Efficiency of Web-Based Education versus Counseling on Diabetic Patients' Outcomes

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Abstract: Background: Diabetes mellitus is one of the most common non-communicable diseases globally, and its related complications result in increasing disability, reduced life expectancy and enormous health costs. Diabetes management education is a critical element of care for all people with diabetes and it is necessary to improve patient outcomes through traditional diabetes patient education strategy and/or through internet based education that has the opportunity to expand the to the massive individuals with diabetes **Objectives**: The aim of this study was to compare the efficiency of Web-Based education versus counseling on diabetic patients' outcomes including patients' diabetic knowledge, level of self-efficacy, self- care activities and blood glucose level. **The design** of this study was a quasi-experimental research design.. **Setting**: The study was conducted at the outpatient clinic for diabetes in Ain Shams University hospitals, Cairo, Egypt. **The Subjects:** Purposive sample of patients were included in the study. Patients for this study were adult and diagnosed with type 2 diabetes. Patients divided randomly into two equal groups (45 patients each) to constitute the web-based group and counseling group. **Instruments:** Patient's assessment and clinical data sheet, Diabetes Management Self-efficacy Sale (DMSES), diabetic patients' knowledge questionnaire sheet and a Summary of Diabetes Self –Care Activities Scale (SDSCA) were used. **Results:** The majority of counseling and web-based group had unsatisfactory knowledge, low level of self efficacy, inadequate self care activities and abnormal glucose level with no statistically significant difference between them pre-intervention. While, post-intervention, The majority of counseling and web-based group had satisfactory knowledge, high level of self efficacy, adequate self care activities and normal glucose level with. Alao, Counseling group had more satisfactory knowledge, high level of self efficacy, adequate self care activities and normal blood glucose level than web-based group with no statistically significant difference in all items except for self care activities **Conclusion:** It was concluded that, both of counseling and web-based diabetic patients' education improve patient outcome however counseling was more effective than web-based education strategy with no statistically significant difference between them in all items except for self care activities. This study recommended further research into the full use of the available technology is imperative for improving the quality of nursing intervention .

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1. Introduction

Diabetes mellitus is one of the most common non-communicable diseases globally, and its related complications result in increasing disability, reduced life expectancy and enormous health costs for virtually every society **(IDF, 2009)**. Egypt had been estimated to be the 9th country in the prevalence of diabetes. Recent changes in physical activity and dietary patterns have promoted the development of diabetes but if different preventive and control activities are not adopted by the year 2025 more than 9 million Egyptians (13**%** of the population above 20 years old) will have diabetes **(Abdo and Mohamed, 2010)**.

People with diabetes can lead a full life, while keeping their diabetes under control. However, this illness requires a life-long management plan, and persons with diabetes have a central role in this plan. Diabetes management plan can be a very effective way to keep diabetes under control. Nevertheless they are not always easy but they can be very effective for controlling diabetes. They can improve blood glucose control and prevent or slow the progression of long-term complications. In many cases, numerous small changes add up to surprising improvements in diabetes control, including a decreased need for medication **(Evans and Pinzur, 2005)**.

Patients play a central role in diabetes care because of their daily responsibility for a large number of behavioral choices and activities **(Heinrich *et al.*, 2010).** Effective education is one component of chronic illness' broader management through traditional diabetes patient education strategy that change knowledge and attitude through information transfer and instruction and/or through internet based education that has the opportunity to expand the to the massive individuals with diabetes **(Kennedy *et al.*, 2007 ; WU *et al.*, 2007).**

Diabetes management education is a critical element of care for all people with diabetes and it is necessary to improve patient outcomes. It is important in promoting health practices and in reducing risks of complications **(ADA, 2007 ;Funnell *et al.*, 2009).** Diabetic management intervention has emerged as a resource to assist patients in managing daily diabetic care through dissemination of information and facilitation of diabetic management behaviors that has effect on diabetes related self efficacy (**Channon *et al.*, 2003; Viner *et al., 2003).***Education, counseling, skill building, and support through behavioral interventions offered by health care providers used to enable diabetic patients to manage their diabetes **(Al-Khawaldeha *et al.*, 2012).**

With the increased prevalence of diabetes**,** there is increasing need for diabetic management support that has the ability to reach large numbers of adults **(IDF, 2009; Song, 2010)**.Traditional clinical approaches, such as counseling and group-based diabetic education programs have inadequate reach, and have not been sufficient to support long-term behavior changes, widespread use of the Internet provides an opportunity to expand the reach to massive individuals with diabetes **(Khattab *et al.*, 2010).**

Internet provides continuous support and tools for achieving necessary changes in multiple behaviors, such as healthful eating, regular physical activity, and managing medications **(Glasgow *et al.*, 2012).** The general public is beginning to seek medical information and support online. There are currently many Web sites providing general information on diabetes, its treatments, knowledge and skills of diabetic management **(Leea *et al.*, 2007).** Internet-based intervention programs for diabetes care are relatively new, but efforts are underway to test their efficacy in diabetic patients **(Lorig *et al.*, 2010).**

There have been limited researches comparing the use and effectiveness of Web-based interventions to non-Web-based interventions such as traditional face-to-face interactions and paper and pencil assessments. The introduction of the Internet into clinical practice as an information-sharing medium has brought about many opportunities for innovative interventions for individuals with chronic illnesses and their care providers. These interventions are often designed to address deficiencies in patient knowledge and chronic illness management skills. Improvements in these areas have been shown to lead to improve health outcomes **(Wantland *et al.*, 2004).**

Diabetes management education is a critical element of care for all people with diabetes and is necessary in order to improve patient outcomes ***(Funnell et al., 2009).*** International Consensus Standards of Practice For Diabetes Education' focuses on the structure of diabetes education programs and the only patient-centred outcome standards described are knowledge and clinical outcomes as glycemic control. However, in recent years diabetes education outcome measures are increasingly focusing on attitudes, self-care skills, lifestyle behaviours, psychological outcomes, quality of life and empowerment/self-efficacy and cost-effectiveness **(Deakin *et al.*, 2005).**

Patient education is one of the most important responsibilities of nurses. Educators emphasize on learning needs of the individual's **(American Diabetes Association, 2007)**. Aiding patients in enhancing their diabetic-management requires consideration of their self-efficacy and motivation. Self-efficacy is a person's belief in his or her ability to overcome the difficulties inherent in a specific task, in a particular situation. Self efficacy influences the choices a person makes, the effort applied to a task and how long a person will persist when confronted with obstacles or failure **(Wallace *et al.*, 2009; Al-Khawaldeha *et al.*, 2012).**

Significance of the study:

Management of type 2 DM is challenging and often requires skillful integration of complex treatment regimen such as healthy diet, regular exercise, optimum weight control, self monitoring of blood glucose, and medication adjustment into the daily routine over long periods **(Montague *et al.*, 2005).** Diabetes educational strategies are of great importance because the adoption of healthy behaviors will produce optimum glycemic control for DM, which in turn will help minimize or prevent subsequent acute and long-term complications of the disease and they improve self efficacy and patients outcomes **(Funnell *et al.*, 2004; Kennedy *et al.*, 2007; Al-Khawaldehaz *et al.*, 2012).**

The prevalence of diabetes for all age-groups worldwide was estimated to be 2.8% in 2000 and 4.4% in 2030. The total number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030 **(Wild *et al.*, 2004)**. An estimated **285 million people** worldwide are affected by diabetes. With a further 7 million people developing diabetes each year, this number is expected to hit 438 million by 2030 **(Canadian Diabetes Association, 2012).**

In the Eastern Mediterranean Region, an estimated 22 million people have diabetes, out of a total adult population of 290 million. Studies conducted in different populations of the Region have reported high prevalence rates varying from 7% to 25% in the adult population. Approximately half of the countries have published incidence rates, the highest rates are reported in Egypt, Kuwait, Lebanon, Oman and Qatar. With current estimates indicating that the number of diabetes cases is set to double by 2025 **(WHO, 2006).**

Since 1980, the number of adults with diabetes worldwide has doubled. There will be an estimated 70% increase in the number of adults with diabetes in

the developing world and a 20% increased in the developed world between 2010 and 2030. **(Canadian Diabetes Association, 2012).**

Inadequate diabetic self-management remains a significant problem facing health care providers in all settings and populations. Based on the previous researches, it was noted that inadequate self-management poses a threat to satisfactory outcome. It was emphasized on the impact of adequate self-management on the patient's morbidity and mortality and on increasing the costs of medical treatment as cost of medication, cost of laboratory tests and cost in time and effort of the care providers in addition to the frustration for both the patients and the care providers. In contrast, other studies reported that the patients who had adequate self-management had better outcomes, live longer, enjoy a higher quality of life, and suffer fewer symptoms and complications.

Aim the study:

The aim of this study was to compare the efficiency of Web-Based education versus counseling on diabetic patients' outcomes through the following:

1. Assessment of patients' diabetic knowledge , level of self-efficacy, self- care activities and blood glucose level pre intervention.
2. Planning and implementation of educational intervention.
3. Evaluation and comparing the efficiency of Web-Based education versus counseling on diabetic patients' outcomes including knowledge, level of self-efficacy, self-care activities and blood glucose level post- intervention.

Research hypothesis:

It was hypothesized that:

1- Both web-Based education and counseling will improve diabetic patients' outcomes.

2- There will be a statistically significant difference between patients' who will be exposed to web-Based education versus counseling regarding diabetic patients' outcomes.

2.Subjects and Methods:

Research Design:

A quasi-experimental research design has been utilized in this study.

Research setting:

The study was conducted at the outpatient clinic for diabetes in Ain Shams University hospitals, Cairo, Egypt.

Subjects:

Purposive sample of patients were included in the study. Patients for this study were adult and diagnosed with type 2 diabetes. Patients divided randomly into two equal groups (45 patients each) to constitute the web-based group and counseling group. Those who came first carried odd numbers constituted the web-based group patients and even numbers assigned to counseling group. Inclusion criteria included that the patients should be able to read and write to understand the goals and procedure of the study, the web-based group had computers and an Internet access in their houses and ability to reach the web site by themselves or by one of their families.

The sample size was estimated with STATA 10 program. The estimated required sample size was 45 patients in each group, to achieve power of study 80%, power = 0-8000 and alpha=0.0500.

Study tools:

The following tools were used to collect data related to this study:

Tool I :Patient's assessment and clinical data sheet: The sheet was designed by the researchers to gather information related to age, sex, education of patients, work status, marital status and, also covered data related to blood sugar test, duration of illness.

Tool II: Diabetes Management Self-Efficacy Scale (DMSES): The scale is developed by van der Bijl, 1999 and also had acceptable reliability and validity. This tool was used to assess self-efficacy of diabetic patients pre- and post intervention. This tool composed of 20-item DMSES to know how the patient confident in doing certain activities with five responses scoring from 5-1, the high score was given for high self-efficacy and it was considered that > 60 % from total score was high self-efficacy..

Tool III: Diabetic patient's knowledge questionnaire sheet: It was used to assess patient's knowledge about diabetes mellitus and its management such as; definition, types, diet, medication, exercises, glucose monitoring, avoidance of complications such as; hyperglycemia, hypoglycemia and diabetic foot. It was written in Arabic language and developed by the researchers based on the related literature (; Lewis et al.,2007; Dewit, 2009; Morten, 2009; Ignatavicius &Workman, 2010 ; Netttina, 2010 ; Urden et al.,2010 ;;). It was composed of 20 questions. The Score was given for each correct answer and zero for incorrect answer. For each area of knowledge, the scores of the items were summed-up and the total score divided by the number of the items. These scores were converted into a percent score. The total nurses' knowledge was considered satisfactory if the percent score was 60% and more, and unsatisfactory if less than 60%.

Tool 4: Summary of Diabetes Self –Care Activities Scale (SDSCA): The scale is developed by **Toobert and Glasgow**, ***1994,*** also had acceptable reliability and validity. The scale translated to Arabic by **Mason, 2005** according to WHO guidelines for translation .It contain 12 questions about diet, exercises, blood sugar test foot care and medication. The questions ask about Diabetes Self –Care Activities during the past 7 days,

so the scale graded from day one today seven and it was considered that, less than three days are inadequate, while more than three days are adequate.

- **Procedure:**

The current study was carried out on three phases, preparatory phase, implementation phase and evaluation phase.

Phase I: Preparatory phase:

- Human rights and ethical permission were obtained to conduct the study. Head of outpatient clinics gave permission to perform the study. Patients were fully informed of the study. The voluntary nature of participation was stressed as well as confidentiality. Consent was obtained from each patient.
- The researchers developed the counseling program for diabetic management intervention based on needs of patients and Booklet was developed illustrating diabetic management based on related literature **(Daniels, *et al.*, 2007; Morten, 2009 ; Timby & Smith, 2010 ; Lewis *et al.*, 2011; potter *et al.*, 2011).**
- Web site for diabetic management was determined and introduced to the Web-based group.

Phase 2: Implementation phase:

A pilot study was carried out by 5 patients to test the clarity, applicability, objectivity and feasibility of the tools to conduct the study. No Changes or modifications were done. The subjects included in the pilot study were included in the study.

Patients in the diabetic clinic who met the study criteria were included immediately after random assignment for counseling group and web-based group (net group). Patient's assessment data sheet was fulfilled as a baseline pre intervention data. Also Patient's assessment for diabetic management knowledge, diabetes self efficacy, diabetes self care activities and blood glucose measure were done pre intervention. Web site for diabetic management was determined and introduced to the Web-based group.

Data collection and program implementation was carried out during the period from June 2011 to February 2012

Counseling was implemented according to DASIE technique. The counseling program was carried out using DASIE technique based on Richard Nelson Jonson 1997. The number of sessions was based on the patient's needs. Each patient was interviewed individually for 30 to 40 minutes counseling sessions were presented by the researcher according to DASIE technique (**D:** Develop the relationship and clarify problems; **A:** Assessment and restate problems in skills terms; **S:** State goals and plan interventions; **I:** Interview to develop life skills; **E:** Emphasize, take-away and end.)

Phase 3: Evaluation phase:

This phase aimed to evaluate the effect of web-based education versus counseling on Diabetic patients' Outcome through assessment of improving knowledge related to diabetic management, diabetes self efficacy, diabetes self care activities and improving in blood glucose measure after implementation and completion of both educational interventions.

Data analysis:

Data entry, validation and analysis were done with the statistical package for social science version 13.0, the statistical tests used are number and percent distribution, mean and stander deviation .A value of $p<0.05$ was considered to be statistically significant.

3. Results:

Table (1), shows that nearly half (48.9%, , 51.1%) of counseling and web-based groups were less than 40 years respectively. Also male represent (51.1%) of counseling group and (43.2%) of web based group. Regarding level of education (53.3%) of counseling group read and write and (57.8%) of web based group had secondary education. Also more than two thirds of two groups (71.1 , 68.9%,) respectively had a work. As regard marital status it was found that more than half (51.1% , 55.6%) were married. Also mean of disease duration was (11.44±5.23, 11.29±5.85) respectively.

Table (2) shows satisfactory knowledge of diabetes in both counseling and web-based group. It illustrates that the minority of the two groups had satisfactory knowledge pre- intervention . However web based group had more knowledge about diabetes in all items except in diet, signs &symptoms of hypo- and hyper-glycemia and management of hyperglycemia than counseling group with no statistically significant differences between them regarding all items.

Table (3) shows the improvement of diabetes knowledge among the majority of two groups regarding general knowledge of diabetes. Conversely to pre intervention, the table shows that counseling group had more satisfactory knowledge than web-based group with no statistically significant difference in all items except for the management of hyperglycemia (p value 0.003).

Table (4) shows that the majority (91.1% & 84.4%) of counseling and web-based group had low level of self efficacy pre-intervention with no statistically significant difference between them. Also the mean score of total self efficacy pre intervention was (2.49±1.24 and 3.47±1.22) among two groups with highly statistically significant difference ($p>0.000$). While post-intervention, the majority (88.9% & 86.7%) of two groups respectively had high level of self efficacy with mean score of total self efficacy (8.1±1.1and 7.9±0.93) with no statistically significant difference between them ($p>0.3$).

Table (1): Socio-demographic characteristics of counseling and web- based groups.

Parameters	(counseling group) Total=45		(web-based group) Total=45		Test	*P* value
	No	**%**	**No**	**%**		
Age/years					X^2	
1840	22	48.9	23	51.1	0.38	
40-50	16	35.6	17	37.8		0.8
above50	7	15.6	5	11.1		
Mean and standard deviation of age	39.24±9.61		37.11±9.69		T 1.04	0.2 NS
Gender					X2	
Male	23	51.1	19	43.2	0.56	0.45
female	22	48.9	25	56.8		NS
Education					X^2	
Read and write	24	53.3	12	26.7	9.4	0.009
Secondary	12	26.7	26	57.8		S
Higher	9	20	7	15.6		
Work status					X^2	
Work	32	71.1	31	68.9	0.05	0.81
Not Work	13	28.9	14	31.1		NS
Marital status					X^2	
Single	8	17.8	6	13.3	0.36	0.8
Married	23	51.1	25	55.6		NS
Widow and divorced	14	31.1	14	31.1		
Duration of disease					X^2	
< 6	7	15.6	12	26.7	5.82	
6-	15	33.3	12	26.7		0.1
12-	21	46.7	14	31.3		NS
>18	2	4.4	7	15.6		
Mean and standard deviation of duration of disease	11.44±5.23		11.29±5.85		T 0.13	0.89 NS

Table (2): Satisfactory knowledge difference between two groups pre –intervention.

Item	(counseling group) Total=45		(web-based group) Total=45		z	*P*-value
	No. (satisfactory)	%	No. (satisfactory)	%		
Basic knowledge:						
Def.	10	22.2	12	26.7	0.491	0.624
Types	13	28.9	15	33.3	0.455	0.649
Self care:						
Diet	11	24.4	10	22.2	0.249	0.803
Medication	9	20.0	11	24.4	0.507	0.612
Exercises	8	17.8	9	20.0	0.269	0.788
Glucose monitoring	7	15.6	8	17.8	0.283	0.777
Avoidance of complication						
Hypoglycemia:						
Def.	7	15.6	8	17.8	0.283	0.777
S&S	8	17.8	6	13.3	0.582	0.561
Management	9	20.0	10	22.2	0.258	0.796
Hyperglycemia:						
Def.	8	17.8	9	20.0	0.269	0.788
S&S	8	17.8	7	15.6	0.283	0.777
Management	10	22.2	8	17.8	0.527	0.598
Diabetic foot:						
Causes	9	20.0	10	22.2	0.258	0.796
Risk factor	6	13.3	7	15.6	0.300	0.764
Prevention	8	17.8	8	17.8	0.000	1.000

Table (3): Satisfactory knowledge difference between two groups post –intervention.

Item	**(counseling group)** Total=45		**(web-based group)** Total=45			
	No. (Satisfactory).	%	No. (satisfactory)	%	**z**	***P*-value**
Basic knowledge:						
Def.	40	88.9	38	84.4	0.620	0.535
Types	44	97.8	39	86.7	1.968	0.049
Self care:						
Diet	43	95.6	40	88.9	1.181	0.238
Medication	40	88.9	37	82.2	0.900	0.368
Exercises	42	93.3	40	88.9	0.741	0.459
Glucose monitoring	43	95.6	39	86.7	1.482	0.138
Avoidance of complication						
Hypoglycemia:						
Def.	39	86.7	38	84.4	0.300	0.764
S&S	40	88.9	39	86.7	0.322	0.748
Management	41	91.1	37	82.2	1.240	0.215
Hyperglycemia:						
Def.	42	93.3	39	86.7	1.054	0.292
S&S	40	88.9	36	80.0	1.163	0.245
Management	44	97.8	35	77.8	2.896	0.004
Diabetic foot:						
Causes	41	91.1	38	84.4	0.965	0.334
Risk factor	40	88.9	37	82.2	0.900	0.368
Prevention	42	93.3	39	86.7	1.054	0.292

Table (4): Self- efficacy difference between two groups pre and post intervention

Parameters	**(counseling group)** Total=45		**(web-based group)** Total=45		**Test**	***P* value**
	No	**%**	**No**	**%**		
Pre intervention						
Low level of self efficacy	41	91.1	38	84.4	X^2 0.93	0.3
High level of self efficacy	4	8.9	7	15.6		
Mean score of total self efficacy pre intervention	2.49±1.24		3.47±1.22		T -3.77	0.000
Post intervention						
Low level of self efficacy	5	11.1	6	13.3	X^2 0.1	0.7
High level of self efficacy	40	88.9	39	86.7		
Mean score of total self efficacy	8.1±1.1		7.9±0.93		T 0.96	0.3

Table (5): Self care activities difference between two groups pre-intervention

Parameters	**(Counseling group)** Total=45		**(web-based group)** Total=45		**T-Test**	***P* value**
	No	**%**	**No**	**%**		
1-Diet						
0-3 days (inadequate)	**41**	**91.1**	**42**	**93.3**		
>3-7 days (adequate)	**4**	**8.9**	**3**	**6.7**		
Mean score of diet	**2.12±0.66**		**2±0.59**		**0.87**	**0.3**
2-Exercise						
0-3 days (inadequate)	**43**	**95.6**	**42**	**93.3**		
>3-7 days (adequate)	**2**	**4.4**	**3**	**6.7**		
Mean score of Exercise	**0.84±0.68**		**0.94±0.86**		**-0.61**	**0.5**
3-Blood sugar test						
0-3 days (inadequate)	**44**	**97.8**	**44**	**97.8**		
>3-7 days (adequate)	**1**	**2.2**	**1**	**2.2**		
Mean score of Blood sugar test	**0.34±0.58**		**0.47±0.67**		-1.004	**0.3**
4- Foot care						
0-3 days (inadequate)	**42**	**93.3**	**42**	**93.3**		
>3-7 days (adequate)	**3**	**6.7**	**3**	**6.7**		
Mean score of foot care	**0.27±0.88**		**0.48±0.96**		**-1.08**	**0.2**
4- Medication					**No test available**	
7 days (adequate)	**45**	**100**	**45**	**100**		

Table (6): Self care activities difference between two groups post- intervention

Parameters	(counseling group) Total=45		(web-based group) Total=45		T Test	*P* value
	No	%	No	%		
1- Diet						
0-3 days (inadequate)	7	15.6	12	26.7		
>3-7 days (adequate)	38	84.4	33	73.3		
Mean score of diet	5.52±1.15		4.88±1.26		2.5	0.01
2- Exercise						
0-3 days (inadequate)	22	48.9	17	37.8		
>3-7 days (adequate)	23	51.1	28	62.2		
Mean score of Exercise	4.17±1.44		3.84±0.76		1.36	0.1
3- Blood sugar test						
0-3 days (inadequate)	2	4.4	22	48.9		
>3-7 days (adequate)	43	95.6	23	51.1		
Mean score of Blood sugar test	5.36±1.25		3.44±0.46		9.63	0.000
4-Foot care						
0-3 days (inadequate)	7	15.6	25	55.6		
>3-7 days(adequate)	38	84.4	20	44.4		
Mean score of foot care	5.04±1.51		3.44±0.50		9.72	0.004
4- Medication						
7 days (adequate)	45	100	45	100	No test available	

Table (7): Fasting Blood sugar difference between two groups pre- and post- intervention

Parameters	(counseling group) Total=45		(web-based group) Total=45		X^2	*P* value
	No	%	No	%		
Fasting Bl. Sugar test pre-intervention					1.66	0.19 NS
Normal	12	26.7	7	15.6		
Abnormal	33	73.3	38	84.4		
Mean score of blood sugar test	163.22±41.4		185±31.75			
Fasting Bl. Sugar test post-intervention					1.81	0.17 NS
Normal	39	86.7	34	75.6		
Abnormal	6	13.3	11	24.4		
Mean score of fasting blood sugar test	128.9±133.5		116±13.2			

Table (8): Relation between mean of fasting blood sugar and self efficacy level pre- and post-intervention.

Group	Self efficacy	Mean of fasting blood sugar level	N Total=45	%	Std. Deviation	F Test	*P* value
Pre intervention						8.03	0.006
(counseling group)	Low	162.68	41	91.1	41.53		
	High	168.7500	4	8.9	45.89		
(web-based group)	Low	183.07	38	84.4	34.05		
	High	197.14	7	15.6	6.98		
Post intervention						0.41	0.52
(counseling group)	Low	114.0	5	11.1	11.40		
	High	130.77	40	88.9	141.71		
(web-based group)	Low	114.16	6	13.3	10.20621		
	High	116.28	39	86.7	13.70353		

Table (9): Relation between mean of blood sugar and mean of self care activity pre- and post-intervention.

Group	Fasting Bl.Sugar test level	Mean of self care activity	N Total=45	%	Std. Deviation	F Test	*P* value
Pre intervention						0.33	0.56 NS
(counseling group)	Normal	1.33	12	26.7	0.25		
	abnormal	1.07	33	73.3	0.30		
(web-based group)	Normal	1.1	7	15.6	0.30		
	abnormal	1.2	38	84.4	0.39		
Post intervention						54.1	0.000 HS
(counseling group)	Normal	5.10	39	86.7	0.71		
	abnormal	5.25	6	13.3	0.48		
(web-based group)	Normal	4.11	34	75.6	0.64		
	abnormal	4.04	11	24.4	0.62		

Table (10): Relation between level of self-efficacy level and mean of self care activity pre- and post-intervention.

Group	Self efficacy	Mean of self care activity	Total=45N	%	Std. Deviation	F Test	*P* value
Pre intervention						0.33	0.56 NS
(counseling group)	Low	1.13	41	91.1	0.31		
	High	1.22	4	8.9	0.33		
(web-based group)	Low	1.18	38	84.4	0.35		
	High	1.18	7	15.6	0.49		
Post intervention						54.16	0.000 HS
(counseling group)	Low	4.78	5	11.1	0.73		
	High	5.17	40	88.9	0.67		
(web-based group)	Low	3.75	6	13.3	0.75		
	High	4.15	39	86.7	0.60		

Table (5) illustrates inadequate level of self care activities pre intervention in two groups. The majority of two groups had inadequate self care activities (0-3 days from 7 days for all items of self care activities) with no statistically significant difference between them except regarding medication, all of both groups had adequate self care activities.

Table (6) illustrates the improvement of level of self care activities post intervention among two groups. Regarding diet the table illustrated that (84.4%) of counseling group had adequate diet self care (the days >3-7 days) compared to (73.3%) of web based group with mean score (5.52±1.15) and (4.88±1.26) among two groups respectively with statistically significant difference between two groups (*p* value= 0.01). Regarding exercise, it was found that (51.1%) of counseling group had adequate exercise self care compared to (62.2%) of web based group with mean score (4.17±1.44) and (3.84±0.76) among two group respectively with no statistically significant difference between two groups (*p* value= 0. 1). Concerning blood sugar test, it was found that (95.6%) of counseling group had adequate blood sugar test compared to (51.1%) of web based group with mean score (5.36±1.25) and (3.44±0.46) among two groups respectively with highly statistically significant difference between two groups (p value 0.000). Also, this table shows that (84.4%) of counseling group had adequate foot care compared to (44.4%) of web based group with mean score (5.04±1.51) and (3.44±0.50) among two groups with statistically significant difference (*p* value=0.004).This table also clarifies that improvement in self care activities in counseling group than web-based group post intervention in all items of self care activities except in exercises.

Table (7) clarifies that (26.7%) of counseling group compared to (15.6%) of web-based group their fasting blood sugar test were normal pre-intervention with no statistically significant differences whereas the mean of fasting blood sugar test were (163.22±41.4) and (185±31.75) between two groups respectively. While, post-

intervention it was found that the majority of both groups achieved glycemic control, whereas (86.7%) of counseling group compared to (75.6%) of web-based group their sugar test were normal with no statistically significant differences whereas the mean of blood sugar test were (128.9±133.5) and (116±13.2) between two groups respectively. This table also clarifies that improvement in blood sugar in counseling group than web-based group post intervention.

Table (8), shows that the minority (8.9% & 15.6%) of two groups respectively had high self efficacy and high mean of blood sugar level pre-intervention with statistically significant relation between blood sugar and self efficacy (*p* value 0.006). While post intervention, it was found that the majority (88.9% & 86.7) of two groups respectively had high self efficacy and low mean of sugar level with no statistically significant relation between blood sugar and self efficacy (*p* value = 0.52).

Table (9), shows that the minority (26.7% & 15.6%) of two groups respectively had normal blood sugar level and low mean of self care activity pre-intervention with no statistically significant relation between mean of blood sugar and mean of self care activity (*p* value = 0.5). Meanwhile post intervention, it was found that the majority (86.7% & 75.6%) respectively of two groups had normal blood sugar level and high mean of self care activity with a highly statistically significant relation between mean of blood sugar and mean of self care activity (*p* value= 0.000).

Table (10) shows that the minority (8.9% & 15.6%) of two groups respectively had high self efficacy level and low mean of self care activity pre-intervention with no statistically significant relation between level of self efficacy and mean of self care activity (*p* value = 0.5). Meanwhile post intervention, it was found that the majority of two groups (88.9% & 86.7%) respectively had high self efficacy level and high mean of self care activity with highly statistically significant relation between level of self efficacy and mean of self care activity (*p* value= 0.000).

4. Discussion

This quasi-experimental study evaluated the effect of counseling versus web-based education on diabetic patients' outcome. The benefits of web - based education include its easy access, without limitations in time and place, for those who have Internet access. The Internet is already utilized as a source of health-related information, especially by patients with chronic illness and diabetes The long-term management of diabetes as a chronic disease is very important Patients with diabetes need to change their lifestyles and, equally importantly, adhere to the regimen over their lifetime that known as self efficacy. They often perform well after receiving education ***(Eigenmann & Colagiuri R,2007; Song et al., 2009).***

The results of the present study revealed that nearly half of counseling and web-based groups were less than 40 years. Also nearly half were male and married. More than half of counseling group read and write and more than half of web-based group had secondary education. Also more than two thirds of both groups work. Also mean of disease duration was (11.44±5.23, 11.29±5.85) respectively. While ***Karakurt and Kas¸ıkçı, 2012*** found that 67% of patients with type 2 diabetes were women, 39% were in the age group of 50–59, 88% were married, 61% were primary school graduates, 67% were housewives. Also they found that duration of diabetes was 1–5 years.

The results of the present study revealed that no statistically significant differences between counseling and web-based groups regarding sociodemogrephic characteristics. This was supported by ***Tjam et al., 2006*** who found no statistically significant differences between two groups when studied Physiological Outcomes of an Internet Disease Management Program vs. In-person Counseling.

As regard knowledge of diabetes and its management pre-intervention, the present findings illustrated that there was lack of knowledge among two groups, also knowledge was similar in the two groups with no statistically significant differences between them. This was congruent with ***Upadhyay et al., 2008*** who found that knowledge and practice of the diabetic patients had low knowledge so the researchers suggested the educational intervention to improve knowledge and self care activities of diabetes and its management.

After the diabetic management educational intervention, the current results showed improvement of knowledge of two groups. Also, the results showed that counseling group had more satisfactory knowledge than web-based group with no statistically significant difference. This was supported by ***Malathy et al., 2011*** who found that counseling improved knowledge of diabetes and its management and ***Krishna*** and ***Boren***, ***2008*** who found that web-based group improved knowledge of diabetes and its management.

Concerning knowledge related to self care, the present findings illustrated that there was lack of knowledge among two groups, also knowledge was similar in the two groups with no statistically significant differences between them pre

intervention. This was in the same line with ***Murphy et al., 2011*** who revealed that all participants had lack of knowledge about medication and diet to manage their diabetes effectively regardless of the time since diagnosis.

While post intervention, the current results showed improvement of knowledge related to self care of two groups with no statistically significant differences between them. This was in the same line of ***Rodrigues et al., 2009*** examined the knowledge and attitudes of patients with DM participating in a self-care educational program and found that participants obtained a good score in diabetes and self-care knowledge. Also, ***Kim*** and ***Song 2008*** who found that web-based group improved self care knowledge of diabetes as medication and foot care and ***Rurike et al., 2010*** who found that counseling improved self care knowledge of diabetes.

As regard self efficacy, the present finding showed that the majority of counseling and web-based group had low level of self efficacy pre-intervention with no statistically significant differences between them. This was congruent with ***Glasgow et al., 2010*** who found that self efficacy of the diabetic patients was low so the researcher suggested the educational intervention to improve knowledge and self efficacy of diabetes and its management.

While post-intervention, the majority of two groups respectively had high level of self efficacy with no statistically significant differences between them. The present study was consistent with ***Robertson et al., 2007 and Wangberg 2008*** who found that web-based education improved the self-efficacy of diabetic patients. Also, ***Pansila 2008*** found that counseling improved the self-efficacy of diabetic patients. Also, other study by ***Lee et al., 2009*** revealed that the patients who received education reported better self-care practices including healthier lifestyles and higher self-efficacy and controlled their blood glucose better than those who did not received. While ***Angeles et al., 2011*** found that web- based education was more effective than other methods regarding patients' satisfaction and self efficacy.

Concerning self care activities pre intervention, the present study illustrated that inadequate level of self care activities among two groups except for medication. This finding was congruent with ***Xu et al., 2010*** who stated that the participants were more likely to carry out self-management in relation to taking medication, but were less likely to carry out self-management with their diet, exercise, self monitoring of blood glucose (SMBG), and foot care. The behavior patterns may indicate that it is easier for individuals with diabetes to follow medication regimens than to change their lifestyle.

Research among people with type 2 diabetes has suggested that the most frequent negative aspects of self-management are negative physical reactions, time constraints, lack of financial resources and performing tasks that they do not like ***(Nagelkerk et al., 2006 ;Pun et al., 2009).***

While post intervention, the present finding illustrated the improvement of level of self care activities post intervention among two groups which was greater among counseling group with statistically significant difference between two groups. This were in congruence with a study evaluated minimal and moderate support versions of an Internet-based diabetes self-management program, compared to an enhanced usual care condition by ***Glasgow et al., 2010*** who revealed that the Internet-based intervention produced significantly greater improvements than the enhanced usual care condition on behavioral outcomes.

In several studies performed with patients with type 2 diabetes, it was found that the education given to patients had a positive effect on their self-care activities and their knowledge about their disease ***(Cosar, 2003; Ko and Gu, 2004; Huang et al,, 2005; Gallegos et al., 2006 Karakurt and Kas¸ıkçı, 2012*)**. In this research, the increase in the average scores of the post education scale indicate that self-care activities of patients have changed positively and the education given to patients have been beneficial. Also this may be due to willingness of patients included in the research to participate regularly in the given education may provide an increase in their self care points.

As regard diet and exercise self care activities pre intervention, the results illustrated that the minority of two groups had adequate diet and exercise self care activities with no statistically significant difference them. The findings of the current study were in accordance with ***Oftedal et al., 2011*** who stated that less than half of the respondents stated that they adhered to their diet 6–7 days per week. On the other hand, less than10% reported exercising every day

While diet self care activities post intervention, the results of the present study illustrated the improvement of diet self care activities post intervention among two groups which was greater among counseling group with statistically significant difference between two groups The present study was in consistent with ***Wangberg 2008*** and ***Rurike et al., 2010*** who found that counseling and web-based education

improved diet self care activities of diabetic patients respectively.

Regarding exercise self care activities post intervention, it was found that nearly half of counseling group had adequate exercise self care compared to near two third of web-based group with no statistically significant difference. The present study was in consistent with ***Robertson et al., 2007*** and ***Malathy et al., 2011*** who found that counseling and web-based education improved exercise self care activities of diabetic patients respectively.

Concerning blood sugar test, the present study clarified that low percent of two groups their sugar test were normal in pre intervention with no statistically significant differences. This was supported by ***Tjam et al., 2006*** who found no statistically significant differences between two groups when studied Physiological Outcomes of an Internet Disease Management Program versus In-person Counseling regarding blood glucose level pre intervention with low percent of two groups their sugar test were normal.

While, post intervention, it was found the majority of counseling group had adequate blood sugar test compared to about half of web based group with no statistically significant difference. This was supported by ***Angeles et al., 2011*** who found the improvement in blood glucose control post intervention and web-based education was more effective than other methods in glucose control. Also***, Leea et al., 2007*** found that web-based education increased the patient's ability to trace blood glucose level. While ***Tjam et al., 2006*** found no statistically significant differences between two groups in blood glucose control post intervention.

Studies involving smaller samples have used technological interventions, such as cellular phone-based and computer feedback-based methods, successfully for glycemic control ***McMahon et al., 2005; Kim, 2007; Kim & Song, 2008).*** Also, the present study were consistent with ***Lu et al., 2011*** who assess whether self-monitoring of quantitative urine glucose or blood glucose is effective, convenient and safe for glycaemic control in non-insulin treated type 2 diabetes and stated that all patients experienced significant reductions in HbA1c and fasting plasma glucose. Self monitoring of urine glucose and self-monitoring of blood glucose shared comparable efficacy in glycemic control.

Concerning medication self care activities, the present study clarified that all of the study subjects in both groups had adequate self care activities pre- and post intervention. This was contradicted with ***Kim et al., 2006*** who found inadequate medication self care activities pre-intervention and web-based education for diabetic patients improved medication self care activities post-intervention. Also the present findings were in accordance with ***Toumas, et al., 2009*** who found that during comparing the effectiveness of small-group training in correct inhaler technique with self-directed Internet-based training, there was a significant improvement in the number of participants demonstrating correct technique in both groups post intervention, with no significant statitically difference between the groups.

Regarding foot self care activities pre intervention, the results illustrated that the minority of two groups had adequate foot self care activities with no statistically significant difference them. While post intervention, the results showed that the majority of counseling group had adequate foot care compared to less than half of web-based group with statistically significant difference between them. The findings of the current study were in the same line with ***Kim et al., 2006*** who found inadequate foot self care activities pre-intervention and web-based education for diabetic patients improved foot self care activities post-intervention.

The present results showed that the majority of two groups had low self efficacy and high mean of blood sugar level pre intervention with statistically significant relation between self efficacy and mean of blood sugar level. Meanwhile post intervention, it was found that the majority of two groups had high self efficacy and low mean of sugar level with no statistically significant difference. Our findings were in the same line with ***Nakahara et al., 2006*** who stated that self-efficacy has been shown to have a consistent relationship with glycemic control. Also ***Chih et al., 2010*** added that patients with higher self-efficacy have a higher probability of reaching target glucose control.

The present results found that the majority of two groups had abnormal blood sugar level and low mean of self care activity pre intervention with no statistically significant relation between self care activity and mean of blood sugar level. Meanwhile post intervention, it was found that the majority of two groups had normal blood sugar level and high mean of self care activity with highly statistically significant difference.

The results of the present study was congruent with ***Compeán et al., 2010*** who stated that to achieve adequate glycemic control, patients should maintain a correct balance between different elements of a comprehensive treatment, such as diet, exercise, medication, glucose monitoring and permanent education. Also the researchers added

that better self-care corresponded to lower HbA1c levels which mean better glycemic control. Also this finding was in the same line with ***Sousa et al., 2005*** and ***Sigh and Press, 2008*** who reported that better self-care predicted better glycemic control (low HbA1c).

Our finding revealed that the majority of two groups had low self efficacy level and low mean of self care activity pre intervention with no statistically significant relation between self efficacy level and mean of self care activity pre intervention. Meanwhile post intervention, it was found that the majority of two groups had high self efficacy level and high mean of self care activity with highly statistically significant relation between them.**.** This findings was congruent with ***Wang and Shiu, 2004*** found that patients with greater self-efficacy were better able to manage their diabetes self-care.

Furthermore, ***Wu et al., 2007*** proposed using the self-efficacy model as a framework for understanding compliance with self-care. Nurses can discuss self-efficacy with patients with type 2 diabetes to promote improvement in their behavior and health outcomes **(*Shi et al., 2010*)**. Self efficacy is strongly related to healthy eating and calories expended in physical activity ***(King et al., 2010)*** and is also a better predictor of other aspects of self-care besides diet and exercise ***(Johnston-Brooks et al., 2002).***

Also ***Sharoni and Wu, 2012*** showed that there was a positive relationship between self-efficacy and self care behavior which was statistically significant .Health education strategy is very important and the nursing profession needs to review it periodically. The concept of self-efficacy should be included in nursing interventions with particular focus on healthy eating, physical exercise, monitoring of blood glucose concentrations and risk reduction behavior.

The present results found that the majority of two groups had abnormal blood sugar level and low mean of self care activity in pre intervention with no statistically significant relation between self care activity level and blood sugar level pre intervention. Meanwhile post intervention, it was found that the majority of two groups had normal blood sugar level and high mean of self care activity with highly statistically significant relation.

The present study in accordance with ***Compeán et al., 2010*** who stated that to achieve adequate glycemic control, patients should maintain a correct balance between different elements of a comprehensive treatment, such as diet, exercise, medication, glucose monitoring and permanent education. Also he added that Better self-care corresponded to lower HbA1c levels which mean better glycemic control. Also this finding is in line with other studies ***Sousa et al., 2005 and Sigh and Press, 2008*** who reported that better self-care predicted better glycemic control (low HbA1c).

5. Conclusion:

It was concluded that, The majority of counseling and web-based group had unsatisfactory knowledge, low level of self efficacy, inadequate self care activities and abnormal glucose level with no statistically significant difference between them pre-intervention. While, post-intervention, The majority of counseling and web-based group had satisfactory knowledge, high level of self efficacy, adequate self care activities and normal glucose level with. Also, Counseling group had more satisfactory knowledge, high level of self efficacy, adequate self care activities and normal blood glucose level than web-based group with no statistically significant difference in all items except for self care activities

Recommendations:

As results of the current research, the following suggestions are proposed:

1. TRY TO INCREASE THE PUBLIC HEALTH IMPACT OF INTERNET-BASED PROGRAMS WHICH CAN SUPPORT DIABETES MONITORING AND SELF-CARE.
2. DEVELOP WEB SITES WHICH ALLOW PATIENTS ONLINE INTERACTION WITH HEALTH CARE PROVIDER TO ENCOURAGE WEB BASED LEARNING USE.
3. FURTHER RESEARCH INTO THE FULL USE OF THE AVAILABLE TECHNOLOGY IS IMPERATIVE FOR IMPROVING THE QUALITY OF NURSING INTERVENTION.

Limitation of the study:

Inadequate researches which performed to compare Efficiency of Web-Based Education versus Counseling on Diabetic Patients' Outcomes.

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