most respondents had good knowledge who were having physical activity than other. The study conducted by Anju Gautam et al supports these findings.⁴⁴

Socio- Economic Status:

There is association between socio-economic status and knowledge, on the basis of education level. Those who were coming under middle and high socio-economic status had better knowledge than others. The studies conducted by Laura A. Rivera et al supports these findings.⁴³

Significant Difference between Pre and Post Survey

Much significant difference is shown between pre and post survey analysis (Table: 3, 4). This shows that pharmacist intervention plays an effective role in improvement of patient knowledge. The study conducted by Titien Siwi Hartayu et al supports these findings.⁴⁸

CONCLUSION

As per Dr. Hans V. Hogerzeil, WHO Director of Medicines Policy and Standards, said, "Pharmacists have an important role to play in health care, which is much more than selling medicines."

This qualitative observational survey shows that

In Pre – survey the majority of individuals had a poor knowledge about type II Diabetes mellitus. The study also revealed that there is slightly elevated risk in developing type II Diabetes mellitus among respondents. This is not surprising since the respondents have school level education and most of the patients need improvement in knowledge about type II DM. The respondents apparently failed to understand their condition and importance of risk that leads to type II DM.

Proper management requires life style changes and adequate Diabetes Knowledge of which is considered a key component of diabetes management. Differences in knowledge level have been described depending on level of education, gender and social classes.

Patient counseling was provided to all respondents who were categorized under: Need improvement and Neutral in case of knowledge. A post – survey was conducted after short time span. A statistical significant difference was observed between pre and post survey.

Indians tend to have more body fat and a higher risk of diabetes for the same BMI as compared to Western populations. Changing diets and declining physical activity levels, especially in urban India, have also contributed to the rising prevalence of obesity and diabetes. Majority of the respondents have slightly elevated risk in the survey conducted for assessing the risk of Type II DM.

Health education campaigns concerning Type II DM and life style modifications should be conducted through hospitals where patients' can

come and share their experiences. Posters and pamphlets regarding disease, drug and life style modifications provided during campaign helps them for their future references. Pharmacist intervention in risk check of patients is always necessary as the level of risk cease to low degree when no interventions are made.

In conclusion this study revealed the need for pharmacist intervention in improving knowledge about Type II Diabetes Mellitus and risk assessment of developing diabetes mellitus.

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Table 1: Percentage distribution of samples according to their demographic characteristics.

S No	Demographic variables	Poor	Average	Good	χ^2 value	df	Table value	'p' value	Inference
1.	Age in years								
	31-40	5	9	0	14.924	8	15.507	0.049*	Significant
	41-50	4	17	7					
	51-60	5	27	13					
	61-70	4	36	20					
	71-80	0	3	0					
2	Sex								
	Male	12	62	12	1.921	2	5.991	0.383	Not Significant
	Female	6	30	6					
3.	Marital status								
	Single	0	0	2	11.562	4	9.488	0.021*	Significant
	Married	18	92	38					
4.	Educational status								
	Illiterate	3	26	4	5.574	2	5.991	0.048*	Significant
	School level	11	58	25					
	University level	4	8	11					
5.	Occupation								
	Employed	12	50	19	1.847	2	5.991	0.397	Not Significant
	Unemployed	6	42	21					
6.	Family History of diabetes mellitus								
	Present	9	48	26	2.091	2	5.991	0.352	Not Significant
	Absent	9	44	14					
7	Habitants								
	Vegetarian	1	7	6	2.145	2	5.991	0.342	Not Significant
	Non vegetarian	17	85	34					
8	Co-morbid disease condition								
	Present	11	65	26	0.855	2	5.991	0.652	Not Significant
9	Smoker								
	Yes	1	25	5	6.510	2	5.991	0.039*	Significant
	No	17	67	35					
10	Alcoholic								
	Yes	8	29	3	11.532	2	5.991	0.003*	Significant
	No	10	63	37					
11	Physical activity								
	Yes	7	35	35	28.563	2	5.991	0.000*	Significant
	No	11	57	5					
12	Socioeconomic status								
	High	2	14	19	23.030	4	5.991	0.000*	Significant
	Middle	16	74	17					
	Low	0	4	4					

 χ^2 at 0.05 level of significance

Table 2: Percentage of risk of developing Type II Diabetes Mellitus

	Frequency	Percentage
Lower risk	46	31%
Slightly elevated	49	33%
Moderate	30	20%
High risk	25	16%

Table 2a: Mean Percentage

N=150

Parameter	Obtained Range	Mean	Median	Standard deviation	Mean percentage
Pre-test	14-48	27.47	26	8.63	57.23
Post-test	32-48	44.62	44.5	2.51	92.96

Table 3: T-test Value

N=150

Parameter	Mean	Standard deviation	Mean difference	't' value	p value
Pre-test	27.47	8.63	17.15	25.917*	<0.001
Post-test	44.62	2.51			

t149=1.655, p<0.05 *Significant