Effect Of Tele-Nursing (Phone-Based Follow-Ups) On Self-Efficacy, Healthy Lifestyle, And Glycemic Control In Diabetic Patients

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Abstract: *Telenursing refers to the use of telecommunications and information technology to provide nursing care at a distance, which may help solve increasing shortages of nurses, reduce both travel distance and time, and keep patients out of the hospital. It is especially useful for diabetes patients who have problems of far distance to the health care clinics or need a long time waiting for visiting a doctor.*
Aim of the study: *To determine the effect of tele-nursing (phone-based follow-ups) on self-efficacy, healthy lifestyle, and glycemic control in type 2 diabetic patients.*
Design: *A quasi - experimental design was adopted.*
Setting: *The study was conducted at medical department and endocrinology outpatient clinic of Menoufia University Hospitals.*
Sample: *One hundred patents with type 2 diabetes were enrolled in the study and randomly divided into two groups of experiment and control based on random numbers table. The experimental group received telephone counseling and follow-up intervention for 12 weeks by the researcher and the follow-ups included instructions on self-care and advices to follow their diets, exercise, and insulin titration.*
Tools: *four tools were used for data collection: I) A structured interviewing questionnaire to assess demographic characteristics II) Self-efficacy scale III), Health promotion lifestyle profile scale, IV) physiological measurement of fasting blood sugar, Glycated Hemoglobin, and postprandial glucose.*
Results: *There were statically significant differences between both groups regarding self-efficacy scores as well as the health promotion lifestyle profile after intervention. The mean level of FBS & PPG was significantly lower in the experimental group than the control after intervention (p < 0.05 & P < 0.001) respectively.*
Conclusion: *According to our findings, we can conclude that telenursing was effective to improve self- efficacy, healthy lifestyle and blood glucose level in type 2 diabetic patients.*
Keywords: *Tele-nursing, Self-Efficacy, Healthy Lifestyle, Type 2diabetes.*

I. Introduction

Diabetes mellitus is a metabolic disorder that is characterized by chronic hyperglycemia along with impaired metabolism of proteins, carbohydrates, and fats resulted from defects in insulin secretion or function; it would hurt different organs of the patients and may decrease his/her lifetime **(1)**. Diabetes is a major and growing problem in all age groups. This disease is the most common endocrine disease and more than 140 million people in the world suffer from it. The prevalence of diabetes in all countries, especially in the developing countries, is increasing, so that it can be called the most important challenge of health care in the 21st century. It is estimated that until 2030, about 366 million people in the world will be suffering from this disease **(2)**. Type 2 diabetes (T2D) accounts for about 90-95% of all diagnosed cases of adult diabetes. Diabetes is not curable, but it is controllable. Many complications result from uncontrolled diabetes such as neuropathy, renal disease, heart disease, or death. The risk of death doubles in diabetics compared to those in the population without diabetes **(3)**.

Patients with diabetes are expected to perform daily self-management activities to help avoid diabetes-related complications. Self-management is a cornerstone of diabetes care, and it is believed that improving patient self-efficacy is a critical pathway to improved self-management **(4, 5)**. Self-efficacy is "the degree to which an individual perceives that he or she can perform a particular behavior" (6).Self-efficacy has been recognized as a critical determinant of health behavior change. The concept of self-efficacy is based on social cognitive theory, which describes the interaction between behavioral, personal, and environmental factors in health and chronic disease. The theory of self-efficacy proposes that patients" confidence in their ability to perform behaviors influences which behaviors they will engage in. When individuals are self-assessed as having high self-efficacy, they will enthusiastically participate in health behaviors or lifestyles and thus improve their ability to have healthy behaviors **(7, 8)**. Self-efficacy has been shown to be important for appropriate self-management for many health conditions as diabetes and, the research demonstrates mixed results for interventions that attempt to improve self-management behavior through improved self-efficacy **(7, 9)**.

Diabetic patients face many barriers when attempting to self-manage their chronic condition. When a patient receives the diagnosis of diabetes, there can be feelings of failure, confusion, uncertainty, anxiety, depression, anger, worry, frustration, and possibly denial that can lead to patient noncompliance. Some physicians fail to effectively communicate with their patients, which leads to lack of knowledge, noncompliance, and a disassociation with sel-fmanagement, but yet the physician or healthcare staff will question the patient on compliance or follow-up visits without considering barriers a patient may face (**10**).

Considering the increasing rate of diabetes incidence and the lack of care-giving personnel, it is necessary to develop new methods to make nursing services more effective. It seems that telenursing as a follow-up caring technology can be helpful in achieving this goal. The nurse has important role in the prevention or reducing complications of diabetes through the educational programs and follow up by telenursing to help patient comply with healthy life style. Also, the roles include the collaboration with physician in the screening, diagnosis, and management of the health problem; to consume valid research findings in nursing practice, and to participate in research studies trying to decrease the problem of diabetes (**11**).

Telenursing includes all kinds of nursing care and services that can be provided from distance and includes a wide range of communication technologies such as phone, fax, email, internet, and video clips to overcome the time and distance obstacles to provide better nursing care. This new field of nurses' activities has expanded in many countries. The most common use of telenursing is to provide opportunities for patient education, nursing teleconsultations, examination of results of medical tests and examinations, and assistance to physicians in the implementation of medical treatment protocols (**12, 13, 14**). Among these devices, phone calls are frequently used in telenursing as telephone is accessible for majority of people in the society. Telephone follow-up is considered a low cost and easily organized intervention, and a good way to manage symptoms and early recognition of complication, reassurance and quality aftercare; and also to exchange information and provide health education. It is especially useful for diabetes patients who have problems of far distance to the health care clinics or need a long time waiting for visiting a doctor(**15, 16 17, 18,19**).

Reviewing the studies conducted on telenursing, it can be concluded that this method has positive effectiveness on the treatment of chronic illnesses but it must be studied more from different dimensions. In recent years, there has been studies on providing care by phone calls in other countries and the results show that this technology has caused less hospitalization and has reduced nursing visits to patients' houses in chronic diseases such as chronic obstructive pulmonary disease (COPD), diabetes, congestive heart failure (CHF) (**20**). Previous studies using telenursing for diabetic patients have shown effectiveness in improving Glycated Hemoglobin (HbA1c) levels reducing the burden of diet therapy confirming the efficacy of short-term intervention and clarifying the process of blood pressure and glycemic changes (**21,22, 23**).

The literature recommends additional research to study the impact of technical innovations on improved disease self-management and medical outcome. However, a standard methodology for telenursing has yet to be established. This study aimed to provide type 2 diabetes patients with remote active care and glycemic control through the use of phone follow- up technology without the need for them to attend hospital.

Significance of the study:

The number of people suffering diabetes around the world is 360 million and is expected to increase to 500 million by 2030. Of all diagnosed cases of adult diabetes, type 2 diabetes accounts for about 90-95% (3).
The rates of diabetes in Egypt have significantly increased exceeding international rates, according to the participants in the 4th Arab Diabetes forum. Egypt is now ranked eighth highest in the world in terms of the disease. Diabetes is a fast-growing health problem in Egypt with a significant impact on morbidity, mortality, and health care resources. Currently, the prevalence of T2D in Egypt is around 15.6% of all adults aged 20 to 79 years (**24**).

Future healthcare costs are increasing due to diabetes diagnoses which are increasing on an annual basis due to increased hospital readmission rates and unnecessary emergency room visits. Many barriers in healthcare can affect patients and cause patients to become reluctant to schedule follow-up visits with their healthcare provider or to follow-up on their routine lab work and tests, or to communicate with their healthcare provider. Tele-nursing, is one of the twelve common telehealth functions identified by the WHO (**25**), as best evidence available. Telephone follow-up, can improve self-management outcomes by allowing the individual to communicate with healthcare staff, provide an outlet to various emotional factors that can hinder learning, and provide empowerment and confidence to improve diabetes self-management behavior that cannot be achieved in clinical settings due to limited time and crowded places. This will empower the patient by helping to build self-confidence, recognize lifestyle changes, issues, or concerns that need to be addressed while becoming self-efficient. This empowerment will lead to better control of their diabetes which reinforces self-efficacy and can demonstrate improved health outcomes, lower readmission rates, and reduced healthcare costs. Hence this study aimed to determine the effect of tele-nursing (phone-based follow-ups) on self-efficacy, healthy lifestyle; and glycemic control in type 2 diabetic patients.

Hypotheses:
1. Self-efficacy and health promotion lifestyle profile scale average scores of the study group will be higher than those of the control group after receiving tele-nursing support.
2. The level of fasting and postprandial blood glucose will be lower in the study group than the control group after receiving tele-nursing support.

II. Subjects And Methods

Design: A quasi- experimental design was adopted in this study.

Sample: One hundred patients with typr2 diabetes were determined according to the following sample size equation:

$$\text{Sample size} = X = \frac{Z\,2*(p)*(1-p)/c2}{c}$$

Where: Z = value (1.96 for 95% confidence level) ; p = percentage picking a choice, expressed as decimal ; c = confidence interval, expressed as decimal.

The inclusion criteria were: Patients (1) between 35-75 years of age, (2) Type 2DM at least for 1 year, (3) Attending the endocrinology outpatient clinic ,(4) A1c ≥7%., (5) Sufficient cognitive maturity to use phones, (6) No neurological or mental problems, (7) No sight or hearing problems, (8) Oral communication ability, (9) Access to telephone Technology,(10) Not using medications which increase blood glucose such as corticosteroids, (11) No history of chronic diseases such as chronic hypertension and willing to participate in the study. **Exclusion criteria included** severe cardiovascular diseases and uncontrolled high blood pressure and hospitalization during the study. The patient who agreed to participate were randomly allocated into two groups of experiment and control based on random numbers table 50 patients in each (study group, adopted the routine care plus the tele-nursing program (telephone support)and control groups receive only the routine care from the clinic).

Setting: The study was conducted at endocrinology outpatient clinic and medical department of Menoufia University Hospitals

Tools for data collection.

Four tools were utilized to collect the required data for this study:

I. **A structured interviewing questionnaire**. It was designed by the researchers to collect demographic and medical data of the studied groups. The questionnaire had two sections, first section included 11 demographic questions and the second section included 12 questions about disease's features, which were completed by patients. Since the questionnaires were as check lists and included completely objective questions, they were considered valid and reliable.

II. **Self-efficacy of health behaviors (SEHB);** Adopted from Sherer et al. (26), the 25-item scale measures the self-reported degree of confidence in doing health lifestyle behaviors over 4 subscales, "nutrition," "exercise," "psychological wellness," and "health responsibility." Each item is scored on a 4-point Likert scale, ranging from 1 (no confidence) to 4 (over 75% confidence). The SEHB scores range from 25 to 100; higher scores indicate better self-efficacy of health behaviors. The patient answers this tool at the first day of the interview (baseline assessment), then at 3 and 6 months of intervention. Cronbach's α for this study was 0 .95 and that for each subscale ranged from 0.86 to 0.92.

III. **Health Promotion Lifestyle Profile scale (HPLP);** Adopted from Walker and Hill-Polerecky, (27), it includes 52 items and six sub-scales as: nutrition, physical activity, health responsibility, spiritual growth, interpersonal support, and stress management. The HPLP was utilized beforehand in Arabic on a Jordanian group (28,29,30). The Cronbach's alpha coefficients were between 0.70 and 0.88 for the subscales and 0.92 for the aggregate scale in this study. For the English version of the HPLP Walker and HillPolerecky, (27) reported a Cronbach's alpha of 0.94 for the overall scale and an alpha ranging from 0.79– 0.87 for the six subscales. The instrument was acquainted with the moms in Arabic dialect. This questionnaire asks the respondents to indicate how often they adopt specific health-promoting behaviors on a 4-point Likert scale, with the options of "never" (1), "sometimes" (2), "routinely" (3) and always (4). The highest score obtained from the scale was 208, and the lowest score was 52. The patient answers this tool at the first day of the interview (baseline assessment), 3months and 6months post intervention. The increase in the score taken from the scale shows that healthy lifestyle behaviors are at a much better.

IV. physiological measurement of fasting blood sugar (FBS), Glycated Hemoglobin (HbA1c), and postprandial glucose (PPG)

Validity of the tool: Tools content and face validity were established by a panel of experts composed of five, professors in medicine from the Faculty of Medicine, Menoufia University, and Adult Health Nursing

Department, Faculty of nursing, Menoufia University. Each of the experts was asked to examine the tools for content coverage, clarity, wording, length, format, and overall appearance.

Supportive material (Educational pamphlets): A pamphlets was designed by the researchers after reviewing of related literature and using evidence-based data on nursing care for patients with diabetes and guided by the WHO (31). The booklet includes all the items regarding definition of diabetes, risk factors, signs, symptoms, complications, managing stress, treatment regimen, the management and treatment of hypoglycemia, and self-measurement of blood glucose and how to manage the disorder by adapted health life style in relation to (nutrition, exercise, medication, and follow up, and health responsibility.

Administrative design and ethical considerations: An official approval was obtained from the Faculty of Nursing, Menoufia University hospitals Counsel. As well, a letter containing the title of the research was submitted to the Directed to the director of Menoufi University Hospitals, to get approval for data collection. The aim of the study was explained to each patient before applying the tools to gain her confidence and trust. An oral consent was obtained from each patient who agreed to participate in the study, after ensuring his/her that data collected will be treated confidentially, and that the study maneuvers do not entail any harmful effects on participating patient. Patients were informed that they have the right to withdraw from the study at any time without giving any reason

Pilot study: The pilot study was carried out on 10 patients (10% of the total sample) in the study setting. The pilot study was done to examine the relevance, clarity and content validity of the tools used for data collection, and to evaluate the time needed for patient to fill in the tools of the study and find the possible obstacles and problems that might face the researchers and interfere data collection. Patients who shared in the pilot study were included in the main study sample as there were no radical modifications on the tools.

Field work: Recruitment and follow-up of participants were carried out from June, 2017 and was completed by May, 2017. The researchers attended the endocrinology clinic three days per week starting at 9.00 a.m. to 2.00 p.m. Before conducting the study, permission was obtained from the Director of the Hospital in the previously mentioned setting, followed by obtaining oral acceptance from the patient who agreed to participate in the study: Data collection was carried out through three phases:

1) Preparatory phase: In this phase, agreement to carry out the study was obtained and an educational booklet was developed after revising and reviewing related local and international literature. The developed educational booklet was distributed to experts from medicine, and nursing. They were asked to assess, evaluate, and validate the educational booklet. As well, the tools were developed and reviewed by experts. A pilot study was done on 10% of the pre-stated sample size.

2) Implementation phase: The researchers selected the sample according to the inclusion and exclusion criteria. The patients in both groups received instructions of self-care for diabetes and also received educational pamphlets including definition of diabetes, risk factors, treatment regimen, the management and treatment of hypoglycemia, and self-measurement of blood glucose to match the two groups regarding information about the disease. After that, the patients were randomly divided into two groups of experiment and control based on random numbers table. Patients in the experiment group received telephone support (tele-nursing) provided by the researchers for 12 weeks .Telephone follow ups were performed twice weekly. The total frequency of telephone counseling averaged 24 calls per subject. The average length of these contacts was 20 minutes per call. The calls and the contents of conversation, number of calls and duration was recorded in a special form. The contents of the phone conversations were based on a support booklet. This booklet had been prepared by the researchers team based on the World Health Organization guideline regarding diabetes, and some other scientific literature, and had been confirmed by experts. At each call, the patient was asked about his /her problems and the researcher guided the patients. As well, the researcher asked the patient if she adapted the instruction that was given before. The other part of the conversation was about giving information to be followed leading to healthy life style behavior as; diet, exercise, adherence to medications, the importance of maintaining blood glucose levels within normal range, how to record blood glucose level and frequent self-monitoring of blood glucose levels, stress management. Before the termination of any telephone call, the patient was once again invited to ask her questions. Over the intervention period of 3 months, the patients performed daily self-monitoring and the nurse provided telenursing support according to the patients' needs and nursing care requirements. On the other hand, the control group did not receive any further intervention during the study period.

3) Evaluation phase Data regarding HPLP scale, SEHB scale, and blood sugar level were collected from both groups at three different points; baseline assessment before any intervention, then at 3and 6 months of intervention.

Statistical analysis

Data entry was done using Epi-Info 6.04 computer software package, while statistical analysis was done using Statistical Packages for Social Science (SPSS), version 18.0. Quality control was done at the stages of coding and data entry. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables, and means and standard deviations for quantitative variables. Qualitative variables were compared using Chi-square test. Statistical significance was considered at p-value < 0.05 and non-significant difference was at P > 0.05.

III. Results

Findings of this study were presented in four main parts: characteristic data of the study sample, self-efficacy of health behaviors, health promotion lifestyle profile scores, and physiological measurement of blood sugar.

Table (1): describes the characteristics of the studied groups. Patients in the both groups of the study were aged from 40 to 78 years, from both sexes (male and female) and they were matched in demographic data (age, sex, BMI, education, job status, and monthly income) and disease features.

Table (2): represents the distribution of self-efficacy scale's average scores at baseline assessment and at 3 and 6 months of intervention. There was no statistically significant differences regarding the self-efficacy scale's average scores among the both groups at baseline assessment before the intervention (p=0.831). On the other hand, the second (p=0.003) and third (p=0. 001) interviews, revealed statistically significant differences in terms of self-efficacy average scores between the experimental and control groups.

Table (3) shows the distribution of HPLP scores at baseline assessment and at 3 and 6 months of intervention. There was no statistically significant difference for the HPLP scale's average scores for between the experimental and control groups at baseline assessment in the first interview before any intervention (p=0.742). While there was a statistically significant difference in the HPLP scale's average scores between both groups in the second assessment (p=0.003). In addition in the third assessment, a significant increase on average scores of HPLP scale of the experimental group compared to the control group was determined (p=0.000).

Table (4) shows the level of fasting blood glucose at baseline assessment before any intervention, which reveal no statistically significant differences (p= 0.066 & 0.077) between the experimental and control groups respectively, while there was statistically significant difference (p= 0.003) between both groups regarding the level of fasting blood glucose at 6 months of intervention. According to the level of postprandial blood glucose level, the results revealed that, there was no statistically significant difference (p: 0.120) between both groups at the baseline assessment, while there were statistically significant differences (p: 0.005 & 0.004) between both groups at 3 and 6 months respectively after the intervention.

Table (5) shows that there was no significant difference between HbA1c of the both groups before the intervention. It was determined that the A1c levels of the individuals in the experimental were significantly lower, with a difference of as much as 0.49% in total at the end of the six-month monitoring. It was determined that the A1c levels of the individuals in the control were as much as 0.17 % higher than baseline value in total at the end of the six-month monitoring. .At six months, it was established that the A1c levels of the individuals in the control were higher than those of the individuals in the experimental by 0.79 % and this difference was found to be statistically significant (p<0.05)

Table 1. Distribution of descriptive characteristics of the two groups before intervention

Features	*Experiment Group N (%)N=50*	*Control Group N (%)N=50*	*P value*
Age (Mean age)	**Mean ±SD 54.41±8.54** Min=43 Max=78	**Mean ±SD 57.25±9.61** Min=40 Max=77	0.767
Gender • Female • Male	24 26	23 27	0.063
Educational Status • Literate • Primary school • High school or university	8 24 18	10 26 14	0.071
Income • Range Income < expenditure • Income equal to expenditure • Income > expenditure	13 27 10	16 26 8	0.081
Time from diagnosis of DM (years)	**Mean ± SD** 9.0 ± 8.08	**Mean ± SD** 8.50 ± 7.10	0.27
BMI (Before intervention)	**Mean ± SD** 27.93 (4.84	**Mean ± SD** 30.69 (6.67)	0.31
Diabetes family • Yes	37 13	33 17	0.12

• No			
Intervals to measure blood sugar	14	14	0.12
• Daily	16	18	
• Weekly	11	12	
• Monthly	9	6	
• Annually			
Drug	16	13	0.34
• Insulin	34	37	
• Oral			
Diabetes complications	27	29	0.37
• Yes	23	21	
• No			
Checking kidneys	26	28	0.09
• Yes	24	22	
• N0			
Examination of cardiovascular system	18	16	0.31
• Yes	32	34	
• No			
Feet examination by doctors	20	14	0.33
• Yes	30	36	
• No			
Examination of eyes	30	28	0.56
• Yes	20	22	
• No			
Following diet	16	18	0.062
• Yes	34	32	
• No			
TOTAL	50	50	100 %

Table 2: Distribution of self-efficacy scores during baseline, second and third assessments of the two groups.

Self-Efficacy Scores	*Experiment Group (n= 50)* Mean ±SD	*Control Group (n=50)* Mean ±SD	*P-value*
Baseline assessment (before intervention)	58.03±10.02	57.22±11.13	0.831
Second assessment(at 3 months of intervention)	73.14±12.22	62.19±09.36	0.003
Third assessment(at 6months of intervention)	75.37±21.25	63.12±12.41	0.001

Table 3: Distribution of health promotion lifestyle profile scores during baseline, at 3 and 6 months after intervention

Health Practice lifestyle scores	*Experiment Group (n= 50)* Mean ±SD	*Control Group (n=50)* Mean ±SD	*P-value*
Baseline assessment (before intervention)	110.23±10.02	108.21±11.12	0.742
Second assessment(at 3 months of intervention)	134.13±17.23	114.17±09.35	0.003
Third assessment(at 6 months of intervention)	145.37±21.25	119.22±12.41	0.000

Table 4: Glucose levels at different points of assessment (baseline, second and third assessments).

Glucose levels at different points of assessment	*Experiment Group (n= 50)* Mean ±SD	*Control Group (n=50)* Mean ±SD	*P-value*
Baseline assessment (before intervention) ▪ Fasting ▪ Postprandial	103.1±15.02 133.01±12.01	101.01±14.02 138.06±10.05	0.076 0.120
Second assessment(at 3 months of intervention) ▪ Fasting ▪ Postprandial	100.2±19.27 123.2±18.85	104±15.75 141.3±18.69	0.066 0.005
Third assessment(at 6 months of intervention) ▪ Fasting ▪ Postprandial	99.15±17.02 128.25±15.01	105.15±15.32 132.58±25.01	0.003 0.004

Table 5: Comparison of HbA1c Levels in Type 2 Diabetic Individuals in the two groups of experiment and control.

HbA1c	*Experiment Group (n= 50)* Mean ±SD	*Control Group (n= 50)* Mean ±SD	*P-value*
▪ Before intervention	7.79 ± 0.78	7.92 ± 2.22	0.796
▪ At 3 months of intervention	7.63 ± 0.97	8.06 ± 1.45	0.229
▪ At 6 months of intervention	7.30 ± 0.79	8.09 ± 1.28	0.013*

* The analysis used independent-sample t tests.

IV. Discussion

Telenursing is becoming the new reality in studying nursing and increasingly used treatment approach to chronic diseases. The purpose of this study was to determine the effect of tele-nursing (phone-based follow-ups) on self-efficacy, healthy lifestyle; and glycemic control in type 2 diabetic patients. The results of this study verifying the hypotheses and proved that using telenursing for follow-ups has positive effects on self- efficacy, healthy lifestyle, and blood glucose level especially postprandial.

Concerning sociodemographic characteristic of studied groups.

Using random allocation based on the results of statistical tests, there was no statistically significant difference between the experimental and the control groups in terms of demographic data (age, sex, BMI, education, job status, and monthly income) and disease features and the two groups were statistically similar in the cases cited. It must be noted that such an outcome was expected because of the random allocation of the samples in the experimental and the control groups and the two groups are matched in terms of demographic data.

Regarding self- efficacy and healthy lifestyle

The current study results determined that there was no statistically significant difference regarding the self-efficacy scale"s average scores between both groups at baseline assessment before any intervention (P>0.05), which represents that the experimental and the control groups were the same before the intervention. This was expected because of the samples and non-interference. Study by KavehSavadkuh et al. with the title: effects of the self-management program in improving the level of self-efficacy in patients with primary hypertension, shows that the two groups of the experimental and the control are homogeneous in terms of self-efficacy before the intervention (P=0.1) that also confirms the results of this study **(32)**.

Meanwhile, results revealed statistically significant differences at 3 and 6 months of intervention. This result may be due to the continues support system adopted by the researchers through tele-nursing which increased the patients"s confidence regarding their ability to adhere to the program in order to promote the life style profile to safe their life. This result was in agreement with that of the study done by Mohammadi et al. 2017, whose study finding showed that telephone follow-up in intervention group compared with the control group; there were significant differences on self-efficacy (P≥0/05) **(33)**. In the same line Dunbar et al. 2011, who investigated the impact of telephone, follow up upon the self-efficacy in women with gestational diabetes. They found difference between the groups in terms of self-efficacy scale average scores **(34)**. This study result came in accordance with Car et al. 2012, whose study finding showed that a simple telephone call for follow up intervention improved self-efficacy in the intervention group than those in control group **(35)**.

In the explanation of the effectiveness of tele-nursing (phone-based follow-ups) on the enhancement of the self-efficacy, it can be said that suffering from chronic disease and long-term treatment of patients with diabetes, causes tiredness from the routine trainings of medical staff and the patient's inability for communication, but quick access to nurses at any time and place without any limitation to express the problems, has provide an opportunity that patients can express their problems in new ways and can receive the useful counselling in order to solve the problems and through this the sense of trust and confidence in the relationship between nurses and patients may develop. This feeling of assurance that the nurses are always available increases the self-efficacy in the patient and gives the person more sense of self-efficacy and self-confidence in self-care.

Another finding of this study was associated with HPLP average scores between both groups, the results of the current study revealed that there was no a significant difference between both groups at the baseline assessment (before intervention). While there were a significant increase in HPLP average scores at second and third assessments detected among the study group. A logical explanation of this result may be due that the support and information given to the patients was the same in both groups before any intervention, however, after intervention the patients in study group had additional support and information through telephone (counselling and follow up). In calling system, patients receive calls from health care personnel in a periodical basis and get advices on their treatment and educational information. This increased the awareness towards the importance of their disorder, which lead them try to adopt appropriate healthy lifestyle to control their blood sugar. A study carried out by Abdul-Rahman et al. 2013, aiming to compare lifestyle of women with gestational diabetes who received telephone support with those who didn"t, agreed with the current result. According to the findings from the study authors, women with gestational diabetes who received telephone support were more adequate on dietary style, physical activity, prenatal self-care, and managed stress compared with those who didn"t. As well the authors emphasized on lifestyle intervention program by telephone which had been practiced by coaches, who are trained on diet, physical activity, social cognitive strategies, and motivational interviewing techniques. It is determined that this program was effective in promoting health life style profile **(36)**. Several studies have been undertaken by offering care through telephone and similar results were achieved with regards to the

effectiveness of telenursing on the adherence to diet (**37 ,38**).In one study, the researchers investigated the effect of telenursing on adherence of diabetic patients with type 2 diabetes mellitus to their diet. The results showed that telenursing improved the dietary adherence in such patients **(39)**. In another study, by Moqaddam et al., results showed that type II diabetes patients followed their diets better due to nurses' phone calls **(40)**. This system also improved the social functioning and self-efficiency and communication with health care staff **(41).**

Regarding blood glucose level

In this study there were no statistically significant differences between the study and control groups regarding the levels of fasting and postprandial blood glucose at baseline assessment (before intervention), while there was a statistically significant difference between the both groups at 3 and 6 months of intervention. Results of the current study is consistent with the results of Franc ,2010) who studied the use of phone follow up intervention and reported that change in postprandial blood sugar was remarkable, which significantly decreased the level of HbA1c, as well as changes in diet, physical activity, adherence to medication, healthy lifestyle, and self-efficacy**(42)**. These also in agreement with the results of Nesari et al. ,2008 .The researchers evaluated the effect of this technique on glycemic and lipid control on 60 patients with type 2 diabetes mellitus. The results indicated that after 12-weeks of telenursing , HbA1c, cholesterol, triglyceride and LDL levels were decreased in the intervention group in comparison to the control group**(43)**.

Also results of the current study came in accordance with the results of other studies. In a study by Sadeqi et al. and Nethari et al., nurses' follow-ups by phone calls was also effective on the rate of HbA1c and there was a significant difference between the two groups **(44, 43)** .In a cohort study by Arsand et al., who looked at mobile phone-based self-management tools for type 2 diabetes, it was determined that the blood glucose levels of diabetic patients being tele-monitored by doctors and nurses over six months fell from160 mg/dl to 140 mg/dl. This was statistically significant **(45)**. In a randomized controlled tele-monitoring study by Stone et al. 2010, it was found that the A1c levels of diabetic individuals in a tele-monitoring group were lower by $1.7 - 0.8$ % in the third and sixth months compared with a telephone group (P < 0.001) **(46)**. In a tele medicine cohort study on type 2 diabetics by, it was determined that the mean±SD A1C value was 8.5±1.4% at the initial visit and was reduced to 6.3±0.6% at 6 months (P < 0.001) (47). Another studies by Del Prato et al. 2012; Narayanan et al. 2012 and Gungar Tavsanli et al. 2013, showed an improvement in glycemic control using tele-medicine in the intervention group in comparison to the control group **(48, 49, 50)**.

A logical explanation of this result is that: In a telephone-based system, patients are being contacted by health care providers on regular bases and they would be provided with some information about their illness and their treatment method. Returning to telephone follow up sessions which the study group received led to better adherence to diet, and drug therapy prescribed by the doctor, more adaption to physical activity, increased awareness and also changing their bad health behaviors which in turn improve blood glucose level.

According to these reports, they received advices of regulating insulin or following special diets from professional nurse. This may be the reason for the control of PPG. Unlike old times when diabetes patients would visit doctors to control their PPG, in this study the patients were educated through phone conversation the importance of PPG and how to measure it and then according to the results, medications were prescribed. Informing and activating patients about their disease were features of this study. There was an increase in the PPG of controls, which means health care team should educate patients about the importance of proper control of PPG to reduce diabetes complications.

It seems that this happens because of the increased roles of the patient in taking care of themselves; the patients have discovered a new kind of relation and training and their motivation for taking care of themselves and contacting with health providers has increased. Therefore telenursing could be programmed as a part of health plan for patients with type II diabetes.

Indeed tele-nursing care provides patients with the opportunity to maintain their education effectively without interruptions. This approach reinforces the collection and interpretation of disease symptoms and findings, and attempts at disease prevention. The application of this modern technology in diabetes treatment allows improved communication between nurses and patients, the collection of reliable information, and the provision of a comfortable life to patients. This will empower the patient by helping to build self- confidence, recognize lifestyle changes, issues, or concerns that need to be addressed while becoming self-efficient. This empowerment will lead to better control of their diabetes which reinforces self-efficacy and can demonstrate improved health outcomes, lower readmission rates, and reduced healthcare costs

Limitations of this study
1. The study was not continued for a longer period than six months due to financial limitations, and large groups and multi-center studies were not performed.
2. Calls for the cases are expensive.

3. Some patients didn't answer from first call and the researchers tried to call them again and all this was time consuming for the researchers because there was no a full team

V. Conclusion

We can conclude that telenursing could promote self- efficacy and healthy behavior in patients with type II diabetes by increasing their awareness towards the disease and a treatment that can lead to controlling glycemic index. Telenursing can provide counseling services by phone after receiving clinical advice from a physician as well as continuous trainings that could have a positive effect and help the patient with diabetes to have healthy behaviors and also help to improve the results of treatment. Phone call follow-ups have a good role in clinic centers especially for patients with diabetes. This method as compared with other methods of follow-up is easier and more accessible and less costly for patients with type II diabetes who are mostly in the middle age or elderly. Phone call follow-up can cover many patients in a wide geographical area with health care they need and therefore, reduces the expenses of human resources and time and energy in health care systems.

VI. Recommendations

In the light of the study findings, the following recommendations are suggested:

- Telenursing should be programmed as a part of health plan for patients with type II diabetes.
- Further researches are required to study the factors affecting implementation and utilization of tele-nursing services.
- Conducting the study in different cultural and geographical areas can discover more facts that are based on local cultures of each area.
- According to the findings of this study, it is suggested that about the other chronic diseases such as diabetes, Cardiac and respiratory insufficiency, training programs through the Internet and the social networks must be designed and its effect on self-efficacy should be considered.

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