Master's Thesis of Nursing Science

The Level of Diabetes Knowledge and Related Factors among Patients with Diabetes Mellitus in Hyderabad, India

February 2015

Seoul National University
Graduate School of Nursing
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A thesis submitted in partial fulfillment
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Abstract

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Diabetes has become the fourth leading cause of death in most developed countries and will be one of the most challenging health problems worldwide in the 21st century. This study investigated on to what is exact knowledge of the diabetic patients regarding diabetes mellitus and to analyze what are the factors to influence level of the patients in Hyderabad.

This study was conducted at CARE hospital, Nizams's institute of medical sciences (NIMS hospital) and Magna hospital in Hyderabad. Descriptive research design was used to recruit a convenient sample of 200 hospitalized adult patients with diabetes mellitus during the period of 1st July 2014 to middle of August 2014. Data was collected through face-to-face interview using the brief diabetes knowledge test (Michigan diabetes

knowledge test); it is composed of 23 multiple choice questions to assess general the scores of DM knowledge, insulin knowledge, and the total DM knowledge. Simple descriptive statistics (frequency, mean, and percentage) were used to describe the study variables.

Results showed that 200 diabetic patients participated in this study (100 men and 100 women). Their age ranged from 20 to 80 years. The majority (81%) were married. The overall scores of the total sample were low. General diabetes knowledge was 64 ± 2.69 out of 18, insulin knowledge was 3.48 ± 1.92 out of 7, and total knowledge was 11.12 ± 4.11 out of 23. Men scored higher than women in the general diabetes knowledge (8.19 vs. 7.09), insulin knowledge (3.74 vs. 3.23), and total DM knowledge (11.93 vs. 10.32). Moreover, there were no significant differences found between patients with type I and type II diabetes, age, duration of diabetes, religion and marital status in the study group. The majority of the patients answered incorrectly about diabetic ketoacidosis, glycosylated hemoglobin, and insulin reaction related questions.

Diabetic patients in this study had low level of diabetes knowledge, which in turn will limit their involvement in the self-management behaviors of diabetes.

Keywords: Diabetes mellitus, diabetes knowledge, Hyderabad, India.

Student Number: 2012-22524

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I. Introduction

1. Background

According to various studies and statistics, diabetes has become the fourth leading cause of death in most developed countries and will be one of the most challenging health problems worldwide in the 21st century (Mohamed, Lenjawi, Amuna, Zotor, & Elmahdi 2013). In the year 2012 World Health organization (WHO 2012) estimated that they are 347 million people are suffering with diabetes in the world. The management of diabetes poses a challenge to the medical and nursing staff as well as to the patients themselves. Diabetes has become a development issue. International diabetic federation (IDF) predicts that diabetes had cost the world economy at least US$ 471 billion in 2012, or 13% of total world health care expenditure (Kandula, & Shegokar 2013).

Care of diabetic patient is a team work; the patient is the most important component of that team. It is important that they learn about the disease, its nature, its course of events, approach in treatment of diabetes, selection of diet, role of exercise, diabetic discipline, use of drugs for diabetes, self monitoring of blood and urine test, early recognition of complications of disease, how to adjust treatment in day to day life (Badruddin, Basit, Hydrie, & Hakeem 2002).

Drug alone is not helpful for the patient to manage their problem unless they strictly follow the non-pharmacological measures like lifestyle changes. Adequate patient knowledge may lead to better therapeutic outcomes in diabetes patients (Upadhyay, Palaian, Shankar, Mishra, & Pokhara 2008). Education to diabetic patients would be more effective if we know the level of knowledge of our patients (Badruddin et al., 2002).

The prevalence of diabetes has increased over the past several decades, in 2012 IDF predicts that total number of diabetic patients in China are estimated to be 92.3 million and ranks no.1 in the number diabetic population in the world and followed by India 61.3 million, USA 24.1 million, Brazil 13.4 million people are suffering with diabetes mellitus (Casagrande et al., 2012).

Age more than 50 years, sedentary lifestyle and no exercise is the possible reasons for increasing diabetic cases in India (Kandula, & Shegokar 2013).

Hyderabad is the capital and largest city of the southern Indian state of Telangana; it had a population of 6.8 million, making it India's 4th most populous city and 6th most populous urban agglomeration (Upadhyay et al., 2008). Hyderabad is rapidly growing IT hub, is the major contributor to the country's diabetic table, with one in every six people above 25 years of age in Hyderabad is diabetic. And the day when the IDF warned India of

dire consequences in case it failed to effectively implement its national diabetes policies (Kandula, & Shegokar 2013).

Among the major cities in India, Hyderabad's lags behind in diabetes awareness with an estimated 1.2 million people in the city were diabetic (Upadhyay et al., 2008). The research is still going on to know the reason behind the increasing cases of diabetes in Hyderabad and neighboring cities like Bangalore and Chennai who also have a similar lifestyle, but still have less diabetic cases when compared to Hyderabad. And undiagnosed diabetes represents about 50% of cases in the population (Murugesan, Snehalatha, Shobhana, Roglic, & Ramachandran 2007).

However, despite the high prevalence of diabetes and its complications and the availability of successful prevention strategies, essential health care requirements and facilities for self care are often inadequate in this region. Age, sedentary lifestyle and lack of exercise are the possible reasons for the increase of diabetes cases in this region. Action is needed at all levels of health care and in the various aspects of diabetes care to bridge this gap and to improve health care delivery to people with diabetes (Kandula, & Shegokar 2013).

Even though resources vary widely within the region, the primary resource in diabetes care is now recognized to be the people with diabetes themselves. Adequate patient knowledge with proper compliance of advices

may lead to better therapeutic outcomes in diabetes patients (Upadhyay et al., 2008).

Knowledge of diabetes is essential for primary health care and other diabetic patients in order to prevent co-morbidities, which may compromise their lifestyles as well as increase the burden on public health care (Moodley, & Rambiritch 2007). The past decades have witnessed a rapid rise in the prevalence of diabetes, especially in the urban areas in India. Therefore, assessing the level of knowledge of people regarding diabetes would be useful for formulating plans on educating people with a low knowledge level regarding the disease.

2. Purposes of the study

The purposes of this study are to assess the level of knowledge of diabetes and related factors among patients.

1. To assess the knowledge of the patients.
2. To examine related factors to diabetes knowledge.

3. Definition of terms

Diabetes mellitus:

Diabetes is a group of disease with one thing in common - a problem

with insulin. The problem could be that your body does not make any insulin, does not make enough insulin or does not use insulin properly.

Diabetes knowledge:

The fact or condition of knowing something related to diabetes with familiarity gained through experience or associations as measured by diabetes knowledge test developed by Michigan diabetes research training center.

II. Literature Review

1. Diabetes self-care knowledge

The prevalence of diabetes is rapidly increasing worldwide, especially in developing countries, thereby representing a major public health burden particularly in growing economics. This results in premature death, disability and reduced quality of life at an escalating economic cost (Mohamed et al., 2013). The management of diabetes poses a challenge to the medical and nursing staff as well as to the patients themselves (Okolie, Ijeoma, Peace, & Ngozi 2009). Self-management support, one of the principles of the chronic air models, involves a collaborative effort of clinicians helping patients acquire the necessary knowledge, skills, and confidence to manage their diabetes (Jeppesen, Hull, Raines, & Miser 2012). The drug alone is not helpful for the patient to manage their problem unless they strictly follow the non-pharmacological measures like lifestyle changes. Adequate patient knowledge with proper compliance of advices may lead to better therapeutic outcomes in diabetes patients (Upadhyay et al., 2008).

Self-care knowledge on diabetes among diabetic patients, this study was done in Warangal region. Warangal is a town, which is located near to Hyderabad. Only 50% of the patient population was aware of the condition Diabetes and remaining 50% were unaware. Authors suggested that there

that was a definite need to empower patients with the knowledge is required to obtain maximum benefit from their treatment for diabetes (Thungathurthi, & Vijay 2012).

Appropriate self-care, seeking treatment early and regula screening can limit diabetic complications but this depends on the person with diab etes having the appropriate knowledge (Jabbar, Contractor, Ebrahim, & Mahmood 2001). So knowledge of diabetes is an integral component in attaining optimal disease control and reduces mortality in India (Irfani, Farheen, Nishat, Fatima, & Mohammed 2013). And the differences in knowledge levels have been described depending on the level of education, gender and social class (Sarihin, Bani-Khaled, Haddad, & Althwabia 2012).

All patients if given proper guidance and education regarding diabetes care would be able to make significant improvement in their lifestyle which is helpful for good glycemic control. Education to diabetic patients would be more effective if we know the level of knowledge of our patients (Badruddin et al., 2002).

Data on diabetes prevalence by age and sex from a limited number of countries were extrapolated to all 191 world health organization (WHO) member states and applied to united nation's population estimates for 2000 and 2030. Urban and rural populations were considered separately for developing countries. The results showed people with diabetes in the world

are expected to approximately double between 2000 and 2030, based solely upon demographic changes. The greatest relative increases will occur in the Middle Eastern crescent, sub-saharan Africa, and India. The greatest absolute increase in the number of people with diabetes will be in India. Most of the expected population growth between 2000 and 2030 will be concentrated in the urban areas of the world.

The most striking demographic change in global terms will be the increase in the proportion of the population > 65 years of age. Globally, diabetes prevalence is similar in men and women but it is strictly higher in men < 60 years of age and in women at an older age. In developing countries, the majority of people with diabetes are in the 45 to 64 year age range. The 10 countries estimated to have the highest number of people with diabetes in 2000 and 2030, the "top three" countries are India, China, and U.S., Bangladesh, Brazil, Indonesia, Japan and Pakistan also appear in the lists for both 2000 and 2030. The Russian federation and Italy appear in the list in 2000 but are replaced by the Philippines and Egypt in 2030. The data provide a growing public health burden of diabetes across the world and indicate that the diabetes epidemic will continue even of obesity remain constant. It is likely that findings provide an underestimate of future diabetes prevalence (Irfani et al., 2013).

2. Demographic variables

In accordance with demographic variables, Adsani et al., compared means knowledge scores according to social-demographic data. It includes socio-demographic data like gender, age in years, education, smoking status, family income, family history of diabetes, treatment of diabetes, duration of diabetes in years, duration of the insulin take in years, and frequency of insulin per day (Adsani, Moussa, Jasem, Abdella, & Hamad 2009).

In another study Qazaz et al., did demographic and disease characteristics of the study patients with differences in knowledge. The demographic data include age, gender, race, education, diabetes duration, therapy type, and insulin use (Qazaz et al., 2011). In the same year in Nigerian city (Odili, Isiboge, & Eregie 2011), did a mean score on the diabetes knowledge test based on the patient's characteristics. Patients' characteristics include family history, recent training in DM, sex, education and fasting blood sugar (FBS) (mmole/L).

Later (Sarihin et al., 2012), did a comparison between mean knowledge scores according to demographic data. The demographic data includes gender, age groups, type of diabetes, and duration of diabetes and education level. In more recently (Fenwick, Xie, Rees, Finger & Lamoureux 2013), studied significant associations between diabetes knowledge and socio-

demographic variables. The socio-demographic variables include age, income, education level and currently employed.

3. Knowledge and related variables

Adequate knowledge of diabetes is a key component of diabetes care. Jabbar administered 34-item knowledge questionnaires to the 230 diabetic patients from outpatient. The average score of correct answers for the group was 40%. A significantly higher score correlated with younger age (16-30 years), educational status and regular follow-up with a diabetic clinic. There was no significant difference in the knowledge score between males and females or between those on oral hypoglycemic agents (OHA) and insulin. 50% of the patients could correctly answer questions regarding food and nutrition and only 60% were aware of target blood glucose levels for optimal control. The study emphasizes the need for diabetes education at all levels, both for the patients as well as the health care providers to counter the pandemic of diabetes-related complications globally (Jabbar et al., 2001).

To assess the general characteristics, knowledge, attitude and practices of type 2 diabetic patients attending the outpatient department (OPD) of the baqui institute of diabetology and endocrinology karachi, Pakistan Badruddin et al., 57% of the patients were overweight, only 10.7% had good glycemic control, 67% did not do exercise of any kind. Overall knowledge

regarding diabetes was not good. Around 54% had poor knowledge, 34% had fair knowledge, and only 13% had good knowledge. The overall awareness about the risk of complications was satisfactory but the misconceptions regarding diet, insulin and diabetes were quite common. This study highlights the need for better health information to the patient through large scale awareness programs so as to change the attitude of public regarding diabetes (Badruddin et al., 2002).

A cross-sectional study used a knowledge, attitude and practice (KAP) questionnaire developed by (2006) Palaian. The study was carried out in the out-patient pharmacy (OPP), manipal teaching hospital, Nepal. All diabetes patients who visited the OPP during this period were enrolled in the study. The questionnaire had 25 questions. Knowledge score was 4.90 ± 3.34; the knowledge scores of the patients were low. This suggests the need for educational interventions to improve the knowledge of the diabetes patients (Upadhyay et al., 2008).

Appropriate self-care, seeking treatment early, and regular screening can limit diabetic complications but this depends on the person with diabetes having the appropriate knowledge (Jabbar et al., 2001). A descriptive study was conducted at the community service center of Brazilian university; the sample was composed of 82 adults with diabetes mellitus. Data were collected through the Portuguese version of the diabetes knowledge

questionnaire; results revealed that 78.05% of the participants obtained scores higher than eight on knowledge about diabetes, which indicates good knowledge. Similar levels of correct results were found between males (65.05%) and females (64.40%). In terms of education, the highest scores are correlated with up to 12 years of schooling of men, and 12 or more years of schooling for women (Rodrigues et al., 2009).

Differences in knowledge level have been described depending on level of education, gender and social class (Sarihin et al., 2012). A cross-sectional survey involved 24 diabetes clinics and Kuwaiti adults with type II diabetes (n = 5114), and used the Michigan diabetes knowledge test (Adsani et al., 2009). Knowledge deficits were apparent in the questions related to diet and self-care. Participants who were older, and with lower educational levels, limited family income, negative family history of diabetes, and who were smokers had significantly lower knowledge scores. The scores were also lower in those who had shorter disease duration and fewer complications, were taking insulin, had less frequent insulin injections, performed less glucose monitoring and had lower HbA1c levels. Education, family income, glucose monitoring, and presence of complications were independent determinants of the knowledge score. Knowledge of diabetes in a type II diabetes population with a high prevalence of illiteracy was poor. Limited family income and lack of self-care are other predictors of knowledge

deficits. Efforts need to be focused on educational programs with strategies to assist diabetes patients with limited education and income to manage their disease more effectively (Adsani et al., 2009).

Diabetes knowledge is influenced by demographic variables. A cross-sectional study sought to establish the level of knowledge of diabetes among community members in rural and urban setups in Kenya and determine how this impacts on their attitude and practices towards diabetes Maina et al., the sample size was 1982 using a structured questionnaire for data collection. 539 (27.2%) of all the respondents had good knowledge of diabetes; of these 52% had tertiary education; 25% had secondary education while 14% and 9% had primary and no education, respectively. This study indicates that the level of knowledge of diabetes in all regions in the country is very poor. And suggested comprehensive nationwide diabetes education programme is necessary to improve this situation (Maina, Ndegwa, Njenga, & Muchemi 2011).

Another study Qazaz et al., conducted with a convenience sample of 540 adult patients with type 2 diabetes attending the clinic, a questionnaire including previously validated Michigan diabetes knowledge test (MDKT) was used and the patient's medical records were reviewed for hemoglobin A1C (HbA1C) levels and other disease related information. A total of 35 (6.48%) patients were excluded after data collection due to lack of HbA1C

results. The median score was 7.0, (IQR, 5.0–10.0). Significant difference in MDKT scores was found between age groups of the patients, educational level and insulin use. Patients aged less than 65 years had higher median knowledge scores than those aged over 65 years ($P < .05$). The MDKT scores increased as the educational level of patients increased ($P < .05$). The study found that MDKT scores were lower in patients using insulin ($P < .05$) (Qazaz et al., 2011).

Misconceptions about diabetes were common. A descriptive cross sectional observational clinic study conducted among previously diagnosed patients with diabetes attending the Consultant outpatient departments of the university of Benin teaching hospital (Odili et al., 2011), the study employed the use of a 14-item diabetes knowledge test (DKT), developed by the university of Michigan diabetes research and training centre and a demographic questionnaire to assess patient's knowledge and its association with some patient specific variables. Results show the overall mean knowledge score of the subjects was 5.54 ± 2.3 (39.5 % ± 16.7 %) ranges 7 - 79 %. There was no statistically significant difference in knowledge scores with respect to family history of the disease, recent training in DM, age and sex $p > .05$. Respondents without any formal education scored significantly higher in the DKT (7.0 ± 2.27) followed by those with post graduate and university education 6.67 ± 2.41 and 6.65 ± 2.41 respectively. The highest

score on the DKT was significantly correlated with duration of disease awareness r = 0.217; 95% CI = 0.02–0.39, $p < .05$. Respondent's knowledge of diabetes mellitus was very poor. There were knowledge deficits which relate to misconceptions in the diabetics diet and knowledge of blood glucose monitoring with the glycosylated hemoglobin test (Odili et al., 2011).

Adequate knowledge of diabetes is a key component of diabetes care. The study was conducted at king hussein hospital; recruit a sample of 100 hospitalized adult patients with diabetes mellitus. Data was collected through brief knowledge test (Fitzgerald et al., 1998). This test is composed of 23 multiple choice questions that assess general knowledge, insulin knowledge as well as the total score for total knowledge. Out of 100 diabetic patients 50 men and 50 women. Men scored higher than women in the total knowledge (52.9 vs. 46.7) general diabetes knowledge (56.8 vs. 51.1) and insulin knowledge (46.8 vs. 39.8). There was no difference found between patients with type I and type II diabetes in the study group. The patients had diabetes knowledge deficit about their disease, which in turn will limit their involvement in the management of the disease (Sarihin et al., 2012).

A descriptive, cross-sectional study was conducted among patients attending the diabetes clinic of a primary care level hospital in moratuwa, Sri Lanka (Perera, Silva, & Perera 2013); during a 1-month period in 2009 all consenting patients diagnosed with type II diabetes who had been attending

the clinic for more than 3 months were included in the study. Using an interviewer administered, structured questionnaire 150 patients (135 females, 15 males) answered 25 questions about diabetes knowledge. A majority of patients (70.0%) had a good score on the knowledge test but critical gaps in knowledge were revealed, especially regarding knowledge about symptoms of poor control and importance of regular follow-up. Although patients with longer duration of diabetes had higher mean knowledge scores, they also had higher fasting blood glucose levels. Education programmes are needed to address critical gaps in patient's knowledge (Perera et al., 2013).

Cross-sectional study for the purpose of evaluating the association between diabetes-related knowledge, demographic and clinical factors with medication adherence among type II diabetes mellitus (Sweileh, Nab, Deleq, Enaia, & Al-Jabi 2014), a total of 405 diabetic. Using Michigan diabetes knowledge test (MDRTC). Analysis of MDKT scores showed that the majority of the participants (327, 80.7%) scored ≥ 7 out of a total score of 14. The mean ± SD of the MDKT scores was 8.2 ± 2 and the median (Q1 – Q3) of 8 (7 – 10) (Sweileh, 2014).

III. Methodology

1. Study Design

A descriptive research design was used to describe knowledge of diabetes and related factors of diabetic patients in Hyderabad.

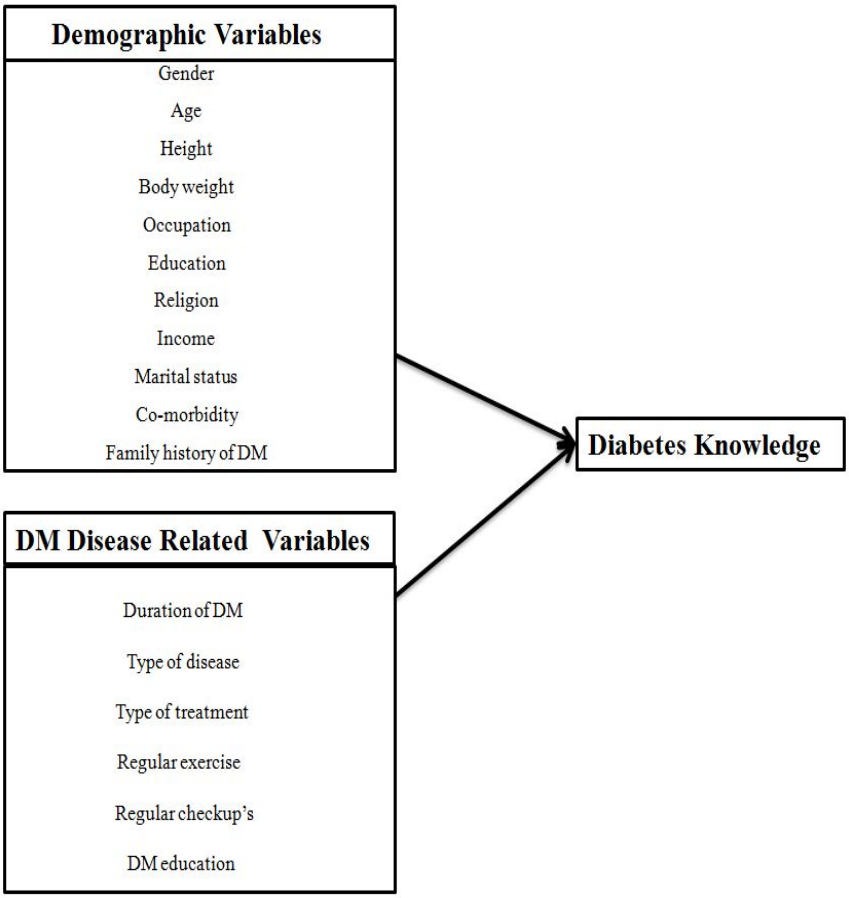

Figure 1: Conceptual framework of the study

DM: diabetes mellitus

2. Sampling

The convenience sample of 200 hospitalized patients with diabetes mellitus was recruited. In order to estimate sample size GPower 3.1.10 was utilized. The effect size of previously reported research was 0.48 for t-test and 0.3 for the F-test (Sarihin et al., 2012), which is similar to our study. The power analysis indicated that the total sample size of our present study is 196%, in which 98 for men and 98 for women because diabetes prevalence is similar in men and women in Hyderabad. Considering the drop offs, 200 patients, 100 for men and 100 for women were recruited.

The inclusion criteria were patients diagnosed with both type I or type II diabetes mellitus (DM), who agreed to participate (oral and written consent), age 20 years or more, who could understand English or Telugu (regional language in Hyderabad) and had no speech & hearing difficulties.

3. Instrument

The nursing faculties and health professionals from the Hyderabad were consulted to make sure that tool to be used fits the situation of the setting and subjects. The tool consists of three parts. The first part consisted of demographic data (gender, age, height, body weight, occupation, education level, religion, income, type of DM, type of treatment, family history of DM, duration of diagnosis, marital status and associated diseases). The second

part includes diabetes related characteristics of subjects like regular exercises, regular visit to check diabetes and attending educational classes for self-care.

The third part was the brief diabetes knowledge test (DKT) developed by Michigan diabetes research training center (MDRTC) used with kind permission from the author. The instrument was translated into Telugu and both English and Telugu forms were used. The diabetes knowledge test consists of twenty three knowledge test items; these 23 items represent a test of general knowledge of diabetes. The first fourteen questions assess general DM knowledge and the last nine questions assess insulin knowledge, the coefficient as for the general test and the insulin-use subscale indicate that both are valid and reliable, $\alpha \geq 0.70$ (Fitzgerald et al., 1998). The 23 item test took approximately 15 minutes to complete. The sample was divided according to gender, type of DM, duration of diagnosis, age, income and level of education. Scores were calculated for total knowledge, general DM knowledge and insulin knowledge. The reliability coefficient obtained for this study, Cronbach $\alpha = .88$.

4. Setting

The setting was CARE hospital, NIMS hospital and Magna hospitals at Hyderabad.

5. Data collection

A letter including the survey tool submitted to the head of the department of diabetes and endocrinology of the hospitals and asked permission to conduct a survey. The hospitalized patients (inpatient unit) were recruited from the hospitals, those who were suffering with diabetes mellitus, and those who could understand English or Telugu (a regional language in the Hyderabad) in the month of 1st July 2014 to middle of August 2014 at day time. Patients were given a questionnaire where a letter of introduction & consent request were attached. Before the patients started to answer the questionnaire, the researcher introduced herself and informed them not to be hesitant if they had questions regarding survey tool. It took around 15 min to complete questionnaire. A copy of the summary of the patient's responses was sent to the head of the department of diabetes and endocrinology of the hospitals.

6. Ethical issues

The research department and ethics committee of hospital reviewed the proposal and the questionnaire before giving the permission to do the research. The researcher received the approval from the head of the department of endocrinology and metabolism of the hospital. All the information kept confidential and only used in this study.

7. Data analysis

Data were analyzed by using statistical package for social science (SPSS) version 21. Descriptive statistics in terms of mean, standard deviation and frequencies was used for analyzing general DM knowledge, insulin knowledge and total DM knowledge. Furthermore, independent t-test was used to compare the means of two groups (comparison of gender, type of diabetes etc.) and one way analysis of variance (ANOVA) was used to compare the means of more than two groups (comparison of age groups, duration of diagnosis, income, & level of education).

By using previously reported study cutting points of knowledge scores that is similar to our knowledge test tool (Sarihin et al., 2012), patients who correctly answer 12 (50%) questions or more on diabetes knowledge test drawn as passing the test and as having acceptable knowledge.

IV. Results

1. Demographic characteristics

The study sample was 200 hospitalized diabetic patients, 100 (50%) men and 100 (50%) women. Thirty four (17%) of the patients were 20-40 years of age, 114 (57%) were 41-60 years of age and 52 (26%) were > 61 years of age. 162 (81%) of the patients were married, 21 (10.5%) were widows/divorced, and 17 (8.5%) were single. 114 (57%) had secondary school education of 12 years or less; 40 (20%) obtained a higher diploma and 46 (23%) had university degrees was shown in Table 1.

One hundred ninety-eight (98%) subjects have at least one associated disease, 55 (27.5%) of them had coronary artery disease, 41 (20.5%) had renal disease, and 102 (51%) had other diseases. One hundred (50%) of the sample were on insulin, 69 (34.5%) on oral hypoglycemic agents and 31 (15.5%) on combined insulin and hypoglycemic agents. One hundred thirty (65%) of them had type I diabetes, 70 (35%) had type II diabetes. 47 (23.5%) of the samples were diagnosed with DM ≤ 5 years from the time of diagnosis, 100 (50%) were diagnosed within 6-10 years from the time of diagnosis, 30 (15%) were diagnosed within 11-15 years from the time of diagnosis and 23 (10.5%) were diagnosed with > 15 years from the time of diagnosis. One hundred four (52%) of the patients were Hindus, 61 (30.5%) were Christians,

and 35 (17.5%) were Muslims. 94 (47%) of the subjects had income levels from 1000-10,000 INR, 62 (31%) had income level of 11,000-20,000 INR and 44 (22%) had an income level from ≥ 21,000 INR. Ninety-two (46%) of the subjects had normal weight, 87 (43.5%) had overweight and 21 (10.5%) had obesity was shown in Table 1.

Eighty-three (41.5%) of the sample had a family history of diabetes and 117 (58.5%) had no family history of diabetes, 69 (34.5%) of the sample were perform regular exercises and 131 (65.5%) were not performed regular exercises. 155 (77.5%) of the patients were attending physician regularly to check diabetes and 45 (22.5%) were not attending to physician to check diabetes. And only 25 (12.5%) of the patients attended educational classes for diabetes self-care and 175 (87.5%) were not attending any educational classes for self-care was shown in Table 3.

Table 1: Demographic Characteristics and the Types of Diabetes Treatment

Demographic data	Number (%)
Gender	
Male	100 (50.0)
Female	100 (50.0)
Age	
20 - 40 years	34 (17.0)
41 - 60 years	114 (57.0)
> 61 years	52 (26.0)
Education	
Secondary or 12 years	114 (57.0)
Diploma	40 (20.0)
University or more	46 (23.0)
Religion	
Hindu	104 (52.0)
Christian	61 (30.5)
Muslim	35 (17.5)
Income	
1000 - 10,000 INR	94 (47.0)
11,000 - 20,000 INR	62 (31.0)
≥ 21,000 INR	44 (22.0)
Type of diabetes	
Type 1	130 (65.0)
Type 2	70 (35.0)
Type of treatment	
Insulin	100 (50.0)
Oral hypoglycemic agents	69 (34.5)
Insulin & oral (combined)	31 (15.5)
Diet	0 (0)

Duration of diabetes	
5 years	47 (23.5)
6 - 10 years	100 (50.0)
11 - 15 years	30 (15.0)
> 15 years	23 (11.5)
Marital status	
Married	162 (81.0)
Single	17 (8.5)
Widow/divorced	21 (10.5)
Co-morbidity	
Coronary heart disease	55 (27.5)
Renal disease	41 (20.5)
Other disease	102 (51.0)
No associated disease	2 (1.0)
BMI	
Normal weight	92 (46.0)
Over weight	87 (43.5)
Obesity	21 (10.5)

2. Diabetes knowledge scores by demographic characteristics:

In the gender, general DM knowledge for men was 8.19 ± 2.80 and 7.09 ± 2.47 for women (t = 2.9, p = 0.004), insulin knowledge was 3.74 ± 2.08 for men and 3.23 ± 1.73 for women (t = 1.8, p = 0.06) and total DM knowledge was 11.93 ± 4.25 for men and 10.32 ± 3.81 for women (t = 2.8, p = 0.005) was shown in Table 2.

At the age of diabetic patients, general DM knowledge for patients with 20 to 40 years age was 8.35 ± 2.47, insulin knowledge was 3.61 ± 1.77, and total DM knowledge was 11.97 ± 3.82. General DM knowledge for patients

with 41 to 60 years age was 7.69 ± 2.68, insulin knowledge was 3.59 ± 1.86, and total DM knowledge was 11.28 ± 4.07. General DM knowledge for patients with more than 61 years of age was 7.05 ± 2.78, insulin knowledge was 3.15 ± 2.14, and total diabetes knowledge was 10.21 ± 4.29. One way ANOVA test revealed that there were no statistically significant differences was found between different age groups of the patients in general diabetes knowledge (F = 2.4, p = 0.08), insulin knowledge (F = 1.0, p = 0.35), and total diabetes knowledge (F = 2.1, p = 0.12) (Table 2)

At the level of education, general DM knowledge for patients with secondary or 12 years of education was 6.10 ± 2.25, insulin knowledge was 2.53 ± 1.59, and total diabetes knowledge was 8.64 ± 3.11. General DM knowledge for patients with diploma was 9.10 ± 1.41, insulin knowledge was 4.37 ± 1.21, and total diabetes knowledge was 13.47 ± 2.23. General DM knowledge for patients with education university or higher was 10.17 ± 1.78, insulin knowledge was 5.06 ± 1.80, and total diabetes knowledge was 15.23 ± 2.87. One way ANOVA test revealed that there were statistically significant differences were found in diabetes knowledge scores in relation to level of education. In general diabetes knowledge (F = 80.23, $p < 0.001$), insulin knowledge (F = 50.08, $p < 0.001$) and total knowledge scores (F = 100.78, $p < 0.001$). Scheffe posthoc comparisons (Figure 2) showed that general DM knowledge was higher in diabetic patients with university or

more education (M = 10.17**)** than patients with secondary or less than 12 years of education (M = 6.10, $p < 0.001$) and patients with diploma education (M = 9.10, $p = 0.05$). Insulin knowledge was higher in diabetic patients with university or more education (M = 5.06) than patients with secondary or less than 12 years of education (M = 2.53, $p < 0.001$) and not significant in patients with diploma education (M = 4.37). Total DM knowledge was higher in diabetic patients with university or more education (M = 15.23) than patients with secondary or less than 12 years of education (M = 13.47, $p < 0.001$) and patients with diploma education (M = 8.64, $p = 0.05$) was shown in Table 2.

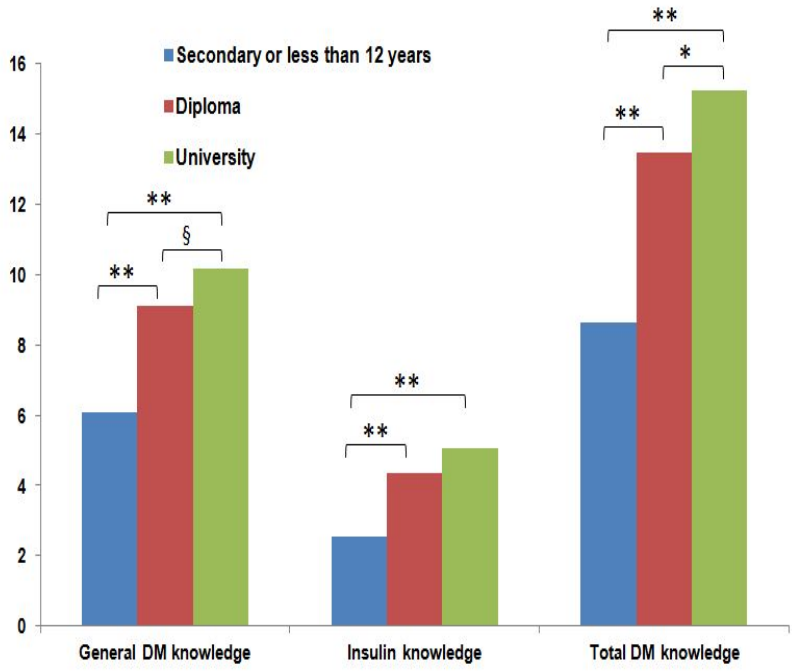

Figure 2: Scheffe posthoc comparisons between educational groups

3. Diabetes knowledge scores according to the diabetes related Characteristics:

In the type of diabetes, general diabetes knowledge (type I: 7.41 ± 2.66; type II: 8.05 ± 2.71), insulin knowledge (type I: 3.66 ± 1.78; type II: 3.14 ± 2.14) and total diabetes knowledge (type I: 11.08 ± 3.97; type II: 11.20 ± 4.38). Independent t-test results showed that there were no statistically significant difference found between types of diabetes for all knowledge types (t = -1.6, p = 0.10 for general diabetes knowledge, t = 1.8, p = 0.06 for insulin knowledge, and t = -0.1, p = 0.85 for total diabetes knowledge) (Table 2).

In the duration of diabetes, general DM knowledge for patient diagnosed with DM less than or equal to 5 years from the time of diagnosis was 8.27 ± 2.47, insulin knowledge was 3.44 ± 2.00 and total diabetes knowledge was 11.72 ± 3.93. General DM knowledge for patient diagnosed with diabetes from 6-10 years was 7.72 ± 2.87, insulin knowledge was 3.56 ± 1.96 and total diabetes knowledge was 11.28 ± 4.34. General DM knowledge for patient diagnosed with DM from 11 to15 years was 7.13 ± 2.11, insulin knowledge 3.79 ± 1.54 and total diabetes knowledge was 10.93 ± 3.33. General diabetes knowledge for patient diagnosed with diabetes for more than 15 years was 6.56 ± 2.72, insulin knowledge was 2.69 ± 1.84 and

total DM knowledge was 9.26 ± 3.97. One way ANOVA test revealed that there were no statistically significant differences in diabetes knowledge scores according to the duration of DM diagnosis in general diabetes knowledge (F = 2.5, p = 0.06), insulin knowledge (F = 1.2, p = 0.30) and total knowledge scores (F = 1.8, p = 0.14) (Table 2).

In the religion of diabetic patients, general diabetes knowledge for Hindus was 8.02 ± 2.65, insulin knowledge was 3.64 ± 1.87, and total diabetes knowledge was 11.67 ± 3.90. General diabetes knowledge for Christians was 7.27 ± 2.53, insulin knowledge was 3.36 ± 1.77, and total diabetes knowledge was 10.63 ± 3.89. General diabetes knowledge for Muslims was 7.11 ± 2.96, insulin knowledge was 3.22 ± 2.30, and total diabetes knowledge was 10.34 ± 4.91. One way ANOVA test, revealed that there were no statistically significant differences between different religions of the patients in general diabetes knowledge (F = 2.3, p = 0.10), insulin knowledge (F = 0.7, p = 0.45), and total diabetes knowledge (F = 2.0, p = 0.13) (Table 2).

In the income of diabetic patients, general DM knowledge for patients with income 1,000 to 10,000 Indian rupees was 5.91 ± 2.17, insulin knowledge was 2.41 ± 1.51 and total DM knowledge was 8.32 ± 3.00. General DM knowledge for patients with income 11,000 to 20,000 Indian rupees were 8.37 ± 2.14, insulin knowledge was 4.09 ± 1.72, and total DM

knowledge was 12.46 ± 3.27. General diabetes knowledge for patients with income more than 21,000 Indian rupees was 10.29 ± 1.54, insulin knowledge was 4.90 ± 1.70, and total DM knowledge was 15.20 ± 2.61. One way ANOVA test revealed that there were statistically significant differences were found in diabetes knowledge scores in relation to the income of the patients. In general diabetes knowledge ($F = 74.58$, $p < 0.001$), insulin knowledge ($F = 41.69$, $p < 0.001$) and total knowledge scores ($F = 86.89$, $p < 0.001$).

In Figure 3, Scheffe posthoc comparisons showed that general DM knowledge was higher with income > 21,000 INR (M = 10.29) than the 11,000 to 21,000 INR income diabetic patients (M = 8.37, $p < 0.001$) and 1,000 to 10,000 INR income diabetic patients (M = 5.91, $p < 0.001$). Insulin knowledge was higher in high income diabetic patients (> 21,000 INR, M = 4.90) than the 11,000 to 21,000 INR income diabetic patients (M = 4.09, $p = 0.04$) and 1,000 to 10,000 INR income diabetic patients (M = 2.41, $p < 0.001$). Total DM knowledge was higher in high income diabetic patients (> 21,000 INR, M = 15.20) than the 11,000 to 21,000 INR income diabetic patients (M=12.46, $p < 0.001$) and 1,000 to 10,000 INR income diabetic patients (M = 8.32, $p < 0.001$) were shown in Table 2.

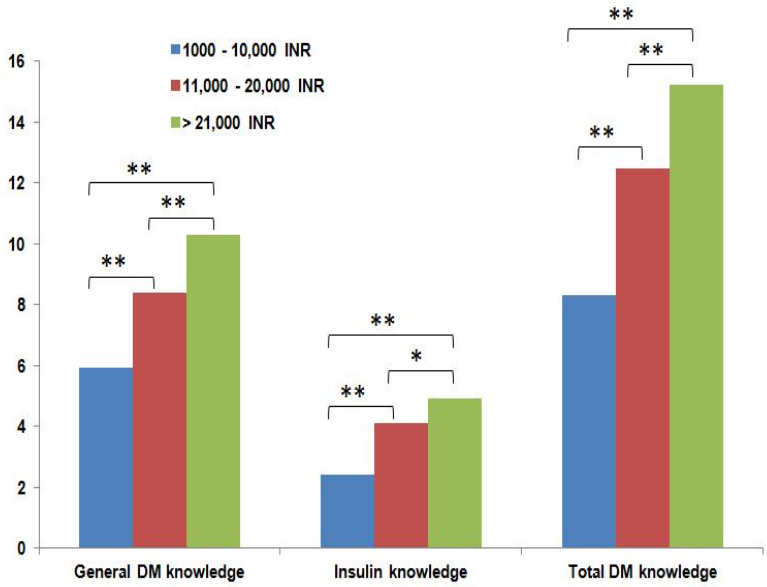

Figure 3: Scheffe post-hoc comparisons between income groups

In the family history, general DM knowledge of the patients who had a family history of diabetes was 8.07 ± 2.64, insulin knowledge was 3.81 ± 1.71, and total DM knowledge was 11.89 ± 3.87. General DM knowledge of the patients who do not have a family history of diabetes was 7.33 ± 2.69, insulin knowledge was 3.24 ± 2.03, and total DM knowledge was 10.58 ± 4.20. Using independent t test showed that there was a statistically significant difference found between family history of all knowledge types (t = 1.9, p = 0.05 for general diabetes knowledge, t = 2.0, p = 0.03 for insulin knowledge and t = 2.2, p = 0.02 for total diabetes knowledge) (Table 2).

Table 2: Comparison between Mean Knowledge Scores according to Demographic Data and Diabetes Knowledge.

	General DM knowledge		Insulin knowledge		Total DM knowledge	
	Mean ± SD	**t or F (*p*)**	**Mean ± SD**	**t or F (*p*)**	**Mean ± SD**	**t or F (*p*)**
Total sample	7.64 ± 2.69		3.48 ± 1.92		11.12 ± 4.11	
Gender						
Male	8.19 ± 2.80**	2.9 (0.004)	3.74 ± 2.08	1.8 (0.06)	11.93 ± 4.25*	2.8 (0.005)
Female	7.09 ± 2.47		3.23 ± 1.73		10.32 ± 3.81	
Age						
20 - 40 years	8.35 ± 2.47	2.4 (0.08)	3.61 ± 1.77	1.0 (0.35)	11.97 ± 3.82	2.1 (0.12)
41 - 60 years	7.69 ± 2.68		3.59 ± 1.86		11.28 ± 4.07	
> 61 years	7.05 ± 2.78		3.15 ± 2.14		10.21 ± 4.29	
Type of diabetes						
Type 1	7.41 ± 2.66	1.6 (0.01)	3.66 ± 1.78	1.8 (0.06)	11.08 ± 3.97	0.1 (0.85)
Type 2	8.05 ± 2.71		3.14 ± 2.14		11.20 ± 4.38	
Education level						
Secondary or less	6.10 ± 2.25	80.23 (<0.001)	2.53 ± 1.59	50.08 (<0.001)	8.64 ± 3.11	100.78 (<0.001)
Diploma	9.10 ± 1.41		4.37 ± 1.21		13.47 ± 2.23	
University or more	10.17 ± 1.78		5.06 ± 1.80		15.23± 2.87	
Duration of diabetes						
> 5 years	8.27 ± 2.47	2.5 (0.06)	3.44 ± 2.00	1.2 (0.30)	11.72 ± 3.93	1.8 (0.14)
6 - 10 years	7.72 ± 2.87		3.56 ± 1.96		11.28 ± 4.34	
11 - 15 years	7.13 ± 2.11		3.79 ± 1.54		10.93 ± 3.33	
> 15 years	6.56 ± 2.72		2.69 ± 1.84		9.26 ± 3.97	

Religion	8.02 ± 2.65	2.3 (0.10)	3.64 ± 1.87	0.7 (0.45)	11.67 ± 3.90	2.0 (0.13)
Hindu	7.27 ± 2.53		3.36 ± 1.77		10.63 ± 3.89	
Christian	7.11 ± 2.96		3.22 ± 2.30		10.34 ± 4.91	
Muslim						
Income						
1000 -10,000 INR	5.91 ± 2.17	74.58 (<0.001)	2.41 ± 1.51	41.69 (<0.001)	8.32 ± 3.00	86.89 (<0.001)
11,000 -20,000 INR	8.37 ± 2.14		4.09 ± 1.72		12.46 ± 3.27	
> 21,000 INR	10.29 ± 1.54		4.90 ± 1.70		15.20 ± 2.61	
Marital status						
Married	7.57 ± 2.75	2.4 (0.08)	3.51 ± 1.91	1.4 (0.23)	11.08 ± 4.17	2.3 (0.09)
Single	8.94 ± 2.43		3.94 ± 1.67		12.88 ± 3.40	
Widow/ divorced	7.09 ± 2.11		2.90 ± 2.16		10.00 ± 3.86	
Family history of DM						
Yes	8.07 ± 2.64[§]	0.05	3.81 ± 1.71[*]	<0.05	11.89 ± 3.87[*]	<0.05
No	7.33 ± 2.69		3.24 ± 2.03		10.58 ± 4.20	

SD: Standard deviation

DM: Diabetes mellitus

According to the marital status of the diabetic patients, general DM knowledge for married patients was 7.57 ± 2.75, insulin knowledge was 3.51 ± 1.91, and total diabetes knowledge was 11.08 ± 4.17. General DM knowledge for unmarried (single) patients was 8.94 ± 2.43, insulin knowledge was 3.94 ± 1.67, and total diabetes knowledge was 12.88 ± 3.40. General DM knowledge for widow/divorced patients was 7.09 ± 2.11, insulin knowledge was 2.90 ± 2.16, and total diabetes knowledge was 10.00 ± 3.86. One way ANOVA test revealed that there were no statistically significant differences between marital status of the patients in general diabetes knowledge (F = 2.4, p = 0.08), insulin knowledge (F = 1.4, p = 0.23), and total diabetes knowledge (F = 2.3, p = 0.09). Although the scores of general, insulin and total DM knowledge was better among patients who were unmarried (single) than those who were married and widow/divorced, but the differences were not statistically significant (Table 2).

4. Diabetes knowledge scores according to diabetes self-management:

According to the regular physical exercises, general diabetes knowledge of the patients who perform regular exercise was 9.49 ± 1.89, insulin knowledge was 4.17 ± 1.97, and total diabetes knowledge was 13.66 ± 3.22. General DM knowledge of the patients who do not perform regular exercise

was 6.66 ± 2.54, insulin knowledge was 3.12 ± 1.81, and total DM knowledge was 9.78 ± 3.90. Using independent t test showed that there was a statistically significant difference found between regular exercise of all knowledge types (t = 8.1, $p < 0.001$ for general diabetes knowledge, t = 3.7, $p < 0.001$ and for insulin knowledge t = 7.0, $p < 0.001$ for total diabetes knowledge) (Table 3).

During the regular checkups, General diabetes knowledge of the patients who attend regular checkups for diabetes was 8.16 ± 2.48, insulin knowledge was 3.74 ± 1.94, and total diabetes knowledge was 11.90 ± 3.96. General DM knowledge of the patients who do not attend regular checkups was 5.84 ± 2.64, insulin knowledge was 2.60 ± 1.60, and total diabetes knowledge was 8.44 ± 3.45. Using independent t test showed that there was a statistically significant difference found between diabetes regular checkups of all knowledge types (t = 5.4, $p < 0.001$ for general diabetes knowledge, t = 3.6, $p < 0.001$ for insulin knowledge and t = 5.2, $p < 0.001$ for total diabetes knowledge) (Table 3).

According to the attended educational classes for diabetic self care, general DM knowledge of the patients who attended educational classes for diabetes self-care was 10.12 ± 1.92, insulin knowledge was 5.20 ± 1.97, and total DM knowledge was 15.32 ± 3.47. General DM knowledge of the patients who do not attend educational classes for diabetes self-care was

7.28 ± 2.60, insulin knowledge was 3.24 ± 1.79, and total DM knowledge was 10.52 ± 3.84. Using independent t-test showed that there was a statistically significant difference found between educational classes for diabetes self care of all knowledge types ($t = 5.2$, $p < 0.001$ for general diabetes knowledge, $t = 5.0$, $p < 0.001$ for insulin knowledge, and $t = 5.8$, $p < 0.001$ for total diabetes knowledge) (Table 3).

Table 3: Comparison of Diabetes Knowledge Scores According to Diabetes Self-management of Subjects:

	General DM knowledge		Insulin knowledge		Total DM knowledge	
	Mean ± SD	**t (*p* value)**	**Mean ± SD**	**t (*p* value)**	**Mean ± SD**	**t (*p* value)**
Total sample	7.64 ± 2.69		3.48 ± 1.92		11.12 ± 4.11	
Regular exercises						
Yes 69(34.5)	9.49 ± 1.89**	8.1 (<0.001)	4.17 ± 1.97**	3.7 (<0.001)	13.66 ± 3.22**	7.0 (<0.001)
No 131(65.5	6.66 ± 2.54		3.12 ± 1.81		9.78 ± 3.90	
Regular physician visit to check diabetes						
Yes 155(77.5)	8.16 ± 2.48**	5.4 (<0.001)	3.74 ± 1.94**	3.6 (<0.001)	11.90 ± 3.96**	5.2 (<0.001)
No 45(22.5)	5.84 ± 2.64		2.60 ± 1.60		8.44 ± 3.45	
Attending educational class for diabetes self-care						
Yes 25(12.5)	10.12 ± 1.92**	5.2 (<0.001)	5.20 ± 1.97**	5.0 (<0.001)	15.32 ± 3.47**	5.8 (<0.001)
No 175(87.5)	7.28 ± 2.6		3.24 ± 1.79		10.52 ± 3.84	

SD: Standard deviation

5. DM knowledge score

The majority of the patients answered incorrectly (96.5%) to the diabetic ketoacidosis (Q.15). Diabetic ketoacidosis is a potentially life-threatening complication in patients with diabetes mellitus. The predominant symptoms are nausea and vomiting. Next, 88.5% patients answered incorrectly to the glycosylated hemoglobin (hemoglobin A1) test (Q.5). Glycated hemoglobin is a form of hemoglobin that is measured primarily to identify the average plasma glucose concentration over prolonged periods of time (6-8 weeks). In relation with insulin reaction questions (Q.19) and (Q.23) incorrectly answered patients were 84.5 and 82% respectably. An increased blood glucose level is responsible for the infection, 74.5% of the patients were answered incorrectly for this question (Q.10).

Table 4: The Scores of DKT Questions

DKT Questions	Correct (%)	Wrong (%)
1) The diabetes diet is.	196(98)	4(2)
2) Which of the following is highest in carbohydrate?	84(43)	114(57)
3) Which of the following is highest in fat?	90(45)	110(55)
4) Which of the following is a "free food"?	86(43)	114(57)
5) Glycosylated hemoglobin (hemoglobin A1) is a test that is measure of your average blood glucose level for the past:	23(11.5)	117(88.5)
6) Which is the best method for testing blood glucose?	162(81)	38(19)
7) What effect does unsweetened fruit juice has on blood glucose?	70(35)	130(65)
8) Which should <u>not</u> be used to treat low blood glucose	114(57)	86(43)
9) For a person in good control, what effect does exercise has on blood glucose?	72(36)	128(64)
10) Infection is likely to cause:	51(25.5)	149(74.5)
11) The best way to take care of your feet is to	156(78)	44(22)
12) Eating foods lower in fat decreases your risk for	166(83)	34(17)
13) Numbness and tingling may be symptoms of	176(88)	24(12)
14) Which of the following is usually not associated with diabetes	75(37.5)	125(62.5)

15) Sign of ketoacidosis include	7(3.5)	193(96.5)
16) If you are sick with flu, which of the fallowing changes should you make?	77(38.5)	123(61.5)
17) If you have taken intermediate-acting insulin (NPH or Lente), you are most likely to have an insulin reaction in:	45(22.5)	155(77.5)
18) You realize just before lunch time that you forgot to take your insulin before breakfast. What should you do now?	113(56.5)	87(43.5)
19) If you are beginning to have an insulin reaction, you should	31(15.5)	169(84.5)
20) Low blood glucose may be caused by:	153(76.5)	47(23.5)
21) If you take your morning insulin but skip breakfast your blood glucose level will usually	83(41.5)	117(58.5)
22) High blood glucose may be caused by	142(71)	58(29)
23) Which one of the following will most likely cause an insulin reaction	36(18)	164(82)

DKT = diabetes knowledge test

VI. Discussion

Diabetes education is required for enhancing the clinical out-comes and quality of life for patients (Funnell et al., 2011). The importance of education of patients has been highlighted by several studies (Fritsche et al., 1999), (Norris, Lau, Smith, Schmid, & Engelgau 2002), (Van den Arend, Stolk, Rutten, & Schrijvers 2000). For this reason, it is now generally accepted that diabetic patients need to be knowledgeable about their disease and its management to complete good metabolic control. However, these studies have shown that there is a significant lack of knowledge and skill in 50 to 80% of patients with diabetes (Clement 1995).

The overall scores of the total knowledge in this study were low. General diabetes knowledge was 7.64 ± 2.69 out of 18, insulin knowledge was 3.48 ± 1.92 out of 7, and total knowledge was 11.12 ± 4.11 out of 23 (Table 3). Men scored higher than women in the general diabetes knowledge (8.19 vs. 7.09) insulin knowledge (3.74 vs. 3.23), and total knowledge (11.93 vs. 10.32).

In this study males are higher educated than females because the negative attitude of parents towards the girl child and her education is one of the major reasons of low female literacy rate in India. In most of the families, boys at home are given priority in terms of education but girls are not treated in the same way. Right from the beginning, parents do not consider girls as

earning members of their family, as after marriage they have to leave their parents' home. So their education is just considered as wastage of money as well as time. For this reason, parents prefer to send boys to school but not girls. As India is a gender segregated society, it is a very important factor in the low female literacy rate in India. Due to strong stereotyping of female and male roles, the Sons are thought of to be more useful and hence are educated (Raju 1988), (Patkar 1995).

Statistically significant difference was found in educational levels and different income groups, in this study 114 (57%) of the patients were secondary or 12 years of education and 94 (47%) of the patient's income were 1,000 to 10,000 INR. However, there were no statistically significant differences were found between patients with type 1 and type 2 diabetes, age, duration of diabetes, religion and marital status in the general diabetes knowledge, insulin knowledge, or the total knowledge.

The findings of this study were similar to the findings of (Adsani et al., 2009) and (Sarihin et al., 2012). The above authors used Fitzzerald diabetes knowledge tools and reported that knowledge deficit was related to low literacy rates, low family income and low self care. Moreover, these findings were supported by (Kheir, Greer, Yousif, Geed, & Okkah 2011) reported that diabetic patients had a low score of knowledge about their disease. Our study consistent with those from previous studies conducted in the urban

Australian community (Bruce, Davis, Cull, & Davis 2003) reported that diabetic patients had a low score of knowledge about their disease in less than primary schooling than more than primary schooling patients. Another study supported by the findings of the present study done at Michigan (Heisler, Piette, Spencer, Kieffer, & Vijan 2005), reported that years of formal education were associated with knowledge of the disease. Another study conducted in Jordan (Habashneh, Khader, Hammad, & Almuradi 2010) reported that the knowledge about diabetes and periodontal health among diabetic patients was low, these observations also provided additional support to the findings of the present study.

Men achieved significantly higher in knowledge score than women and this finding was consistent with many other studies done in other countries, like Pakistan (Badruddin et al., 2002), (Rafique, Azam, & White 2006), (Sabri, Qayyum, Saigol, Zafar, & Aslam 2007), Nepal (Upadhyay et al., 2008), and the Philippines (Ardena et al., 2010) that had a similar socioeconomic status and literacy levels of subjects. A study was conducted in four provinces of Kenya, that was also proved men has a higher knowledge than women (Maina et al., 2011).

When the findings of the present study were compared with (McCleary 2010) who used the same tool (Michigan diabetes knowledge test), they found a higher score of knowledge than our study, due to the fact that their

population received diabetes education and higher literacy rates. The present study showed low literacy levels, 57% of present sample had secondary or less than 12 years of education.

The main socio-demographic factors affecting diabetes knowledge, according to our survey were low level of education and limited family income. These results are consistent with previously reported results by other researchers (Bruce et al., 2003), (Gunay et al., 2006) and (Murata et al., 2003). Old age is seen as a barrier to diabetes education while younger patients may have higher degrees of motivation and adaptability towards their disease (Bruce et al., 2003) and (Rhee et al., 2005). Low levels of education as well as limited family income are problems faced by many patients and can adversely affect their diabetes outcomes and ability to self-manage their illness (Kemper, Savage, Niederbaumer, & Anthony 2005) (Powell, Hill, & Clancy 2007), (Sarkar, Fisher, & Schillinger 2006) (Schillinger et al., 2002), and (Von Goeler, Rosal, Ockene, Scavron, & De Torrijos 2003). Furthermore, lower education could be a barrier to effective Clinician-patient communication, indicating the need to identify strategies to improve such communication in this patient subgroup and to maximize the effectiveness of self-management education (Rothman et al., 2003), (Schillinger, Bindman, Wang, Stewart, & Piette 2004).

There were statistically significant differences found in diabetes

knowledge scores according to family history, regular exercise, regular diabetes checkups, and attended educational classes for diabetes self-care. General diabetes knowledge (8.07 vs. 7.33) insulin knowledge (3.81 vs. 3.24), and total DM knowledge (11.89 vs. 10.58) scores were higher for patients who had a family history of diabetes than who had not a family history of diabetes. General diabetes knowledge (9.49 vs. 6.66), insulin knowledge (4.17 vs. 3.12) and total DM knowledge (13.66 vs. 9.78) scores were higher for patients who perform regular exercises than who do not perform regular exercises.

General diabetes knowledge (8.16 vs. 5.84), insulin knowledge (3.74 vs. 2.60) and total DM knowledge (11.90 vs. 8.44) scores were higher for patients who were attending regular diabetic checkups than who do not attend regular checkups. The patients who were attending education classes had higher scores than who had not attended educational classes in the general diabetes knowledge (10.12 vs. 1.92), insulin knowledge (5.20 vs. 3.24) and total DM knowledge (15.32 vs.10.52) scores were higher for patients who attended educational classes than who do not attend educational classes. In our study only 25% of the patients they attended diabetes education classes, when we compare to the study that was done in the urban Australian community (Bruce et al., 2003) approximately two-third of the patients reported attending diabetes education programs.

The majority of the patients answered incorrectly about diabetic ketoacidosis, glycosylated hemoglobin and insulin reaction related questions in the diabetes knowledge test. Nurses have a responsibility in providing information for the diabetic to enable the patient live a quality life. The nurse must possess the expected knowledge to enable the achievement of this goal. Patient teaching is an independent function of the nurse. The roles of nurses in the management of diabetes include the teaching of patients in acute, elderly and extended care facilities. Understanding health behaviors in this group and creating appropriate health-promotion interventions will allow nurses to play their part in limiting the burden of diabetes mellitus.

VII. Conclusion

In this study, a descriptive research design was used to investigate the levels of knowledge on diabetes mellitus in patients in Hyderabad, India. During the period of 1st July, 2014 to middle of August, 2014, a convenient sample of two hundred hospitalized adult patients with diabetes mellitus was recruited. Data was collected through face-to-face interview using the brief diabetes knowledge test (Michigan Diabetes knowledge test). Simple descriptive statistics were used to describe the study variables.

The overall scores of the total sample were low. General diabetes knowledge was 7.64 ± 2.69 out of 18, insulin knowledge was 3.48 ± 1.92 out of 7 and total knowledge was 11.12 ± 4.11 out of 23. Men scored higher than women in the general diabetes knowledge (8.19 vs. 7.09), insulin knowledge (3.74 vs. 3.23), and total DM knowledge (11.93 vs. 10.32) due to the high illiteracy in women compared to men. Highly educated and high income patients have a good level of knowledge compared to low educated and low income patients.

The lower size of the sample in this study limits the generalization of the findings. A larger sample is required for future studies. Another limitation is that the sample of the present study was restricted to few hospitalized diabetic patients in Hyderabad only, which might make the sample not truly

ideal of the overall diabetic patient population whose health care is mainly conducted in outpatient clinics without being hospitalized. Recruiting sample from inpatient and outpatient clinics will enhance the generalisability of the findings of future studies. Additionally another limitation is using only knowledge questionnaire, required to add attitude, practice and behavior etc. for future studies.

In conclusion, the diabetic patients involved in this study had lack of diabetes knowledge about their disease, which in turn will limit their involvement in the management of the disease. Health care provider should focus on improving patient's knowledge about diabetes by means of diabetes education by doctor, nutrition clinic for outpatient and dietary counseling for inpatient and via nursing specialized in diabetes to train patients about self monitoring blood glucose and self insulin injection.

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Appendix 1

Patient consent form

THE LEVEL OF DIABETES KNOWLEDGE AND RELATED FACTORS AMONG PATIENTS WITH DIABETES MELLITUS IN HYDERABAD, INDIA

Name of the patient: _____

Name of the investigator: swathi.yaramala

Name of the institution: Seoul National University College of Nursing

Documents of the informed consent

I, ----------, have read the information in this form (or it has been read to me). I was free to ask any questions and they have been answered.

My free power of choice, hereby give my consent to be included as a participant in "THE LEVEL OF DIABETES KNOWLEDGE AND RELATED FACTORS AMONG PATIENTS WITH DIABETES MELLITUS IN HYDERABAD, INDIA"

(1) I have read and understood this consent form and the information provided to me.

(2) I have had the consent document explained to me.

(3) I have been explained about the nature of the study.

(4) My rights and responsibilities have been explained to me by the investigator.

(5) I agree to cooperate with the investigator and I will inform him/her immediately if I suffer any problem.

(6) I have had my questions answered to my satisfaction.

(7) I have decided to be in the research study.

For adult patients

Name and signature / thumb impression of the participant (or legal representative if participant incompetent):

_____ (Name) _____ (Signature)

Date: _____ Time: _____

Name and signature of the investigator

Swathi.yaramala (Name) _____ (Signature)

_____ (Date)

Information to participants and consent form

Patient name:

THE LEVEL OF DIABETES KNOWLEDGE AND RELATED FACTORS AMONG PATIENTS WITH DIABETES MELLITUS IN HYDERABAD, INDIA

You are invited to take part in this research study. The information in this document is meant to help you decide whether or not to take part. Please feel free to ask if you have any queries or concerns.

What is the purpose of the study?

The purposes of this study are to assess the level of knowledge and related factors among patients in Hyderabad.

1. To assess the knowledge of the patients.
2. By using descriptive statistics to compare with the DM knowledge and demographic variables of the patients.

Contact person

For further information / questions, you can contact us at the following address:

Principal investigator:
Swathi.yaramala. Ph: 8790545432
Dept. of adult health nursing, SNU College of nursing, Seoul, South Korea

Appendix 2

Patient demographic form

Dear Participant,

This survey is being conducted to establish the level of diabetes mellitus knowledge among diabetes patients. Please mark that best describes your response.

Participant Name _____ Occupation _____

Height _____ Weight _____

1) Gender
   a) Male
   b) Female
2) Age in years
   a) 20 - 40years
   b) 41 - 60 years
   c) > 61 years
3) Education level
   a) Secondary or less≤12 years
   b) Diploma
   c) University or more
4) Religion
   a) Hindu
   b) Christian
   c) Muslim
5) Income
   a) 1,000 – 10,000 Rs
   b) 11,000 – 20,000 Rs
   c) >21,000 Rs
6) Type of diabetes
   a) Type 1 DM
   b) Type 2 DM

7) Type of treatment
   a) Insulin
   b) Oral hypoglycemic agents
   c) Insulin and oral (combined)
   d) Diet
8) Duration of diabetes
   a) ≤5 years
   b) 6 – 10 years
   c) 11 -15 years
   d) >15 years
9) Marital status
   a) Married
   b) Single
   c) Widow/divorced
10) Associated disease
   a) Coronary artery disease
   b) Renal disease
   c) Other disease
   d) No associated disease

11) Family history of diabetes? Yes [1] No [2]
12) If yes, who patient living with you _____
13) Do you think the control of your blood glucose levels is an important factor in reducing Complications of diabetes mellitus? Yes [1] No [2] Do not know [3]
14) Do you follow a dietary modification to control your diabetes mellitus? Yes [1] No [2]
15) Do you perform regular exercises? Yes [1] No [2]
16) Do you go to physician regularly to check diabetes? Yes [1] No [2]
17) Have you attended educational class for diabetes self-care? Yes [1] No[2]
18) If yes, how many hours _____

Diabetes Knowledge Test

1. The diabetes diet is:
   a) The way most American people eat
   b) A healthy diet for most people
   c) Too high in protein for most people
   d) I don't know
2. Which of the following is highest in carbohydrate?
   a) Baked chicken
   b) Swiss cheese
   c) Baked potato
   d) Peanut butter
   e) I don't know
3. Which of the following is highest in fat?
   a) Low fat milk
   b) Orange juice
   c) Corn
   d) Honey
   e) I don't know
4. Which of the following is a "free food"?
   a) Any unsweetened food
   b) Any dietetic food
   c) Any food that says "sugar free" on the label
   d) Any food that has less than 20 calories per serving
   e) I don't know
5. Glycosylated hemoglobin (hemoglobin A1) is a test that is measure of your average blood glucose level for the past:
   a) Day
   b) Week
   c) 6- 10 weeks
   d) 6 months
   e) I don't know
6. Which is the best method for testing blood glucose?
   a) Urine testing
   b) Blood testing
   c) Both are equally good
   d) I don't know
7. What effect does unsweetened fruit juice have on blood glucose?
   a) Lowers it
   b) Raises it
   c) Has no effect
   d) I don't know
8. Which should <u>not</u> be used to treat low blood glucose
   a) 3 hard candies
   b) ½ cup orange juice
   c) 1 cup diet soft drink
   d) 1 cup skim milk
   e) I don't know
9. For a person in good control, what effect does exercise have on blood glucose?
   a) Lowers it
   b) Raises it
   c) Has no effect
   d) I don't know
10. Infection is likely to cause:
   a) An increase in blood glucose
   b) A decrease in blood glucose
   c) No change in blood glucose
   d) I don't know

Appendix 3

11. The best way to take care of your feet is to:
    a) Look at and wash them each day
    b) Massage them with alcohol each day
    c) Soak them for one hour each day
    d) Buy shoes a size larger than usual
    e) I don't know
12. Eating foods lower in fat decreases your risk for:
    a) Nerve disease
    b) Kidney disease
    c) Heart disease
    d) Eye disease
    e) I don't know
13. Numbness and tingling may be symptoms of:
    a) Kidney disease
    b) Nerve disease
    c) Eye disease
    d) Liver disease
    e) I don't know
14. Which of the fallowing is usually <u>not</u> associated with diabetes:
    a) Vision problems
    b) Kidney problems
    c) Nerve problems
    d) Lung problems
    e) I don't know
15. Signs of ketoacidosis include:
    a) Shakiness
    b) Sweating
    c) Vomiting
    d) Low blood glucose
    e) I don't know
16. If you are sick with the flu, which of the fallowing changes should you make?
    a) Take less insulin
    b) Drink less liquids
    c) Eat more proteins
    d) Test for glucose and ketones more often
    e) I don't know
17. If you have taken intermediate-acting insulin (NPH or Lente), you are most likely to have an insulin reaction in:
    a) 1-3 hours
    b) 6-12 hours
    c) 12-15 hours
    d) More than 15 hours
    e) I don't know
18. You realize just before lunch time that you forgot to take your insulin before breakfast. That should you do now?
    a) Skip lunch to lower your blood glucose
    b) Take the insulin that you usually take at breakfast
    c) Take twice as much insulin as you usually take at breakfast
    d) Check your blood glucose level to decide how much insulin to take
    e) I don't know
19. If you are beginning to have an insulin reaction, you should:
    a) Exercise
    b) Lie down and rest
    c) Drink some juice
    d) Take regular insulin
    e) I don't know
20. Low blood glucose may be caused by:
    a) Too much insulin
    b) Too little insulin
    c) Too much food
    d) Too little exercise
    e) I don't know

21. If you take your morning insulin but skip breakfast your blood glucose level will usually:
    a) Increase
    b) Decrease
    c) Remain the same
    d) I don't know
22. high blood glucose may be caused by:
    a) Not enough insulin
    b) Skipping meals
    c) Delaying your snack
    d) Large ketones in your urine
    e) I don't know
23. Which one of the following will most likely cause an insulin reaction:
    a) Heavy exercise
    b) Infection
    c) Overeating
    d) Not taking your insulin
    e) I don't know

Appendix 4

SEOUL NATIONAL UNIVERSITY

College of Nursing

28-Yeongeon Dong, Jeongno-Gu, Seoul 110-799, Republic of Korea

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Dt. 2014.07.02

To:
Care Hospitals
Banjara hills,
Hyderabad- 500081

From:
Swathi Yaramala
Seoul National University
College of Nursing
28-YeongeonDong, Jeongno-Gu, Seoul 110 - 799
Republic of Korea
yswathi@snu.ac.kr

Sub: Request for academic research project

Respected sir,

I am Swathi Yaramala, pursuing Master's in Nursing at Seoul National University (SNU), College of Nursing, Seoul from March, 2012. As a part of my course curriculum I have to do a research project to fulfill the requirements of the course work. Therefore kindly accept my request to do a research project on diabetic patients to access their knowledge towards the diabetes mellitus, at Care hospitals, Hyderabad, India.

Thanking You,

Sincerely,

Swathi Yaramala

SR Haritha - ANS
We Can allow 15 pts per day for two days interaction c pt's (Diabetics only) with IC-NS permission

CARE HOSPITAL HYDERABAD BANJARA HILLS

2/7/14.

서울대학교 간호대학서울시 종로구 연건동 28번지 110-711 대학민국

SEOUL NATIONAL UNIVERSITY

College of Nursing

28-Yeongeon Dong, Jeongno-Gu, Seoul 110-799, Republic of Korea

---

Dt. 2014.07.03

To:
NIMS Hospitals
Punjagutta
Hyderabad- 500034

From:
Swathi Yaramala
Seoul National University
College of Nursing
28-YeongeonDong, Jeongno-Gu, Seoul 110 - 799
Republic of Korea
yswathi@snu.ac.kr

Sub: Request for academic research project

Respected sir,

I am Swathi Yaramala, pursuing Master's in Nursing at Seoul National University (SNU), College of Nursing, Seoul from March, 2012. As a part of my course curriculum I have to do a research project to fulfill the requirements of the course work. Therefore kindly accept my request to do a research project on diabetic patients to access their knowledge towards the diabetes mellitus, at NIMS hospitals, Hyderabad, India.

Thanking You,

Sincerely, Y. Swathi

Swathi Yaramala

ACADEMIC

DR P.V. RAO 7/7/14

Dr. P.V. RAO, MD DipDiab PhD FRCP (L)
Senior Professor and Head
Department of Endocrinology and Metabolism
Nizam's Institute of Medical Sciences
Hyderabad 500 082

서울대학교 간호대학서울시 종로구 연건동 28번지 110-711 대학민국

SEOUL NATIONAL UNIVERSITY

College of Nursing

28-Yeongeon Dong, Jeongno-Gu, Seoul 110-799, Republic of Korea

---

Dt. 2014.07.05

To:
Magna Hospital
Jubilee Hills
Hyderabad- 500096

From:
Swathi Yaramala
Seoul National University
College of Nursing
28-YeongeonDong, Jeongno-Gu, Seoul 110 - 799
Republic of Korea
yswathi@snu.ac.kr

Sub: Request for academic research project

Respected sir,

I am Swathi Yaramala, pursuing Master's in Nursing at Seoul National University (SNU), College of Nursing, Seoul from March, 2012. As a part of my course curriculum I have to do a research project to fulfill the requirements of the course work. Therefore kindly accept my request to do a research project on diabetic patients to access their knowledge towards the diabetes mellitus, at Magna hospital, Hyderabad, India.

Thanking You,

Sincerely,

Swathi Yaramala

Dr. R Santosh
MD, DM.
Consultant Endocrinologist
Regd. Number : 1035/03/03
Magna Clinics, Road No. 1,
Film Nagar, Hyderabad.

서울대학교 간호대학서울시 종로구 연건동 28번지 110-711 대학민국

Appendix 5

FW: Request for permission DKT Personal x

Hardy, Sandy <skhardy@med.umich.edu>
to Martha, me, Pam

Hi Marti,
Please see question below regarding the DKT.

Thank you,
Sandy

~~~~~~~~~~~~~~~~~~~~~~~~~~

Sandy Hardy, MBA, Administrator
University of Michigan
Michigan Diabetes Research Center (MDRC)
Michigan Center for Diabetes Translational Research (MCDTR)
1000 Wall Street
Brehm Tower Room 6107
Ann Arbor MI 48109-5714
(tel) 734.764.6103
(fax) 734.647.2307
Regular Office Hours: Mon 9:30-1:30 and Tues-Fri 8:30-1:30
http://www.med.umich.edu/mdrtc/index.htm

Remember to cite the Michigan Diabetes Research Center (MDRC) and/ publications:

"The project described was supported by Grant Number **P30DK020572** (Diseases" OR the project described was supported by Grant Number **P30** and Kidney Diseases."

Funnell, Martha <mfunnell@med.umich.edu>
to me

You have our permission.

Martha M. Funnell, MS, RN, CDE
Associate Research Scientist
Department of Learning Health Sciences
Michigan Diabetes Research and Training Center
1111 E. Catherine St.
225 Victor Vaughan
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