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Perceived and Actual Knowledge of Diabetes Mellitus and Associated Factors among Nurses at Selected Public Hospitals in Addis Ababa, 2024

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APPROVAL SHEET

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ACRONYMS AND ABBREVIATIONS

ADA – American Diabetic Association

CDC – Center for Diseases Control

DKQ – Diabetes Knowledge Questionnaire

DSRKQ - Diabetes Self Reporting Knowledge Questions

FMOH – Federal Ministry of Health

GDM – Gestational Diabetes Mellitus

IDF – International Diabetic Federation

PAS _ Proportional allocation to size

SRS – Simple Random Sampling

STG – Standard Treatment Guideline

TASH – TikurAnbesa Specialized Hospital

T1DM – Type 1 Diabetes Mellitus

T2DM - Type 2 Diabetes Mellitus

Y12HMC – Yekatit 12 Hospital Medical College

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ABSTRACT

Background: Diabetes mellitus is a chronic diseases affecting huge number of people worldwide. Nurses are expected to have adequate knowledge of diabetes for effective management and care of patients. But studies showed that there are gaps in actual and perceived level knowledge of diabetes of nurses.

Objective: The objective of this study was to assess perceived and actual knowledge of diabetes mellitus and associated factors among nurses at selected Hospitals of Addis Ababa, Ethiopia.

Methods: Cross-sectional study design was used. Simple random sampling method was used to select the 3 hospitals as well as the 358 nurses from the selected hospitals. The adopted Diabetes Basic Knowledge tool and Diabetes Self Reporting tool were used to assess actual and perceived knowledge of diabetes. SPSS software version 25 was used to analyze the data. Percentages, mean, standard deviation were used to describe the data. The t- test, the Pearson's correlation, and the regression analysis were used to analyze the results.

Findings: The mean score of perceived knowledge was 62 ± 4.01 and the mean score of actual knowledge was 28.2 ± 5.20. The regression analysis has shown that for a 1 year increase in age there is -0.126 point decrease in the perceived knowledge of diabetes the nurses participating in this study (β = -0.126, p = 0.015). Participants with diploma level of education had 3.534 times higher perceived knowledge of diabetes than the other educational category (B = 3.534, 95%CI = 1.627, 5.440, p = 0.000). An increase in work experience by 1 year is associated with a decrease in -0.126 point perceived knowledge of diabetes (β = -0.126, p = 0.015). But, the regression analysis has not shown any association between the independent variables with the actual knowledge of diabetes among nurses.

Conclusion: Based on the findings of the study it was concluded that nurses have high perceived knowledge of diabetes but lower actual knowledge of diabetes; and there is significant gap between perceived and actual knowledge of diabetes mellitus among nurses at the selected hospitals of Addis Ababa. However, the study showed that there is no significant association of demographic variables with actual knowledge of diabetes. Based on the conclusion it was recommended that nurses should be encouraged to update themselves and the hospitals should prepare trainings and workshops to increase actual diabetic knowledge of nurses.

CHAPTER ONE: INTRODUCTION

1.1 Background

American Diabetes Association (ADA) defined diabetes mellitus as "a group of metabolic disease characterized by hyperglycemia resulting from defects in insulin secretion, action or both" [1]. Although there are more classifications of diabetes mellitus (DM), the more prevalent ones are Type 1 diabetes mellitus (T1DM) and Type 2 diabetes mellitus (T2DM). T2DM accounts for about 95% of all diabetes mellitus cases and is still increasing as a result of increased weight as well as sedentary life or physical in activity [2].

Diabetes mellitus is among the chronic diseases which results in acute and chronic morbidity as well as mortality for a significant number of people in the world. It is the leading cause of cardiovascular disease, chronic kidney disease, visual loss and non-traumatic amputations in the world [3]. Diabetes mellitus is also highly prevalent and increasing from time to time. The International Diabetes Federation (IDF) projections estimates people with diabetes in the world will be 693 million by 2045 [4]. The prevalence of diabetes mellitus is more in low income countries.

According to the WHO report more than half a billion people worldwide are living with diabetes; and 1.5 million deaths are directly attributed to diabetes each year [5]. A study by Saeedi described that diabetes causes one in nine deaths worldwide [6]. Diabetes incidence can be influenced by national economic conditions such as limited food resources with high carbohydrate diets, and lack of physical education being more likely to occur in low income countries [7].

The prevalence of diabetes in Ethiopia ranged 2.0%- 6.5% with low (2%) in small rural areas. The most reported diabetes associated problems included retinopathy (2.7%-25%), neuropathy (4.8%-35.0%), kidney disease (18.2%-23.8%), hypertension (23.0%-54.82%)[8]. The prevalence of diabetes mellitus in Addis Ababa is 14.8% [9].

Nurses are among frontline health workers in management and care of diabetic patients in giving medications, involved in teaching or diabetic education that guide patients in nutrition, injection of insulin, psychological support, adherence to medications and follow up, and exercise [10].

With the dramatic rise in diabetes worldwide, there is a need for continuing education to improve nursing knowledge about diabetes care and management since nurses play vital role in diabetic management of patients. This knowledge is critical and knowledge gap have impact for effective disease management and prevention of its complications, particularly in primary healthcare settings [11]. In order to give the required services to diabetic patients, nurses should have enough knowledge about diabetes mellitus. However, various researches findings showed that there is gap in actual and perceived knowledge of diabetes in nurses working at hospitals [12, 13, 14].

1.2 Statement of the problem

Diabetes mellitus is a chronic disease that causes both acute and chronic complications. It is a major cause of blindness, kidney failure, heart attacks, stroke and lower limb amputations [2]. Diabetes causes millions of deaths from time to time. According to recent WHO report, the number of people with diabetes is increasing; it rose from 108 million in 1980 to 422 million in 2014 with more rapid prevalence in low and middle income countries [2].

Besides the prevalence, the mortality rate by age has increased by 3% between 2000 and 2019 [2]. It is important to prevent the complications, to treat and care of patients with diabetes. With the dramatic rise in diabetes worldwide, for professionals including nurses, there is a need to update by reading, referring and using revised guidelines to improve nursing knowledge about diabetic prevention, care and management. This knowledge is critical for effective disease management and prevention of its complications, particularly in primary healthcare settings [10]. Nurses are among the primary professionals in preventions of complications, treating and care of patients.

To play their role successfully, nurses should be knowledgeable enough about diabetes. Nurses working with diabetes should play a role of educators, caregivers and motivators as part of diabetic care [15]. Many institutions must rely on staff nurses to conduct initial and continuing diabetes education but they should be equipped with knowledge since the effectiveness of patient education is largely dependent on adequate knowledge [12].

Various research findings showed that there are gaps among nurses in their perceived and actual knowledge of diabetes. A study done on examining perceived and actual diabetes mellitus knowledge among nurses in Saudi Arabia showed that knowledge low actual knowledge (mean score 25.4 or 52%) of the nurses' in knowledge questions; the response to diet and nutrition questions was (41.1%), diabetes pathology and symptoms questions was (42.7%) and (45.7%) was related to diabetes medication [16].A study by Albagawi also showed that nurses had high

perceived knowledge [mean score 38.4 (64 %); and low actual knowledge (mean score 23.2 (47.3 %) of diabetes [14].

Yacoub and his colleagues on their study demonstrated knowledge deficient in clinical and theoretical based topics such as initial treatment of hypoglycemia, insulin storage and preparation, meal planning and duration of action with hypoglycemic agents [13].In a study by Albitobil and his colleagues also found that lowest percentage mean score (33.3 % was observed for knowledge about diabetes diets or nutrition [19].

Other studies have also showed the presence of gaps with high perceived and low actual knowledge among nurses working in hospitals [14, 17]. Studying the extent of the knowledge gap between the actual and perceived knowledge among health professionals and working to narrow the gap is paramount important to improve quality of diabetic care and management.

However, there are no published studies available that show the gaps as well as the level of perceived and actual knowledge among nurses in the area in Ethiopia. The purpose of this study is, therefore, to: assess perceived and actual knowledge of diabetes mellitus and associated factors among nurses at selected Hospitals of Addis Ababa, Ethiopia.

1.3 Significance of the Study

The study is to provide evidence on perceived and actual knowledge of diabetes so that to take measures on knowledge of nurses in improving quality of diabetic management and care. The findings from this study can inform nurses and other health professionals the importance of assessing their level of perceived and actual knowledge of diabetes in order to keep them abreast with the current scientific development in the area. It may give opportunities to policy makers to devise strategies to improve nurses' knowledge in all areas of diabetes care. The findings can also serve as baseline for future large scale study.

CHAPTER TWO: LITERATURE REVIEW

Introduction

This chapter reviews related literature available around perceived and actual knowledge of diabetes mellitus and associated factors among nurses. Recent related articles were searched using internet by using Google Scholar, from other online sources as well as printed articles. The chapter has been organized as: introduction, perceived and actual knowledge of diabetes mellitus and factors associated with knowledge of diabetes mellitus.

2.2 Perceived and Actual Knowledge of Diabetes Mellitus

Diabetes mellitus is among the complex chronic diseases that need continuous treatment, care and follow up in order to control the blood sugar level so that to prevent or reduce acute or chronic complications that results morbidity and mortality. In this regard Baig and his colleagues argued that chronic diabetic mellitus co morbidities that impact individuals' quality of life can be avoided with proper diabetic care as well as diabetic education. This is because individuals' knowledge regarding diabetes mellitus may help identify their diabetic risk, urge them to get the treatment they need and motivate them to take care of their health [27].

According to center for diseases control and prevention (CDC), knowledge regarding diabetes mellitus for family and patient awareness for proper blood glucose monitoring, diabetic care and prevention of complications, is given by a team of health professionals. The team may include endocrinologists, dietitians, ophthalmologists or optometrists, exercise specialists, pharmacists and nephrologists [28]. Regarding nurses, Donna argued that hospital nurses are frequently expected to teach patients with diabetes and their families besides care and treatment [31].Diabetic management and care together with diabetic education provides self-management skill of patients by modifying their life styles including nutrition, glucose monitoring and being physically active in order to prevent complications.

In order to provide effective care and management, and to provide effective education, adequate knowledge is paramount important [12]. In this regard Abdulellah and his colleagues on a study conducted at Saudi Arabia argued that there has been an increase in the scope and

scale of nursing care and education required for patients with diabetes due to the worldwide increase in the incidence and prevalence of diabetes [27].

Various studies conducted on knowledge of health professionals showed that there are discrepancies in what they think they know (perceived knowledge) and what practically they know (actual knowledge) of diabetes among health professionals including nurses working in diabetic care and management. A study conducted on examining perceived and actual diabetes mellitus knowledge among nurses working in tertiary hospital in Saudi Arabia confirmed that knowledge (mean score 25.4 or 52%) of the nurses' responses were particularly low accuracy in knowledge questions; the response to diet and nutrition questions was (41.1%), diabetes pathology and symptoms questions was (42.7%) and (45.7%) was related to diabetes medication [16].

In another study done in Saudi Arabia on levels and predictors of nurses' knowledge about diabetic care and management disparity between perceived and actual knowledge showed that there was lack of adequate knowledge about diabetes with no correlation between what is perceived to be known by nurses and what they actually know. The percentages mean score knowledge about diet/nutrition was (33.3%) [14].

A study conducted in Jordan on assessment of diabetes related knowledge among registered nurses in hospitals in Jordan showed that nurses' actual knowledge of diabetes was moderately associated with their perceived knowledge. Knowledge deficits in diabetes were identified in initial treatment of hypoglycemia, insulin storage and preparation, meal planning and duration of action with hypoglycemic agent [13].

A qualitative study conducted in Sweden reported that none of the participating enrolled nurses could distinguish the different types of diabetes or the symptoms of diabetes [18]. Together these findings indicate that the nursing workforces internationally may experience significant knowledge deficits across many areas of diabetes care [19].

The study conducted in Pakistan also demonstrated considerable gaps in diabetes knowledge of all surveyed participants especially residents in surgery and nurses with overall mean score of the participants was found to be quite low (Mean score 40%) [20].

A study done in Ghana on professional nurses' knowledge showed that knowledge was good 44 (32.4%); however, knowledge level in the area of diabetic complications was generally poor among majority (68.4%) [21].

A survey in Uganda estimated that half of the healthcare workers had only fair knowledge of diabetes, and they generally had little experience in managing diabetic patients [22].A Study done in Rwanda on diabetes health education of nurses' knowledge essential components showed that the nurses that participated in the study exhibited poor knowledge concerning T2DM health education content [23].

Studies like Drass and his colleagues found that perceived knowledge of nurses is inversely proportional to their actual knowledge, that staff nurses were questioned to the adequacy of their knowledge of diabetes and the ability of staff nurses to assess themselves for knowledge deficits accordingly the adequacy of staff nurse knowledge of diabetes and the ability of staff nurses to assess themselves for knowledge deficits [12].

A study conducted in Ethiopia on Nurses' knowledge and attitude towards diabetes foot care in Bahir Dar demonstrated that there was important gaps in nurses' knowledge and attitude towards diabetes foot care [24].

2.3 Factors related to Perceived and Actual Knowledge

There are a number of factors that affect perceived and actual knowledge of diabetes mellitus among nurses including demographic and practice-related factors. These factors need to be uncovered to tailor appropriate interventions at individual and institutional levels to increase the quality of diabetic care and management provided by nurses.

2.3.1 Socio-demographic related Factors

Socio-demographic factors like level of education and experience can affect actual knowledge of diabetes. In this regard Albagawi and his colleagues found that level of education and having long term experience at work, especially in diabetic wards, can significantly predict their actual knowledge of diabetes [14]. In contrary to this a study conducted on diabetes knowledge and training needs among endocrinology nurses at China showed that females had a higher knowledge level than males; and diabetes knowledge levels were also positively associated with age, education, title, and position. In contrast, diabetes knowledge was poorer among nurses with more children and years of work experience [25].

A study finding in Australia showed that practice nurses had a basic understanding of diabetes and its complications, but knowledge was lacking in key areas that it was recommended that practice nurses need appropriate initial and ongoing diabetic education to enable them to manage diabetes competently, deliver diabetes education and facilitate early diagnosis of risk factors for complications [31].

2.3.2 Practice related Factors

There are also various factors related to actual practical work that can affect knowledge of diabetes mellitus. The knowledge and skill acquired at work places like as workshops, trainings, and research based evidences during diabetic management, presence of guidelines during diabetic care and management as well as working experience at endocrine or medical wards with diabetic patients have effect on knowledge of practitioner nurses. In this regard Albagawi and his colleagues found that lack of access to diabetes guidelines, lack of attending courses/workshops, and having a poor or fair self-perception of competence in diabetes care can significantly predict nurses' perceived knowledge [14].

The same study also showed that external factors like, training attendance, self-perception of competence in diabetes can significantly predict nurses' diabetic knowledge. Access to specific diabetes education programs; providing skills training to enhance perceived competency;

ensuring all staff have ready access to diabetes management policies or guidelines can also affect perceived and actual knowledge of diabetes [14].

To use research evidences in practical world is useful to provide and update knowledge in the treatment and care of patients. Researches also suggest that use of research evidence can influence professional practices of nurses as far as they help professionals to update their knowledge [26].

CHAPTER THREE: OBJECTIVES OF THE STUDY

3.1 General Objective

- To Assess the Perceived and Actual Knowledge of Diabetes Mellitus and Associated Factors Among Nurses at Selected Public Hospitals in Addis Ababa, Ethiopia, 2024.

3.2 Specific Objective

- To determine the perceived knowledge of diabetes mellitus in nurses at selected hospitals of Addis Ababa
- To determine the actual knowledge of diabetes mellitus in nurses working at selected hospitals of Addis Ababa
- To assess factors associated with perceived and actual knowledge of diabetes among nurses at selected public hospitals in Addis Ababa

CHAPTER FOUR: METHODS AND MATERIALS

This chapter deals with study area, research design, populations, sample and sampling procedures, data gathering tools and procedures, variables, data analysis, ethical consideration, and disseminations of the findings of the study.

4.1 Study Area and Period

This study was conducted in Addis Ababa, Ethiopia. Addis Ababa is the capital city of Ethiopia, and the head quarter of African union and other international organizations. According to the central statistics agency report of census 2007, Addis Ababa city has a total population of 3,384,569.

In the city there are 13 public hospitals (5 federal, 6 under Addis Ababa health bureau, 1 owned by the police force and 1 owned by armed force) distributed throughout 11 sub-cities.

The study was conducted in three selected public hospitals found in Addis Ababa, the capital of Ethiopia: at Tikur Anbesa Specialized Hospital (TASH), Zewditu Memorial Hospital (ZMH) and Yekatit 12 Hospital Medical College (Y12HMC).

TASH is located at Lideta Subcity. It served more than 50 years as teaching and medical hospital. It has its diabetic unit serving for patients from referral hospitals and other health institutions. Now it is under the federal Ministry of Health (FMoH).

Zewditu Memorial Hospital is located at Kirkos Sub city and is under Addis Ababa Health Bureau. It was built, owned and operated by the Seventh - day Adventist Church but was nationalized during the Derg regime in 1976.

Yekatit 12 Hospital Medical College is one of the oldest hospitals in Ethiopia. It is located at Arada Sub city and is under Addis Ababa Health Bureau. It was named as Bethsaida. It was renamed to Y12HMC when the Derg Regimme came to power in 1970. The hospital served for 100 years as both medical and teaching institutions. It has its diabetic clinic for diabetic patients.

The study was conducted from February to March 2016 E.C.

4.2 Study Design

An institution-based cross-sectional survey design was used in this study.

4.3 Population

4.3.1 Source Population

The source populations were all staff nurses working in Addis Ababa public hospitals.

4.3.2 Study Population

The study populations were all staff nurses working in the three selected public hospitals in Addis Ababa.

4.4 Eligibility Criteria

4.4.1 Inclusion Criteria

All staff nurses hired and working in the three selected public hospitals in Addis Ababa who were available during the study were included.

4.4.2. Exclusion Criteria

Nurses who were on annual leave and who were seriously ill during data collection period in the three selected Addis Ababa public hospitals were excluded from the study.

4.5 Sample size determination

The sample size was determined by using a sample size determining single population proportion formula and considering the following assumptions:

- There is no previous study so that p was taken as 50%
- Z = Standard normal distribution value at 95%, confidence level of $Z\alpha/2$ = 1.96, and margin of error (d) = 5%:

$n = (Z\alpha/2)2\ P\ (1 - P)/\ (d)^2$ n = (1.96)2 0.5(1 – 0.5)/ (0.05)2 = 384

The final sample size was determined as follows by using correction formula:

$nf = no/\ [1 + no/N]$

Where nf is the final sample size, no is the initial sample size 384 and N is the number of staff nurses working in Addis Ababa government hospitals:

$nf = no/1 + no/N$

384 /1 + 384/3010

= 384/1.1275 = 341

Considering a 10% non-response rate, the total sample size is

10/100× 341 = 34

34 + 341 = 375

4.6 Sampling procedure

A simple random sampling method was used to select the three hospitals from twelve public hospitals in Addis Ababa. After allocating nurses from the three selected public hospitals by proportional allocation to size, the participants were selected by using simple random sampling.

Table 1: Showing sample size by proportional allocation to size of the Study

Hospitals	**TASH**	**Yekatit12 HMC**	**ZMH**	**Total**
No of nurses	800	480	260	1560
PAS (nj=n/NxNj	193	115	67	375

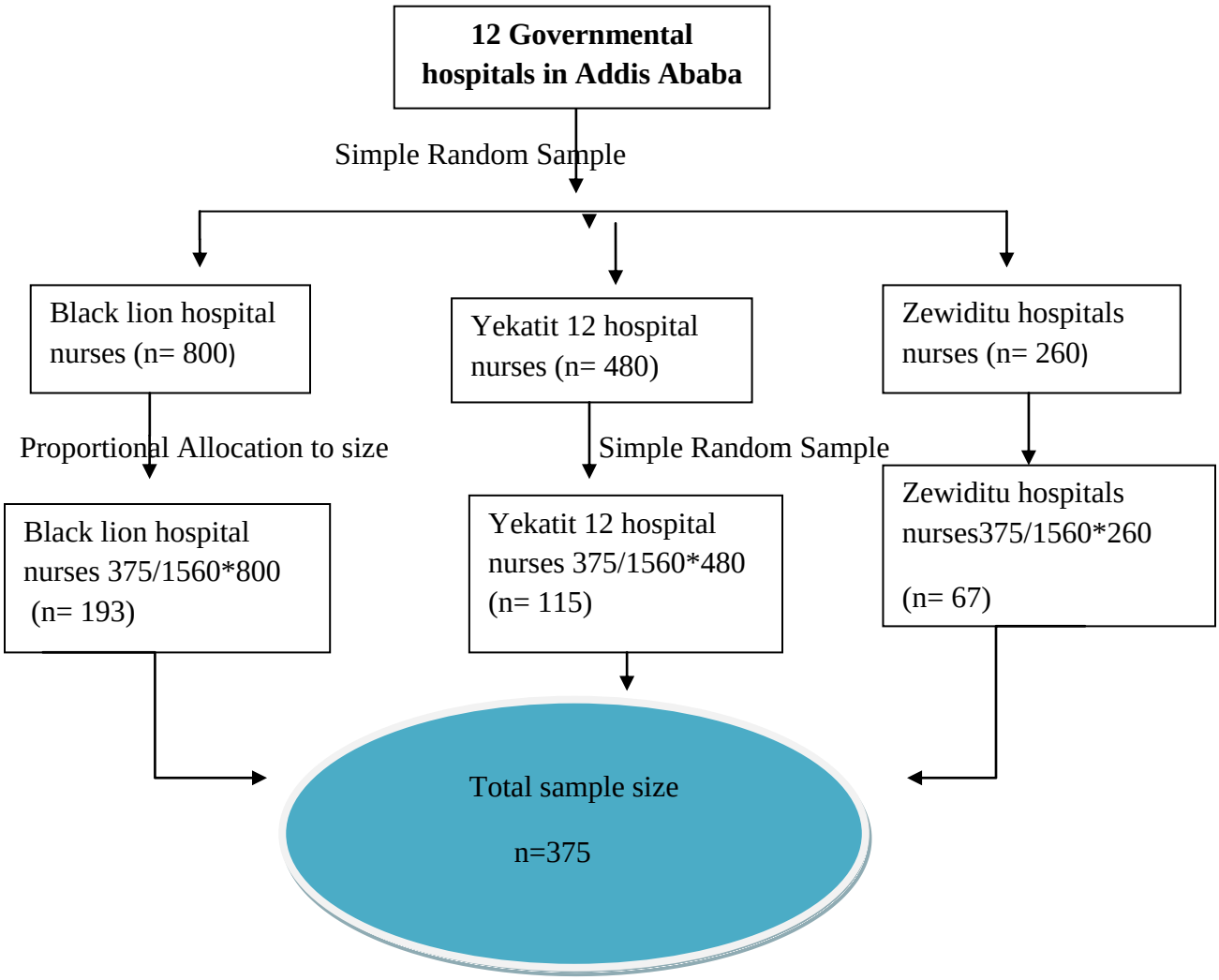

Figure 1.The schematic presentation of sampling procedure to select study participants from Addis Ababa government hospitals.

4.7 Variables of the Study

4.7.1 Dependent Variables

The dependent variables of the study were:

- Actual knowledge of diabetes mellitus
- Perceived knowledge of diabetes mellitus

4.7.2 Independent Variables

The independent variables of the study include:

Socio-demographic factors:

-Age, years of experience, Gender, Level of education

Practice related factors:

-Presence or absence of guideline, previous diabetes training participation, Access to research based evidence and ward the nurses worked, competence

4.8 Operational definition

Perceived Diabetes knowledge: is self-assessment or belief of their own, which was measured using the Diabetes Self-Report scale. It is a Likert scale with 5 response options. The total score ranges from 15 – 75. High score was considered as higher the perceived diabetic knowledge of nurses.

The Actual Diabetes Knowledge: is factual understanding which was measured using the Diabetes Basic Knowledge test. The score ranges from 0 – 49. The score above the median was considered good actual diabetic knowledge.

4.9 Data collection Tools

The Diabetes Self-Report Tool (DSRT) and Diabetes Basic Knowledge Tool (DBKT) self-report questionnaires were used to collect data on nurses' perceived and actual knowledge about diabetes [12]. A pre-designed questionnaire were also used to collect nurses' demographic and practice-related characteristics, including gender, age, level of qualification, years of experience of nurses, participation in diabetes-related training, access to diabetes management guidelines,

access to evidence based practice and experience at medical or endocrine unit in the care and management of diabetic patients.

Perceived knowledge about diabetes was assessed using the DSRT, which included 15 items related to the etiology of types 1 and 2 diabetes, complications, medications, symptom management, blood glucose monitoring, dietary recommendations and diabetic ketoacidosis. This tool measures the nurses' perceived ability to describe or complete tasks related to diabetes through agreement or disagreement with these items using a five-point Likert scale, where responses were scored from 5 for strongly agree to 1 for strongly disagree. Accordingly, the overall score for all items ranged from 15 to 75, with a higher score denoting greater perceived knowledge.

Actual knowledge about diabetes was assessed using the DBKT, which included 49 multiple-choice questions related to knowledge about diabetes, including medications, pathology, symptoms, diet, blood glucose monitoring and care for diabetic patients [15]. On scoring each correct answer as 1 and incorrect answer as 0, the overall score for all items ranged between zero and 49, with a higher score denoting greater actual knowledge.

The content validity index of the study tool among Saudi nurses was previously established at 0.96[14]. Internal consistency was acceptable, as revealed by Cronbach's alpha coefficients of 0.896 and 0.893 for DBKT and DSRT respectively.

4.10 Data Collection Procedure

A structured questionnaire was adopted and some socio-demographic questions were developed after reviewing the relevant literatures and used for data collection. The self-administered questionnaire was also carefully designed; and English version was used for data collection. Data was collected by five professionals two degree and three diploma nurses from selected hospitals. For data collectors relevant training was given by the investigator to make them familiar with the data collection tool and to reduce bias. Data was collected after obtaining informed consent from

the study participants by the data collectors. Completeness of questionnaire was regularly checked and finally the reviewed questionnaires were returned to the researcher.

4.11 Data Quality Assurance

In order to maintain quality of the data, data collectors were oriented in data collection procedures by the researcher for half day. Before actual data collection time, the questionnaire (tool) was checked for clarity and comprehensiveness to minimize bias. Pre-testing of the questionnaire was carried out on the 5% of sample size in St Pawlos Millennium Hospital 3 weeks before the data collection. Then, based on the finding of the pretest, the questions were modified for wording and clarity. The most recently reported Cronbach's alpha coefficient scores demonstrating the internal consistency of the Diabetes Self-Report Tool and the Diabetes Basic Knowledge Tool were 0.896 and 0.893 for DBKT and DSRT respectively. The collected data was then reviewed and checked for completeness and consistency by the researcher.

4.12 Method of data analysis

Data entry, cleaning and analysis was by using SPSS software version 25. Data Descriptive statistics (frequencies, percentages) were used to describe the respondents' demographic characteristics (gender, age, level of qualification, and years of experience), and practice-related factors (absence and presence of guidelines, participation in courses/workshop, and access to evidence based practice). One sample t- test was used to determine the level of perceived diabetic knowledge; and the independent *t*-test was used to compare the mean scores between perceived and actual knowledge of diabetes. Correlation between perceived and actual knowledge was tested using Pearson's correlation coefficient. Multiple linear regression analysis was used to estimate or predict the relationship or association between the perceived diabetic knowledge and independent variables while logistic regression used to see the association between actual diabetes knowledge and the independent variables. For both regressions models the assumptions for normality of residual and multicollinearity was met. Significance of statistical association was tested using 95% confidence interval (CI) and p value (<0.05).

4.13 Ethical Consideration

Ethical clearance was obtained from Addis Ababa University (AAU), College of Health Sciences, Department of Nursing, Institutional Review Board (IRB) research committee; and Addis Ababa Health Bureau. After obtaining official letter from Addis Ababa Health Bureau, a permission letter was provided to Tikur Anbesa Specialized Hospital, Zewditu Memorial Hospital and Yekatit 12 Hospital Medical College before data collection. The study participants were informed about the objective, rationale, their right to participate or not to participate in the study, and expected outcomes of the study, and they were also asked to participate in the study on voluntarily bases.

4.14 Dissemination of the result

At the end, result of the study will be presented to Addis Ababa University College of Health Sciences School of Nursing and Midwifery and to research methodology instructor after completion of the study and the course Nursing Research Methodology. Result of the document will be submitted to Addis Ababa University and to respective study facilities for planning and interventional purpose. The result will also be submitted for the concerned governmental body and national level as well for those individuals who want to conduct further research on it. This research is the property of document is Addis Ababa University. It will be published in the University's journal.

CHAPTER FIVE: RESULTS OF THE STUDY

This chapter is about the presentation of results of the data collected.

5.1 Characteristics of the Respondents

For the study a total of 375 samples of nurses working at three public hospitals (TikurAnbesa Specialized Hospital (TASH), Yekatit 12 Hospital Medical College (Y12HMC), and Zewditu Memorial Hospital (ZMH)) were selected for questionnaires. However, 11 (2.9 %) sample subjects did not return the questionnaires; and 6 (1.6 %) of the questionnaires were incomplete. The rest 358 (95.5 %) questionnaires were responded well and returned back.

As Table 2 below shows, 266 (74.3 %) of the respondents were in the age category between 20 - 39 years and 92 (25.7 %) were in the age category between 40 – 59 years. Gender wise, 222 (62 %) of respondent samples involved in the study were females while 136 (38 %) were males.

With respect to level of education (see Table 2 below), 33 (9.2 %) of the respondents were diploma holders, 270 (75.4 %) were first degree holders while 55 (15.4 %) were masters holder nurses. Regarding to the year of experience, 100 (27.9 %) of the respondents have experience of 1-5 years, 138 (38.5 %) of the respondents have 6-12 years experiences, and 120 (33.5 %) of the respondents have more than 12 years experiences.

Regarding to experience at medical ward or endocrine unit, as Table 2 below shows, 205 (57.3 %) of the respondents do not have experience of working at medical or endocrine wards; while 153 (42.7 %) of the respondent nurses do have experiences of working at medical or endocrine wards in managing diabetic cases.

As can be seen from Table 2 below, with regard to participation in training on diabetic management, 107 (29.9 %) of the respondents were participated in trainings on topics of diabetic care or management; while 251 (70.1 %) of the respondents did not participated in trainings related to diabetic management.

Most, 55 (43.3 %) of the respondents (Table 2) responded as they have access of research based evidences for diabetic management but 203 (56.7 %) of the respondents responded as they have no access of research based evidences for diabetic management.

Regarding to the presence of guideline for diabetic care and management at their hospitals, 168 (46.9 %) of the respondent nurses responded as they know the presence of guideline for diabetic management; 147 (41.1 %) responded as there is no management guideline for diabetic care and management; while 43 (12 %) of the respondents do not know whether there is guideline for diabetic care and management or not.

Table 2: Demographic Characteristics of the Respondent Nurses

Variables	**Characteristics**	**Number**	**Percentage**
Age	20- 39	266	74.3
	40 – 59	92	25.7
	$\geq$ 60	-	-
Gender	F	222	62
	M	136	38
Level of education	Diploma	33	9.2
	Degree	270	75.4
	Masters	55	15.4
Year of Experience	1- 5 years	100	27.9
	6-12	138	38.5
	>12 years	120	33.5
Did you worked at endocrine/medical ward with diabetic cases	Yes	153	42.7
	No	205	57.3
Did you participate in Training about diabetic management	Yes	107	29.9
	No	251	70.1
Do you have access of research based evidence for diabetic management	Yes	155	43.3
	No	203	56.7
Do you have guideline for diabetic management	Yes	168	46.9

No	147	41.1
I don't know	43	12

5.2 Nurses' perceived knowledge about diabetes

Based on a highest maximum score of 75 using the DSRT, the overall mean score of perceived knowledge was 62.33±4.0, corresponding to a percentage mean score of 83%. Regarding to the etiology of type 1 diabetes mellitus, Table 3 Item one below showed that 93.9 % of the respondent nurses with [M=4.4] either strongly agreed or agreed but few 5.5 % of the respondent nurses disagreed or strongly disagreed to the statement that says "I can describe the etiology of type 1 diabetes". Regarding to the etiology of type 2 diabetes mellitus, as Table 3 below shows, 91.6 % of the respondent nurses with [M=4.2] either strongly agreed or agreed as they can describe the etiology of type 2 diabetes mellitus**.**

With respect to basic treatment plan of type 1 diabetes mellitus (see Table 3 below), 88.9 % of the respondent nurses with [M=4.2] either strongly agreed or agreed to statement "I can describe the basic treatment plan for Type 1 Diabetes". Regarding to basic treatment plan of type 2 diabetes mellitus (see Table 3 below), 92 % of the respondent nurses with [M=4.1] either strongly agreed or agreed as they can plan for treatment of type 2 diabetes mellitus.

With regard to the nursing care of a patient for mild hypoglycemia (see Table 3 Item 5 below), 98.3 % of the respondent nurses with [M=4.3] either strongly agreed or agreed that they can manage the nursing care of a patient experiencing mild hypoglycemia.

Regarding to managing the nursing care of a person with Diabetes that experiences loss of consciousness (see Table 3 Item 6 below), 90.6 % of the respondent nurses with [M=4.3] either strongly agreed or agreed to the statement " I can manage the nursing care of a person with diabetes mellitus that experiences loss of consciousness".

With respect to instructing a person with diabetes mellitus on self-care management for a "sick day" (see Table 2 Item 7 below), 87.2 % of the respondent nurses with [M=4.2] either strongly agreed or agreed that they can instruct a person with diabetes mellitus on self-care management

for a “sick day”. Concerning assessing for the development of diabetic ketoacidosis (DKA) (see Table 3 Item 8 below), 86.2 % of the respondent nurses with [M=4.3] either strongly agreed or agreed to the statement “I can assess for the development of ketoacidosis”.

Regarding to the management of a patient with diabetes experiencing hypoglycemia without DKA (see Table 3 below), 91.9 % of the respondent nurses with [M=4.1] either strongly agreed or agreed as they can manage a patient with hypoglycemia without DKA.

As Table 3 Item 11 below, regarding knowledge about the action and effect of insulin shows, 83.9 % of the respondent nurses with [M= 3.9] either strongly agreed or agreed to the statement “I can instruct/describe the action and effect of insulin”.

With respect to the steps of the procedure for administering insulin (see Table 3 Item 12 below), 85.3 % of the respondent nurses with [M= 3.9] either strongly agreed or agreed as they can list the steps of the procedure for administering insulin. Regarding to instructing on daily personal care for Someone with diabetes, as Table 3 Item 14 below shows, 84.6 % of the respondent nurses with [M=4.2] either strongly agreed or agreed to statement “I can instruct on daily personal care for Someone with diabetes”.

With respect to the action and effect of oral hypoglycemic agents (see Table 3 Item 15 below), 52.5 % of the respondent nurses with [M=3.4] either strongly agreed or agreed to the idea that says I can describe the action and effect of oral hypoglycemic agents.

Table 3 Perceived knowledge of Nurses

S. No.	Statements	SA	A	NO	DA	SDA	M	t
1	I can describe the etiology of T1 DM	48.6	45.3	2.8	2.2	1.1	4.4	0.00
2	I can describe the etiology of T2 MD	37.7	53.9	3.4	3.6	1.4	4.2	0.00
3	I can describe the basic treatment plan for Type 1 Diabetes	45.6	43.3	7.5	1.7	1.4	4.2	0.00
4	I can describe the basic treatment plan for	28.9	63.1	4.7	1.1	1.7	4.1	.000

	Type 2 Diabetes.							
5	I can manage the nursing care of a patient experiencing mild hypoglycemia	34.4	63.9	0	1.1	0	4.3	0.000
6	I can manage the nursing care of a person with Diabetes that experiences loss of consciousness	35.3	55.3	3.3	5.6	0	4.3	.000
7	I can instruct a person with diabetes on self-care management for a “sick day”.	48.3	38.9	0	12.2	0	4.2	.000
8	I can assess for the development of diabetic ketoacidosis.	50.6	35.6	6.7	6.7	0	4.3	.000
9	I can manage the nursing needs of a person with diabetes experiencing hyperglycemia without ketosis	31.1	60.8	1.7	4.3	1.7	4.1	.000
10	I can identify the long-term complications associated with diabetes	19.7	70.8	3.6	5.0	.3	4	.000
11	I can instruct/describe the action and effect of insulin	7.2	76.7	14.2	1.4	0	3.9	.000
12	I can list the steps of the procedure for administering insulin	7.0	78.3	8.8	1.6	0	3.9	.000
13	I can identify three sites for the administration of insulin.	49.6	49.6	0	.3	0.3	4.4	.000
14	I can instruct on daily personal care for someone with diabetes.	50.0	34.6	8.4	7	0	4.2	.000
15	I can describe the action and effect of oral hypoglycemic agents	10.9	41.6	24.0	22.3	1.1	3.4	.000
Average (overall mean)							62	

Note: SA – Strongly agree A- Agree NO – No opinion DA- disagree SDA- Strongly disagree M- mean t- One sample t-test p- value

5.3 Actual Diabetic knowledge of nurses

As Table 4 below shows, of the maximum possible score of 49, for each 358 respondent nurses were checked or computed. Accordingly, the actual maximum correct response score was 39 (79.6%) while the minimum response score was 15 (30.6). The average (mean) response score was 28.2 (57.4 %). The median was 31 (63 %), and standard deviation (SD) scores is 4.0. The score below the median was considered as poor and score above the median was considered as good.

Table 4 Showing Actual Diabetic knowledge of respondent nurses

No. of respondents	Scores								
	Maximum		Minimum		Mean		Median		Standard deviation
358	Out of 49	%	Out of 49	%	Out of 49	%	Out of 49	%	4.01
	39	79.6	15	30.6	28.15	57.4	31	63	

5.4 Correlation between Perceived and Actual Knowledge of Diabetes of Nurses

As table 5 below shows there is negative correlation between the mean scores of the diabetic self-reporting knowledge test (perceived) and diabetic basic knowledge test (actual knowledge) of diabetes (r= -0.031, P=0.562).

Table 5 Pearson correlation between Actual and Perceived knowledge of diabetes

		Mean actual knowledge Score	Mean Perceived score
Mean Actual knowledge Score	Pearson Correlation	1	-.031
	Sig(2tailed)		.562
	N	358	358
Mean Perceived score	Pearson Correlation (r)	-.031	1
	Sig.(2tailed)	.562	
	N	358	358

r= Pearson's correlation

5.5 Factors associated with perceived knowledge of diabetes among nurses

Multiple linear regression analysis of demographic and practice-related variables as predictors of perceived knowledge scores shows that the model was significant for perceived knowledge (P = .000).

Table 6 below shows that the findings from the multiple linear regression analysis for the perceived knowledge score. Accordingly, for a 1 year increase in age there is -0.126 point decrease in the perceived knowledge of diabetes the nurses participating in this study (β = -0.126, p = 0.015). Participants with diploma level of education had 3.534 times higher perceived knowledge of diabetes than the other educational category (B = 3.534, 95%CI = 1.627, 5.440, p = 0.000). An increase in work experience by 1 year is associated with a decrease in -0.126 point perceived knowledge of diabetes (β = -0.126, p = 0.015).

Table 6 Multiple linear regressions of predictors of perceived knowledge about diabetes among nurses

Model	Unstandardized Coefficients		standardized Coefficients Beta	Sig.	95.0 % confidence interval for B		Collinearity statistics	
	B	Std Error			Lower Bound	Upper Bound	Tolerance	VIF
1 constant	86.893	2.662		.000	81.657	92.129		
Age in years	-.112	.046	-.126	.015	-.202	-.022	.978	1.023
Sex male	.358	.575	.032	.534	-.773	1.488	.948	1.055
Educational level diploma	3.534	.968	.191	.000	1.627	5.440	.939	1.065
Educational level MSC	1.834	.775	.124	.019	.309	3.359	.944	1.060
Work experience of respondents	-.108	.044	-.126	.015	-.194	-.021	.987	1.014
Do you worked at medical or endocrine unit with diabetes cases?	-.835	.557	-.077	.135	-1.929	.260	.973	1.027
Did you participate in training about Diabetes mellitus management	-.361	.608	-.031	.553	-1.556	.834	.954	1.048
Do you have access of research based evidence for diabetic management?	.472	.562	.044	.402	-.634	1.578	.950	1.052

5.6 Factors associated with actual knowledge of diabetes among nurses

The data was not fit for multiple linear regressions. So, logistic regression was done to see the association of demographic characteristic variables (the age, the sex, level of education, experience, working experience at diabetic or endocrine ward, participating in training related to diabetes, presence of research evidence during diabetes management, and the presence of guideline in diabetic management) with the overall mean actual knowledge of diabetes of nurses.

As can be seen from Table 7 below, the p-value for all variables is above 0.05. This shows that there is no any demographic variable statistically significantly associated with the actual diabetic knowledge of nurses.

Table 7 Logistic Regression of Actual knowledge of diabetes among Nurses

Variables	B	S.E	Wald	Df	Sig.	Exp (B)	95% CI	
							lower	Upper
Age of the respondents	.218	.264	.682	1	.409	1.243	.741	2.085
Sex of the respondents (1)	-.036	.224	.025	1	.874	.965	.621	1.498
Level of education			2.915	2	.233			
Level of education (1)	.350	.382	.841	1	.359	1.240	.671	3.001
Level of education (2)	.751	.457	2.703	1	.100	2.118	.866	5.583
Experience of respondents	-.024	.139	.029	1	.864	.976	.744	1.282
Did you work at endocrine or medical ward	.097	.219	.198	1	.656	1.102	.718	1.694
Participation in training in	-.193	240	.650	1	.420	.824	.515	1.318

DM management								
Access for research evidence	-.066	.226	.087	1	.769	.936	.601	1.457
Presence of guideline for management	-.105	.170	382	1	.537	.900	.646	1.256

CHAPTER SIX: DISCUSSION OF THE STUDY

Most of the respondents (Table 2) were young according to WHO age categorization [2]. Gender wise, most 222 (62 %) of respondent samples involved in the study were females. With respect to level of education most of the respondents involved were first degree holders.

Regarding to the year of experience (see Table 2), most of the respondents have experience of 1-5 years. With respect to experience at medical ward or endocrine unit, most of the respondents worked at different wards than medical and endocrine unit.

With regard to participation in training on diabetic management (Table 2), more than half of the respondents did not take training related to diabetic management. Most of the respondents have no access of research based evidences for diabetic management. Regarding to the presence of guideline for diabetic care and management at their hospitals, most of the respondents know the presence of guideline for diabetic management.

With regard to the etiology of diabetes mellitus, (see Table 3 Item 1 and 2 above), most of the respondent nurses either strongly agreed or agreed to the statement that says “I can describe the etiology of diabetes”. The p-value for one sample t-test (t= 0.00) is statistically significant which shows that they believe they have knowledge of describing the etiology of diabetes mellitus. This finding is similar to the findings of Albagawi who found that nurses scored high to etiology related perceived knowledge questions [14].

With respect to basic treatment plan of diabetes mellitus (see Table 3 Item 3 and 4 above), most of the respondent nurses either strongly agreed or agreed to the statement “I can describe the basic treatment plan for Diabetes”. The p-value for one sample t-test (t= 0.00) is also statistically significant showing that they perceive as they know the basic treatment plan of diabetes. This finding is similar to the findings of Albagawi and Drass who found high perceived knowledge of nurse to diabetic self-reporting questions [12,13, 14,16].

With regard to the nursing care of a patient for mild hypoglycemia (see Table 3 Item 5 above), most of the respondent nurses either strongly agreed or agreed that they can manage the nursing care of a patient experiencing mild hypoglycemia. The p-value for one sample t-test (t= 0.00) is

statistically significant showing that they perceive they can manage the nursing care of a patient experiencing mild hypoglycemia. This finding is similar to the findings Drass [12, 13,16].

Regarding to managing the nursing care of a person with Diabetes that experiences loss of consciousness (see Table 3 Item above), most of the respondent nurses either strongly agreed or agreed to the statement " I can manage the nursing care of a person with diabetes mellitus that experiences loss of consciousness". The p-value for one sample t-test (t= 0.00) is statistically significant showing that they perceive they can manage a patient with diabetes with loss of consciousness. This finding is similar to the findings of Albagawi [14,16].

With respect to instructing a person with diabetes mellitus on self-care management for a "sick day" (see Table 2 Item 7 above), most of the respondent nurses either strongly agreed or agreed that they can instruct a person with diabetes mellitus on self-care management for a "sick day". The p-value for one sample t-test (t= 0.00) is statistically significant indicating that they perceive they know the basic treatment plan of diabetes. This finding is similar to the findings of Albagawi [14].

Concerning assessing for the development of diabetic ketoacidosis (DKA), (see Table 3 Item 8 above), most of the respondent nurses either strongly agreed or agreed to the statement "I can assess for the development of ketoacidosis". The p-value for one sample t-test (t= 0.00) is also statistically significant which indicates that they perceive they have knowledge to assess for the development of diabetic ketoacidosis of a patient with diabetes. This finding is similar to the findings of Albagawi [14].

Regarding to the management of a patient with diabetes experiencing hypoglycemia without DKA (see Table 3 Item 9 above), most of the respondent nurses either strongly agreed or agreed as they can manage a patient with hypoglycemia without DKA. The p-value for one sample t-test (t= 0.00) is statistically significant which shows that they perceive they have knowledge of managing hypoglycemia with no DKA. The finding is similar to the findings of Albagawi and Drass [12, 14].

With respect to identifying the long term complications associated with diabetes mellitus (see Table 3 Item 10 above), most of the respondent nurses either strongly agreed or agreed as they

can identify the long-term complications associated with diabetes. The p-value for one sample t-test (t= 0.00) is also statistically significant showing that they perceive they have knowledge to identify the long-term complications associated with diabetes mellitus. The finding is similar to the findings of Albagawi and Drass [12, 14].

As Table 3 Item 11 above regarding knowledge about the action and effect of insulin shows, most of the respondent nurses either strongly agreed or agreed to the statement "I can instruct/describe the action and effect of insulin". The p-value for one sample t-test (t= 0.00) is also statistically significant showing that they perceive they know how to instruct/describe the action and effect of insulin. The finding is similar to the findings of Albagawi [13, 14,16].

With respect to the steps of the procedure and site for administering insulin (see Table 3 Item 12 and 13 above), most of the respondent nurses either strongly agreed or agreed as they can list the steps of the procedure for administering insulin. The p-value for one sample t-test (t= 0.00) is statistically significant which shows that they perceive they know to list the steps of the procedure for administering insulin. This finding is similar to the findings of Drass [12].

Regarding to instructing on daily personal care for someone with diabetes, as Table 3 Item 14 above shows, most of the respondent nurses either strongly agreed or agreed to statement "I can instruct on daily personal care for someone with diabetes". The p-value for one sample t-test (t= 0.00) is statistically significant showing that they perceive they have knowledge to instruct on daily personal care for someone with diabetes. The finding is similar to Albagawi [14].

With respect to the action and effect of oral hypoglycemic agents (see Table 3 Item 15 above), most of the respondent nurses either strongly agreed or agreed with the idea that says I can describe the action and effect of oral hypoglycemic agents. The p-value for one sample t-test (t= 0.00) is statistically significant showing that they perceive they have knowledge of describing the action and effect of oral hypoglycemic agents. This finding is similar to the findings of Albagawi [14]. In present study the perceived knowledge of nurses show that, the maximum score was 72 (96 %) and the minimum score was 41 (54.7 %) and the overall mean score 62 (82.7 %) with standard deviation of 4.1 which indicates high scores or high perceived knowledge of diabetes to self-reporting questions. This finding is similar to the finding of Alotaibi [14, 16,19]

Structured questionnaires with 49 item questions were distributed to respondent nurses to assess actual knowledge of diabetes mellitus. The questionnaire was adopted, which was, developed by Drass and his colleagues [14].

In order to assess the actual knowledge of the respondent nurses, the Diabetic Basic Knowledge Test (DBKT) response scores for each respondent nurses were checked out of 49 to determine the level of actual knowledge of diabetes mellitus among nurses at the selected hospitals of Addis Ababa [12].

As Table 4 above shows, of the maximum possible score of 49, for each 358 respondent nurses were checked or computed. Accordingly, the actual maximum response score was 39 (79.6%) while the minimum response score was 15 (30.6 %). The average (mean) response score was 28.2 (57.4 %); the median was 31 (63 %) and the standard deviation (SD) score was 4.0. The score below the median was considered as poor and score above the median was considered as good. Accordingly 177 (49.4 %) were poor and 181 (50.6 %) were good. None of the nurses answered all of the multiple-choice questions correctly.

As Table 5 above shows there is negative correlation between the mean scores of the diabetic self-reporting knowledge test (perceived) and diabetic basic knowledge test (actual knowledge) of diabetes. This shows that they have negative correlations in that respondents have higher perceived but lower actual knowledge of diabetes. The p-value for independent t- test ($t = 0.031$) is statistically significant showing that there is gap between perceived and actual knowledge among nurses at the selected hospitals of Addis Ababa.

As Table 6 above of regression analysis shows, although there are mean differences among the socio-demographic factors or variables, it is not statistically significant to predict the actual knowledge of diabetes mellitus in the study. This finding is different from the findings of Albagawi who found that either gender or age was significant actual or perceived knowledge predictor. In contrary to this Albagawi also found that level of education has predicted both actual and perceived knowledge in that master holder nurses scored significantly higher than diploma and BSc nurses.

CHAPTER SEVEN: CONCLUSION AND RECOMMENDATIONS

7.1 Conclusions

Based on the findings of the study the following conclusions were made:

The finding showed that there is significant gap between perceived and actual knowledge of diabetes mellitus among nurses at the selected hospitals of Addis Ababa. The results of the findings also showed that nurses have high perceived knowledge of diabetes but lower actual knowledge of diabetes. However, the study showed that there is no significant association between variables and actual knowledge of diabetes

7.2 Recommendations

Based on the conclusions of the study, the following recommendations were forwarded to fill the diabetes knowledge gaps among nurses at selected hospitals of Addis Ababa so as to improve patient quality care and outcomes:

- The hospitals better prepare appropriate trainings, workshops or other methods regarding diabetes mellitus by collaborating with Addis Ababa City Health Bureau and Federal Ministry of Health to fill gaps of nurses' knowledge to increase the actual knowledge of nurses.
- The hospitals also better make management guidelines, research articles and online course related to diabetes available to help health professionals increase their knowledge in care and treatment of patients.
- Rotations could be arranged to provide opportunities to work with experienced diabetes clinicians and gain increased experience as well as knowledge in providing diabetes care.
- Nurses better use research based evidences and updated sources to update their knowledge while managing diabetes mellitus
- Nurses also be encouraged to read guidelines, research evidences, books and other updated information to improve their knowledge regarding diabetes, as well-educated nurses can educate other nurses and can better contribute to patients' care, education and outcomes

- Collaborative efforts involving interdisciplinary teams, mentorship and peer support, especially from experienced staff, can contribute to reduce the diabetes knowledge gaps among nurses
- Policy makers better focus on activities that increase actual knowledge of nurses; more researchers are to be done in the area

7.3 Strength of the study

The study used publicly available primary data from nurses, which may make the study more accurate and reliable. The tools used in the study were adopted standard questionnaire which were tested for their validity. The questionnaire was also pretested. There was also high response rate of the questionnaire.

7.4 Limitation of the study

The length of time needed for nurses to complete all questionnaires exceeded 40 min. A practical, reliable tool that captures current diabetes-related knowledge and practices would be important in this type of study. The DBKT questionnaire needs to be routinely updated so it can be used effectively in this rapidly evolving field of diabetes to address more current issues, new medications, current technology and recent trends in diabetes. The researcher could not found a study conducted so far in Ethiopia on this topic; no enough literature was available to discuss in national context. The study may be subjected to response set bias from the respondents.

8. REFERENCES

1. American Diabetes Association; Diagnosis and Classification of Diabetes Mellitus. Diabetes Care. 2014; 37(1): 81-90. https://pubmed.ncbi.nlm.nih.gov/24357215/

2. WHO Global report on diabetes.

3. National Standard Treatment Guideline of 2021.http;//fmhaca.gov.et

4. Williams R, Karuranga S, Malanda B, Seeadi P, Basit A, Besancon S, BommerCh, Esteghamati A, Ogutsova, Zhang P &Colagiuri S (2020). Global and regional estimates and projections of diabetes related health expenditure: Results from the International Diabetes Federation Diabetes Atlas, 9th ed. Volume 162. https://doi.org/10.1016/j.diabres.2020.108072

5. WHO Global Report of 2023.www.who.int

6. Saeedi P, Salpea P, Karuragna S, Petersohn I, Malanda B, Gregg E, Unwin N & Williams Mortality attributable to diabetes in 20-79 years old adults. Results from the International Diabetes Federation Diabetes Atlas, 9th ed. Diabetes Res ClinPract. 2020 Apr: 162: 108086. https://pubmed.ncbi.nlm.nih.gov/32068099

7. International Diabetes Federation. IDF Diabetes Atlas. 9th ed. Brussels: IDF; 2019.

8. Knife G,bishu, Jenkins C, Henok. G.Yabyo, MerawitAtsbha, TeweldeWubayehu, MulgetaGebregziabher (). Review Diabetes in Ethiopia: A systematic review of prevalence, risk factors, complications, and cost. *Elsevier*. 2019. Volume 15. https://www.semanticscholar.org/paper/Diabetes-in-Ethiopia%253A-A-systematic-review-of-risk-Bishu-Jenkins/b2d3082

9. Sahile AT, Bekele GE. Prevalence of Diabetes Mellitus and Associated Factors in Addis Ababa Public Health Facilities, Addis Ababa, Ethiopia. Diabetes MetabSyndrObes. 2020 Feb 25;13: 501-508. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7049281

10. Flynn S. Nurse's role in diabetes management and prevention in community care. BrJCommunityNurs.2022;27(8):374-376. https://pubmed.ncbi.nlm.nih.gov/35924905

11. Daly B, Arroll B, Sheridan N, Kenealy T, Scragg R. Diabetes knowledge of nurses providing community care for diabetes patients in Auckland, New Zealand. Prim Care Diabetes. 2014 Oct; 8(3):215-23.https://pubmed.ncbi.nlm.nih.gov/24485171

12. Drass JA, Muir-Nash J, Boykin PC, Turek JM, Baker KL. Perceived and actual level of knowledge of diabetes mellitus among nurses. Diabetes Care. 1989;12(5):351–6. https://doi.org/10.2337/diacare.12.5.351

13. Yacoub MI, Demeh WM, Darawad MW, Barr JL, Saleh AM, Saleh MY. An assessment of diabetes-related knowledge among registered nurses working in hospitals in Jordan. IntNurs Rev. 2014; 61(2):255–62. https://doi.org/10.1111/inr.12090.

14. Albagawi B, Alkubati SA and Abdul-Ghani R. Level and predictor of nurses' knowledge about diabetes care and management: disparity between Perceived and actualknowledge.2023;22:34.https://bmcnurs.biomedcentral.com/articles/10.1186/s12912-023-01504-5

15. Nikitara M, Constantinou C, Andreou E &Diomidous . The Role of Nurses and the Facilitators and the Barriers in Diabetic care: A Systematic Literature Review. BahavSci (Basel). 2019; 14; 9(6). https://doi: 10.3390/bs9060061.

16. Alotaibi A, Gholizadeh L, Al-Ganmi AHA, Perry L. Factors influencing nurses' knowledge acquisition of diabetes care and its management: a qualitative study. JClinNurs.2018;27(23–24):4340–52. https://doi.org/10.1111/jocn.1454

17. Farzaei M, ShahbaziSh, Gilani N, &Ostadrahimi A). Nurses' knowledge, attitudes, and practices about nutritional management of diabetes mellitus. *BMC Med Educ.*2023;192 https://*bmcmededuc.biomedcentral.com/articles/10.1186/s12909-023-04178-4*

18. Olsen M, Granath A, Wharén P, Blom T, Leksell J. Perceived knowledge about diabetes among personnel in municipal care: a qualitative focus group

interview study. Eur Diabetes Nurs. 2012;9(2):52–5. https://doi.org/10.1002/edn.206

19. Alotaibi A, Al-Ganmi A, Gholizadeh L, Perry L. Diabetes knowledge of nurses in different countries: an integrative review. Nurse Educ Today. 2016;39:32–49. https://doi.org/10.1016/j.nedt.2016.01.017.

20. Ahmed A, Jabbar A, Zuberi L, Islam M, Shamim K. Diabetes related knowledge among residents and nurses: a multicenter study in Karachi, Pakistan. BMC EndocrDisord. 2012 Sep 11; 12: 18. https://pubmed.ncbi.nlm.nih.gov/22967029

21. Davies AA and Buxton C. Professional Nurses' Knowledge level on Type II Diabetes Mellitus at Selected teaching and Training Hospitals in the Central Region of Ghana. J Nurs Care. 2015, 4:229.http://dx.doi.org/10.4172/2167-1168.1000229

22. Bagweneza1 V, Musabiremal P, Mwiseneza1 MJ, Collins A. Diabetes Health Education: Nurses' Knowledge of Essential Components at a Rwandan Hospital. Busisiwe Rosemary Bhengu, Rwanda Journal of Medicine and Health Sciences May 2019. Vol. 2 No. 2. https://dx.doi.org/10.4314/rjmhs.v2i2.13

23. BagwenezaV, MusabiremaP, Mwiseneza MJ, Collins A, Bhengu BR. Diabetes Health Education: Nurses' Knowledge of Essential Components at Rwandan Hospital .Rwanda J Med Health Sci 2019;2(2):172-177. https://www.ajol.info/index.php/rjmhs/article/view/186894

24. Abate TW, Enyew A, Gebrie F, Bayuh H. Nurses' knowledge and attitude towards diabetes foot care in Bahir Dar, North West Ethiopia. Heliyon. 2020 Nov 23; 6(11). https://pubmed.ncbi.nlm.nih.gov/33294694/

25. Wang Y, Zhang Y, Han J, Chen Y, Li L, Wei X , Fu G.Diabetes knowledge and training needs among non-endocrinology nurses. Heliyon. May 2023. Volume 9, Issue 5. https://www.sciencedirect.com/science/article

26. Zhou .w, Huaug, J, Yang. L, Qiu. T. Zhang. Y, Liu. F and Zhou. Z (2020). Lond term training in diabetes related knowledge, attitudes and self – reported practice among

diabetes liaison nurses in china. *J Int Med Res*,48(2) https://pubmed.ncbi.nlm.nih.gov/31662018/

27. Baig M, Alzahrani S, Abualhamael S, Alotaibi A, Alharbi M, Almohammadi T, Alkaabi T() . Diabetes Mellitus Knowledge, Attitudes, Preventive Practices and Associated Factors Among a Sample of Adult Non-Diabetic Saudi Residents. Diabetes MetabSyndrObes. 2023May 15; 16:1393-1406. doi: 10.2147/DMSO.S409330. PMID: 37213209; PMCID: PMC10198170

28. Center for diseases control and prevention (2023).https://www.cdc.gov//

29. Shiferaw WS, Gatew A, Afessa G, Asebu T, Petrucka PM, Aynalem YA (2020) Assessment of knowledge and perceptions towards diabetes mellitus and its associated factors among people in DebreBerhan town, northeast Ethiopia. PLoS ONE 15(10): e0240850. https://doi.org/10.1371/journal.pone.0240850

30. Serrano-Gil, M., Jacob, S. Engaging and empowering patients to manage their type 2 diabetes, Part I: a knowledge, attitude, and practice gap?. *Adv Therapy* **27**, 321–333 (2010). https://doi.org/10.1007/s12325-010-0034-5

9. ANNEXES

Annex I- Information Sheet

Dear Respondent;

My name is Tigist Kinfe. I am the principal investigator for the study titled “To Assess the Perceived and Actual Knowledge of Diabetes Mellitus and Associated Factors among Nurses at Selected Public Hospitals in Addis Ababa. The permission letter was obtained from Addis Ababa University. The purpose of this questionnaire is to gather data on the Perceived and Actual Knowledge of Diabetes Mellitus and Associated Factors among Nurses at Selected Public Hospitals in Addis Ababa. I am going to ask you some questions that are very important about nurses‟ the Perceived and Actual Knowledge of Diabetes Mellitus and Associated Factors. However, your willingness and support to answer all of the questions would be appreciated and thank you.

Title of study

To Assess the Perceived and Actual Knowledge of Diabetes Mellitus and Associated Factors among Nurses at Selected Public Hospitals in Addis Ababa, Ethiopia, 2023/24

Objective of the study

To Assess the Perceived and Actual Knowledge of Diabetes Mellitus and Associated Factors A among Nurses at Selected Public Hospitals in Addis Ababa, Ethiopia, 2023/24.

Procedure and duration

The questionnaires will be self-administered to provide me with pertinent data that is helpful for the study. The questionnaires will be taken about 40 minutes.

Risks and benefits of study

The risk of being participating in this study is very minimal, but only taking your time. There would not be any direct payment for participating in this study. But the findings from this research may reveal important information for hospitals in Addis Ababa.

Rights of participants

Participant of this study will be fully voluntary. You have the right to declare to participate or not in the study. If you decide to participate, you have the right to withdraw from the study at any time. You do not have to answer any question that you do not want to answer.

Confidentiality

Confidentiality of the participants will be provided. There will be no any information that identified study participant in particular. Any information forwarded will be kept private and name will be excluded.

Contact address

If there are any questions or enquires any time about the study or the procedures, you can contact by using the following addresses.

Principal investigator: Tigist Kinfe

E-mail: tsegatigist5@gmail.com Mobile phone: +251- 968231810

Annex II – Consent form

It is clear that the purpose of this study is To Assess the Perceived and Actual Knowledge of Diabetes Mellitus and Associated Factors A among Nurses at Selected Public Hospitals in Addis Ababa. Similarly, I understand that participating in this study is completely voluntarily and provided my privacy is guaranteed and is not exposed to third parties. I promised to answer honestly all questions and not provide any false information or, in any other way purposely mislead the researcher. Signature of participant …….. Date ……

Name of the data collector who sought the consent……Signature……

Name of the supervisor…… ……..signature……

1. RESPONDENT AGREES TO PARTICIPATED- -- START
2. RESPONDENT DOES NOT AGREE TO PARTICIPATED--- END

Thank you for your cooperation

Annex III: Questionnaire prepared for nurses

Part I. Please circle the choices and write answers.

1. Socio-demographic Data

1.1 Age ……..

1.2 Sex

Female Male

1.3 Years of experience after last gradation----------

1.4 Do you worked at medical or endocrine unit with diabetes cases? Yes No

1.5 Did you participate in training about Diabetes mellitus management? Yes No

1.6 Do you have access of research based evidence for diabetic management? Yes No

1.7 Do you have guideline for diabetic management? Yes No

1.8 Did you participate in nursing education in the last two years on the topic of diabetes education? Yes No

PART II Diabetes Self Reporting Tool

Below are sentences about diabetes mellitus, for each of the statements presented in the table, five options are given in front of them. Numbers 1-5 are symbolized to represent your degree of agreement:

(5)= Strongly agree

(4)= Agree

(3)= No opinion

(2) =Disagree

(1)= Strongly disagree

Please, circle your alternative choice for each statement in the table

S.No.	Statement	Alternatives				
1	I can describe the etiology of Type 1 diabetes.	5	4	3	2	1
2	I can describe the etiology of Type 2 diabetes.	5	4	3	2	1
3	3. I can describe the basic treatment plan for Type 1 Diabetes	5	4	3	2	1
4	I can describe the basic treatment plan for Type 2 Diabetes.	5	4	3	2	1

5	I can manage the nursing care of a patient experiencing mild hypoglycemia.	5	4	3	2	1
6	I can manage the nursing care of a person with Diabetes that experiences loss of consciousness.	5	4	3	2	1
7	I can instruct a person with diabetes on self-care management for a "sick day".	5	4	3	2	1
8	I can instruct/describe the action and effect of insulin	5	4	3	2	1
9	I can list the steps of the procedure for administering insulin.	5	4	3	2	1
10	I can describe the action and effect of oral hypoglycemic agents	5	4	3	2	1
11	I can assess for the development of diabetic ketoacidosis.	5	4	3	2	1
12	I can identify the long-term complications associated with diabetes.	5	4	3	2	1
13	I can instruct on daily personal care for someone with diabetes.	5	4	3	2	1
14	I can identify three sites for the administration of insulin.	5	4	3	2	1
15	I can manage the nursing needs of a person with diabetes experiencing hyperglycemia without ketosis.	5	4	3	2	1

PART III Diabetes Basic Knowledge Assessment Tool

Questions concerning Diabetes Basic Knowledge Assessment Tool

Diabetes: Basic Knowledge Test

Instructions: For each item, select the one best answer to the question. The last answer to each question, "I don't know" should be used if you truly do not know the answer. Circle the letter corresponding to your answer on the separate answer sheet. Please do not write on the questionnaire.

Please answer all the questions.

Source of test: Modified version of "Diabetes Knowledge Test" by Sandra Scheiderich
Revised for use in 2007 by Sally Gerard

1. Which statement is characteristic of the etiology of Type 1 diabetes?
a. strongly associated with obesity
b. predominantly genetic
c. autoimmune, viral or toxic destruction of the beta cells
d. I do not know
2. Which of these statements about the management of Type 1 diabetes is true?
a. insulin injections are necessary to maintain life
b. insulin injections are not always necessary if diet and exercise are well controlled.
c. oral hypoglycemic agents are sufficient for blood control in most patients
d. I do not know.
3. Which statement is characteristic of the etiology of Type II diabetes?

a. predominately non-genetic
b. frequently associated with obesity and resistance to insulin
c. autoimmune, viral or toxic destruction of the beta cells
d. I do not know
4. Which of these statements about management of Type II diabetes is true?
a. insulin injections are necessary to maintain life
b. a controlled diet and exercise program is the most effective treatment.
c. oral hypoglycemic agents are sufficient for blood control in most patients
d. I do not know
5. What effect does insulin have on blood glucose?
a. insulin causes blood glucose to increase
b. insulin causes blood glucose to decrease
c. insulin has no effect on blood glucose
d. I do not know
6. Which are physiological actions of insulin?
1. transports glucose across cell membranes for use by the cells
2. enhances the formation of proteins for amino acids
3. enhances the breakdown of fats for energy
a. 1 and 2
b. 1,2 and 3
c. 1 and 3
d. 2 and 3
e. I do not know
7. If a person with diabetes is found unresponsive which of these assumptions should guide your initial actions?
a. The blood sugar may be very high
b. The blood sugar may be very low
c. The blood sugar may be normal
d. I do not know
8. Normal fasting blood glucose level can be best described as:
a. below 150 mg/dl
b. between 100 and 200mg/dl
c. between 65 and 110 mg/dl
d. I do not know
9. Which of the following affect the accuracy and preparation of test results obtained with most of the blood glucose strips?
1. size and placement of the blood sample
2. timing of the test
3. expiration of test strips
4. the patient's hematocrit level
a. 1,2 and 3
b. 1,2 and 4
c. 1.2, 3 and 4
d. I do not know

10. What would a negative urine glucose test indicate about the blood glucose level in a diabetic with a normal renal threshold?
a. it is less than 100 mg/dl
b. it is less than 200 mg/dl
c. it is less than 60 mg/dl
d. I do not know
11. Which of the following tests can determine the patient's average blood glucose control over an extended period of time?
a. glycosylated hemoglobin
b. plasma renin activity (PRA)
c. insulin antibodies
d. I do not know
12. Which of these statements indicates one of the best reasons for utilizing blood glucose monitoring rather than urine testing?
a. drugs such as penicillins, ASA, cephalosporins, barbiturates, etc. can create falsely negative urine test results.
b. urine retention and changes in kidney function can increase the lag time between blood glucose rise and spill over of glucose into the urine.
c. the diagnosis of diabetes can be more readily confirmed at the patient's bedside than by laboratory testing.
d. I do not know
13. A "double –voided" urine specimen can be described as:
a. urine that is collected and tested 30 to 60 minutes after the bladder has been emptied
b. urine that is collected and tested twice a day, in the morning and at bedtime.
c. urine that is collected and tested twice before the result is recorded
d. I do not know
14. When should a person with diabetes check urine for ketones?
a. whenever exercising
b. after eating ice cream
c. whenever blood glucose is greater than 240 mg/dl.
d. I do not know
15. What should a person with diabetes do when he/she has a blood glucose greater than 240/mg/dl for two consecutive days and now has positive ketone urine tests?
a. omit the next dose of insulin or oral hypoglycemic medication and test blood as usual.
b. call the doctor, continue to test blood every four hours or as directed by physician and continue insulin or oral hypoglycemic medication.
c. continue with insulin or oral hypoglycemic medication and blood testing as usual. these are normal results for diabetics
d. I do not know
16. The maximum effect (peak) of regular insulin occurs:
a. 2-4 hours after injection
b. 6-12 hours after injection
c. 24-28 hours after injection
d. I do not know
17. The maximum effect (peak) of both NPH and Lente insulin occurs:

a. 2-4 hours after injection
b. 8-12 hours after injection
c. 24-28 hours after injection
d. I do not know
18. Where should one store insulin that is presently being used?
a. in the refrigerator near the freezer section
b. in the refrigerator away from the freezer section
c. at room temperature away from the excess light
d. I do not know
19. A person with diabetes contaminates the needle while preparing an insulin injection. What would be the best action to take?
a. dispose of the needle even if this means disposing of the insulin and syringe and starting the preparation from the beginning.
b. wipe the needle with an alcohol sponge and continue preparing the injection.
c. continue to prepare the injection, but wipe the injection site thoroughly with alcohol.
d. I do not know
20. When short acting (regular) and intermediate-acting (NPH) are ordered to be given by injection at the same time, the nurse should:
a. use separate syringes to administer each insulin
b. mix them in the syringe drawing up the intermediate acting first.
c. notify the doctor since theses two insulins should not be given together.
d. mix them in the syringe drawing up the short acting first.
e. I do not know
21. The duration of action of glipizide (Glucotrol) is:
a. 6-12 hours
b. 10-24 hours
c. 24-60 hours
d. I do not know
22. Which is not a reported side effect of oral hypoglycemic agents?
a. gastrointestinal upset
b. allergic reaction
c. skin rash
d. constipation
e. I do not know
23. A symptom of hypoglycemia (low blood sugar) is:
a. frequent urination
b. dry mouth and dry skin
c. nervousness
d. I do not know.
24. A symptom of hyperglycemia (high blood sugar) is:
a. frequent urination
b. low grade fever
c. cool clammy skin
d. I do not know.

25. What is one cause of hypoglycemia (low blood sugar) in someone who is taking insulin or oral hypoglycemic agents?
a. skipping a meal
b. emotional stress
c. too little exercise
d. I do not know
26. What is one cause of hyperglycemia (high blood sugar)?
a. decreased food intake
b. infection
c. excessive insulin
d. I do not know
27. One symptom associated with diabetic ketoacidosis (diabetic coma) is:
a. cold, clammy skin
b. acetone (fruity) breath
c. negative urine for glucose
d. I do not know
28. What is one cause of diabetic ketoacidosis (diabetic coma) in Type 1 diabetes?
a. excessive exercise
b. excessive intake of diet soft drinks over a prolonged period
c. failure to take daily insulin dose
d. I do not know
29 What effect does illness (for example a "sick day") have on a person with diabetes' insulin requirements?
a. illness causes a decreases in insulin requirements
b. illness causes an increase in insulin requirements
c. illness causes no changes in insulin requirements
d. I do not know
30. In general, changes in the pattern of insulin administration for the person undergoing surgery might include which of the following?
a. increase the dose of long-acting insulin the night before and the morning of surgery.
b. discontinue all subcutaneous insulin the day of surgery and instead infuse long acting insulin intravenously at a constant drip.
c. on the day of surgery, reduce the usual a.m. dose of insulin and give subcutaneous or IV boluses of short acting insulin per frequent blood glucose monitoring results
d. I do not know
31. Which of the following long-term complications are associated with diabetes?
a. eye changes
b. renal and cardiovascular changes
c. nervous system changes
d. all of the above
e. I do not know
32. The effect of physical and emotional stress on diabetes control include:
a. the secretion of stress hormones that cause an elevation in blood glucose levels.
b. the secretion of stress hormones that cause a decrease in blood glucose levels.
c. the secretion of stress hormones that has no effect on blood glucose levels

d. I do not know
33. Why is it necessary that people with diabetes pay special attention to proper care of their feet?
a. several years of injecting insulin into the thighs can cause edema in both the legs and the feet.
b. flat feet are commonly associated with diabetes unless preventative measures are routinely used.
c. persons with diabetes often have changes in sensation and poor circulation in their feet.
d. I do not know
34. A person with diabetes has a small corn on the right foot and wants it removed. What should be done first?
a. use a liquid corn remover, following the directions carefully.
b. refer the person to a podiatrist
c. carefully trim the corn with a sterile cutting instrument
d. I do not know
35. A person with diabetes has just received a minor abrasion on the left leg. What should be done to treat the abrasion?
a. wash gently with mild soap and water, dry with clean towel and observe carefully for any signs of infection.
b. wash gently with mild soap and water, apply a small amount of iodine and observe carefully for any signs of infection.
c. apply a small amount of iodine and call the doctor
d. I do not know
36. What effect does exercise have on blood glucose when the diabetics blood glucose is less than 300 mg/dl?
a. decrease blood glucose
b. increase blood glucose
c. has little effect on blood glucose
d. I do not know
37. What effect does increased exercise have on the food needs of a person with well controlled type 1 diabetes?
a. decreases the need for food
b. increases the need for food
c. has little effect on the need for food
d. I do not know
38. Which is the most appropriate INITIAL action to take for a person with diabetes who is having a hypoglycemic reaction (low blood sugar)?
a. drink 4oz of regular soda
b. drink 4 oz of orange juice with 2 tsp. Of sugar
c. eat 4 crackers with butter or margarine
d. I do not know
39. A person with Type 1 diabetes does not like one of the food items on the meal tray. What would be the BEST action for the nurse to take?
a. advise the patient to eat all other items on the tray and omit that one item.
b. advise the patient to omit that item and adjust the next scheduled dose of insulin to accommodate this deletion.

c. explain to the patient that the diabetic diet is carefully calculated and that the dietitian will be consulted about exchanging this item for another.
d. I do not know
40. Which of these is the main objective when developing a meal plan for the person with Type 2 diabetes?
a. a calorie-controlled diet that will achieve and maintain ideal body weight.
b. a high-carbohydrate, high protein diet that encourages an increase in body protein reserves.
c. a low-carbohydrate, high protein diet that will prevent fluctuations in blood glucose levels.
d. I do not know
41. A diabetic diet is calculated for which of the following nutrients:
1 carbohydrates
2. protein
3. fats
a. 1 and 2
b. 1and 3
c. 1,2 and 3
d. I do not know
42. Which of these is the main objective when developing a meal plan for a person with diabetes?
a. a nutritionally balanced, six , small-meal –per –day plan that will prevent delayed stomach emptying time.
b. an individualized diet plan that will maintain euglycemia and normal growth and development to include foods from the basic four food groups, while ensuring that calories are evenly distributed to prevent excess weight.
c. a low-fat, low-fiber diet to prevent excessive weight gain and minimize the risk of cardiovascular disease.
d. I do not know
43. A person with diabetes has refused an evening snack of fruit juice and one half of a sandwich. You should substitute with:
a. give graham crackers and 8oz of plain yogurt
b. six crackers and 2 oz of cheese
c. a piece of fresh fruit,1oz of peanut butter and 4 crackers
d. I do not know
44. For the past 2 days a person with diabetes has demonstrated the following: wide fluctuations in blood glucose, levels over several hours often unrelated to meals, hyperglycemia upon awakening, preceded by nocturnal sweating, nightmares or headache.
Based on this assessment data, which of the following is the patient demonstrating?
a. pass-through or flashback phenomenon
b. somogi or rebound effect
c. dawn phenomenon
d. I do not know
45. In recent years the average age of onset for type 2 diabetes has decreased. The average age of Americans diagnosed with type 2 diabetes is:
a. Between 30 and 39 years old
b. Between 40 and 49 years old

c. Between 50 and 59 years old
d. Between 60 and 69 years old
e. I do not know.
46. Which of the following is not true about the drug exenatide (extendin-4)?
a. It is used in type 1 diabetes
b. It is used in type 2 diabetes
c. It must be injected
d. It is used in conjunction with oral medications
e. I do not know
47. Continuous insulin infusion therapy (insulin pumps) can be a treatment option for which of the following types of diabetes?
a. Type 1 diabetes
b. Type 2 diabetes requiring insulin injections
c. Both type 1 and type 2 requiring insulin injections
d. I do not know
48. Which of the following insulins have an onset time of 0-15 minutes?
a. Glargine (Lantus)
b. NPH (Humalin N, Novalin N)
c. Lispro (Humalog)
d. Regular (Humalin R, Novalin R)
49. The American Diabetes Association's goal for optimal glycemic control is a glycated hemoglobin of:
a. less than 6.5%
b. 7-9 %
c. 9-11%
d. I don't know