The Impact of Diabetes Educational Interventions on Nurses' Knowledge of In-Patient Diabetes Management in Hospitals in Abu Dhabi & Dubai

أثرممارسة تثقيف مرضى السكري على توعية ومعرفة الممرضات كيفية التعامل مع مرضى السكري داخل المستشفيات في أبوظبي ودبي

by

ZEINAB DAHIR AWAD ALISHAQ

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ABSTRACT

Diabetes rate is increasing worldwide which is associated with health and economic issues. The current study has addressed ways to design and implement educational intervention in general hospitals in UAE. Potential challenges and project feasibility criteria have also been determined for better project initiation and further implementation (Bindon, 2017). Danat-al-Emirate and al-Jalila children hospitals have been considered for this paper and Quasi-experimental design research approach has been presented. The Diabetes Knowledge Test (DKT) has been used for the pre-test/post-test reasoning. Benner's Novice to Expert Theory to describe competency levels related to nursing experience and Knowles's Adult Learning Theory to describe adult educational assumptions have been discussed to develop a successful intervention program. Quantitative and qualitative data analyses were performed to find results validity. Quantitative data determined their learning level while qualitative analyses determined their view, concerns and feedback and future requirements. Nurses freely expressed their opinions and views regarding the training program. The current study revealed that there was less diabetes awareness among the population but they had positive perspectives in relation to the significance of DM quality **(**Poutiainen et al., 2016). Programs for patients and nurses DM awareness were found compulsory in the UAE to increase their level of understanding, management, and compliance to enable them to avoid disease complications. The study determined that nurses' knowledge of diabetes management improved after attending these training sessions. About 95 % of nurses agreed that educational intervention had positive effects on their learning and expertise (Deeb et al., 2017).

Keywords: Diabetes Mellitus, Diabetes Management, DKT Tool, Knowles's Adult Learning Theory, The Diabetes Intervention.

ملخص البحث

معدل مرض السكري يتزايد في جميع أنحاء العالم والذي يرتبط مع القضايا الصحية والاقتصادية. تناولت الدراسة الحالية طرقًا لتصميم وتنفيذ التدخلات التعليمية في المستشفيات العامة بدولة الإمارات العربية المتحدة. كما تم تحديد التحديات المحتملة ومعايير جدوى المشروع لتحسين بدء المشروع ومواصلة تنفيذه (بيندون 2017). وقد تم دراسة مستشفيات دانة الإمارات وجليلة للأطفال في هذه الورقة كما تم عرض مقاربة البحث التجريبي شبه التجريبي.وقد تم استخدام اختبار المعرفة السكري (DKT) لاختبار ما قبل الاختبار / ما بعد الاختبار. نظرية "بينر" المبتدئة إلى الخبراء لقد تمت مناقشة النظرية لوصف مستويات الكفاءة المتعلقة بتجربة التمريض ونظرية معرفة الكبار لدى "نولز" لوصف افتراضات تربوية للبالغين لتطوير برنامج تدخل ناجح. أجريت تحليلات البيانات الكمية والنوعية لإيجاد نتائج صالحة. حددت البيانات الكمية مستوى التعلم في حين حددت التحليلات النوعية وجهة نظرهم ، مخاوفهم وردود الفعل والمتطلبات المستقبلية. الممرضات بحرية التعبير عن آرائهم ووجهات نظرهم بشأن برنامج التدريب.وكشفت الدراسة الحالية أن هناك وعي أقل بالسكري بين السكان ولكن لديهم وجهات نظر إيجابية فيما يتعلق بأهمية جودة السكري (بوبينين أت إل 2016). برامج للمرضى والممرضات تم العثور على وعي السكري في الإمارات العربية المتحدة لزيادة مستوى الفهم والإدارة والامتثال لتمكينها من تجنب مضاعفات الأمراض. حددت الدراسة أن معرفة الممرضات بإدارة مرض السكري تحسنت بعد حضور هذه الدورات التدريبية. وافق حوالي 95٪ من الممرضات على أن التدخل التعليمي كان له آثار إيجابية على تعلمهن وخبراتهن (ديب إيت أل 2017).

الكلمات الرئيسية: داء السكري ، إدارة مرض السكري ، أداة DKT ، نظرية التعلم لدى نولز للكبار ، التدخل في مرض السكري

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LIST OF ACRONYMS

DM	Diabetes Mellitus
IDF	Institute of Diabetes research
ADA	American Diabetes Association
DKT	Diabetes knowledge test
WHO	World Health Organization
UAE	United Arab Emirates
A1C test	Blood glucose test
HbA1c	Hemoglobin blood glucose test
RCT	Random Control Trials
CDE	certified diabetes educator
LPN	Licensed Practical Nurse
AD	Associate Degree
SPSS	Statistical Package for the Social Sciences

LIST OF TABLES

THE IMPACT OF DIABETES EDUCATIONAL INTERVENTIONS ON NURSES' KNOWLEDGE OF IN-PATIENT DIABETES MANAGEMENT IN HOSPITALS IN ABUDHABI & DUBAI

1. INTRODUCTION

Nursing is a science-based medical field which has the theoretical framework of study that establishes nursing practices and service quality care basics. Healthcare advancement, mechanization, specialization, and technology also require experienced nursing staff and continuous skill development. Benner's novice theory is the nursing theory that provides the ways for diabetes educational interventions for better in-patient diabetes management (Hajat, Harrison and Al Siksek, 2011). Diabetes treatment needs Educational intervention for better management to get better health outcomes for pediatric patients. Education plan must have strategic goal orientation to nursing training, learning, and practices at broad organizational, national and international level. It would be helpful in better diagnosis and shortened hospitalization period (Shareef, 2016).

Literature has highlighted the current practices on diabetes nursing education and the process of this human body disorder has been deliberately explained. Human Body converts food sugars and starch contents into glucose to provide energy for work. The body produces Insulin through pancreas organ that burns glucose to energy (Krening, 2000). Diabetes mellitus is a metabolic disorder of increased blood sugar because Insulin low or no production stops sugar breakdown and it is accumulated in the urine and blood that causes long-term complications. Studies suggest that unhealthy lifestyles are the reasons for glucose-insulin imbalance. Diabetes affects life quality and imposes high financial costs in UAE. Since 1991 diabetes is on rising in UAE and it has been estimated that by 2040 about90 % population will suffer from it (Nathanson et al., 2008). It was found that in 2010 above 45% medical expense was imposed by diabetes. It also reduces functionality and productivity of country economic systems (AbuAlRub and Abu Alhijaa, 2014).Diabetes reduces life expectancy and burdens financial base of the healthcare sector. The Diabetes Research Foundation in 2004 reported above 1.4 million diabetes patients in the US many children are hospitalized with diabetes 1 diagnosis and most of them have diabetic ketoacidosis. Well experienced nurses can properly guide their patients for a self-managing diabetic treatment (Umpierrez, Murphy and Kitabchi, 2002).

Health care personnel has the responsibility to appropriately guide the families and patients and thus there is a need for standardized education plan for nurses (Mulvaney, 2009). Diabetes careful examination and treatment plan can decrease LOS. Diabetes program needs to address in-patient concepts of education with progressive management expertise. Nurses learn throughout their career with daily communication and treatment practices (Cox, 2015). Studies revealed that in UAE nurses do not have perfect diabetes knowledge. It was found that more resources are needed for knowledge improvement and awareness in nurses, and innovative tools or educational models for better diabetes management practices. Research studies have revealed that occurrence of diabetes type-two is increasing in UAE. Research paper took a dynamic model approach to describe disease level in UAE in the current scenario (Livingston and Dunning, 2010).

1.1 STATEMENT OF THE PROBLEM

Diabetes rate is increasing worldwide which has health and economic related consequences. Each year more than 485,958 diabetic patients are hospitalized and readmission rate is also high. DM prevalence is high in Gulf and Middle East countries; patients do not have skills and knowledge to self-manage health care and nurses are usually lack in expertise to provide the excellent level of patient care (Deeb et al., 2017).IDF has ranked the UAE's at tenth for the highest diabetic levels worldwide in 2010. A study in 2006 depicted poor knowledge and compliance levels among UAE DM patients (Shareef, 2016).

Education was identified as the priority route to restructure link nurse exercises to deal with the diabetic patients (Jackson, 2009). Diabetes educational intervention implementation will improve nurses' diabetic management skills and knowledge which will also bring improvement in patient health outcomes (Majid et al., 2011). Effective communication skills, adequate resources, and up to date diabetes treatment technology also addresses the need for diabetic educational intervention for nursing personnel learning on advanced bases (Weiss, 2006). American Diabetes Association ADA guidelines have been followed for diabetes management for in-patient care nurses training. The current study has addressed ways to design and implement educational intervention at general hospitals in UAE. Potential challenges and project feasibility criteria have also been determined for better project initiation and more participation for better project support. Post-project analyses determined that nurses' knowledge to treat the diabetic patients improved after attending these training sessions (Coates and Boore, 1996).

1.2 PURPOSE AND OBJECTIVES

The objective of the current study was to examine practices to enhance the knowledge of nurses for managing hospitalized patients diagnosed with diabetes (Shoqirat, 2014). This work is significant because previously the nurses were more likely to have theory-practice gaps and the inability to provide the best patient outcomes. Several authors discovered that diabetes management knowledge of nurses improved after attending the educational training sessions on diabetic patient's management (Krening, 2000).

The educational plan was designed by considering ADA guideline and the purpose was to determine current and new ways of enhancing the nurses' education and practical experience to deliver better diabetic patient care. The study also considered post analyses to determine improvement level of nurses' knowledge in UAE to assess improvement level after such interventions for comparative situation analyses with pre-test outcomes (Majid et al., 2011).

Intervention plan was developed for nurses in ICU, obstetrical units, and surgical units. Diabetes Knowledge Test or DKT before and after an intervention implementation was conducted. This research area is significantly important for nursing skills advancement and enhanced performance for better diabetic patient care. In regular educational programs, nurses only get theory-based teaching and learning patient care experience. Nominal group technique to evaluate nurses' views and self-directedness was used for results analyses (Nathanson et al., 2008).

1.3 RESEARCH QUESTIONS

Research questions which have been addressed are:

1-Does diabetes management educational program on improve the diabetes management nursing knowledge for hospitalized diabetic patients?

2-Does diabetes management educational program in comparison with no such educational intervention, improve the diabetes management nursing knowledge for hospitalized diabetic patients?

Benner's Theory of Novice/Expert gives a theory based training framework for nursing practice. Benner has described five competency levels related to nursing experience which are the novice, advanced beginner, competent, proficient, and expert. Similarly, Knowles gave the Adult Learning Theory which has six adult educational assumptions: experience, self-concept, readiness,

orientation, and motivation for learning (Weiss, 2006).The DKT tool has been employed for the post/ pre results analyses. DKT tool has about 2o multiple choice questions has been considered to assess healthcare worker and nursing diabetes relevant information. Quasi-experimental design research approach has been presented in this study (Livingston and Dunning, 2010). From direct diabetic care provider department, fifty-eight registered nurses from diabetic inpatient departments were evaluated for their views within the quasi-experimental design context. Danat al Emirate and al-Jalila children hospital have diabetes units and have been considered for the research study in this paper. This section has addressed problem statement which has theoretical and contextual study background (Jackson, 2009).Purpose and objectives, research questions, study relevance, importance and structural brief summary of each chapter have also been covered here.

This provides the whole thesis structural view for better conceptual understanding. Literature related to the research question, methodology, paper findings, discussion, and analysis with recommendations, implications, and limitations has been given in this paper to facilitate future research with a solid background knowledge base (Krening, 2000).

1.4 STUDY BACKGROUND

Diabetes is the seventh major death cause and it reduces life expectancy due to associated heart disease and other health problems. It also causes kidney failure, blindness, renal disease, and coma. Mississippi, United States, UAE and Grenada County have high mortality rates due to diabetes and they are continuously struggling to improve diabetes management practices for better patient outcomes (Shoqirat, 2014).The current study area, such as al-Jalilia and Danat al Emirates have diabetic management resources but have an increase in diabetes cases. Hospitals have certified nursing staff and diabetes educators to train their nursing personnel but the number of registered diabetic patients and number of cases is increasing with time. Both these hospitals have diabetic care units with increasing number of patients and there is a need for strategic educational intervention for nursing knowledge improvement. These interventions will help in better patients hypoglycemic levels monitoring and better care provision that will promote patients' health better outcomes (Jackson, 2009).

1.5 HYPOTHESIS

Ineffectual communication, the absence of evidence-based patient management, inefficient glucose and hypoglycaemic monitoring need more training on practical and technical bases.

Long-term hospital stay needs more inpatient care or otherwise late check-ups after hyperglycaemic occurrences may create further complications (Yanikkerem and Koker, 2014). Hyperglycaemia and Hypoglycaemia thus need careful monitoring and proper treatment planning. Therefore, educational interventions presented in this study are based on research data, and competency estimation mechanisms to establish the contemporary professional expertise for nurses (Shoqirat, 2014).

FOLLOWING HYPOTHESIS CAN BE CONSIDERED FOR THE CURRENT STUDY:

The Diabetes Management Educational Program Will Improve the Diabetes Management Nursing Knowledge for Hospitalized Diabetic Patients

Diabetes Management Educational Program In Comparison With No Such Educational Intervention Will Improve the Diabetes Management Nursing Knowledge for Hospitalized Diabetic Patients

1.6 THE RATIONALE FOR THE STUDY

Research revealed nurses' knowledge improvement after an educational training program for diabetic patient care and diabetes management. Diabetes expertise needs medication skills, glucose monitoring and dietary maintenance with excellence. Daily work experience, previous knowledge base, and competency level also contribute to diabetic administration. Diabetes management intervention plans must be based on systematic and organized mechanism and the team must be headed by skill full and experienced educator. These intervention projects need long-term developmental framework to avoid complexities in the future. Benner's Novice to Expert Theory and Knowles's Adult Learning Theory have been described to develop progressive ways for educational intervention to promote better training and nursing staff learning. Both of these theories suggest nursing practices and adult learning in the context of clinical care for diabetics. Benner's stages are progressive movements to become skilful and pro-efficient (Shareef, 2016). This pathway involves empirical experiences, intuitions, and critical situations handling and by following this theory nursing career can be improved. This model promotes reflective thinking, nursing expertise, and actual experience. Thus, nurses were encouraged to participate in these programs by describing project value and benefits of professional expertise. Nurses' feedback on their learning and new experiences have also been encountered for results evaluation (Umpierrez, Murphy and Kitabchi, 2002).

Novice nurses were found dependent on experienced nurses for insulin management. To make them independent in treatment decision they need expertise in screening tests, monitoring, diagnosis or overall disease management technical-medical skills. It can help in preventing type-two diabetes and in avoiding associated complications like kidney or heart disease, nerve damage, limb amputation and blindness.

There are continuous efforts to make latest updates in diabetes services available to patients. Accessibility to all has linguistic and cultural factors for quality care provision. Medicine's Institute reported unequal and imbalanced treatment facilities for minorities. Strategic educational intervention must design training programs for rural areas and minority communities to reduce overall financial pressure on the country economy. Disease incidences and the costs are increasing every year, thus preventive and educational measures can promote healthy society for country welfare (Shoqirat, 2014).

1.7 THEORETICAL FOUNDATION

Ways to enhance nurses' knowledge of managing the care of a hospitalized patient diagnosed with diabetes have been discussed in this section. The current study revealed that there was less diabetes awareness among the population but they have positive perspectives in relation to the significance of DM quality in UAE (Mulvaney, 2009). Programs for patients and nurses DM awareness are compulsory in the UAE for diabetic patients to increase their level of understanding, management, and compliance to enable them to avoid disease complications. Currently, increasing diabetes incidences need educational intervention for better disease management to get better health outcomes for the pediatric patient. Literature has determined current practices on diabetes nursing education because they have to attend the patients on regular bases (Shrestha, 2014).Health care personnel has the responsibility to appropriately guide the families and patients and thus there is a need for a standardized education plan. Nurses have the responsibility to properly monitor and manage diabetes and hypoglycemic situation otherwise death may occur.

Training is important for nurses to improve their monitoring and treatment skills. Competent, well experienced and educated nurses can communicate effectively with the patients and ensure quality care for diabetes patients which leads to better patient health outcomes (Moriarty and Stephens, 1990). The researchers said that any educational project initiation must also view the strengths, threats, opportunities, and weaknesses from all the relevant perspectives. Project manager, educator, mentors, experienced team members and their positive attitudes make the project

powerfully applicable and thus ensure better outcomes. Literature studies have highlighted several strengths of the educational intervention program (Shoqirat, 2014). On the other hand, no educational program due to a number of factors such as low staff contribution, limited resources etc. shows the weakness that must be resolved prior to the project initiation and implementation. Opportunities are the evidence-based knowledge, upgraded knowledge and better learning skills to improve the professional career. For this current work SWOT analyses was performed and literature has shown all the strengths in terms of potential outcomes that can be achieved by implementing such interventions. Nurses were enthusiastic to participate in such interventions to get professional expertise in their field. The mission of this work was to facilitate evidence-based approach for nursing diabetes education to bring professional competence and excellence. The goal was to devise an educational program for better management of diabetes by nurses independently. It will improve their confidence and decision making power at the times of severity. Hospitals may adopt that evidence-based learning program for ongoing training purpose for diabetes management.

1. 8 STRUCTURE OF THE DISSERTATION

Chapter 1

Chapter 1 has described the study overview, aims, objectives and theoretical background on which current research structure is based.

Study objectives

The most important objective for this study is to implement an educational intervention to improve the nurses' knowledge of managing patients with diabetes illness and to enhance the continuous application of the diabetes educational interventions for diabetic patients' quality care improvement.

STUDY AIMS

This study has addressed two basic aims which are:

Does diabetes management educational program improve the diabetes management nursing knowledge for hospitalized diabetic patients?

Do diabetes management educational program in comparison with no such educational intervention improves the diabetes management nursing knowledge for hospitalized diabetic patients?

LITERATURE REVIEW

CHAPTER 2 Literature summarized previous studies on nurses learning. Diabetes severity, nurses' educational knowledge base, and competency have been described in the current and future perspectives. Diabetes severity was described under hypoglycemia, glycemic control, and hyperglycemia (Shoqirat, 2014). Next section described nurses' knowledge, challenges and barriers to learning and patient's management, which would be helpful in clinical reasoning and monitoring. Nurses and hospital top management agrees on nurses' roles in diabetes management because patient's regular monitoring and check-ups are the nurse's responsibility (Livingston and Dunning, 2010).

Benner's Novice to Expert Theory to describe competency levels related to nursing experience and Knowles's Adult Learning Theory to describe adult educational assumptions have also been covered deliberately under literature review(Butler and Johnson, 2018).Literature also addressed evaluation of nurses' knowledge after an educational program on diabetic patient management. Measurement instrument was The Diabetes Knowledge Test (DKT) to assess diabetes information level, knowledge gaps, and potential project feasibility aspects that make its implementation attractive for hospitals, nurses and top management (Umpierrez, Murphy and Kitabchi, 2002).

METHODOLOGY

CHAPTER 3 This chapter has included the research approach, research method, population samples and analytical tools that were considered to perform the study. Quasi-experimental design approach has been taken for the current study.

The Diabetes Knowledge Test (DKT) has been used for the pre-test/post-test reasoning. The DKT is a 2o-item multiple choice instrument that has been used to assess healthcare worker and nurses' diabetes information.

Exact 58 registered nurses with direct care role to treat 200 diabetic patients in inpatient departments have been selected as a population sample (Majid et al., 2011).

Quasi-experimental design research approach has been used. Hospital has institutional review board approval and permission to use and modify the Diabetes Knowledge Test (DKT). DKT pre

and post-test have been designed and planed with the consideration of time limit, nurses work hours and their previous knowledge base (Kitabchi and Nyenwe, 2006).

The educational intervention will be based on pre-test results, and multiple sessions will be held with educational purpose of diabetes management. After all, DKT post-test will be used for final test results analyses.

FINDINGS

CHAPTER 4 Findings are expected to indicate that nurses will continue the diabetes management education intervention to get the best patient outcomes.

DISCUSSION AND RECOMMENDATIONS

CHAPTER 5 The results will indicate that there is an improved knowledge of nurses receiving diabetes management education compared to those who would not receive the intervention.

2. LITERATURE REVIEW

2.1 CONCEPTUAL BACKGROUND / ANALYSES

The body converts food sugars into glucose that provides energy to the body. The liver also generates glucose but the digestion process produces the major part of it. Body cells take glucose to generate energy. Insulin is produced in the body by the pancreas that burns glucose to energy. Thus, diabetes mellitus is a metabolic disorder of increased blood sugar. Insulin low production increases the sugar in the urine and blood and alternative metabolic byproducts are accumulated in the body that disturbs acid-base blood balance which results in long-term complications (Shoqirat, 2014). Diabetes mellitus management depends on nurses' ability to provide care to patients. Studies determine that better control on glycemic levels minimizes the chances of complications and proper routine check-ups can maintain glycemic levels within control limits. Moreover, patient guidance can also help health care maintenance. Thus, nursing knowledge, practices, and experiences are indispensable (Shareef, 2016).Zhang used dynamics model to improve diabetes strategies and possible educational interventions in Canada. Since 1991 diabetes is on rising in UAE and it has been estimated that by 2040 about 90% population will suffer from it (Majid et al., 2011).

Diabetes affects life quality and imposes high financial costs in UAE. It was found that in 2010 above 5o% medical expense was caused by diabetes treatment costs and in this way, it negatively affects functionality and productivity of country economic systems. The health system of UAE is divided into primary, tertiary or secondary health care. Government hospitals outpatient departments, al-Jalilia and Danat al Emarates were surveyed for data acquisition from two general diabetes centers for the study. The survey was carried out to evaluate the practical knowledge and attitude of nursing staff in the selected hospitals (Ajayi, 2017). A questionnaire was designed for nursing staff of both genders and different ages. Nurses' diabetes knowledge was assessed by asking about symptoms, complications, and causes of DM. Attitudes on management and awareness and nurse's practices were acquired by considering a dietary modification, medications compliance, weight control, and blood sugar monitoring, etc for the patients. The Likert scales scoring system has been used. SPSS statistical analyses, variable correlation, t-test and linear regression were used for patient knowledge, attitude, and practical experience analysis (Hulkower, Pollack and Zonszein, 2014).

The analysis presented a positive association or correlation among nurses' education or experience and the better patient outcomes. Bivariate analysis was used to determine the nursing attitudes. The analysis determined nursing satisfactory practices and regular follow-ups, however, contradictory cases were also observed as monitoring was not good. The bivariate analysis determined the significant correlation between practice and education level and also practice and attitudes. Bivariate analysis also determined the strong link between knowledge and practice (Hart and Mareno, 2013).Studies revealed that diabetes' knowledge is usually poor in UAE hospitals' nursing personnel. Staff nurses have been observed with limited training, knowledge, and motivation in diabetes field work. In a research study, patients gave negative feedback on inpatients service and asked for a specialist nurse or DSN for their care (Majid et al., 2011).As a result hospital management developed a link nurses group to examine the barriers and challenges in their role performance. Lack of training, skill development, guidance for role performance of link nurse was observed.

It was found that more resources are needed for knowledge improvement in nurses, and furthermore, innovative tools or educational models are also required for better diabetes management practices and awareness (Ajayi, 2017). Group members mutually determined that education for better practice, participation for patients' guidance, quality assurance, commitment to patients concerns are needed for training sessions discussion. Nurses highlighted major barriers such as lack of training, knowledge, confidence, skills, cost and study leaves. Education was identified as the priority route to restructure link nurse exercises to deal with the diabetic patient (Butler and Johnson, 2018).An audit was performed to describe ICSI standards implementation for diabetes care because it was necessary to properly manage and apply good care standards for diabetes patients. Audit scheme was prepared for the project to promote better learning.

The project planners incorporated link nurses and DSN managers (Shrestha, 2014). Another flexible program was started within the unit of diabetes and computerized programs and books mode of teaching were selected for training sessions (Kitabchi and Nyenwe, 2006). A diabetes education program was designed for healthcare providers such as physicians and nurses to make them certified diabetes instructors, mentors or guiders (Yanikkerem and Koker, 2014).The article also discussed the challenges in managing these workshops for nurses.

Similarly, competency program established by WHO was conducted and according to that knowledge, skills, and attitudes were assessed within a designated setting to train nurses to work

effectively and safely without any regular supervision. Attendance was found as a critical factorin determining the project success (Hulkower, Pollack and Zonszein, 2014).Results showed nurses positive feedback, good attendance rate and skills improvement as link nurses thenwere better able to guide the patients about glucose meter or insulin pen. Audits involved hypoglycemia prevention rate assessment in the ward patients and monitoring blood glucose of inpatients. One nurse found inappropriate insulin doses and after training, she was able to manage it well. Patient satisfaction audits were found to have positive results. The decrease in inappropriate referrals was also progressive. Thus, nurses' meetings, audits, and attendance rate assessment were good approaches. Flexible programs also facilitated nurses to attend the session in accordance with their timetable (AbuAlRub and Abu Alhijaa, 2014).

2.2 THEORETICAL FRAMEWORK

Training is important for nurses to improve their monitoring and treatment skills. Competent, well experienced and educated nurses can communicate effectively with the patients and ensure quality care for diabetes patients which leads to better patient health outcomes.

2.2.1 Benner's Novice to Expert Theory for Nursing Practice

Benner has described five levels related to nursing experience. Skill development stages in a nursing career have five competency levels: novice- advanced beginner-competent-proficient-expert (Shoqirat, 2014). The beginner or novice does not have the experience of managing critical situations. They do not have practice and confidence of performance in their field. Advanced Beginner has better performance level due to some previous experience and skill development (Weiss, 2006). The competent stage for nursing determines two to three years of the job prior experience and in this way nurses can perform efficiently and with confidence (Hart and Mareno, 2013).At the proficient stage, nurses can handle critical situations and can plan according to the patient condition.

Stage five is the expert nursing level, as nurses are able to determine alternative treatments and possible solutions. Nursing is a scientific occupation, which has a theoretical base of framework and goals to determine nursing practices and service standards in terms of costs and quality (Ajayi, 2017). Nursing theories gave deep clinical and science-based research approach. Benner's novice theory is the most crucial nursing theory developed by extensive research, consensus and evaluation in 1999 and presents Dreyfus skill model of a nursing career. Benner emphasized

acuity, skilled pro-efficiency, experiential learning and clinical judgment for nurses to better perform in the field (Butler and Johnson, 2018).

Proficiency was found compulsory for best nursing practice. Benner employed Heidegger's phenomenological path to interpret research related interviews and observations. Benner stages are progressive movements to become skillful and pro-efficient (Hulkower, Pollack and Zonszein, 2014). This pathway involves empirical experiences, intuitions, and critical situations handling and by following this theory nursing career can be improved. On the other hand, simulators and technologies also facilitate skill development. Benner's model promotes reflective thinking, nursing expertise, performance evaluation and actual experience which can be obtained through daily routine check-ups and assessments. (Nathanson et al., 2008).

The current study gave the aesthetics management concept for the clinical site. This management style is similar with the Benner's theory and has a special emphasis on competency. Brudzinski said that Benner's theory helps to determine competency levels and strategies for better performance and curriculum design for practitioners and students. It has a questioning mechanism for achieving in-depth feed-back from learners and mentors. This theory has less emphasis on education while more focus is on experience of skill development (Ajayi, 2017). This theory is particularly associated with nursing education. Application of Benner's theory in clinical and hospitals need financial allocation to establish and smoothly run training courses. The knowledge gained from training and experience brings competency in tasks performance. Moreover, it does not use quantitative approach instead it depends on personal accounts for this model which is also a drawback. Non-empirical and qualitative nature are other drawbacks but qualitative approach help in acquiring the in-depth personal views regarding the concerned issue (Kim and Song, 2015). With the advancement in healthcare mechanization, specialization, and technology, there is also the requirement for experienced nursing staff and continuous skill development. Dreyfus Model is a tool for skill acquisition in this way and developed by Hubert Dreyfus and Berkeley. It includes both experience and education for skilled developers in clinical nursing. Dreyfus model also describes five stages of Benner (Hamaideh, 2016). It was found that Novice Beginners were taught about blood pressure, water retention level, fluid balance, patient weight, temperature, pulse and other parameters to determine patient's situation and imbalances. Novice is unable to carry

discretionary judgment and situation management. Advanced Beginners can develop guidelines with their prior experience (Jackson, 2009).

About 65 nurses from seven hospitals were selected for attitude assessment or feedback acquisition, aspect recognition and education level for clinical skill development. Competency can be brought by proper planning and managing clinical aspects with effective decision-making. Competent nurses are able to apply standardized procedures of nursing. Proficiency comes with constant practice and Maxims can be used by a proficient worker for guidance (Song and Kim, 2009). They help in decision making by highlighting critical points in situations. The expert level performer does not need analytical principles or maxim or guidelines for situation analyses. They can determine the best intervention to treat the patient. An expert, however, can also need analytical tools to handle new situations. Dreyfus model suggests that nurses do not rely on rules but use experiences base and that experience comes from the handling of various practical situations. Dreyfus Model takes an interpretive stance for Skill development and nursing practices (Gomez-Valdes, 2014).

National Diabetes Information Clearinghouse documented that 18.2 million U.S people are the patients of diabetes mellitus, and it was the sixth major death cause in the U.S in the year 2000. It was found that only 12 million people were aware of the whole process (Hamaideh, 2016). Texas has about 8.2% of DM cases.DM is the chronic illness needs ongoing and careful attention. Nurses have the responsibility to assist patients for the treatment. Thus, diabetes management communication is based on diabetes illness treatment information (Hart and Mareno, 2013). Pearce in 2002 said about control factor in diabetes management with recommendations and guidelines (Hijji, 2003). Nurses must deliver latest, effective and accurate information for better understanding and implementation of treatment criteria. In the West Texas area which has a rural and urban setting, healthcare workshops describing strategies for managing the needs of patients were held because disease incidences and the cost were increasing every year (Gomez-Valdes, 2014). There are continuous efforts to make latest updates in diabetes services available to patients, but accessibility to all has linguistic and cultural factors for quality care provision. Medicine's Institute reported unequal and imbalanced treatment facilities for minorities (AbuAlRub and Abu Alhijaa, 2014).

2.2.2 Knowles's Adult Learning Theory

Knowles defined six inferences about adult learning and education. These are self-concept, preparedness for learning, experience role in learning, motivation, and relevance. Postgraduate students in the nursing field are described as adult learners (Kitabchi and Nyenwe, 2006).The research paper has focused on mature students learning patterns, Dornan and Justice described them as non-traditional learners of age 23 to 64 years (Hamaideh, 2016). Malcolm Knowles contrasted andragogy with pedagogy and he took andragogy concept to describe principles and conditions that can support adult learning and self-concepts development by self-directedness, experience and learning promoted by social performance, problem-centered and capability to administer new information and requirement for learning. These characteristics were selected by the researcher for adult learner or postgraduate nursing in the region of South Africa (Gomez-Valdes, 2014). Students had clinical experience and they were asked to work in clinical hours, therefore clinical facilities were selected for 20 h/ week work duration. It gave them the chance to interact with the patients, experts, and peers at clinical work environment where they were working (Yanikkerem and Koker, 2014). Simulation learning program was found effective for nursing education as it enhanced innovative thinking which helped in problem-solving skills enhancement, confidence level improvement, and clinical judgment. Simulation brings interaction and it promotes skill and knowledge among nurses (Song and Kim, 2009). Computerized simulator develops a patient caring scenario which allows the learner to apply personal and clinical knowledge according to the scenario.

It reveals improvement areas, psychomotor and cognitive learning areas and finally presents attendant's brain evaluation scheme (Yanikkerem and Koker, 2014).The study revealed that postgraduate students having diploma do not attend cases with proper preparation. The study determined that mature students can be placed for nursing courses at postgraduate level in the context of Knowles' adult theory. Professional nurses have clinical and life experiences of socio-cultural aspects and previous learning practices in dynamics surrounding. Nurses from different hospitals were asked questions to express their priorities and therefore qualitative analysis was performed (Evaluating Continuing Nursing Education, 2017). Nominal group technique or NGT was used to evaluate nurse's views and self-directedness was found basic Knowles learning theory element. The study compared expected and actual learner's behavior of adults in this scenario (Hart and Mareno, 2013). Dependent behavior, discomfort, and improper time management were

considered for the questioning section. It determined the need for good learning atmosphere, guidance, practice, and availability of necessary equipment, debriefing, and enough time allocation to get properly prepared for the session.

Beginner practitioners were found to be rule-bound, hesitant, and slow with the poor ability of decisions making (Hulkower, Pollack and Zonszein, 2014).Competent nurses did not need to be given instructions to handle the tasks because they were found able to evaluate results from their prior information, reflection and expertise. Students were being prepared for scheduled simulations and scenario suggested inadequate intrinsic motivation to avail learning opportunities. Mature learners were unable to perform self-directed learning and situation management (Gomez-Valdes, 2014). Thus, technological or educational exposure was found necessary for them. Postgraduate educators must be competent and proficient according to Benner's theory of learning. The recordings were used for evaluation of simulation results (Bindon, 2017). The debriefing was also found like simulation, during simulation practice, exact hospital like situation has been established. Pre-briefing about the professional roles made participants able to develop similar experience base (Deeb et al., 2017).

Mature students were expected to perform just like they performed in real life clinical area. The researcher used simulations and discussions in the debriefing sessions. This paper was of high value for nurses' educators to assess mature students learning level to provide them with educational support accordingly. This paper has focused on dynamics surrounding, mature learner behavior, educators' perceptions and learner's approach. Nurse educators must use assessment tools to evaluate mature students' learning approach. Self-Directed learning readiness scale application prior to course implementation can determine educators' learning level. Better learning environments promote self-directed skills for better learning with the help of multiple learning and teaching strategies (Krening, 2000). This study lacks in the description of cultural differences and it needs more research in this context (Kim and Song, 2015).

2.3 REVIEW OF THE LITERATURES

Research studies have revealed that occurrence of diabetes type two is increasing in UAE. Type-two diabetes gradually develops due to unhealthy livings and need preventive measures. Research paper took a dynamic model approach to describe disease level in UAE in the current scenario and educational measures were also designed for better disease management (Hagovská, Dzvoník and Olekszyová, 2017). Diabetes reduces life expectancy and burdens financial base of the healthcare

sector. Above 9o% UAE population is 20 to 70 years of ages and by 2020 it is expected that 32 % adult population will suffer from diabetes which will cost $8.62 billion USD (Evaluating Continuing Nursing Education, 2017). Screening tests, improved lifestyle, or especially disease management can help prevent diabetes and those who already have diabetes would be able in handling the complications like kidney or heart disease, nerve damage, limb amputation and blindness. The UAE's is working to design and implement culturally relevant and community-based diabetes control and prevention in the UAE. Currently, UAE has high diabetic prevalence and narrow health policies.

Dynamic approaches have been used to evaluate existing scenario to organize better future educational policies (Lithgow, Edwards and Rabi, 2017). There are numerous research articles and studies on diabetes-related complications. DuChemin in 2004 addressed the importance of self-management diabetes education. American Association of Diabetes established educational programs standards for diabetes that must be reimbursed when implementing educational training intervention. Studies addressed effective knowledge and treatment approaches for particular ethnic groups. Izquierdo in 2003 performed research to assess the effective approach for educational session delivery venue. Telemedicine technology was used for instructional session's delivery in remote areas with a focus on diabetic self-management (Hagovská, Dzvoník and Olekszyová, 2017).

Telemedicine delivery method can reduce the financial load of carrying educational sessions. Group sessions' criterion was found the most effective in this scenario. The use of that technology was feasible but it had many other requirements to manage as well. Through innovative strategies and technologies, updated information on diabetes can be delivered to nurses and patients in a much better way. Diabetes education has a comprehensive and interdisciplinary mechanism that is adhered to national standards. Core committee can cover the different geographic areas with the holistic training approach. Texas University of Health Sciences Center TTUHSC developed three years plan to produce certified educators in diabetes field (Karlin et al., 2015). Program planning, budget assessment, and marketing were the parts of project initiation. The committee was comprised of nursing, pharmacy, allied health, and medical staff to bring more expertise and skills for planning the diabetes education program. Satellite and web technology was selected as delivery means for large rural and urban areas (Wang and Tsai, 2010).Curriculum depending on the ADA Standards, self-management concept and the American Diabetes Educators Curriculum was

developed to make certified educators in diabetes management field. It incorporated cultural and linguistic factors as well and thus services standards were established according to them. Classes were broadcasted from the central site to other locations by telehealth mechanics which reduced travel time and ensured maximum participation. After that, standard evaluation methods to assess learning and competency were used for auditing analyses (Yanikkerem and Koker, 2014).

Feedback was received from the participants; 90 % were agreed that learning objectives have obtained, and on the basis of feedback amendments were made. Technology issues were also found and all the participants were required to have an electronic podium and furthermore, multiple participants' interference was challenging. Site facilitators also found it difficult to manage the learning environment in this way (Karlin et al., 2015).The Diabetes mellitus is the principle chronic disorder needs ongoing careful attention and knowledge development approaches. Diabetics may face both chronic and acute health threats from diabetes disorder. Regular monitoring of blood glucose is mandatory and it should be a safe and perfect treatment for 0% errors. ADA in 2016 gave glucose checkup rules and instructions. This paper has addressed diabetes core concepts and ways to improve competency and knowledge of nurses for diabetes care. Moreover, ways to evaluate nurses' knowledge for better patient care have also been presented (Bindon, 2017).

Patient' testing is important because medication for non- diabetic patients increases more glucose in the blood. Blood glucose normal levels must be below than 140 mg/ dL and at ICU stage patient has blood glucose range above than 140 mg/ dL (Weiss, 2006). Lack of evidence-based, advanced, and up to date diabetic education may lead to more complications which are associated with hypoglycemia, glycemic control, and hyperglycemia (Al-Tamtami, Al-Lawati and Al-Abri, 2011). Sloane in 2010 said that poor control of glycemic levels and associated complications which impose high treatment costs and cause high mortality rates. Research studies, governmental and hospital records revealed that above 265 poor glycemic management cases were reported because the facility was not available in California hospitals till 2006(Wang and Tsai, 2010). Administrative data for the diagnostic section and chronic conditions in nonteaching and teaching departments of hospitals was taken into consideration. It was found that nonteaching hospitals need more nursing facilities to provide safer and better quality care (Kim and Song, 2015).

Hypoglycemia symptoms are sweating, hunger, and fatigue and therefore timely monitoring and treatment are necessary to avoid worsening situation. Insulin levels monitoring, proper diet and

care testing are essential for glycemic control and educational intervention training plans must consider these topics for nurses training. Nurses have the responsibility to properly monitor and manage hypoglycemic situation otherwise death may occur. Training is important for nurses to improve their monitoring and treatment skills enhancement. Nam and Chesla in 2011 said that beliefs, knowledge and attitudes also are important factors for disease management. Patients do not properly follow diabetes care prescriptions advised by the nurses. Competent, well experienced and educated nurses can communicate effectively with the patients and ensure quality care for diabetic patients to ensure better patient health outcomes. Educational approaches such as interactive teaching and individualized education can improve the diabetes management learning process. Evidence-based or current websites can improve nursing knowledge for diabetes management which will also bring professional competency (Lithgow, Edwards and Rabi, 2017). Thus, they must also be familiar with searching skills to assess scholarly resources to keep up-to-date with new trends and challenges in quality care. Sharif in 2013 reported knowledge deficit among nurses for diabetes management (AbuAlRub and Abu Alhijaa, 2014). The study was conducted in which diabetes knowledge level among about 1oo nurses in the general hospitals was evaluated in Libya. The questionnaire was designed having diet, hypoglycemia, chronic complications, and ketoacidosis related questions. Diabetic's educational training programs and hyperglycemia management session were found particularly important. Part-time workshops for improving the technical knowledge of nursing such as glucose monitoring, hyperglycemia, and hypoglycemia management of patients were conducted (Shareef, 2016).

The questionnaire was also designed for post-test analyses. Results showed that nurses were satisfied with the educational programs positive results in their career. Another study used the questionnaire as pre-test Assessment Tool having hyperglycemia, hypoglycemia and insulin management related questions. The study revealed that nurses were not highly skilled in diabetes management expertise because of emerging drug patterns technologies (Al-Tamtami, Al-Lawati and Al-Abri, 2011). Post-test analyses revealed that nurses' knowledge improved after educational intervention. Self-Report Tool for Diabetes and Diabetes Basic Knowledge Test also found knowledge deficiency in clinical or theoretical concepts such as hypoglycemia, meal planning, insulin storage etc (Hajat, Harrison and Al Siksek, 2011).

Research study found that insulin levels maintenance, glucose stability, medication and proper food within the exact time are essential measures for insulin activity, which are challenging to

maintain and hospitals are not perfectly following this management. Researchers applied fixed medication dosage and other hyperglycemic control factors for diabetes patients (Umpierrez, Murphy and Kitabchi, 2002).

The A1C test is used for diabetes diagnosis which determines glucose and hemoglobin balance in the body. The A1C test is also called HbA1c and glycohemoglobin test that is required for 3 to 4 months interval for regular inspection and can minimize costs and rates of readmission. The study evaluated the 10 years data of 70,000 diabetes patients from 55 general hospitals of USA (Yanikkerem and Koker, 2014). Patients with normal A1C test or without A1C or A1C results above 8% with same diabetic medications or A1C above 8% with changed medication were evaluated for final results (Wang and Tsai, 2010).It was found that not only the medication is important while other factors also significantly contribute to glycemic levels management otherwise it will lead to diabetes. A1C levels below than 5.6% are considered normal while 6.5% level is a diabetes stage (Hijji, 2003). Other issues like anemia, kidney problems, and liver and high cholesterol levels cause false test outcomes. Thus, A1C consideration is crucial for further treatment. Medications and mental stress also cause hyperglycemia. The A1C test can depict the diabetic's severity. Proper medication brings glycemic levels under control (Cox, 2015).Programs on diabetes education can bring improvement in A1C levels. Small-scale projects were found effective than more in-depth and long duration formats. Nurses provide care to diabetes patients thus they must be aware of current information and new technological advances to improve glycemic control and patient health (Lithgow, Edwards and Rabi, 2017).

Williams in 2014 performed random control trials RCTs and quasi-experimental tests and about 93 special care nurses were selected for the study. Research results showed that education, training, and problem-solving skills were most crucial for successful diabetes treatment (Bindon, 2017). Quality strategies and training programs contribute well to diabetes management. ADA recommendations are focused on glycemic control and nurses are obliged to follow them. Blood glucose monitoring, integrative team development and educational programs were the areas of William's research. Research studies suggested that nurses' hada low knowledge, education, and training for better diabetes management (Deeb et al., 2017).

Moreira in 2013 carried a study in Brazil and encountered 24 hospitals for diabetes management. High mortality rates were observed due to Hyperglycemia (Kim and Song, 2015). Diabetes, ketoacidosis and hyperglycemic cause dehydration, weakness, increased urination and even coma

conditions. Insulin control is thus very important and miss-treatment or lack of insulin therapy may lead to cardiac problems such as myocardial infarction, unstable angina, arteries or nerves break down, kidneys and brain injury, amputations, and death. Furthermore, the patients monitoring is extremely important because improper medication may further increase in blood glucose levels. The study also found that high mortality rates were also associated with patients longer stays in the diabetic units (Shrestha, 2014). Nurses' better management skills can minimize patient's complications and readmissions as well.

Young used live presentations criteria in Eke, Benin, used hospitals to assess pathophysiology, diabetes risk factors and associated heart disease knowledge level. He addressed current diabetes guidelines, hyperglycemia, and nursing care knowledge guidelines and evaluated live sessions affects with the help of questionnaire tool. Diabetes information related to current and new nursing practice was assessed. Evaluation tools were valid and reliable for diabetes knowledge assessment. Diabetes Knowledge Test (DKT) was used to determine knowledge gaps and knowledge level of hospital nurses. Questions about diagnosis, complications, treatment, glucose control, hypoglycemia, and insulin were asked. The researcher used DKT tool to determine the knowledge of nurses' diabetes administration. Results found the importance of data-based teaching training seminars to enhance nursing knowledge for better treatment of diabetic patients (Kitabchi and Nyenwe, 2006).

Bindon in his research work said that any educational project initiation must also view the strengths, threats, opportunities, and weaknesses from all the relevant perspectives. Project manager, educator, mentors or organizational support, experienced team members, and their positive attitudes made the project implementation successful and better outcomes are obtained (Bindon, 2017). Literature view has suggested educational interventions strengths as compared to no educational programs due to a number of factors such as staff limited contribution, limited resources etc. (Gentile, 2012).Evidence-based knowledge and multidisciplinary nature bring more skills development during group learning can be considered as project opportunities. Increase work pressure, nurse shortages, timetable issues were found possible threats however, flexible sessions were found beneficial to manage timetable of nursing staff (Mulvaney, 2009).

SWOT assessment clearly presented restraining or driving forces. Innovative training and educational seminars or workshops improved nurses' knowledge, skills, patient safety, and compliance with work standards. Diabetic management has economic pressure on health care

sector. Organizational support can make the project successful by providing requisite resources for project implementation. Organizational culture to promote learning and evaluation can be created by viewing the patient positive health outcomes, minimized hospitalizations cases, nurse's contribution and patient satisfaction (Haag-Heitman, 2001). An educational program for diabetes management must focus training sessions for nurses with a basic purpose of quality improvement. Project feasibility analyses suggested that current project was encouraging, and therefore hospital administration coordinated and nurses took part in it. Head of the department approved educational sessions for nurses according to their work schedules (Gentile, 2012).

2.4 SITUATING THE CURRENT STUDY

Ways to enhance nurses' knowledge of managing the care of a hospitalized patient diagnosed with diabetes have been discussed in this section (Kitabchi and Nyenwe, 2006).The study showed low levels of diabetes awareness but positive attitudes towards the importance of DM care and satisfactory diabetes practices in the UAE. Programs to increase patients' awareness about DM are necessary for all diabetic patients in the UAE to improve their level of understanding, compliance, and disease management to enable them to manage the disease (Lithgow, Edwards and Rabi, 2017).

Diabetes treatment needs educational interventions for better management practices to get better health outcomes of the pediatric patients. Education plan for diabetes treatment in the hospital must be strategically oriented and must be for improved nurses' learning and practices. It would help in the better diagnosis of illness level and less hospitalization time (Gentile, 2012). Literature has determined current practices on diabetes nursing education because they have a major role in attending the patients on regular bases (Livingston and Dunning, 2010). The Diabetes Research Foundation in 2004 reported above 1.4 million diabetes patients in the U.S and they were mostly children with this illness in their childhood stage. Well experienced nurses can better guide their patients for self-managing diabetic illness. Health care personnel has the responsibility to appropriately guide the families and patients and thus there is a need for a standardized education plan (Deeb et al., 2017). Many children have been hospitalized with diabetes 1 diagnosis and most of them have diabetic ketoacidosis. Diabetes has an associated length of stay LOS which can be anticipated after examination. In case of increased LOS, pressure on nurse's increases to attend the patient for day and night. Hospitals have diabetes nurse experts like certified diabetes educator CDE for patient management (Song and Kim, 2009). However, less experienced and less qualified

nursing personnel also presents challenging situation in diabetes management and the literature has described educational programs for less experienced nurses.

The American Diabetes Association or ADA recommends educational programs for skills development. The diabetes patient care skills involve treating hypoglycemia and hyperglycemia, monitoring of blood glucose and insulin, meal planning etc. (Coates and Boore, 1996). Diabetes program needs to address inpatient concepts of education with progressive management expertise. Nurses learn throughout their career with every communication and treatment. General hospital data showed that 60 diabetes patients are hospitalized every year in UAE. CDE unit guides patients and provides care to outpatient and inpatient adult diabetic patients. An alternative learning and education program was found urgent and Pediatric Diabetes Task Force was developed in the hospital comprised of care coordinators, pediatric endocrinologists, nurses, CDE, and nutritionists to determine the working processes of LOS and diabetes education. It was to find the limitations and variances in current diabetes management nursing practices and to develop the appropriate educational model.

Literature gave standard skills criteria for diabetes education, methods of training, and nursing personnel (Hagovská, Dzvoník and Olekszyová, 2017).Theories on adult learning encourage multiple education programs that have specified learning methodology such as visual/audio and discussion sessions must determine the cognitive and developmental level for nurses for proper training. Pediatric nurses were asked to attend nine-hour diabetic class to carry exams and case discussions on diabetes management and nutrition with competency analyses on annual bases (Karlin et al., 2015). It was found that unit level educational programs were feasible. The data was measured about LOS after diabetes diagnosis and readmissions rates were assessed. The effectiveness of education program was determined in 2004 and thirty-five patients were evaluated. LOS mean 3.1, median 3, and no readmissions were reported. Thus team implemented the standard educational program to support diabetic patient care.

Readmissions were reduced after the implementation of the intervention program (Song and Kim, 2009). The nursing staff was observed guiding better to the patients and their families and educational programs were held during holidays and weekends. It needs further research to determine the influence of this standard approach in the clinical setting, staff and patient satisfaction etc. (Hajat, Harrison and Al Siksek, 2011).

3. METHODOLOGY

3.1 RESEARCH APPROACH

The Quasi-experimental design approach has been used. The qualitative method of research inquiry was applied to get in-depth opinions and views of nurses. The questionnaire was designed having open and close-ended questions.

Objectives are

1. Educational program development for diabetes management for nursing and implementation of that educational program
2. Evaluation and assessment of changes in nurses' practices of diabetic management by considering or applying pre and post DKT

3.2 DATA COLLECTION

Logic Model refers to a plan for diabetes management training and education. It considers SWOT analyses, long-term benefit, and minimized readmissions of diabetes patients and availability of more nurses for patient's diagnoses, better practice, and patient guidance. Quasi-experimental design research approach has been employed to design the study methodology (Hijji, 2003). The Diabetes Knowledge Test DKT will be used for the pre or post-tests. The DKT is a 23-item multiple choice instrument that has been used to assess healthcare provider and patient diabetes knowledge.

SAMPLE

The research sample was comprised of 58 registered nurses with direct care responsibility to treat diabetic patients in in-patient departments to look after 200 diabetic patients with chronic illness (Cox, 2015).

3.3 PILOTING THE INSTRUMENTS

The pre/ post DKT instruments have been attached in the appendices.

3.3.1 *Method*

Method of study has quasi-experimental design approach for current research. After receiving Institutional Review Board approval from the hospital and permission to use and modify the Diabetes Knowledge Test (DKT), participants were recruited via flyers posted on nursing units (Mapping Life – Quality Assessment of Novice vs. Expert Georeferencers, 2016). An information

sheet and a paper and pencil demographic survey and DKT pre-test would be disseminated to all participants by placing in workplace lockers weeks 1-2(Mulvaney, 2009).The educational intervention will be reviewed based on pre-test results week 3, followed by multiple sessions of 45-minute educational diabetes offerings delivered weeks 4-7. Following the intervention, the study information sheet with the paper and pencil demographic survey and DKT post-test would be distributed to all participants via workplace lockers weeks 8-9(Hijji, 2003).

3.3.2 Tool Used

DKT tool was used for pre and post-tests. DKT tools have multiple choice questions for obtaining the views of nurses to assess their diabetes knowledge. Michigan Diabetes Research Training Center has developed this tool. The DKT is scored based on the sums of questions and their responses properly (Haag-Heitman, 2001). Higher scores suggest that high knowledge level. Scores rate can also be mentioned in a percentage format. Score less than 75% is considered as a low or poor score (Advancing oncology nursing practice — from novice to expert, 2001).DKT may have demographic information in terms of gender and qualifications.

3.3.3 Study Area

Danat al Emirate and al-Jalilia children hospital have diabetes units and have been considered for a research study in this paper. The current study area, such as al-Jalila and Danat al Emirates have diabetic management resources but have more diabetes cases (Cox, 2015). Hospitals have certified Diabetes Educators and nursing staff, but the number of registered diabetic patients and number of cases is increasing with time.

3.4 DATA ANALYSIS

SPSS tool will be used for finding the results significance, correlation and coefficients that will provide the base for further evaluation of derived results. Methodology timeline chart has been given that shows the months, tasks and performance outcomes (Shrestha, 2014). Quantitative and qualitative data analyses have been performed to find results validity.

Some issues faced were scheduling and timetable conflicts, and less participation from nurses. The study involved hospital management, patients, nurse managers, clinical mentor, CEO. ADA guidelines for educational workshops were also considered (Kitabchi and Nyenwe, 2006). According to ADA lower costs, nurse's compliance with work codes and better health outcomes were the benefits. Affordable Care Act or ACA also has guidelines for quality health improvements.

3.5 CURRENT STUDY SCOPE/ DELIMITATION

Both these hospitals have diabetic care units with increasing number of patients and there is a need for strategic educational intervention for nursing knowledge improvement. It would be helpful for better patient's care that will promote patient health outcomes (Mulvaney, 2009).

3.6 ETHICAL CONSIDERATIONS

The data was collected by getting the consent of the participants. They were informed about the purpose of the study and main objectives. They were also told that their identity will remain anonymous and information that is shared will be confidential. This helped in understanding their views and opinions better that is a good thing. This helped in getting more information that was appropriate and unbiased. This is important for the study to analyse the questions effectively.

3.7 RELIABILITY/ TRUSTWORTHINESS OF THE SITE, DATA, SAMPLES

The current study area, al-Jalila and, Danat al Emirates are governmental hospitals which have diabetic management units (Cox, 2015). Hospitals have certified Diabetes Educators and nursing staff. The research sample was comprised of 58 registered nurses with direct care responsibility to treat diabetic patients in in-patient departments (Cox, 2015).

Institutional Review Board approval from the hospital and permission to use the Diabetes Knowledge Test was obtained. The data was collected by getting the consent of the participants. By informing them about the study purpose and objectives. They were also told that their identity will remain confidential and therefore they provided more appropriate and unbiased information. It confirms the trustworthiness of the site, samples and data for the current study.

4. RESULTS, ANALYSIS AND DISCUSSION

Research questions which have been addressed in this study are:

1-Does an educational program on diabetes management improve the nursing knowledge of diabetes management for hospitalized patients?

2-Does an educational program on diabetes management as compared to no educational program enhance the nursing knowledge of diabetes management for hospitalized patients with diabetes

4.1 Quantitative Data Analyses

Table 1 Pre-Test Results

Pre-test results			
Gender (M, F)	Qualification	Longevity	Experience
M – 21 F – 37 Blank - 0	Master's – 3 Bachelor's – 26 AD– 16 LPN – 13	< 1 year – 17 1-5 years – 15 6-10 years – 15 11-15 years – 5 16-20 years –4 >21 years – 2	< 1 year – 21 1-5 years – 13 6-10 years – 13 11-15 years – 5 16-20 years – 4 >21 years - 2
Post-test results			
Gender (M, F)	Qualifications	Longevity	Experience
M – 27 F – 31 Blank - 0	Master's – 10 Bachelor's – 25 AD– 11 LPN - 12	< 1 year – 7 1-5 years – 14 6-10 years – 17 11-15 years – 12 16-20 years –5 >21 years - 3	< 1 year – 8 1-5 years – 7 6-10 years – 20 11-15 years – 15 16-20 years – 6 >21 years – 2

4.1.1 Results Frequencies for Pre-Test

Table 2 Gender Frequency

GENDER

Gender	Frequency	Percent	Valid Percent	Cumulative Percent

	Male	21	36.2	36.2	63.8
Valid	Female	37	63.8	63.8	100.0
	Total	58	100.0	100.0	

Male and female both participants took part in the educational training sessions. Frequencies of pre-test results show that there were 21 males and 37 females' nurses took part in it. Thus, there were a total of 58 participants that appeared in the pre-test.

QUALIFICATION

Table 3 Qualification Frequency

		Frequency	Percent	Valid Percent	Cumulative Percent
	Bachelor's	26	44.8	44.8	44.8
	Master's	3	5.2	5.2	50.0
Valid	AD	16	27.6	27.6	77.6
	LPN	13	22.4	22.4	100.0
	Total	58	100.0	100.0	

Result analyses for pre-test show that there were more Bachelors and associated degree holders. Master level participants were found to have more knowledge because their response rate had 80 % accuracy level. Bachelor's awareness level was 30 % which was higher than LPN or AD degree holders. It was found from the test results that there was the intense need for an educational intervention or training sessions to improve their practical and theoretical knowledge level.

LONGEVITY

Table 4 Longevity

		Frequency	Percent	Valid Percent	Cumulative Percent
	<1 Year	17	29.3	29.3	29.3
	1-5 Years	15	25.9	25.9	55.2
Valid	6-10 Years	15	25.9	25.9	81.0
	11-15 Years	5	8.6	8.6	89.7

	16-20 Years	4	6.9	6.9	96.6
	>21 years	2	3.4	3.4	100.0
	Total	58	100.0	100.0	

Longevity suggests the length of work or job in the hospital and this table gives the comparative view of longevity period and nurses knowledge level. In the pre-test, nurses with more than 1o years of longevity period gave better response rate than those who had less than 1o years of longevity period. Longevity period does not about the job length in single hospital but it also refers to cumulative longevity period for the current and previous job. Overall, the response rate was not so good in the perspective of longevity period.

EXPERIENCE

Table 5 Experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<1 Year	21	36.2	36.2	36.2
	1-5 Years	13	22.4	22.4	58.6
	6-10 Years	13	22.4	22.4	81.0
	11-15 Years	5	8.6	8.6	89.7
	16-20 Years	4	6.9	6.9	96.6
	>21 years	2	3.4	3.4	100.0
	Total	58	100.0	100.0	

The highest level of corrective response rate was obtained from nurses with more years of work experience. Nurses having more than 5 years of work experience in their nursing field gave better responses than those with less than 5 years of nursing experience. The response rate was also dependent on other variables such as qualification. For example, nurses with a higher level of qualification but less period of longevity and job experience were found better in their response rates than those who had less qualification level but higher longevity. Post-test results will determine the improvement level in nurses response rate by considering their qualification level, longevity period and work experience. SPSS analyses to get correlation analyses to determine the significance of these variables on learning and performance has also been performed.

4.1.2 Post-Test Data Results

After 3-4 weeks of educational sessions, a post-test was held. The questionnaire with the same format of pre-test questionnaire was contained with open and close-ended questions. All the questions were related to diabetes management to evaluate their knowledge level after progressive learning sessions.

GENDER

Table 6 Post Test Gender Frequency

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	27	46.6	46.6	46.6
	Female	31	53.4	53.4	100.0
	Total	58	100.0	100.0	

There were again 58 participants but variation in male and female numbers shows that there were scheduling issues for some participants. Therefore, their colleagues attended those sessions.

QUALIFICATION

Table 7 Post Test Qualification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Bachelor's	25	43.1	43.1	43.1
	Master's	10	17.2	17.2	60.3
	AD	11	19.0	19.0	79.3
	LPN	12	20.7	20.7	100.0
	Total	58	100.0	100.0	

Results show an overall improvement in response rates accuracy level. Licensed nurses and associated degree holders learned more from these sessions as there was a great level of improvement observed after these training sessions. Their response rate increased from 1o % to 70 %. Master level qualifiers further showed enhanced levels of learning progress.

LONGEVITY

Table 8 Post Test Longevity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<1 Year	7	12.1	12.1	12.1
	1-5 Years	14	24.1	24.1	36.2
	6-10 Years	17	29.3	29.3	65.5
	11-15 Years	12	20.7	20.7	86.2
	16-20 Years	5	8.6	8.6	94.8
	>21 years	3	5.2	5.2	100.0
	Total	58	100.0	100.0	

There were more people with 5 to 10 years of job longevity interval. Overall, post-test analyses show an increase in the Cumulative response learning level that was assessed by their number of correct answers in the questionnaire. It is point noting that all the participants received the same level of training but those with less qualification and weak nursing concepts were given more attention to enabling them for better patient care.

EXPERIENCE

Table 9 Post Test Experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<1 Year	8	13.8	13.8	13.8
	1-5 Years	7	12.1	12.1	25.9
	6-10 Years	20	34.5	34.5	60.3
	11-15 Years	15	25.9	25.9	86.2
	16-20 Years	6	10.3	10.3	96.6
	>21 years	2	3.4	3.4	100.0
	Total	58	100.0	100.0	

This table shows that people having more years of experience such as 2o years showed more progressive results. Only a few nurses were having above than 15 years of experience. In this way,

this sample was comprised of nurses with different levels of qualification, years of experience and longevity to analyze them at each level for the better development of training criteria. Overall, the results show that knowledge and information level of nurses improved after training sessions. With the pretest comparison, we got better answers and positive feedback from nurses.

SPSS tool was used to apply paired sample T-test for pre-test and post-test results as a whole for comparative purpose.

PAIRED SAMPLE T-TEST

Paired Samples Statistics

Table 10 Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre-Test	11.8621	58	2.66523	.34996
	Post-Test	14.9655	58	1.94635	.25557

The Pre-test mean value is 11.8621 which is lower than the Post-test mean value 14.9655 for the 58 participants. The standard deviation for pre-test is 2.66523 while in post-test the standard deviation is 1.94635. The mean value for both tests is not same. An increment in the mean value of post-test results determines that nurses gave the much better performance after joining the training sessions and their awareness level improved. They were able to give the right answers related to diabetes management. This mean value shows cumulative analyses for these variables: qualification, longevity, and experience.

Paired Samples Correlations:

Table 11 Paired Sample Correlation

		N	Correlation	Sig.
Pair 1	Pre-Test & Post-Test	58	.861	.000

The correlation for the values is 0.861 and the result is significant as the p-value is below 0.05. The SPSS correlation analyses also proved that there were significant differences among pre and post-test results. It means that their knowledge level improved after the diabetes training sessions.

Paired Samples Test

Table 12 Paired Samples test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 Pre-Test - Post-Test	-3.10345	1.39786	.18355	-3.47100	-2.73590	-16.908	57	.000

The data shown in the paired samples test has the mean of 3.10345 which is the mean difference between pre-test and post-test. The standard deviation difference is 1.39786. The confidence interval is 95% which is critical for understanding the results well. The t value is -16.908 which is very low value and this is proved by the significance value is lower than 0.05 that shows there is a significant difference between the pre-test and post-test. The people that have used educational program for diabetes management seem to have higher awareness about the diabetes management as compared to those who did not had such educational programs. The post-test questionnaire also had open-ended questions regarding the feedback on diabetes management training sessions. All the participants gave a positive response about the educational intervention and said their practical knowledge has been improved now.

CORRELATIONS

Table 13 Correlation

		Gender	Qualification	Longevity	Experience	Pre-Test	Post-Test
Gender	Pearson Correlation	1	.150	-.030	-.076	-.219	-.340**
	Sig. (2-tailed)		.260	.822	.571	.099	.009
	N	58	58	58	58	58	58
Qualification	Pearson Correlation	.150	1	.003	-.149	-.067	-.154
	Sig. (2-tailed)	.260		.983	.263	.616	.248
	N	58	58	58	58	58	58
Longevity	Pearson Correlation	-.030	.003	1	.367**	.149	.244
	Sig. (2-tailed)	.822	.983		.005	.265	.065
	N	58	58	58	58	58	58
Experience	Pearson Correlation	-.076	-.149	.367**	1	.816**	.713**
	Sig. (2-tailed)	.571	.263	.005		.000	.000
	N	58	58	58	58	58	58
Pre-Test	Pearson Correlation	-.219	-.067	.149	.816**	1	.861**
	Sig. (2-tailed)	.099	.616	.265	.000		.000
	N	58	58	58	58	58	58
Post-Test	Pearson Correlation	-.340**	-.154	.244	.713**	.861**	1
	Sig. (2-tailed)	.009	.248	.065	.000	.000	
	N	58	58	58	58	58	58

**. Correlation is significant at the 0.01 level (2-tailed).

The correlation suggests the relationship between variables. It can be seen from the above table that experience variable has a significant value less than 0. 005. Experience factor has been found the most critical factor that can determine persons' knowledge level. The more experience in the relevant field makes them more professional. This significantly emphasizes on practical, technical and clinical experience to manage diabetic patients. A nurse with less education level but with more work experience can manage the critical cases with more efficiently. Similarly, longevity factors can have various dimensions such as a nursing professional career in different hospitals and in the different or relevant field.

4.1.3 SUMMARY

The quantitative data analysis has been performed to analyze the significance of results to check either current study meets its set objectives or not. Result analyses for pre-test show that Master level participants had more knowledge because their response rate was more accurate as compared to other degree holders. Bachelor's knowledge level was higher than LPN or AD degree holders. Overall results were not so good when their qualification was considered for the pre-test evaluation. In the pre-test, nurses with higher longevity period gave better response rate as compared to those with less than 10 years of longevity period. The response rate was not so good in the perspective of longevity period.

The highest level of corrective response rate was obtained from nurses with more years of work experience. Nurses with a higher level of qualification but less job experience or longevity performed better in pre-tests. SPSS analyses for correlation analyses were performed to determine variables influence on learning and performance behavior. Post-Test was held after 3-4 weeks of educational sessions. A questionnaire with the same format of pre-test questionnaire was designed with open and close-ended questions to evaluate their knowledge level after progressive learning sessions. There were again 58 participants but variations were due to the scheduling issues. Results reflected an overall improvement in accuracy level. A great level of improvement was observed for licensed nurses and associated degree holders. Master level qualifiers further showed enhanced levels of learning progress. Overall, post-test analyses showed an increase in the Cumulative response learning level that was assessed by their number of correct answers in the questionnaire.

The sample was comprised of nurses with different levels of qualification, years of experience and longevity to analyze them at each level for the better development of training criteria. Overall results show that information of nurses improved after training sessions. With the pretest comparison, we got better answers and positive feedback from nurses. SPSS tool was used to test results for comparative purpose. Nurses gave the much better performance after joining the training sessions and their awareness level improved. They were able to give the right answers related to diabetes management. The SPSS correlation analyses also proved that there were significant differences among pre and post-test results. The nurses who joined the educational program for diabetes management seemed to have higher awareness about the diabetes management as compared to those who did not have such educational programs. The post-test questionnaire also had open-ended questions to get the feedback on diabetes management training sessions. All the participants gave a positive response to the educational intervention and said their practical knowledge has been improved now.

Experience factor has been found the most critical factor that can determine persons' knowledge level. The more experience in the relevant field makes them more professional. This significantly emphasizes on practical, technical and clinical experience to manage diabetic patients. A nurse with less education level but with more work experience can manage the critical cases with more efficiently.

4.2 QUALITATIVE DATA ANALYSES

The qualitative data analyses were performed to analyze the views of respondents that were acquired by asking open-ended questions in the questionnaire. Open-ended questions were asked to get their opinions and views from different perspectives of diabetes management intervention programs. Current table has maximum relevant response rates replies from the participants for pre and post-test analyses.

Table 14 Qualitative Data Analysis

	Questions	Maximum response rate
Pre- test		
1	Does awareness and education level help to treat patients in a better way?	Yes. The maximum response rate was positive and in its favor.
2	Do they need training and workshops relevant to their field, how it can affect them?	Yes. The maximum response rate was positive and in its favor. They said that they need practical and technological training to handle critical cases. Some of the nurses said that training workshops can improve their knowledge and keep them up to date with emerging concepts, medication, technology and treatments, and trends.
3	What are the issues and problems of the current educational system?	They said that current educational system is theory based while they need more training and practical experience. Nurses with more years of experience and longevity said that they need up to date information and technological applications to manage diabetic patients.
4	How the issues and problems of the current educational system can be resolved?	Most of the responses were in the favor of training, and educational interventions along with their professional career. Some said that there must be universal nursing teaching and training mechanism. Some also said that current educational system must be based on

		practical work more than the theoretical basis.
5	What sort of changes do you consider for attention?	Some nurses said that strategic policy amendments are required in educational and health sector because the number of diabetes incidents is increasing.
Post-test		
1	Does awareness and education level help to treat patients in a better way?	Nurses said that current educational intervention brought awareness and improved their learning and knowledge level to assist diabetic patients.
2	Did they learn from training, how it affected their level of knowledge?	They said that it improved their practical experience in treating, diagnosing and managing diabetic patients. Almost all the responses were positive and in its favor.
3	What are the issues and problems in the current educational system? Does training system address some of them?	Nurses in its response talked about lack of practice-based learning. They were strongly agreed that training system has provided them practical, technical and clinical- based learning experience. New comers in nursing field were highly satisfied with it. The nurses with more experience and longevity also appreciated this effort.
4	How the issues and problems in the current educational system can be resolved? Did the current training intervention help to gain the point?	Respondents gave positive answers in this context. Current training system improved their level of learning and knowledge. They were strongly agreed that training system has provided them a practical, technical and clinical-based learning experience.
5	What sort of changes do you consider for attention?	Technological, political, educational

4.2.1 SUMMARY

Qualitative analyses of data clearly show that diabetes management educational program improved the diabetes management nursing knowledge for hospitalized diabetic patients. Close-ended questions were also asked to evaluate their knowledge gains before and after the training session. Their output was significantly improved in post-test results. Open-ended questions asked to get their views on current educational systems, educational intervention effects and nursing field emerging requirements to meet the quality health standards.

They said that awareness level surely helps to treat patients in a better way. Nurses said that current educational intervention improved their learning and knowledge level to manage diabetic patients. They said that their practical and clinical experience enhanced to treat, diagnose and manage diabetic patients. Almost all the responses were positive. They were agreed that training system has provided them a practical, technical and clinical-based learning experience and developed the base for newcomers. They said that technological, political, and educational amendments are required at a strategic level to promote holistic policy for training programs at all learning stages.

Thus, it is clear that diabetes management educational program in comparison with no such educational intervention has improved the diabetes management nursing knowledge for hospitalized diabetic patients. This system is the requirement of current times because the diabetic rate is increasing in UAE.

4.3 DISCUSSION

The current study examined practices to increase the knowledge of nurses for managing hospitalized diabetic patients (Shoqirat, 2014). The educational system has theory-practice gaps and therefore the nurses were unable to provide the best patient outcomes. Literature studies revealed diabetes management knowledge of nurses improved by attending the diabetes educational training sessions organized for research purpose by different authors (Krening, 2000). Nurses have the more responsibility for patients' regular check-ups and medication (Nath, Gross and Jacques, 2000). Thus, they must have the proper knowledge to performing effectively and efficiently in this field and this knowledge can be enhanced by educational training in diabetes management. By developing skills they can handle their patients with accurate treatments in terms

of diagnosing, medication and dietary management (Silva et al., 2013). Discussion section will reveal that either we successfully met with our research objectives for the current study.

4.3.1.1 Discussion on Research Question 1: Diabetes Management Educational Program Improved the Diabetes Management Nursing Knowledge

Danat al Emirate and al-Jalila children hospital have diabetes units and have been considered for a research study in this paper. The study found Al-Jalila and Danat al Emirates diabetic departments had more Bachelors and associated degree holders as compared to high-level master degree holders. Master level participants had more knowledge because their response rate had 8o % accuracy level. Bachelor's response accuracy level was higher than LPN or AD degree holders. Pre-test results determined the intense need for an educational intervention or training sessions to improve nurse's practical, technical and theoretical knowledge level (SarrafZadegan and Sajadi, 2000).

Longevity comparative view with nurses' knowledge level was also evaluated. Nurses with more years of longevity period gave better response rate than with less longevity period workers. Longevity period may represent both current and previous job work. Overall, the response rate was not so good for the longevity period. The highest level of accuracy was obtained from nurses with more years of work experience. Nurses with more work experience gave better responses than those with less nursing experience. The response rate was also dependent on other variables such as qualification, longevity etc. Nurse with a higher level of qualification and less longevity and job experience gave a better response than nurses with less qualification level. In the same way, nurses with higher work experience and less qualification level gave better results than those with less little work experience and high qualification. It suggests that experience was the most critical factor in determining nurses' skills. SPSS analyses to find response rate accuracy level in relation to nurse's qualification, experience and longevity were performed to determine the results' significance (Nath, Gross and Jacques, 2000).

After 3-4 weeks of educational sessions, a post-test was held. The questionnaires with open and close-ended questions related to diabetes management to evaluate their knowledge gained from learning sessions were distributed among 58 participants. Male and female participant numbers were varied from pre-test due to scheduling issues and therefore, their colleagues attended those sessions. Male-female staff nurses frequency variation before and after the intervention program

showed that a number of male participants varied in post-test due to their busy work schedule. Flexible scheduling was the program strategy to increase the participation rate. Multidisciplinary members grouping as learners and mentors brought more knowledge for expertise and skills development through interventional programs.

Results showed an overall improvement in responses accuracy level. Licensed nurses and associated degree holders learned more from these sessions as there was a great level of improvement observed after these training sessions. Master level qualifiers further showed enhanced levels of learning progress. All the participants received the same level of training but those with less qualification and weak nursing concepts were given more attention to enabling them for better patient care.

The sample was comprised of nurses with different levels of qualification, years of experience and longevity to analyse their knowledge level for better training criteria. Knowledge and information of nurses improved after training sessions. In comparison with pre-test results, higher accuracy level and positive feedback from nurses was documented.

SPSS correlation and T-test for pre-test and post-test results confirmed that nurses gave the much better performance after joining the training sessions and their awareness level improved. They gave the right answers related to diabetes management in relation to their qualification, longevity and experience level (Saydah et al., 2009). Nurses' diabetes knowledge was assessed by asking about symptoms, complications, and causes of DM. Attitudes on management and awareness and nurse's practices were acquired by considering a dietary modification, medications compliance, weight control, and blood sugar monitoring, etc for the patients. The Likert scales scoring system has been used. SPSS statistical analyses, variable correlation, t-test were used for nursing knowledge, attitude, and practical experience analyses (Hulkower, Pollack and Zonszein, 2014). The analysis presented a positive association or correlation between nurses' education or experience and better patient outcomes (Iqbala, Islamb and Hossain, 2014).

Nursing knowledge, practices, and experiences are indispensable for better patient care (Shareef, 2016).

Diabetes affects life quality and imposes high financial costs in UAE. It was found that in 2010 above 5o% medical expense was caused by diabetes treatment costs and in this way, it negatively affects functionality and productivity of country economic systems. The health system of UAE thus needs amendments in their healthcare sector. Literature studies revealed that diabetes'

knowledge is usually poor in UAE hospitals' nursing personnel. Staff nurses have been observed with limited training, knowledge, and motivation in diabetes field work. This study has placed the bases for political, educational and medical implication in UAEs healthcare sector.

4.3.1.2 Discussion On Research Question 2: Diabetes Management Educational Program In Comparison With No Such Educational Intervention Improved The Diabetes Management Nursing Knowledge For Hospitalized Diabetic Patients.

Lack of training, skill development, and guidance for role performance of nurses have been observed from literature studies. It was found that more resources are needed for knowledge improvement in nurses, and furthermore, innovative tools or educational models are also required for better diabetes management practices and awareness (Ajayi, 2017). The current research study has developed a diabetes management educational program to improve the diabetes management nursing knowledge for hospitalized diabetic patients (Silva et al., 2013).

Quantitative data analyses were performed with the help of SPSS and results showed significant outcome differences for pre and post-test results. The nurses who had attended the educational program for diabetes management seemed to have higher awareness about the diabetes management as compared to those who did not have such educational programs. Pre and Post-test questionnaire also had open-ended questions to acquire in-depth nurses' views and concerns on diabetes educational training sessions. For that purpose qualitative analysis was performed that has been described in the next section. Nurses gave a positive response to the educational intervention and their practical knowledge became improved (SarrafZadegan and Sajadi, 2000).

SPSS quantitative data analyses, correlation, and T-test result clearly determine that pre and post-test results had significant difference regarding the nursing knowledge level of diabetes management. Experience factor has been found the most critical factor that can determine persons' knowledge level. The more experience in the relevant field made them more professional. A nurse with less education level but with more work experience can manage the critical cases with more efficiently. Study significantly emphasized on practical, technical and clinical experience for nurses to manage diabetic patients (Saydah et al., 2009).

Theory of Knowles on Adult Learning suggested that nurses learn through experience and it further leads to more learning experiences. The results show the more experience they had, the more accurately they responded in the pre and post-tests. However, their accuracy level was much

higher than pre-test results. Thus, nurses with fewer years of experience also can improve their learning and practical knowledge by taking part in an educational intervention to acquire professional competency in their nursing career.

During the 1990s, diabetes rate in UAE was below than 6%. After that time period of the 1990s, UAE became economically powerful and people became fond of fast food with fewer exercise patterns in a daily routine that affected people' health. It is indicated that diabetes rate will be doubled till the 2030 year according to WHO records according to WHO and about 70% UAE population is overweight, 74% of women and above 65% of men are obese there. In UAE, medical data shows that physical inactivity and obesity develop diabetes risk. Allen Hamilton Study on Diabetes suggests that UAE people have awareness about diabetes. Female population as compared to men was less educated about it and therefore, women were found more at risk of diabetes. They were also less aware of preventive measures. It shows the root causes of diabetes and that the nurses need to be aware of them for better patient guidance. Educational intervention can bring awareness to eliminate risk factors from society.

Diabetes costs analyses can push the government for tremendous measures. Policies development must consider long-term policy influences for people to reduce the rate of diabetes incidences, especially among children and adults. Awareness is essential in this case to make proper and on - request medical checkups. This determines the need for Educational intervention to bring awareness to eliminate risk factors from society by educating nurses so that they can better guide their patients in adopting healthy lifestyles. The difference between pre and post tests clearly determines that information, awareness and knowledge level of nurses improved after joining of educational intervention diabetic management training sessions. They were learned in the groups and group members mutually determined education for better practice and participation for patients' guidance, quality assurance and commitment to patients concerns needed for training sessions discussion (Silva et al., 2013).

4.3.2 Critical Analysis and Interpretation of Qualitative Data

Qualitative data analyses have been performed to analyze the views of nurses and their opinions. Open-ended questions were asked to get their opinions and views from different perspectives of diabetes management intervention programs. Maximum relevant response rate replies from the participants for pre and post-test analyses have been considered. After the session, feedback was

taken from the participants. This open-ended qualitative question gave the opportunity to freely express their opinions and views regarding the training program. It was to assess what improvements can be made, what were the projects strengths and training level they needed related to their field.

Knowledge Level of Participants was assessed by checking and calculating the percentage of right answers to close-ended questions in quantitative data analyses. It was found that some participants had more information relative to other participants in diabetes mellitus and there was a need to improve their practical work experience. Research shows that hospitals are struggling to develop training programs and this research will give the way to better plan for this purpose. (Iqbala, Islamb and Hossain, 2014). Qualitative data analyses of nurse's responses showed the progress for the diabetes management educational program. Questions were asked that were open-ended in nature prior to the training sessions and after the training program. Nurses clearly stated that it improved the diabetes management nursing knowledge for hospitalized diabetic patients treatment and management. Close-ended questions were also asked to evaluate their knowledge gains before and after the training session that has been evaluated in quantitative data analyses section. Their output was significantly improved in post-test results. Nurses gave their views on current educational systems, educational intervention effects and nursing field emerging requirements to meet the quality health standards. Nurses highlighted major barriers such as lack of training, knowledge, confidence, skills, cost and study leaves (Ardelt, 2004). Almost all the nurses had similar positive attitudes toward training educational mechanism. They said that higher awareness level surely helped them to treat the patients in a better way.

Nurses said that current educational intervention improved their learning and knowledge level to manage diabetic patients by clearing their practical concepts in the clinical work atmosphere. Some nurses said that their practical and clinical experience enhanced to treat, diagnose and manage diabetic patients. Almost all the responses were positive. They were agreed that training system has provided them a practical, technical and clinical-based learning experience and developed the base for newcomers. They said that technological, political, and educational amendments are required at a strategic level to promote holistic policy for training programs at all learning stages. Knowles Adult Theory gave more emphasize on experience to become professionally competent. The research results show that the nurse's professional experience improved for their job. Less experienced nurses learning and knowledge enhanced by taking part

in the educational intervention. Flexible scheduling was the program strategy to increase the participation rate. Multidisciplinary members grouping as learners and mentors brought more knowledge for expertise and skills development through interventional programs (SarrafZadegan and Sajadi, 2000).

Thus, it is clear that diabetes management educational program in comparison with no such educational intervention has improved the diabetes management nursing knowledge for hospitalized diabetic patients. This system is the requirement of current times because diabetes rate is increasing in UAE. The curriculum was designed according to the learner's needs. The positive feedback on diabetes education intervention and attendance ratio showed that it was the successful approach that enhanced the participant's knowledge. Well trained professionals can bring the quality inpatient treatment and improvement in their health outcomes which will definitely reduce associated costs on health care sector (Iqbala, Islamb and Hossain, 2014).The current work evaluated the current procedures of diabetes education system and nursing practices in hospitals. Literature studies revealed the current trends and practices in nursing educational and professional field. For the current study, nurses learning level was evaluated with the help of questionnaire which was comprised of diabetes-related general questions. These questions were open-ended and close-ended questions to have deep insights into their views and opinions. Education criteria and patient's treatment and discharge criteria were also considered. Mentors for the multi-disciplinary group were also assessed to determine their clinical expertise, and education or work experiences. And results proved the successful accomplishment of teams with excellent mentors or instructors who were able to educate patients, nurses and attendants about the disease severity. Nurses are particularly seen as major role players in inpatient or attendants education (Saydah et al., 2009).

Patient education or guidance also remained the priority of educational sessions. Therefore communication and behaviors also remained the focus of training. The team was also learned to evaluate the stage of discharge in terms of accuracy, preparedness and health recovery through play schemes (Ardelt, 2004). Timely diagnoses are important because any delays give rise to other complications and timely disease diagnosis and monitoring help to properly treat it. The study shows that knowledge and awareness prevent diabetes problems. Awareness helps to manage diet, medication, and self-care for disease control. The government also need to work on awareness related policies and projects to eliminate diabetes risk factors from the society (Henderson, 2005).

UAE government has launched many campaigns to enhance awareness on the adoption of healthy diet and living conditions to eliminate diabetes.

Landmark Group 2009 awareness campaign, free tests of glucose for people, ICLDC initiatives for diabetes prevention and awareness, and free glucose check-ups were some governmental efforts in this scenario (Burgess-Allen and Owen-Smith, 2010). UAE government need more awareness and training policies for educational purpose. Action for Diabetes-action and Beat Diabetes like events can also be organized. Educational games to promote learning among children can also be considered for diabetes awareness among schools. It would lead young generation for better diabetes management and future disease prevention. The government can allow check-ups on annual bases with no cost for diabetes prevention. Governmental policies are needed in this regard (Domino, 2015). Literature review analyses regarding the disease prevalence and educational training effects on nurses learning suggested the improved learning trends and this study also proved the same thing. It shows that the results are valid (Stubbings, Chaboyer and McMurray, 2012).

5. CONCLUSION

5.1 SUMMARY OF THE STUDY

The current research study has five sections: introduction, literature review, methodology, results and discussion and conclusion. All main chapters have subheadings for in-depth and explanatory study structure. Introduction section has described the study overview, aims, objectives and theoretical background on which current research structure is based. The most important objective for this study was to implement an educational intervention to improve the nurses' knowledge of managing patients with diabetes illness and to enhance the continuous application of the diabetes educational interventions for diabetic patient's quality care improvement. This study had two basic aims: to determine the positive effects of the diabetes management educational program on diabetes management nursing knowledge to manage diabetic patients in a better way and to determine that diabetes management educational program in comparison with no educational intervention improved the diabetes management nursing knowledge to managed hospitalized diabetic patients (Bahammam, 2015).

Literature review chapter has summarized previous studies on nurses learning. Diabetes severity, nurses' educational knowledge base, and competency have been described in the current and future perspectives. Diabetes severity, nurses' knowledge, challenges and barriers to learning and

patient's management have been described. Nurses and hospital top management agrees on nurses' roles in diabetes management because patient's regular monitoring and check-ups are the nurse's responsibility (Livingston and Dunning, 2010).Benner's Novice to Expert Theory and Knowles's Adult Learning Theory applications have been briefly mentioned to develop a framework of the educational intervention program(Butler and Johnson, 2018). Literature also addressed educational programs implementation criteria performed by other authors and researchers (Burgess-Allen and Owen-Smith, 2010). Measurement instrument "The Diabetes Knowledge Test (DKT)" and potential project feasibility aspects have been described (Umpierrez, Murphy and Kitabchi, 2002). Methodology chapter has included the research approach, research method, population samples and analytical tools descriptions to conduct the study. Quasi-experimental design approach has been taken for the current study. The Diabetes Knowledge Test (DKT) has been used for the pre-test/post-test reasoning.

The DKT is a 2o-item multiple choice instrument that was used to assess healthcare worker and nurses' diabetes information. Exact 58 registered nurses with direct care role to treat 200 diabetic patients in inpatient departments had been selected as a population sample (Majid et al., 2011).

DKT pre and post-test were planned with the consideration of time limit, nurses work hours and their previous knowledge base (Kitabchi and Nyenwe, 2006). The educational intervention program was based on pre-test results, and multiple sessions were held with the educational purpose of diabetes management. After all, DKT post-test and pre-test results comparison has been used for final test results analyses (Henderson, 2005). Each educational session had specially designed content, goals, complexity, and proper method to evaluate and train the participants. Mentors for the multi-disciplinary group were also assessed to determine their clinical expertise, and education or work experiences. Results proved the successful accomplishment of teams with excellent mentors or instructors who were able to educate patients, nurses and attendants about the disease severity (Stubbings, Chaboyer and McMurray, 2012). Nurses are particularly seen as major role players in inpatient or attendants guidance.

"Results and findings" chapter has quantitative and qualitative data analyses techniques to evaluate the results significantly. It was found from pre- and post-test results that educational diabetic training sessions have improved their practical and clinical learning level to treat diabetic patients. After that, results findings were discussed to developing the deep understanding of the current scenario and to develop strong assumptions from the outcomes. The final chapter has study

conclusion, study limitations, and study implications. The results indicated that there is an improved knowledge of nurses who received diabetes management education compared to those who had not received the intervention (Ardelt, 2004).

5.2 KEY FINDINGS

The study found that nurses need more technological resources, and practice-based learning instead of theoretical learning approaches. There is also a need for the assessment of competency level among nurses to evaluate educational intervention programs strengths and effects. Contemporary diabetic research is essential for maintaining the advance knowledge among nurses for better treatment criteria. Hospital leadership must focus on evidence-based learning interventions for diabetes management. The current study and other similar studies confirmed that nurses' knowledge upgraded after the diabetes management educational intervention. To maintain professional nursing position, management support, more research and academic work is required in the context of long-term planning for competency and awareness among nurses. Research also determined that educational intervention planning for the research field of education. Results give insights for programs interpretation and evaluation. About 95 % of people agreed that educational intervention had positive effects on learning and expertise (Stubbings, Chaboyer and McMurray, 2012).

Multidisciplinary members of groups as learners and mentors brought more knowledge for expertise and skills development through interventional programs. Flexible scheduling was the program strategy to increase the participation rate (Domino, 2015). The curriculum was designed according to the learner's needs. Current program elements were diabetes management, reasons for disease growth and nutrition or dietary management, patient/attendants education, and competency enhancement. The positive feedback on diabetes education intervention and attendance ratio showed that it was the successful approach that enhanced the participant's knowledge. Well trained professionals can bring the quality in patients' treatment and improvement in their health outcomes which definitely reduces associated costs on health care sector (Bahammam, 2015).

5.3 RECOMMENDATIONS

Study results suggest that there is a need for educational interventions specifically for diabetes management to train the nurses in excellent diabetic care. It would minimize diabetic readmission rate and financial burden on the health sector.

The private sector, rural areas diabetic centers and other hospitals in different cities must also need research to assess their treatment criteria, available facilities and nurse's management level so that educational intervention programs can be designed accordingly (Saydah et al., 2009).

Flexibly scheduled daily bases workshops and training seminars can provide the opportunity for almost all the department nurses to participate in it. It will increase attendance ratio and will promote more learning, cooperative and practical management environment to manage the patients (Henderson, 2005).

Licensed dietician practices, nursing care etc topics can be specially prepared for training purpose after assessing the core areas of the field that need particular nursing and management attention. It is to increase their care quality service.

The study found that nurses need more technological resources and practice-based learning instead of theoretical learning approaches. There is also a need for the assessment of competency level among nurses to evaluate educational intervention programs strengths and effects. Contemporary diabetic research is essential for maintaining the advance knowledge among nurses for better treatment criteria (Burgess-Allen and Owen-Smith, 2010).

Hospital leadership must focus on evidence-based learning interventions in diabetes management. Educational programs must consider timely and proper communication, marketing and announcement, support and resources and coordination among all departments (Kaiser et al., 2012). Diabetic units must also work on technology advancement, medicinal research and nurses training to enable them to utilize that advance technology and medicines for better diabetic treatment (Gabrielle, Jackson and Mannix, 2008). These learners can further teach and instruct other new participants and learners who want to join this field as a profession. Certification criteria for diabetes education programs can further improve the attendance rate and willingness to perform better during the sessions. Certification exams can be conducted for successful implementation of diabetes management programs.

Tools for diabetes management for patients and families can be offered such as any guidebook, paper or online site that must be easily accessible to them. Similarly, discussion classes and evaluation exams can also be managed by the top level hospital management (Wills, 2o11). Unit level education must be more feasible. The government also need to work on awareness related policies and projects to determine diabetes risk factors. UAE government has launched many campaigns to enhance awareness on the adoption of healthy diet and living conditions to eliminate diabetes from the country. Landmark Group 2009 awareness campaign, free tests of glucose for people, ICLDC initiatives for diabetes prevention and awareness, free glucose check-ups are some example of such government efforts. UAE government need more awareness and training policies for educational purpose. Action for Diabetes-action and Beat Diabetes like events can also be organized on monthly bases **(**Poutiainen et al., 2016). Educational games to promote learning among children can also be considered for diabetes awareness among schools. It would lead young generation for better diabetes management and prevention.

The government can allow check-ups on annual bases with no public cost for diabetes prevention. Governmental policies are needed in this regard (Steinman and Birshtein, 2007). There are continuous efforts to make latest updates in diabetes services available to patients. Accessibility to all has linguistic and cultural factors for quality care provision. Medicine's Institute reported unequal and imbalanced treatment facilities for minorities. Strategic educational intervention must design training programs for rural areas and minority communities to reduce overall financial pressure on the country economy. Disease incidences and the costs are increasing every year, thus preventive and educational measures can promote healthy society for country welfare (Shoqirat, 2014). Diabetes' costs analyses can push the government for tremendous measures. Policies development must consider long-term policy influences for people to reduce the rate of diabetes, especially among children and adults. Awareness is essential in this case to make proper and on-request medical checkups. An emphasis on adopting a healthy living style can reduce diabetes risk **(**Pfister-Minogue and Salveson, 2010).

5.4 STUDY IMPLICATIONS

Current educational' intervention work significantly improved the nurses' knowledge and practices of diabetes management. The study also gave the basses and concerns to minimize diabetic incidents and associated economic pressure. Literature gave the point of a healthy diet

that can surely reduce diabetes risk among UAE' people. According to the Theory of Knowles on Adult Learning, nurses can learn through experience and it further leads to more learning experiences. The results show the more experience they have, the more they have the knowledge in their work field. Their experience' level made them more professional and demanding for this job. Nurses with fewer years of experience also can improve their learning and knowledge by taking part in educational intervention because it will improve their value as professionals (Kaiser et al., 2012).

The pre and post-tests results when discussed with hospital management, and the Diabetes mentors, instructors, and other nurses, they supported it to implement on continuous bases for new staff and currently for in-services nurse workers (Hirsh and Jensen, 2009).

This learning environment empowers nurses for independent decisions, and to handle severe diabetes complications during emergency situations. This study was based to increase the awareness for successively updating the knowledge. Nurses must have access to evidence-based and innovative knowledge for diabetes management (Steinman and Birshtein, 2007). These mechanisms certainly improve nursing competency. Benner's stages are progressive movements to become skillful and pro-efficient (Shareef, 2016). This pathway involves empirical experiences, intuitions, and critical situations handling and by following this theory nursing career can be improved. This model promotes reflective thinking, nursing expertise, and actual experience. Thus, nurses were encouraged to participate in these programs by describing project value and benefits of professional expertise. Nurses' feedback on their learning and new experiences have also been encountered for results evaluation (Umpierrez, Murphy and Kitabchi, 2002).

5.5 LIMITATIONS AND SCOPE FOR FURTHER STUDY

The study was carried out on a small population sample and considering two hospitals. It has the opportunity for other researchers to include private sector and large population sample for having a broader view of the situation. Participants were willing to take part in it and it was also cost effective way of training method. Researchers can work to design more advanced mode of training and development methods by considering current study training program. Participants were given a time of more than a week prior to post-tests. This work was significant because previously the nurses were more likely to have theory-practice gaps and the inability to provide the best patient

outcomes. Study solely considered the nurses in diabetic sector and sample is useful to present overall nursing trends.

This, on the other hand, increases results' reliability. This research can also be considered to train nurses professionally in other medical areas. To maintain professional nursing position management support, more research and academic work are required in the context of long-term planning for competency and awareness among nurses. Study participants talked about the technological and political amendment. They also mentioned limitation in their learning and experience. Future studies can focus on these issues and political and technological aspects to bring new ideas for technological development and strategical amendments to provide quality care to the patients (Gabrielle, Jackson and Mannix, 2008).

The current work evaluated the current procedures of diabetes education system and nursing practices in hospitals. In the current study, a structured training program was developed. Patient education or guidance also remained the priority of educational sessions Therefore communication and behaviors also remained the focus of training. Teaching also focused children diabetes treatment and management according to their cognitive level and requirements. Thus, different forms of evaluations were addressed in the programs for better patient management. Future studies can make it base and include more topics and criteria for designing their research work.

5.6 CONCLUSION

Study findings suggest that diabetes educational intervention for nurses improved their practical skills and it helped them to provide the quality patient care which brought positive outcomes. The current study and other similar studies confirmed that nurses' knowledge upgraded after the diabetes management educational intervention. Research also determined that educational intervention planning for the research field of education. About 95 % of nurses agreed that educational intervention had positive effects on learning and expertise. Quantitative data determined their learning level while qualitative analyses determined their view, concerns and feedback and future requirements. Nurses freely expressed their opinions and views regarding the training program. It was to assess what improvements can be made, what were the projects strengths and training level they needed related to their field. Research shows that hospitals are struggling to develop training programs and this research will give the way to better plan for this purpose (Le et al., 2011)

During the 1990s, diabetes rate in UAE was below than 6%. After that time period of the 1990s, UAE became economically strong and people became fond of fast food with fewer exercise patterns in a daily routine that affected people health. It is indicated that diabetes rate will be doubled till the 2030 year according to WHO records. It shows the root causes of diabetes that nurses need to be aware of for better patient guidance. Above 70% UAE population is overweight, 74% of women and about 65% of men are obese there. In UAE, medical data shows that physical inactivity and obesity develop diabetes risk (Steinman and Birshtein, 2007). Allen Hamilton Study on Diabetes suggests that UAE' people have awareness about diabetes. Female population as compared to male was less educated about it and therefore women were found more at the risk of diabetes. They were also less aware of preventive measures (Nath, Gross and Jacques, 2000). Educational intervention can bring awareness to eliminate risk factors from society. Early diagnosis can control the disease.

Timely diagnosis are important because any delays give rise to other complications and timely disease diagnosis and monitoring help to properly treat it. The study shows that knowledge and awareness prevent diabetes problems (Hirsh and Jensen, 2009). Awareness helps to manage diet, medication, and self-care for disease control.

Literature review analyses regarding the disease prevalence and educational training effects on nurses learning suggested the improved learning trends and this study also proved the same thing. SWOT analyses for the current study determined that it is feasible to conduct and can be carried later for future training programs in the diabetic units **(**Pfister-Minogue and Salveson, 2010).

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APPENDEX A

Pre-test

Questionnaire 1.

1. Glucose levels of are appropriate when it is
   A. Less than 180 mg/dL
   B. Between 70 and 130 mg/dL
   C. Between 100-140 mg/dL
   D. Less than 160 mg/dL

2. Which possibly causes insulin imbalance and reaction?
   A. Overeating
   B. Not taking your insulin
   C. Heavy exercise
   D. Infection

3. When nurse can administer orders insulin lispro (Humalog) to the patient?
   A. When the meal trays arrive to the floor
   B. When the patient is eating
   C. 15 minutes before meals
   D. 30 minutes before meals

4. What is linked with diabetes management?
   A. Nerve problems
   B. Kidney problems
   C. Vision problems
   D. Lung problems

5. Diabetes complication are
   A. Hypoglycemia
   B. Delayed healing
   C. Weight gain
   D. Kidney failure

6. Ketoacidosis signs are
   A. Sweating
   B. Shakiness
   C. Blood glucose
   D. Vomiting

7. Causing factors of diabetes 2 are
    A. Weight
    B. Enzyme deficiencies
    C. Heredity
    D. Liver disease
    E. Childhood illnesses

8. Difference between ketoacidosis and hypoglycaemic reaction is:
    A. Nausea
    B. Weakness
    C. Blurred vision
    D. Diaphoresis

9. Diabetes cardinal sign is
    A. Hyperactivity
    B. Seizure
    C. Nausea
    D. Frequent urination

1o. Diabetes is associated with
    A. Lung problems
    B. Kidney problems
    C. Vision problems
    D. Nerve problems

11. How dietary variations impact insulin levels?

12. What things affect stored insulin?

13. What is the treatment of hypoglycemia?

14. Describe the concept of diabetes?

15. What makes diabetic patients' situation worse? Give 3 reasons

16. Does awareness and education level help to treat patients in a better way?
    A. Yes
    B. No
    C. Explain

17. Do they need training and workshops relevant to their filed, how it can affect them?
    A. Yes
    B. No
    C. Explain

18. What are the issues and problems in the current educational system?

19. How the issues and problems in the current educational system can be resolved?

2o. What Sort of changes you consider for attention?

Post-test
Questionnaire 2

1. What is the management of diet for diabetic patient
    A. Frequent small meals
    B. Large meals
    C. Regulated food
    D. Sugar and Salt restricted diet

2. After giving intermediate-acting insulin or NPH, insulin reaction occurs in
    A. 12-15 hours
    B. 6-12 hours
    C. 1-3 hours

3. ketoacidosis signs are
    A. Sweating
    B. Shakiness
    C. Low blood glucose
    D. Vomiting

4. What is linked with diabetes management?
    A. Nerve problems
    B. Kidney problems
    C. Vision problems
    D. Lung problems

5. ketoacidosis signs are
    A. Sweating
    B. Shakiness

C. Blood glucose
D. Vomiting

6. Diabetes complication are
   A. Hypoglycemia
   B. Delayed healing
   C. Weight gain
   D. Kidney failure

7. Causing factors of diabetes 2 are
   A. Weight
   B. Enzyme deficiencies
   C. Heredity
   D. Liver disease
   E. Childhood illnesses

8. Difference between ketoacidosis and hypoglycemic reaction is:
   A. Nausea
   B. Weakness
   C. Blurred vision
   D. Diaphoresis

9. Diabetes cardinal sign is
   A. Hyperactivity
   B. Seizure
   C. Nausea
   D. Frequent urination

10. Diabetes is associated with
   A. Lung problems
   B. Kidney problems
   C. Vision problems
   D. Nerve problems

11. How exercise affects blood sugar?

12. How insulin can be administered into the body?

13. What are the symptoms of hyperglycemia?

14. How stress impacts insulin levels?

15. What is the interval of medical check-ups?

16. Does awareness and education level help to treat patients in a better way?
    A. Yes
    B. No
    C. Explain

17. Did they learnt from training, how it affected their level of knowledge?
    A. Yes
    B. No
    C. Explain

18. What are the issues and problems in the current educational system? Does training system addressed some of them?

19. How the issues and problems in the current educational system can be resolved? Did the current training intervention helped to gain the point?

2o. What sort of changes you consider for attention?