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**RESEARCH ARTICLE**

# IMPACT OF AN INSTRUCTIONAL PROGRAM ON KNOWLEDGE OF DIABETIC PATIENTS AND GLYCEMIC CONTROL TO PREVENT DIABETES COMPLICATION AT AZADI TEACHING HOSPITAL IN DUHOK CITY

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**ABSTRACT**

*Background: Diabetes is a lifelong condition characterized by extreme blood glucose (or blood sugar) levels, which can cause major damage and complications to the heart, blood vessels, eyes, kidneys, and nerves over time.*

*Objectives: Investigation of the effectiveness of patient's instructional program using an assessment of patient's knowledge, through the utilization of a knowledge test.*

*Methods: The study carried out at Azady teaching hospital in Duhok Governorate. A quasi-experimental design (pre-post-test) study had been adopted through the present study with the application of the pre- post-test approach for both studied and controlled groups during the period 30 of March 2021 to 20 January 2022. In order to get reliable data and a representative sample, a nonprobability (purposive) sample was selected. The sample included in the present study is (54) patients. The sample is divided into two groups; (27) patients as the study group is exposed to the instructional program and (27) patients are not exposed to the program, considered as the control group. It is a questionnaire format for the research purpose and is composed of three parts. The first part delves into the social and demographic aspects of patients consisting of (14) items, which include (Age, gender, marital status, educational level, family income, diabetes duration, diabetes type), while the second part related to patients knowledge about diabetes and its complication, which consists of (7) items as multiple-choice questions. The third part consists of (12) items related to patients' knowledge regarding management and control of their diabetes.*

*Results: After applying for the instructional program, results were reported highly significant differences toward the effect of the program's contents through raising knowledge grades of studied respondents toward controlling their diabetes and preventing diabetes complications particularly at the post1 period.*

*Recommendation: Instruction programs should be designed for all diabetic patients with both types of diabetes to improve their knowledge about the management of their diabetes and its complications and their knowledge should be updated periodically.*

***Keywords:*** *Instructional program, Diabetic patients, Knowledge, Complication.*



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## INTRODUCTION

Both type 1 diabetes (T1DM) and type 2 diabetes (T2DM) affect millions of people around the world. Diabetes is characterized by hyperglycemia and diabetes complications, which hurt cases' quality of life and place a significant profitable burden on society. Opinion, operation, and prevention of diabetes and its consequences are so critical. Microvascular conditions analogous to retinopathy, nephropathy, and neuropathy are classical diabetic complications, as are macro vascular issues analogous to a cardiovascular complaint (Armstrong, 2017).

International Diabetes Federation (IDF, 2017) stated that the frequency of diabetes mellitus is in adding worldwide with diabetes-related complications counting for over to 60 – 70 of health- care costs related to diabetes. The frequency of diabetes in grown-ups progressed 18 – 99 times was estimated to be 8.4 in 2017 and prognosticated to rise to 9.9 in 2045. The high frequency of diabetes has important social, fiscal and development counteraccusations especially in low-and middle- income countries (International Diabetes Federation [IDF], 2017).

The prevalence of diabetes is increasing in low and middle-income countries briskly than in high-income countries. Diabetes is one of the main causes of blindness, order failure, heart attacks, strokes, and lower limbs amputations. The rate of early deaths from diabetes increased by 5% between 2000 and 2016. In 2012, elevated blood glucose caused 2.2 million deaths. . In 2019, diabetes was a direct cause of nearly1.5 a million deaths. Diabetes can be treated and its consequences avoided or delayed with a healthy diet, exercises, specified drugs, regular check-ups, and treatment of complications (World Health Organization [WHO], 2021)

When compared to T1DM of similar duration, complications are a particular problem in young-onset T2DM, which is increasingly recognized as a severe phenotype of diabetes and associated with higher mortality rates, more complications, and unfavorable cardiovascular disease risk factors (Constantino, et al, 2013; Hamman et al., 2014).

## METHOD

A quasi-experimental design (pre-post-test) study had been adopted through the present study with the application of the pre- post-test approach for both studied and controlled groups during the period 30 of March 2021 to 20 January 2022. In order to get reliable data and a representative sample, a nonprobability (purposive) sample was selected. The sample included in the present study is (54) patients. The sample is divided into two groups; (27) patients as the study group is exposed to the instructional program and (27) patients are not exposed to the program, considered as the control group, The instruction program is designed based on the patient's knowledge assessment need, information gained from the review of literature, scientific lecturer and previous study. The content of the program is evaluated by (11) experts in a different field; Revision is made on the contents of the program form based on these experts' recommendations and suggestions. The study instrument was constructed depending on literature reviews and previous studies related to diabetes management and its complication

It is a questionnaire format for the research purpose and is composed of three parts. The first part delves into the social and demographic aspects of patients consisting of (14) items, which include (Age, gender, marital status, educational level, family income, diabetes duration, diabetes type), while the second part related to patients knowledge about diabetes and its complication, which consists of (7) items as multiple-choice questions. Third part consists of (12) items related to patient's knowledge regarding management and control of their diabetes such as (sources of carbohydrates, proteins, and fats. Foods recommended for diabetics, monitoring blood sugar, maintaining a healthy weight, and exercising).

Reliability of the questionnaire was used to determine the accuracy of the questionnaire since the results showed a very high level of stability and internal consistency of principle parts concerning item's responses' of the questionnaire. After applying for the proposed program, all those were calculated by using the major statistical parameter: Alpha Cronbach through calculated the result that the questionnaire is successful, meaningful, as well as a designed questionnaire for the pre-and post-test for evaluating patients about diabetes complications at Azadi teaching hospital in the city of Duhok.

### Statistical analysis

Statistics tables including. Observed Frequencies, Percents, Mean of score (MS), Grand Mean of Score (GMS), Global Mean of Score (GMS), Standard Deviation (SD), Pooled Standard Deviation (PSD), Relative Sufficiency (RS%), and Percentile (Grand/or Global) Relative Sufficiency (PGRS%), as well as scoring scales of two categories, such that (True, and False), with integer numbers (1, and 0).

Assessments intervals Scored by: [L: Low (0.00 – 33.33)]; [M: Moderate (33.34 – 66.66)]; [H: High (66.67 – 100)].

## RESULTS

Table 1, shows a summary of statistics of (Patients' knowledge about diabetes and its complications) related to the formed questionnaire's MCQ along studied (Pre, Post1, and Post2) periods. Results of testing comparisons significant with reference to studied items, as well as scoring scales assessments concerning effectiveness of applying instructional program were reported highly significant differences at $P<0.01$ toward the effect of program's contents

through raising knowledge grades of studied respondents particularly at the post1 period. Table 2, shows a summary statistics of (Patients' knowledge about controlling diabetes) related to formed questionnaire's MCQ along studied (Pre, Post1, and Post2) periods due to applying a proposed of an instructional program for the study group with comparisons significant, as well as a test retest were followed for controlled respondents. Results of testing comparisons significant with reference to studied items, as well as scoring scales assessments concerning effectiveness of applying instructional program were reported highly significant differences at P<0.01 toward effect of program's contents through raising knowledge grades of studied respondents particularly at the post1 period.

Table 1. Descriptive Statistics of the studied groups according to the (Patients' knowledge about diabetes and its complications Items) along studied periods with comparisons significant

| CQ Items | Periods | No. | Study | | | | | | Control | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | MS | SD | RS% | Ass. | Com. | C.S. (*) | MS | SD | RS% | Ass. | Com. | C.S. (*) |
| Is considered short-term diabetes complications | Pre | 27 | 0.26 | 0.45 | 26 | H | 1X2 | HS | 0.26 | 0.45 | 26 | L | 1X2 | NS |
| | Post1 | 27 | 0.78 | 0.42 | 78 | H | 1X3 | HS | 0.26 | 0.45 | 26 | L | 1X3 | NS |
| | Post2 | 27 | 0.78 | 0.42 | 78 | H | 2X3 | NS | 0.33 | 0.48 | 33 | L | 2X3 | NS |
| All of the following complications of diabetes are long term except | Pre | 27 | 0.41 | 0.50 | 41 | M | 1X2 | HS | 0.22 | 0.42 | 22 | L | 1X2 | NS |
| | Post1 | 27 | 0.89 | 0.32 | 89 | H | 1X3 | HS | 0.44 | 0.51 | 44 | M | 1X3 | NS |
| | Post2 | 27 | 0.89 | 0.32 | 89 | H | 2X3 | NS | 0.44 | 0.51 | 44 | M | 2X3 | NS |
| When the blood sugar level exceeds 600 mg/dL (33.3 mmol/L) it is called | Pre | 27 | 0.11 | 0.32 | 11 | L | 1X2 | HS | 0.07 | 0.27 | 7.41 | L | 1X2 | S |
| | Post1 | 27 | 0.70 | 0.47 | 70 | H | 1X3 | HS | 0.30 | 0.47 | 30 | L | 1X3 | HS |
| | Post2 | 27 | 0.59 | 0.50 | 59 | M | 2X3 | NS | 0.33 | 0.48 | 33 | L | 2X3 | NS |
| If the blood sugar level rises to more than 300 mg / dl, you will need | Pre | 27 | 0.70 | 0.47 | 70 | H | 1X2 | HS | 0.70 | 0.47 | 70 | H | 1X2 | NS |
| | Post1 | 27 | 1.00 | 0.00 | 100 | H | 1X3 | S | 0.74 | 0.45 | 74 | H | 1X3 | NS |
| | Post2 | 27 | 0.96 | 0.19 | 96 | H | 2X3 | NS | 0.78 | 0.42 | 78 | H | 2X3 | NS |
| Increased ketones in urine (diabetic ketoacidosis) requires | Pre | 27 | 0.41 | 0.50 | 41 | M | 1X2 | HS | 0.63 | 0.49 | 63 | M | 1X2 | NS |
| | Post1 | 27 | 0.89 | 0.32 | 89 | H | 1X3 | HS | 0.41 | 0.50 | 41 | M | 1X3 | NS |
| | Post2 | 27 | 0.78 | 0.42 | 78 | H | 2X3 | NS | 0.37 | 0.49 | 37 | M | 2X3 | NS |
| Low blood sugar is treated through | Pre | 27 | 0.63 | 0.49 | 63 | M | 1X2 | HS | 0.70 | 0.47 | 70 | H | 1X2 | NS |
| | Post1 | 27 | 1.00 | 0.00 | 100 | H | 1X3 | HS | 0.78 | 0.42 | 78 | H | 1X3 | NS |
| | Post2 | 27 | 1.00 | 0.00 | 100 | H | 2X3 | NS | 0.81 | 0.40 | 81 | H | 2X3 | NS |
| Diabetic patients can avoid long-term complications by | Pre | 27 | 0.22 | 0.42 | 22 | L | 1X2 | HS | 0.33 | 0.48 | 33 | L | 1X2 | NS |
| | Post1 | 27 | 1.00 | 0.00 | 100 | H | 1X3 | HS | 0.44 | 0.51 | 44 | M | 1X3 | NS |
| | Post2 | 27 | 0.63 | 0.49 | 63 | M | 2X3 | HS | 0.33 | 0.48 | 33 | L | 2X3 | NS |

Table 2. Descriptive Statistics of the studied groups according to the (Patients' knowledge about controlling diabetes Items) along studied periods with comparisons significant

| MCQ Items | Periods | No. | Study | | | | | | Control | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | MS | SD | RS% | Ass. | Com. | C.S. (*) | MS | SD | RS% | Ass. | Com. | C.S. (*) |
| All of the following options are main sources for diet balancing in the body except | Pre | 27 | 0.37 | 0.49 | 37 | M | 1X2 | S | 0.33 | 0.48 | 33 | L | 1X2 | NS |
| | Post1 | 27 | 0.67 | 0.48 | 67 | H | 1X3 | NS | 0.26 | 0.45 | 26 | L | 1X3 | NS |
| | Post2 | 27 | 0.59 | 0.50 | 59 | M | 2X3 | NS | 0.15 | 0.36 | 15 | L | 2X3 | NS |
| The following sources of nutrition differ in the speed of their dissemination of energy in the body | Pre | 27 | 0.37 | 0.49 | 37 | M | 1X2 | HS | 0.33 | 0.48 | 33 | L | 1X2 | NS |
| | Post1 | 27 | 0.89 | 0.32 | 89 | H | 1X3 | HS | 0.44 | 0.51 | 44 | M | 1X3 | NS |
| | Post2 | 27 | 0.78 | 0.42 | 78 | H | 2X3 | NS | 0.44 | 0.51 | 44 | M | 2X3 | NS |
| Simple carbohydrates lead to a rapid increase in the level of sugar in the blood. like | Pre | 27 | 0.63 | 0.49 | 63 | M | 1X2 | HS | 0.52 | 0.51 | 52 | M | 1X2 | NS |
| | Post1 | 27 | 0.96 | 0.19 | 96 | H | 1X3 | HS | 0.59 | 0.50 | 59 | M | 1X3 | NS |
| | Post2 | 27 | 0.96 | 0.19 | 96 | H | 2X3 | NS | 0.56 | 0.51 | 56 | M | 2X3 | NS |
| Proteins have many benefits for body, such as the importance of proteins for | Pre | 27 | 0.41 | 0.50 | 41 | M | 1X2 | HS | 0.52 | 0.51 | 52 | M | 1X2 | NS |
| | Post1 | 27 | 0.96 | 0.19 | 96 | H | 1X3 | HS | 0.48 | 0.51 | 48 | M | 1X3 | NS |
| | Post2 | 27 | 0.93 | 0.27 | 93 | H | 2X3 | NS | 0.41 | 0.50 | 41 | M | 2X3 | NS |
| Which of the following foods contains protein? | Pre | 27 | 0.41 | 0.50 | 41 | M | 1X2 | HS | 0.26 | 0.45 | 26 | L | 1X2 | NS |
| | Post1 | 27 | 0.81 | 0.40 | 81 | H | 1X3 | HS | 0.41 | 0.50 | 41 | M | 1X3 | NS |
| | Post2 | 27 | 0.89 | 0.32 | 89 | H | 2X3 | NS | 0.30 | 0.47 | 30 | L | 2X3 | NS |
| | Pre | 27 | 0.41 | 0.50 | 41 | M | 1X2 | HS | 0.19 | 0.40 | 19 | L | 1X2 | NS |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Beneficial (healthy) fats for diabetics are unsaturated fats, which come from | Post1 | 27 | 1.00 | 0.00 | 100 | H | 1X3 | HS | 0.19 | 0.40 | 19 | L | 1X3 | NS |
| | Post2 | 27 | 0.96 | 0.19 | 96 | H | 2X3 | NS | 0.26 | 0.45 | 26 | L | 2X3 | NS |
| Which of the following foods is recommended for diabetics? | Pre | 27 | 0.85 | 0.36 | 85 | H | 1X2 | NS | 0.81 | 0.40 | 81 | H | 1X2 | NS |
| | Post1 | 27 | 0.96 | 0.19 | 96 | H | 1X3 | NS | 0.81 | 0.40 | 81 | H | 1X3 | NS |
| | Post2 | 27 | 0.96 | 0.19 | 96 | H | 2X3 | NS | 0.89 | 0.32 | 89 | H | 2X3 | NS |

Continue …

| MCQ Items | Periods | No. | Study | | | | | | Control | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | MS | SD | RS% | Ass. | Com. | C.S. (*) | MS | SD | RS% | Ass. | Com. | C.S. (*) |
| Foods recommended for diabetics to reduce | Pre | 27 | 0.19 | 0.40 | 19 | L | 1X2 | HS | 0.44 | 0.51 | 44 | M | 1X2 | NS |
| | Post1 | 27 | 0.93 | 0.27 | 93 | H | 1X3 | HS | 0.56 | 0.51 | 56 | M | 1X3 | NS |
| | Post2 | 27 | 0.81 | 0.40 | 81 | H | 2X3 | NS | 0.48 | 0.51 | 48 | M | 2X3 | NS |
| When measuring the amount of sugar by the patient, it is preferable to take a blood sample from | Pre | 27 | 0.52 | 0.51 | 52 | M | 1X2 | HS | 0.44 | 0.51 | 44 | M | 1X2 | NS |
| | Post1 | 27 | 0.89 | 0.32 | 89 | H | 1X3 | HS | 0.41 | 0.50 | 41 | M | 1X3 | NS |
| | Post2 | 27 | 0.96 | 0.19 | 96 | H | 2X3 | NS | 0.41 | 0.50 | 41 | M | 2X3 | NS |
| The patient should check the blood sugar level before exercising, and the blood sugar level should be | Pre | 27 | 0.37 | 0.49 | 37 | M | 1X2 | HS | 0.56 | 0.51 | 56 | M | 1X2 | NS |
| | Post1 | 27 | 0.93 | 0.27 | 93 | H | 1X3 | HS | 0.37 | 0.49 | 37 | M | 1X3 | NS |
| | Post2 | 27 | 0.85 | 0.36 | 85 | H | 2X3 | NS | 0.41 | 0.50 | 41 | M | 2X3 | NS |
| It is preferable to exercise | Pre | 27 | 0.22 | 0.42 | 22 | L | 1X2 | HS | 0.44 | 0.51 | 44 | M | 1X2 | NS |
| | Post1 | 27 | 0.89 | 0.32 | 89 | H | 1X3 | HS | 0.48 | 0.51 | 48 | M | 1X3 | NS |
| | Post2 | 27 | 0.89 | 0.32 | 89 | H | 2X3 | NS | 0.37 | 0.49 | 37 | M | 2X3 | NS |
| In order to increase sensitivity to the effect of insulin and improve blood sugar levels, an obese patient needs to lose weight by | Pre | 27 | 0.07 | 0.27 | 7.41 | L | 1X2 | HS | 0.15 | 0.36 | 15 | L | 1X2 | NS |
| | Post1 | 27 | 0.56 | 0.51 | 56 | M | 1X3 | HS | 0.22 | 0.42 | 22 | L | 1X3 | NS |
| | Post2 | 27 | 0.56 | 0.51 | 56 | M | 2X3 | NS | 0.26 | 0.45 | 26 | L | 2X3 | NS |

(*) HS: Highly Sig. at P<0.01; S: Sig. at P<0.05; NS: Non Sig. at P>0.05; Testing based on repeated Measurement test; Com. : Combination of all probable pair wised. Evaluation Intervals Scoring Scales of Relative Sufficiency Coefficient (RS%): [L: Low (0.00 – 33.33)]; [M: Moderate (33.34 – 66.66)]; [H: High (66.67 – 100)]. Testing are based on McNemar Test.

## DISCUSSION

Table 1, shows descriptive Statistics of the studied groups according to the (Patients' knowledge about diabetes and its complications Items) along studied periods with comparisons significant, highly significant differences at P<0.01 toward the effect of program's contents through raising knowledge grades of studied respondents, particularly at the post1 period. The results of the controlled group have recorded immovable responses over the three periods with a mostly low level of the assessed border to a moderate.

The finding of the present study supported by Abd-El Mohsen, & Mohamed Shehata (2020) conducted their study about evaluating the effect of health education program on outcomes of T1DM: A randomized controlled study, there was a statistically significant difference between the study group patients pre and post-application of the program and between post-application of the program, while in control group there was no statistically significant difference between pre and post-program implementation on the patient's knowledge regarding diabetes complications.

Another study by Bett (2019) conducted about Educational Intervention on Diabetic Knowledge & HbA1c Levels on Kenyan Adults with T2DM also stated that the post-intervention mean diabetic knowledge score of the experimental group was statistically significantly higher than that of the control group at p < .001.

Table 2, shows summary statistics of (Patients' knowledge about controlling diabetes), Results of testing reported highly significant differences at P<0.01 toward the effect of program's contents through raising knowledge grades of studied respondents particularly at the post1 period. The results of the controlled group have recorded completely immovable responses over the three periods of time with a mostly low level of the assessed border to a moderate.

The result of the present study is in agreement with study conducted by Mokabel and others (2017) who studied the efficacy of a diabetic educational program and predictors of compliance of patients with noninsulin-dependent (type 2) diabetes mellitus in Al-Khobar, Saudi Arabia, and revealed that there was an improvement in regular self-checks of blood sugar, dietary regimen, and exercise and lifestyle behavior following the educational program.

## CONCLUSIONS

After applying for the instructional program, results were reported highly significant differences toward the effect of the program's contents through raising knowledge grades of

studied respondents toward control their diabetes and prevent diabetes complications particularly at the post1 period.

**ETHICAL CONSIDERATIONS COMPLIANCE WITH ETHICAL GUIDELINES**

Ethical permission was obtained from the Director of Duhok Health Office to ensure their approval and to facilitate the researcher's task The participants were informed about the research's purpose and ensured anonymity and confidentiality of the information. A written informed, voluntary participation consent was obtained from each participant.

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**AUTHOR'S CONTRIBUTIONS**

Study concept: Dr. Hussein H. Atia; Writing the original draft Emad Elias Khaleel; Data collection: Data analysis: Emad Elias Khaleel, Reviewing the final edition: All authors.

**DISCLOSURE STATEMENT**: The authors report no conflict of interest.

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