# Effect of Information Technology Based Intervention on Glycemic Control of Children Suffering from Diabetes

## Thesis

Submitted for partial fulfillment of Doctorate Degree
in Pediatric Nursing

**Prepared by**


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M.Sc. Pediatric Nursing, 2003
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**Faculty of Nursing**
**Ain Shams University**
**2015**

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Submitted for partial fulfillment of Doctorate Degree
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# ACKNOWLEDGMENT

First and foremost, I feel always indebted to **Allah** the Most Beneficent and Merciful.

I wish to express my deepest gratitude and thanks to **Dr. Wafaa El-Sayed Ouda,** Professor of Pediatric Nursing, Faculty of Nursing, Ain Shams University, for her constructive criticism, unlimited help and giving me the privilege to work under her supervision.

My deepest thanks and sincere appreciation are also presented to **Dr. Randa Mohammed Adly,** Assistant Professor of Pediatric Nursing, Faculty of Nursing, Ain Shams University, for her intensive support, continuous encouragement and valuable guidance.

My most sincere gratitude is also extended to **Dr. Hayam Refaat Tantawi,** Assistant Professor of Pediatric Nursing, Faculty of Nursing, Ain Shams University, for her enthusiastic help, continuous supervision, guidance and support throughout this work.

Special thanks to **Palestinian Medical Relief Society,** for their enormous help and support during data collection and program implementation. Special thanks to diabetic children and their families, to my family members for their efforts and support me in this thesis.

Lastly, I would like to express my deep thanks to all those who contributed by giving their time, efforts, and encouragement to the fulfillment of this work.

**Candidate**

**Mohammed Fathy Eljerjawy**

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# List of Abbreviations

| Abbrev. | Full-term |
|---|---|
| **ANOVA** | **:** Analysis of Variance |
| **BG** | **:** Blood Glucose |
| **CVCs** | **:** Cardiovascular Complications |
| **CD** | : Compact Disk |
| **DM** | **:** Diabetes Mellitus |
| **DID** | **:** Diabetes Interactive Diary |
| **DKA** | **:** Diabetic Keto- Acidosis |
| **E-mail** | **:** Electronic Mail |
| **FIT** | **:** Functional Insulin Therapy |
| **GAD** | **:** Glutamic Acid Decarboxylase |
| **$HBA_{1c}$** | **:** Glycosylated Hemoglobin |
| **HPs** | **:** Health Professionals |
| **ICA** | **:** Islet Cells Antibodies |
| **IT** | **:** Information Technology |
| **ITDM** | **:** Information Technology Enabled Diabetes Management |
| **LDLs** | **:** Low-Density Lipoproteins |
| **MODY** | **:** Maturity Onset Diabetes of the Young |
| **M-health** | **:** Mobile Health |
| **MOH** | **:** Ministry of Health |
| **MENA** | **:** Middle East and North Africa |
| **PMRS** | **:** Palestinian Medical Relief Society |
| **PT** | **:** Physical Therapy |
| **PDA** | **:** Personal Digital Assistant |

**SMBG** **:** Self-Monitoring of Blood Glucose

## List of Abbreviations *(Cont....)*

| Abbr. | Full-term |
|---|---|
| **SMS** | **:** Short Message Service |
| **T1DM** | **:** Type $_1$ Diabetes Mellitus |
| **T2DM** | **:** Type $_2$ Diabetes Mellitus |
| **TLC** | **:** Telephone-Linked Care |
| **TM** | **:** Telemedicine |
| **USA** | **:** United States of America |
| **UK** | **:** United Kingdom |
| **USB** | **:** Universal Serial Bus |
| **WAP** | **:** Wireless Application Protocol |
| **3G** | **:** Third Generation |

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## Abstract

**Introduction:** Information technology enabled diabetic children for management of themselves and helps to improve their care processes, which in turn reduces the rate of diabetic complications. **Aim:** The study aimed to study the effect of information technology based intervention on glycemic control of children suffering from diabetes. **Subjects & Methods:** A quasi-experimental study design was utilized in this study. This intervention study was carried out including a purposive sample of 80 diabetic children with a predetermined criteria, suffering from type $_1$ diabetes and attending diabetes clinic in Palestinian Medical Relief Society, Gaza Strip from January 2013 to June 2013. A structured questionnaire was used to collect data about characteristics of the studied children (pre/posttest questionnaire) about knowledge, actual practice and use of information technology in glycemic control. According to the deficit needs of the studied children, the information technology based intervention was designed. **Results:** The study results revealed that, there was a statistical significant difference between pre and post test of information based intervention in most items related to diabetic children's knowledge and actual practice and use of information technology in glycemic control. Post information technology based intervention a significant improvement was observed in children's knowledge and actual practice with lowering of their mean levels of blood glucose. **Conclusion:** Information technology based intervention was effective in improving glycemic control of children with type $_1$ diabetes. **Recommendation:** The study recommended to apply such IT based intervention programs in other diabetic clinics and hospitals for better glycemic control of diabetic children.



**Key words**: information technology, type $_1$ diabetes mellitus, knowledge, practice, glycemic control, health education program, pediatric nursing.

# Introduction and aim of the study

# Introduction

Information technology enable diabetes management (ITDM) and helps to improve diabetic-care processes, which in turn reduces the rate of diabetic complications. Self-management technologies provide diabetic children and their care givers with educational resources and data gathering mechanisms for managing their own care. These technologies include automated phone systems that generate reminders or offer educational content; electronic diary tools that collect information to be taken **(Davis et al., 2012)**. However, Information technology in the form of the Telephone-Linked Care (TLC) diabetes system is considered the important program in providing management of diabetes through monitoring, educating and coaching the children with diabetes to improve their nutrition, physical activity, blood glucose testing and medication taking. Currently, the TLC complements the care provided to children with diabetes by general practitioners, endocrinologists, diabetes educators and other health care workers **(Interactive Information Technology in Diabetes Care, 2011)**.

Type $_1$ diabetes incidence varies greatly between different countries, within countries and between different ethnic population. Mean annual incidence rates for childhood type $_1$ diabetes (0-14 years age group) is 0.1 to 57.6 per

100,000 comparing different countries of the world **(Gage et al., 2012).**

Approximately one in three children born in the United States will develop diabetes. The odds are higher for African-American and Hispanic children: nearly 50% of them will develop diabetes **(Urrutia-Rojas and Menchaca, 2009).**

It is generally accepted that in order to effectively manage diabetes, education about components of management such as blood glucose monitoring, insulin replacement, diet, exercise, and problem solving strategies must be delivered to the diabetic children and their families. Education seems necessary both at diagnosis, where there is usually no knowledge base and diabetic children and their families are given the basic skills for controlling the disease and throughout the patient's lifetime, with ongoing attention to self-management skills, screening and prevention of complications and new development in these areas. Since management of diabetes requires lifestyle changes, most clinicians feel it is important for education to be delivered to the whole family **(Gage et al., 2012)**.

The existing and emerging technologies such as wireless devices (cell phones) with E-mail and text messaging (SMS) functionality, pagers, and the Internet can

help facilitate patient self-management of diabetes. These types of devices are practical and cost-effective methods for monitoring clinical outcomes and increasing patient adherence to treatment **(Krishna and Boren, 2008).** Wireless technologies can be used as intermediary tools to facilitate the information between patient and care provider and treatment advice between clinic visits. Results from studies incorporating the use of remote patient monitoring devices (cell phones and other wireless tools) have indicated significant decreases in $HBA_{1c}$ levels and improved health-related outcomes in diabetes **(Faridi, 2008 and Krishna and Boren 2008 ).**

**Significance of the study:**

According to the annual report of the department of health Gaza Strip in 2010, there are 986 children were diagnosed as Type $_1$ diabetes and 4.8% of them complaining from diabetes related complications, they faced some difficulties in accessibility to Palestinian Medical Relief Society (PMRS) which care given for 1,440,332 populations at 364 km **(Ministry of Health, (MOH), Gaza Strip 2009)**. Thus this study would be of great value for nursing practice by testing the effect of information technology in glycemic control of children suffering from Type $_1$ diabetes.

# Aim of the Study

This study aimed to study the effect of information technology based intervention on glycemic control of children suffering from diabetes.

## Objectives of the Study

- Assess knowledge of the diabetic children regarding the effect of information technology based intervention on their glycemic control.
- Design IT based intervention in the light of the actual need assessment of the study sample.
- Implement and evaluate the effect of IT based intervention on glycemic control of the study sample.

## Hypothesis

The information technology based intervention would affect the glycemic control of the diabetic children.

# Review of Literature

# Review of Literature

## Part I: Overview about Diabetes Mellitus

**Definition:**

Diabetes mellitus is a chronic disorder of metabolism characterized by a partial or complete deficiency of the insulin hormone. It is the most common metabolic disease, resulting in metabolic adjustment or physiologic change in almost all areas of the body **(Urrutia-Rojas and Menchaca, 2009).**

Type $_1$ diabetes mellitus (T1DM) is a disease in which the cells in the pancreas that produce insulin are destroyed by the body's own immune system (an autoimmune disease), this process leads to insulin deficiency. While, insulin is a hormone that lowers blood glucose (sugar), therefore, without insulin, hyperglycaemia (high blood glucose levels) occurs **(Daneman, 2010).**

## Pathophysiology:

Certain foods are converted into glucose, which is the primary energy supply. Insulin from beta cells of the pancreas transports glucose into cells for cell metabolism. Diabetes mellitus occurs when beta cells are unable to produce insulin (Type $_1$ diabetes mellitus). As a result, glucose doesn't enter cells and remains in the blood. Increased glucose levels in the blood signal the body to increase the intake of fluid to flush

glucose out of the body in urine, resulting in increased thirst and increased urination in the patient. Cells become starved for energy because of the lack of glucose and signal the body to eat causing the patient to experience an increase in hunger **(Jonson and Keogh, 2010).**

Diabetes mellitus is considered as a group of metabolic diseases characterized by elevated blood glucose levels (hyperglycemia) resulting from defects in insulin secretion, insulin action or both. Chronic hyperglycemia is associated with microvascular and macrovascular complications that can lead to visual impairment, blindness, kidney disease, nerve damage, amputation, heart disease and stroke **(American Diabetes Association, 2012).**

## Epidemiology:

### Prevalence:

In the United States, the prevalence of diabetes is estimated to be 23.6 million people, roughly 7.8% of the population **(National Institute of Diabetes, 2009).**

According to the International Diabetes Federation it was mentioned that, Egypt considered to be on top of all the countries in the Middle East and North Africa (MENA), with a prevalence of diabetes reported as 12.6% under the age of 15 years **(Soltesz et al., 2010).**

However, the true prevalence of diabetes is dramatically underestimated **(Canadian Diabetes Association, 2008)**. The total prevalence of diabetes under 20 years of age was estimated as 215.000, or 0.26% of all people in this age group have diabetes, about 1 in every 400 children has diabetes **(American Diabetes Association, 2011).**

## Incidence:

Diabetes mellitus in children can occur at any age but has a peak incidence between ages 10 and 15 years, with 75% diagnosed before 18 years of age. The incidence in boys is slightly higher than in girls (1:1 to 1.2:1), the highest reported incidence rates are in Finland, with increasing from 31.4 per 100.000 inhabitants per year in 1980 to 64.2 per 100.000 inhabitants per year in 2005, and the lowest 0.1 per 100.000 inhabitants per year among children under the age of 15 years in China and Venezuela **(Hockenberry and Wilson, 2009).**

In Palestine according to the annual report of the department of health in 2010, there are 986 children were diagnosed as Type $_1$ diabetes and 4.8% of them complaining from diabetes related complications. The total number of new diabetes mellitus was 3485 with incidence rate 24.2/10000 of population, while the number of dead cases was 85 cases according to death certificate, distributed among sex as

45.9% male and 54.1% female **(Ministry of Health/ Palestine, 2009).**

## Clinical manifestations:

Diabetes Mellitus is not a single hereditary disease but a heterogeneous group of diseases, all of which ultimately lead to an elevation of glucose in the blood (hyperglycaemia) and loss of glucose in the urine as hyperglycaemia increases. It is also characterized by the three "polys" and inability to reabsorb water, resulting in increased urine production (polyurea) excessive thirst (polydipsia) and excessive eating (polyphagia), sweating, tremor, dizziness, tachycardia, pallor and headache **(Sue, 2011).**

## Diagnosis of type $_1$ DM in children

The diagnosis of type $_1$ DM in childhood is not difficult, depending on physician and nurse's awareness about the manifestations of diabetes and the investigations which include urine analysis for glucose & ketones, random blood glucose, blood electrolytes and acid-base balance **(Robinson & Roberton, 2013)**.

The diagnosis is usually straightforward when the classic symptoms are confirmed and supported with laboratory diagnosis which include fasting plasma glucose levels above 126 mg/dl or post prandial values consistently

above 200 mg/dl and whether ketonuria accompanies the glucosuria **(Lawrence et al., 2012)**.

Additionally, glucosylated hemoglobin ($HBA_{1C}$): is glucose normally attaches itself to the hemoglobin molecule on a red blood cell. Once attached, it cannot dissociate. Therefore, the higher of blood glucose levels, consequently the higher of $HBA_{1C}$ levels, the results of this test show the average blood glucose level over the previous three months. Samples of $HBA_{1C}$ can be drawn at any time during the day. Other investigations are connecting peptide (c-peptide), when produced by pancreatic beta cells is broken apart by an enzyme, two products are formed: insulin and connecting peptide. Because c-peptide and insulin are formed in equal amounts. This test indicates the amount of endogenous insulin production. Child with type $_1$ diabetes usually have no or low concentrations of c-peptide **(Joyce et al., 2011)**.

## Classification:

### Type $_1$ DM:

Type $_1$ DM is the most common form among children and adolescents, caused by partial or total destruction of the beta cells of the Langerhans islets, resulting in progressive inability to produce insulin. This aggression is generally of an autoimmune nature, resulting both from environmental and genetic processes. There is a great propensity to diabetic

ketoacidosis, which is a severe state of diabetic decompensation with immediate risk of death. In type $_1$ DM, Insulin is always necessary for its treatment and should be initiated as soon as diagnosis is confirmed **(Sociedade, 2010).**

Type $_1$ DM has two forms. Immune-mediated diabetes mellitus results from an autoimmune destruction of the beta cells. It typically starts in children or young adults who are slim, but it can arise in adults of any age. Idiopathic type $_1$ refers to rare forms of the disease that have un known cause **(Hockenberry and Wilson, 2009).**

**Type $_2$ DM:**

The increase in the number of cases of type $_2$ DM in the young has followed the increase in prevalence of childhood obesity. Currently, type $_2$ DM accounts for a considerable proportion of recently diagnosed cases of diabetes in the pediatric population. The changes in lifestyle that took place during the last century, such as changes in the diet and the dramatic reduction in physical activity, together with fetal exposure to hyperglycemia, in the form of gestational diabetes and glucose intolerance of pregnancy, have determined the impact of this phenomenon. There are no specific markers for type $_2$ DM. Low birth weight and obesity during the prepubescent phase are risk factors for insulin resistance and diabetes **(Gautier et al., 2011).**

**Maturity-onset diabetes of youth (MODY) (related to type $_2$):**

Maturity-onset diabetes of youth (MODY), which is a form of diabetes mellitus that is inherited genetically, with early onset, caused by defects in beta cell function and exhibiting an autosomal dominant transmission pattern. However, in type $_1$ DM, the parents are generally not diabetic; in MODY, one of the parents is generally affected and in type $_2$ DM, both parents have type $_2$ DM or impaired glucose tolerance **(Barret, 2013).**

## Complications:

Type $_1$ DM has two major acute complications, Diabetic Keto Acidosis (DKA) and hypoglycemia. The DKA is a metabolic state resulting from acute hyperglycemia and results in a mortality rate of 0.5 percent, mostly due to cerebral edema. The DKA is occurring in an average of 40 percent of children presenting with diabetes. In established diabetes, the rate is 1 to 8 percent per year. Risk factors include infection and insulin omission. The DKA is treated with immediate hospitalization, insulin replacement and rehydration **(Glastras et al., 2009).**

Hypoglycemia is a complication of insulin treatment. Symptoms caused by a fall in blood glucose include shakiness and emotional instability. In severe cases, there may be seizures or unconsciousness. There has been concern about possible brain dysfunction due to prolonged or repeated hypoglycemic episodes. However, there is limited evidence

of permanent cognitive sequelae and they are considered minor **(Schoenle et al., 2012).**

Chronic complications associated with Type $_1$ DM include microvascular complications such as retinopathy, nephropathy, neuropathy, and macrovascular complications. Macrovascular complications include circulatory and cardiovascular events such as stroke and myocardial infarction, which are rare in children and adolescents. However, risk factors such as hypertension, smoking and dislipidemia should be managed **(Glastras et al., 2009).**

Chronic complications have been linked to poor glycemic control and the duration of the disease. Many chronic complications are rare in childhood, but management of diabetes in childhood has implications for later development of complications**.** The survival-free period of retinopathy and microalbuminuria was significantly longer for those diagnosed before 5 years of age compared with those diagnosed later **(Donaghue et al., 2013).**

The risk of clinical retinopathy increased by 28 percent for every pre pubertal year of duration and by 36 percent for every post-pubertal year of duration. However, there has been a declining incidence of some of the long term complications over recent decades likely due to improvements in diabetes management **(Pambianco et al., 2006 and Finne et al., 2005)**.

Diabetes is associated with a number of health-related complications. The level of hyperglycemia and duration of the disease are associated with an increased risk of developing macrovascular and microvascular complications such as neuropathy, nephropathy, retinopathy, myocardial infarction, and stroke **(American Diabetes Association, 2012).**

Developing cardiovascular complications is one of the effects of long-term, poorly controlled type $_1$ DM. The effects occur in both small and large blood vessels. Small vessels in the kidneys, the retina of the eye and the nerves are damaged, leading to kidney disease and possible failure (diabetic nephropathy); sight problems and possible blindness (diabetic retinopathy); and changes in pain sensation, loss of muscle control and poor balance. Damage to large blood vessels increases the risk of heart disease **(Daneman, 2010).** Diabetes mellitus contributes to the increased morbidity and mortality **(Whittemore et al., 2005)**.

## Management:

Type $_1$ diabetes is managed by a combination of insulin replacement and balancing of diet and exercise in order to maintain glycemic control and prevent the occurrence of complications. Glycemic control, which is directly linked to complication rates and is monitored by the measurement of glycosylated hemoglobin ($HBA_{1c}$), which

reflects the mean blood glucose level over the previous 2 to 3 months **(Glastras et al., 2009)**.

Lowering $HBA_1c$ has been associated with a reduction of microvascular and neuropathic complications of diabetes. It is generally accepted that in order to effectively manage diabetes, education about components of management such as blood glucose monitoring, insulin replacement, diet, exercise, and problem solving strategies must be delivered to the diabetic children and their families. Since management of diabetes requires lifestyle changes, most clinicians feel it is important for education to be delivered to the whole family **(Gage et al., 2012)**.

## Part II (A) Information Technology and Glycemic Control

Information Technology (IT), a term coined in the 1970s, which literally means "healing at a distance" signifies, the use of IT to improve diabetic children outcomes by increasing access to care and medical information **(Strehle and Shabde, 2009)**.

### History of information technology

Historically, IT can be traced back to the mid to late 19th century with one of the first published accounts occurring in the early 20th century when electrocardiograph data were transmitted over telephone wires. The IT, in its modern form, started in the 1960s in large part driven by the military and space technology sectors, as well as few individuals using readily available commercial equipment. Examples of early technological milestones in telemedicine include the use of television to facilitate consultations between specialists at a psychiatric institute and general practitioners at a state mental hospital, and the provision of expert medical advice from a major teaching hospital to an airport medical centre **(Rao and Lombardi, 2009).**

Recent advancements and increasing availability and utilization of IT by the general population have been the biggest drivers of telemedicine over the past decade, rapidly creating new possibilities for health care service and

delivery. This has been true for developing countries and underserved areas of industrialized nations. The replacement of analogue forms of communication with digital methods, combined with a rapid drop in the cost of IT, have sparked wide interest in the application of IT among health-care providers, and have enabled health care organizations to envision and implement new and more efficient ways of providing health care **(Wootton et al., 2010).**

The introduction and popularization of the internet has further accelerated the pace of IT advancements, thereby expanding the scope of telemedicine to encompass Web-based applications (e.g. E-mail, SMS, tele consultations and conferences via the internet) and multimedia approaches (e.g. digital imagery and video). These advancements have led to the creation of a rich tapestry of telemedicine applications that the world is coming to use **(Wootton et al., 2009).**

**Importance of using information technology in glycemic control**

As technology becomes increasingly accessible and affordable, in addition, it is playing a growing role in the management of chronic diseases. However, many clinicians are now investigating the role of the internet, cellular phones and other wireless technologies in monitoring their diabetic children and improving access to medical care and information **(Idriss et al., 2009, Morak et al., 2008 and Wilkinson et al.,**

**2008).** An increasing number of diabetic children are expressing interest in integrating such technologies into their health care management **(Grover et al., 2012)**.

This provides an opportunity for new technologies, such as mobile phones linked to glucometers, to be leveraged to improve the communication between diabetic children, their parents and their health care providers **(Lipton et al., 2005).**

Education and information technology is part of diabetes care that have been studied. There are other reviews on health care telephone technology, automated telephone messages, cell phone technology diabetes, Web-assisted interventions and diabetes-computerized learning technologies **(Boren et al., 2008).**

Existing and emerging technologies such as wireless devices (cell phones) with E-mail and text messaging, short message service (SMS), pagers and the internet can help facilitate diabetic child self-management of diabetes. These types of devices are practical and cost-effective methods for monitoring clinical outcomes and increasing diabetic child adherence to treatment **(Krishna and Boren, 2008).**

The use of the motivational game may also increase the frequency of monitoring and improve diabetes knowledge. The cell-phone-based diabetes management system, in conjunction with Web-based analytics and therapy optimization tools

(WellDoc system), may significantly improve HbA1c in patients with diabetes **(Quinn et al., 2008).** The use of these devices may encourage diabetic child to adhere to their monitoring regimens by acting as reminders to self-manage their disease. While, long-term telemedicine-based follow-up of insulin-pump-treated diabetic child using a cell phone, SMS, and Web-based platforms is safe and feasible and may improve metabolic control **(Benhamou et al., 2007**). While it was a self-managed wireless two-way pager able to send and receive text message reminders may improve metabolic control (average HBA1c decrease of 0.1%–0.3%) and adherence to the treatment plan **(Leu et al., 2005).** Also, it was suggested that, the use of a wireless personal digital assistant (PDA) with diabetes management software and an integrated motivational game may assist youth (8–18 years) with diabetes (Type $_1$ and Type $_2$) in managing their blood glucose levels **(Kumar et al., 2008)**.

Technological developments allow remote monitoring of diabetic child and improve diabetes care. However, although systematic reviews have confirmed the feasibility of remote monitoring, questions remain regarding its efficacy in long-term diabetes control **(Farmer et al., 2010 and Montori et al., 2009).** This was emphasized in IT communication for health care (m-health) represents the evolution of telemedicine from desktop to wearable

technologies **(Istepanian et al., 2009).** In the case of diabetes management, m-health might improve the accessibility to and ability of diabetic children to engage in self treatment.

One study of 93 diabetic child with type $_1$ diabetes and another of 30 diabetic children with type $_2$ diabetes showed no benefit of the m-health intervention on $HBA_{1c}$ **(**However, a recent qualitative analysis of the diabetic patient's perspective of using telemedicine concluded that, its potential depends on consistent, supportive interactions with health-care providers **Faridi et al., 2008 and Farmer et al., 2005).**

Self-management is recognized as an integral part of diabetes care. The automated interactive telephone system aiming to improve the uptake and maintenance of essential diabetes self-management behaviors **(International Diabetes Federation, 2012 and Shaw et al., 2010).** There is growing interest in the use of interactive telephone technology to support chronic disease management. The implementation of an automated telephone self-management support program for diabetic children give the opportunity to monitor child safety **(International Diabetes Federation, 2009)**.

Lifestyle modifications such as increased physical activity (PA) and dietary changes were shown to have a positive impact that improved metabolic syndrome and reduced

the risk of developing diabetes by 39% to 58%. A systematic review of health technologies for monitoring and managing type $_1$ and type $_2$ diabetes mellitus determined that there are gaps in current understanding of evidence for effectiveness of self-monitoring devices and technologies **(Russell et al., 2009).**

**Health education:**

In order to effectively manage diabetes, education about components of management such as blood glucose monitoring, insulin replacement, diet, exercise, and problem solving strategies must be delivered to the diabetic child. Therefore, education is important both at diagnosis, where there is usually no knowledge base and patient and family are given the basic skills for controlling the disease and throughout the diabetic child's lifetime, with ongoing attention to self management skills, screening and prevention of complications and to new development in these areas. Since management of diabetes requires lifestyle changes, it is important that education be delivered to the whole family members **(Gage et al., 2012).**

Education is the key to successful management of diabetes. However, there is evidence that educational interventions in childhood and adolescent diabetes have a modestly beneficial effect on glycemic control and a stronger effect on psychosocial outcomes **(Murpy et al., 2006 and Northam et al., 2006).**

## Uses of IT in glycemic control

The use of IT has been driven by the need to provide cost effective, efficient, timely health care information to diabetic children in, rural and remote areas. While this form of IT has been available for the past thirty-five years in countries such as the USA and Canada. These new technologies have provided different platforms in which to provide healthcare. Advances such as these, have led to health professionals communicating using cell phone, SMS, internet, E-mail with diabetic children located in their own home, increasing accessibility and equity of services provided **(Schlachta et al., 2010).**

The IT applications can be classified into two basic types, according to the timing of the information transmitted and the interaction between the individuals involved health professional-to-health professional or health professional-to-diabetic children. Store-and-forward, or asynchronous. The IT involves the exchange of pre-recorded data between two or more individuals at different times. For example, the diabetic children or referring health professional sends an E-mail description of a medical case to an expert who later sends back an opinion regarding diagnosis and optimal management **(Rao and Lombardi, 2009).**

In contrast, real time, or synchronous, IT requires the involved individuals to be simultaneously present for

immediate exchange of information, as in the case of videoconferencing. In both synchronous and asynchronous telemedicine, relevant information may be transmitted in a variety of media, such as text, audio, video, SMS. E-mail or still images. The majority of IT services, most of which focus on diagnosis and clinical management. In addition, biometric measuring devices such as equipment monitoring heart rate, blood pressure and blood glucose levels are increasingly used to remotely monitor and manage diabetic children as chronic illnesses. Some predict that IT will profoundly transform the delivery of health services in the industrialized world by migrating health care delivery away from hospitals and clinics into homes **(Heinzelmann et al., 2009).**

In low-income countries and in regions with limited infrastructure, IT applications are primarily used to link health-care providers with specialists, referral hospitals, and tertiary care centers. Even though low-cost IT applications have proven to be feasible, clinically useful, sustainable, and scalable in such settings and underserved communities **(Wootton, 2008).**

**Advantages and disadvantages of using information technology in glycemic control:**

Information Technology (IT) is a common expression for a variety of different computer, information and communication devices (hardware), applications (program), networks (internet), and services. It is a general concept which encompasses all communication devices of the modern society and their usage. Its primary purpose is mediating information and enabling the communication process. When it comes to IT, the internet and mobile technology, and their applications are most often considered, it is important to stress that IT does not include only computers and mobile phones, but is also present in many other types of technology, which can be encountered also by diabetic children **(Pinterič and Grivec, 2007)**.

The broad IT definition also includes a variety of everyday technologies, like: internet, cell phone, playing consoles, various players and digital cameras. Put shortly, all types of technology that diabetic child may encounter in their home environment and also uses them. Because of its nature, IT already has numerous advantages. Besides using it for pleasure and entertainment, it can be also used for sending SMS, E-mail and phone calls to the doctor regarding diabetes problems **(Punie, 2007).**

The IT encourages diabetic children to send messages to specialist asking him how to do if any medical problems occured ; it motivates them and at the same time gives the capability to do certain activities. Besides that, its presence betters the learning environment and enriches the learning experience **(Markovac and Rogulja, 2009).** It was claimed by **Punie (2007),** that IT enables the diabetic children to process the learning content of diabetes in an entertaining and interesting way, while **McPake et al. (2009)** have proved that the usage of IT also develops the child's competencies.

The IT is not only an educational tool, but also a supporting one, because it helps to develop children with special needs and behavioral problems. Besides that, it lays the foundation for long life learning and personal development, because among other things it also develops the digital competence and technical competences, which are needed for employment, education, self-development, and general activeness in the modern society **(Markovac and Rogulja, 2009).**

The usage of IT is essential for the diabetic children, because it can help him or her to integrate in the "electronic-society", meanwhile the child can use it to communicate with others. For many years, the IT have been judged for their potentially bad influence on the child. Often, worries about the usage of IT are concerned with the question how early

exposing of the child to the IT influences its general development **(Punie, 2007)**. Experts claim that the diabetic children learn more from real-life experiences than from the ones offered by IT, especially if the content is not suitable for the children. The debate about the technology's influence on the child's development has long ago exceeded the borders of academic circle and became public **(Kirkorian et al., 2009).**

The general public thinks that, the usage of IT is dangerous for the diabetic children, and that its creative potential is being more and more overlooked. But where hide the reasons for such thinking? The major argument of all studies, which stress the negative sides of IT is that the children in early stages of development are the most susceptible and because of that also very vulnerable **(Plowman et al., 2010)**.

Disadvantages of IT usage divided into three major categories. The first category includes dangers and disadvantaged of IT usage for the child's socio-cultural development. IT supposed endangers the child's social development, because children spend less time playing with their peers and are mostly isolated; IT might be offer virtual experiences from "the second hand" and not realistic experiences from "the first hand"; besides that the marketing of IT is in the society very intense and prays on vulnerable children, which represent the biggest part of its target group. The

second category includes the dangers and disadvantages of IT usage for the child's cognitive development. IT might be endanger the child's intellectual development, the development of imagination (it stimulates passivity and not activity), and the development of language (lack of communication with peers). The last category includes dangers and disadvantages of IT usage for the child's wellbeing **(Punie, 2007)**.

Children have a desire to spent more time in enclosed spaces and not outdoors, the child's health is also endangered (sitting usage, which increases the risk of obesity), the usage of IT leads to addiction with technology and exposure to inappropriate content besides all that the chances of child interacting with family members are also decreased, what is supposedly to lead towards decreasing of child's emotional development. All these dangers and disadvantages of IT usage are mostly connected with the amount of IT usage, its content and the degree of parent control. Today, children can through IT more easily access various contents than ever before. Adults do not have control over this access, because the media environment has changed so drastically that a complete control over the child's usage of IT is today practically impossible **(Plowman et al., 2010)**.

**Obstacles of using IT in glycemic control**

The IT holds great potential for reducing the variability of diagnoses as well as improving clinical management and delivery of health care services worldwide by enhancing access, quality, efficiency, and cost-effectiveness. In particular, IT can aid communities traditionally underserved, those in remote or rural areas with few health services and staff, because it overcomes distance and time barriers between health-care providers and patients. Further, evidence points to important socioeconomic benefits to diabetic children, families, health practitioners and the health system, including enhanced patient-provider communication and educational opportunities **(Jennett, 2013).**

Despite its promise, IT applications have achieved varying levels of success. In both industrialized and developing countries, IT has yet to be consistently employed in the health care system to deliver routine services, and few pilot projects have been able to sustain themselves once initial seed funding has ended. Several routinely cited challenges account for the lack of longevity in many telemedicine endeavors **(Wootton, 2008).**

One such challenge is a complex of human and cultural factors. Some diabetic children and health care workers resist adopting service models that differ from

traditional approaches or indigenous practices, while others lack IT literacy to use telemedicine approaches effectively. Most challenging of all are linguistic and cultural differences between diabetic children (particularly those underserved) and service providers. A shortage of studies documenting economic benefits and cost-effectiveness of IT applications is also a challenge. Demonstrating solid business cases to convince policy-makers to embrace and invest in IT has contributed to shortcomings in infrastructure and underfunding of programmes **(Craig and Patterson 2009).**

Legal considerations are a major obstacle to IT uptake. These include an absence of an international legal framework to allow health professionals to deliver services in different jurisdictions and countries; a lack of policies that govern diabetic children privacy and confidentiality vise - visa data transfer, storage, and sharing between health professionals and jurisdictions, health professional authentication, in particular in E-mail applications and the risk of medical liability for the health professionals offering IT services. Related to legal considerations are technological challenges. The systems being used are complex, and there is the potential for malfunction, which could trigger software or hardware failure. This could increase the morbidity or mortality of diabetic children and the liability of health-care providers as well **(Qaddoumi and Bouffet 2009).**

In order to overcome these challenges the IT must be regulated by definitive and comprehensive guidelines, which are applied widely, ideally worldwide. Concurrently, legislation governing confidentiality, privacy, access, and liability needs to be instituted. As public and private sectors engage in closer collaboration and become increasingly interdependent in eHealth applications, care must be taken to ensure that IT will be deployed intelligently to maximize health services and optimal quality and guarantee that for-profit endeavors do not deprive diabetic children access to fundamental public health services. In all countries, issues pertaining to confidentiality, dignity, and privacy are of ethical concern with respect to the use of IT in diabetes. It is imperative that IT be implemented equitably and to the highest ethical standards, to maintain the dignity of all diabetic children and ensure that differences in education, language, geographic location, physical and mental ability, age and sex will not lead to marginalization of care **(Resol, 2009).**

## (B) Types of Information Technology

Recent advances in information technology (IT) have been used to manage chronic diseases including diabetes mellitus **(Piette, 2007)**. Specifically, IT can enhance communication among health professionals (HPs) and diabetic children and improve diabetes management **(Joshy and Simmons, 2006)**. A number of IT applications are currently available including electronic patient registers, electronic decision support systems, videoconferencing, telemedicine, biometric devices capable of uploading information such as blood glucose test results to the internet or the HP's computer and internet-based interactive patient support networks **(Nobel, 2005)**.

### 1- Mobile phones and SMS

The telemedicine system is based on telephone lines, mobile phones, and web-based technology. A tele-communication system connecting between the diabetic children unit and the medical unit was tested on six intensively treated Type $_1$ DM, aged 10–16 years. While, the unit allows data collection and transmission from the diabetic child's house to the hospital, assists self monitoring activity and suggests insulin variations. The medical unit assists the physician in periodic evaluation and recommends with appropriate prescriptions to be transmitted to the diabetic child as well as defining a treatment protocol **(d'annunzio et al., 2013)**.

The Telephone-Linked Care (TLC) diabetes system is one from the important program in information technology (IT) and it provided important role in management of diabetes through monitor, educate and coach children with diabetes to improve their nutrition, physical activity, blood glucose testing and medication taking. It complements the care currently provided to children with diabetes by general practitioners, endocrinologists, diabetes educators and other health workers. While, the child, who have diabetes, call the TLC which consists of mobile phone to engage in weekly "conversations". Prior to each call, users upload their most recent glucose meter results via a data transmitter connected to a dedicated mobile phone **(Balas et al., 2008, Faridi, 2008, Krishna and Boren, 2008 and Murray et al., 2005).**

Evaluating the feasibility of a telemedical support program was studied on 63 children on intensive insulin therapy in a cross over trial covering 6 months. While the diabetic child stored their data (date, time, blood glucose, carbohydrate intake and insulin dosage) in an electronic logbook and these were automatically sent to the physician's mobile phone unit using a short message service (SMS). The data were also transmitted to the central database of the hospital server daily and diabetologists sent back their advice via SMS once a week. This telemedical support program proved to be feasible in children and helped them to improve glycemic control **(Chase et al., 2013).**

Diabetes education and management support through automated telephone have been shown to increase knowledge, increase frequency of self-care behaviors among children with diabetes, and improve health outcomes for diabetic child who need regular care, monitoring and self-care management **(Boren et al., 2008).**

Because monitoring and support from a health care provider play important roles in achieving the desired clinical goals, the use of cell phones, especially text messaging, is a step further in achieving the health and quality of life for children with diabetes. Using cell phones and text messaging offers great opportunities to improve diabetic child self-management by facilitating education, monitoring, and feedback between scheduled clinic visits. However, the nature of cell phones provides the mobility and flexibility so that care can be provided wherever diabetic child may be available **(Boland, 2007).** Additionally text messaging may even provide cost-effective alternatives to regular phone communication when combined with other methods of education and support **(Leong et al., 2006).**

Many features of cell phone technology (e.g., short messaging service [SMS], digital camera, capability of running custom software applications) can strengthen health services through removing physical barriers to care and service delivery and by improving choice, evidence-based

care, management, supply systems and communication. In addition, it is likely that high-end cell phone (smart phone) prices will continue to drop and capabilities continue to increase (e.g., more sophisticated third generation networks capable of fast internet connectivity), making them highly cost-effective **(Vital Wave Consulting, 2009).**

It is an ongoing challenge to provide care and support that will produce and sustain the desired improvements in the health of persons with a chronic illness such as diabetes. Quality health care requires effective collaboration between clinicians and diabetic child**.** Finding novel ways to enhance communication and improve the health of those with chronic diseases is also a continuing part of providing care. Interventions involving automated telephone message systems have been shown to improve knowledge and health outcomes**.** Telephone-based interventions have had positive results even among persons of low socioeconomic status and ethnic minorities **(Albright et al., 2005).**

Intensive telephone-based behavioral health interventions may lower barriers to treatment access, providing lower-cost treatment that is easier to access for youth. Moreover, according to delivery via telephone permits the interventions to take place at home. Implementation of telehealth interventions incorporating intensive video and phone conferencing with psychology services to children with poor diabetes control and to

family members in an open trial has shown that intensive telehealth interventions can improve metabolic control, the mechanism of change is intervention in adherence behaviors and diabetes specific family processes related to adherence. It is hoped that continuous telemonitoring of the diabetic child data during normal daily activities will result in faster achievement of normoglycemia without the necessity of frequent ambulatory visits **(Cellular Telecommunication and Internet Association [CTIA], 2008)**.

According to the CTIA, there are over 255 million cell phone subscribers in the United States**.** Although income may seem to be a major barrier in cell phone ownership, every two out of three households in the United States have a cell phone. In, 35% of the United States said that, they use it for text messaging **(Pew Internet & American life project, 2008).**

A growing body of evidence suggests that diabetes-management programs need an information technology (IT) backbone in order to be effective **(Bu et al., 2007)** From a health system perspective, high-quality data on disease trends, cost and quality of care are vital to developing, monitoring, and evaluating diabetes prevention and control programs. However, increasing the computing power of high-end cell phones, i.e., smart phones and the roll out of

third generation and fourth generation networks have a positive impact on increasing the access to the internet in developing countries, particularly in rural areas. This low-cost communication platform is capable of addressing the data requirements of the health system and continued care for people with diabetes as well. The benefits from the application of cell phones in diabetes care falls into three domains: benefits for the health system, physicians, and diabetic children. Another application of cell phones is in computing calorie consumption, which is often a difficult task. Several mobile phone applications are already on the market that help people with diabetes to make healthier meal choices with information on carbohydrates, portion size, and food labels **(The Mobile Health Crowd, 2010).**

Children and their families education and self-management are important components of good diabetes care. Simple-to-follow and always-with-you information will have the maximum influence on subjects with diabetes to make positive choices on diet, physical activity, and compliance to therapy. Cell phones can host software applications that are programmed to provide encouraging messages to remind them of adherence to medication, food intake, physical activity information, and more. A systematic review that evaluated the evidence on the impact of cell phone interventions for persons with diabetes in improving health outcomes has found that, cell

phones were useful tools for providing general information on diabetes and weight reduction, but also for providing educational intervention and support tailored to an individual care plan **(Krishna and Boren, 2008).**

**2- The internet:**

The internet is a global network of interconnected computers, enabling users to share information along multiple channels. Typically, a computer that connects to the internet can access information from a vast array of available servers and other computers by moving information from them to the computer's local memory. The same connection allows that computer to send information to servers on the network; that information is in turn accessed and potentially modified by a variety of other interconnected computers. A majority of widely accessible information on the internet consists of inter-linked hypertext documents and other resources of www **(Encyclopedia, 2009).**

Recently, the internet has established itself as a worldwide communication system that allows a person to contact other people anywhere at any time and exchange information on line. However, the diabetic children are accessing the medical content on the internet with increasing frequency. Chronic disease management programs that incorporate mobile and Web based technologies offer potential to shift the focus away from the clinic and towards

diabetic children' daily lives, where behavior change is actualized **(Horrigan, 2009).** Mobile application downloads are projected to increase by 145% this year **(Largent, 2010).** Along with this explosion in mobile technology, a range of new health management tools has proliferated. Numerous internet-enabled personal medical devices are now available, ranging from body scales to sophisticated wearable physiologic sensors **(Business, 2010).**

Internet connection is also possible via alternative networks using mobile devices. This includes access via mobile telephones to a wireless application protocol (WAP) network (rather than to the world wide web) or to the third generation (3G) network. Adaptors connecting to a universal serial bus (USB) port can be used to access the 3G network using a laptop computer **(TechWeb Network, 2008).**

The internet and cell phones used to assist diabetes self-care in a clinic population **(Faridi et al., 2008)**. The nurse use short message service (SMS) and internet for management of blood glucose (BG), and a Web-based SMS protocol for blood glucose management. Compliance was relatively good with older subjects and those who had diabetes for a longer time **(Kwon et al., 2014).** For those employed in a technical occupation or for those in the information technology field, more readings were transmitted than in other subject groups **(Vahalato et al., 2011).** Systematic reviews of health behavior

change in diabetes self-management with mobile telephone SMS and self-monitoring devices for management of individuals with type $_1$ and type $_2$ diabetes **(Fjeldsoe et al., 2009 and Russell et al., 2009)**.

Nowadays, mobile phones and wireless internet technology are advancing rapidly and are highly available at low cost **(European Commission, 2007).** Hence, mobile phones are poised to serve as the universal diabetic child terminal in telemedicine scenarios and data services in the self-management of diabetes mellitus type $_1$ **(Giménez et al., 2012).** Several mobile phone–based approaches to support pediatric patients suffering from diabetes mellitus type $_1$ in their daily self- management have already been pursued using short message service (SMS) text messaging wireless internet (WAP) or Bluetooth functionality of mobile phones **(Kim, 2007, Rami et al., 2007, Tasker et al., 2007, Franklin et al., 2006, Wangberg et al., 2006, Zou et al., 2006 and Gammon et al., 2005 )**. Mobile phones can be used for standard voice communication and transmission of a variety of multimedia information (text, audio, images, video), thus making them the patient terminal of choice for interactive communication and information exchange **(Kollmann et al., 2007).**

Data can be entered using the numeric keypad, or mobile phones can serve as a hub to enable wireless or wired, data transfer from measurement devices (such as blood glucose

meter). The data are then forwarded to a central database via mobile internet or text messaging. The mobile phone can also provide an additional link between the health care professional and the diabetic child for personalized feedback (such as reminders, statistics, or medical advices) **(Tasker et al., 2007).**

The increased use of the internet by ordinary people is changing the way health care providers and the general population search for and retrieve medical information, which, in turn, modifies user-provider interaction and health care delivery. Studies have evaluated the use of the internet in different medical conditions to assess its impact on diabetic children' knowledge and well-being **(Idriss et al., 2009).**

Another aspect to be considered is the lack of a specifically-designed, professionally-moderated Web page, which is felt by diabetic children to be a reassuring tool **(Reponen et al., 2010)** and might increase the rate of health-related internet use. However, in the best case, this specific product would have been used by 59% of children with type $_1$ DM. Based on the profile of younger, male internet users with a shorter duration of diabetes, this percentage would have been lower in patients with type $_2$ DM, because (a) patients with type $_2$ DM are older (because type $_2$ DM usually starts in people older than 40 years) and (b) it seems that age is one of the determinants of internet use **(Maglaveras et al., 2011).**

Some studies conducted by **Kim (2007), Kubota et al., (2007) and Rami et al. (2007)** stated that, diabetic children had the option of using wireless or wired internet to input their glucose measurements.

**3- Computer:**

The development of the personal computer in the late 1970s enabled households to purchase a computer for the home, and children to gain access to an important new technology. At present, over three-quarters of all American children aged 3 to 17 years live in a household with a computer. However, computers have their roots 300 years back in history. Mathematicians and philosophers like Pascal, Leibnitz, Babbage, and Boole made the foundation with their theoretical works. Only in the second half of this century was electronic science sufficiently developed, to make practical use of heath care **(U.S Census Bureau, 2011).**

Computer and communication technology-based education and support are becoming vital components of quality diabetes care **(Balas et al., 2008).** Diabetes self-management involves a difficult balancing act between insulin, food and exercise. Children with diabetes have not appreciated traditional learning methods as they rarely contain the elements of fun and interactivity. Computer-based educational approaches have a great deal of potential for diabetic child use and may offer a means to train health-care professionals to

deliver improved care. The challenge is to develop innovative, validated algorithms to aid diabetic children decision making and optimize glycemic control. The application of models in computer-based interactive simulators and educational video games can help the diabetic child in his daily life. Librae' is a computerized diabetes simulator in diary format, developed as an educational predictive tool for diabetic child, reducing trial and error' by allowing diabetic child to simulate and experiment with dietary or insulin adjustments **(Franklin et al., 2006).**

Diabetes self-management is important in promoting health practices and in reducing risks of complications, the diabetes education is the cornerstone of effective diabetes care **(Institute of Medicine, 2011).** Computerized knowledge management and education can enhance diabetes education and become an important component of quality diabetes care **(American Association of Diabetes Educators, 2013).** Therefore, technology can assist with the provision of tailored and personalized education, feedback, and goal setting, thereby facilitating diabetic child-centered care **(Balas et al., 2008).**

Because self-management support interventions are increasingly being implemented using population-based health communication strategies, such as those using telephone or computer-assisted outreach with or without nurse care management, it is important to measure the value

of these programs from a public health perspective with respect to desired changes in health behaviors. Also the cost of the Palestinian Families were affected by continuous visit the hospital by their children suffering from diabetes because of their lack of knowledge about diabetes and its management and how to prevent complications **(Interactive Information Technology in Diabetes Care, 2011, Yoon and Kim, 2008, Hee, 2007 and Franklin et al., 2006).**

**4- E- mail:**

The most popular activities on the internet among 10-18 years old were visiting Web sites, and receiving E-mail. It's a method of communication used globally and is provided with a system of creating, storing and forwarding mails **(Valkenburg and Soeters, 2011).**

The E-mail is easy to use, widely available internationally and inexpensive. It is used in many areas of life, including health, banking, travel and retail. Despite the availability of E-mail in day-to-day life and in other sectors, its use in the healthcare sector is still not routine but very important **(Dixon 2010 and Neville et al., 2009)**.

Factors driving the trend of increasing E-mail use include: the natural demographic shift towards an increasing proportion of people comfortable with using technology-driven care solutions; and higher demands on healthcare

resources with, for instance, the advent of increased chronic care and demand for more preventive screening, which resulting in a focus on working more efficiently. Where E-mail communication has been demonstrated in healthcare settings, it is used for requesting prescriptions, booking appointments and for clinical consultation **(Kittler et al., 2011 and Anand et al., 2009)**.

Methods of accessing the internet and thus an E-mail account have changed with time. Traditionally, access would occur via a personal computer or laptop at home or work, connecting to the internet using a fixed line. There are now several methods of accessing the internet. Wireless networks (known colloquially as wifi) allow internet connection to a personal computer, laptop computer or other device wherever a network is available to send E-mail to diabetic children regarding health status or medical problems with continous connection **(TechWeb Network, 2008).**

## (C) Over view about glycemic control

Diabetes control revealed to a process of achieving an optimal blood glucose range, appropriate diabetes knowledge and early management of diabetes related complications either acute or chronic **(ADA, 2012)**.

There are positive effects of controlling blood glucose level due to an increased contact with clinicians, which leads to improve in child's glycemic control. However, health care deficits, physician shortages and the inability of many children to visit their clinics, they have prompted the clinical research community and individuals themselves to search for feasible solutions. This supports the need for effective self-management of the disease through self-monitoring of blood glucose (SMBG), as well as increasing levels of physical exercise **(Benhamou et al., 2007, Bravata et al., 2007 and Farzanfar et al., 2005).**

### Importance of glycemic control

There is no cure for diabetes, consequently, the overall goal of care for diabetic children is to control or regulate their disease rather than cure. When diabetes is successfully regulated, the diabetic child is able to avoid many complications while continuing to live a normal useful life **(Petter, 2010).**

**Table (1):** Guidelines for glycemic control

| Items | Poor control | Average control | Intensive control |
|---|---|---|---|
| HbA1c | >10% | 8-10% | 5-8% |
| Postprandial plasma glucose | >240 mg/dl | 180-240 mg/dl | 120-180 mg/dl |
| Fasting plasma glucose | >200 mg/dl | Up to 140 mg/dl | Up to 115 mg/dl |

**(International Society for pediatric and Adolescent Diabetes, 2009):** Consensus Guidelines for the management of type $_1$ diabetes mellitus and adolescent. 13(2): 79-85.

Glycemic goals recommended by the ADA (2012) are preprandial plasma glucose (90 mg/dl to 130 mg/dl) and peak of post prandial plasma glucose (<180 mg/dl) **(ADA, 2012)**.

Table (1) showed that, the major criteria for good control of diabetes are; the fasting blood glucose is normal, the blood glucose is no higher than 180 mg/100 ml after 2 hours breakfast and no more than 200mg/100ml post 2 hours lunch, the urine is negative for glucose and acetone before breakfast. **(Petter, 2010)**.

## Achieving and maintaining glycemic control

There is a top 10 list for achieving and maintaining diabetes control (daily blood glucose testing, following a meal plan, taking of prescribing insulin, daily exercise, maintenance and review of records, interpretation of blood glucose results in the context of food and exercise, quarterly glucosylated hemoglobin measurement, frequent contact with

diabetes care provider and body image and weight perception acceptable to child) **(Baker, 2011)**.

**Insulin therapy and diet:**

Self management of type $_1$ DM is essential to prevent acute and long-term complications. Therefore, diabetic children are trained in functional insulin therapy (FIT) to independently control their blood glucose levels by multiple daily insulin injections **(Pavlicek and Lehmann 2006).** To monitor important glycemic parameters such as HBA1c, LDLs and nephropathy and detect abnormalities at the earliest possible stage, diabetic children are asked to carefully monitor their blood glucose levels and insulin doses. This information is used to help them adjust their diabetes regimen **(Mediaspects, 2007)**.

**Physical exercise:**

Exercise programs have been shown to reduce blood pressure, improve glycemic control, and improve overall cardiovascular health **(Balas et al., 2008 and Murray et al., 2005)**. Current self-management interventions for children with diabetes mellitus who are at risk for cardiovascular complications (CVCs) include the use of devices that monitor blood glucose, blood pressure, heart rate and physical activity. Although recent surveys indicate that children and their parents are willing to become more actively involved in managing their own care. It is unclear

how much children and their parents know about these self-monitoring techniques or how accessible and feasible they are to implement into daily life **(Interactive Information Technology in Diabetes Care, 2011, Bravata et al., 2007).**

The first objective of glycemic control by exercise program to determine the strength of evidence for the effectiveness of any type of established or emerging self-monitoring device for improving key health outcomes (HBA1c, blood pressure, low-density lipoproteins (LDLs) in child and youth with diabetes (Type $_1$ or Type $_2$) who are at risk of developing cardiovascular complications **(Toobert et al., 2010).** Additionally secondary objective of glycemic control by exercise program examine the factors that may affect diabetic child's adherence to these established or emerging self-monitoring blood glucose and to assess the feasibility or usability of the technologies **(Daniels et al., 2008, Ogden et al., 2008, Dominique et al., 2007, Prevalence Data Estimates Released by the Centers for Disease Control and Prevention, 2007, Richardson et al., 2007 and Paschali et al., 2005).**

**Fig. (1):** Insulin injection sites


**Phipps W., Monaham F. and Marek J, (2003):** Medical Surgical Nursing (Health and Illness Perspectives), 7th ed., Mosby Company, United States of America, PP. 949-975.

**Part III Nursing role regarding information technology in glycemic control of children:**

Glycemic control is a successful diabetes management that requires the delivery of complicated medical tasks like blood glucose (BG) monitoring and insulin administration along with the practice of healthful behaviors around food and exercise. The healthcare providers such as physician, nurses and educators have an important role in improving glycemic control and reducing the risk of complications on diabetic children **(Johnson, and Keogh, 2010).**

Diabetes self-management support interventions are increasingly being implemented using population-based health communication strategies, such as those using telephone or computer-assisted outreach with nurse care management **(Interactive Information Technology in Diabetes Care, 2011)**. Technology-driven solutions, such as computer physician/nurses order entry and computer medication monitoring, are considered as an integral to child safety guidelines. Indeed, The nurses play a significant role in diabetes information technology, this role include children education which increase children's satisfaction, improve access to care, reduce drop-in visits and unnecessary visits, and also the health care costs **(CTIA, 2008).**

Information obtained via IT is interpreted, read on a computer screen and documented all simultaneously. Understanding of equipment and dexterity in the use of telephone and computers are therefore essential for diabetic children. Video equipment, cameras, SMS, internet to transmit the messages, which require knowledge and technical ability to ensure each diabetic children receives appropriate care. Nurses may also be involved in teaching the diabetic children receiving care how to use digital cameras, video equipment, SMS, internet. Hence, whatever equipment is required to practice IT, nurses must be educated and competent in its use. Nurses require knowledge of equipment used to guide the diabetic children receiving care in their use and also the ability to read and interpret the information obtained **(College of Registered Nurses of Nova Scotia, 2008).**

Nurses who deliver, manage and coordinate care and services using telecommunication technology are determined to be providing phone calls, SMS and E-mail enabling of the nurses to determine the appropriate care or education required. Diabetic children receiving care are able to stay in their own home, limiting the need for nurses to travel significant distances to see diabetic children. Information technology may be used where a nurse is located with diabetic children in their own home and contacts a medical practitioner/ specialist or other healthcare professionals to discuss the

required care. In this case the nurse will have assessed them to determine the need for further expertise or act as an advocate to discuss future treatment with a medical specialist **(American Telemedicine Association Telehealth Nursing, 2011).**

Information technology allows nurses to examine and monitor chronic conditions such as diabetes from a distance. Assessment using cell phone calls, SMS, internet and E-mail, increase the assessment process. The different types of IT are varied and contribute to the ability of nurses to discuss and receive data about the diabetic children for whom they provide care. Importantly, the technology is a means to care, not a replacement for care or the information provided by nurses **(Prinz et al., 2008).**

The internet and cell phones used to assist diabetes self-care in a clinic population **(Faridi et al., 2008)**. The nurse use short message service (SMS) and internet for management of blood glucose (BG), and a Web-based SMS protocol for blood glucose management. Compliance was relatively good with older subjects and those who had diabetes for a longer time **(Kwon et al., 2014).** For those employed in a technical occupation or for those in the information technology field, more readings were transmitted than in other subject groups **(Vahalato et al., 2011).** Systematic reviews of health behavior change in diabetes self-management with mobile telephone SMS and self-monitoring devices for management of

individuals with type $_1$ and type $_2$ diabetes **(Fjeldsoe et al., 2009 and Russell et al., 2009)**.

Because monitoring and support from a health care provider, the nurses play important roles in achieving the desired clinical goal of glycemic control through the use of cell phones, SMS, chatting, E-mail which is a step further in achieving the health and quality of life for children with diabetes. Using cell phones and text messaging offers great opportunities to improve diabetic child self-management by facilitating education, monitoring, and feedback between scheduled clinic visits. Nursing IT promote knowledge sharing within the diabetic children community to improve child health, quality and safety, safe adoption of IT into diabetic children require understanding child health **(Boland, 2007).**

# Subjects and Methods

# Subjects and Methods

The subjects and methods of the current study are discussed under the following designs:

I- Technical design
II- Operational design
III- Administrative design
IV- Statistical design

## I-Technical design:

Technical design includes; the research design, setting, subjects and tools for data collection.

**Research Design:**

A quasi-experimental study design was utilized in carrying out this study.

**Research Setting:**

This study was conducted at Palestinian Medical Relief Society (PMRS) which care was given for 1,440,332 inhabitant, it has the largest numbers of diabetic children in Gaza strip. The services provided at this society include laboratory services for blood samples with special room for care of diabetic children, giving injections and pharmaceutical services.

**Subjects:**

A purposive sample was involved in the study from children suffering from diabetes mellitus who are attending the Palestinian Medical Relief Society (PMRS) in Gaza Strip over a period of 6 months, their number was 80 children. The following inclusion criteria was considered in their selection:

1- Children with confirmed diagnosis of diabetes (regardless to their gender, residence, glycemic control and presence or absence of diabetes related complications).

2- Children in the age group of 10-18 years.

3- Able to read and write.

4- Availability and accessibility of IT devices such as internet, mobile phone, CD, memory flash, SMS, E-mail.

5- Having the willingness and skills of information technology.

**Exclusion criteria:** Exclude diabetic children suffering from other chronic physical or mental illness**.**

**Tools of data collection**

Tools of the study were developed by the researcher after reviewing the relevant literature and include the following:

I- **Structured Questionnaire (by interview) (pre/post)** includes data about:

a- Socio-demographic characteristics of the diabetic children (age, gender, educational level etc..).

b- Knowledge of the diabetic children related to the use of information technology (such as internet, mobile phone and SMS, etc..) and its effect on glycemic control. As well as, their knowledge regarding diabetes mellitus (definition, predisposing factors, signs and symptoms etc..).

**2- Observation Checklists (pre/post):** That were adopted from **John & William (1997)** to assess the actual practices of the diabetic children including urine and blood testing, insulin preparation and injection,……etc,

**3-Information technology based intervention was designed according to the actual needs assessment of the diabetic children,** accordingly different IT tools were used for the intervention including internet, SMS, telephone calls, E-mails, CD and flash memory.

## Scoring System

According to the children's answers, each correct answer had score 1 degree and both wrong answer and do not know had 0 degree. Also, their practices were assessed and scored 1 degree if done correctly and zero if not done or done incorrectly. Then the total scoring was calculated as level of knowledge and practice satisfactory (>70%) and unsatisfactory level of knowledge and practice (< 70%).

**Tools validity and reliability**

Tools validity was checked through distribution of the tools to seven experts in the field of the study of IT and type $_1$ diabetes mellitus, content validity was assessed to determine whether the tool covers the appropriate and necessary content, as well as its relevance to the aim of the study, clarity, and its simplicity. The suggested modifications were done (rephrasing of some statements, omission and addition of certain items). Then the final form was stated.

## II-Operational design:

The operational design of the study entails three main phases: preparatory phase, exploratory phase (pilot study) and field of the work.

## 1-Preparatory phase:

A review of past and current, local and international related literature using journal, magazines, scientific periodicals and books was done to develop the study tools and to get acquainted with the various aspects of the research problem.

**2-Pilot Study (exploratory phase):**

A pilot study was carried out including 8 children suffering from Type $_1$ DM to test the applicability and clarity of the study tools and to determine the needed time for fulfilling the study tools. Then necessary modifications of

some questions were done based on the findings of the pilot study. The diabetic children who participated in the pilot study were excluded later from the study sample.

**3-Field work**

Data collection was carried out in the period from the beginning of January 2013 to the end of June 2013. The researcher was available at the study setting three days weekly (Sunday, Monday and Tuesday).

The researcher started by explaining the nature, aim and expected outcomes of the study to the diabetic children and their care givers. Children were assessed individually using the previously mentioned tools twice pre/post IT based intervention.

The IT based intervention was prepared according to the actual need assessment of the studied children using multiple methods of information technology including Compact Disk (CD), internet, SMS, telephone calls, E-mails and flash memory. The CDs were distributed to all diabetic children which includes nine sessions. **The first session** (60 minutes) focused on knowledge about information technology (meaning, types and importance of IT in control of glycemic condition, methods and uses). **The second session** (60 minutes) focused on knowledge about diabetes mellitus (meaning, predisposing factors, clinical manifestations, measure of blood glucose,

complications and management). **The third session** (80 minutes) focused on knowledge about the importance of glycemic control (parameters and patterns of glycemic control). **The fourth session** (60 minutes) focused on knowledge about diabetic hyper and hypoglycaemia (types, causes, signs and symptoms, management and prevention). **The fifth session** (80 minutes) focused on knowledge and practices related to insulin therapy (importance, types, sites, routes, preparation, injection, storage and complications). **The sixth session** (50 minutes) focused on diet management for diabetic children (recommended and un recommended diet and the relationship between diet and glycemic control). **The seventh session** (30 minutes) focused on physical exercise (importance, precautions, types and technique of suitable exercise). **The eighth session** (60 minutes) focused on the personal hygienic care (importance, oral care, feet care, skin care and technique of cutting nails). **The ninth session** (40 minutes) focused on glucose monitoring, importance to control glucose and measuring glucose in blood and urine.

Videos, CDs and flash memory were used to demonstrate the management of glycemic control in children with Type $_1$ DM, it includes video for physical exercise, diet, insulin preparation and injection in addition to, blood glucose measurement. SMS and E-mails were sent weekly to the children to refresh their knowledge about glycemic control by

mobile phone. Chatting with the children was every three days to follow up their health condition. Also, telephone calls sometimes were needed to discuss any issue about diabetes mellitus and glycemic control. Additionally, flash memory was distributed among the studied subject to be used as a reference about their health problems related to Type $_1$ DM.

The researcher met with the children during the intervention period for blood glucose monitoring and follow up of their progress, to discuss any difficulties which may face them during the intervention period.

**Ethical and legal issues**

Parental agreement was a prerequisite to involve the child in the study sample at the first session. All ethical issues of research were maintained. The purpose, specific objectives, anticipated benefits and methods of the study were carefully explained to each eligible subject. When the subjects agreed to participate in the study, they were assured that they could withdraw at any time and they would not be identified in the report of the study. Also, the researcher informed the studied subject that, the research would be harmless, confidentiality in gathering and treating subjects information was secured.

## III-Administrative design

Approval was obtained from the dean of Faculty of Nursing (Ain Shams University) and the directors of Palestinian Medical Relief Society (PMRS) to conduct the study at the previously mentioned settings.

## IV-Statistical design

The data collected were revised, coded, tabulated and statistically analyzed using statistical package for the social science (SPSS) version 20. numbers and percentages distribution were done. Chi-square test, t-test and the pearson correlation coefficient test, One way analysis of variance (ANOVA) test, mean and stander deviation were used to estimate the statistical significant difference between variables of the study. Probability of error (p-value) $<0.05$ was considered significant.

# Results

# Results

**The results of the present study are presented as the following:**

**Part I:**

- Characteristics of the studied subjects

  Tables 1-2, figures 1-3

**Part II:**

- Knowledge and practices of the studied subjects about information technology and diabetes mellitus and its effect on their glycemic control pre and post IT based intervention.

  Tables 3-15

**Part III:**

- Relation between information technology, knowledge, practice and Demographic characteristics.

  Tables 16-22

## Part I: Characteristics of the Studied Subjects:

### 1. Socio-Demographic Characteristics

**Figure (1):** Distribution of the studied subject according to their gender (n=80)

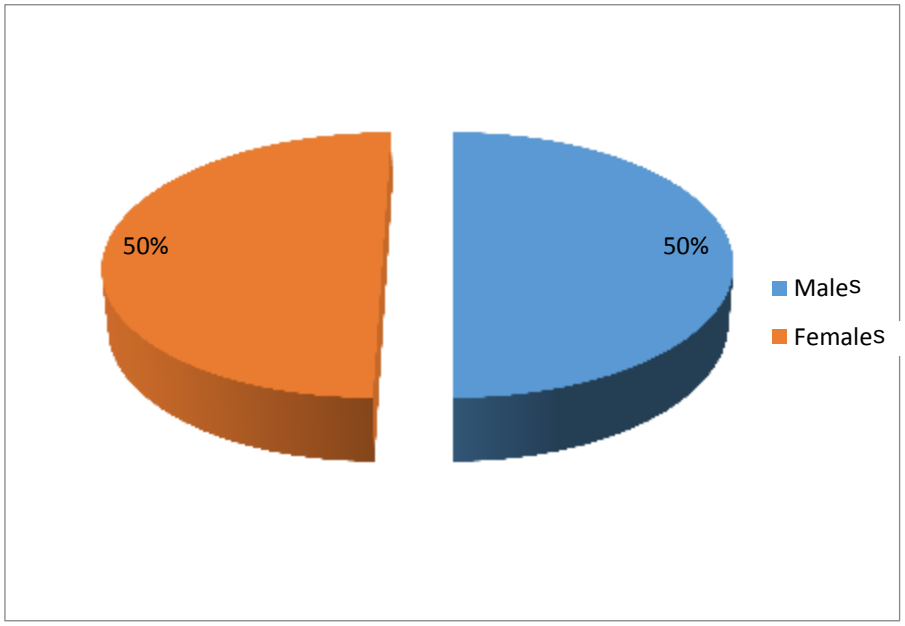


Figure (1) revealed that 50% were males and the rest of them were females.

**Figure (2):** Distribution of the studied subject according to their age in years (n=80)

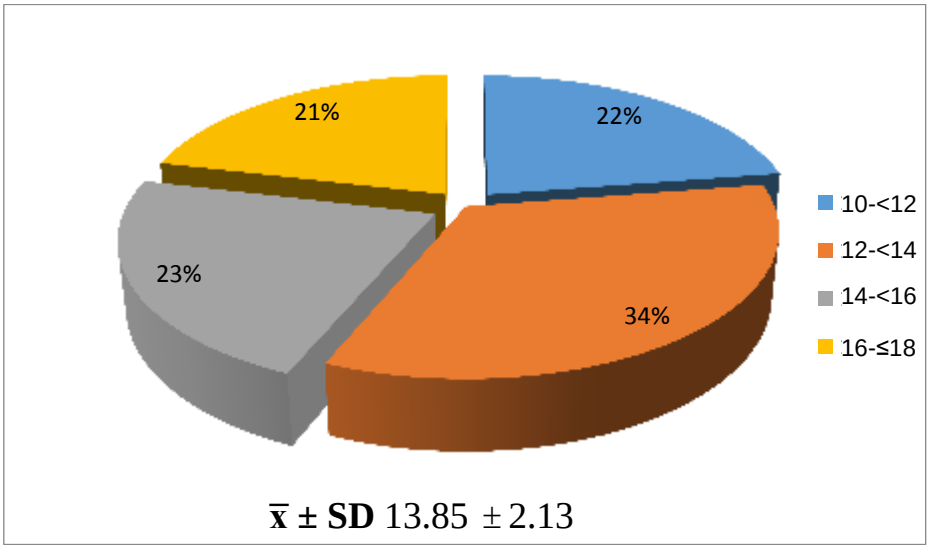


Figure (2) showed that, more than half of the studied children (56%) aged from 10 years to less than 14, while 21% of them aged from 16 ≤ 18 years.

**Figure (3):** Distribution of the studied subject according to their educational level (n=80)

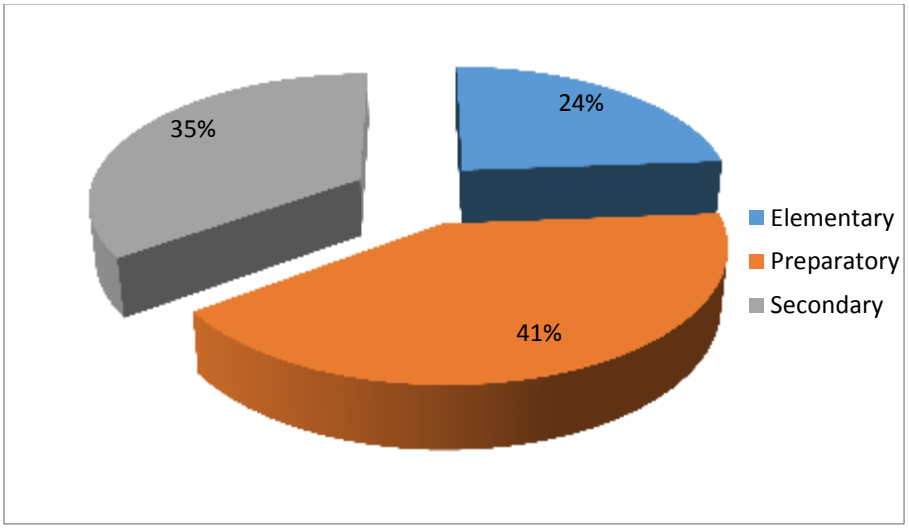


Figure (3) illustrated that, 41%, 35%, and 24% of the studied children were enrolled in phase of preparatory, secondary, and elementary education respectively.

**Table (1):** Number and percentage distribution of the studied subject according to their characteristics (n=80).

| Item | n=80 | 100% |
|---|---|---|
| **Ranking** | | |
| First | 13 | 16.2 |
| Second | 18 | 22.5 |
| Third | 18 | 22.5 |
| Fourth | 31 | 38.8 |
| **Family size** | | |
| 4-6 | 21 | 26.2 |
| 7-9 | 36 | 45.0 |
| +10 | 23 | 28.8 |
| **Residence** | | |
| Urban | 48 | 60 |
| Rural | 32 | 40 |

As regards characteristics of the studied subject, table (1) showed that 38.8% of them were ranked as the fourth child in the family, nearly, half of them (45%) were having a family size of 7 - 9 members and 60% of them were from urban residence.

**Table (2):** Distribution of the studied subject according to their history of the disease (n=80).

| Item | no | (%) |
|---|---|---|
| **Positive family history** | | |
| Father | 18 | 22.5 |
| Grandfather/mother | 17 | 21.3 |
| Mother | 12 | 15 |
| Relatives | 8 | 10 |
| Brother/Sister | 4 | 5 |
| **Negative family history** | 21 | 26.2 |
| **Duration of the disease in years** | | |
| 1 | 6 | 7.5 |
| 2 | 21 | 26.3 |
| 3 | 12 | 15 |
| 4-6 | 41 | 51.2 |
| **Management of diabetes by:** | | |
| Insulin injection | 73 | 91.3 |
| Diet regimen | 1 | 1.2 |
| Diet and insulin injection | 6 | 7.5 |

In terms of family history, table (2) indicated that, 22.5% of the studied subject had a positive father history of diabetes mellitus. Only 7.5% of them were suffering from the disease since one year and 91.3% of them were managed by insulin injection.

## Part II. Knowledge and practices of the studied subject about information technology and diabetes mellitus and its effect on their glycemic control pre and post IT based intervention.

**Table (3):** Distribution of the studied subject according to their knowledge about the meaning of IT and its effect on glycemic control pre and post IT based intervention (n=80).

| Item | Pre-test Satisfactory Knowledge | | Post –test Satisfactory Knowledge | | $X^2$ | p-value |
|---|---|---|---|---|---|---|
| | no | (%) | no | (%) | | |
| **Meaning of IT** | | | | | | |
| Easy access of information | 78 | 97.4 | 80 | 100.0 | | |
| Complex uses system | 1 | 1.3 | 0 | 0.0 | 1.342 | 0.180 |
| Do not know | 1 | 1.3 | 0 | 0.0 | | |
| **Methods of IT**** | | | | | | |
| Internet | 80 | 100.0 | 80 | 100.0 | | |
| Mobile | 80 | 100.0 | 80 | 100.0 | | |
| Computer | 80 | 100.0 | 80 | 100.0 | | |
| Memory flash | 79 | 98.8 | 79 | 98.8 | .378 | .705 |
| E-mail | 77 | 96.3 | 78 | 97.5 | | |
| SMS | 79 | 98.8 | 80 | 100.0 | | |
| CD | 79 | 98.8 | 80 | 100.0 | | |
| **Information technology methods will control glycemia** | | | | | | |
| Yes | 76 | 95.0 | 80 | 100.0 | 2.000 | 0.046* |
| No | 4 | 5.0 | 0 | 00.0 | | |
| **Information technology control glycemia by: **** | | | | | | |
| Easy access of diabetes knowledge | 58 | 72.5 | 73 | 91.3 | | |
| Easy communication with care provider | 25 | 31.3 | 64 | 80.0 | 7.778 | 0.001* |
| Saving of lab. results | 21 | 26.3 | 61 | 76.3 | | |
| Blood sugar measurement | 36 | 45.0 | 80 | 100 | | |
| Data saving of insulin dose | 23 | 28.8 | 44 | 55.0 | | |

* P value is significant at level of ≤ 0.05

** Number is not mutually exclusive

As regards the knowledge of the studied subject regarding the methods of IT, there is no statistical significant difference pre and post IT based intervention ($x^2$ = .378, p value 0.705). this table revealed that, the great majority of the studied subject (97.5-100%) were aware about the methods of IT pre and post the intervention. While, there was a significant difference pre and post IT based intervention ($x^2$ =7.778, p value 0.001) related to the effect of IT on glycemic control. While less than half of them (45%) stated that IT help in measurement of blood sugar pre the intervention compared to all of them (100) post the intervention.

**Table (4):** Distribution of the studied subject regarding to their knowledge about the definition of diabetes mellitus, its types and the normal value of blood glucose level pre and post IT based intervention (n=80).

| Items | Pre-test Satisfactory Knowledge | | Post -test Satisfactory Knowledge | | $x^2$ | p-value |
|---|---|---|---|---|---|---|
| | no | (%) | no | (%) | | |
| **Definition** Increase glucose level in blood | 48 | 60.0 | 74 | 92.5 | 4.513 | 0.001* |
| Decrease glucose level in blood | 3 | 3.8 | 0 | 0 | | |
| Disturbance in glucose level in blood | 17 | 21.2 | 6 | 7.5 | | |
| Don't know | 12 | 15.0 | 0 | 0 | | |
| **Types** ** type $_1$ insulin dependent | 48 | 60.0 | 79 | 98.8 | 4.625 | 0.001* |
| type $_2$ non insulin dependent | 25 | 31.3 | 75 | 93.8 | | |
| Don't know | 26 | 32.5 | 0 | 0 | | |
| **Blood glucose level in mg.** 80-120 | 39 | 48.8 | 80 | 100 | 4.797 | 0.000* |
| 100-140 | 19 | 23.8 | 0 | 0 | | |
| Don't know | 22 | 27.4 | 0 | 0 | | |

* P value is significant at level of ≤ 0.05

** Number is not mutually exclusive

As regards the knowledge of the studied subject regarding the definition of diabetes mellitus, its types and normal value of blood glucose level, this table revealed that, there was a significant difference pre and post IT based intervention. Where $x^2$ = 4.513, 4.625 and 4.797 respectively.

**Table (5):** Distribution of the studied subject regarding to their knowledge about the predisposing factors of diabetes mellitus pre and post IT based intervention (n=80).

| Items | Pre-test | | Post -test | | $x^2$ | p-value |
|---|---|---|---|---|---|---|
| | Satisfactory Knowledge | | Satisfactory Knowledge | | | |
| | no | (%) | no | (%) | | |
| **Predisposing Factors **** | | | | | 6.832 | 0.002* |
| Hereditary | 43 | 53.8 | 73 | 91.3 | | |
| Obesity | 21 | 26.3 | 70 | 87.5 | | |
| Aging | 13 | 16.3 | 48 | 60.0 | | |
| Insulin deficiency | 33 | 41.3 | 56 | 70.0 | | |
| Don't know | 27 | 33.8 | 2 | 2.5 | | |

* P value is significant at level of ≤ 0.05

** Number is not mutually exclusive

As regards the knowledge of the studied subject regarding the predisposing factors of diabetes mellitus, this table revealed that, there was a significant difference pre and post IT program intervention ($x^2$ =6.832, p value 0.002). Where, the hereditary and obesity factors were known by 91.3% and 87.5% of them respectively after the IT based intervention compared with 53.8% and only 26.3% of them respectively before the intervention.

**Table (6):** Distribution of the studied subject according to their knowledge about signs and symptoms of hypo/hyperglycemia pre and post IT based intervention (n=80).

| Items | Pre-test | | Post -test | | $x^2$ | p-value |
|---|---|---|---|---|---|---|
| | Satisfactory Knowledge | | Satisfactory Knowledge | | | |
| | no | (%) | no | (%) | | |
| **Signs and symptoms Hyperglycemia**** | | | | | | |
| Polyuria | 55 | 68.8 | 78 | 97.5 | | |
| Thirst | 54 | 67.5 | 79 | 98.8 | | |
| Fatigue | 39 | 48.8 | 66 | 82.5 | 5.997 | 0.000* |
| Polyphagia | 33 | 41.3 | 60 | 75.0 | | |
| Don't know | 13 | 16.3 | 0 | 0.0 | | |
| **Hypoglycemia**** | | | | | | |
| Blurred vision | 43 | 17.6 | 70 | 87.5 | | |
| Inability to concentrate | 42 | 17.2 | 63 | 78.8 | | |
| Tremor | 38 | 15.6 | 68 | 85.0 | | |
| Sweaty skin | 37 | 15.2 | 73 | 91.3 | 7.192 | 0.000* |
| Tachycardia | 31 | 12.7 | 65 | 81.3 | | |
| Headache | 29 | 11.9 | 66 | 82.5 | | |
| Pallor | 16 | 6.6 | 53 | 66.3 | | |
| Don't know | 8 | 3.3 | 0 | 0.0 | | |

* P value is significant at level of ≤ 0.05

** Number is not mutually exclusive

As regards the knowledge of the studied subject regarding signs and symptoms of hypo/hyperglycemia, this table revealed that, there was a significant difference pre and post IT based intervention. Where, 67.5% of them stated that thirst related to hyperglycemia pre the intervention compared to the majority of them (98.8%) post the intervention. 15.2% of them stated that, sweaty skin related to hypoglycemia pre the intervention compared to the majority of them (91.3%) post the intervention.

**Table (7):** Distribution of the studied subject regarding to their knowledge about the management of hypoglycemia and hyperglycemia pre and post IT based intervention (n=80).

| Items | Pre-test | | Post –test | | $x^2$ | p-value |
|---|---|---|---|---|---|---|
| | Satisfactory practice | | Satisfactory practice | | | |
| | no | (%) | no | (%) | | |
| **Intervention ** Hypoglycemia** | | | | | | |
| Taking sweet or juice | 59 | 73.8 | 78 | 97.5 | 6.817 | 0.002* |
| Have sandwich | 28 | 35.0 | 52 | 65.0 | | |
| Consult my doctor | 14 | 17.5 | 45 | 56.3 | | |
| Take rest | 19 | 23.8 | 53 | 66.3 | | |
| Don't do any thing | 9 | 11.3 | 1 | 1.3 | | |
| **Hyperglycemia **** | | | | | | |
| Blood glucose level analysis | 42 | 53.2 | 77 | 96.3 | 7.006 | 0.001* |
| Taking drug at proper time | 47 | 59.5 | 70 | 87.5 | | |
| Consult doctor | 20 | 25.3 | 44 | 55.0 | | |
| Have snack | 12 | 15.2 | 48 | 60.0 | | |
| Don't do any thing | 6 | 7.6 | 1 | 1.3 | | |
| Others | 12 | 15.2 | 4 | 5.0 | | |
| **Having diabetic identification card** | | | | | | |
| Yes | 23 | 28.8 | 77 | 96.3 | -3.286 | 0.001* |
| No | 57 | 71.2 | 3 | 4.1 | | |
| **Having chocolate in a pocket** | | | | | | |
| Yes | 41 | 51.2 | 66 | 82.5 | -4.352 | 0.000* |
| No | 39 | 48.8 | 14 | 17.5 | | |

* P value is significant at level of ≤ 0.05

** Number is not mutually exclusive

As regards the knowledge of the studied subject regarding intervention of hypoglycemia and hyperglycemia, this table revealed that, there was a significant difference pre and post IT based intervention. Where near to three quarters of them (73.8%) stated that taking sweet or juice pre the intervention of hypoglycemia compared to majority of them (97.5%) post the intervention. More than half of them (53.2%) stated that blood glucose level analysis pre the intervention of hyperglycemia compared to majority of them (96.3%) post the intervention.

**Table (8):** Distribution of the studied subject according to their knowledge about insulin therapy pre and post IT based intervention (n=80).

| Items | Pre-test Satisfactory Knowledge | | Post –test Satisfactory Knowledge | | $x^2$ | p-value |
|---|---|---|---|---|---|---|
| | no | (%) | no | (%) | | |
| **Effects of insulin**** | | | | | | |
| Help pancreas to secrete insulin | 22 | 27.5 | 55 | 68.8 | 6.541 | 0.000* |
| Decrease blood glucose level | 34 | 42.5 | 68 | 85.0 | | |
| Keep normal blood glucose | 46 | 57.5 | 72 | 90.0 | | |
| Don't know | 16 | 20.0 | 0 | 0 | | |
| **Injection sites of insulin**** | | | | | | |
| Arm | 62 | 77.5 | 79 | 98.8 | 6.004 | 0.000* |
| Abdomen | 35 | 43.8 | 79 | 90.0 | | |
| Thigh | 55 | 68.8 | 75 | 93.8 | | |
| Don't know | 6 | 7.5 | 0 | 0 | | |
| **Side effects of insulin**** | | | | | | |
| Nausea and vomiting | 11 | 13.8 | 66 | 82.5 | 7.152 | 0.000* |
| Itching | 9 | 11.3 | 43 | 53.8 | | |
| Hypoglycemia | 35 | 43.8 | 72 | 90.0 | | |
| Don't know | 39 | 48.8 | 2 | 2.5 | | |
| **Nature of insulin**** | | | | | | |
| Hormone | 23 | 30.7 | 64 | 80.0 | 7.086 | 0.000* |
| Therapy | 41 | 54.7 | 70 | 87.5 | | |
| Body secretions | 23 | 30.7 | 61 | 76.3 | | |
| Don't know | 18 | 24.0 | 1 | 1.3 | | |
| **Types**** | | | | | | |
| Long acting insulin | 29 | 36.3 | 70 | 87.5 | 6.496 | 0.000* |
| Short acting insulin | 22 | 27.5 | 66 | 82.5 | | |
| Mixed insulin | 42 | 52.5 | 66 | 82.5 | | |
| Don't know | 29 | 36.3 | 4 | 5.0 | | |

* P value is significant at level of ≤ 0.05 *

**Number is not mutually exclusive

As regards the knowledge of the studied subject regarding effects of insulin injection, this table revealed that, there was a significant difference pre and post IT based intervention. Where more than half of them (57.5%) stated that keep normal blood glucose as effect of insulin pre the intervention compared to majority of them (90%) post the intervention. While more than three quarters of them (77.5%) stated that arm as a site of injection pre the intervention compared to majority of them (98.8%) post the intervention.

**Table (9):** Distribution of the studied subject according to their knowledge about types of food allowed and prohibited pre and post IT based intervention (n=80).

| Types of foods | Pre-test Satisfactory Knowledge | | Post -test Satisfactory Knowledge | | $x^2$ | p-value |
|---|---|---|---|---|---|---|
| | no | (%) | no | (%) | | |
| **Types of ** allowed foods** | | | | | | |
| Beans | 21 | 32.8 | 70 | 87.5 | 7.276 | 0.000* |
| Vegetables | 41 | 64.1 | 72 | 90.0 | | |
| Fruits | 31 | 48.4 | 51 | 63.8 | | |
| Pastry | 8 | 12.5 | 43 | 53.8 | | |
| Cereals | 21 | 32.8 | 62 | 77.5 | | |
| Don't know | 6 | 9.4 | 0 | 0.0 | | |
| **Types of ** prohibited foods** | | | | | | |
| Honey | 51 | 64.6 | 79 | 98.8 | 6.500 | 0.000* |
| Jam | 47 | 59.5 | 78 | 97.5 | | |
| Jelly | 37 | 46.8 | 67 | 83.8 | | |
| Chocolate | 60 | 75.9 | 76 | 95.0 | | |
| White bread | 38 | 48.1 | 64 | 80.0 | | |
| Rice | 36 | 45.6 | 68 | 85.0 | | |
| Gases drinks | 45 | 57.0 | 78 | 97.5 | | |
| Fatty foods | 42 | 53.2 | 75 | 93.8 | | |
| Meat | 14 | 17.7 | 39 | 48.8 | | |
| Don't know | 6 | 7.6 | 0 | 00.0 | | |

* P value is significant at level of ≤ 0.05

** Number is not mutually exclusive

As regards the knowledge of studied subject regarding types of allowed and prohibited foods, this table revealed that, there was a significant difference pre and post IT based intervention. Where less than two thirds of them (64.1%) stated that vegetables as allowed food pre the intervention compared to majority of them (90%) post the intervention. While less than two third of them (64.6%) stated that honey as prohibited food pre the intervention compared to majority of them (98.8%) post the intervention.

**Table (10):** Distribution of the studied subject according to their knowledge about the complications and prevention of diabetes mellitus pre and post IT based intervention (n=80).

| Items | Pre-test | | Post -test | | $x^2$ | p-value |
|---|---|---|---|---|---|---|
| | Satisfactory Knowledge | | Satisfactory Knowledge | | | |
| | no | (%) | no | (%) | | |
| **Complications **** | | | | | | |
| Weight loss | 30 | 37.5 | 58 | 72.5 | | |
| Joint pain | 17 | 21.3 | 45 | 56.3 | | |
| Acetone odor | 19 | 23.8 | 56 | 70.0 | | |
| Vision weakness | 37 | 46.3 | 68 | 85.0 | | |
| Inflammation of nerves | 11 | 13.8 | 46 | 57.5 | 6.818 | 0.000* |
| Sensory loss | 10 | 12.5 | 34 | 42.5 | | |
| Teeth extraction | 15 | 18.8 | 44 | 55.0 | | |
| Delay wound healing | 25 | 31.3 | 61 | 76.3 | | |
| Don't know | 26 | 32.5 | 2 | 2.5 | | |
| **Prevention **** | | | | | | |
| Regular follow up | 44 | 55.0 | 75 | 93.8 | | |
| Taking medications regularly | 57 | 71.3 | 78 | 97.5 | 5.888 | 0.000* |
| Regular diet and physical exercise | 45 | 56.3 | 73 | 91.3 | | |
| Don't know | 9 | 11.3 | 0 | 0.0 | | |

* P value is significant at level of ≤ 0.05

** Number is not mutually exclusive

As regards knowledge of the studied subject regarding the complications and prevention of diabetes mellitus, this table revealed that, there was a significant difference pre and post IT based intervention. Where less than half of them (46.3%) stated that vision weakness as complication of DM pre the intervention compared to most of them (85%) post the intervention. While regarding their knowledge about the prevention of DM, it was found that, more than two thirds of them (71.3%) stated that taking medications regularly pre the intervention compared to majority of them (97.5%) post the intervention regarding their knowledge about the prevention of DM.

**Table (11):** Distribution of the studied subject regarding to their knowledge about physical exercise pre and post IT based intervention (n=80)

| Items | Pre-test Satisfactory knowledge | | Post –test Satisfactory knowledge | | $x^2$ | p-value |
|---|---|---|---|---|---|---|
| | no | (%) | no | (%) | | |
| **Practicing of physical exercise** | | | | | | |
| Yes | 55 | 68.8 | 75 | 93.8 | 3.780- | 0.000* |
| No | 25 | 31.2 | 5 | 6.2 | | |
| **Importance of physical exercise **** | | | | | | |
| Improve the physical health status | 33 | 45.8 | 57 | 77.0 | 6.596 | 0.001* |
| Decrease glucose level in the blood | 40 | 55.6 | 33 | 44.6 | | |
| Decreased weight | 29 | 40.3 | 42 | 56.8 | | |
| Don't know | 43 | 59.7 | 3 | 4.1 | | |
| **Types of exercise **** | | | | | | |
| Walking to school | 33 | 60.0 | 57 | 77.0 | 4.593 | 0.002* |
| Doing sport | 24 | 43.6 | 33 | 44.6 | | |
| Running | 23 | 41.8 | 42 | 56.8 | | |
| Others | 9 | 16.4 | 3 | 4.1 | | |

* P value is significant at level of ≤ 0.05

** Number is not mutually exclusive

As regards the knowledge of the studied subject regarding of physical exercise, this table revealed that, there was a significant difference pre and post the intervention. Where, it was found that 68.8% of them were practicing the physical exercise pre the intervention compared to the majority of them (93.8%) post the intervention. As regards the importance of physical exercise, it was found that less than half of them (45.8%) stated that improve the physical health status pre the intervention compared to more than three quarters of them (77%) post the intervention. Walking to school was the common exercise by the studied subject pre intervention compared with 77% post intervention.

**Table (12):** Distribution of the studied subject regarding to their actual practices for the complications related to physical exercise and its immediate intervention pre and post IT based intervention (n=80).

| Items | Pre-test Satisfactory practice | | Post –test Satisfactory practice | | $x^2$ | p-value |
|---|---|---|---|---|---|---|
| | no | (%) | no | (%) | | |
| **Complications of physical exercise **** | | | | | | |
| Vertigo | 24 | 61.5 | 34 | 63.0 | | |
| Sweat | 23 | 59.0 | 36 | 66.7 | | |
| Fatigue | 17 | 43.6 | 39 | 72.2 | | |
| Fainting | 7 | 17.9 | 19 | 35.2 | | |
| Headache | 10 | 25.6 | 23 | 42.6 | | |
| Breathing difficulties | 10 | 25.6 | 23 | 42.6 | 3.873 | 0.002* |
| Do not know | 2 | 5.1 | 0 | 0.0 | | |
| Decrease glucose level in blood | 43 | 55.8 | 72 | 91.1 | | |
| Increase glucose level in blood | 3 | 3.9 | 24 | 30.4 | | |
| Extra effort | 24 | 31.2 | 48 | 60.8 | | |
| Do not know | 24 | 31.2 | 0 | 0.0 | | |
| **Immediate intervention **** | | | | | | |
| Taking chocolate or sweet | 50 | 64.1 | 76 | 95.0 | | |
| Stop practicing exercise | 26 | 33.3 | 66 | 82.5 | | |
| Return home | 13 | 16.7 | 36 | 45.0 | 6.659 | 0.001* |
| Going to near health centre (Early referral) | 11 | 14.1 | 34 | 42.5 | | |
| Do not know | 20 | 25.6 | 0 | 0 | | |

*P value is significant at level of ≤ 0.05

**Number is not mutually exclusive

As regards the practices of studied subject regarding immediate intervention if complications of physical exercise occurred, this table revealed that, there was a significant difference pre and post IT program intervention. Where less than two thirds of them (64.1%) stated that, taking chocolate or sweet as immediate intervention pre the intervention compared to majority of them (95%) post the intervention.

**Table (13):** Distribution of the studied subject regarding to their actual practices about hygienic care pre and post IT based intervention (n=80)**.**

| Items | Pre-test | | Post -test | | $x^2$ | p-value |
|---|---|---|---|---|---|---|
| | Satisfactory practice | | Satisfactory practice | | | |
| | no | (%) | no | (%) | | |
| **Brush teeth regularly** | | | | | | |
| Yes | 55 | 68.8 | 72 | 90.0 | 3.710- | 0.000* |
| No | 25 | 31.2 | 8 | 10.0 | | |
| **Foot care** | | | | | | |
| Yes | 73 | 91.2 | 78 | 97.5 | 1.890- | 0.030* |
| No | 7 | 8.8 | 2 | 2.5 | | |
| **Dry foot after washing** | | | | | | |
| Yes | 67 | 83.8 | 71 | 88.8 | 943.- | 0.346 |
| No | 13 | 16.2 | 9 | 11.2 | | |
| **Nail cutting** | | | | | | |
| Straight method | 29 | 36.2 | 66 | 82.5 | 4.635- | 0.000* |
| Round method | 41 | 51.3 | 11 | 13.8 | | |
| Nail files | 6 | 7.5 | 2 | 2.5 | | |
| Any thing | 4 | 5.0 | 1 | 1.3 | | |
| **Drying skin** | | | | | | |
| Apply cream | 45 | 56.3 | 73 | 91.2 | 4.343- | 0.000* |
| Washing skin and dry | 22 | 27.5 | 4 | 5.0 | | |
| Don't do any thing | 13 | 16.2 | 3 | 3.8 | | |
| **Types of shoes** | | | | | | |
| Closed comfortable | 24 | 30.0 | 65 | 81.2 | 5.364 | 0.001* |
| Opened leather shoes | 19 | 23.8 | 11 | 13.8 | | |
| Plastic shoes | 6 | 7.4 | 0 | 00. | | |
| Clothes shoes | 3 | 3.8 | 0 | 00. | | |
| Sport shoes | 27 | 33.8 | 2 | 2.5 | | |
| Other | 1 | 1.2 | 2 | 2.5 | | |
| **Types of socks** | | | | | | |
| Cotton or wool | 53 | 66.2 | 71 | 88.8 | 2.946 | 0.001* |
| Socks synthetic fiber | 14 | 17.5 | 5 | 6.2 | | |
| Not wearing socks | 13 | 16.3 | 4 | 5.0 | | |

***** P value is significant at level of ≤ 0.05

Table (13) showed that, there was a statistical significant difference between the studied subject regarding to their practices for hygienic care pre and post IT based intervention except dry foot after washing.

**Table (14):** Distribution of the studied subject regarding to their actual practice for blood glucose monitoring pre and post IT based intervention (n=80).

| Items | Pre-test Satisfactory practice | | Post -test Satisfactory practice | | $x^2$ | p-value |
|---|---|---|---|---|---|---|
| | no | (%) | no | (%) | | |
| **Responsible person ** for the analysis** | | | | | | |
| Parents | 42 | 52.5 | 31 | 38.8 | | |
| Family member | 4 | 5.0 | 3 | 3.8 | 2.623- | 0.009* |
| My self | 34 | 42.5 | 80 | 100 | | |
| **Type of tests **** | | | | | | |
| Analysis of glucose in the urine | 31 | 38.8 | 32 | 40.0 | | |
| Analysis of glucose in blood | 45 | 56.3 | 79 | 98.8 | 2.245 | 0.025* |
| Analysis of acetone in the urine | 3 | 6.5 | 17 | 21.3 | | |
| Don't make analysis | 1 | 2.2 | 3 | 3.8 | | |
| **Keeping strips of glycemic analysis ****| | | | | | |
| Inside fridge | 43 | 54.4 | 56 | 70.0 | | |
| Outside fridge | 21 | 26.6 | 14 | 17.5 | | |
| Any place | 14 | 17.7 | 9 | 11.3 | 6.186 | 0.000* |
| Don't know | 3 | 3.8 | 0 | 0.0 | | |
| Others | 12 | 15.2 | 6 | 7.5 | | |

* P value is significant at level of ≤ 0.05

**Number is not mutually exclusive

As regards the knowledge of the studied subject regarding their practices for blood glucose monitoring, this table revealed that, there was a significant difference pre and post IT based intervention. As regards the person responsible for the analysis, it was found that, less than half of them (42.5%) stated that the child pre the intervention compared to all of them (100%) post the intervention. While more than half of them (56.3%) stated that analysis of glucose in blood pre the intervention compared to majority of them (98.8%) post the intervention. As regards keeping strips of glycemic analysis more than half of them (54.4%) stated that inside fridge pre the intervention compared to more than two thirds of them (70%) post the intervention.

**Table (15):** Mean value for blood glucose level among the studied subject pre and post IT based intervention (n=80).

| Items | Pre test | Post test | t-test | p-value |
|---|---|---|---|---|
| | $\bar{x} \pm SD$ | $\bar{x} \pm SD$ | | |
| Blood glucose level | 312.27±119.73 | 118.16±42.36 | 7.52 | 0.000* |

*p-value is significant at level of ≤ 0.05

Table (15) showed that, there was a statistical significant difference between the studied subject regarding to their mean value for blood glucose level pre and post IT based intervention (t = 7.52, p =0.000).

## Part III. Relation between information technology, knowledge, practice and characteristics of the studied subjects

**Table (16):** Relation between the studied subject's mean scores of Knowledge and actual practice pre and post IT based intervention (n=80)

| Items | $\bar{x} \pm SD$ | | t-test | P-value |
|---|---|---|---|---|
| **Knowledge** | | | | |
| Knowledge Pre test | 29.35 | 17.23 | 7.608 | 0.000* |
| Knowledge Post test | 56.34 | 7.02 | | |
| **Practice** | | | | |
| Practice Pre test | 11.99 | 5.25 | 7.512 | 0.000* |
| Practice Post test | 20.49 | 3.83 | | |

* The mean difference is significant at 0.05 level

Table (16) showed that, there was highly statistically significant difference between the studied subject regarding to their Knowledge and practices pre and post IT based intervention.

**Table (17):** Relation between the total knowledge and actual practices of the studied subject regarding IT and DM pre and post IT based intervention (n=80).

| Items | Correlation coefficient value | P-value |
|---|---|---|
| Total knowledge | .286 | 0.005* |
| Total practice | .312 | 0.002* |

* The Correlation coefficient is significant at 0.05 level

Table (17) showed that, there was statistically significant difference (Spearman correlation coefficient) between the studied subject regarding to their total Knowledge and practices regarding IT and DM pre and post IT based intervention.

**Relation between mean and SD for total knowledge about IT, DM and actual practices of the studied subjects with their characteristics.**

**Table (18):** Relation between the studied subject's mean scores of knowledge, actual practice and their gender pre and post IT based intervention (n=80).

| Items | Male | | Female | | t. Test | P-value |
|---|---|---|---|---|---|---|
| | $\bar{x}$ ± SD | | $\bar{x}$ ± SD | | | |
| IT_Pre | 6.55 | 3.43 | 7.15 | 3.39 | -0.851 | 0.395 |
| IT_Post | 12.55 | 3.23 | 12.10 | 3.15 | -0.897 | 0.370 |
| knowledge_Pre | 29.10 | 17.69 | 29.60 | 16.99 | -0.135 | 0.893 |
| knowledge_Post | 56.60 | 7.61 | 56.08 | 6.47 | -0.077 | 0.939 |
| Practice_Pre | 11.78 | 5.35 | 12.20 | 5.21 | -0.333 | 0.739 |
| Practice_Post | 20.93 | 3.31 | 20.05 | 4.28 | -0.716 | 0.474 |

Table (18) showed that, there was no statistically significant difference observed between the studied subjects mean scores of knowledge, practice and their gender pre and post IT based intervention.

**Table (19):** Relation between the studied subject's knowledge about IT, DM, glycemic control, actual practices and their age in years pre and post IT based intervention (n=80).

| Items | 10 - < 12 yrs | | 12 -< 14 yrs | | 14- < 16 yrs | | 16- < 18 yrs | | ANOVA Test | P-value |
|---|---|---|---|---|---|---|---|---|---|---|
| | $\bar{x}$ ± SD | | $\bar{x}$ ± SD | | $\bar{x}$ ± SD | | $\bar{x}$ ± SD | | | |
| IT_Pre | 6.56 | 3.01 | 6.15 | 3.38 | 7.39 | 3.15 | 7.71 | 4.04 | 2.844 | 0.416 |
| IT_Post | 11.44 | 3.58 | 11.74 | 3.85 | 13.39 | 1.94 | 13.06 | 2.22 | 4.084 | 0.253 |
| knowledge_Pre | 17.28 | 12.58 | 29.59 | 18.06 | 33.61 | 15.52 | 37.24 | 16.18 | 13.549 | 0.004* |
| knowledge_Post | 54.83 | 6.63 | 55.70 | 6.68 | 56.11 | 8.48 | 59.18 | 5.98 | 5.176 | 0.159 |
| Practice_Pre | 9.56 | 4.72 | 12.85 | 5.92 | 12.17 | 3.84 | 13.00 | 5.57 | 5.364 | 0.147 |
| Practice_Post | 20.17 | 3.76 | 20.33 | 4.37 | 20.44 | 3.42 | 21.12 | 3.66 | 0.809 | 0.847 |

* Means differences are significant at $\alpha = 0.05$

Table (19) showed that, there was statistically significant difference was observed between the studied subject knowledge regarding IT, DM, glycemic control, actual practice and their age in years pre and post IT based intervention except IT pre, IT post, knowledge post, practice pre and practice post.

**Table (20):** Relation between the studied subject's knowledge about IT, DM, their actual practices pre and post IT based intervention and the children's level of education (n=80).

| Items | Elementary | | Preparatory | | Secondary | | ANOVA Test | P-value |
|---|---|---|---|---|---|---|---|---|
| | $\bar{x}$ ± SD | | $\bar{x}$ ± SD | | $\bar{x}$ ± SD | | | |
| IT_Pre | 6.53 | 2.95 | 6.12 | 3.29 | 7.93 | 3.65 | 4.484 | 0.106 |
| IT_Post | 12.00 | 3.37 | 11.61 | 3.67 | 13.39 | 2.06 | 4.369 | 0.113 |
| knowledge_Pre | 17.16 | 11.78 | 27.27 | 17.80 | 40.07 | 13.11 | 20.452 | 0.000* |
| knowledge_Post | 55.05 | 6.70 | 55.09 | 6.22 | 58.68 | 7.73 | 6.061 | 0.048* |
| Practice_Pre | 9.79 | 4.32 | 11.70 | 6.03 | 13.82 | 4.28 | 7.696 | 0.021* |
| Practice_Post | 20.79 | 3.38 | 19.82 | 4.25 | 21.07 | 3.59 | 1.583 | 0.453 |

* Means differences are significant at $\alpha = 0.05$

Table (20) showed that, there was a statistically significant difference between the studied subjects knowledge regarding IT, DM, glycemic control, actual practice and the children's level of education pre and post IT based intervention except IT pre, IT post and practice post.

**Table (21):** Relation between the studied subject's knowledge about IT, DM, their actual practices pre and post IT based intervention and the children's family size (n=80).

| Items | 4-6 | | 7-9 | | 10+ | | ANOVA Test | P-value |
|---|---|---|---|---|---|---|---|---|
| | $\bar{x}$ ± SD | | $\bar{x}$ ± SD | | $\bar{x}$ ± SD | | | |
| IT_Pre | 7.24 | 3.05 | 6.92 | 3.92 | 6.39 | 2.89 | 0.809 | 0.667 |
| IT_Post | 11.14 | 3.89 | 12.58 | 3.26 | 13.00 | 1.93 | 2.789 | 0.248 |
| knowledge_Pre | 36.67 | 14.70 | 31.50 | 18.64 | 19.30 | 12.39 | 12.317 | 0.002* |
| knowledge_Post | 54.90 | 8.11 | 57.86 | 6.57 | 55.26 | 6.44 | 2.957 | 0.228 |
| Practice_Pre | 13.67 | 4.52 | 12.14 | 5.88 | 10.22 | 4.42 | 5.379 | 0.068 |
| Practice_Post | 19.90 | 3.81 | 21.33 | 3.71 | 19.70 | 3.92 | 5.416 | 0.067 |

* Means differences are significant at $\alpha = 0.05$

Table (21) showed that, there was a statistically significant difference between the studied subjects knowledge regarding IT, DM, glycemic control, actual practice and the children's family size pre and post IT based intervention except results pre/post related to IT, knowledge and actual practice .

**Table (22):** Relation between the mean of scores of knowledge and actual practice of the IT and blood glucose level of the studied subject pre and post IT based intervention (n=80)

| Tests | $\bar{x} \pm SD$ | | t-test | P-value |
|---|---|---|---|---|
| IT Pre test | 6.85 | 3.40 | 6.869 | 0.000* |
| IT Post test | 12.33 | 3.18 | | |
| Blood glucose level (pre test) | 312.27 | 119.73 | 7.52 | 0.000* |
| Blood glucose level (post test) | 118.16 | 42.36 | | |

* The mean difference is significant at 0.05 level

Table (22) showed that, there was a statistically significant difference observed between the studied subjects blood glucose level pre and post IT based intervention.

# Discussion

# Discussion

Rapid advancements in information and communication technologies open new possibilities for improved type $_1$ DM therapy management. In recent years, several mobile and Web-based telemedicine applications have been developed in order to support diabetic children in their self-management. (**Jaana and Paré, 2007; Ładyzynski and Wójcicki, 2007 and Farmer et al., 2005)**.

This study aimed to study the effect of information technology based intervention on glycemic control of children suffering from diabetes in Gaza Strip. The findings of the study would be discussed in terms of diabetic children's knowledge and practice regarding information technology, Type $_1$ DM as well as their glycemic control.

In this study (figure, 2), the results revealed that, more than half of the studied subjects aged from 10 to less than 16 years old. This result is supported by **Hockenberry and Wilson, (2009),** who studied the prevalence of diabetes mellitus and found that, diabetes mellitus most common among children with the peak age between 10 and 15 years, this result could be due to that the majority of children in this age group are used to eat junket food.

Regarding the educational level of the studied subject (figure, 3), the current study illustrated that, three fourths of them were enrolled in preparatory and secondary level of education. This study finding is incongruent with a study undertaken in Sultanate of Oman by **Al-Shafaee et al. (2008)** who studied the relation between educational level of children and diabetes where, it was found that, about 46% had studied up to high school level.

The current study (table, 2) showed that, almost three quarters of the studied subject had a positive family history of diabetes. This study was in an agreement with **Ahmad et al. (2011),** who, studied the prevalence of diabetes mellitus among the children, and found a positive family history of diabetes among the studied subject.

The findings of the study (table, 3) revealed that, the knowledge of studied subject about information technology was satisfactory, because the majority of them have previous knowledge and experience about information technology from schools classes according to the Palestinian curriculum. In addition to availability and facilities of IT methods in their homes and schools (internet, mobile, computer, memory flash, E-mail, SMS, and CD). This finding is supported by **McManis and Gunnewing, (2012)** who found that the majority of diabetic children had a satisfactory knowledge about information technology.

However, **Gammon et al. (2005)** studied the effect of information technology on diabetic children by testing the telecommunication system connecting between diabetic children unit and a medical unit on six intensively treated Type $_1$ diabetic children, aged 10–16 years and found that glycated hemoglobin (HBA1c) levels were decreased.

The researcher believes that diabetic children's were used the different methods of information technology effectively, since age 10 years help them from difficult transportation and save their times and money.

Several studies have already pointed out the impact of IT on adherence to therapy and self-management when mobile phones are used **(Kim, 2007;Tasker et al.; 2007 and Franklin et al., 2006)**. In the same line for DM, there are reports of improved glycemic control and decreased glycated hemoglobin (HBA1c) levels **(Kim, 2007 and Rami et al., 2007)**. While, other studies found no significant effects **(Franklin et al., 2006).** Differing results regarding improved glycemic control were also reported by large-scale review studies on telemedical intervention in diabetes management **(Jaana and Paré, 2007 and Farmer et al., 2005).**

The current study finding (table, 3) illustrated that, there were a large number of diabetic children, mentioned that different methods of information technology can be

helpful in glycemic control. This was in an accordance with the study of **Idriss et al. (2009), Morak et al. (2008) and Wilkinson et al. (2008),** who mentioned that, technology becomes increasingly accessible and affordable, while, it is playing a growing role in the management of chronic diseases. Many clinicians in USA are now investigating the role of the internet, cellular phones and other wireless technologies in monitoring their diabetic children and improving access to medical care and information**.** Similarly **Grover et al. (2012)** mentioned that, there was an increasing number of diabetic children are expressing interest in integrating such technologies into their health care management. From the researcher point of view that there is a relationship between using different methods of information technology and glycemic control such as internet, chatting, E-mail….etc.

The current study revealed that, the knowledge of studied subject regarding definition of diabetes mellitus as a health problem and its management was improved post IT based intervention. These findings were in an accordance with the study of **Walker et al. (2010)** who mentioned that, there was significant differences between pre and post IT based intervention regarding the knowledge about diabetes mellitus, also it was added that, education program is an important part of disease control, so there was great

importance to provide the diabetic children with correct and clear information about their disease to enable them for self management. From the researcher point of view using IT in educating the diabetic subject and their care givers can facilitate their glycemic control positively.

The current study revealed that, the knowledge of studied subject regarding normal value of blood glucose was improved post IT based intervention. These findings were in an accordance with the study of **Barret (2013)** who studied the normal value of blood glucose among children, mentioned that, there was significant differences between pre and post IT based intervention regarding the knowledge about normal blood.

The current study (table, 6) illustrated that, the majority of diabetic children pre IT based intervention had poor knowledge about signs and symptoms of hyperglycemia and hypoglycemia, while post IT based intervention there were improvement in knowledge. These findings were in agreement with **Ali (2011)**, who studied the changes in knowledge about hypo/hyperglycemia among diabetic children in Naser Institute, Elentage Elharby and Helwan hospital in Egypt, mentioned that, there were improvement in knowledge regarding to hyperglycemia and hypoglycemia, signs and symptoms post IT based intervention.

The present study, (table, 8) showed that, there was a statistically significant difference in diabetic children's knowledge about insulin therapy after the IT based intervention. This finding is congruent with the similar study of **Palaian et al. (2008)** who studied the effect of insulin for diabetic children at India, mentioned that, the importance of education self administered of insulin medication, this could help the diabetic children to understand the medication rights related used in term of dose, frequency, routes and sites. From the researcher point of view, the commitment of diabetic subject and their care givers about insulin therapy is an important for glycemic control.

Concerning the knowledge of diabetic subject about types of foods and its relation with control of glucose level in the blood, the results (table, 9) of this study revealed that, there was a statistically significant difference between their knowledge about allowed foods pre and post IT based intervention. This study finding was supported by **Deakins et al. (2006)** who studied the effect of nutrition on diabetic subject, it was mentioned that, there was a positive improvement in diabetic children's knowledge about the allowed and prohibited foods post intervention. From the researcher point of view, good selection of the studied subject and care givers about allowed and prohibited foods is important for their glycemic control.

It was clear from the current finding (table, 11) that, there was a statistically significant difference pre and post the intervention regarding children's knowledge about the importance of physical exercises. This study finding was similar to **Azimah et al. (2010**) who studied primary care at the centre in Kuala Lumpar, Malaysia, about diabetes education, concluded that, diabetic children education and empowerment were improved post diabetes education regarding physical exercise. From the researcher point of view, regular physical exercises to the studied subjects is an important to control glycemia.

Regarding to the diabetic subjects' knowledge about the complications of diabetes, there was a significant improvement in the subjects' knowledge post IT based intervention, these findings (table, 10) were in an agreement with **Ooi et al. (2007),** who assessed the effectiveness of group education in improving diabetic children awareness about diabetes mellitus complications, it was mentioned that diabetic children education was improved post diabetes education regarding complications. While the current study was not in an accordance with the study of **Mashige et al. (2008),** who studied the effectiveness of diabetic education program on diabetes mellitus complications in South Africa, mentioned that, there was no improvement in their knowledge regarding the complications of diabetes mellitus,

The researcher believes that this may be due to different setting and culture.

In relation to the hygienic care of the studied subject, the current study revealed that, (table, 13) a highly statistically significant difference post IT based intervention was observed. These findings were highly supported with the study of **Baker (2011),** who studied the impact of hygienic care on diabetic children, that reported an improvement in their knowledge regarding the hygienic care among diabetic children.

In relation to the mean value of blood glucose of studied subject, the current study revealed that, (table, 15) a highly statistically significant differences post IT based intervention also, there was a positive correlation coefficient between IT based intervention and blood glucose post IT based intervention. These findings ($t = 7.52$, $p = 0.000$), were highly supported with the study of **Kwon et al. (2014),** who study the impact of IT on glycemic control, that reported decreased glycated hemoglobin (HBA1c) levels and improvement of glycemic control in diabetic children with type $_1$ DM.

In another study conducted by **Adkins et al. (2009),** who studied whether modem technology allows for effective management of diabetes among diabetic children at Canada. While, the control group of diabetic children continued the usual program of quarterly clinic visits, whereas the modem

group of diabetic children were instructed to transmit blood glucose data through SMS every 2 weeks for 6 months instead of the clinic visit. The health care providers analyzed the data received by the modem and contact diabetic children to discuss treatment changes. Which demonstrated that, electronic transmission of data resulted in a similar level of decrease in $HBA_{1c}$ values and similar incidence of acute complications to that recorded with current standard care. The researcher believes that, it is important to serve different methods of information technology in health clinics and homes specially for children who cannot easily access to the clinics for follow up and to help them keep their blood glucose level within normal range.

As regards to the relation between information technology based intervention and mean blood glucose level of the studied children, (table, 22) a statistically significant difference was observed. The current finding is in an accordance with **Faridi et al., (2008) and Krishna and Boren (2008)**, who studied the relation between information technology and mean value of blood glucose level, it was found that, there was a positive relation between information technology and significant decrease in $HBA_{1c}$ levels as well as an improved health outcomes related diabetes.

As regards to the relation between information technology, knowledge and practice of the studied subject, the current finding clarified that, there was a statistically significant difference pre and post IT based intervention. This finding was in an accordance with **Al-Shafee et al. (2008),** who studied the relation between IT, knowledge and practice, found that, there was a positive correlation between information technology, knowledge and practice among children. These findings were highly supported with the study of **D'annunzio et al. (2013)**, who studied the impact of IT on children (aged 9–15 years) with cellular phone glucometers that sent text message glucose readings to them, improvement in diabetic self care was observed.

Concerning to the relation between studied subject according to their mean scores of knowledge, practice and gender pre and post IT based intervention, no statistically significant difference was observed. This result (table, 18) is in an accordance with **Chromas and Slany, (2011),** who studied the relation between total knowledge and practice of IT and glycemic control and gender, mentioned that no difference between boys and girls regarding information technology. This result could be due to the same interests of both sex in new technology methods.

As regards to the relation between the studied subject's knowledge about IT, DM, glycemic control, actual practices

and their age in years, a statistically significant difference was observed regarding IT, DM, glycemic control and actual practice among children aged 10-18years pre and post IT based intervention. This result (table, 19) is in an accordance with **Gammon et al. (2005),** who studied the relation between IT, DM, glycemic control and actual practice and age, it was found that children ages (9-15) years can use information technology. The result of the current study could be due the curiosity of children at this age period to use IT.

Concerning to the relation between the studied subjects according to their knowledge about IT, DM and their actual practices pre and post IT based intervention and the children's level of education of the studied children, a statistically significant difference was observed. This result (table, 20) is in an accordance with **Shi et al. (2009)**, who studied the relation between IT, DM and actual practices and the child's level of education, it was observed that a positive relation between information technology and the level of education of the studied subject specially among preparatory and secondary school. From the researcher point of view, this could be due the children of high school more aware with IT methods.

As regards to the relation between between the studied subjects according to their knowledge about IT, DM and their actual practices pre and post IT based intervention and the children's family number, there was a statistically significant difference was observed. The current finding (table, 21) is in an accordance with **Ahmad et al. (2011)**, who studied the relation between IT, DM and actual practices and family numbers, found that, a positive relation between information technology and family numbers. From the researcher point of view, this could be due to easy to obtain knowledge about using of IT from family size.

# Conclusion & Recommendations

# Conclusion

It can be concluded that, the IT based intervention facilitate an access of information for diabetic children (by using IT methods namely CD, SMS, E-mail, internet, flash memory and mobile phone). Therefore, the IT based intervention was successful in improving the knowledge and practices of the children which affects positively on their blood glucose level.

## Recommendations

According to the result of the current study, the following recommendations are suggested:

1. It is recommended to apply such IT based intervention program in primary health care centers and hospitals caring for diabetic children and their care givers.
2. Periodic and constant follow up using IT methods is very important to discuss and facilitate any difficulties that may face the children suffering from diabetes.
3. Educate the diabetic children self care activities using available means of information technology.
4. Availability of illustrated CD and videos to be distributed for each diabetic children and their care givers.
5. More studies are needed to investigate the long-term effect of such IT based intervention on glycemic control of diabetic children with type $_1$ diabetes at Gaza strip and its complications.

# Summary

# Summary

Glycemic control is a successful diabetes management that requires the delivery of complicated medical tasks like blood glucose (BG) monitoring and insulin administration along with the practice of healthful behaviors around food and exercise. The healthcare providers such as physician, nurses and educators have an important role in improving glycemic control and reducing the risk of complications on diabetic children **(Johnson and Keogh, 2010).**

This study aimed to study the effect of information technology based intervention on glycemic control of children suffering from diabetes in Gaza Strip at Palestinian Medical Relief Society among 80 diabetic children suffering from type $_1$ diabetes mellitus who met the inclusion criteria.

## I-Technical design:

Technical design includes; the research design, setting, subjects and tools for data collection.

### 1-Research Design:

A quasi – experimental study design was utilized in carrying out this study.

**2-Research Setting:**

This study was conducted at Palestinian Medical Relief Society (PMRS) which care given for 1,440,332 inhabitant, it has the largest numbers of diabetic children in Gaza strip. The services provided at this society include laboratory services for blood samples with special room for care of diabetic children, giving injections and pharmaceutical services.

**3-Subjects:**

Purposive sample that was involved children suffering from diabetes mellitus who are attending the Palestinian Medical Relief Society (PMRS) in Gaza Strip over a 6 months period, their number was 80. The following inclusion criteria was considered in their selection:

1- Children with confirmed diagnosis of type $_1$ diabetes (regardless to their gender, residence, glycemic control and presence or absence of diabetes related complications).

2- Children in the age group of 10-18 years.

3- Able to read and write.

4- Availability and accessibility of IT devices such as internet, mobile, CD, memory flash, SMS, E-mail.

5- Having the willingness and skills of information technology.

**Exclusion criteria:** Exclude diabetic children suffering from other chronic physical or mental illness.

**4-Tools of data collection**

Tools of the study were developed by the researcher after reviewing the relevant literature and include the following:

1- **Structured Questionnaire (by interview) (pre/post)** which includes data about characteristics of the diabetic children (age, gender, educational level……etc), knowledge of the diabetic children related to the use of information technology and its effect on glycemic control. (such as internet, mobile, SMS, diet, exercise etc…) as well as, their knowledge regarding diabetes mellitus.

2- **Observation Checklists (pre/post)**: That were adopted from **John & William, (1997)** to assess the actual practices of the diabetic children such as urine and blood testing, insulin preparation and injection,……etc,

3- **Information technology based intervention was designed according to the actual needs assessment of the diabetic children,** accordingly different IT tools were used for the intervention including internet, short message services (SMS), telephone calls, E-mails, CD and memory flash.

**Scoring System**

According to the children's answer, each correct answer had score 1 degree and both wrong answer and do not know had 0 degree. Also, their practices were assessed and scored 1 degree if done correctly and zero if not done or done incorrectly. Then the total scoring was calculated as level of knowledge and practice satisfactory (>70%) and unsatisfactory level of knowledge and practice (< 70%).

**Tools Validity and reliability**

Tools validity was checked through distribution of the tools to seven experts in the field of the study, content validity was assessed to determine whether the tool covers the appropriate and necessary content, as well as its relevance to the aim of the study, clarity, and its simplicity.

## II-Operational design:

The operational design of the study entails three main phases: preparatory, exploratory (pilot the study) and field of the work phases.

## 1- Preparatory phase:

A review of past and current, local and international related literature using journal, magazines and scientific periodicals and books was done to develop the study tools and to get acquainted with the various aspects of the research problem.

**2- Pilot Study (exploratory phase):**

A pilot study was carried out including 8 children suffering from Type $_1$ diabetes mellitus to test the applicability and clarity of the study tools and to determine the needed time for fulfilling the study tools. Then necessary modifications of some questions were done based on the pilot study. The diabetic children who participated in the pilot study were excluded later from the study sample.

**3- Field work**

Data collection was carried out in the period from January 2013 to June 2013. The researcher was available at the study setting three days weekly (Sunday, Monday and Tuesday).

The researcher started by explaining the nature, aim and expected outcomes of the study to the diabetic children and their care givers. Children were assessed individually using the previously mentioned tools twice pre/post IT based intervention.

The IT based intervention was prepared according to the actual needs assessment of the studied children using multiple methods of information technology including Compact Disk (CD), internet, short message services (SMS), telephone calls, E-mails and flash memory. The CD's were distributed to all diabetic children which includes nine

sessions. **The first session** (60 minutes) focused on knowledge about information technology (meaning, types and importance of IT in control of glycemic condition, methods and uses). **The second session** (60 minutes) focused on knowledge about diabetes mellitus (meaning, causes, clinical manifestation, measure of blood glucose, complications and management). **The third session** (80 minutes) focused on knowledge about the importance of glycemic control (parameters and patterns of glycemic control). **The fourth session** (60 minutes) focused on knowledge about diabetic hyper and hypoglycaemia ( types, causes, signs and symptoms, management and prevention). **The fifth session** (80 minutes) focused on knowledge and practices related to insulin therapy (importance, types, sites, routes, preparation, injection, storage and complications). **The sixth session** (50 minutes) focused on diet management for diabetic children (recommended and un recommended diet and the relationship between diet and glycemic control). **The seventh session** (30 minutes) focused on physical exercise (importance, precautions, types and technique of suitable exercise). **The eighth session** (60 minutes) focused on the personal hygienic care (importance, oral care, feet care, skin care and technique of nail cut). **The ninth session** (40 minutes) focused on glucose monitoring, importance to control glucose and measuring glucose in blood and urine.

Videos, CDs and flash memory were used to demonstrate the management of glycemic control in children with diabetes mellitus. It includes video for physical exercise, diet, insulin preparation and injection in addition to, blood glucose measurement. SMS and E-mails were sent weekly to the children to refresh their knowledge about glycemic control by cell phone. Daily chatting with the children was every three days to follow up their health condition. Also, telephone calls sometimes were needed to discuss any issue about diabetes mellitus and glycemic control. Additionally, flash memory was distributed among the studied subject to be used as reference for their health problems.

The researcher was met with the children during the intervention period for blood glucose monitoring and follow up of their progress also, to discuss any difficulties which may face them during the intervention period.

**Ethical and legal issues**

Parental agreement was a prerequisite to involve the child in the study sample at the first session. All ethical issues of research were maintained. The purpose, specific objective, anticipated benefits and methods of the study were carefully explained to each eligible subject. When the subjects agreed to participate in the study, they were assured that they could withdraw at any time and they would not be identified in the report of the study. Also the researcher promised the subject

that the research will be harmless, confidentiality in gathering and treating subjects information was done.

## Results:

**The main findings of the study were as the following:**

- Fifty percentage of the studied subject were males and the rest of them were females. More than half of studied children (56%) aged from 10 <14 years.
- More than one third of the studied subject (41%) were in preparatory school. More than one third (38.8%) of them were ranked as the fourth child while, the residence of 60% of them were from urban areas.
- As regards positive family history of diabetes, it was found that, near to three quarters (73.75%) of the studied subject had DM among their families.
- The majority of subjects (97.5%) reported the meaning of IT and all of them reported that IT methods can control glycemic condition pre and post IT based intervention program.
- Almost two thirds (64.1%) of the studied subject reported that vegetables food allowed pre intervention compared with (90%) post intervention, and two thirds (64.6%) of them reported that honey is prohibited food pre intervention compared with (98.8%) post IT based intervention program.

- More than half (55.6%) of the studied subject reported that, exercises can decrease glucose level in the blood.
- pre intervention compared with (97.5%) post IT based intervention program.
- Less than half (48.8%) of the studied subject reported correctly, the normal glucose level in the blood pre intervention compared with (100%) post IT based intervention program.
- The studied subject mean level of blood glucose was (312.27) Pre IT intervention compared with (118.16) post intervention. The difference was statistically significant at (0.05).
- There was a statistical significant difference in relation to the studied subject knowledge about IT, as well as their Knowledge, and practices about DM pre and post intervention among subjects post IT based intervention program (P=0.000).
- There was significant relationship between studied subjects IT, knowledge and practice pre and post intervention with subjects' age, educational level and family numbers .

## Conclusion:

It can be concluded that, the IT based intervention facilitate an access of information for diabetic children (by using IT methods namely CD, SMS, E-mail, internet, flash

memory and cell phone). Therefore, the IT based intervention was successful in improving the knowledge and practices of the children which affect positively their blood glucose level.

**Recommendations:**

According to the result of the current study, the following recommendations are suggested:

1. It is recommended to apply such IT based intervention program in primary health care centers and hospitals caring for diabetic children and their care givers.
2. Periodic and constant follow up using IT is very important to discuss and facilitate any difficulties that may face the children suffering from diabetes.
3. Educate the diabetic children self care activities using available means of information technology.
4. Availability of illustrated CD and videos to be distributed for each diabetic children and their families.
5. More studies are needed to investigate the long-term effect of such IT based intervention on glycemic control of diabetic children with type $_1$ diabetes at Gaza strip.

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# Appendices

# إستمـــارة المقـابلـــة

## رسالة تعريف وموافقة

مرحبا بك، يقوم الباحث بدراسة بحثية تتعلق بأثر استخدام تكنولوجيا المعلومات في التحكم في نسبة السكر في الدم من الأطفال الذين يعانون من مرض السكري ومقدمي الرعاية لهم في قطاع غزة. علماً بأن هذه الدراسة هي من متطلبات الحصول على درجة الدكتوراه في علوم التمريض تخصص تمريض الأطفال.

نحن نقدر عاليا مشاركتك لأن إجاباتك سوف تكون مهمة جداً لنا لاستكمال هذه الدراسة . سوف نسألك بعض الأسئلة عن معلومات تتعلق بتكنولوجيا المعلومات وأخرى تتعلق بمرض السكري، ونقيس نسبة السكر في دمك عند بداية الدراسة، كما سنعيد هذه الأسئلة ونقيس نسبة السكر بالدم مرة أخرى بعد ستة أشهر من البرنامج التعليمي. إن المشاركة في هذه الدراسة غير إجبارية ويمكنك الانسحاب من المشاركة في أي وقت دون أي تأثير على الرعاية التي تتلقاها، علماً بأن مشاركتك ستعود بالفائدة على تعزيز صحة مرضى السكري من النوع الأول في قطاع غزة.

هذا الإستبيان سوف يستغرق حوالي عشرين دقيقة لاستكماله و مهما تكن المعلومات التي تعطيها فإنها ستبقى سرية ولن يطلع عليها أحد باستثناء الباحث بغرض البحث العلمي فقط.

**جوال رقم: ٠٥٩٩٨٦٧٦٥٣ الباحث/ محمد فتحي الجرجاوي**

**يمكن التواصل أيام السبت والاثنين والأربعاء والخميس من الساعة الرابعة مساءا إلى الساعة الثامنة مساءا**

**توقيع ولى الأمر بالموافقة**

.....

# سجل المقـابلــة

IR = Interview Record, DI = Demography/history Indicator, DM = Diabetes Mellitus, T=Treatment D=Diet, E.=Effort, C=Complications, H=Hygiene, I=Investigation, pt.= Point, IT= Information Technology

| | | |
|---|---|---|
| IR 1 | الرقم المتسلسل للاستمارة | ☐☐☐ |
| IR 2 | تاريخ المقابلة الأولى ( قبل تطبيق البرنامج ) | ☐☐/☐☐/☐☐☐☐ |
| IR 3 | تاريخ المقابلة الثانية ( بعد تطبيق البرنامج ) | ☐☐/☐☐/☐☐☐☐ |

## الجزء الأول ( القسم الأول: المعلومات الديموغرافية والتاريخ المرضى)

| | | | | | | |
|---|---|---|---|---|---|---|
| DI 1 | عنوان السكن | محافظة الشمال | محافظة غزة | محافظة الوسطى | محافظة خان يونس | محافظة رفح |
| DI 2 | رقم التليفون و الجوال | ت ☐☐☐☐☐☐☐ | | ج ☐☐☐☐☐☐☐☐☐ | | |
| | البريد الالكترونى | | | | | |
| DI 3 | الجنس | ذكر ☐ | أنثى ☐ | | | |
| DI 4 | العمر (سنة) | من ١٠- < ١٢ ☐ | من ١٢ - <١٤ ☐ | من ١٤- > ١٦ ☐ | من ١٦- > ١٨ | |
| DI 5 | الحالة الاجتماعية للأب | ١. متزوج ☐ | ٢. مطلق ☐ | ٣. أرمل ☐ | | |
| DI 6 | الحالة الاجتماعية للأم | ١. متزوجة ☐ | ٢. مطلقة ☐ | ٣. أرملة ☐ | | |
| DI 7 | مستوى التعليم للأب | ١. غير متعلم ☐ | ٢. تعليم أساسي ☐ | ٣. تعليم ثانوي ☐ | ٤. بكالوريوس ☐ | |
| DI 8 | مستوى التعليم للأم | ١. غير متعلمة ☐ | ٢. تعليم أساسي ☐ | ٣. تعليم ثانوي ☐ | ٤. بكالوريوس ☐ | |
| DI 9 | مستوى التعليم للطفل | ١. رياض الاطفال ☐ | ٢. ابتدائي ☐ | ٣. إعدادي ☐ | ٤. ثانوي ☐ | |
| DI 10 | المهنة للأب | ١. لا يعمل ☐ | ٢. يعمل ☐ | | | |

| | | |
|---|---|---|
| DI 12 | ما هو متوسط دخل الأسرة شهرياً (الشيكل)؟ | ١. أقل من ١٠٠٠ شيكل ☐ ٢. من ١٠٠٠ <٢٠٠٠ شيكل ☐<br>٣. من ٢٠٠٠ < ٣٠٠٠ شيكل ☐ ٤. من ٣٠٠٠ < 4000 شيكل ☐ آخر يذكر ☐ |
| DI 13 | عدد أفراد ألأسرة | ..... أفراد |
| DI 14 | ترتيب الطفل بين إخوته | الأول ☐ الثاني ☐ الثالث ☐ أخرى ☐<br>..... |
| DI 15 | منذ متى تعانى من الإصابة بمرض السكري؟ | سنة ☐ سنتان ☐ ثلاث سنوات ☐ أخرى ☐<br>..... |
| DI 16 | هل يوجد احد بأسرتك مصاب بمرض السكري؟ | نعم ☐ لا ☐ |
| DI 17 | إذا كانت الإجابة بنعم فهل هو : | ١. الأب ☐ ٢. الام ☐ ٣. أحد الأخوة ☐<br>٤. الأجداد ☐ ٥. الأقارب ☐ ٦. لا أحد ☐<br>أذكرهـــــا: ..... "يمكن اختيار أكثر من خيار" |
| DI 18 | ما هو نوع العلاج الذي تأخذه؟ | ١. حقن (الانسولين) ☐ ٢. نظام غذائي ☐ ٣. حقن (الانسولين) ونظام غذائي ☐<br>٤. أعشاب أو مأكولات كبديل علاج ☐ ٥. أخرى ☐<br>أذكرهـــــا: ..... |
| IT 1 | بالنسبة لتكنولوجيا المعلومات:<br>ما هو تعريف تكنولوجيا المعلومات؟ | ١. وسيلة سهلة لتوصيل المعلومات ☐ ٢. أجهزة معقدة الاستخدام ☐<br>٣. لا أعـــرف ☐ ٤. أخـــرى ☐<br>أذكرهـــــا: ..... |
| IT 2 | ما هى وسائل تكنولوجيا المعلومات ؟ | ١. النت ☐ ٢. الهاتف الخلوي ☐<br>٣. الكمبيوتر ☐ ٤. الفلاش ميموري ☐<br>٥. الايميل ☐ ٦. الرسائل القصيرة ☐<br>٧. الأسطوانات المدمجة ☐ "يمكن اختيار أكثر من خيار" |
| IT 3 | من يساعدك في استخدام وسائل تكنولوجيا المعلومات؟ | الأب ☐ الام ☐ الأخوة ☐ |
| IT 4 | هل تعتقد أن وسائل تكنولوجيا المعلومات ستساعدك في التحكم بسكري الدم | نعم ☐ لا ☐ |

| | | | |
|---|---|---|---|
| IT 5 | كيف يمكن لوسائل تكنولوجيا المعلومات أن تساعدك في التحكم بسكري الدم؟ | ١. سرعة وسهولة المعلومة عن مرض السكري ☐<br>2. سهولة التواصل مع مقدمي الخدمة ☐<br>٣. التعرف على نتائـج التحاليل بسرعة ☐<br>٤. تخزين نتائج المعلومات وحفظها ☐<br>٥. أخرى ☐ | "يمكن اختيار أكثر من خيار لمن قال نعم في السؤال السابق |

**القسم الثاني: (الاختبار القبلي/البعدي) لمعلومات وممارسات الطفل حول مرض السكري النوع الأول**

**أجب من فضلك عما يلي من أسئلة؟ وأختر في حالة الاختيار الإجابة المناسبة لكل سؤال:**

**أولاَ: بالنسبـــة لمرض السكري:**

| | | | |
|---|---|---|---|
| DM 1 | ما هو مرض السكري ؟ | ١. زيادة نسبة السكر في الدم ☐ ٢. إنخفاض نسبة السكر في الدم ☐<br>٣. إضطراب في نسبة السكر في الدم ☐ ٤. لا أعرف ☐ | |
| DM 2 | ما هي أنواع مرض السكري ؟ | ١. النوع الأول المعتمد في علاجه على الأنسولين ☐<br>٢. الثاني غير المعتمد في علاجه على الأنسولين ☐<br>٣. السكر الثانوى ☐<br>٤. سكر الحمل ☐<br>٣. لا أعرف ☐ | "يمكن اختيار أكثر من خيار |
| DM 3 | ما هو الأنسولين ؟ | ١. هرمون ☐ ٢ . دواء للسكري ☐<br>٣. مادة يفرزها الجسم ☐ ٤. لا أعرف ☐ | "يمكن اختيار أكثر من خيار |
| DM 4 | ما هو العضو الذي يفرز الأنسولين في جسم الإنسان؟ | ١. الكبد ☐ ٢. البنكرياس ☐<br>٣. الطحال ☐ | |
| DM 5 | ما هي أنواع الأنسولين؟ | ١. أنسولين طويل المدى ☐<br>٢. أنسولين قصير المدى ☐<br>٣. أنسولين مختلط ☐<br>٤. لا أعرف ☐ | "يمكن اختيار أكثر من خيار |

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| DM 6 | ماذا تعرف عن أعراض زيادة نسبة السكر في الدم؟ | ١. كثرة التبول ☐ ٢. كثرة الأكل ☐<br>٣. شدة العطش ☐ ٤. التعب ☐<br>٥. لا أعرف ☐ | "يمكن اختيار أكثر من خيار |
| DM 7 | ماذا تعرف عن أعراض نقص نسبة السكر في الدم؟ | ١. عرق شديد ☐ 2. شحوب في الوجه ☐<br>٣. زغللة في العينين ☐ ٤. صداع ☐<br>٥. رعشة ☐ ٦. سرعة ضربات القلب ☐<br>7. عدم القدرة على التركيز ☐ 8. لا أعرف ☐ | "يمكن اختيار أكثر من خيار |
| DM 8 | ما هي أسباب الإصابة بمرض السكر؟ | ١. عامل الوراثة ☐ 2. السمنة ☐<br>٣. السن ☐ ٤. نقص إفراز غدة الأنسولين ☐<br>٥. لا أعرف ☐ | "يمكن اختيار أكثر من خيار |

| ثانيـــــاً: بالنسبـــة للعلاج: | | | |
|---|---|---|---|
| T 1 | ما هو مفعول الأنسولين؟ | ١. تساعد البنكرياس على إفراز الأنسولين ☐<br>2. تخفض نسبة السكر في الدم ☐<br>٣. المحافظة على نسبة السكر في الدم ☐<br>٤. لا أعرف ☐ | "يمكن اختيار أكثر من خيار |
| T 2 | ما هي كمية الأنسولين (وحدة) التي تأخذها؟ | ١. عشرة ☐ ٢. عشرون ☐ ٣. ثلاثون ☐ ٤.جرعات متغيرة ☐ ٥. لا أعرف ☐ | |
| T 3 | ما هي أماكن حقن الأنسولين؟ | ١. الذراع ☐ ٢. البطن ☐ ٣. الفخذين ☐<br>٤. لا أعرف ☐ | "يمكن اختيار أكثر من خيار |

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|---|---|---|---|
| T 4 | ما هي الأعراض الجانبية للعلاج بالأنسولين؟ | ١. غثيان وقيئ ☐<br>٢. حكة ☐<br>٣. نقص في نسبة السكر في الدم ☐<br>٤. ضمور الأنسجة ☐<br>٥.لا أعرف ☐ | "يمكن اختيار أكثر من خيار" |
| **ثالثـــاً: بالنسبـــة للطعام:** | | | |
| D 1 | هل تعتقد أن نوعية الطعام لها علاقة بضبط نسبة السكر في الدم ؟ | | نعم ☐ لا ☐<br>إذا كانت الإجابة لا انتقل إلى السؤال D3 |
| D 2 | ما هي أسباب الإصابة بمرض السكر؟ | ١. عامل الوراثة ☐ ٢. السمنة ☐<br>٣. السن ☐ ٤. نقص إفراز غدة الأنسولين ☐<br>٥. لا أعرف ☐ | "يمكن اختيار أكثر من خيار" |
| D 3 | هل تعرف ما هي الأطعمة التي يجب تجنبهاً عن مريض السكر؟ | ١. العسل ☐ ٢. المربى ☐<br>٣. الجيلى ☐ ٤. الشيكولاتة ☐<br>٥. الخبز الابيض ☐ ٦. الأرز ☐<br>٧. المشروبات الغازية ☐ ٨. الدهون ☐<br>٩. اللحوم ☐ ١٠. لا أعرف ☐ | "يمكن اختيار أكثر من خيار" |

| | | | |
|---|---|---|---|
| D 4 | كم عدد مرات وجبات الطعام التي تتناولها في اليوم ؟ | ١. مرة واحدة ☐ ٢. مرتين ☐ ٣. ثلاثة ☐<br>٤. أربعة ☐ ٥. خمسة ☐ ٦. أكثر ☐ | |
| D 5 | يجب أن يحتوى الطعام الذي تأكله على: | ١. قليل من السكريات ☐ ٢. زيادة في الدهون ☐<br>٣. زيادة في الالياف ☐ ٤. قليل من الملح ☐<br>٥. كثير من الخضروات ☐ | "يمكن اختيار أكثر من خيار" |
| **رابعـــاً: بالنسبـــة لممارسـة التمارين الرياضيـــة:** | | | |
| E 1 | هل ممارسة التمارين الرياضية ضرورية لمريض السكر؟ | | نعم ☐ لا ☐<br>إذا كانت الإجابة لا انتقل إلى السؤال E 3 |

| | | | |
|---|---|---|---|
| E 2 | إذا كانت الإجابة بنعم فما هي أهميتها لمريض السكر؟ | ١. تحسن الحالة الصحية للجسم ☐<br>2. تقلل نسبة السكر في الدم ☐<br>٣. تقلل الوزن ☐<br>٤. تنشط الدورة الدموية ☐ | "يمكن اختيار أكثر من خيار" |
| E 3 | هل تقوم بعمل تمارين رياضية يوميا؟ | | نعم ☐ لا ☐ |
| E 4 | إذا كانت الإجابة بنعم فما هي أنواع التمارين الرياضية الذي تؤديه يومياً؟ | ١. المشي إلى المدرسة ☐<br>٢. ممارسة رياضة ☐<br>٣. جري ☐<br>٤. أخرى ☐<br>أذكرهـــا ..... | "يمكن اختيار أكثر من خيار" |
| E 5 | هل تقوم بشرب شيء حلو مثل كوب من العصير قبل ممارسة التمارين الرياضية؟ | | نعم ☐ لا ☐ |
| E 6 | هل سبق لك عند ممارستك لنوع من الرياضة أن حدثت لك أي مضاعفات أو تأثير سلبى؟ | | نعم ☐ لا ☐<br>إذا كانت الإجابة لا انتقل إلى السؤال E 8 |
| E 7 | إذا كانت الإجابة بنعم ما هي المضاعفات التي يمكن أن تحدث نتيجة القيام بممارسة الرياضة؟ | ١. دوخة ☐ ٢. عرق ☐<br>٣. تعب شديد ☐<br>4.إغماء ☐ ٥. صداع ☐<br>٦. ضيق التنفس ☐<br>٧. لا أعرف ☐ | "يمكن اختيار أكثر من خيار" |
| E 8 | هل تعرف سبب لحدوث هذه المضاعفات؟ | ١. نقص مستوى السكر في الدم ☐<br>٢. زيادة نسبة السكر في الدم ☐<br>٣. زيادة مجهود الرياضة ☐<br>٤. لا أعرف ☐ | "يمكن اختيار أكثر من خيار" |
| E 9 | ماذا تفعل عند حدوث أحد هذه المضاعفات؟ | ١. تسارع بأخذ قطعة سكر أو حلوى أو كوب عصير أو أي شيئ حلو المذاق ☐<br>٢. تتوقف عن ممارسة الرياضة ☐<br>٣. تعود للمنزل ☐<br>٤. تذهب لاقرب مركز صحي ☐<br>٥. لا أعرف ☐ | "يمكن اختيار أكثر من خيار" |

| خامســـاً: بالنسبــة للمضاعفــات: | | | |
|---|---|---|---|
| C 1 | ماذا تعرف عن مضاعفات مرض السكر؟ | ١. نقص في الوزن ☐<br>٢. ألم في المفاصل ☐<br>٣. وجود رائحة الأستون في الفم ( خل التفاح ) ☐<br>4. ضعف في الابصار ☐ ٥. إلتهاب الأعصاب ☐<br>٦. فقدان حاسة اللمس ☐ ٧. تساقط الاسنان ☐<br>٨. عدم إلتئام الجروح بسرعة ☐ ٩. لا أعرف ☐ | |
| C 2 | هل أصبت بأحد هذه المضاعفات ؟ | نعم ☐ لا ☐ | أذكرهـــا<br>..... |
| C 3 | ماذا تفعل عند الشعور ببعض أعراض نقص السكر في الدم؟ | ١. أتناول قطعة سكر أو حلوى أو كوب حليب أو عصير ☐<br>٢. أتناول وجبة خفيفة( ساندويتش) ☐<br>٣. أستشير طبيبي الخاص ☐<br>٤. أخلد للراحة ☐<br>٥. لا أفعل شيء ☐ | "يمكن اختيار أكثر من خيار |
| C 4 | ماذا تفعل عند الشعور بأعراض ارتفاع نسبة السكر في الدم؟ | ١. أقوم بعمل تحليل لنسبة السكر في الدم ☐<br>٢. أتناول العلاج في ميعاده ☐<br>٣. أستشير الطبيب ☐<br>٤. أتناول وجبة خفيفة ☐<br>٥. لا أفعل شيء ☐<br>٦. أخرى ☐<br>أذكرهـــا ..... | "يمكن اختيار أكثر من خيار |
| C 5 | ماذا تعرف عن طرق الوقاية من كل هذه المضاعفات؟ | ١. المتابعة المستمرة والاستجابة لنصائح الطبيب وهيئة التمريض ☐<br>٢. أخذ العلاج بانتظام ☐<br>٣. تنظيم الأكل وعمل التمارين الرياضية المناسبة ☐<br>٤. لا أعرف ☐ | "يمكن اختيار أكثر من خيار |
| C 6 | هل تستشير الطبيب فوراَ إذا حدث و أحسست تغيراَ أو ضعف بالجسم؟ | | نعم ☐ لا ☐ |
| C 7 | هل تحمل معك دائماَ بطاقة تدل على انك مريض سكر؟ | | نعم ☐ لا ☐ |
| C 8 | هل تحمل معك قطعة حلوى أو شيكولاته باستمرار في جيبك؟ | | نعم ☐ لا ☐ |

| سادســـاً: بالنسبة للنظـافة الشخصيـــة: | | | |
|---|---|---|---|
| H 1 | هل تقوم بتنظيف أسنانك بانتظام؟ | | نعم ☐ لا ☐<br>**إذا كانت الإجابة لا انتقل إلى السؤال H4** |
| H 2 | إذا كانت الإجابة نعم فماذا تستعمل لتنظيف أسنانك؟ | ١. فرشاه ومعجون ☐ ٢. ماء فقط ☐ | |
| H 3 | كم مرة فى اليوم تنظف اسنانك؟ | ١. مرة واحدة يومياً ☐ ٢. مرتين يومياً ☐<br>٣. ثلاث مرات يومياً ☐ ٤. أخرى ☐ | |
| H 4 | هل تقوم بتنظيف قدميك يومياَ؟ | | نعم ☐ لا ☐ |
| H 5 | إذا كانت الإجابة نعم فماذا تستعمل في تنظيف قدميك؟ | ١. ماء وصابون ☐ ٢. ماء فقط ☐<br>٣. مادة مطهرة ☐ ٤. أشياء أخرى ☐ | |
| H 6 | هل تجفف قدميك بعد غسلها جيدا؟ | | نعم ☐ لا ☐ |
| H 7 | إذا كانت الإجابة نعم بماذا تجفف القدم؟ | ١. فوطة خشنة ☐<br>٢. فوطة ناعمة أو قطعة قماش ناعمة ☐<br>٣. لا أعرف ☐ | |
| H 8 | كيف تقص أظافرك؟ | ١. بطريقة مستقيمة ☐<br>٢. بطريقة مستقيمة مع تدوير الطرفين ☐<br>٣. برد الاظافر بمبرد مع تدوير الطرفين ☐<br>٤. بأي شيئ آخر ☐<br>أذكرهـــا ..... | |
| H 9 | ما هو نوع الحذاء الذي تلبسه؟ | ١. حذاء جلد مغلق مريح ☐ ٢. حذاء جلد مفتوح ☐<br>٣. حذاء بلاستيك ☐ ٤. حذاء قماش خفيف ☐<br>٥. حذاء رياضي ☐ ٦. أشياء أخرى ☐<br>أذكرهـــا ..... | |
| H 10 | ما نوع الجوارب التي ترتديها؟ | ١. قطن / صوف ☐ ٢. جوارب ألياف صناعية ☐<br>٣. لا أرتدي جوارب ☐ | |

| | | | |
|---|---|---|---|
| H 11 | ماذا تفعل إذا جف الجلد؟ | ١. أضع كريم ☐ ٢. أغسل الجلد وأجففه ☐<br>٣. لا أفعل له شيئ ☐ ٤. أخرى ☐<br>أذكرهـــا ..... | |
| H 12 | هل تهتم بغسيل وتجفيف أماكن الشعر وثنايا الجلد يومياً؟ | | نعم ☐ لا ☐ |

| سابعـــــاً: بالنسبة للتحـــاليـــل: | | | |
|---|---|---|---|
| I 1 | من يقوم بعمل التحاليل لك؟ | ١. أحد الوالدين ☐<br>٢. أحد أفراد الأسرة ☐<br>٣. بنفسك ☐ | |
| I 2 | إذا كانت الإجابة نعم فما هي هذه التحاليل؟ | ١. تحليل السكر في البول ☐<br>٢. تحليل السكر في الدم ☐<br>٣. تحليل الأسيتون في البول ☐<br>٤ .تحاليل أخرى ☐ | "يمكن اختيار أكثر من خيار |
| I 3 | ما هي النسبة الطبيعية للسكر في الدم؟ | ١. من ٨٠-١٢٠ ملغم / ديسيليتر ☐<br>٢. من ١٠٠-١٤٠ ملغم / ديسيليتر ☐<br>٣. لا أعرف ☐ | |
| I 4 | هل تعرف في أي وقت من النهار يمكنك عمل تحليل السكر في البول؟ | ١. قبل الأكل ☐ ٢. بعد الأكل ☐<br>٣. لا أعرف ☐ | |
| I 5 | هل هناك أنواع من الأكل تؤثر أو تغير من نتيجة تحليل السكر في الدم؟ | نعم ☐ لا ☐<br>إذا كانت الإجابة بنعم فما هي هذه الأطعمة؟<br>أذكرها:---------- | |
| I 6 | كيف تحفظ شرائط التحاليل / الأنسولين ؟ | ١. في الثلاجة ☐<br>٢. خارج الثلاجة ☐<br>٣. في أي مكان ☐<br>٤. أخرى ☐<br>أذكرهـــا .....<br>٥. لا أعرف ☐ | "يمكن اختيار أكثر من خيار |

## ملاحظات الباحث

**ملاحظات حول المريض أو بعض الأسئلة أو إجاباتها مع التحديد:**

.....

.....

.....

**ملاحظات أخرى:**

.....

.....

**التاريخ للمقابلة الأولى: / / ٢٠١٢ م** **توقيع الباحث :** .....

**خطوات تحليل السكر بالبول بواسطة شريط التحليل**

| الخطوات | يفعل | لا تفعل | ملاحظات |
|---|---|---|---|
| ١- غسل اليدين جيدا ثم بتجفيفها جيدا<br>٢- أخرج شريط واحد من العلبة<br>٣- أغلق الغطاء الخاص بالعلبة مباشرة بعد إخراج الشريط<br>٤- بلل الجزء الخاص بالتحليل في الشريط بالبول لمدة ثانية واحدة<br>٥- انتظر نصف دقيقة ثم قارن لون الشريط بالألوان المثبتة علي العلبة ويجب أن تقارن اللون في مكان به إضاءة كافية<br>٦- سجل نتيجة التحليل ونظف مكان التحليل وأعد علبة الشرائط إلي مكانها المعتاد | | | |

**(adopted from John & William, 1997).**

## خطوات تحليل السكر بالدم

| الخطوات | يفعل | لا تفعل | ملاحظات |
|---|---|---|---|
| ١- أغسل يدك بالماء والصابون ثم جففها جيدا | | | |
| ٢- أخرج شريط واحد من العلبة بدون أن تلمس الجزء الخاص بالتحليل | | | |
| ٣- أغلق العلبة بسرعة | | | |
| ٤- ضع الشريط علي سطح نظيف وجاف حيث يكون الجزء الخاص بالتحليل غير ملامس لسطح المنضدة | | | |
| ٥- نظف مكان التحليل بالكحول أو الماء ثم جفف المكان | | | |
| ٦- وخذ الإصبع بواسطة شكاكة أو سن الإبرة | | | |
| ٧- أضغط علي الإصبع حتى يخرج الدم (قطرة مناسبة الحجم) ضع هذه القطرة علي الجزئيين الخاصين بالتحليل علي الشريط مع عدم ملامسة الإصبع للشريط احرص إلا تضيف قطرة دم أخري بعد القطرة الأولي | | | |
| ٩- جفف الدم الموجود علي الشريط بعد دقيقة واحدة بواسطة قطعة من القطن الجاف أو مناديل ورقية | | | |
| ١٠- أنتظر دقيقة أخري بعد ذلك ثم قارن لون الشريط بالألوان المثبتة علي العلبة. | | | |
| ١١- يجب الانتظار دقيقة أخري إذا كانت نتيجة التحليل للدم ٣٠٠ أو أكثر ثم قارن لون الشريط بالصف الثاني من الألوان وفي هذه الحالة يفضل تحليل البول للأسيتون | | | |
| ١٢- سجل النتيجة بالكراسة الخاصة لذلك | | | |
| ١٣- تنظف مكان التحليل وأعد العلبة والكراسة إلي مكانها | | | |

**(adopted from John & William, 1997).**

## خطوات إعداد حقنة الأنسولين للحقن

| الخطوات | يفعل | لا تفعل | ملاحظات |
|---|---|---|---|
| ١- اغسل يداك جيدا بالماء والصابون | | | |
| ٢- أحضر السرنجة الخاصة بالأنسولين | | | |
| ٣- احضر زجاجة الأنسولين من الثلاجة حتى تصبح في درجة حرارة الغرفة | | | |
| ٤- اخلط الأنسولين المعكر بواسطة تحريك الزجاجة برفق بين اليدين وليس عموديا لأعلي ولأسفل | | | |
| ٥- نظف الجزء العلوي من زجاجة الأنسولين (الغطاء) بقطعة من القطن (كحول و جاف) | | | |
| ٦- أرفع الغطاء الخاص بالسن من فوق سن الإبرة | | | |
| ٧- أسحب مكبس السرنجة إلي أسفل مسافة مساوية لجرعة الأنسولين | | | |
| ٨- أدخل سن الإبرة داخل زجاجة الأنسولين ثم أحقن الهواء داخل الزجاجة | | | |
| ٩- اسحب الأنسولين داخل السرنجة إلي أن تصل إلي الجرعة المطلوبة | | | |
| ١٠- قم بتحريك المكبس حتى تتخلص من الهواء الموجود داخل السرنجة ثم راجع الجرعة مساوية للجرعة المطلوبة | | | |
| ١١- أخرج سن الإبرة من الزجاجة ثم يغطي بالغطاء الخاص به | | | |
| ١٢- ثم حدد مكان الحقن – نظف مكان الحقن بقطن مبلل بالكحول أو الماء ثم بقطن جاف | | | |
| ١٣- اسحب الجلد بين أصابعك للخارج | | | |
| ١٤- أدخل سن الإبرة بطريقة عمودية إلي المكان المناسب | | | |
| ١٥- أحقن الأنسولين ببطء ثم أخرج سن الإبرة بسرعة من الجلد | | | |
| ١٦- أضغط بقطعة من القطن علي مكان الحقن لعدة ثواني ولا تدلك المكان | | | |

**(adopted from John & William, 1997).**

## خطوات فحص قدم السكر

| الخطوات | يفعل | لا تفعل | ملاحظات |
|---|---|---|---|
| ١- الفحص المستمر للقدمين من أي جروح او تغير في لون الجلد<br>٢- غسل القدمين بالماء الدافئ والصابون<br>٣- استخدام الكريم في حالة جفاف الجلد<br>٤- استخدام فوطة ناعمة لتجفيف الجلد<br>٥- قص الاظافر بشكل مستقيم<br>٦- تجنب المشي حافي القدمين<br>٧- لبس جوارب قطنية أو صوفية<br>٨- استخدام الاحذية المريحة للقدمين والمصنوعة من الجلد الطبيعي الطري | | | |

**(adopted from John & William, 1997).**

| خطوات فحص الفم والاسنان | يفعل | لا تفعل | ملاحظات |
|---|---|---|---|
| ١- فحص الفم والأسنان يوميا<br>٢- ملاحظة أى تغير فى اللثة<br>٣- أكل وجبة غذائية صحية<br>٤- تنظيف الأسنان مرتين يوميا بالفرشاة والمعجون<br>٥- استخدام فرشاة ناعمة<br>٦- ازالة الترسيبات الموجودة بين الأسنان<br>٧- استخدام الخيط للأماكن الصعبة لتنظيف الأسنان يوميا<br>٨- زيارة طبيب الأسنان مرتين سنويا | | | |

**(adopted from John & William, 1997).**

***Session (1)***

**General Objective:** *By the end of this session each child will acquire knowledge about the importance of information technology in glycemic control*

**Setting**: Lecture Room

**Subject No.** (80) **Time allowed:** 60 minutes

| Specific Objective | Domain | Content | Time required in minutes | Teaching Strategies | | Learning activities | Method of Evaluation |
|---|---|---|---|---|---|---|---|
| | | | | Teaching Method | Media | | |
| ***At the end of this session, each participant will be able to:***<br>• Identify the outcomes of the program, aims and objectives.<br>• Distribution of pre test by researcher<br>• Define the meaning of information technology | C | • Expectation of diabetic child outcome of the program, aims and objectives.<br>• Pretest<br>• Meaning of information technology | 10 | • Modified lecture<br>• Group discussion | • CD<br>• Mobile | • Share in discussion | • Feed back<br>• On line evaluation |
| • Specify types of IT | C | • Types of IT in glycemic control | 10 | • Modified lecture<br>• Group discussion | • CD<br>• Pictures | • Share in discussion | • Ask question.<br>• Feedback |
| • Identify the importance of IT in glycemic control | C | • Importance of IT in glycemic control | 10 | • Modified lecture<br>• Group discussion | • Flash memory<br>• CD | • Share in discussion | • Ask question.<br>• Feedback |
| • Determine uses of IT in glycemic control | C | • Uses of IT in glycemic control | 10 | • Modified lecture<br>• Group discussion | • CD<br>• Pictures | • Share in discussion | • Ask question.<br>• Feedback |
| • Demonstrate using IT methods in glycemic control | P | • Apply IT methods in glycemic control | 10 | • Demonstration<br>• Re demonstration | • Chatting | • Share in demonstration | • Practical exam<br>• On line check list |
| • Encourage regular uses of IT in glycemic control | A | • Regular using of IT in glycemic control | 10 | • Role play & Scenario | • CD | • Share in role play | • Ask question.<br>• Feedback |

***A: Attitude*** ***C: Cognitive*** ***P: Psychomotor***

***Session (2)***

**General Objective:** *By the end of this session each child will acquire Knowledge about diabetes mellitus disease .*

**Time allowed:** 60 minutes

**Setting**: Lecture Room **Subject No.** (80)

| Specific Objective | Domain | Content | Time required in minutes | Teaching Strategies | | Learning activities | Method of Evaluation |
|---|---|---|---|---|---|---|---|
| | | | | Teaching Method | Media | | |
| ***At the end of this session, each participant will be able to:***<br>• Define the meaning of diabetes mellitus<br>• Explain causes of diabetes mellitus | C | • Meaning of diabetes mellitus<br>• Causes of diabetes mellitus | 10 | • Modified lecture<br>• Group discussion | • CD<br>• Pictures | • Share in discussion | • Ask question.<br>• Feedback |
| • List clinical manifestation of diabetes mellitus | C | • Clinical manifestation of diabetes mellitus | 10 | • Modified lecture<br>• Group discussion | • CD<br>• Pictures | • Share in discussion | • Ask question.<br>• Feedback |
| • Measure blood glucose level<br>. | P | • Monitor of blood glucose level of normal fasting , post prandial and $A_1c$ | 10 | • Demonstration<br>• Re demonstration | • Real equipment | • Share in demonstration | • Ask question.<br>• Feedback<br>• Practical exam<br>• On line check list |
| • Enumerate complications of diabetes mellitus | C | • Complications of diabetes mellitus | 10 | • Modified lecture<br>• Group discussion | • CD<br>• Chating | • Share in discussion | • Ask question.<br>• Feedback |
| • Discuss the management for diabetes mellitus | C | • Methods of management of diabetes mellitus | 10 | • Role play & Scenario<br>• Group discussion | • CD<br>• Vedio | • Share in discussion | • Ask question<br>• Feed back |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| • Encourage the child to monitor blood glucose | A | • Monitoring blood glucose | 10 | • Modified lecture<br>• Group discussion | • E-mail<br>• CD | • Share in discussion | • Ask question.<br>• Feedback |

***A: Attitude*** ***C: Cognitive*** ***P: Psychomotor***

***Session (3)***

**General Objective:** *By the end of this session each child will acquire Knowledge about* glycemic control .

**Setting**: Lecture Room **Subject No.** (80) **Time allowed:** 45 minutes

| Specific Objective | Domain | Content | Time required In minutes | Teaching Strategies | | Learning activities | Method of Evaluation |
|---|---|---|---|---|---|---|---|
| | | | | Teaching Method | Media | | |
| ***At the end of this session, each participant will be able to:***<br>• Define glycemic control | C | • Definition of glycemic control | 10 | • Modified lecture<br>• Group discussion | • CD | • Share in discussion | • Feed back |
| • List the importance of glycemic control | C | • The importance of glycemic control | 10 | • Modified lecture<br>• Group discussion | • E-mail<br>• Pictures<br>• CD | • Share in discussion | • Ask question.<br>• Feedback |
| • Identify patterns of glycemic control | C | • Patterns of glycemic control | 10 | • Modified lecture<br>• Group discussion | • Mobile<br>• CD | • Share in discussion | • Ask question.<br>• Feedback |
| • Enumerate the importance follow up | C | • Importance of follow up | 10 | • Modified lecture<br>• Group discussion | • Flash memory<br>• Pictures<br>• CD | • Share in discussion | • Ask question.<br>• Feedback |
| • Discuss the glucose parameters | C | • Glucose of the parameters | 5 | • Modified lecture<br>• Group discussion | • CD | • Share in discussion | • Ask question.<br>• Feedback |

***A: Attitude*** ***C: Cognitive*** ***P: Psychomotor***

***Session (4)***

**General Objective:** *By the end of this session each child will acquire Knowledge about* Hypoglycemia and hyperglycemia .

**Setting**: Lecture Room

**Subject No.** (80) **Time allowed:** 60 minutes

| Specific Objective | Domain | Content | Time required in minutes | Teaching Strategies | | Learning activities | Method of Evaluation |
|---|---|---|---|---|---|---|---|
| | | | | Teaching Method | Media | | |
| ***At the end of this session, each participant will be able to:***<br>• Define the meaning of diabetic hypoglycemia | C | • Meaning of diabetic hypoglycemia | 10 | • Modified lecture<br>• Group discussion | • CD<br>• Mobile | • Share in discussion | • Feed back |
| • Specify types of diabetic coma | C | • Types of diabetic coma | 10 | • Modified lecture<br>• Group discussion | • CD<br>• Pictures | • Share in discussion | • Ask question.<br>• Feedback |
| • Enumerate causes of hypoglycemia and hyperglycemia | C | • Causes of hypoglycemia and hyperglycemia | 10 | • Modified lecture<br>• Group discussion | • Flash memory<br>• CD | • Share in discussion | • Ask question.<br>• Feedback |
| • Differentiate clinical manifestations of hypoglycemia and hyperglycemia | C | • Clinical manifestations of hypoglycemia and hyperglycemia | 10 | • Modified lecture<br>• Group discussion | • CD<br>• Pictures | • Share in discussion | • Ask question.<br>• Feedback |
| • Manage hypoglycemia and hyperglycemia attack properly | C | • Management of hypoglycemia and hyperglycemia | 10 | • Modified lecture<br>• Group discussion | • SMS<br>• CD<br>• mobile | • Share in discussion | • Ask question.<br>• Feedback |
| • Raise the awareness about the prevention hypoglycemia and hyperglycemia | A | • Prevention of hypoglycemia and hyperglycemia | 10 | • Demonstration<br>• Re demonstration | • CD<br>• Video | • Share in demonstration | • Ask question.<br>• Feedback |

***A: Attitude*** ***C: Cognitive*** ***P: Psychomotor***

***Session (5)***

**General Objective:** *By the end of this session each child will acquire knowledge and practice about* insulin therapy.

**Setting**: Lecture Room **Subject No.** (80) **Time allowed:** 80 minutes

| Specific Objective | Domain | Content | Time required in minutes | Teaching Strategies | | Learning activities | Method of Evaluation |
|---|---|---|---|---|---|---|---|
| | | | | Teaching Method | Media | | |
| ***At the end of this session, each child will be able to:*** • Define the meaning of insulin | C | • Meaning of insulin | 5 | • Modified lecture • Group discussion | • Flash memory • CD | • Share in discussion | • Ask question. Feedback |
| • Identify the importance of insulin to the body | C | • Importance of insulin to the body | 10 | • Modified lecture • Group discussion | • CD • Pictures | • Share in discussion | • Ask question. • Feedback |
| • List types of insulin | C | • Types of insulin | 5 | • Modified lecture • Group discussion | • CD • E-mail | • Share in discussion | • Ask question. • Feedback |
| • Identify routes of insulin administration | C | • Routes of insulin administration | 5 | • Modified lecture • Group discussion | • mobile • Pictures • CD | • Share in discussion | • Ask question. • Feedback |
| • Localize sites of insulin injection | P | • Sites of insulin injection | 5 | • Demonstration • Re demonstration | • CD • Real object | • Share in demonstration | • Practical exam. • Feedback |
| • State the proper time of insulin injection | C | • Proper time of insulin injection | 5 | • Modified lecture • Group discussion | • CD | • Share in discussion | • Ask question. • Feedback |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| • Store insulin vial correctly | A | • Storage of insulin vial | 5 | • Modified lecture<br>• Group discussion | • CD | • Share in discussion | • Feedback |
| • List complication of insulin therapy | C | • Complication of insulin | 10 | • Modified lecture<br>• Group discussion | • CD | • Share in discussion | • Feedback |
| • Prepare an insulin injection | P | • Step by step preparing Insulin injection | 15 | • Demonstration<br>• Redemonstration | • Real object | • Share in demonstration | • Practical exam.<br>• Feedback |
| • Inject an insulin subcutaneous | P | • Step by step injection insulin subcutaneous | 15 | • Demonstration<br>• Redemonstration | • Real object | • Share in demonstration | • Practical exa.<br>• Feedback |

***A: Attitude*** ***C: Cognitive*** ***P: Psychomotor***

***Session (6)***

**General Objective:** *By the end of this session each child will acquire Knowledge about* the proper diet for glycemic control.

**Setting**: Lecture Room **Subject No.** (80) **Time allowed:** 50 minutes

| Specific Objectives | Domain | Content | Time required in minutes | Teaching Strategies | | Learning activities | Method of Evaluation |
|---|---|---|---|---|---|---|---|
| | | | | Teaching Method | Media | | |
| ***At the end of this session, each child will be able to:***<br>• Enumerate the essential nutritive food elements | C | • Essential nutritive foods elements | 10 | • Modified lecture<br>• Group discussion | • CD | • Share in discussion | • Feed back |
| • Identify the food rich in proteins, carbohydrates, fats and low calories | C | • Food rich in proteins, carbohydrates, fats and low calories | 10 | • Modified lecture<br>• Group discussion | • CD<br>• Pictures | • Share in discussion | • Ask question.<br>• Feedback |
| • Identify the relation between diet and glycemic control | C | • Relation between diet and glycemic control | 10 | • Modified lecture<br>• Group discussion | • CD<br>• E-mail | • Share in discussion | • Ask question.<br>• Feedback |
| • Specify characteristic of diet | P | • Characteristic of diabetic diet for the child | 10 | • Demonstration<br>• Re demonstration | • Real object | • Share in demonstration | • Practical exam<br>• Feedback |
| • Encourage the child to select healthy diet in glycemic control | A | • Selection of healthy diet | 10 | • Demonstration<br>• Re demonstration | • Real object | • Share in demonstration | • Ask question.<br>• Feedback |

***A: Attitude*** ***C: Cognitive*** ***P: Psychomotor***

***Session (7)***

**General Objective:** *By the end of this session each child will acquire knowledge about physical exercise.*

**Setting**: Lecture Room **Subject No.** (80) **Time allowed:** 30 minutes

| Specific Objectives | Domain | Content | Time required In minutes | Teaching Strategies | | Learning activities | Method of Evaluation |
|---|---|---|---|---|---|---|---|
| | | | | Teaching Method | Media | | |
| ***At the end of this session, each child will be able to:*** • Define the importance of physical exercise to glycemic control | C | • Importance of physical exercise to diabetic child | 10 | • Modified lecture • Group discussion | CD | • Share in discussion | • Feed back |
| • List the precaution to be followed in practicing exercise | C | • Precaution to be followed in practicing exercise | 10 | • Modified lecture • Group discussion | • E-mail • Picture • CD | • Share in discussion | • Ask question. • Feedback |
| • Practicing suitable exercise | P | • Step by step doing suitable exercise | 10 | • Demonstration • Re demonstration | • Role play | • Share in demonstration | • Check list. • Feedback |
| • Encourage the child for physical exercise periodically | A | • Schedule exercise periodically | 10 | • Modified lecture • Group discussion | • CD | • Share in discussion | • Ask question. • Feedback |

***A: Attitude*** ***C: Cognitive*** ***P: Psychomotor***

***Session (8)***

**General Objective:** *By the end of this session each child will acquire information about personal hygienic care.*

**Setting**: Lecture Room **Subject No.** (80) **Time allowed:** 60 minutes

| Specific Objectives | Domain | Content | Time required In minutes | Teaching Strategies | | Learning activities | Method of Evaluation |
|---|---|---|---|---|---|---|---|
| | | | | Teaching Method | Media | | |
| ***At the end of this session, each child will be able to:***<br>• Identify the importance of hygiene | C | • Importance of hygiene | 10 | • Modified lecture<br>• Group discussion | • CD | • Share in discussion | • Feed back |
| • Perform care of the skin according to checklist | P | • Step by step perform skin care | 15 | • Demonstration<br>• Re demonstration | • Real object | • Share in demonstration | • Practical exam<br>• Feedback |
| • Perform oral care according to checklist | P | • Step by step perform oral care | 15 | • Demonstration<br>• Group discussion | • Video | • Share in demonstration | • Practical exam<br>• Feedback |
| • Demonstrate practicing care for extremities according to check list | P | • Step by step practicing care for extremities | 15 | • Demonstration<br>• Re demonstration | • Real object | • Share in demonstration | • Practical exam.<br>• Feedback |
| • Emphasize on initiate the child to apply steps of hygiene | A | • Apply steps of hygiene | 5 | • Modified lecture<br>• Group discussion | • CD | • Share in discussion | • Ask question.<br>• Feedback |

***A: Attitude*** ***C: Cognitive*** ***P: Psychomotor***

***Session (9)***

**General Objective:** *To acquire knowledge and practice about monitoring of glucose monitoring.*

**Setting**: Lecture Room **Subject No.** (80) **Time allowed:** 40 minutes

| Specific Objective | Domain | Content | Time required in minutes | Teaching Strategies | | Learning activities | Method of Evaluation |
|---|---|---|---|---|---|---|---|
| | | | | Teaching Method | Media | | |
| ***At the end of this session, each participant will be able to:***<br>• Monitoring of glucose in blood according to check list | P | • Step by step of glucose analysis in the blood | 10 | • Demonstration<br>• Re demonstration | • Internet<br>• CD | • Share in demonstration | • Feed back<br>• Practical exam and check list |
| • Identify the glucose level in blood and urine | C | • Glucose level in blood and urine | 10 | • Modified lecture<br>• Group discussion | • CD | • Share in discussion | • Ask question.<br>• Feedback |
| • Demonstrate urine analysis for glucose and ketones according to check list | P | • Step by step of urine analysis for sugar and ketenes | 10 | • Demonstration<br>• Re demonstration | • CD | • Share in demonstration | • Practical exam<br>• Feedback |
| • Encourage for monitoring blood glucose level perdiocally | A | • Monitoring blood glucose level<br>• Post test | 10 | • Modified lecture<br>• Group discussion | • CD | • Share in discussion | • Ask question.<br>• Feedback |

***A: Attitude*** ***C: Cognitive*** ***P: Psychomotor***

# تأثير التدخل المبنى على تكنولوجيا المعلومات على التحكم في السكر عند الأطفال الذين يعانون من مرض السكر في قطاع غزة


كلية التمريض

جامعة عين شمس

تحت إشراف :

أ.د. وفاء السيد عودة

استاذ تمريض الأطفال

أ.م.د. رندا محمد عدلى

استاذ مساعد تمريض الاطفال

أ.م.د. هيام طنطاوي

استاذ مساعد تمريض الأطفال

إعداد :

أ. محمد الجرجاوي

طالب دكتوراه في جامعة عين شمس والمحاضر في كلية فلسطين للتمريض

غزة – فلسطين

0599867653


2013

# المحتويات

# مقدمة

- يعتبر المرض في معظم وجوهه حالة قدرية لا نملك دفعها عن أنفسنا أو عمّن حولنا ، وداء السكر هو أحد هذه الأمراض التي قد تشكل للمصاب ولمن حوله ما يشبه الأزمة وتجعلهم في حالة استنفار دائم لما يتطلبه هذا المرض من متابعة دورية ومراقبة دقيقة ونظام غذائي صارم.

- وإذا كان الحديث عن سكر الأطفال فلابد هنا من الأخذ بجملة من الاحتياطات التي تمكن الأهل من إحكام المراقبة وتنظيم الحياة اليومية للطفل بالشكل الذي يشعره بأنه لا يختلف في شيء عن أبناء جيله، وأن عليه التأقلم مع هذا المرض وتقوية عزيمته للتعايش معه.



# أهداف البرنامج

- **في نهاية هذا البرنامج يكون أطفال السكر قادرين على معرفة :**

١. مرض السكر
٢. معنى تكنولوجيا المعلومات
٣. وسائل تكنولوجيا المعلومات
٤. البريد الإلكتروني وكيفية استخدامه
٥. القرص المضغوط
٦. الانترنت
٧. الفلاش ميموري
٨. الهاتف المحمول وكيفية ارسال الرسائل
٩. معنى التحكم بسكر الدم
١٠. انخفاض وارتفاع السكر في الدم
١١. الانسولين وكيفية حفظه
١٢. نظام غذاء المصاب بالسكر
١٣. أهمية الرياضة ونظافة الأسنان
١٤. خطوات تحليل السكر في الدم

# مرض السكر عند الأطفال

## تعريف مرض السكر:

- مرض السكر هو ارتفاع سكر الدم عن الحدود الطبيعية لجسم الإنسان.
- السكر هو عنصر هام لطاقة الجسم نحصل عليه من الغذاء حيث يخزن الجسم قسم منه والقسم الاخر الجسم يستهلكه في نشاطه العقلي ( طاقة للدماغ) و العضلي.

## ما هي اسباب مرض السكر؟

١. جينات وراثية
٢. السمنة
٣. العمر
٤. التهابات فيروسية
٥. خلل في جهاز المناعة
٦. اسباب اخرى غير معروفة



# ما هي أعراض مرض السكر ؟

١. العطش الشديد
٢. كثرة التبول
٣. كثرة الاكل
٤. الاحساس بالتعب
٥. فقدان الوزن
٦. تغيّرات في الرؤية
٧. التأخر في اندمال الجروح و في الشفاء من العدوى
٨. حكة جلدية مستمرة

## أنواع مرض السكر :

### هناك نوعان من مرض السكر النوع الأول والنوع الثاني :

- النوع الأول ( سكر الأطفال ): يحدث في حالة عدم إفراز البنكرياس للأنسولين أو إفراز كمية قليلة غير كافية. وهذا النوع من مرض السكر يحدث في حوالي ٥ الى ١٠ % من المرضى.
- النوع الثاني ( سكر البالغين ): هو الأكثر انتشاراً بين مرضى السكر ، ويصيب حوالي ٩٠ إلى ٩٥% من مرضى السكر فوق سن العشرين.
- النوع الثالث ( سكر الحمل )
- النوع الرابع ( سكر ثانوي )

المعدل الطبيعي للسكر في الدم : ٨٠ - ١٢٠ ملغم/ ديسيلتر

# تشخيص مرض السكر

- تشخيص مرض السكر يبدأ بأخذ معلومات عن التاريخ الطبي للمريض وفحصه، فإذا شك الطبيب بوجود المرض يقوم بفحص نسبة السكر في الدم للمصادقة على التشخيص. و يعتبر المجال الرقمي لسكر الدم ( ٧٠-١١٠ ملغ/دل ) هو المجال الطبيعي عند كل الأشخاص غير المصابين بالسكر .
- **يمكن إجراء فحص لنسبة الجلوكوز في الدم بإمكانيات مختلفة حيث يكفي تواجد احداها فقط لتشخيص المرض :**

١. نسبة الجلوكوز بعد صوم ٨ ساعات اكبر من ١٢٦ مغم/دل. وهو الاختبار المفضل عادة .
٢. نسبة الجلوكوز ساعتين بعد تناول المريض لـ ٧٥ غرام جلوكوز اكبر من ٢٠٠ مغم/دل. يتم عمل هذا الاختبار إذا كانت نتيجة الاختبار الأول سلبيّة بوجود شكوك عالية بأنَّ المريض مصاب بالسّكر.
٣. نسبة الجلوكوز في فحص عشوائي 200 <مغم/دل ولكن شريطة ان تتوفر أعراض المرض الملائمة .

- لإكمال عمليّة التشخيص يجب أن نحصل على نتيجة إيجابيّة في أحد الفحوصات في فرصتين مختلفتين .
- من الجدير بالذكر أنه في الكثير من الحالات يفتقر المرض لعوارض بارزة لفترة طويلة ولا يحدث تشخيصه إلا عن طريق الصدفة مثلاً من خلال فحص دم روتيني أو بعد اكتشاف إحدى مضاعفات المرض مثل الفشل الكلوي .



# علاج ومضاعفات مرض السكر

١. اخذ حقن الانسولين بانتظام
٢. الغذاء المتوازن
٣. القيام بتمارين رياضية

**مضاعفات مرض السكر:**

تظهر بعض المضاعفات مع طول مدة الإصابة بمرض السكر وعدم التحكم في نسبة سكر الدم

- **مضاعفات حادة (قصيرة الأجل)**

**١. هبوط مستوى السكر في الدم**

وهو عبارة عن نقص نسبة السكر في الدم عن المعدل الطبيعي (أقل من ٥٠ ملغرام/ديسيلتر)

**٢. ارتفاع مستوى السكر في الدم**

وهو نتيجة لنقص الانسولين بالدم وتصيب عادة مرضى السكر المعتمدين على الانسولين

**٣. ارتفاع الأحماض في الدم**

- **مضاعفات مزمنة (طويلة الأجل)**

ارتفاع السكر في الدم يؤدي الى التهابات الجلد واللثة والمسالك البولية ومضاعفات قد تصيب على المدى البعيد معظم اعضاء الجسم الحيوية مثل العين والكلى والأعصاب والشرايين والقدم والجلد.

# تكنولوجيا المعلومات والسكر عند الأطفال

-تكنولوجيا المعلومات :

تكنولوجيا المعلومات هي كافة الأجهزة والبرامج المستخدمة فى تجهيز وخزن واسترجاع المعلومات وهى وسيلة سهلة لتوصيل المعلومات.

أنواع وسائل تكنولوجيا المعلومات :





١. البريد الالكتروني
٢. القرص المدمج
٣. الفلاش الميموري
٤. الهاتف المحمول
٥. الانترنت
٦. الرسائل القصيرة



# علاقة تكنولوجيا المعلومات بالتحكم بمرض السكر :

علاقة تكنولوجيا المعلومات بالتحكم بمرض السكر :

١. سرعة وسهولة المعلومة عن مرض السكر

تستطيع تكنولوجيا المعلومات ان تقوم بسرعة توصيل المعلومات عن مرض السكر للأطفال وذلك بطرق شتى منها عن طريق الهاتف الخلوي او ارسال رسالة قصيرة أو ارسال ايميل او اعطائهم قرص مدمج فيه كل المعلومات عن المرض.

٢. سهولة التواصل مع مقدمي الخدمة

يستطيع طفل مريض السكر التواصل بكل سهولة مع مقدمي الخدمة بالهاتف الخلوي او الرسائل القصيرة او الايميل.

٣. التعرف على نتائج التحاليل بسرعة

تمكن تكنولوجيا المعلومات طفل مريض السكر التعرف على نتائج التحاليل بسرعة اما بإرسال رسالة قصيرة أو بالهاتف الخلوي او الايميل.

# علاقة تكنولوجيا المعلومات بالتحكم بمرض السكر :

### ٤. قياس سكر الدم

تكنولوجيا المعلومات لها القدرة على قياس سكر الدم لما لها من تقنية عالية وقدرة فائقة.

### ٥. تخزين نتائج الفحوصات وحفظها

توجد إمكانية عالية لتخزين نتائج الفحوصات وحفظها في جهاز الكمبيوتر للاستفادة منها وقت اللزوم فهو جهاز يستطيع حفظ المعلومات الكثيرة.

### ٦. متابعة الحالات بسرعة

يمكن لتكنولوجيا المعلومات متابعة أطفال السكر والتواصل معهم بشكل مستمر للمحافظة على التحكم بسكر الدم.



# كيفية استخدام تكنولوجيا المعلومات

### البريد الإلكتروني:

البريد الإلكتروني عبارة عن نظام للتراسل الإلكتروني إرسال واستقبال الرسائل الإلكترونية.

### كيفية الاستخدام:.

١- إذا كان لديك المستعرض إنترنت إكسبلورر، فيمكنك استخدام البريد الإلكتروني عن طريق الزرّ Mail
٢-أنقر زرّ Mail لفتح نافذة برنامج البريد الإلكتروني، واختَر New Massage ، عندها ستظهر أمامك نافذة برنامج البريد الإلكتروني
٣-أكتب عنوان البريد الإلكتروني للمرسَل إليه وموضوع الرسالة ثمّ اكتب رسالتك في الأماكن المخصصة لها .
٤-إذا أردت إرسال نُسخة من رسالتك إلى عنوان بريدي آخر فاكتب هذا العنوان الآخر في المكان المخصص له أمام زرّ النسخة الكربونية ،أما إذا أردت أن ترفق وثائق أو ملفات برسالتك الإلكترونية، فيمكنك عمل ذلك عن طريق زرّ المرفقات (Attachmentأو Insert File) أو اختيار قائمة Insert ثم File ثمّ تحديد الملفات التي تريد إرفاقها.

# كيفية استخدام تكنولوجيا المعلومات

❖ ملاحظات :

- يمكن عن طريق البريد الإلكتروني ارسال رسالة الى الطبيب المختص اثناء حدوث أي أعراض تدل على أن هناك مشاكل صحية أو لمجرد الاستشارة.

- نستطيع تنزيل فيديوهات مختصة بمرض السكر.

- يوجد رابطة مرضى السكر على الانترنت نستطيع ارسال رسالة عبر البريد الإلكتروني نطرح فيه سؤالا عن مرض السكر ويكون الرد بالإجابة.



# كيفية استخدام تكنولوجيا المعلومات

**القرص المضغوط: (CD )**

هو قرص ليزر يقوم بتخزين كمية هائلة من البيانات والمعلومات ، ويمكن ان نضع به كل المعلومات اللازمة عن مرض السكر ويمكن تشغيله عن طريق وضع القرص في الحاوية المخصص لها في جهاز الكمبيوتر ومن ثم تبدأ عملية فتح القرص وقراءة ما بداخله.

**الإنترنت:**

شبكة اتصالات عالمية تسمح بتبادل المعلومات بين العالم ونستطيع ارسال ايميلات منه بمواضيع مختلفة الى جميع انحاء العالم.

# كيفية استخدام تكنولوجيا المعلومات

### الفلاش الميموري:

هو كرت إلكتروني يتميز بصغر حجمة وتستطيع أن تضعه داخل الجيب أو حتى تركيبة في سلسلة المفاتيح ويتميز بسعة تخزينية عالية ويمكنك من سرعة الوصول للبيانات وسهولة التخزين بداخلة

### الهاتف المحمول :

هو أحد أشكال أدوات الاتصال والذي يعتمد على الهاتف اللاسلكي عن طريق أبراج البث الموزعة ويمكن ارسال رسائل قصيرة منه الى جميع انحاء العالم. فيستطيع طفل السكر ارسال رسالة قصيرة للطبيب المعالج يخبره فيها عن صحته او شكواه ويقوم الطبيب بالرد.



# التحكم في سكر الدم


### ماذا يعني التحكم بسكر الدم؟

مرض السكر يلازم المصاب طوال حياته ولا يمكن شفاؤه ولكن يمكن التحكم به ومنع الكثير من مضاعفاته والمحافظة على نسبة السكر في الدم بالمعدل الطبيعي ٨٠- ١٢٠ ملغم/ديسيلتر.

### والمحافظة على :

١. التثقيف الصحي المستمر
٢. النظام الغذائي السليم
٣. ممارسة التمارين الرياضية الغير مجهدة
٤. حقن الانسولين الخافضة للسكر
٥. المراقبة الذاتية لسكر البول وسكر الدم
٦. الفحوصات المخبرية الدورية
٧. الرعاية النفسية
٨. منع الاصابة بالعدوى

# التحكم في سكر الدم

**وكذلك يتم التحكم بسكر الدم عن طريق اجراء فحص السكر في الدم والبول :**

١. عمل تحليل سكر للدم كل ٤ ساعات
٢. عمل اختبار كيتون في البول اذا كان مستوى السكر في الدم اعلى من ٢٤٠ ملغم – ديسيلتر.
٣. عمل اختبار سكر في البول اذا كان مستوى السكر في الدم اعلى من ١٨٠ ملغم – ديسيلتر.
٤. حفظ شرائط تحليل السكر في الثلاجة وعدم تعريضها للحرارة والرطوبة.

**تعريف نقص السكر في الدم :**

هي نقص نسبة السكر في الدم أقل من ٥٠ ملغم – ديسيلتر.

**اسبابها :**

١. تناول جرعة كبيرة من الانسولين .
٢. عدم الالتزام بمواعيد الطعام .
٣. ممارسة الرياضة أكثر مما ينبغي .



# نقص السكر في الدم

**اعراضها :**

١. رجفة مع شعور بالجوع
٢. صداع مع دوخة
٣. العرق
٤. سرعة نبضات القلب
٥. عدم القدرة على التركيز
٦. فقدان الوعي


**علاج نقص السكر في الدم :**

١. عند الامكان وفي حال ظهور هذه الاعراض يجب قياس سكر الدم ( **تحت ٦٠ مغ/دسل ٤ ممول/ل يجب علاجه فوراً كنقص سكر حتى بغياب الاعراض**) اعطاء المريض أطعمة حلوة مثل الشوكولاتة غير الدسمة أو كوب من العصير.
٢. **اذا كان الطفل بكامل وعيه:** يعطى ١٠-١٥ غرام سكر سريع الامتصاص لرفع السكر لحدود آمنة الخيارات المتاحة حسب الجدول: ( تتفاوت الكمية المطلوبة حسب وزن الطفل، شدة النقص ، اعراضه و درجة الضبط العامة للسكر و توقيته من جرعة الانسولين .مثال: اذا حدث الهبوط بعد ساعة من اعطاء الانسولين سيحتاج الطفل كمية اكبر من السكر كون الانسولين لا زال فاعلا بجسمه)

**لا بد من استعمال سكر سريع الامتصاص يرفع سكر الدم لحدود امنة ( فوق ٥,٥ ممول/ل أو ١٠٠ مغ/دسل ) خلال ١٠-١٥ دقيقة**

## الاطعمة التالية لا ينصح بها لرفع معدل سكر الدم في نوبات هبوطه:

الحليب و الشوكولاتة و الحلويات التي فيها دسم ( معظم انواع الحلويات المضاف لها سمن او زبده) لان الدسم في هذه الاطعمة تبطئ هضمها بالمعدة مما يؤخر امتصاص السكر فيها . و لكن يستعمل الحليب عند الاطفال الرضع كخيار لرفع السكر.

- يعاد قياس السكر بعد ١٠-١٥ دقيقة و اذا استمر نقص السكر يعاد اعطاء الكمية السابقة مع اعادة التحليل مرة اخرى بعد ١٠ دقائق اخرى
- يعطى الطفل و جبة خفيفة ١٠-١٥ غ كربوهيدرات للمحافظة على سكر الدم مثال:

- ١-٢ قطعة من البسكويت
- رغيف صغير
- فواكه كموزة صغيرة

- إذا فقد الطفل وعيه (نوبة شديدة) او بدأ بالتشنج تجنب اعطاء العلاج فمويا بسبب خطر الاختناق و الاستنشاق. ينصح هنا باستعمال ابرة الغلوغاكون لرفع سكر الدم (وهى عبارة عن حقنة تعطى بالعضل و تستخدم لرفع السكر في الدم)



# أنواع السكر المتوفر بالغذاء

١. **أبسطها السكر الحر غلوكوز** ( تباع اقراص الغلوكوز بالصيدليات او مشروبات الطاقة مثال Lucozade) و هو اسرعها امتصاصا و الافضل لعلاج النوبات.

٢. **فركتوز :** سكر الفواكه و سرعة امتصاصه ابطأ ، اذ على الجسم استقلابه بالكبد لتحويله لغلوكوز ( معظم سكر عصائر الفواكه ٥٠-٧٠% من الفركتوز و الباقي غلوكوز مما يعني انها تحتاج وقت اطول لرفع السكر بالدم).

٣. **السوكروز** : و هو نوع السكر المتوفر بمنازلنا و المستعمل بمعظم السكاكر و الحلويات و هو ايضا سريع الامتصاص و يتألف من الغلوكوز و الفركتوز و امتصاصه يقارب امتصاص السكر الحر غلوكوز

٤. **اللاكتوز:** و هو سكر الحليب و يهضمه الجسم الى غلوكوز حر و غالالكتوز.

# ارتفاع السكر في الدم

**تعريفه** : يحدث عندما يكون مستوى السكر بالدم أكثر من ٢٤٠ ملجم/ديسيلتر خاصة اذا كان مصحوبا بوجود اسيتون في البول.

## الأسباب :

١. اهمال او انقاص جرعة الانسولين او الاقراص المخفضة للسكر
٢. الزيادة في كمية الطعام خاصة السكريات
٣. الاصابة ببعض الامرا مثل البرد والانفلونزا والالتهاب الرئوي
٤. التعرض لانفعال او توتر عصبي شديد


## علامات ارتفاع السكر في الدم:

١. العطش الشديد
٢. كثرة التبول
٣. الغثيان والقيء
٤. الارهاق والتعب
٥. الام في البطن
٦. زوغان النظر
٧. التنفس السريع العميق مع ظهور رائحة خل التفاح (الاسيتون) و فقدان الوعي



# ارتفاع السكر في الدم والغيبوبة

## العلاج :

١. اخذ الانسولين في موعده وبجرعته المحددة
٢. قياس نسبة السكر في الدم من ٤-٦ ساعات
٣. تنظيم الغذاء
٤. في حالة فقدان الوعي يجب نقل المريض مباشرة الى المستشفى

## الغيبوبة :

الغيبوبة هي فقدان المريض الوعي فلا يستجيب للمؤثرات الخارجية ولا يدري بمن حوله.

## الاسباب :

١. انخفاض السكر بالدم
٢. ارتفاع السكر بالدم

**تحدث الغيبوبة في مرض السكر نتيجة انخفاض شديد في مستوى السكر بالدم أو ارتفاع شديد في مستوى السكر بالدم لذلك ينصح بمعرفة اعراض انخفاض او ارتفاع السكر بالدم وعلاجها قبل تطور الامر والدخول في غيبوبة.**

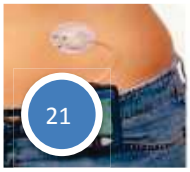
# الغيبوبة و الأنسولين

- واذا اصيب المريض بالغيبوبة وفقدان الوعي تماما فيجب على المحيطين به الاتي:

١. طلب سيارة اسعاف فورا
٢. تجنب اعطاءه أي سوائل او طعام
٣. تجنب وضع يدك في فمه
٤. تجنب اعطائه أي علاج مثل الانسولين

ما هو علاج الانسولين :

- **الانسولين هو الهرمون الذي يحتاجه الجسم لضبط سكر الدم.**
- هو عبارة عن مادة بروتينية تفرزه غدة البنكرياس ، كونه بروتين لا يمكن اعطاؤه عن طريق الفم لان الجهاز الهضمي للإنسان سيهضمه مما يفقده فعاليته ( كما يهضم باقي البروتين كالبيض).
- الطريقة الوحيدة الفعالة حاليا لإعطاء الهرمون هي عبر الحقن تحت الجلد باستعمال الابر الخاصة اقلام الانسولين او مضخات الانسولين.





# أنواع الأنسولين

١. انسولين سريع المدى:

يتميز بسرعة بدء الفاعلية خلال ١٥ دقيقة (مما يجعل بالإمكان اعطائه مباشرة قبل وجبة الطعام أو حتى بعدها في حالات الأطفال الصغار للتأكد من اتمامهم وجبة الطعام) و يدوم تأثيره ٣ - ٥ ساعات فقط

**الأنواع المتوفرة :** ١ -نوفورابيد NOVORAPID

٢ - هيومالوغ HUMALOG

٣ - أبيدرا APIDRA

٢. الانسولين القصير المدى:

يبدأ تأثيره خلال ٣٠ دقيقة و يستمر تأثيره ٦ - ٨ ساعات حسب الجرعة و قد قل استخدامه كثيرا لصالح الانواع السريعة كونها ذات فعالية اسرع و اقصر مدة مما يقلل من مخاطر نقص السكر

**الأنواع ألمتوفرة :** اكترابيد ACTRAPID

# أنواع الأنسولين

### ٣. الأنسولين متوسط المدى:

و تتميز هذه الانواع بأن تأثيرها يبدأ بعد ١-٢ ساعة و تبلغ ذروة تأثيرها بعد ٥-٦ ساعات و الذي يدوم حتى ١٨-٢٢ ساعة حسب الجرعة، و تستعمل حاليا بالأنسولين المختلط مع النوع السريع . مشكلتها بالذروة التي قد تحدث نوبات هبوط سكر خاصة ليلا

**الأنواع المتوفرة:** ١-هيومولين HUMULIN I

٢- انسولتارد INSULTARD

### ٤. الأنسولين طويل المدى:

و تتميز هذه الأنواع بمدة تأثيرها التي تبدأ بعد ساعة و تستمر ٢٤ ساعة تقريبا و بخلوها من الذروة الموجودة بالأنواع متوسطة التأثير

**الأنواع المتوفرة :** ١- ليفيمير LEVEMIR

٢- لانتوس LANUS



# أنواع الأنسولين

### ٥. الأنسولين المختلط:

هي تحوي مزيج من الانسولين السريع و المتوسط

**الأنواع المتوفرة:**

١. نوفوميكس ٣٠ NOVOMIX 30 (يحوي ٣٠ % انسولين سريع و ٧٠% متوسط)

٢. هيومالوغ ميكس ٧٥/٢٥ و ٥٠/٥٠ HUMALOG MIX و Humalin M3

COMB 25, 15, 50 INSUMAN


### اماكن اعطاء الحقن:

١. الذراع
٢. البطن
٣. الفخذين
٤. الأرداف

تحفظ أدوية الأنسولين في الثلاجة

# اعداد حقنة الأنسولين

## خطوات اعداد حقنة الانسولين للحقن :

١. اغسل يداك جيدا بالماء والصابون
٢. احضر السرنجة الخاصة بالأنسولين
٣. احضر زجاجة الانسولين من الثلاجة حتى تصبح في درجة حرارة الغرفة
٤. اخلط الانسولين المعكر بواسطة تحريك الزجاجة برفق بين اليدين وليس عموديا لأعلى ولأسفل
٥. نظف الجزء العلوي من زجاجة الأنسولين (الغطاء) بقطعة من القطن ( كحول وجاف)
٦. ارفع الغطاء الخاص بالسن من فوق سن الإبرة
٧. اسحب مكبس السرنجة إلى اسفل مسافة مساوية لجرعة الانسولين
٨. ادخل سن الابرة داخل زجاجة الانسولين ثم احقن الهواء داخل الزجاجة
٩. احسب الأنسولين داخل السرنجة الى أن تصل الى الجرعة المطلوبة
١٠. قم بتحريج المكبس حتى تتخلص من الهواء الموجود داخل السرنجة ثم راجع الجرعة مساوية للجرعة المطلوبة
١١. اخرج سن الابرة من الزجاجة ثم يغطى الغطاء الخاص به
١٢. ثم حدد مكان الحقن – نظف مكان الحقن بقطن مبلل بالكحول او الماء ثم بقطن جاف
١٣. اسحب الجلد بين أصابعك للخارج
١٤. ادخل سن الإبرة بطريقة عمودية الى المكان المناسب
١٥. احقن الانسولين ببطء ثم اخر سن الابرة بسرعة من الجلد
١٦. اضغط بقطعة من القطن على مكان الحقن لعدة ثواني ولا تدلك المكان



# النظام الغذائي المثالي للطفل المصاب بمرض السكر

## يهدف النظام الغذائي المثالي للطفل المصاب بمرض السكر الى :

١. التحكم بمستوى سكر الدم لمنع فقدان السكر عن طريق البول
٢. الوصول الى الوزن المثالي
٣. توفير السعرات الحرارية الكافية للأنشطة اليومية الاعتيادية
٤. المحافظة على المستويات الطبيعية لذهنيات الدم

## وذلك عن طريق :

١. الالتزام بنظام غذائي محدد طول الحياة
٢. يجب ان يكون الغذاء متنوعا ومتكاملا
بحيث يكون نسبة النشويات فيه ٥٠ – ٦٠% من السعرات
الحرارية اللازمة يوميا والبروتينات ١٥ – ٢٠% والباقي من الدهنيات
٣. الانتظام في تناول وجبات الطعام في مواعيدها المحددة
٤. توزيع كمية الغذاء على ثلاثة وجبات رئيسية مع وجبتين خفيفتين بينهما
٥. تجنب كميات كبيرة من الطعام في نفس الوجبة
٦. ان يكون الطعام المتناول يوميا متساوي الكمية تقريبا

# النظام الغذائي المثالي للطفل المصاب بمرض السكر

## يمكن تقسيم الأغذية حسب ملائمتها لمريض السكر الى ثلاثة مجموعات :


### أ. الأطعمة المنصوح بها لمرضى السكر بحرية:

١. الخضروات مثل الملفوف والبندورة والخيار والخس والجزر واللفت
٢. الفواكه الطازجة مثل التفاح والبرتقال والخوخ
٣. يمكن تناول الشاي والقهوة واليانسون والمرمية بدون سكر

### ب. الأطعمة المنصوح بها لمرضى السكر باعتدال:

١. النشويات وتشمل الخبز والمكرونة والأرز والبطاطس
٢. البروتينات مثل البيض والجبن والحليب قليل الدسم
٣. البقوليات مثل العدس والفول والحمص
٤. الزيوت النباتية مثل زيت الزيتون وزيت الذرة وزيت دوار الشمس

### ج. الأطعمة التالية غير منصوح بها كليا:

١. الحليب والشوكولاتة والحلويات التي فيها دسم (معظم انواع الحلويات المضاف لها سمن او زبده لان الدسم في هذه الأطعمة تبطئ هضمها بالمعدة مما يؤخر امتصاص السكر فيها ولكن يستعمل الحليب عند الأطفال الرضع كخيار لرفع السكر
٢. تجنب المشروبات الغازية
٣. تجنب الزيادة في تناول النشويات والسكريات مثل العسل والمربى والدبس والحلاوة
٤. تجنب السموم البيضاء (الملح والسكر والدقيق)



# أمثلة على النظام الغذائي

## وجبة الافطار:

| | | | | |
|---|---|---|---|---|
| كوب شاى بالحليب | 50 سعر حرارى | أو | أربع ملاعق كبيرة فول | 210 سعر حرارى |
| بيضة مسلوقة | 80 سعر حرارى | | ملعقة صغيرة زيت | 45 سعر حرارى |
| قطعة جبن منزوع الدسم | 50 سعر حرارى | | ربع رغيف خبز بلدى | 105 سعر حرارى |
| ربع رغيف فينو | 50 سعر حرارى | | | |
| **وجبة الصباح الخفيفة** | | | **وجبة الصباح الخفيفة** | |
| مقدارين من الخضار الموسمية | | | حبة تفاح أو برتقال أو ما يعادلها من الفواكه الموسمية | |

## وجبة الغذاء:

| | | | | |
|---|---|---|---|---|
| 8 ملاعق كبيرة خضار مطبوخ | 180 سعر حرارى | أو | طبق سلطة | 105 سعر حرارى |
| شريحة لحمة 100 جرام | 240 سعر حرارى | | ربع كيلو سمك | 370 سعر حرارى |
| 6 ملاعق مكرونة | 210 سعر حرارى | | نصف رغيف | 220 سعر حرارى |
| حبتين جوافة | 120 سعر حرارى | | ربع كيلو بطيخ أو شمام | 70 سعر حرارى |
| **جبة العصر الخفيفة** | | | **وجبة العصر الخفيفة** | |
| قدار صحن من الخضار الموسمية الطازجة | | | حبة تفاح أو برتقال أو ما يعادلها من الفواكه الموسمية | |

## وجبة العشاء:

| | | | | |
|---|---|---|---|---|
| علبة زبادى 100 جرام | 60 سعر حرارى | | 2 بيضة صغيرة | 160 سعر حرارى |

# الرياضة ونظافة الأسنان

## أهمية الرياضة:

- تساعد على تخفيض سكر الدم والتخلص من السمنة والوزن الزائد وكذلك تنشط الدورة الدموية وتقوي عضلة القلب وتقس من هشاشة العظام وتخفض نسبة الدهون في الدم.
- ممارسة الرياضة بصوره منتظمة مثل المشي أو الجري أو كرة القدم أو السباحة

## نظافة الأسنان:

العناية الجيدة بالأسنان مهمة جدا ويجب غسل الاسنان مرتين يوميا بالفرشاة والمعجون وزيارة طبيب الأسنان كل ستة شهور.

## خطوات فحص الفم والأسنان :

١. فحص الفم والأسنان يوميا
٢. ملاحظة أي تغير في اللثة
٣. أكل وجبة غذائية صحية
٤. تنظيف الأسنان مرتين يوميا بالفرشاة والمعجون
٥. استخدام فرشاة ناعمة
٦. ازالة الترسيبات الموجودة بين الأسنان
٧. استخدام الخيط للأماكن الصعبة لتنظيف الأسنان يوميا
٨. زيارة طبيب الأسنان مرتين سنوياً



# نظافة القدمين وخطوات تحليل السكر

## نظافة القدمين :


١. الفحص المستمر للقدمين من أي جروح أو تغير في لون الجلد
٢. غسل القدمين بالماء الدافئ والصابون
٣. استخدام الكريم في حالة جفاف الجلد
٤. استخدام فوطة ناعمة لتجفيف الجلد
٥. قص الأظافر بشكل مستقيم
٦. تجنب المشي حافي القدمين
٧. لبس جوارب قطنية أو صوفية
٨. استخدام الأحذية المريحة للقدمين والمصنوعة من الجلد الطبيعي الطري

## خطوات تحليل السكر بالبول بواسطة شريط التحليل :

١. اغسل اليدين جيدا ثم قم بتجفيفها جيدا
٢. أخرج شريط واحد من العلبة
٣. أغلق الغطاء الخاص بالعلبة مباشرة بعد اخراج الشريط
٤. بلل الجزء الخاص بالتحليل في الشريط بالبول لمدة ثانية واحدة
٥. انتظر نصف دقيقة ثم قارن لون الشريط بالألوان المثبتة على العلبة ويجب ان تقارن اللون في مكان به اضاءة كافية
٦. سجل نتيجة التحليل ونظف مكان التحليل وأعد علبة الشرائط إلى مكانها المعتاد

# خطوات تحليل السكر في الدم

١. اغسل يدك بالماء والصابون ثم جففها جيدا
٢. اخرج شريط واحد من العلبة بدون أن تلمس الجزء الخاص بالتحليل
٣. أغلق العلبة بسرعة
٤. ضع الشريط على سطح نظيف وجاف حيث يكون الجزء الخاص بالتحليل غير ملامس لسطح المنضدة
٥. نظف مكان التحليل بالكحول أو الماء ثم جفف المكان
٦. وخز الإصبع بواسطة شكاكة أو سن الإبرة
٧. اضغط على الإصبع حتى يخرج الدم (قطرة مناسبة الحجم) ضع هذه القطرة على الجزئيين الخاصين بالتحليل على الشريط مع عدم ملامسة الإصبع للشريط ، احرص ألا تضيف قطرة دم أخرى بعد القطرة الأولى
٨. جفف الدم الموجود على الشريط بعد دقيقة واحدة بواسطة قطعة من القطن الجاف أو مناديل ورقية
٩. انتظر دقيقة أخرى بعد ذلك ثم قارن لون الشريط بالألوان المثبتة على العلبة
١٠.يجب الانتظار دقيقة اخرى اذا كانت نتيجة التحليل للدم ٣٠٠ أو أكثر ثم قارن الشريط بالصف الثاني من الألوان وفي هذه الحالة يفضل تحليل البول للأسيتون
١١.سجل النتيجة بالكراسة الخاصة لذلك
١٢.تنظف مكان التحليل وأعد العلبة والكراسة الى مكانها



# قواعد مرض السكر في ايام المرض

طفل السكر يتعرض كما الاطفال الاخرين للأمراض الشائعة في هذه المرحلة العمرية.
معظم هذه الامراض هي امراض فيروسية بسيطة بالإمكان تجاوزها دون اي خطورة زائدة على صحة الطفل المصاب بالسكر **اذا اتبعت النصائح التالية:**

١- لا توقف اعطاء الانسولين ابدا خلال المرض حتى لو لم يستطيع الطفل تناول الطعام
٢- شجع الطفل على تناول السوائل الخالية من السكر بكثرة
٣- يمكن الاستعاضة عن وجبة الطعام برشفات من سائل سكري
٤- لابد من قياس السكر بتواتر اعلى كل ثلاث ساعات : و التصرف حسب قراءات السكر

# قواعد مرض السكر في ايام المرض

## سكر عالي ( فوق ١٨٠):

- اذا ارتفعت معدلات السكر ( غالبا ما يحدث بالأمراض المترافقة مع حرارة) لابد من اعطاء جرعات تصحيحية من الانسولين اذا كان العيار فوق ١٤ (٢٥٠ ملغم/ديسيلتر) حسب خطة العلاج الموضوعة مع الطبيب او **حسب ما يلي:**

- بشكل عام جرعة الانسولين الاضافية لتصحيح السكر هي ١٠% من اجمالي الانسولين اليومي (مثال الطفل يحتاج يوميا ٢٠ وحدة انسولين من الانسولين السريع و القاعدي او المختلط جرعة التصحيح هي ٢ وحدة)
- طريقه اخرى سهلة هي اعطاء كمية تعادل نصف عمر الطفل اذا كان شخص له مرض السكر من اكثر من عام (مثال طفل عمره ٨ سنوات جرعة التصحيح ٤ وحدات)
- يجب معايرة الكيتون بالبول (باستخدام الشرائح الخاصة) : ان عيار الكيتون المتوسط او العالي يشير الى خطورة تطور حماض خلوني و الذي بالإمكان تجنبه بعيار السكر و تصحيحه بتواتر كل ٣ ساعات ( باستخدام الانسولين السريع) مع شرب سوائل خالية من السكر (لتصحيح الجفاف المرافق)
- يقاس الكيتون بالبول ايضا مع كل خروج بول و علامة التحسن هي استقرار عيار السكر ( < ٢٥٠) و بدء انخفاض عيار الكيتون .اما في حال استمرار ارتفاع السكر و الكيتون ،خاصة اذا ترافق المرض بالقيء ، فلا بد من الذهاب للمستشفى اذ غالبا سيحتاج الطفل علاج و سوائل وريدية.



# قواعد مرض السكر في ايام المرض

## سكر منخفض ( تحت ٧٠):

- يعالج انخفاض السكر كالمعتاد و في حال عدم تمكن الطفل من الاكل يشجع على تناول رشفات من السوائل السكرية مع مراقبة مستمرة لعيار السكر
- لا يجب ايقاف الانسولين ابدا في ايام المرض لكن في حالات الامراض المترافقة بإسهال و قلة شهية و تكرار هبوط السكر يمكن تخفيض جرعة الانسولين القاعدي ب ٢٠-٤٠ % مع متابعة عيار السكر

ملاحظات :

١. من المهم في ايام المرض مراجعة الطبيب للتشخيص و وصف العلاج اللازم كالمضادات الحيوية و المعالجات العرضية كخافضات الحرارة اذا اقتضى المرض
٢. من المهم الاحتفاظ بالأنسولين السريع ( اقلام او ابر) دوما مهما كان نوع الانسولين المستعمل يوميا (مختلط او مضخة انسولين) للاستعمال عند الضرورة
٣. تحفظ أقلام الانسولين في الثلاجة

# قواعد مرض السكر في ايام المرض

### قواعد ايام المرض عند استعمال مضخة الانسولين:

تستعمل النصائح السابقة ١- ٤

### سكر عالي:

هناك دوما خطورة توقف الانسولين نتيجة انسداد او فقاعة هواء او نادرا تعطل المضخة

### مضخة الانسولين / اذا ارتفع السكر بشكل غير متوقع فوق ال ٢٥٠ :

-اذا بدا الطفل بصحة جيدة يمكن اعطاء فرصة للتصحيح عبر المضخة و لمرة واحدة مع اعادة القياس بعد ساعة واحدة اذا بدء السكر بالتراجع ( هذا يعني ان المضخة تعمل) يقاس السكر بعد ساعة اخرى و يعطى جرعة تصحيح اخرى حسب الحاجة . اما اذا لم يهبط السكر لا بد من اعطاء حقنة انسولين سريع تصحيحية عبر القلم او الابرة مما يمنح وقتا لتبديل ابرة و انبوب المضخة و يتم اعادة قياس السكر بعد ساعتين و من ثم التصحيح عبر المضخة

-اذا الطفل بدا مريضا يقاس الكيتون و يعطى فورا جرعة التصحيح عن طريق الحقن بإبرة او قلم الانسولين مما يمنح وقتا لتبديل ابرة و انبوب المضخة و يتم اعادة قياس السكر بعد ساعتين و من ثم التصحيح عبر المضخة.

ان تجاهل القراءات العالية عند استعمال المضخة و عدم اتباع النصائح السابقة قد يعرض الطفل لخطورة المرض الشديد بالأحماض الكيتونية



# تأثير تكنولوجيا المعلومات على الجوانب النفسية والاجتماعية:

١- تكنولوجيا المعلومات ساهمت في رفع معنويات الأطفال الذين يعانون من مرض السكر حيث انهم استطاعوا أن يتواصلوا مع الآخرين الذين يعانون من نفس المرض على مستوى العالم وكل منهم يشاور ويشارك الآخرين على حسب خبراته.

٢- يستطيع الطفل اذا تغيب عن المدرسة لأمر ما خاصة مرض السكر التواصل مع المدرسة عن طريق تكنولوجيا المعلومات.

٣- توجد إمكانية تبادل الفيديوهات الكرتونية مع الأطفال وبعضهم فيستطيع الطفل ان يتعايش مع المرض ويصاحبه.

# لا تنسى أن :

١. تحمل معك دائماً بطاقة تدل على أنك مريض سكر.

٢. تحمل معك قطعة حلوى أو شوكولاتة باستمرار في جيبك.

٣. تشرب كوبا من العصير قبل ممارسة الرياضة.

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# Protocol

# Effect of Information Technology Based Intervention on Glycemic Control of Children Suffering from Diabetes in Gaza Strip

**Protocol**

Submitted for partial fulfillment of Doctorate Degree in Pediatric Nursing


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# Introduction

Diabetes mellitus (DM) is a chronic disorder of metabolism characterized by a partial or complete deficiency of the insulin hormone that result in elevation of the blood glucose level **(Urruta-Rojas and Menchaca, 2006).** Diabetes mellitus was classified into Type $_1$ diabetes, diabetes Type $_2$, gestational diabetes and other specific types related to genetic defects of beta cell function, diseases of the endocrine pancreas, infections and drug or chemical induced **(ADA, 2012)**.

Diabetes mellitus in children can occur at any age but has a peak incidence between ages 10 and 15 years, with 75% of children diagnosed before 18 years of age. The incidence in boys is slightly higher than in girls (1:1 to 1.2:1) **(Hockenberry and Wilson, 2009)**. In Gaza strip the total number of diabetic children with Type $_1$ was 986 cases and 4.8% of them have high risk of diabetes related complications **(The Annual Report of the Department of Health, 2010).**

Glycemic control is a successful diabetes management that requires the delivery of complicated medical tasks like blood glucose (BG) monitoring and insulin administration along with the practice of healthful behaviors around food and exercise. The healthcare providers such as physician, nurses and educators have an

important role in improving glycemic control and reducing the risk of complications on diabetic children **( Johnson, and Keogh, 2010).**

Information technology enabled diabetes management (ITDM), helps to improve diabetic-care processes, which in turn reduces the rate of diabetic complications. Self-management technologies provide diabetic children and their care givers with educational resources and data gathering mechanisms for managing their own care. These technologies include automated phone systems that generate reminders or offer educational content; electronic diary tools that collect information to be taken to a visit; interactive educational programs on computers, and online resources, such as peer support groups, sponsored by providers **(Davis et al., 2007)**. Information technology in the form of the Telephone-Linked Care (TLC) diabetes system is considered the important software in providing management of diabetes through monitoring, educating and coaching the children with diabetes to improve their nutrition, physical activity, blood glucose testing and medication taking. The TLC complements the care currently provided to children with diabetes by general practitioners, endocrinologists, diabetes educators and other health workers **(Interactive Information Technology in Diabetes Care, 2006)**.

However, it was emphasized that, using information technology in diabetes may cause low-cost clinic-based interventions in younger adolescents that caused a positive impact on both glycemic control and quality of life **(Gimenez et al., 2009 and Farmer et al., 2005 ).**

The existing and emerging technologies such as wireless devices (cell phones) with email and text messaging (SMS) functionality, pagers, and the Internet can help facilitate patient self-management of diabetes. These types of devices are practical and cost-effective methods for monitoring clinical outcomes and increasing patient adherence to treatment **(Krishna and Boren, 2008).** Wireless technologies can be used as intermediary tools to facilitate the information between patient and care provider and treatment advice between clinic visits. Results from studies incorporating the use of remote patient monitoring devices (cell phones and other wireless tools) have indicated significant decreases in HbA1c levels and improved health-related outcomes in diabetes **(Faridi, 2008 and Krishna, 2008 ).**

Diabetes self-management support interventions are increasingly being implemented using population-based health communication strategies, such as those using telephone or computer-assisted outreach with or without nurse care management. **(Interactive Information Technology in Diabetes Care, 2006)**. Technology-driven solutions, such as computer physician/nurses

order entry and computer medication monitoring, are considered as an integral to child safety guidelines. Indeed, The nurses play a significant role in diabetes information technology, this role include children education which increase children satisfaction, improve access to care, reduce drop-in visits and unnecessary visits, and also the health care costs **(CTIA, 2007 and Greenberg, 2000).**

**Significance of the study:**

According to the annual report of the department of health in 2010, there are 986 children were diagnosed as type $_1$ diabetes and 4.8% of them complaining from diabetes related complications, they faced some difficulties in accessibility to Palestinian Medical Relief Society (PMRS) which care given for 1,440,332 populations at 364 km **(Ministry of Health, (MOH) 2009)**. Thus this study would be of great value for nursing practice by testing the effect of information technology in glycemic control of children suffering from type $_1$ diabetes. And it will help diabetic children and their care givers to maintain glucose concentration as near to normal as possible by near glycemic control which is essential to delay and/or prevent the diabetic related complications, as well as for improving the length and quality of life of diabetic children.

## Aim of the Study

This study aims to study the effect of information technology based intervention on glycemic control of children suffering from diabetes.

## Objectives of the Study

- Assess knowledge of the diabetic children regarding the effect of information technology based intervention on their glycemic control.
- Design IT based intervention in the light of the actual need assessment of the study sample.
- Implement and evaluate the effect of IT based intervention on glycemic control of the study sample.

## Hypothesis

The information technology based intervention will affect the glycemic control of the diabetic children.

## Subjects and Methods

### Research Design:

A quasi – experimental design will be utilized in carrying out this study.

### Research Setting:

This study will be conducted in Palestinian Medical Relief Society (PMRS) because it has the largest numbers of diabetic children in Gaza strip. The services provided at this society include also laboratory services for blood samples especially for diabetic

children in special room, giving injections and pharmaceutical services.

**Study Sample:**

Purposive sample that will involve all the available diabetic children attending the (PMRS) in Gaza Strip under the following inclusion criteria:

1- Children with confirmed diagnosis of diabetes (regardless to their gender, residence, glycemic control and presence or absence of diabetes related complications) .

2- Children in the age group of 10-18 years.

3- Able to read and write.

4- Availability and accessibility of IT devices such as (Internet, Mobile, CD, memory flash, SMS, E- mail).

5- Having the willingness and skills of information technology.

Exclusion criteria: Exclude diabetic children suffering from other chronic physical or mental illness.

# Technical design

**Tools of data collection**

The researcher will review the related national and international references to be acquainted with the research

problem and develop the study tools . The following tools will be used Pre and post nursing intervention:

**I- Questionnaire (by interview)** that will be designed by the researcher and will be written in simple Arabic language in form of open and closed ended questions to assess the following:

I. Socio-demographic data of the studied subject (Age, gender, educational level……etc).

2. knowledge of the studied subject related to use of information technology in glycemic control such as (internet, mobile, SMS,.....etc) and glycemic control (such as insulin injection, diet, exercise etc…)

**II- Observation checklist** to assess the actual practice of the studied subject such as urine and blood testing, insulin preparation and injection,……etc, **(adopted from John & William, 1997).**

**III-Information technology based intervention will be designed according to the actual need assessment of the Studied sample,** different IT will be used for the intervention such as internet, short message services (SMS), telephone calls, E-mails, CD and memory flash.

## Ethical and legal issues

Written permission (informed consent) for participation will be obtained from each participant at the first session. All ethical issues of research will be maintained. When the subjects agreed to participate in the study, they will be assured that they could withdraw at any time and they would not be identified in the report of the study. Also the researcher promise the subject that the research will be harmless, confidentiality in gathering and treating subjects information, feedback upon completion of this study for study group will be done (when possible).

## Field work

The study will be conducted through three main phases:

1- The assessment phase:

In which the children (and their care givers when necessary) will be interviewed using the previously mentioned tools.

2- The Intervention phase:

The researcher will describe the nature and the aim of the study to the studied subject, they will be assessed pre and post the intervention using the study tools. The intervention will be prepared according to the actual needs assessment and will be implemented through information technology.

The researcher will meet the studied subjects during the research period for monitoring and follow up of their progress and to discuss any difficulties which may face them during the intervention period.

3- The evaluation phase:

After implementing the nursing intervention, reassessment will be done immediately and six months later using the same pretest tools .

## Administrative design

Approval will be obtained from the dean of Faculty of Nursing (Ain Shams University) and directors of Palestinian Medical Relief Society (PMRS) and diabetic children with their care givers as well to conduct the study at the previously mentioned settings. The aims of the study and its expected outcomes will be explained.

## Pilot Study

Pilot study will be conducted to evaluate the efficiency and content validity of the study tools. The necessary modifications will be done based on its result.

## Statistical design

Data will be coded, organized, revised and analyzed by the suitable statistical test.

## Results

The result of the study will be presented in tables and figures

## Discussion

The results of the study will be discussed in the light of the past, recent, local and international related studies.

**Conclusion, recommendations and summary** will be stated.

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# تاثير التدخل المبنى على تكنولوجيا المعلومات على التحكم فى السكر عند الاطفال الذين يعانون من مرض السكر

في قطاع غزة

## بروتوكول توطئة

للحصول على درجة الدكتوراه في تمريض الأطفال


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2012

**مقدمة:**

داء السكري هو اضطراب مزمن في التمثيل الغذائي ,الذي يتميز بنقص جزئي أو كامل لهرمون الأنسولين ,والذي يرفع مستوى السكر في الدم .هذا هو المرض الأكثر شيوعا في العالم , تقريبا واحد من كل ثلاثة أطفال يولدوا في الولايات المتحدة بمرض السكري ,يمكن لداء السكري في الأطفال أن يحدث في أي عمر ولكن أعلى نسبة ارتفاع بين سن 10 و 15 سنة، مع أن75 ٪ من الحالات يتم تشخيصها قبل 18 سنة من العمر .الإصابة في الذكور أعلى قليلا من الأناث ( 1:1)إلى (1.2:1).

في فلسطين- غزة كان إجمالي عدد حالات السكري في الأطفال من النوع الأول986 حالة واجمالى عدد حالات السكري في النوعين 3485 حالة بمعدل 24.2/10000 ، ومعدل وفيات بنسبة 8.5٪، ويصنف مرض السكري إلى النوع الأول المعتمد على الأنسولين والنوع الثاني الغير معتمد على الأنسولين وسكري الحمل.

إن مراقبة نسبة السكر في الدم جنبا إلى جنب مع ممارسة سلوكيات صحية حول الغذاء وممارسة الرياضة ,له أهمية كبرى في تحسين السيطرة على سكر الدم ويقلل من خطر حدوث مضاعفات ,إن استخدام تكنولوجيا المعلومات مثل الهاتف الخلوي والرسائل القصيرة عبر الهاتف واستخدام الرسائل الالكترونية والمحادثة عبر ألنت تساعد على تحسين الرعاية الصحية لمرضى السكري ، والذي بدوره يقلل من نسبة حدوث مضاعفات مرض السكري، ولقد ازداد في العالم اليوم استخدام تكنولوجيا المعلومات في علاج مرض السكري لدى الأطفال مما أثر ايجابيا على حياتهم وخفف عن أهلهم عبء الحياة ,وكان له أثر إيجابي على مراقبة نسبة السكر في الدم على حد سواء ونوعية الحياة اليومية .

**أهمية الدراسة:**

لاحظ الباحث هذه المشكلة من خلال التجارب العملية المستمدة من الإحصاءات المتوفرة التي تعكس مدى ارتفاع معدل انتشار مرض السكري في غزة حيث يوجد 986 طفلا مصابين بالسكري من النوع الأول في مساحة ضيقة لا تتعدى360 كم وعدد سكانه 1500000 نسمة ومن النوعين )أكثر من10.5 ٪(، ومعدل الوفيات8.5) ٪ (وبالتالي هذه الدراسة ستكون ذات قيمة كبيرة لممارسة مهنة التمريض من قبل اختبار تأثير تكنولوجيا المعلومات في إدارة مرض السكري .وسوف يدخل من هذا البرنامج مساعدة أطفال مرضى السكري وعائلاتهم للحفاظ على نسبة الجلوكوز في وضعها الطبيعي من قبل مراقبة نسبة السكر في الدم والوقاية من مضاعفات السكري، وكذلك لتحسين طول ونوعية الحياة لدى أطفال السكري .إن استخدام تكنولوجيا المعلومات من قبل الباحث في عيادات السكري لتثقيف أطفال مرضى السكري وعائلاتهم حول العلاج والوقاية من مضاعفات مرض السكري، وسوف تساعد هذه الدراسة في عملية صنع القرار بشأن التدخل من مثل هذا البرنامج إلى الحد من انتشار مضاعفات مرض السكري بين الأطفال في قطاع غزة.

**الهدف من هذه الدراسة:**

دراسة تاثير التدخل المبنى على تكنولوجيا المعلومات على التحكم فى السكر عند الاطفال الذين يعانون من مرض السكر

**طرق البحث :**سوف يتم استخدام التصميم شبه التجريبي في تنفيذ هذه الدراسة

**مكان الدراسة:**

وستجرى هذه الدراسة في جمعية الإغاثة الطبية الفلسطينية) الإغاثة الطبية (لأنه يحتوي على أكبر عدد من مرضى السكري في قطاع غزة .هذه العيادة تخدم حوالي 1500000 نسمة ,الخدمة المقدمة في هذه العيادة تشمل خدمات المختبرات، ورعاية الأمراض المزمنة، وخاصة تلك مع مرض السكري وارتفاع ضغط الدم وأمراض القلب، وصحة الطفل، ورعاية الفم والأسنان، الأمراض الجلدية، وإعادة التأهيل، والعلاج الطبيعي، وتضميد الجروح ، وإعطاء الحقن، والخدمات الصيدلانية.

**عينة الدراسة:**

جميع الأطفال الذين يترددوا للرعاية اليومية لمرض السكر في قطاع غزة وفقا للمعايير الآتية:

- 1الأطفال الذين تم تشخيصهم بمرض السكري

- 2كلا الجنسين.

- 3الأطفال في سن من10 :18 سنة

- 4القدرة على القراءة والكتابة.

- 5وجود الإنترنت والهاتف الجوال و الأستعداد و المهارة لأستخدام تكنولوجيا المعلومات

**معايير الاستبعاد** :استبعاد الأطفال المصابين بأمراض عقلية وجسدية

**أدوات الدراسة:**

استمارة استبيان لتقييم ما يلي:

١- البيانات الاجتماعية والديموغرافية للأطفال (العمر والجنس والمستوى التعليمي .....الخ
٢- معلومات الأطفال المتصلة بتكنولوجيا المعلومات واستخداماتها في التحكم بسكر الدم
٣- برنامج التدخل المبنى على تكنولوجيا المعلومات

**القضايا الأخلاقية والقانونية:**

سيتم الحصول على موافقة الأطفال و امهاتهم كشرط اساسى لأدراجهم فى عينة الدراسة. سيتم مراعاة السرية و الخصوصية فى جمع البيانات مع احقية كل طفل فى الأنسحاب من الدراسة فى اى مرحلة.

**مجال العمل:**

ستجرى الدراسة من خلال 3 مراحل رئيسية:

١ -مرحلة التقييم القبلى
٢- مرحلة التدخل
٣- مرحلة التقييم البعدى

**الدراسة الأستطلاعية**

ستجرى دراسة استطلاعية لتقييم مدى كفاءة وصلاحية أدوات الدراسة .وسوف يتم إجراء التعديلات اللازمة بناء على النتائج.

**التصميم الإداري:**

سيتم الحصول علي موافقة من عميد كلية التمريض – جامعة عين شمس، و إدارة جمعية الإغاثة الطبية الفلسطينية لإجراء الدراسة. و سيتم شرح أهداف الدراسة و نتائجها المتوقعة.

**التصميم الإحصائي:**

بعد جمع البيانات، سوف يتم تحليلها باستخدام الاختبارات الإحصائية المناسبة.

**النتائج:**
سوف يتم عرض النتائج في جداول و أشكال بيانية.

**المناقشة:**
سيتم مناقشة نتائج الدراسة مع نتائج الدراسات المحلية و العالمية المماثلة.

**الإستنتاجات و التوصيات:**
سيتم صياغة الخلاصة و التوصيات في ضوء نتائج الدراسة.

**المراجع.**

# Arabic Summary

**التوصيات:**

استنادا لنتائج البحث يقترح الباحث التوصيات التالية:

- تطبيق برنامج تكنولوجيا المعلومات التعليمي على مراكز الرعاية الصحية الأولية والمستشفيات بهدف تعليم أطفال مرضى السكر عن مرضهم وكيفية التحكم فيه.
- عمل متابعة دورية ومستمرة لأطفال مرض السكر باستخدام طرق تكنولوجيا المعلومات لمناقشة وتسهيل أي صعوبات تواجه الأطفال تخص مرض السكر والتحكم فيه.
- تعليم أطفال مرضى السكر عن كيفية القيام بعملية فحص السكر في الدم والبول من خلال استخدام تكنولوجيا المعلومات.
- توفير قرص مدمج وفيديو يحتوي على معلومات حول مرض السكر لكل طفل مريض بالسكر وعائلته لتزويدهم بالمعلومات المهمة عن المرض والتحكم فيه.
- اجراء المزيد من الدراسات والبحوث المستقبلية لمعرفة مدى تأثير التدخل المبنى على تكنولوجيا المعلومات فى التحكم بمرض السكر.

الدم قبل تطبيق التدخل المبنى على تكنولوجيا المعلومات مقارنة ب ١٠٠ ٪ بعده.

- وجد أن ٦٤,١ ٪ من المشاركين يعرفون أن الخضروات واحدة من المواد الغذائية المسموح بها قبل تطبيق التدخل المبنى على تكنولوجيا المعلومات مقارنة ب ٩٠ ٪ بعده.
- وجد أن ٦٤,٦ ٪ من المشاركين يعرفون أن العسل من الأطعمة الممنوعة قبل تطبيق التدخل المبنى على تكنولوجيا المعلومات مقارنة مع ٩٨,٨ ٪ بعده.
- وجد أن ٥٥,٦ ٪ من المشاركين قبل تطبيق التدخل المبنى على تكنولوجيا المعلومات يعلمون أن التمارين الرياضية تساعد في انخفاض مستوى السكر في الدم مقارنة ب ٩٧,٥ ٪ بعده.
- قبل تطبيق التدخل المبنى على تكنولوجيا المعلومات كان معدل متوسط مستوى السكر في الدم (٣١٢,٢٧) مقارنة مع (١١٨,١٦) بعده. وكان الفرق ذو دلالة إحصائية عند (٠,٠٥).

**الخلاصة:**

يمكننا أن نستخلص من هذه الدراسة أن التدخل المبنى على تكنولوجيا المعلومات قد أدى الى تحسن معلومات وممارسات الأطفال عن مرض السكر والتحكم فيه باستخدام وسائل تكنولوجيا المعلومات (القرص المدمج، البريد الإلكتروني، خدمة الرسائل القصيرة، الإنترنت، ذاكرة الفلاش و الهاتف المحمول) في التحكم بمرض السكر، وكانت النتائج إيجابية حيث تم التحكم بسكر الدم حول المعدل الطبيعي.

إجراء بحث ومراجعة للدراسات المرتبطة محليا وإقليميا وعالميا. حيث تضمن المحتوى معلومات عن تأثير تكنولوجيا المعلومات على التحكم في سكر الدم وعلى سبيل المثال أنواعها واستخداماتها بالإضافة إلى مرض السكر من حيث تعريفه وعوامل الخطر، المسببات، الأعراض والعلامات، المضاعفات والوقاية والعلاج، والنظام الغذائي، وممارسة الرياضة، العناية بالقدم، العلاج بالأنسولين، والمتابعة المنتظمة لمستوى السكرى في الدم.

**٣ – مرحلة التقييم البعدى:**

بعد تنفيذ التدخل المبنى على تكنولوجيا المعلومات، تم إعادة تقييمه بعد ستة أشهر باستخدام نفس أدوات الاستبيان القبلي، وتسجيل متوسط مستوى السكر في الدم.

**وكانت أهم نتائج الدراسة على النحو التالي:**

- اشتملت عينة الدراسة على ٥٠ ٪ ذكورا، ٥٠ ٪ إناثا.
- بلغت نسبة عدد أفراد الأسرة الذين عددهم اكثر من سبعة افراد ٤٥ ٪.
- لوحظ ان ٧٣,٧٥ ٪ من الذين شاركوا في الدراسة كان لهم تاريخ إيجابي لمرض السكر بالأسرة.
- وجد أن الغالبية العظمى من المشاركين قبل وبعد التدخل المبنى على تكنولوجيا المعلومات كان لديهم القدرة على تعريف تكنولوجيا المعلومات.
- وجد أن ١٠٠ ٪ من المشاركين يعلمون أن استخدام تكنولوجيا المعلومات من الأساليب التي من الممكن أن تسيطر على سكر الدم بعد التدخل المبنى على تكنولوجيا المعلومات مقارنة ب ٩٥% قبله.
- وجد أن ١٦,٣ ٪ من المشاركين لا يعرفون أي علامات أو أعراض ارتفاع السكر في

**مجال الدراسة:**

أجريت الدراسة من خلال ثلاثة مراحل رئيسية:

١ مرحلة التقييم القبلى

٢- مرحلة التدخل

٣- مرحلة التقييم البعدى

بدأت الدراسة خلال الفترة من الأول من يناير ٢٠١٣ إلى نهاية يونيو ٢٠١٣

حيث أجريت الدراسة من خلال ثلاث مراحل رئيسية:

**١ – مرحلة التقييم:**

تم اجراء مقابلات فردية مع الأطفال و مقدمي الرعاية لهم لملء استمارة الاستبيان، وتسجيل مستوى السكر في الدم. بالإضافة إلى تقييم معلوماتهم تجاه تكنولوجيا المعلومات ومرض السكر وممارساتهم من خلال قوائم الملاحظات حيث تضمنت خطوات تحليل السكر بالدم والبول وكيفية اعداد حقنة الانسولين وحقنها وفحص الفم والاسنان. تم توزيع أقراص مدمجة CD وفلاشات لكل اطفال السكر الذي يحتوي على جميع المعلومات الخاصة بالتدخل.

**٢ – مرحلة التدخل:**

وقد استخدم الباحث أساليب متعددة لتكنولوجيا المعلومات (مثل CD، والإنترنت، وخدمات الرسائل القصيرة (SMS)، والمكالمات الهاتفية ورسائل البريد الإلكتروني و ذاكرة فلاش).

تم تصميم التدخل المبنى على تكنولوجيا المعلومات من قبل الباحث بعد

- **عينة الدراسة:**

بلغ عدد الأطفال ٨٠ طفلا مريض بالسكري من النوع الأول.

- **أدوات الدراسة:**

استمارة استبيان لتقييم ما يلى:

١- البيانات الاجتماعية والديموغرافية للأطفال (العمر والجنس والمستوى التعليمي.....الخ)

٢- معلومات الأطفال المتصلة بتكنولوجيا المعلومات واستخداماتها في التحكم بسكر الدم

٣- قوائم ملاحظة لتقييم ممارسات عينة الدراسة عن: كيفية فحص السكر فى الدم والبول وكيفية تحضير الانسولين واعطاؤه ونظافة الجسم.

١- برنامج التدخل المبنى على تكنولوجيا المعلومات في ضوء الاحتياجات الفعلية لعينة الدراسة.

**الجوانب الأخلاقية والادارية:**

تم الحصول على موافقة الأطفال وامهاتهم كشرط أساسى لأدراجهم فى عينة الدراسة. تم مراعاة السرية والخصوصية فى جمع البيانات مع احقية كل طفل فى الانسحاب من الدراسة فى اى مرحلة.

**الدراسة الاستطلاعية:**

تم عمل دراسة استطلاعية لاختبار كفاءة أدوات البحث متضمنة عينة تتكون من ثمانية أطفال بأماكن الدراسة السابق ذكرها وتم تحليل البيانات وعمل بعض التعديلات في ضوء نتائج الدراسة الاستطلاعية.

# الملخص العربي

## مقدمــة:

لقد أصبح استخدام تكنولوجيا المعلومات في مجال الصحة مهما جدا وخاصة في رعاية الأمراض المزمنة مثل مرض السكري. حيث ان استخدام الهاتف والبريد الإلكتروني وخدمة الرسائل القصيرة بالإضافة الى الانترنت والقرص المدمج لمتابعة أطفال مرض السكرى يعتبر مهم جدا حيث أنه فعال لا يكلف كثيرا ويقرب المسافات ويوفر الجهد والوقت ويمكن من خلاله متابعة الطفل المصاب بالسكر بسهولة دون الاحتياج الى الزيارات الدورية.

ولقد أشارت الدراسات السابقة الى أن الأطفال المصابون بمرض السكرى والذين يتم متابعتهم من خلال تكنولوجيا المعلومات قد حصلوا على نتائج مهمة، فقد هبط عندهم مستوى السكر في الدم للمعدلات الطبيعية بصورة ملحوظة وأعطى نتائج ملموسة للتحكم في مرض السكر.

## هدف الدراسة:

دراسة تأثير التدخل المبنى على تكنولوجيا المعلومات على التحكم فى السكر عند الاطفال الذين يعانون من مرض السكر.

## طرق الدراسة:

- **مكان الدراسة:**

أجريت الدراسة في جمعية الإغاثة الطبية الفلسطينية بقطاع غزة

**كلية التمريض**

**جامعة عين شمس**


**اسم الطالب:** محمد فتحى عبد الجرجاوى

**الدرجة العلمية:** دكتوراة – علوم التمريض

**القسم التابع له:** تمريض الأطفال

**اسم الكلية:** كلية التمريض

**الجامعة:** عين شمس

**سنة التخرج:** 2003 م

**سنة المنح:** 2015 م

# شكر

**أتقدم بخالص الشكر والتقدير للسادة الآساتذة اللذين قاموا بالاشراف على هذه الرسالة وهم:-**

**أ.د/وفاء السيد عبد الجليل عودة**

أستاذ تمريض الأطفال

كلية التمريض – جامعة عين شمس

**أ.م.د/ رندا محمد عدلي**

أستاذ مساعد تمريض الأطفال

كلية التمريض – جامعة عين شمس

**أ.م.د/ هيام رفعت طنطاوى**

أستاذ مساعد تمريض الأطفال

كلية التمريض – جامعة عين شمس

**كما لا يفوتنى ان أشكر كل من تعاون معى فى البحث من زملائى وأفراد عينة البحث وعائلتى.**

## رسالة دكتوراة

**اسم الطالب:-** محمد فتحى عبد الجرجاوى

**عنوان الرسالة:-** تأثير التدخل المبنى على تكنولوجيا المعلومات على التحكم فى السكر عند الاطفال الذين يعانون من مرض السكر في قطاع غزة

**الدرجة العلمية:-** دكتوراة – علوم التمريض

### لجنة المناقشة

**أ.د/وفاء السيد عبد الجليل عودة**

أستاذ تمريض الأطفال

كلية التمريض – جامعة عين شمس

(عن المشرفين)

**أ.م.د/ رندا محمد عدلي**

أستاذ مساعد تمريض الأطفال

كلية التمريض – جامعة عين شمس

(عن المشرفين)

**أ.د/ صافى صلاح الدين**

أستاذ تمريض الأطفال

كلية التمريض – جامعة عين شمس

(ممتحن داخلى)

**أ.م.د/ صفاء صلاح اسماعيل**

أستاذ مساعد تمريض الأطفال

كلية التمريض – جامعة حلوان

(ممتحن خارجى)

**تاريخ البحث / /**

**الدراسات العليا**

**ختم الاجازة / / أجيزت الرسالة بتاريخ / /**

**موافقة مجلس الكلية / / موافقة مجلس الجامعة / /**

# تأثير التدخل المبني على تكنولوجيا المعلومات على التحكم في السكر عند الأطفال الذين يعانون من مرض السكر

رسالة

**توطئة للحصول على درجة الدكتوراه**

**في تمريض الأطفال**

تحت إشراف


## الأستاذة الدكتورة/ وفاء السيد عودة

**أستاذ تمريض الأطفال**

**كلية التمريض – جامعة عين شمس**

## الدكتورة/ رندا محمد عدلي

**أستاذ مساعد تمريض الأطفال**

**كلية التمريض – جامعة عين شمس**

## الدكتورة/ هيام رفعت طنطاوي

**أستاذ مساعد تمريض الأطفال**

**كلية التمريض – جامعة عين شمس**



كلية التمريض

جامعة عين شمس

٢٠١٥

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**توطئة للحصول على درجة الدكتوراه**

**في تمريض الأطفال**


مقدمة من

**محمد فتحي الجرجاوي**

ماجستير تمريض الأطفال، ٢٠٠٣

جامعة القدس



كلية التمريض

جامعة عين شمس

٢٠١٥