Shendi University

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Assessment of knowledge and practice of diabetic patients regarding insulin use in Elmak Nimer university hospital

Dissertation submitted in requirement for partial fulfillment of the degree of MSc in medical surgical nursing

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بسم الله الرحمن الرحيم

قال تعالى

(ربى أوزعنى أن أشكر نعمتك التى أنعمت على وعلى
والدى وأن أعمل صالحا ترضاه وادخلنى برحمتك فى
عبادك الصالحين)

الاية "14" من سورة النمل

Dedication

To that person for whom I kept all the meaning of love

and respect.

lovely dear…… Mama; Hayat

To the person who taught me the sense of life and what

the meaning of life and filled my heart with delight

and support me to face a trouble life.

lovely dear …….Papa; Ahmed Eltyeb

To those persons who give happiness to my life.

Dear brothers and sisters

To who taught me to give even without expecting.

dear Dr. Aala Abu-alfatah

To those who lead me to the way of success.

My teachers

To all friend and colleagues.

I dedicate this study

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their helping in conducting this study.

Abstract

The present study is a descriptive study aiming to assess The knowledge and practice of patients with type 2 diabetes mellitus regarding

insulin use. It was conducted in Elmak Nimer University on 50 diabetic patients randomly were   chosen. Data was collected using predesigned questionnaire. The result revealed that all studied patient had partial knowledge about the diabetes mellitus, insulin and types of insulin, beside optimum skills about preparing insulin dose and, 38% inject needle at 90 degree.

A significant proportion have a poor knowledge and skills regarding insulin storage 8%, technique of injection 8% , site 2% and the angle of injection 62%, habit of discard needle 6%.

The present study indicated that there was statistically, significant relation between level of education and knowledge about diabetes.

ملخص البحث

أجريت هذه الدرسة الوصفية بهدف تقييم معرفة وممارسة مرضى السكري النوع الثاني تجاه إستخدام الأنسولين.

أجريت الدراسة بمستشفى الملك نمر الجامعي على 50 مريض ، تم الاختيار عشوائياً ، جمعت المعلومات بواسطة الإستبيان .

أوضحت الدراسة أن معرفة المرضى حول مرض السكري الأنسولين جيدة. وكل المرضى لديهم المهارة الكافية في تحضير جرعة الأنسولين.

يلاحظ من الدراسة ضعف معرفة المرضى تجاه حفظ الأنسولين 8% ، 8% لا يستخدمون شد أو قبض الجلد لحقن الأنسولين ، 2% منهم لا يعرفون مواضع حقن الأنسولين ، 62% لا يستخدمون الزاوية القائمة للحقن ، 6% لا يتخلصون من الحقن المستعملة بصورة صحيحة.

أيضاً أوضحت الدراسة أن هناك علاقة واضحة بين التعليم ومعرفة المرضى عن مرض السكري.

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Introduction

Diabetes mellitus (DM) is one of the world's biggest health problems.

The first actual description of diabetes dates about 1500 years before Christianity when a Pharaoh's doctor noticed the accumulation of ants around the urine of some people instead of others. Hess Raa described it as a curable disease. It was then spoken of by Gallinious in Roman books. But, the most accurate description of the disease and its complications appeared in a book, The Law in Medicine, by President Ibn Sina (Avicenna) in the 10th century (www.e medicine.com) 1,12 It usually appears NovDec07.indd 36 01/29/2008 1:34:19 PM November/December 2007 Texas EMS Magazine 37.

Diabetes mellitus is define as a group of metabolic disorders characterized by hyperglycemia which results from defects in insulin secretion, insulin action or both (Lewis et al).

There are three types of diabetes mellitus , the first one is *Type1 Diabetes Mellitus* (juvenile diabetes mellitus, insulin-dependent diabetes mellitus, or IDDM) is caused by destruction of the beta cells of the pancreas. The second type is *Type 2 Diabetes Mellitus* (adult-onset diabetes mellitus, non–insulin-dependent diabetes mellitus, or NIDDM), In this type, insulin is still made by the pancreas, but in inadequate amounts. The amount of insulin is normal or even high, but the tissues are resistant to it and hyperglycemia results. The last type is *Gestational Diabetes mellitus (GDM)* which is develop during pregnancy, especially in women with the risk factors for type 2 diabetes .

Incidence of diabetes mellitus, both Type 1 and Type 2, varies from country to country. Also it becomes one of the most prevalent and economically important diseases of the 21st century. In western countries, it is estimated that DM affects, 6–8 percent of the adult population. Type 2 DM is, however, very frequent in persons over 60 years old (frequency around 20 percent) of both

sexes. Type 2 comprises 85–90 percent of cases of Caucasians and 95 percent of other races. Type 2 DM frequency is increasing worldwide, but the biggest increase is seen in the developing countries, In type 2 diabetes over 90 % of patient with diabetes , occurs in age over 35 years , 80 % -90 % of patient are over weight and now being seen in children (Katsilambros N. etal. 2006). The study of the epidemiology of diabetes mellitus is difficult, as many people who have diabetes are undiagnosed. It's consider the one of the foremost causes of death in many countries and a leading cause of blindness, renal failure, and non traumatic amputation. Global prevalence of diabetes in 2003 was estimated to be 194 million by 2030; this figure is predicted to rise to 366 million due to longer life expectancy and changing dietary habits.

In type 1 diabetes occur under 35 years of age , with a peak onset in age between 11 – 13 years , but can occur at any age . (Lewis etal . , 2007).

Causes of diabetes mellitus include Syndrome x , pancreatitis or cystic fibrosis , some drugs such as steroids - phenytoin - thiazide diuretics   (Linda and Paula , 2003) .

Diabetes mellitus may present with characteristic symptoms such as thirst, polyuria, blurring of vision, and weight loss. In its most severe forms, ketoacidosis or a non–ketotic hyperosmolar state may develop and lead to stupor, command, in absence of effective treatment, death (World Health Organization 1999) .

Diagnostic Tests in diabetes mellitus include fasting blood glucose , oral glucose tolerance test (OGTT) , Glycohemoglobin test , random blood sugar and 2 hours post bran dial (Linda and Paula , 2003) .

Management of diabetes mellitus Include *Medical Nutrition Therapy (MNT)* which it goal to achieve and maintain blood glucose and lipid levels as near to normal to prevent long-term complications . The diabetic patient has a limited

amount of insulin (endogenous or injected) so it is important to eat an amount of food that will not exceed the insulin's ability to carry it into the cells. Exercise is one of treatment , it modulates blood glucose, both immediately and for approximately 24 hours after the exercise. So it help to contro blood glucose and lipid levels , Also improves circulation, that decreased risk of cardiovascular disease. Patients are instructed to exercise on a regular basis, ideally 30 minutes on 2 to 3 days of the week to stabilize blood glucose levels and promote health. Medication involve injected insulin and oral hypoglycemic medication . Insulin is a protein so it can be digested if taken by mouth . Insulin is given subcutaneously , intramuscular , and through intravenous route in urgent situations or inhaled .Also given in many sites such as abdomen an thigh .Oral hypoglycemic medication are not insulin pills . Because most oral hypoglycemic agents depend on at least a partially functioning pancreas, most are not useful for patients with type 1 diabetes.

Complication of diabetes is divided in to tow categories, Acute complications such as hyperglycemia and hypoglycemia .Long-term complications, in circulatary system, include tow types, macrovascular complication such as atherosclerosis and arteriosclerosis in brain , heart, Microvascular complication occur in multiple organs such as eye   (retinopathy) , kidney (nephropathy) .Other complication as infection and foot complication (Linda and Paula 2007) .

Diabetes has high economic costs. The economic loss to the nation in 1975 in medical care costs was estimated to be $56 billion ,direct costs from complications, and indirect costs from loss of productivity. This $56 billion figure was surpassed in 1992, reaching $90 billion when the increased numbers and costs plus inflation were taken into consideration. In 1992, $37 billion was spent on hospital care. Indirect costs based on premature death cannot be

estimated but would also be in the billions. Direct costs for medical care and supplies, in 1997, were estimated at $44 billion. Indirect costs for short-term morbidity, long-term disability, and premature mortality estimated at $54 billion make the total cost $98 billion. This estimate was published by the (ADA) American Diabetes Association (1997) and was probably a conservative estimate. Some estimates for 1999 ran as high as $140 billion. In 2002, the costs were still increasing (ADA, 2003). Today, the cost exceeds $174 billion dollars (ADA, 2008). One of every 7 health care dollars in the United States is spent on diabetes. For Medicare, 1 of every 4 health care dollars is spent on diabetes. This economic loss is especially appalling because much of it is avoidable. Several studies have indicated that the economic loss from diabetes can be greatly reduced by careful medical control of the diabetes, careful continued medical surveillance, and patient education programs. In one of the first comparative reports, Miller and Goldstein (1972) in Los Angeles were able to save Los Angeles County $53 million/year in direct hospitalization costs by such a program. Diabetes Control and Complications.

Trial data (1993) confirm these savings by showing a reduction in microvascular disease of 50%–76%. A consensus conference on diabetes (1999) revealed similar savings and a marked reduction in amputations because of improved patient programs. In their update of the ADA report (2003) of the economic costs of diabetes in the United States, D'Souza and Padiyara (2008) revealed that diabetes costs have increased up by 32% since 2002.(Guthrie d. and Guthrie A,(2009)

Rational

Diabetes mellitus is one of the commonest in the community and remaining major cause of morbidity and immortality.

Insulin needs in medical cases which long life modulates of which, but recent it use increase and encompasses the both home and primary health care institutions beside using in control of type 2 diabetes and some health problem such as low body weight .

The wrong use of insulin is one of the causes of uncontrolled diabetes for this reasons it important to know the knowledge and practice of patients regarding insulin use to find out the suitable recommendation to the wellbeing of patients and to prevent or minimize the development of complications.

Research objectives

General objective :

To assess the of knowledge and practice of diabetic patients regarding insulin use .

Specific objectives :

- To evaluate patient's knowledge about Diabetes mellitus .

- To assess patient's knowledge and practice about insulin injection use.

- To identify the relation between wrong insulin use and diabetic control.

Literature Review

Definition of diabetes mellitus :

Diabetes is a metabolic disease or group of diseases resulting from an alteration in the availability and use of the pancreatic hormone insulin and irregularities in the endocrine system that may involve other hormones and the body's ability to use insulin (Management of Diabetes Mellitus, 2009). The American Diabetes Association define diabetes mellitus as a group of metabolic diseases characterized by increased levels of glucose in the blood (hyperglycemia) resulting from defects in insulin secretion, insulin action, or both (Smeltzer S . and Bare B (2000).

It is a heterogeneous group of metabolic disorder characterized by chronic hyperglycemia (Joslin's Diabetes Mellitus, 2006).

Epidemiology of Diabetes Miletus:

The estimated incidence of diabetes in the US exceeds 1.5 Million new cases annually, with an overall prevalence of 20.8 million people or 7% of the nation's population. An estimated 14.6 million persons are currently diagnosed with the disease, while an additional 6.2 million people who have diabetes

remain undiagnosed; this represents a six fold increase in the number of persons with diabetes over the past four decades.

In Sudan the actual prevalence of diabetes mellitus is unknown although one small study showed a prevalence of 3.4%. Diabetes is the commonest cause of hospital admission and morbidity due to a non communicable disease (7and 10% respectively). The problems of diabetes care in Sudan include the lack of efficient diabetes care centers, lack of specially trained personnel, the high cost of antidiabetic treatment, poor compliance with therapy or diet, ignorance and wrong beliefs, food and dietary factors and gender- related problem (Awad Mohamed and Nada Hassan).

Pathophysiology :

Body tissues, and the cells that compose them, use glucose for energy. Glucose is a simple sugar provided by the food we eat. Eaten carbohydrates are digested into sugars, including glucose, which is then absorbed into the bloodstream. Carbohydrates provide most of the glucose used by the body; proteins and fats provide smaller amounts of glucose. Glucose is able to enter the

cells only with the help of insulin, a hormone produced by the beta cells in the islets of Langerhans of the pancreas . When insulin comes in contact with the cell membrane, it combines with a receptor that allows activation of special glucose transporters in the membrane .

By helping glucose enter the body's cells, insulin lowers the glucose level in the blood. Insulin also helps the body store excess glucose in the liver in the form of glycogen. Another hormone, glucagon, is produced by the alpha cells in the islets of Langerhans which raises the blood glucose when needed by releasing the stored glucose from the liver and muscles.

Insulin and glucagon work together to keep the blood glucose at a constant level.

Diabetes results from faulty production of insulin, or from inability of the body's cells to use insulin or Abnormal glucagon secretion in type 2 diabetes. When glucose is unable to enter body cells, it stays in the bloodstream; hyperglycemia results, and the cells are dening their energy source (Linda and Paula 2007) .

Risk factor of diabete mellitus:

Race (eg, African Americans, Hispanic Americans, Native Americans, Asian Americans, Pacific Islanders) - Age ≥45 years - Previously identified impaired fasting glucose or impaired glucose

Tolerance - Hypertension (≥140/90 mm Hg) - History of gestational diabetes – life stressor such as the death of a family member, illness (Lewis et al).

Causes of diabetes mellitus:

The etiology of disease is not completely understood, but there are probably several causative factors within each type that is varying from patient to patient. It remains to be proven whatever the etiology is related to an inherited defect, an environmental factor e.g. (viruses, obesity) or interaction of both inheritance and environmental factors (William L. and Hopper P.2003). In type 1 (insulin dependent diabetes) it is felt that genetics or viruses or an autoimmune response alone or in combination are involved. In type 2 (non insulin dependent diabetes), genetics (responsible for up to 90% of cases) and obesity (≥20% over desired body weight) play a more significant role. Also prolonged use of some drugs, such as steroids,

phenytoin (Dilantin), thiazide diuretics, and thyroid hormone, may also impair insulin action and raise blood glucose (Management of Diabetes Mellitus 2009).

Classification of diabetes :

Diabetes mellitus is not a single disease but a syndrome, so the classification cannot be based on etiology and pathogenesis but it is convenient presently to include other consideration into classification as clinical manifestation or treatment requirement. In 1979 the National Diabetes Data group (NDDG) classified diabetes and it is related disorders. The (WHO) adopted this classification in next year and in 1985 added malnutrition related diabetes. So that past decade classification depends on pathogenesis and etiology of the various categories of diabetes (WHO 1999). The American Diabetes Association and WHO provided a new classification of diabetes (2003) and its related disorders. This classification are, type one which includes all forms of diabetes that are either primarily as type 1 or secondary as type 2, also category of gestational diabetes and category of malnutrition related diabetes. So it is important to realize that in this new classification, patients with any form of diabetes may require insulin treatment at some stage of their disease.

The common two types of diabetes mellitus; they may differ in cause, clinical course and treatment. According to the latest classification, they are:

Type 1 (insulin dependant diabetes mellitus IDDM):

Approximately 5% to 10% of diabetic patient have type 1 diabetes in which the insulin producing pancreatic beta cell are destroyed by an autoimmune process . so that insulin are needed to control blood glucose level . Type 1 diabetes is characterize by an acute onset , usually before age 30 .

Type 2 (non insulin dependant diabetes mellitus IDDM):

Approximately 90% to 95% of diabetic patient have type 2 diabetes . Type 2 diabetes result from a decreased sensitivity of insulin (called insulin resistant) or from decrease amount of insulin produced . It is first treated by diet and exercise . if elevated glucose level persist , diet and exercise are supplemented with oral hypoglycemic agent .In some individuals of type 2 diabetes, oral hypoglycemic agent do not control hyperglycemia, and insulin injections are required .In addition, some individuals who usually can control their type 2 diabetes with diet , exercise and oral hypoglycemic agent may require insulin injections during period of acute stress (eg, illness or surgery) .Some patients with type 2 diabetes who are treated with oral agent may have border line diabetes this refer to condition in which blood glucose in normal level   (border line diabetes is classified as impaired glucose tolerance or impaired fasting glucose so it consider diagnostic for diabetes) .

Signs and Symptoms of Diabetes :

An increase of blood glucose, result in signs and symptoms of diabetes mellitus, include polyuria (excessive urination), nocturia

(urination at night) that occur because the body need large amounts of water in requir to excrete the high blood glucose. polydipsia (excessive thirst), due to increased osmolality and dehydration. Polyphagia (excessive hunger), because glucose is unable to enter the cells, the cells starve, causing hunger. The large amount of glucose in the blood causes an increase in serum concentration, or osmolality, the renal tubules are unable to reabsorb all the excess glucose that is filtered by the glomeruli, and glycosuria results. High blood glucose may also cause fatigue, blurred vision, abdominal pain, and headaches.

Diagnosis of diabetes mellitus:

An abnormally high blood glucose level is the basic criterion for the diabetes diagnosis. Fasting plasma glucose (FPG) levels of 126 mg/dL (7.0 mmol/L) or more , random plasma glucose levels more than 200 mg/dL (11.1 mmol/L) on more than one occasion . The oral glucose tolerance test and the intravenous glucose tolerance test are no longer recommended for routine clinical use. In addition to the assessment and diagnostic evaluation for patients with known diabetes and evaluation for complications in patients with newly diagnosed diabetes are important in diabetes diagnosis (Lewis et al).

The National Diabetes Data Group has a framework for diagnosis of diabetes mellitus, and any one of theses criteria is sufficient to establish a firm diagnosis. Diagnose by the classic symptoms of diabetes, include polydipsia, polyuria and unexplained weight loss. Random plasma glucose determines in excess of 200mg/dl are sufficient to make the diagnosis, but in symptomatic individuals fasting blood glucose determinations must be performed and if the level is in excess of 140mg/dl on two occasions these will be necessary to meet diagnostic criteria,(the normal fasting blood glucose level ranges from 60 to 110 mg/dl). But those unusual circumstances in which the fasting glucose level is normal but there is a high index of suspicion that diabetes exists (i.e. family history or other risk factors or clinical signs suggestive of long term diabetic complications) .Also William L. and Hopper P., mentioned that, when the fasting blood glucose (drawn after at least 4 hours without eating) is above 126 mg/dl on two separate occasions, diabetes is diagnosed. (Lewis et al, 2007).

Oral glucose tolerance test another test to diagnose diabetes is the oral glucose tolerance test (OGTT). It measures blood glucose at intervals after

the patient drinks a concentrated carbohydrate drink. Diabetes is diagnosed when the blood glucose level is 200 mg/dl or higher after 2 hours.

Glycohemoglobin test also called glycosylated hemoglobin or HbALC is used to gather baseline data and to monitor progress of diabetes control. Glucose in the blood attaches to hemoglobin in the red blood cells. Red blood cells live about 3 months in the body. When the glucose that is attached to the hemoglobin is measured, it reflects the average blood glucose level for the previous 3 month. Results should be approximately 4 to7 percent, depending on the laboratory. This is a helpful measurement when blood glucose levels fluctuate and a single measurement would be misleading. It also assists in patient's treatment plan. Glycohemoglobin testing might be inaccurate in some people, such as those with anemia. Those individuals may have a glycated serum protein test which is a similar test that indicates glucose levels over a period of 1to2weeks instead of 3 month.

Additional tests are also used to evaluate the effect of body or dody area and system ,these tests recommended to gather baseline data include a lipid profile, serum creatinine and urine microalbumin levels to monitor kidney function, urinalysis, and electrocardiogram (Williams L and Hopper D, 2003)

Complications of diabetes mellitus :

Complications of both type 1 and type 2 DM can be categorized as acute complications include hyperglycemia, hypoglycemia (insulin reaction), diabetic ketoacidosis, hyperglycemia, hyperosmolar noketotic syndrome. Chronic or long term complications of diabetes that can be categorize as either microvascular or Macrovascular in nature. Microvascular complications refer to nephropathy, neuropathy and retinopathy and these

problems develop due to macrovascular complication (Lewis L. and Heitkemper M.2007)

Hyperglycemia:

When calories eaten exceed insulin available or glucose used, high blood glucose (hyperglycemia) occurs. The most common cause of hyperglycemia is eating more than the meal plan prescribes. Another major cause is stress. Stress causes the release of counter-regulatory hormones, including epinephrine, cortisol, growth hormone, and glucagon. These hormones all increase the blood glucose level. In a person without diabetes, this is an adaptive function. However, the patient with diabetes is unable to compensate for the increased blood glucose with increased insulin secretion, and hyperglycemia occurs (Lewis etal).

Hypoglycemia:

Low blood glucose, or hypoglycemia, occurs when there are not enough calories available in relation to circulating insulin. Hypoglycemia is usually defined as a blood glucose level below 50 mg/dl. It commonly occurs before meals or in the early morning. When the blood glucose falls rapidly the sympathetic nervous system is stimulated to produce adrenaline causing sweating, tremor, tachycardia, palpation and nervousness. But when blood glucose falls slowly, there is depression of the central nervous system resulting in headache, emotional change, memory lapses, numbness of the lips and tongue, slurred speech, incoordination, double vision, drowsiness, convulsion and eventually coma because the brain depends on glucose for its energy supply. As hypoglycemia progress, brain function deteriorates and permanent central nervous system damage may result from prolonged hypoglycemia. The combination of symptoms varies considerably in different patients and in same patient at different time. To treat low blood

glucose, administer a "fast sugar" 15 grams of carbohydrate that will enter the bloodstream quickly. This may be 4 ounces of orange juice, commercially available glucose tablets. If the patient is not alert or is unable to safely swallow, give the glucose by intravenous (IV) according to agency policy. Recheck glucose in 15 minutes. If the blood glucose does not return to normal, repeat the procedure every 15 minutes until relief occurs. Do not over treat hypoglycemia with too much sugar, because this may cause hyperglycemia and rebound hypoglycemia (. Joslin, 2006).

Diabetic Ketoacidosis:

Diabetic ketoacidosis (DKA) occurs when blood glucose levels become very high and insulin is deficient. This most commonly occurs in individuals with type 1 diabetes but it may occur also in persons with type 2 diabetes. DKA is often keto with undiagnosed type 1 diabetes first seeks help. It is usually prompted by an illness, infections, trauma, operation, pregnancy or other stressor and noncompliance of an insulin regimen. In some patients with type 1DM the simple omission of one dose of insulin can results in hyperglycemia and leads to a series of biochemical disorders and the altered physiology is the result of insulin deficiency. It will affect the metabolism of carbohydrate, protein and fat so the amount of glucose entering the cells is reduced and fat is metabolized instead of carbohydrate and free fatty acids are mobilized from adipose tissue. With lowering of serum bicarbonate and PH and its clinical picture occur as a result of changes in body fluid, electrolytes and acid-base status (Lewis L. and Heitkemper M.2007).

The early features, of DKA are polyuria, polydipsia, and osmotic dieresis causes water loss (dehydration) and electrolyte depletion. So patient becomes more dehydrate and oliguria (diminished urination) develops, later on malaise , visual changes ,headache, muscle ache ,abdominal pain, anorexia, nausea and vomiting may occur. If infection has precipitated the ketoacidosis, fever may be present; the patient's respiratory rate increases to compensate for acidosis. Respiration will be very deep but not labored (kussmaul's breathing), sweetish odor of the breath (acetone odor) and so patient is drowsy and soon becomes comatose (Williams L. and Hopper D.2003).

The blood glucose is elevated, the serum bicarbonate and blood PH are decreased, the blood urea is increased and plasma ketone is strongly positive, the urine is positive for acetone and the patient's conditions is serious at this stage but recovery can be anticipated after prompt and vigorous treatment with insulin and intravenous fluids.

The treatment of the diabetic ketoacidosis includes intravenous fluids, intravenous insulin, and monitoring blood glucose. Monitoring blood glucose levels closely and notify the registered nurse or physician when the desired level is reached. Intravenous glucose should be added when the blood glucose drops to 250 mg/dl to avoid disequilibrium. Potassium should also be monitored, because the serum potassium level drops rapidly as it reenters the cells. The cause of the DKA should be identified and treated (Brunner).

Hyperosmolar, Hyperglycemic, Nonketotic Syndrome:

(HHNK) syndrome occurs primarily in type 2 diabetes, when blood glucose levels are high as a result of stress or illness. Because the person with type 2 diabetes has some insulin production, cells do not starve and

DKA usually does not occur. It occurs more often in the elderly. As the blood glucose raises (hyperglycemic), polyuria causes profound dehydration, producing the hyperosmolar (concentrated) state. Blood glucose may rise as high as 1500 mg/dl. Because ketoacidosis is not present, the patient may not feel as physically ill as the patient with DKA and may delay seeking treatment. Symptoms of HHNK develop slowly and include extreme thirst, lethargy, and mental confusion. Shock, coma, and death occur if HHNK is left untreated. The mortality rate for HHNK is about 15 percent (Lewis etal 2007).

The treatment of HHNK includes IV fluids, insulin and glucose monitoring. The cause should be identified and treated. HHNK syndrome can be prevented with careful monitoring of glucose levels at home. Patients should be instructed to drink plenty of fluids if blood glucose levels are beginning to rise, especially in times of stress and illness. They should also know when to call their physician with high blood glucose results (Smeltzer S . and Bare B (2000).

Chronic complications of diabetes :

Over time, chronic hyperglycemia causes a variety of serious complications in persons with diabetes. These involve the circulatory system, eyes, kidneys, and nerves. Most of the complications involve either the large blood vessels in the body (macrovascular complications) or the tiny blood vessels, such as those in the eyes or kidneys (Microvascular complications). The United Kingdom Prospective Diabetes Study (UKPDS), completed in 1998, showed that individuals with type 2 diabetes who maintain an HbA1c below 7 percent can significantly reduce complications.

Macrovascular Complications:

Macrovascular complications are disease of the large and medium- size blood vessels that occur with greater frequency and with an earlier onset in people with diabetes(Lewis etal 2007). They are more likely to have hypertension and elevated low-density lipoprotein (LDL) cholesterol and triglyceride levels. High blood glucose may also affect platelet function, leading to increased clotting. These problems lead to a higher incidence of strokes, heart attacks, and poor circulation in the feet and legs. The risk of cardiovascular disease and strokes is two to four times more common in persons with diabetes than in the general population. Patient with type 2 diabetes mellitus who have multiple cardiac risk factors are more likely to suffer from macrovascular complications and therefore should be targeted to undergo intensive education regarding lifestyle modification. Blood glucose and blood pressure control is vital to help prevent these deadly complications. Patients should also avoid smoking, and maintain normal weight. Aspirin therapy to reduce platelet aggregation is recommended for patients older than 21 years of age with diabetes (Joslin 2006).

Retinopathy:

Diabetic retinopathy is the leading cause of blindness in people between 20 and 74 years of age in the United States; it occurs in both type 1 and type 2 diabetes (ADA, Diabetic Retinopathy, 2003). People with diabetes experience higher rates of cataracts and glaucoma. The rupture of small aneurysms in the retinal vessels is the major cause of blindness in diabetic patient.

The first focus of management is on primary and secondary prevention. So the maintenance of blood glucose to a normal or near-normal level in type 1 diabetes through intensive insulin therapy and patient education decreased the

risk for development of retinopathy by 76% when compared with conventional therapy in patients without preexisting retinopathy (Lewis et al).

Nephropathy:

Brunner mentioned that 39 percent of all new cases of end-stage renal disease are related to diabetes. Renal disease causes 50 percent of all deaths among adults with insulin dependent diabetes, thickening of the glomerular capillary is the main specific renal problem related to diabetes. This chronic hyperglycemia induces intercapillary glomerulosclerosis (kimmelstiel Wilson Sclerosis) and micro albuminurea is an early warning sign of nephropathy. Therefore detection and management of elevated urine albumin levels can prevent further kidney damage, and if damage is allowed to progress the eventual need for renal replacement therapy may be only one of remaining options for survival (Joslin 2006).

Neuropathy:

Diabetic neuropathy refers to a group of diseases that affect all types of nerves, including peripheral (sensorimotor), autonomic, and spinal nerves. They are the earliest signs of chronic complications of diabetes. The extend and severity of neuropathy is often linked to the severity and duration of the hyperglycemia. Autonomic neuropathy can affect the cardiovascular system result in silent, or painless, myocardial ischemia and infarction. Also can lead to considerable disruption in the lifestyle of the patient with diabetes. As manifested by gastroparesis, nocturnal diarrhea, urinary bladder dysfunction and impotence. The Peripheral Neuropathy with Initial symptoms include paresthesias (prickling, tingling, or heightened sensation) and burning sensations (especially at night). As the neuropathy progresses, the feet become numb. In addition, a decrease in proprioception (awareness of posture and movement of the body and of position and weight of objects

in relation to the body) and a decreased position sensation may lead to an unsteady gait, the first modality to be vest is vibration. Decreased sensations of pain and temperature place patients with neuropathy at increased risk for injury and undetected foot infections. On physical examination, a decrease in deep tendon reflexes and vibratory sensation is found.

Peripheral neuropathy treated by intensive insulin therapy and control of blood glucose levels that delay the onset and slow the progression of neuropathy. Pain, particularly of the lower extremities, manage with nerve sedation (preferably nonopioid). The combination of vascular changes and peripheral neuropathy put the patient's feet at particular risk from damage and this can lead to gangrene, requiring amputation (Lewis et al).

Infection:

Persons with diabetes are prone to infection for several reasons. If injuries occur, healing may be slow because of impaired circulation. There may not be enough blood supply to heal the wound or fight an infection. For the same reason, it may be difficult for intravenous antibiotics to reach an infected site, and topical antibiotics may be preferable. In the presence of hyperglycemia, white blood cells become sluggish and ineffective, further reducing the body's ability to fight infection. The incidence of periodontal (gum) disease, caused by bacteria in plaque, is also increased in individuals with diabetes. Patients must be taught to maintain good oral hygiene and make regular visits to the dentist (Williams L. and Hopper D,2003).

Foot Complications:

The combination of vascular disease, neuropathy, and risk for infection makes patients with diabetes prone to foot problems. Consider patients who have no feeling in their feet because of neuropathy. If they step on a tack, they may not feel it right away. Vascular disease prevents good blood

supply to promote healing. If infection sets in, it is slow to resolve. Pressure points on the feet may also break down. Neuropathy can lead to deformities of the feet, an even charcoat join , further increasing the risk for injuries (Lewis etal, 2007).

Insulin therapy:

The insulin should be added when the combined use of oral antidiabetic drugs and nonpharmacologic measures (exercise and diet) are no longer able to achieve glycemic control. Benefits associated with early initiation of insulin therapy include prevention of glucose toxicity, preservation of existing B-cell function, and prevention or delay of microvascular and macrovascular complications and improve wellbeing , maintain , improve body weight.

The initiation of insulin administration is often delayed in patients with type 2 diabetes for several reasons, including a perception that insulin therapy is complex, lacks resources in an office-based practice, fear of hypoglycemia, provider and patient resistance to its use.

The action of insolin:

Insulin was discovered in Canada in 1922 .

Insulin unlocks the 'doors' of cells to let the glucose in and it also suppresses liver glucose production. People with Type 2 diabetes may need supplementary injected insulin if they are insulin deficient and/or insulin resistant due to obesity or taking certain drugs, such as steroids, and where diet, physical activity and oral hypoglycaemic agents are no longer sufficiently effective in lowering blood glucose.

Normal meal-time insulin:

As well as this 24-hour background insulin secretion, there is a burst of insulin at every meal - often called the meal-time bolus. Whenever glucose

is released into the blood stream from food, a matching release of insulin is required for up to two hours in order to move the glucose into the cells. How long this increased insulin level is needed depends on the type of carbohydrate, its glycaemic index, and the fat content of the meal.

Strong indications for insulin therapy for patient with Type 2 diabetes include:

✦ Failure of oral therapy

✦ Stressful condition.

✦ Pregnancy or planning pregnancy.

✦ Oral hypoglycaemic treatments not tolerated/ contra-indicated.

✦ Weight loss without dieting in someone of low weight.

Possible indications for insulin therapy in type 2 include:

✦ Unsatisfactory glycaemic control, even with the maximum tolerated dose of oral hypoglycaemic agents (HbA1c higher than 7 per cent, self blood glucose monitoring results higher than 7 mmols/litre before meals or 9 mmols/litre two hours after meals)

✦ Personal preference

✦ Painful neuropathy

✦ Foot ulceration and infection.

Preventable patient harm associated with errors in insulin use continues to be a problem in many patient,these errors include:

-Administration of a wrong dose due to calculation errors or measurement errors.

-Wrong timing of doses result from mis-timing of doses.

 Omission of doses, failure to properly adjust insulin therapy, and improper monitoring, timing, and assessment of blood glucose results from insulin

therapy knowledge deficit (Starting insulin treatment in adult with type 2 diabetes 2004).

Tips on initiating insulin therapy:

Wrong time, site, technique, dose, storage, use of biologically inactive insulin.

It is important to educate the patient about this point early in the process of care and remind her/him with some regularity that insulin is not a punishment, it is perhaps the most effective treatment available. In addition, it should be emphasized that insulin is not needed because the patient was "bad".

Diabetes education is a necessary preparation for patient self-management.

● Addressing the patient's fears and concerns about diabetes and insulin therapy is also critical for successful self-management.

● Referral to a dietitian is essential.

● Have the patient self-administer the first dose of insulin in the office.

The prescription for insulin should include the brand name, type (70/30, 75/25, glargine, neutral protamine hagedorn NPH, regular, etc.), rote of administration (pen, cartridge, syringe), and the approximate total daily dose .

Insulin Selection :

Along with recognition of the benefits associated with intensive glycemic management, the need for insulin formulations that more closely approximate the physiologic insulin secretion profile has become apparent. The ideal insulin preparation should produce the same biphasic physiologic pattern as that of endogenous insulin in a healthy person, evidencing a rapid rise from a baseline between 5 μU/mL and 12 μU/mL, reaching a peak

concentration of 80 μU/mL to 120 μU/mL within 30 to 60 minutes after a meal, and followed by a rapid return to baseline before the next meal .This physiologic serum insulin profile reflects both the basal-level secretion of insulin, and the stimulated release of insulin following meals. The rapid initial rise in insulin level affords postprandial glycemic control, while the rapid decline reduces the potential for hypoglycemia and secondary weight gain.

Although none of the currently available insulin preparations exactly mimic the endogenous biphasic insulin pattern, the rapid- and short-acting insulins are best suited for coverage of mealtime glycemia, while the intermediate- and long-acting insulins serve to control basal levels of plasma glucose. Various insulin combinations are often used, typically a rapid- or short-acting insulin with an intermediate- or long-acting insulin, to more closely simulate the physiologic insulin profile. Basal insulin formulations suppress hepatic glucose production between meals and overnight, and reflect 40% to 50% of daily needs for an individual. Therefore, approximately half of the insulin (or combination of insulins) dose should cover glycemia associated with the basal need, reserving the remaining half for mealtime needs. Low basal concentrations of insulin reduce hepatic glucose production while allowing sufficient glucose levels for brain energy production. The stimulated insulin release that occurs with food intake is primarily responsible for limiting postprandial hyperglycemia. Characterized by an immediate rise and sharp peak at approximately 1 hour following each meal, postprandial insulin (reflecting 10% to 20% of total daily insulin requirements for each meal) concentrations return to basal levels in 2 to 4 hours.

The principal goal of intensive glycemic management is to achieve the lowest possible glycosylated hemoglobin A1C without inducing hypoglycemia. With exogenous insulin therapy, this can be accomplished through the use of insulin analogs, which are designed to approximate the effects of physiologic insulin secretion. Various insulin analog formulations allow for improved basal or postprandial coverage, while premixed formulations provide control for both.

Conventional (Human) Insulin:

Conventional insulins are ultimately limited by time action profiles that do not closely match physiologic insulin secretion. As a result, there is a higher incidence of hypoglycemia, and the dosing schedules of conventional insulins do not enhance compliance. Weight gain, which exacerbates diabetes, frequently accompanies treatment with conventional insulins. Regular human insulin has a relatively slow onset of action, and must be administered at least 15 to 30 minutes before meals for greatest effectiveness. Furthermore, peak effect and duration of action are longer than those of the rapid-acting insulin analogs.

Rabid -Acting Insulin Analogs:

In recent years, analogs of human insulin have been designed to better reflect the physiologic insulin secretion profile. The ideal rapid-acting insulin analog should have the following characteristics: onset of less than 1 hour, duration of fewer than 4 hours, and similar effects in all patients. Rapid-acting insulin analogs (aspart, glulisine, and lispro) are associated with a more rapid onset and shorter duration compared with regular human insulin, thereby simulating the effects of physiologic, postprandial insulin secretion more closely. Rapid acting insulin analogs are designed to provide a short, rapid burst of insulin to minimize the postprandial rise in glucose.

This effect lowers postprandial blood sugars much better than regular human insulin and confers less risk of hypoglycemia between meals. Patients do not have to inject themselves 30 minutes before the meal, but can take their insulin at the time of the meal, which tends to be more convenient. Less variability within individuals has also been documented for insulin aspart than for human regular insulin. The rapid-acting analogs require concomitant basal insulin.

Basal Insulin Analogs:

Long- or intermediate-acting insulins have been available for several years, but have been associated with the risk of hypoglycemia, a side effect dreaded by both patients and physicians. Ultralente, the long-acting insulin that has been available for many years, is very difficult to control, particularly because of its variable duration. It also may be difficult to titrate because of the time needed for equilibration after a dose change.

Neutral Protamine Hagedorn (NPH) insulin has also been used for many years. It is a twice-a-day, intermediate- acting insulin with a significant peak, rendering patients prone to hypoglycemia, in particular nocturnal hypoglycemia. The onset, peak, and duration of action of NPH fall between those of the rapid-/short-acting and long-acting insulins. The basal insulin analogs (insulin detemir and insulin glargine) have taken longer to develop than the rapid-acting analogs but are evolving as new choices for the treatment of diabetes. Desirable features for basal insulins are solubility at neutral pH (avoiding problems associated with resuspension) and a long, flat pharmacokinetic profile. The time-action profile of a long-acting basal insulin also should be predictable and reproducible from injection to injection and from patient to patient. While insulin glargine does not possess all of these desirable attributes, its introduction broadened options

for therapy by providing relatively peakless coverage lasting for nearly 24 hours. Glargine and ultralente insulin are similar in that neither has a peak effect, but the duration of action for glargine is longer than for ultralente. Insulin detemir is a long-acting insulin analog currently under clinical investigation. It has shown a consistent pharmacokinetic profile across age groups24 and less within-subject variability than either NPH or glargine. Detemir has proven superior to NPH in patients with type 1 diabetes. The low variability and more physiologic profile of detemir have been associated with improved glycemic control and tolerability.

Insulin Analogs Premixes:

In addition to multiple daily injection regimens and insulin pump therapy, the use of an insulin analog premix can provide coverage of both post prandial and basal glucose needs. Insulin lispro premix 75/25 contains insulin lispro protamine suspension as the long-acting component, mixed at a 75/25 ratio with rapid-acting insulin lispro. Insulin aspart premix 70/30 contains rapid-acting insulin aspart, of which 70% has been protaminated to extend the duration of action to provide a basal insulin component. Insulin aspart premix 70/30 has been shown to lower PPG excursions compared with both human insulin premix 70/30 and insulin lispro premix 75/25.In patients with type 1 and type 2 diabetes, insulin aspart premix 70/30 significantly improved postprandial glycemic control without increasing the risk of hypoglycemia when compared with human insulin premix 70/30.

Clinical Trial Of Insulin:

The efficacy of insulin in type 2 diabetes has been extensively investigated in clinical trials. In the majority of these trials, insulin was initiated in

patients whose hyperglycemia was not adequately controlled with one or more oral hypoglycemic agents.

Long-acting insulin analogs:

In a trial comparing various combinations of OADs and bedtime NPH, metformin with bedtime NPH showed the largest decreases in A1C levels. Self-adjustment of NPH doses was based on fasting blood glucose (FBG) assessments, aiming for a level below 108 mg/dL. Despite self adjustment of the insulin dose, no treatment groups reached a mean A1C value below 7%. In a more recent trial comparing insulin glargine and NPH, both administered at bedtime in combination with oral therapies, an FBG of 100 mg/dL or less was targeted. Systematic titration resulted in approximately 60% of patients in both insulin treatment groups achieving an A1C of 7% or less, with significantly fewer occurrences of nocturnal hypoglycemia observed in the insulin glargine group.

Short-acting insulin analogs:

In a study of sulfonylurea therapy combined with mealtime insulin lispro, bedtime NPH, or twice-daily metformin in patients with type 2 diabetes not maximally controlled with oral sulfonylureas alone, premeal rapid-acting insulin analog lispro with twice-daily glyburide resulted in significantly improved glycemic control. Two-hour PPG and A1C levels were significantly lower than the combination of glyburide and metformin or glyburide and bedtime NPH. In a recent trial of rapid-acting insulin aspart, human insulin, and 70/30 premixed human insulin among patients with type 2 diabetes, the most pronounced reductions in A1C and PPG levels corresponded to therapy with mealtime insulin aspart. PPG control correlated with improved A1C values.

Insulin analog premixes:

Nearly all studies of insulin analog premixes to date have compared one premix with another (eg, human insulin premix 70/30). One recent study compared twice-daily insulin aspart premix 70/30 to a single shot of long-acting insulin glargine. Each was used with a simple titration schedule in 233 patients with type 2 diabetes who were not achieving glycemic targets on OADs alone. Baseline A1C values were 8% or greater and body mass indices were 40 kg/m2 or less. Secretagogues and alpha-glucosidase inhibitors were discontinued during the run-in period, metformin was optimized to 1,500 mg/day or more, and patients receiving pioglitazone were switched to rosiglitazone. Patients were then randomly assigned to either insulin glargine (10 to 12 U) at bedtime or insulin aspart premix 70/30 (5 or 6 U) before breakfast and dinner. The results confirmed that insulin aspart premix 70/30 provided significantly greater A1C reduction (0.43% more) and better postprandial glycemic control compared with insulin glargine. Of subjects treated with insulin aspart premix 70/30, 66% reached an A1C of less than 7% at 28 weeks compared with 40% of glargine-treated subjects (*P*<0.01). Similarly, an A1C of 6.5% or less was achieved in 42% of patients using insulin aspart premixed 70/30 as a starting regimen compared with 28% of patients using bedtime glargine (*P*<0.05). No major hypoglycemic episodes were reported.

Furthermore, these data are supported by a separate study by Malone et al that emphasized the importance of addressing PPG in insulin treatment strategies. An A1C of 7% or less was achieved by 41.4% of patients using twice-daily insulin lispro premix plus metformin and by 22% of those using once-daily glargine plus metformin (Journal of family practice May 2005).

Delivery device of insolin:

There are many types of injection devices.

Pens:

Some 'pens' come 'pre-loaded'with insulin, and are disposable, easier to use, but are more expensive.

Others use cartridges of insulin that are inserted into a re-usable device, most cartridge pens are available on prescription. People who are frightened of needles may wish to use the NovoPen Penmate, which conceals the needle, while those with severe needle-phobia may want a completely needle-free device.

Traditional syringes and vials:

Are still available if they prefer them.

Teaching pen injection technique:

✦ The patients assembles the pen, attaches the needle, dials the dose and gives the injection themselves.

✦ Do an air shot before each injection, especially if a new cartridge and/or needle has been fitted.An air shot will make sure the plunger is connected, and expel air from the pen.

✦ If using intermediate or pre-mixed insulin, invert or rotate the pen at least 20 times to mix the insulin.

✦ Inject into clean skin with clean hands.Alcohol wipes are not recommended because it is an astringent and hardening the skin so can make the injection more painful.

✦ Insulin should be injected into soft fat, not muscle.To avoid intramuscular injection, people using injection sites without much subcutaneous fat,may need to 'pinch up' and/or use a shorter needle length

(Correct 'pinch up': Use the thumb and index finger to pinch up the subcutaneous fat, leaving the muscle behind.Using the whole hand tends to pull up the muscle).

✦ Inject at a 90º angle.

✦ Push the needle in all the way.

✦ Needles come in 5, 6, 8, 12 and 12.7 mm lengths.

✦ After the injection, leave the needle in the skin for 5 to 10 seconds to avoid leakage. With large doses, it may need to be left in for longer.

✦ Occasionally, there may be bleeding after the needle is withdrawn. Reassure the person, and advise them to apply gentle pressure for a couple of minutes to minimise bruising.

They should not rub the area, as this may increase the rate of insulin absorption.

Injection sites:

There are a number of alternatives.

✦ Abdomen - fastest absorption, usually plenty of subcutaneous fat,making it easy to do a pinch up.Agood option for fast-acting insulin.

✦ Thighs - slower absorption.Best with intermediate acting insulin, or the evening dose of a twice-daily insulin regimen.Very little subcutaneous fat laterally, so use a pinch up and/or short needles.

✦ Arms – medium to fast absorption.Make sure there is sufficient fat, and use short needles.

✦ Buttocks – slowest absorption.Use for intermediate or long-acting insulins. Plenty of subcutaneous fat, so no 'pinch up' is needed.

Rotating injection sites:

Repeatedly injecting into the same smal area results in lumps (lipohypertrophy) which hinder insulin absorption.

Alternate between the left and right side on a weekly basis, and rotate sites within the same area. Each injection should be at least a finger's breadth away from the last one.Check for lumps on a regular basis.

If lipohypertrophy is found, that area should not be used for injection until it has become soft again. This may take weeks or even months, depending on the severity of the lipoatrophy.

Storing insulin:

✦ Insulin should be kept in degree between 4 and 8° C.

✦ Cold insulin may take longer to absorb, and cause stinging. Give the insulin at least half-an-hour at room temperature before injecting.

✦ Insulated pouches will keep insulin cool in hot weather.

✦ The insulin device or cartridge in use can be kept at normal room temperature for one month.

✦ Keep insulin away from children.

✦ Always check the expiry date (Starting insulin treatment in adult with type 2 diabetes 2004).

Research Methodology

Study design :

The study is descriptive.. Included 50 diabetic patients and it will be conducted in the period between January 2010 – March 2010. The information will be collected randomly through a predesigned questionnaire and check list.

Study area:

This study was carried out at elmak nimer university hospital in Shendi city, river Nile state, Sudan, which is located northern, about 176 Km of Khartoum, population about 80000 persons (WHO 2003) most of them are farmers. The hospital include main four department, medicine, surgery, pediatric and obstetric and gynecology beside oncology and also encompasses cardiac care unit, intensive care unit, otorinolaryngology (ENT), ophthalmology, psychiatric, oncology, orthopedic and there is department of radiology which include ultrasound (US), x-ray, computerize tomography (C-T scan), hemodialysis unit, out patient clinic for various

specialty, also advance investigation can be done in hospital as echocardiogram and stress ECG. Cardiac catheterization laboratory will start to work.

The hospital provide it's services to city and it's drawing area which extend from Elgaily to Atbara. The villages on bortle fide of the river Nile and the bed wins.

Study population :

The population in this study includes the diabetic patient who attending elmak nimer university hospital and using insulin to treat diabetes mellitus. Diabetic under 15 years were excluded.

Sampling and sample size :

All diabetic patient using insulin who attended elmak nimer and diabetic clinic. Sample size is 50 persons.

Data analysis :

The collected data was stored, analyzed and tabulated by using Statistical Package Social Sciences (SPSS).

Ethical consideration :

The aim of present study will be explained to the director of the study setting to take his permission to carry out the study . Also the aim of present study will be explained to diabetic patients, and verbal consent will be taken from them.

Results

Table (1) shows the distribution of the studied population according to their age.

Age	Frequency	Percent
0 – 15 years	-	-
16 – 25 years	5	10 %
26 – 40 years	15	30 %
41 – 65 years	21	42 %
More than 65 years	9	18 %
Total	50	100 %

The study shows that age of the studied population ranged between 17- 70 years.

Figure (1) shows the sex distribution among the studied population.
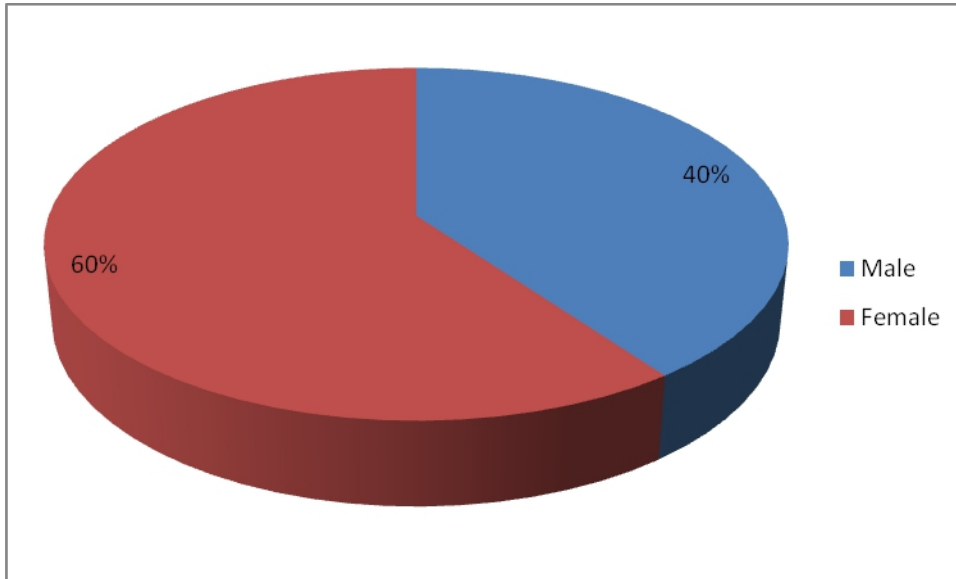
The figure shows that most of the group studied were females 60 %.

**Figure (2): Distribution of the studied population according to their residence.**
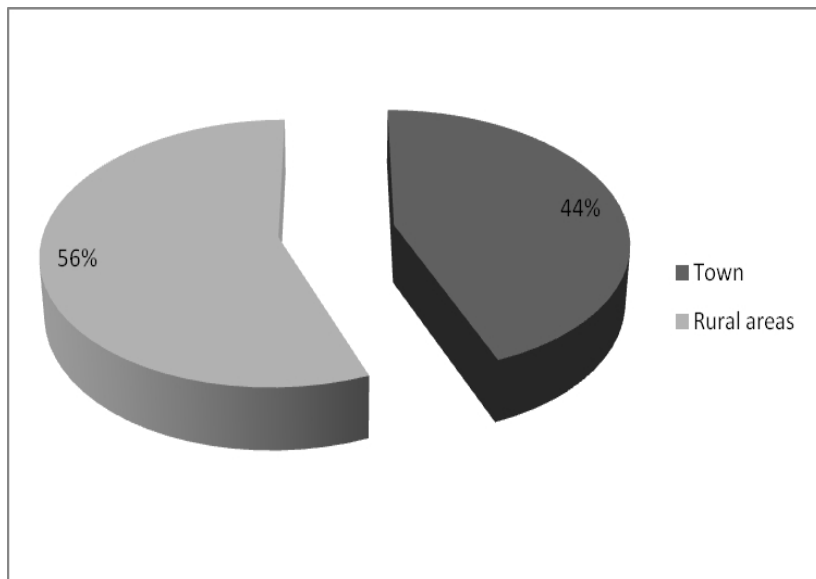
The figure shows that patients coming from rural area 56 % are more than those from the town.

Figure (3): Shows distribution of the studied population according to their marital status.
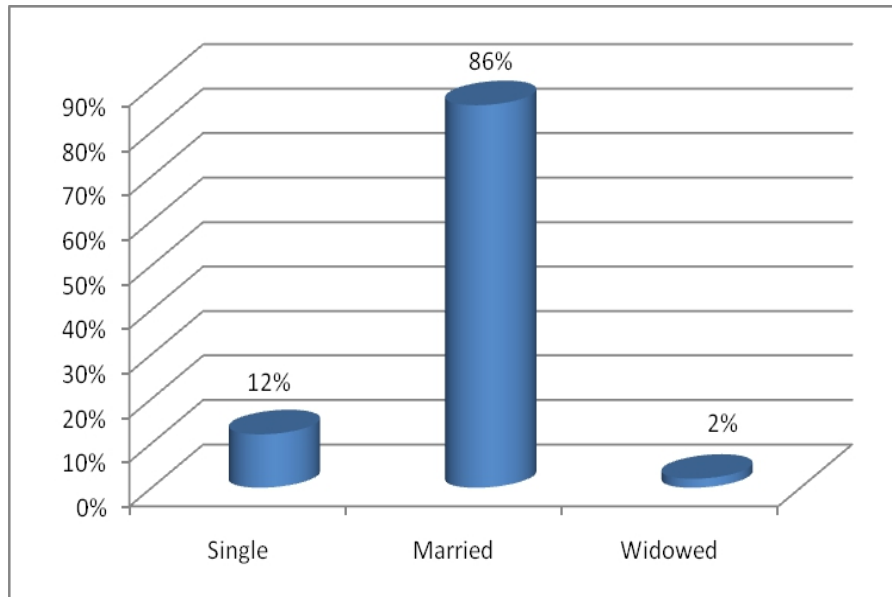
The figure

shows that most of the studied group 86 % were married

Table (2): Distribution of the studied population according to the their family size.

Member	Frequency	Percent
1 – 3 members	7	14 %
4 – 6 members	21	42 %
7 – 9 members	16	32 %
More than 9 members	6	12 %
Total	50	100 %

The table shows that 42 % of the study population had a family size of 4 – 6 members, 32 % of 6 – 9 members and 1 – 3 members is 14% followed by 12 % of more than 9 members.

Table (3) distributes the studied group according to their educational level

Educational level	Frequency	Percent
Illiterate	17	34 %
Primary school	17	34 %
secondary school	11	22 %
Graduate & post graduate	5	10 %
Total	50	100 %

The table shows that 34 % of studied group were illiterate, primary school level 34% and only 10 % were graduated.

Figure (4) distributes the occupation of the studied population.
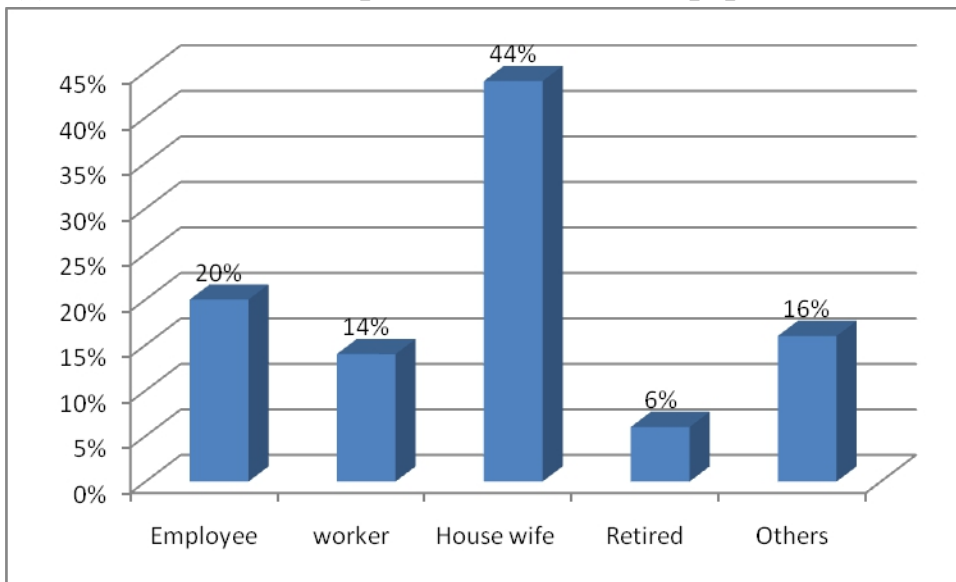
The figure shows that 44 % of the studied population are housewives followed by employee 20%.

**Figure (5) Distribution of the studied population according to the duration of the disease.**
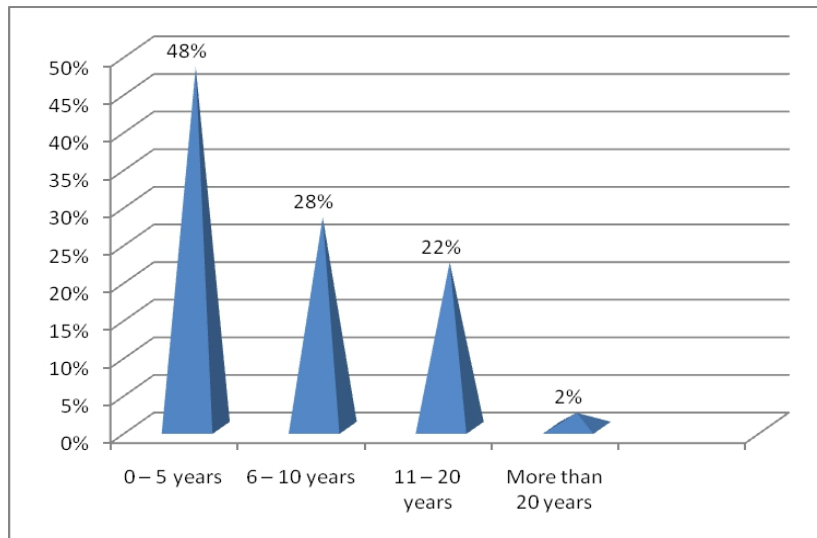
The table shows that about half of the patients 48% have the disease for 0 -5 years duration.

Table (4): Distribution of the studied population according to their knowledge about definition of diabetes.

Definition	Frequency	Percent
A Total or partial decrease of insulin in the blood	6	12 %
Increased blood sugar than normal level	37	74 %
Both Definition	7	14 %
Total	50	100 %

The table shows that the most of the studied group 74% know that diabetes is an increased of blood sugar than normal level.

Table No. (5): Distribution of the studied population according to their knowledge about the definition of insulin.

What is the insulin:	Frequency	Percent
Is a hormone secreted by the pancreas to regulate blood sugar	10	20 %
A drug for the treatment of diabetes	34	68 %
Both definitions	6	12 %
Total	50	100 %

The table shows that most of the studied group 68% know that insulin is a drug used for the treatment of diabetes.

Table No. (6): Distribution of the studied population according to the level of knowledge according to the types of insulin.

Type	Frequency	Percent
Soluble	1	2 %
mixtard	10	20 %
zinc	1	2 %
All type	22	44 %
Soluble + mixtard	13	26 %
Soluble + zinc	3	6 %
Total	50	100 %

The table shows that all the group have partial knowledge about type of insulin

Table No. (7): Distribution of the studied population according to their knowledge regarding methods of store of insulin.

Method	Frequency	Percent
Room temperature	2	4 %
Store at degree of freezing	2	4 %
Refrigerator- degree of cooling	15	30 %
break ice	1	2 %
Option 3 + 4	28	56 %
Option 2 + 3	1	2 %
Option 1 +3 +4	1	2 %
Total	50	100 %

The table shows that more than half of the studied population 56% know that insulin can be store at degree of cooling or in break ice.

Figure (6): Distribution of the studied population according to their level of knowledge about the need of control of diabetes.
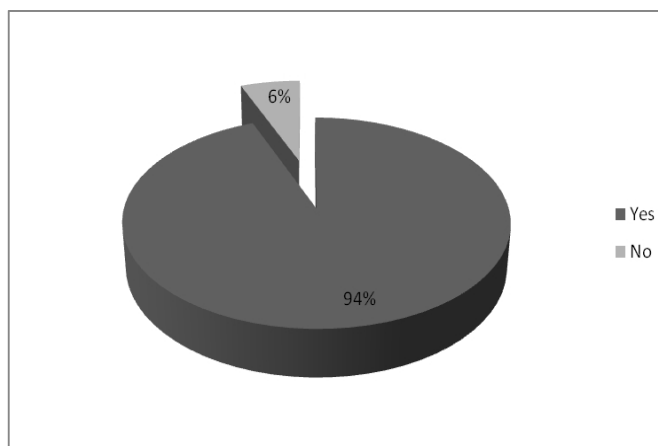
The table shows that only 6% of the group ware stated that diabetes can not be treated.

Table (8) Distribution of the studied population according to their level of knowledge about Complications of diabetes.

Complications	Frequency	Percent
Nephropathy	4	8 %
Heart disease	2	4 %
Retinopathy	8	16 %
Neuropathy (diabetic septic foot- DSF)	1	2 %
All of above	5	10 %
Nephropathy, heart disease, retinopathy	9	18 %
Nephropathy, heart disease	4	8 %
Nephropathy, heart disease, retinopathy, neuropathy	1	2 %
Nephropathy, heart disease, retinopathy, cardiovascular	5	10 %
Nephropathy, retinopathy	1	2
Heart disease, retinopathy	7	14
Others	3	6

		50	100 %
Total		50	100 %

The table shows that 18% of the studied population stated that the complication of diabetes is nephropathy, heart disease and retinopathy, and only 6% of the population are not aware about the complication.

Table (9): Distribution of the studied population according to their knowledge regarding their reaction against hypoglycemia.

Reaction	Frequency	Percent
Consult a doctor	9	18 %
Consult a sister	1	2 %
Consult a health center	1	2 %
Self remedying	34	68 %
Others	5	10 %
Total	50	1oo %

The table shows that 68% of the studied group can recognize hypoglycemia and positively react against it.

Table (10) Distribution of the studied population according to their compliance to worse the timing of insulin dose.

Sticking	Frequency	Percent

	Frequency	Percent
Yes	50	100 %
No	0	0%
Total	50	100%

The table shows that all the studied group were stickled to the time of prescribed insulin dose.

Table (11): Distribution of the study population according to their knowledge about the sites of the injection.

Site	Frequency	Percent
Around umbilicus	29	58 %
Thigh muscle	17	34 %
Deltoid muscle	3	6 %
Others	1	2 %
Total	50	100 %

The table shows that more than half of the group 58% ware used the site around umbilicus to inject insulin, followed by 34% in the thigh muscle.

Angle	Frequency	Percent
15 – 45 degrees	25	50 %
45 – 90 degrees	6	12 %
90 degrees	19	38 %

Total	50	100 %

Table No. (12): Distribution of the studied population according to their knowledge about the angle used to inject insulin.

The table shows that more than one third 38% of the studied group were used to inject insulin perpendicularly and half of them 50% injected obliquely 15 – 45 degrees

Table (13): Distribution of the studied population according to their knowledge about the complications of insulin injections.

Complications	Frequency	Percent
Lipid hypertrophy	28	556 %
Muscle atrophy	4	8 %
Hypoglycemia	5	10 %
Weight gain - sensitivity	6	12 %
Others	7	14 %

Total	50	100 %

The table shows that 55% of studied group know that the complication of insulin injection is lipid hypertrophy and 14% are not aware about the complication.

Figure (7): Distribution of the studied population regarding their skills of spreading or pinching skin with non- dominant hand.
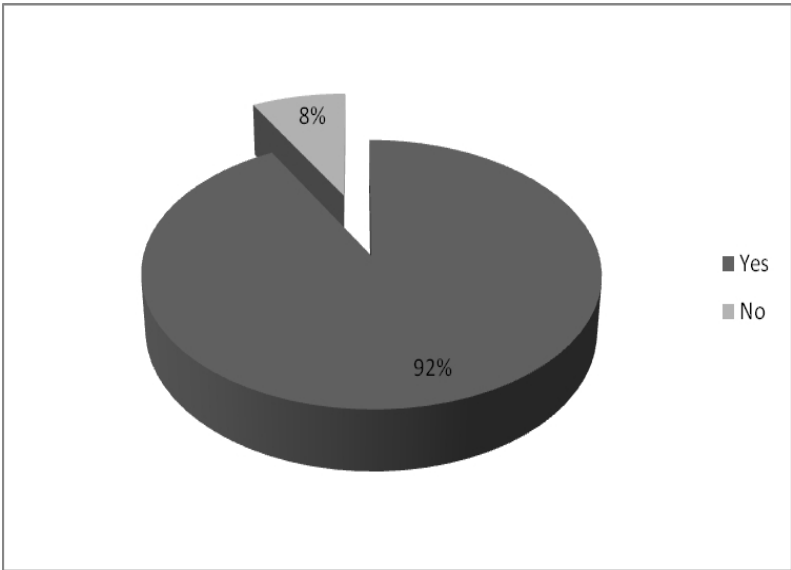
The figure shows

that about fifth of the studied group 8 % do not spread or pinch the skin when injecting insulin.

Table (14): Distribution of the studied population regarding the habit of safely discarding the needles.

Safely needle discard	Frequency	Percent
Yes	47	94 %
No	3	6 %
Total	50	100 %

The table shows that 6% of the studied population were reused the needle and do not safely discard it.

Table (15): Relation between level of education and knowledge about diabetes.

Education	Definition of diabetes			Total
	Absolute or relative deficiency of insulin in blood	Increase of blood sugar more than normal range	Both definitions	
Illiterate		16	1	17
Primary	1	14	2	17
Secondary	2	6	3	11
University and above	3	1	1	5
Total	6	37	7	50

Chi-square test

	Value	df	Asymp.sig. (2 sided)
Person Chi-square	18.517	6	.005

The table shows clearly that 32% of illiterate patients had knowledge about the definition of diabetes as an increased blood sugar more than normal range and they do not know that it is the result of absolute or relative deficiency of insulin in blood. Followed by primary school 28 % who know the first definition and only 2% of patients know the other, graduate patient have better knowledge about diabetes. The relation statistically significant, **p value = .005.**

Discussion

The wrong insulin uses is one of the causes of uncontrolled diabetes which lead to the development of complications.

This study is a descriptive study was conducted to assess the knowledge and practice of diabetics regarding the insulin use in elmak nimer university hospital from January 2010 to march 2010. 50 diabetic patients randomly were chosen. Data was collected using predesigned questionnaire.

The age of the studied group ranged between 17 – 70 years, most of diabetic studied were female (60% versus 40% male, female to male ratio of 3:2)This is consistence with (William L. and Hopper P.2003).

The study revealed most of the diabetic studied are marred 86%, and those who come from rural areas 56% this may due to insufficient services provided or not meet the patient needs in the rural health institutions, and most of them have a family size of 4 – 6 members, The importance of this demographic variables is

those effect knowledge and practice of insulin use as that reported by Yousif (1994), and Hsaio & Salmon (1999) who stated that personal or demographic variables could be effective factors in adjustment to chronic illness.

Moreover, more population in the study were diabetic in range of 0 - 5 years duration 48%, according to the study findings there are newly discover diabetic patient because some patient suffer from the disease before 21 day and other before 6 months.

The study showed that most of patients were housewives 44%. This may due to that most of the group were from diabetic clinic and this may attribute to the fact that the working time of clinic, 8:30 to 11:30 am may not be suitable for working patients who are mostly male, while this time was suitable for housewives. This is agreement with the finding of EL-Dosogy (2001). In addition to the low percent of male participants in the study, and to the fact that male patients may seek other health care services provided by their work, as health insurance clinics.

A regarding occupation most of the studied group ware house wives while employees in percent of 20% and other occupations ware few percent.

A regarding to their level of education, most of the patients were illiterate 34% and primary school 34%

Regarding knowledge about diabetes and insulin, the present study detected that all the group have partial knowledge about the diabetes, insulin and type of insulin. These knowledge was gained from medical education, the mass media or other. But some of the studied population had poor knowledge about storing of insulin and this could be one of the causes of poor diabetic control. Also a minority 6% stated that diabetes can not be treated; and this may referred to repeated short term complication (hypo - hyperglycemia) due to failure of adjustment of medical description or use of insulin. That the failure of therapy used due to omission of doses, failure to properly adjust insulin therapy, and

The study indicate that 10% of patients do not recognized hypoglycemia and positively react agonist it.

The study revealed that most of the studied population are familial to around umbilicus 58% and thigh 34% sites of insulin injection.

The present study revealed that about 38 % of patient had good skills regarding the angle of the injecting needle. (Inject at a 90º angle - Royal College in nursing, 2004). Also found more than half patient 56% do not apply swab after insulin injection, this step need to apply pressure to prevent leakage of insulin dose from the tissue and stop bleeding. As the Royal College, 2004 stated that (Occasionally, there may be bleeding after the needle is withdrawn. Reassure the person, and advise them to apply gentle pressure for a couple of minutes to minimize bruising).

Also the study revealed that about (6%) of patient do not follow the safely discard the needles and reuse it. This attributes with the study of David et al ((Almost half (49%) of diabetic patients in a combined university clinic and private practice reused supposedly disposable insulin syringes - a mean of 3.9 times. Compliance with standard aseptic precautions was poor, only 29% of patients follow recommended practices.

The study indicated that there was statistically, significant relation between level of education and knowledge about diabetes. This is similar to finding of the Gazvin university 2008 who found statistically, significant relationship between knowledge and skills, skills and education.

Conclusion

The present study had shown that the studied group of all diabetic patients have a satisfactory level of knowledge regarding the diabetes, it's complication and insulin as a drug.

A significant proportion have a poor knowledge and skills regarding insulin storage 8%, technique of injection 8% , site 2%, the angle of injection 62% and habit of discard needle 6%..

The present study indicated that there was statistically, significant relation between level of education and knowledge about diabetes.

Recommendations

1. Introduction of a proper diabetic clinic.
2. Introduction of education as apart of diabetic clinic.
3. Preparation of qualified personnel to lead the diabetic clinic.
4. Use simplified treatment regimen.
5. Encourage Intra patients spreading of information.
6. Use of mass media as a tool for education.
7. Encourage single and group base discussion.

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بسم الله الرحمن الرحيم

جامعة شندي

كلية الدراسات العليا

ماجستير التمريض الباطني الجراحي

استبيان عن تقييم معرفة وتطبيق مرضى السكر للانسولين

في مستشفى المك نمر الجامعي 2009- 2010م

الرقم المسلسل:-   (   )

1- ألاسم ....

2- العمر :   أ- 15- 25 سنة   (   )   ب- من 26 - 35 سنة (   )

ج- من 36 - 45 سنة   (   )   د- من 46 – 55 سنة (   )

ه- من 56 – 65 سنة   (   )   و- أكثر من 65 سنة   (   )

3- الجنس: أ- ذكر   (   )   ب- انثى   (   )

4- السكن :

....

5- الحالة الاجتماعية :   أ- اعزب   (   )   ب- متزوج   (   )

ج- ارمل   (   )   د- مطلق   (   )

6- عدد أفراد الأسرة ....

7- مع من تعيش   أ- مع الزوج أو الزوجة (   )   ب- الزوج والزوجة والاولاد (   ) ج-

الوالدين (   ) د- الاولاد (   ) و- أحد الاصدقاء (   ) ز- دار مسنين (   ) ه-

بمفرده (   )

8- القبيلة :   أ- الجعلية   (   )   ب-الشايقية   (   )

ج- نهود   (   )   د- أخرى حدد ....

9- التعليم:

أ- امي   (   )   ب- اساسي   (   )

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ج- ثانوي ( )   د- جامعي فما فوق ( )

10- الوظيفة:-   أ- موظف ( )   ب- عامل ( )

ج- ربة منزل ( )   د- أخرى حدد ....

11- متى اكتشفت أنك مريض بالسكرى :

أ- من 0 - 2 ( )   ب- من 2 – 5 سنة ( )

ج- من 5 – 10 سنة ( )   د- من 10 – 20 سنة ( )

هـ- أكثر من 20 سنة ( )

12- هل اكتشفت أنك مريض بالسكرى :

أ عن طريق الصدفة ( )   ب- عند ظهور أعراض ( )   ج- عند ظهور مضاعفات ( )

د- من 10 – 20 سنة   هـ- أكثر من 10 سنة ( )

13- هل تعاني من امراض اخرى غير السكر :

ا- الضغط ( )   ب- مرض بالبنكرياس ( )

ج- مرض بالغدد الصماء ( )   د- أخرى حدد ....

14- ما هو مرض السكرى :

أ- نقصان الانسولين الكلى أو الجذئى فى الدم ( )

ب- زيادة سكر الدم عن المستوى الطبيعى له ( )

15- ما هو الانسولين :

أ- هو هرمون يفرز من البنكرياس لتنظيم سكر الدم ( )

ب- هو عقار لعلاج مرض السكرى ( )

16- ما هى أنواع الانسولين :

أ- أنسولين عادة ( )   ب- أنسولين مخلوط ( )   ج- أنسولين زنك ( )

17- ما هى طريقة حفظ الانسولين :

أ- فى درجة حرارة الغرفة العادية ( )   ب- فى الثلاجة فى درجة التجميد ( )

ج- فى الثلاجة فى درجة التبريد ( )   د- خارج الثلاجة فى قطع ثلج ( )

18- ما هى الاسباب التى تؤدى الى مرض السكرى :

أ- السمنة ( )   ب- أسباب وراثية ( )

ج- النظام الغذائى (   )   د- السبب غير معروف (   )

19- ما هى أعراض وعلامات مرض السكرى :

أ-- فتور عام (   )   ب- كثرة التبول (   )

ج- كثرة شرب الماء (   )   د- نقصان الوزن (   )

20- هل يمكن علاجه : أ- نعم (   )   ب- لا (   )

21- اذا كانت الاجابة بنعم كيف ؟

أ- الانسولين (   )   ب- حبوب السكرى (   )

ج - التغذية (   )   د- التمارين الرياضية (   )

هـ اخرى حدد ....

22- ما هى مضاعفات مرض السكرى :

أ- أمراض الكلى (   )   ب- أمراض القلب (   ) ج- اعتلال البصر (   )

د- اعتلال الاعصاب (   )   هـ- امراض الاوعية الدموية (   )

23- هل يمكن الوقاية من هذا المرض :

نعم (   )   لا (   )

24- اذا كانت الاجابة بنعم ، كيف ؟

أ - تقليل الوزن (   )   ب- عدم الافراط فى تناول السكر (   )

ج- الرياضة البدنية (   )   د- الفحص الدورى لسكر الدم والبول (   )

25- نوع مرض السكر :

أ- سكرمعتمد على الانسولين (   )

ب- سكر غير معتمد على الانسولين (   )

26- العلاج الذي تأخذه: أ- علاج غذائي (   )

ب- انسولين (   )

ج- اقراص (   )

د- دواء اخر حدد ....

27- هل تعرف اعراض نقص سكر الدم :

أ- تعرق شديد (   )   ب- رجفة فى الجسم (   )

ج- فقدان الوعى   (   )   د- برودة الاطراف   (   )

28- كيف تقوم بعلاجها :

أ- تذهب الى الطبيب المعالج (   )   ب- تذهب للسستر   (   )

ج- تذهب للمركز الصحى   (   )   ب- تقوم بعلاجها بنفسك   (   )

كيف ....

....

29- هل تعتقد أن المعالجة بالانسولين ضرورية :

أ- نعم   (   )   ب- لا   (   )

30- هل أنت ملتزم بمواعيد جرعة الانسولين المحدده من قبل الطبيب المعالج :

أ- نعم   (   )   ب- لا (   )

31- هل أنت ملتزم بمقدار جرعة الانسولين المحدده من قبل الطبيب المعالج :

أ- نعم   (   )   ب- لا (   )

32- ماهي مواضع حقن الانسولين :

أ- العضلة البطنية حول السرة   (   )

ب- فى العضلة الامامية للفخذ   (   )

ج- فى عضلة العضد   (   )

د- فى الجانب الاعلى من الالية   (   )

هـ- أخرى حدد   (   )

33- ما هى الزاوية التى تستخدمها لحقن الانسولين :

أ- أقل من 15 درجة   (   )   ب- من 15 – 45 درجة   (   )

من 45 – أقل من 90 درجة   (   )   ج- 90 درجة   (   )

34- في رأيك ما هى مضاعفات حقن الانسولين :

أ- تضخم العضلة   (   )   ب- ضمور العضلة   (   )

ج- ظهور أعراض نقص سكر الدم   (   )   د- أخرى حدد ....

35- هل تلقيت اي معلومات عن كيفية استخدام الانسولين :

نعم (   )   لا (   )

36- اذا كانت الاجابة بنعم ، من :

أ- الطبيب المعالج (   )   ب- المركز الصحي (   )   ج- من أجهزة الاعلام (   )

د- دوريات   (   )   ه- اخرى حدد ....

Check List of *Subcutaneous insulin injection*

Serial number   (   )

Step /Task	Yes	No
1. Insure time of insolin injection.		
2. Prepare correct amount of insolin dose from vial. Check carefully. Be sure all air is expelled.		
3. Keep privacy.		
4. Wash hands .		
5. Select appropriate injection site. Inspect skin surface over site for bruises, inflammation or edema palpate site for mass or tenderness (avoid theses area).		
6. Assume comfortable position (have client relax arm, leg, or abdomen, depending on site chosen)		
7. Relocate site using anatomical landmarks.		
8. Cleans site with antiseptic swab. Apply swab at center of the site and rotate outward in a circular direction for about 5 cm.		
9. Hold swab or gauze between third and fourth fingers of non-dominant hand.		
10.Remove needle cap or sheath from needle by pulling it straight off.		
11.Hold syringe between thumb & forefinger of dominant hand (hold as dart, palm down)		
12.Administer injection: For average size client, spread skin tightly across injection site or pinch skin with non- dominant hand.		
13.Inject needle quickly and firmly at 90 degree angle. Then release skin, if pinched.		
14.After needle enters site, grasp lower end of syringe barrel with non – dominant hand. Move dominant hand to end of plunger.		
15.Inject insolin slowly.		
16.Withdraw needle while applying alcohol swab or gauze gently over site.		
17.Do not massage site after injection of insulin.		
18.Discard uncapped needle in safety shield.		
19.Wash hands.		
20.Inspect site for bruising ,indurations.		