European Chemical Bulletin
ISSN 2063-5346

THE EFFECTIVENESS OF AN EDUCATIONAL PROGRAM TO EDUCATE FEMALE STUDENTS WITH LEARNING DISABILITIES WITH DIABETES ABOUT FOOD CHOICES THAT IMPROVE DIABETES RATE AND ACADEMIC ACHIEVEMENT

Nagafa Rezk Abd Elgleel Abd Elnaby[1] and Fadya Rezk Abd Elgalil Abdelnaby[2]

Article History: Received: 10.05.2023 **Revised:** 15.06.2023 **Accepted:** 20.06.2023

ABSTRACT

This study aims to evaluate the effectiveness of an educational program to educate students with learning difficulties with diabetes about food choices that improve diabetes rate and academic achievement. The descriptive and semi-experimental approach was used using the design of two equal groups and one group. The descriptive sample includes (120) female students with learning difficulties with diabetes, whose ages range between (12-15) years, with an average age of (13.5) years and a standard deviation of (0.87) years. (20) of them were selected to participate in the educational program, and they were divided to an experimental and control group of (10) female students in each group. The study used a measure of awareness of food choices that improve diabetes rate and academic achievement, and an educational program (prepared by the two researchers). The results of the study show that the level of awareness of food choices among female students is average, and that the highest dimension is the food choices that improve the rate of diabetes, followed by the food choices that improve the rate of academic achievement, and that there are statistically significant differences between the two groups in the post-measurement in favor of the experimental group, and that these differences She continued in the follow-up measurement, and there were statistically significant differences between the pre and post measurement in the experimental group in favor of the post measurement, which indicates the effectiveness of the program in raising the level of awareness of food choices that improve the rate of diabetes and the academic achievement of students with learning difficulties with diabetes.

Keywords: *educational program, food choices, diabetes, learning difficulties, academic achievement*

DOI: 10.48047/ecb/2023.12.si6.691

[1]Assistant Professor, Department of Home Economics College of Education - Najran University, KSA
nrabdelnaby@nu.edu.sa
[2]Assistant Professor, Department of Special Education, College of Education Najran University, Najran, KSA
frabdalgilel@nu.edu.sa

INTRODUCTION

Diabetes is a chronic metabolic disease characterized by high levels of glucose in the blood. It is one of the most important chronic diseases. It is widespread all over the world and is not limited to a specific age period or gender without the other, until it has become a global issue. (1-2). International statistics indicate a significant increase in the number of people with diabetes worldwide, as it reached 423 million in 2019, and is expected to increase further (3). In the Kingdom of Saudi Arabia, the rates of diabetes are increasing, as the statistics of the World Health Organization indicated that the Kingdom ranks seventh in the world in terms of rates of infection with this disease (4-5). Diabetes prevalence rates were almost ten times higher among the Saudi population in the past three ages (6), as indicated by the statistics contained in the report of the results of the Family Health Survey for the year (2018) to the prevalence of this disease among the total population by 9.9% (7)

Diabetes occurs as a result of an imbalance in the metabolism of carbohydrates due to a lack of secretion by the pancreas gland (beta cells from the islets of Langerhans) or the resistance of the body's cells to insulin or both, which leads to an increase in the level of sugar in the blood and urine. This disease is also accompanied by a disorder in the metabolism of each of the proteins. and fats (8).

Diabetes has two types that are more prevalent, the first type of which occurs in a complete inability to secrete insulin from the pancreas due to damage to beta cells, and it affects young people, and those affected depend entirely on external insulin injections. The second type is the most common in 90% of cases. And it occurs as a result of a lack of insulin secretion so that it is not enough to reduce blood sugar(9-10)

Many factors contribute to the onset of diabetes and are called predisposing factors or risk factors, including diet, obesity, and a sedentary lifestyle that increase the risk of developing diabetes (11) Other important risk factors include high familial adiposity, and insulin resistance. nutritional status, age, lifestyle changes due to urbanization etc. (12)

Diabetes mellitus can play a vital role in mortality and morbidity through persistent clinical consequences and impact on heart function, kidney failure, visual impairment and blindness, diabetic ketoacidosis or blood deficiency and infection (13) .Related complications are associated with long-term damage and failure of various organ systems, and there is an increased risk of stroke, heart disease, and peripheral nerve damage among people with diabetes compared to the general population (14). According to the World Health Organization, diabetes will be the seventh leading cause of death by 2030 (15)

In addition, it negatively affects children and adolescents and their psychological, emotional, behavioral and cognitive development, and the structure of their self-esteem, which is negatively reflected on their academic path and their performance and cognitive achievement (16). In terms of feeling tired, concentration problems, problems understanding lessons due to absence and hospitalization, which in turn leads to a decrease in academic achievement (17).

Cognitive impairment has been observed in adolescents with type 1, and poor planning, adaptation, and interaction abilities with the environment, especially in concept formation, cognitive flexibility, anticipation, problem-solving ability, and word-reading speed (18). Both type 1 and type 2 diabetes are associated with cognitive impairment (19). The prevalence of fatigue symptoms is 61% among students with diabetes. (20). There are also complications that affect the level of intelligence and academic performance in patients with diabetes over time, and that these effects are more common in females than in males (21). Teachers may add undue restrictions on top of those imposed by the disease itself; They may provide the child with extra privileges and protection, which would limit the acquisition of the necessary skills and develop passive roles instead of active ones (22).

While (23) indicates that learning disability is a co-morbid condition among American children under the age of 18 with asthma and diabetes. This is because hypoglycemia leads to a feeling of tiredness and blurry eyes, which affects absorption at school or home. It becomes even more difficult if the child or adolescent already has learning difficulties with diabetes. Individuals with diabetes who have a learning disability have worse health outcomes than those without a learning disability

On the other hand, (24) found that diabetes has a higher prevalence in people with learning disabilities than in the general population. The estimated prevalence ranges between 9-11% (compared to 4%-5% in the general population(20-26).

Studies have shown that diabetic patients' adherence to diabetes medications, nutritional advice, and physical exercise has a significant impact on the degree of diabetes control (27-28)And a positive relationship between poor dietary adherence and high blood sugar levels (29). As there is a fundamental role for the patient in controlling the level of sugar in the blood, and thus the matter does not depend on the treating physician, but rather with the participation of the patient himself (30).

However, it was revealed from the (31) study that many young people have difficulties with exercise and healthy

eating. As it was found in the study of (32) that patients who adhere to a healthy diet represent only 38.6% of the total cases. As demonstrated by the study of (33) The risk of consuming large amounts of oil is widespread among (58%) of the study sample. Also, (100%) are taking in less than 20 grams of fiber per day. Moreover, (98%) of them do not eat any nuts in their daily food. This adds significant risks DM which is why the importance of diet for the cause of diabetes must be emphasized.

However, diet is a modifiable risk factor, and dietary changes have the potential to significantly reduce disease incidence (34). Controlling the diet can improve glycemic control (35). and is therefore one of the first steps in disease management. Diet depends on nutritional assessment and treatment goals. Diet recommendations should be made in light of the patient's eating habits and lifestyle. Diet management includes education about the timing, size, frequency or composition of meals to avoid hypo or hyperglycemia after eating. and calorie distribution. The recommended distribution consists of 20% of daily calories for breakfast, 35% for lunch, 30% for dinner, and 15% for snacks. A low-cholesterol diet is also recommended (36).

Numerous studies have also shown that foods with a low glycemic index (GI) improve blood sugar levels in patients with type 2 diabetes (DM)(37).Legumes, including beans, chickpeas, lentils, and other foods recommended in national diabetes guidelines (DM) as legume-lowering glycemic index (38).Whereas, the study of (39) found that the glucose level after eating lentils alone is much lower than the glucose level after eating rice and potatoes. Studies also recommend increasing the intake of fiber found in fruits, vegetables, and legumes, increasing the intake of dairy and dairy products in the meal, and reducing the intake of snacks and fast food (40) Evidence also supports avoidance of processed foods, refined grains, processed red meat, and sugar-sweetened beverages and encouragement of fiber, vegetables, and yogurt (41). Dietary habits play a greater role in regulating blood sugar (42). Dietary habits are also linked to school performance. The study of (43) confirms a positive association with eating breakfast, eating fruits and milk, and a negative association with soft drinks, instant noodles, fast foods, and sweets.

Just as nutrition plays a major role in the proper control of blood glucose and in preventing and treating some of the risk factors for diabetes complications (44). it improves students' levels of knowledge and concentration (45). (46) study found a positive relationship between nutritional status and academic achievement. Where it was found that malnutrition in approximately (60-70%) of children is accompanied by learning difficulties, attention problems (concentration) and a decrease in academic achievement, and that iron deficiency is accompanied by poor educational ability, and iodine deficiency is accompanied by mental weakness in children (47). The nutritional behavior of children has a clear effect on intelligence, as the positive effect of the natural nutrients present in the food was observed. Choline and pantothenic acid are among the elements that help improve memory and the speed of information retrieval in children, and vitamin A, C, and B complex help improve the performance of the nervous system. Focus, intelligence development and mental activity (48). Studies have shown that there is a positive relationship between body health and mental health, and that the basis of their health is proper nutrition(49-50).

This is why it was important to educate about nutritional food options suitable for diabetics and students with learning difficulties. Diabetes education is the key to treatment (51). Nutrition education can improve DRNK and dietary practices in patients with T2DM (52). Nutrition education is a key factor in improving diet quality, health, and well-being (53). It is a construct that affects an individual's ability to evaluate food and nutrition information, understand food labels, take food safety precautions, use healthy cooking methods, apply dietary recommendations, and make healthy food choices(54-56). And a major factor in shaping nutritional behaviors, especially among children and adolescents (57). Healthy eating behaviors are essential to maintaining physical health and promoting optimal learning and school achievement (43). Therefore, it is preferable that meals be balanced in terms of quantity and quality, and not to neglect or leave a meal from it so that the body gets all its nutritional needs without excess or negligence, with a focus on nutrients related to intelligence, mental abilities, brain development, and cognitive functions. Such as iron, iodine, zinc, folic acid and essential fatty acids..

Therefore, adherence to the recommendations must be pursued through continuous nutritional education (58). Diabetes requires continuous medical care and self-management of the patient, and education and support (59). to reach and maintain near-normal blood glucose levels by ensuring proper management of insulin therapy, physical activity and diet. However, in children, it is important that the diet also provides for their other macro- and micro-nutritional needs to ensure normal growth and development (60). Which clearly confirms the need for modifications to their diet and lifestyle. (61) .or need improvement (62). Research also shows that patients with diabetes suffer from significant deficits in nutritional knowledge and skills related to diabetes(63-64).

Nutritional knowledge and skills enable individuals to make food choices that improve metabolic self-management and quality of life. Structured nutrition education is vital in the management of diabetes in children because it enhances their ability to successfully manage their condition using available resources (65-66). Therefore, it is necessary to spread food culture and food awareness among female students in schools in general, and female students with learning difficulties and those with diabetes in particular, so that they learn the appropriate food choices according to their nutritional needs and health status, which helps control the rate of diabetes and improves comprehension and academic achievement so that they can easily practice daily. From this, the research problem can

be formulated in this question: What is the effectiveness of an educational program to educate students with learning disabilities with diabetes about food choices that improve diabetes rate and academic achievement?

RESEARCH AIMS

The study aims to identify "the extent of the effectiveness of an educational program to educate schoolgirls with learning difficulties with diabetes about food choices that improve diabetes rate and academic achievement", and other sub-objectives branch out from this objective, as follows:

1-Exposing the awareness of diabetic students with learning disabilities about food choices that improve the rate of diabetes.

2- Exposing the awareness of diabetic students with learning difficulties about food choices that improve the rate of academic achievement.

3- Planning and implementing an educational program to educate female students with learning disabilities and diabetics about food options that improve diabetes rate and academic achievement.

4-Examining the effectiveness of an educational program to educate female students with learning difficulties and diabetics about appropriate food choices that improve diabetes and academic achievement.

5- Detecting the effectiveness of an educational program to educate female students with learning difficulties and diabetics about food choices that improved the rate of diabetes and academic achievement after applying the program in follow-up measurement.

RESEARCH IMPORTANCE

1- Shedding light on one of the most prevalent chronic diseases, which is diabetes, in terms of defining it, its types, and prevention factors, and introducing students to how to calculate meals according to the appropriate calories, as well as the type of food that is allowed and prohibited for diabetics.

2- Educating students with learning difficulties about appropriate foods that help them improve academic achievement.

3-The importance of this research lies in its handling of an important stage in human life, which is childhood, where there is a passion for knowledge and curiosity, which is a stage of intellectual and cognitive building for the child, and it is necessary to provide it with the necessary information and knowledge, including appropriate nutrition for diabetes, which helps to improve academic achievement.

4- Increasing public awareness so that people who are most vulnerable to the risk factors for this disease can be identified and encouraged to consult a doctor and obtain early preventive programs.

5- Benefiting from the results of this research in other studies on people with special needs and diabetes.

RESEARCH LIMITS

The current research was limited to the following limits:

1- Objective limits of the effectiveness of an educational program to educate female students with learning difficulties with diabetes about food choices that improve diabetes rate and academic achievement.

2- Human limits: students with learning disabilities who have diabetes in the intermediate stage.

3-Temporal limits: The field study was conducted in the first semester of the academic year 2022-2023.

4- Spatial boundaries: schools of education in the Najran region.

RESEARCH TERMS

-Academic achievement: It is every performance that the student performs in the various school subjects, which can be evaluated and measured by the marks of certain tests or the estimates of teachers (67) and is defined procedurally as the degree that the student obtains in the achievement tests.

-learning difficulties: It is manifested by the appearance of one or more of these symptoms and lasts for at least six months. These symptoms are (inaccurate pronunciation of the word or slowly and effort while reading the words, difficulty in understanding the words or texts read by the learner, difficulty in spelling, difficulty in written work, difficulty mastering numbers and arithmetic problems or grouping, difficulties in mathematical thinking. Special learning (68), which the researchers adopted, is a procedural definition for this research.

-Students with learning disabilities and diabetes:These are the students diagnosed at school as having learning difficulties and having diabetes.

-Food choices: They are food choices and alternatives that suit each student individually according to his health condition and nutritional needs

RESEARCH METHODOLOGY AND PROCEDURES:

First - Study Methodology:
First - the study methodology: The current research relies on the descriptive approach to identify the level of awareness of food choices that improve diabetes rate and academic achievement, and the quasi-experimental approach as an experiment aimed at identifying the effectiveness of an educational program (independent variable) educating schoolgirls with learning difficulties with diabetes about food choices that improve diabetes rate and academic achievement (dependent variable), in addition to using the experimental design with two equal groups (experimental and control) to determine the impact of the program (post-measurement) on the variables of the study, as well as the use of design with one group to find out the continuity of the effect of the program after the follow-up period (traceral measurement of the experimental group)

Second - the study population:
The study population consisted of all female students with learning difficulties who had diabetes in the integration schools affiliated to the Ministry of Education in the Najran region in the Kingdom of Saudi Arabia.

Third, the study sample:
Study sample: The descriptive sample consisted of (120) schoolgirls with learning disabilities who had diabetes, and (20) schoolgirls were selected among them who had the lowest scores in awareness of food choices that improve diabetes rate and academic achievement. Several steps were used, namely:

•A questionnaire was applied to awareness of food choices that improve the rate of diabetes and their academic achievement to limit the students who have a low or medium level at a minimum level in this area.

•They were met and the idea of the educational program was presented to them.

•A questionnaire on awareness of dietary choices that improve diabetes rate and academic achievement was applied to female students who agreed to participate in the program.

• The educational program was applied, data analyzed and results extracted.

Fourth - the equivalence between the members of the experimental and control groups:
Equivalence was conducted between the experimental and control groups before applying the program, using the Mann-Whitney test, to verify the equivalence of the two groups in each of: chronological age, awareness of food choices that improve diabetes rate, and academic achievement, and Table (1) illustrates this.

Table (1) Significance of the differences between the average ranks of the scores between individuals in the experimental and control groups in chronological age, socio-economic level, awareness of food choices that improve diabetes rate and academic achievement is clear from Table (1) that the Z value calculated for the total score and sub-dimensions is less than the limiting value (1.96), and this indicates that there are no statistically significant differences between the averages of the chronological age ranks and the level of awareness of food choices that improve the rate of diabetes and academic achievement for the members of the experimental and control groups, which reassures the researchers of the homogeneity of the two samples before applying the program.

Dimensions	Group	Rank average	Total ranks	U value	z value	sig
chronological age	Experimental	11.45	114.50	40.500	- 0.763	0.446
	Control	9.55	95.50			
Awareness of food choices that improve diabetes	Experimental	9.05	90.50	35.500	-1.108	0.268
	Control	11.95	119.50			
Awareness of food choices that improve academic achievement	Experimental	9.55	95.50	40.500	- 0.729	0.466
	Control	11.45	114.50			
The overall score of the scale	Experimental	8.75	87.50	32.500	-1.334	0.182
	Control	12.25	122.50			

Fifth: Study tools:
1- .A measure of awareness of food choices that improve diabetes and academic achievement (prepared by the two researchers).

2-An educational program to educate students with learning disabilities who have diabetes about food options that improve diabetes rate and academic achievement (prepared by the two researchers).

These tools can be presented in detail as follows:

1- A measure of awareness of food choices that improve diabetes and academic achievement, prepared by the two researchers

Description of the measure and its purpose:
This scale aims to measure the level of awareness of dietary choices that improve diabetes rate and academic achievement. It consists of 50 statements, which are divided into two main dimensions. The first dimension is the awareness of food choices that improve the rate of diabetes and includes 25 statements, while the second dimension is awareness of food choices that improve the rate of academic achievement and also includes 25 statements.

Psychometric properties of food choices awareness scale that improve diabetes rate and academic achievement in the current study:
The validity of the internal consistency was calculated by applying it to (40) female students with learning difficulties with diabetes by finding the Pearson correlation coefficient between the scores of each item and the total score of the scale after deleting the score of the item from the total score of the scale. The correlation coefficient was also calculated between the score of each dimension and the total score of the scale, and this is shown in Table (2):

Table (2) Correlation coefficients between each score and the total score of the dimension to which it belongs after deleting the paragraph score of the scale of awareness of food choices that improve diabetes rate and academic achievement

Awareness of food choices that improve diabetes				Awareness of food choices that improve academic achievement			
Sequence	**correlation coefficient**	**Sequence**	**correlation coefficient**	**Sequence**	**correlation coefficient**	**Sequence**	**correlation coefficient**
1	0.891**	14	0.841**	26	0.721**	39	0.591*
2	0.872**	15	0.811**	27	0.711**	40	0.581**
3	0.854**	16	0.831**	28	0.701**	41	0.571**
4	0.865**	17	0.821**	29	0.691**	42	0.561**
5	0.881**	18	0.801**	30	0.681**	43	0.551**
6	0.871**	19	0.791**	31	0.671**	44	0.541**
7	0.861**	20	0.781**	32	0.661**	45	0.841**
8	0.851**	21	0.771**	33	0.651**	46	0.811**
9	0.841**	22	0.761**	34	0.641**	47	0.831**
10	0.831**	23	0.751**	35	0.631**	48	0.821**
11	0.821**	24	0.769**	36	0.621**	49	0.801**
12	0.811**	25	0.769**	37	0.611**	50	0.791**
13	0.789**			38	0.601**		

** Correlation coefficients at (0.01) level * Correlation coefficients at (0.05) level. It is clear from Table (2) that all items of the questionnaire of awareness of dietary choices that improve diabetes rate and academic achievement have positive and statistically significant correlation coefficients at (0.01), which means that the scale has a high degree of validity.

Internal consistency (the item with the overall score of the dimension to which it belongs) The validity of the internal consistency was calculated through the scores of the rationing (exploratory) sample by finding the Pearson correlation coefficient between scores between the score of each dimension and the total score of the scale, and this is indicated in Table (3)

Table (3) Correlation coefficients between the score of each dimension of the scale and the total score of the scale after deleting the dimension score from the total score n = (40)

Dimensions	**correlation coefficient**
Awareness of food choices that improve diabetes	**0.836****
Awareness of food choices that improve academic achievement	**0.947****

****Correlation coefficients at (0.01) level * Correlation coefficients at (0.05) level

It is clear from the table (3) that the values of the correlation coefficients are high and a function at the level (0.01), which indicates the validity of the scale.

The stability of the scale by two methods (alpha-Cronbach) and the split half method : The stability of the study tool was calculated using the (alpha-Cronbach) coefficient and the split half method, which is illustrated in Table (4)

Table (4) coefficients of stability of the study tool using the coefficient (alpha-Cronbach) n = (40)

s	Dimensions	Alpha-Cronbach	Half segmentation

1	Awareness of food choices that improve diabetes	0.870	0.850
2	Awareness of food choices that improve academic achievement	0.830	0.810
Total marks		0.860	0.840

- Weak Less (0.5) ◆ Medium between (0.5-0.7) ◆ High Greater (0.7)

It is clear from Table (4) that the stability coefficients are high and are greater than (0.7), which gives a good indicator of the stability of the tool, and accordingly the scale can be used in the current study.

Resolution correction:
The response system was determined on the items of the questionnaire and corrected, for each item there were three responses (agree, do not know, disagree) and the order of scores (3-2-1) in the case of positive statements and vice versa in the case of negative statements. options, so get category range = (3 - 1) / 3 = 0.67. The criterion for judging the results of the questionnaire is 1.67 or less (low) More than 1.67 but less than 2.23 (medium) 2.23 or more (high).

3- **An educational program to educate students with learning disabilities who have diabetes about the appropriate food options for them.**
An educational program was prepared to educate students with learning disabilities who have diabetes about food choices that improve diabetes rate and academic achievement.

Techniques used in the program: Many techniques were used, including cognitive reconstruction, problem-solving method, role-playing, modeling, homework, and reinforcement. Educational activities were also used: - Lecture, brochures on diabetes, video clips, illustrations, leaflets, brainstorming.

Program objectives
This program aims to educate students with learning disabilities who have diabetes about food choices that improve diabetes rate and academic achievement. This program uses techniques of education and awareness, which is a type of cognitive-behavioral counseling, that focuses on changing thoughts and feelings related to diabetes and academic achievement, and promoting behaviors that are in line with personal goals and values. This program includes goals that include the following:

1.Indicative objective: To educate students with learning disabilities who have diabetes about food options that improve diabetes rate and academic achievement.

2. The preventive goal: to provide the experimental group with healthy eating behaviors that protect them from complications of diabetes and increase their self-confidence

The general objectives of the programme

-Enhancing the understanding of female students with learning disabilities with diabetes about the concept of healthy food choices that are appropriate for their condition, and providing the necessary tools and techniques to apply them in their daily lives.

-Enhancing the academic achievement skills of female students with learning difficulties with diabetes, in order to improve their academic level and provide them with appropriate educational support.

-Provide the necessary information about the nature of diabetes and its potential effects on the body and health, and enhance understanding and awareness of the special needs of female students and how to meet them.

-Enhancing the skills of controlling the level of sugar in the blood of students with learning disabilities who suffer from diabetes, and providing effective tools and strategies to maintain a normal level of sugar and avoid complications.

-Encouraging female students to develop a daily routine prepared for physical, sports, cultural and social activities, and to promote positive and creative moments in their daily lives.

- Providing psychological support to the students by establishing support groups and exchanging experiences among the students who suffer from similar challenges, and encouraging communication and joint cooperation in overcoming problems.

Procedural objectives:

These objectives are the practical applications achieved through the program sessions, and include the following:

-That participants acquire positive thinking skills and turn negative thoughts into positive ones.

-That the participants be able to apply the techniques of positive thinking and show mental flexibility.

-Optimism and a positive perception of the future should be improved among the participants.

-That the participants learn communication skills and positive interaction with teachers and colleagues, in order to

improve the social and academic relationship between them.

-That the academic achievement skills of the participants be improved, by applying the education and awareness techniques used in the program.

-For the participants to acquire information about the nature of diabetes and its effects on health and the body, and the importance of following a healthy and appropriate diet for their condition.

-That the techniques of selecting healthy and appropriate food options be applied to the condition of the participants, by involving them in the process of planning, preparation and consumption.

-Techniques for controlling blood sugar level should be applied to the participants, by involving them in the process of measuring, recording and analyzing the blood sugar level.

-To train participants to develop a daily routine prepared for physical, sports, cultural and social activities, by involving them in the process of planning and implementing these activities.

-That the positive and creative moments in the lives of the participants be enhanced, by involving them in the process of creating artistic, literary or scientific works that express their hobbies or interests.

-To provide psychological support to the participants through the establishment of support groups and the exchange of experiences among the participants who suffer from similar challenges, by involving them in the process of communication and joint cooperation in overcoming problems.

- To assess the level of achieving the desired goals of the program, by involving participants in the evaluation process, observations and recommendations for future improvement of the program.

Program limits

•Time limits: The implementation of the program took about a month, with 3 sessions per week, with a total of 12 sessions, and the time of each session ranged between 45-60 minutes.

•Spatial boundaries: The program was implemented in the schools of integration of education in Najran.

•Human limits: The program was applied on a sample of schoolgirls with learning disabilities who suffer from diabetes, in the age group of 12-15 years.

Key features of the program:

•The method of counseling used: The program was applied in a (collective) manner on the members of the counseling group.

•Language of the program: The program is presented in an easy language, ranging from colloquial to classical, to make it easier for them to understand and benefit from the sessions.

•Stages of implementing the program: It was carried out in five stages, namely: preparation, preparation, initiation, implementation, evaluation, and follow-up.

•Content of the sessions: The content of the educational sessions was selected based on the general and procedural goals that were identified for the program and the practical procedures, including the techniques, the guiding method and the material means used.

Exploratory study:

An exploratory study of the program used in the current research was conducted on a number of female students who meet the same conditions as the experimental sample**. The** appropriate duration for each session, the appropriate number of sessions to achieve the goal, and the techniques used were identified.

Table No. (5) shows the arrangement of the educational program sessions.

session number	Session title	Objective of the session	The techniques used	educational activities	time
1	Introduction and acquaintance between the researchers and the guide group and the definition of the program	-Achieving familiarity, familiarity, affection and trust between researchers and sample members. -Defining the sample members the reason for their presence in the advisory group - Introducing the program and giving a comprehensive idea about it and the main steps in light of which	- Dialogue and discussion - Presentations - reinforcement	-lecture - Video scenes - illustrative pictures	(45-60) minutes

		the educational sessions take place - Identifying the status of the participants and identifying their individual needs			
2	Learning difficulties, and how to overcome them.	Clarifying the causes and sources of learning difficulties that they face in their academic lives. Learn how to overcome learning difficulties in effective ways. - That the participants identify some strategies and skills that help them improve academic achievement.	-Cognitive reconstruction - Problem solving - Modeling - Dialogue and discussion - Reinforcement - homework	Lecture - Video - Illustrations - Leaflets - Brainstorming	(45-60) minutes
3	Diabetes and its impact on health and the body	-Identifying the pancreas and the hormone insulin and their relationship to diabetes - Differentiate between types of diabetes - Determine the causes of diabetes -Remember the risk factors - Explain the methods of prevention- Remember the effect of diabetes on the body	Cognitive reconstruction - problem solving - modeling - dialogue and discussion - presentations - reinforcement - homework	-Lecture - Booklets -video -illustrative pictures - Leaflets - Brainstorming	(45-60) minutes
4-5	Nutrients	Know the importance of nutrients Determine the sources of nutrients Remember the effect of nutrients on blood sugar	- Cognitive reconstruction - problem solving - modeling - dialogue and discussion - presentations - reinforcement - homework -	-lecture- -illustrative pictures - Brochures - brainstorming - live examples of types of food	(45-60) minutes
6	Appropriate food choices that improve academic achievement	-Remember the nutrients that improve academic achievement - Identify foods that reduce concentration	Dialogue and discussion Presentations - reinforcement - homework	-Lecture - Video scenes - Illustrations - Brochures - brainstorming - live examples of food	(45-60) minutes
7-8	Food choices that improve diabetes	Remember the allowed foods Determine which foods are best avoided Learn about foods that should be eaten with caution -The multiplicity of foods that benefit the diabetic patient - Identifying suitable food alternatives for diabetes	Dialogue and discussion Presentations - Reinforcement - role playing - homework	-Lecture - Video scenes - Illustrations -Brochures - brainstorming - live examples of food	(45-60) minutes
9-10-11	Healthy eating and meal planning	Learn how to calculate carbohydrates, proteins and fats Using food alternatives to create healthy meals that improve diabetes and academic achievement	Dialogue and discussion Presentations - Reinforcement - role playing - homework	Lecture - Video scenes - Illustrations - Brochures - brainstorming - live examples of food	(45-60) minutes
12	Review and	Review what has been accomplished	-Discussion	-lecture	(45-60)

	integrative view of the program. Closing calendar, day for fun	in previous sessions. -Remind the respondents of all the techniques, information and skills they acquired through the programme .- Standing on the strengths and weaknesses in the extent to which the program achieves its main objective .-Review any shortcomings, defects, or any technical or session before ending the program .Preparing the sample members to finish the program Evaluation of the effectiveness of the program in developing awareness of dietary choices that improve diabetes rate and academic achievement Thanking the respondents, celebrating them, and encouraging them to continue implementing and following up on what they learned through the program sessions	- reinforcement	Brainstorming	minutes

Program evaluation:

•Initial formative evaluation: It is done at the end of each session to measure the students' achievement of the activity and the homework.

•Final evaluation: Post-tests are conducted to identify awareness of food choices that improve diabetes rate and academic achievement, and compare the results with the pre-tests and with the control group.

• Follow-up of the program: It takes place two months after taking the post-test by applying a follow-up test.

Seventh: The statistical methods used in the study:

Seventh: The statistical methods used in the study: In order to reach the results that achieve the objectives of the study and analyze the data, a variety of statistical methods were used, by using the Statistical Package for Social Sciences (SPSS), after the data was encoded and entered into the computer, and the statistical methods that were used in this study are:

-To calculate the psychometric characteristics of the questionnaire, the correlation coefficient (Pearson), Cronbach's alpha, and half-partition using (Sieberman's) equation were used, in order to verify the validity and stability of the questionnaire.

Means and standard deviations to find out the level of awareness of food choices that improve the rate of diabetes and academic achievement of female students with learning disabilities who have diabetes before and after applying the program.

The Mann-Whitney test, the Wilcoxon test, and the binary correlation coefficient of ranks in order to verify the hypotheses of the study regarding the effect of the program on the level of awareness of food choices that improve the rate of diabetes and the academic achievement of the participants.

Study results and discussion

First, the results of the descriptive study: The first question was presented, which states: "What is the level of awareness of food choices that improve the rate of diabetes and academic achievement in a sample of female students with learning disabilities with diabetes ?.

To answer this question, arithmetic means, standard deviations, percentages and ranks were calculated for the responses of female students with learning disabilities with diabetes on the dimensions of awareness of food choices that improve diabetes rate and academic achievement Table (6)

Table (6): shows the results of the arithmetic mean and standard deviation of the dimensions of awareness of food choices that improve diabetes rate and academic achievement.

Dimensions	M	S d	relative weight	The level	arrangement
Awareness of food choices that improve diabetes	2.093	0.105	69.8%	Medium	1
Awareness of food choices that improve academic achievement	2.090	0.093	69.7%	Medium	2

The general arithmetic mean	2.092	0.069	69.7%	Medium	

It appears from Table (6) that the level of awareness of food choices that improve diabetes rate and academic achievement among female students with learning disabilities with diabetes is average (2.092) with a relative weight of (69.7%), and that the highest dimension is food choices that improve diabetes rate, followed by food choices that improve academic achievement rate. These results explain that schoolgirls with learning disabilities with diabetes have moderate knowledge of foods and drinks that affect the level of sugar in the blood and school performance, and that they need more awareness and guidance on how to choose a healthy and balanced diet that helps them control their disease and improve their learning abilities. And the vocabulary of the scale is explained in Tables (7, 8).

The first dimension: the dimension of food choices that improve the rate of diabetes

Table 7: The results of the arithmetic mean and standard deviation of the food choices dimension items that improve the rate of diabetes among schoolgirls with learning disabilities who have diabetes, arranged in descending orde.

S	Phrases (sentence)	M	S d	relative weight	the level	arrangement
7	Increasing rice in diabetic patients' meals raises the level of sugar	2.558	0.499	85.3%	high	1
24	Carbohydrates account for 55-60% of calories.	2.525	0.501	84.2%	high	2
12	Eating 3 servings of whole grains a day reduces the risk of type 2 diabetes.	2.517	0.502	83.9%	high	3
14	Diabetics can eat milk and low-fat dairy products	2.517	0.502	83.9%	high	3
2	Sugar is completely avoided when designing diabetic meals.	2.508	0.502	83.6%	high	5
9	It is better for a diabetic to eat brown bread than white bread	2.500	0.502	83.3%	high	6
10	Cinnamon is associated with a reduced risk of type 2 diabetes.	2.500	0.502	83.3%	high	6
20	Diabetics can eat cucumber in any quantity.	2.500	0.502	83.3%	high	6
19	Eating foods rich in natural fiber reduces the risk of developing diabetes.	2.492	0.502	83.1%	high	9
22	Diabetics distribute their calories over 5 meals a day	2.492	0.502	83.1%	high	9
11	Diabetics eat meals at about the same time	2.483	0.502	82.8%	high	11
8	Garlic lowers blood sugar	2.475	0.501	82.5%	high	12
21	Meals high in saturated fat increase the risk of developing diabetes.	2.475	0.501	82.5%	high	12
25	Diabetics should not go more than 4-6 hours without eating	2.475	0.501	82.5%	high	12
23	Breakfast is eaten before taking the insulin dose	2.458	0.500	81.9	high	15
15	Legumes lower the glycemic index.	1.608	0.490	53.6%	low	16
4	Onions increase the body's metabolism of sugar	1.525	0.501	50.8%	low	17
1	The glycemic index of quinoa is lower than that of other grains.	1.517	0.502	50.6%	low	18
13	Peas contribute to lowering the digestion of sugar	1.483	0.502	49.4%	low	19
18	Read food labels to check the glycemic index.	1.475	0.501	49.2%	low	20
3	Lupine activates the pancreas to secrete insulin	1.467	0.501	48.9%	low	21
5	Diabetics eat fatty meat a lot	1.467	0.501	48.9%	low	21
16	Lentils help regulate glucose in the body	1.458	0.500	48.6%	low	23
17	Diabetics who take diabetes medications do not need to organize meals	1.442	0.499	48.1%	low	24
6	Diabetics increase the amount of spicy	1.408	0.494	46.9%	low	25

	foods in their meals.					
	The general arithmetic mean	2.093	0.105	69.8%	Medium	

Table (7) shows that the level of awareness of food choices that improve the rate of diabetes among female students with learning disabilities with diabetes came to a moderate degree with an average of (2.093) and a relative weight of (69.8%) from their point of view. This indicates that they are not completely ignorant of the appropriate food choices for them, but they are not proficient in choosing and applying them in their daily lives. The two researchers explain these results by the fact that schoolgirls with learning difficulties with diabetes may be affected by the food habits and culture around them, or they may lack the guidance and supervision of their parents or teachers.

The table also reveals that the highest averages were represented in paragraph (7), which states that "increased rice in the meals of a diabetic patient raises the level of sugar", as it reached (average = 2.558, standard deviation = 0.499) and with a relative weight of (85.3%) and came with a "high" degree, followed by paragraph (24) which states "carbohydrates represent 55-60% of calories" as it reached (average = 2.525, standard deviation = 0.501) and b Relative weight (84.2%) and came with a "high" degree. The table also reveals that the lowest averages were represented in Paragraph (6), which states that "a diabetic patient has a lot of spicy (hot) substances in his meals," as it reached (average = 1.408, standard deviation = 0.494) and with a relative weight of (46.9%). 99) with a relative weight of (48.1%) and a "low" score.

The second dimension: food choices that improve academic achievement

Table 8: The results of the arithmetic mean and standard deviation of food choices items that improve the academic achievement rate of female students with learning disabilities with diabetes, arranged in descending order.

S	Phrases (sentence)	M	S d	relative weight	the level	arrangement
46	Iron deficiency reduces cognitive performance	2.550	0.500	85.0%	high	1
44	Milk is useful for cognitive functions	2.533	0.501	84.4%	high	2
47	Nuts help improve memory	2.533	0.501	84.4%	high	2
48	Eating 3-5 servings of vegetables and fruits per day improves school performance	2.533	0.501	84.4%	high	2
37	Vitamin E improves learning ability	2.508	0.502	83.6%	high	5
32	High cholesterol lowers performance-related intelligence	2.500	0.502	83.3%	high	6
33	A meal rich in protein increases alertness	2.492	0.502	83.1%	high	7
35	Iodine affects mental development	2.492	0.502	83.1%	high	7
49	Drink 8 glasses of water daily	2.492	0.502	83.1%	high	7
45	The level of glucose in the blood affects memory	2.483	0.502	82.8%	high	10
27	Pumpkin energizes and strengthens memory	2.475	0.501	82.5%	high	11
50	Eating fish increases the speed of remembering	2.475	0.501	82.5%	high	11
39	Fast food increases school performance	2.467	0.501	82.2%	high	13
34	Balanced food in the early stages of life improves cognitive performance	2.458	0.500	81.9%	high	14
36	Soft drinks activate memory	2.442	0.499	81.4%	high	15
28	Neglecting breakfast affects mental abilities	1.585	0.496	52.5%	low	16
42	Malnutrition raises the rate of academic achievement	1.550	0.500	51.7%	low	17
29	Zinc enhances learning ability	1.525	0.501	50.8%	low	18
41	Low level of magnesium in the body leads to learning difficulty	1.525	0.501	50.8%	low	18
26	Vitamin B1 plays a role in concentration and knowledge acquisition	1.500	0.502	50.0%	low	20
30	Pure (Unsweetened) Cocoa Powder contains brain-boosting ingredients	1.467	0.501	48.9%	low	21
31	Omega 3 contributes to the improvement of intelligence	1.458	0.500	48.6%	low	22
43	Selenium deficiency impairs brain function	1.433	0.498	47.8%	low	23
40	High levels of lead in the body lead to	1.400	0.492	46.7%	low	24

	learning difficulties					
38	Vitamin C contributes to protecting the brain	1.392	0.490	46.4%	low	25
	The general arithmetic mean	2.090	0.093	69.7%	Medium	

Table (8) shows that the level of awareness of food choices that improve the rate of academic achievement among female students with learning disabilities with diabetes came to a medium degree with an average of (2.090) and a relative weight of (69.7%) from their point of view. This indicates that they are not completely ignorant of the appropriate food choices for them, but they are not proficient in choosing and applying them in their daily lives. The researcher explains these results that the students with learning difficulties with diabetes may be affected by the food habits and culture around them, or they may lack guidance and supervision from their parents or teachers.

The table also reveals that the highest averages were represented in paragraph (46), which states that "iron deficiency reduces cognitive performance", as it reached (average = 2.550, standard deviation = 0.500) and with a relative weight of (85.0%) and came with a "high" degree, followed by paragraph (44) which states "milk is beneficial for cognitive functions" as it reached (average = 2.533, standard deviation = 0.501) and with a relative weight of (84. 4%, and it came with a "high" score.

The table also reveals that the lowest averages were represented in paragraph (38), which states "Vitamin C contributes to protecting the brain," as it reached (mean = 1.392, standard deviation = 0.490) and with a relative weight of (46.4%) and came with a "low" degree, followed by paragraph (40) which states "a high level of lead in the body leads to difficulty in learning" as it reached (average = 1.400, standard deviation = 0.492) and with a relative weight of (4). 6.7%, with a "low" score.

Second: the experimental study:

The results of the first hypothesis: It states that "there are statistically significant differences at the level of significance ($\alpha \leq 0.05$) in the average ranks on the scale of awareness of dietary choices that improve the rate of diabetes and academic achievement between the members of the experimental group and the control group in the post-measurement".

In order to validate this hypothesis, the Mann-Whitney test (U) and the value of Z were used as one of the non-parametric methods to identify the significance of the differences between the mean scores of female students in the telemetry, in order to determine the significance of what might happen to the awareness of food choices that improve the rate of diabetes and academic achievement among female students with learning difficulties with diabetes. Two independent samples

Table (9) Significance of the differences between the mean ranks of the post-measurement scores and the effect size of the experimental and control groups in the questionnaire of awareness of food choices that improve the rate of diabetes and academic achievement among female students with learning disabilities with diabetes

Dimensions	Group	Rank average	Total ranks	U value	z value	sig	r prd
Awareness of food choices that improve diabetes	Experimental	15.50	155.00	0.0	-3.788	0.000	1.0 Very large
	Control	5.50	55.00				
Awareness of food choices that improve academic achievement	Experimental	15.50	155.00	0.0	- 3.788	0.000	1.0 Very large
	Control	5.50	55.00				
The overall score of the scale	Experimental	15.50	155.00	0.0	-3.784	0.000	1.0 Very large
	Control	5.50	55.00				

It is clear from Table (9) that the Z value calculated for the total score and sub-dimensions is higher than the cut-off value (1.96), which indicates that there are statistically significant differences between the mean ranks of the scores of the experimental and control groups on the scale of awareness of food choices that improve the rate of diabetes and academic achievement of schoolgirls with learning disabilities with diabetes in the post-measurement in favor of the experimental group, which means high awareness of food choices that improve diabetes rate and academic achievement of the experimental group.

The researcher explains this result by the fact that the educational program contributed to raising the level of awareness of food choices that improve the rate of diabetes and academic achievement in the experimental group of female students with learning difficulties with diabetes. The program used counseling techniques and educational activities, which aim to change the thinking and behavior of the participants, and increase their ability to adapt to their health and academic conditions. Introducing them to the appropriate food options for each of them available in

the market, and how to form a healthy, balanced meal that helps control the rate of diabetes, improves academic achievement, and deals with obstacles and difficulties. In this way, the experimental group was able to learn about their values and goals as students, and to adhere to the behaviors that help them achieve them, such as choosing foods that are beneficial to their health, or reviewing their lessons regularly.

The results of the second hypothesis: It states that "there are statistically significant differences at the level of significance ($\alpha \leq 0.05$) in the average ranks on the questionnaire of awareness of dietary choices that improve the rate of diabetes and academic achievement among the members of the experimental group in the pre and post measurement."

To test the validity of this hypothesis, the Wilcoxon test and the Z value were used as one of the non-parametric methods to identify the significance of the differences between the mean ranks of the scores of the experimental group, the measure of awareness of food choices that improve the rate of diabetes and the academic achievement of female students with learning difficulties with diabetes and its dimensions in the pre and post standards.

Table (10) the significance of the differences between the mean scores of the experimental group in the pre and post measurements, and the effect size of the level of awareness of food choices that improve the rate of diabetes and academic achievement among female students with learning difficulties with diabetes.

Dimensions	Measurement AFTER ME/FOLLOW ME	N	M	Total	Values Z	.Sig	r prd
Awareness of food choices that improve diabetes	Negative ranks	0	0.00	0.00	-2.812	0.005	1.0 Very large
	positive ranks	10	5.50	55.00			
	Equality	0					
Awareness of food choices that improve academic achievement	Negative ranks	0	0.00	0.00	-2.803	0.005	1.0 Very large
	positive ranks	10	5.50	55.00			
	Equality	0					
Total	Negative ranks	0	0.00	0.00	-2.805	0.005	1.0 Very large
	positive ranks	10	55.00	55.00			
	Equality	0					

Table (10) indicates that there are statistically significant differences between the mean ranks of the cycles in the awareness of food choices that improve the rate of diabetes and the academic achievement of female pupils with learning disabilities with diabetes in the pre and post measurements of the experimental group in favor of the post measurement.

The researchers explain this result by the fact that the educational program that was prepared to educate female students with learning difficulties with diabetes about food choices that improve diabetes rate and academic achievement led to an increase in the level of awareness of the experimental group in the post-measurement compared to the pre-measurement. This may be due to the students' willingness and enthusiasm to benefit from the educational program. The program used behavioral techniques and educational activities, which aim to change the thinking and behavior of the participants, and increase their ability to choose foods that are beneficial to their health and improve their academic performance. Among these techniques, cognitive reconstruction, problem-solving method, role playing, modeling, homework, and reinforcement (reinforcement). In addition to lectures, presentations, dialogue and discussion, in this way, the experimental group was able to identify and correct misconceptions and beliefs about diabetes and food, and to develop problem-solving skills that they encounter in choosing appropriate foods, and to reduce the level of anxiety and fear of disease, and to improve their self-confidence and awareness of their abilities. She was also able to witness positive examples of other female students overcoming their difficulties, to play some roles that simulate real situations, to perform some homework that helps her apply what she has learned in her daily life, and to receive encouragement and praise for her efforts and achievements.

The results of the third hypothesis: It states that "there are no statistically significant differences at the level of significance ($\alpha \leq 0.05$) in the average ranks on the scale of awareness of food choices that improve the rate of diabetes and academic achievement among the members of the experimental group in the post and follow-up measurement.

To test the validity of this hypothesis, the Wilcoxon test and the Z value were used as one of the non-parametric methods to identify the significance of the differences between the mean ranks of the scores of the experimental group in the questionnaire of awareness of dietary choices that improve the rate of diabetes and academic achievement of female students with learning disabilities who have diabetes and its dimensions in the post and

follow-up measures.

Table (11) Significance of the differences between the mean scores of the experimental group in the post and follow-up measurements of the awareness scale of food choices that improve the rate of diabetes and academic achievement among female students with learning difficulties with diabetes

Dimensions	Measurement after me/follow me	N	M	Total	Values Z	.Sig
Awareness of food choices that improve diabetes	Negative ranks	4	4.13	16.50	-0.714	0.475
	positive ranks	5	5.70	28.50		
	Equality	1				
Awareness of food choices that improve academic achievement	Negative ranks	7	4.43	31.00	-0.357	0.721
	positive ranks	3	8.00	24.00		
	Equality	0				
Total	Negative ranks	5	5.90	29.50	-0.204	0.838
	positive ranks	5	5.10	25.50		
	Equality	0				

The results from Table (11) show that the Z value calculated for the scale of awareness of food choices that improve the rate of diabetes and academic achievement is less than the borderline value (1.96), which indicates that there are no statistically significant differences between the mean ranks of the scores in awareness of food choices that improve the rate of diabetes and academic achievement for schoolgirls with learning difficulties with diabetes between the post and follow-up measurements of the experimental group, which means the continuing effect of the educational program

The researcher explains this result by the fact that the educational program that was prepared to educate female students with learning difficulties with diabetes about food choices that improve diabetes rate and academic achievement was not only effective in increasing the level of awareness of the experimental group in the post-measurement compared to the pre-measurement, but also in maintaining this effect after two months of follow-up. This result supports the hypothesis of the study, and is consistent with the theory of the educational program, which focuses on changing the pattern of thinking and behavior of individuals, and increasing their ability to choose foods that are beneficial to their health and improve their academic performance. According to the educational program, individuals can learn how to identify and correct misconceptions and beliefs about diabetes and food, how to develop problem-solving skills in choosing appropriate foods, how to reduce anxiety and fear of disease, and how to improve self-confidence and awareness of one's abilities. It can also benefit from positive examples from other students who overcome their difficulties, play some roles that simulate real situations, perform some homework that helps them apply what they have learned in their daily life, and receive encouragement and praise for their efforts and achievements.

The results of the current research agree with the findings of the following studies (69-71) , which concluded that the educational program used in raising or developing the level of nutritional awareness was effective.

STUDY RECOMMENDATIONS:

In the light of the research results, the following recommendations can be reached Based on the positive results of the study, the following can be suggested as recommendations:

-Inclusion of food culture within the subjects of the curricula.

-Increasing the role of extra-curricular activities in raising nutritional awareness of diabetes.

-Implementation of seminars and lectures for students and parents to raise awareness of food systems that improve academic achievement

-Mainstreaming the use of the educational program that was prepared to educate students with learning difficulties with diabetes about food options that improve the rate of diabetes and academic achievement in integration schools and other educational institutions that receive this group of students.

-Involving parents of schoolgirls with learning disabilities who have diabetes in the education and counseling process, and providing them with the necessary nutritional and health information to help their daughters choose foods that are beneficial to their health and improve their academic performance.

- Developing similar educational programs to educate female students with learning disabilities who suffer from

other diseases, such as blood pressure, heart or kidney diseases, about food options that improve their health and academic achievement**.**

ACKNOWLEDGMENTS
The author are thankful to the deanship of scientific research at Najran University for funding this work under Najran Region research program funding program grand code (NU/NRP/SEHRC/12/32)

REFERENCES

1. Chatterjee S.; Khunti K. and Davies MJ. (2017).Type 2 diabetes. Lancet.;389(10085): 2239–51. https://doi.org/10.1016/S0140-6736(17)30058-2.
2. Shan PF .; Li Q.; Khamaisi M. and Qiang GF.(2017).Type 2 diabetes mellitus and macrovascular complications. Int J Endocrinol.;2017:4301461.
3. International Deabetes Federation (IDF).(2019).IDF Diabetes Atlas 2019.
4. Al-Harbi B M.(2017). Geographical characteristics of diabetic patients in the city of Onaizah. Unpublished master's thesis, Qassim University, Saudi Arabia.
5. Khlid, A.; Abbas, A. and Nisha, S. (2017). Risk Factors Associated with Diabetes Mellitus in a Saudi Community: A Cross-Sectional Study. Prim Health Care Journal, 7 (2), 1-4.
6. Al Dawish MA.; Robert AA.; Braham R.; Al Hayek AA.et al.(2016).Diabetes Mellitus in Saudi Arabia: A Review of the Recent Literature . Curr Diabetes Rev.;12(4):359-368. doi: 10.2174/1573399811666150724095130.
7. General Authority for Statistics (2018) Report of the results of the Family Health Survey 2018, Kingdom of Saudi Arabia.
8. Abdel Rahman N. (2011):. Nutrition for obesity, diabetes and heart patients, training program in nutrition, part two, National Institute of Nutrition, Cairo.
9. Musaiqer A. (1997): Food and Nutrition, University Medical Writing, World Health Organization, International Academy, Lebanon, Dar Al-Kitab Al-Arabi.
10. Gharbawy R and Masoud I. (2002) .Principles of Health Culture, Riyadh. Saudi Arabia. dar Publishing International .
11. Zimmet P.; Alberti MM and Shaw J.(2001). Global and societal implications of the diabetes epidemic. Nature, 414: 782787
12. Ramachandran A(2000). Epidemiology of Type II Diabetes Mellitus in Indians. International Conference on Diabetes and Nutrition, International Life Science Institute. New Delhi.
13. Chawla A.; Chawla R and Jaggi S.(2016). Microvasular and macrovascular complications in diabetes mellitus: Distinct or continuum? Indian Journal of Endocrinology and Metabolism.; 20(4): 546-551. DOI: 10.4103 / 2230-8210.183480
14. Centers for Disease Control and Prevention. (2017). National Diabetes Statistics Report, Atlanta, GA: Centers for Disease Control and Prevention, U.S. Dept of Health and Human Services.p 201.
15. World Health Organization(2019). Global status report on non-communicable diseases 2010. Geneva: World Health Organization. [cited April 18,] Available from: www.who.int/nmh /publications/ncd-status-report2014/en/ 10
16. Burisha J. (2020). Diabetes (Type 1) and its impact on self-esteem and academic achievement, a clinical study of three schoolchildren with type 1 diabetes, Journal of Psychological and Educational Studies, 13 (3), 30-340.
17. Muhammad M and Hakimuh , A H . (2014). Psychological and academic effects of type 1 diabetes (subject to insulin) on schooled adolescents: a study of 08 cases, Journal of Human and Social Sciences, Issue 15, 223-233.
18. Ohmann S.; Popow C.; Rami B.; K¨onig M, Blaas S. et al. (2010).Cognitive functions and glycemic control in children and adolescents with type 1 diabetes. Psychol Med;40:95–103. https://doi.org/10.1017/S0033291709005777
19. Marissal -Arvy N and Moisan MP.(2022). Diabetes and associated cognitive disorders: Role of the Hypothalamic-Pituitary Adrenal axis, Metabolism Open 15,100202. doi:

10.1016/j.metop.2022.100202.

20. Drivsholm T.; De fine olivrius N.;Nielsen A B.; Siersma V.(2005).Symptoms ,Signs and compteations in Newly Diagnossedtype 2 Diabetic Patients, and their Relationhep Glyaemia,Blood Pressure and Weight.Diabetologia, 48 (2),214-210 DOI: 10.1007 / s00125-004-1625-y
21. Kovacs M.; Goldston D. and Iyengar S. (1992). Intellectual development and academic performance of children with insulin-dependent diabetes mellitus: A longitudinal study. Developmental Psychology, 28(4), 676–684. https://doi.org/10.1037/0012-1649.28.4.676
22. Al-Khatib J . (2009). Introduction to physical and health disabilities, 1st edition, 4th edition, Amman: Dar Al-Shorouk
23. Altarac M. (2007). Prevalence of Learning Disability among United States Children with Asthma and Diabetes, Annals of Epidemiology , 17(9), 746-747
24. McVilly K.; McGillivray J.; Curtis A.; Lehmann J . (2014). Diabetes in people with an intellectual disability: a systematic review of prevalence, incidence and impact. Diabetic Medicine, 1;31(8), 897–904. https://doi.org/10.1111/dme.12494.
25. Emerson E. and Baines S. (2011). Health inequalities and people with learning disabilities in the UK. Tizard Learning Disability Review, 16(1), 42– 48.
26. MacRae S.; Brown M.; Karatzias T.; Taggart L.; Truesdale-Kennedy M.et al. (2015). Diabetes in people with intellectual disabilities: a systematic review of the literature. Research in Developmental Disabilities, 1(47), 352– 374. https://doi.org/10.1016/j.ridd.2015.10.003
27. Khattaba M.; Khader Y S.; Al-Khawaldehd A and Ajlouni, K. (2010).Factors associated with poor glycemic control among Jordanian patients with Type 2 diabetes. Journal of Diabetes and Its Complications, 24, 84 –89 .
28. Ataur R K.; Zaki N A.; Mohammad A A.; Montaser A B. et al.(2012). Factors contributing to non-compliance among diabetics attending primary health centers in the Al Hasa district of Saudi Arabia. j family community med. 19(1) 26–32 .
29. Patton S R; Dolan L M and Powers S W. (2007). Dietary Adherence and Associated Glycemic Control in Families of Young Children with Type 1 D RESEARCH CURRENT RESEARCH| (107) 1, 46-52 DOI: https://doi.org/10.1016/j.jada.2006.10.012
30. Al-Obeidi , H M. (2006). Nutritional culture and its relationship to dietary behavior among patients with diabetes, in Khartoum State, Omdurman Islamic University Journal. (14) 258-285.
31. Balfe M.(2007). Diets and discipline: the narratives of practice of university students with type 1 diabetes , Sociology of Health & Illness (1)29136–153 doi: 10.1111/j.1467-9566.2007.00476.
32. El Shourbagy O , Karam Eddin M , Farid M , and El Naggar R.(2015). A descriptive Study of Diabetes Mellitus among School Children Attending Health Insurance Clinic . Childhood Studies Jul,18(68),27-30
33. Sachdev A. and Patil S V.(2023).Assessment of Risk Factors of Diabetes Mellitus in Postpartum Women in a Tertiary Hospital in Maharashtra, India: Results from a STEPS Survey: Eur. Chem. Bull. 12(Special Issue 6), 625-632
34. Akter R.; Nessa A.; Husain MF.; Wahed F.; Khatun N et al . (2017). Effect of Obesity on Fasting Blood Sugar. Mymensingh medical journal: MMJ, 26(1), 7-11.
35. Rivellese A A.; Boemi M.; Cavalot F. et al .(2008). Dietary habits in type II diabetes mellitus: how is adherence to dietary recommendations? Eur J Clin Nutr. 62(5) 660-664.
36. American Diabetes Association (2001): Clinical Practice Recommendations. Diabetes Care, 24 (Suppl) 1:S1-133.
37. Brand-Miller J.; Hayne S.;Petocz P and Colagiuri S.(2003). Low-glycemic index diets in the management of diabetes: a meta-analysis of randomized controlled trials: Diabetes Care;26(8):2261-7. doi: 10.2337/diacare.26.8.2261.
38. Jenkins DJ.; Kendall CW.; Augustin LS, et al.(2012).Effect of legumes as part of a low glycemic index diet on glycemic control and cardiovascular risk factors in type 2 diabetes mellitus: a randomized controlled trial.Arch Intern Med ;172(21):1653-60. doi: 10.1001/2013.jamainternmed.70.

39. Moravek D. (2018). The Effect of Lentils on Postprandial Glycemic Response in Healthy Adults and the Ability of In Vitro Digestion to Predict Glycemic Response. Doctor of Philosophy in Human Health and Nutritional Sciences.

40. Naga M E.M.(2011). Evaluation Of Nutrition And Health Status Among Children With Diabetes. Research Journal Specific Education Faculty Of Specific Education Mansoura University . (22), 712-730

41. Forouhi N G .; Misra A .; Mohan V .; Taylor R and Yancy W .(2018).Dietary and nutritional approaches for prevention and management of type 2 diabetes: science and politics of nutrition ;361:k2234 https://doi.org/10.1136/bmj.k2234

42. Almosawi S M J. and AL-Hadrawy S M J . (2023).The effect of marital status and depression on Fasting Blood glucose in Al-Najaf governorate. Eur. Chem. Bull:, 12(Special Issue 6), 1832-1837.

43. Kim SY.; Sim S.; Park B.; Kong IG, et al.(2016). Dietary habits are associated with school performance in adolescents. Medicine (Baltimore). 95:e3096.

44. American Diabetes Association (2006) Nutrition Recommendations and Interventions for Diabetes-2006. A position statement of the American Diabetes Association. Diabetes Care 29, 2140–2157.

45. Cargill Foundation. (2014) : Nutrition and Students' Academic Performance, Wilder Research. Retrieved from www.wilderresearch.org .

46. Elsayead, M A and Said A S .(2020). Study of The Relationship Between Nutritional Status and Scholastic Achivement Among Primary School Students in Wadi Eldawasir City n Kingdom of Saudi Arabia :Journal of medical & pharmaceutical Sciences , 4 (1) 57 – 82.

47. Al-Jawaldeh F ; Imam M .and Mohsen E . (2012). The effect of a counseling program based on food education in the development of social interaction and nutritional behavior among children with motor disabilities, An-Najah University Journal for Human Sciences, (3) 26,609-632.

48. Al-Tarzi S N . (2002). Two Threats to Intelligence: Learning Difficulties and Poor Eating. Arab Childhood Journal, 3(12), 126-136. Retrieved from http://search.mandumah.com/Record/26409.

49. Corcoran S P.; Elbel B. and Schwartz A E. (2016). The effect of breakfast in the classroom on obesity and academic performance: evidence from new york city. Journal of Policy Analysis and Management, 35(3), 509-532.

50. Jackson J A.; Smit E.; Branscum A .et al. (2017). The family home environment, food insecurity, and body mass index in rural children. Health Education & Behavior, 44(4), 648-657.

51. Ministry of Health .(2011): National Reference for Diabetes Education, Assistant Agency for Preventive Medicine, General Administration of Non-communicable Diseases, Kingdom of Saudi Arabia.

52. Miller LM and Cassady DL. (2015).The effects of nutrition knowledge on food label use. A review of the literature. Appetite; 92: 207–216.

53. Colatruglio S and Slater J.(2014). Food literacy: bridging the gap between food, nutrition and well being. In: Deer F, Falkenberg T, McMillan B, Sims L, editors. Sustainable well-being: concepts, issues, and educational practices. Winnipeg: ESWB Press;. Chapter: 3 37–55.

54. Zoellner J.; You W.; Connell C. Smith -Ray RL.; Allen K. et al.(2011). Health literacy is associated with healthy eating index scores and sugar-sweet- ened beverage intake: findings from the rural Lower Mississippi Delta. J Am Diet Assoc. 111(7):1012-1020. doi: 10.1016/j.jada.2011.04.010.

55. Laska MN.; Larson NI.; Neumark- Sztainer D and Story M.(2012). Does involvement in food preparation track from adolescence to young adulthood and is it associated with better dietary quality? Findings from a 10 -year longitude- nal study. Public Health Nutr. 15(7):1150–8. DOI: 10.1017 / S1368980011003004.

56. Vidgen HA and Gallegos D. (2014). Defining food literacy and its components : Appetite ., 76:50–9. DOI: 10.1016/j.appet.2014.01.010

57. Vaitkeviciute R.; Ball LE and Harris N.(2015). The relationship between food literacy and dietary intake in adolescents: a systematic review. Public Health Nutrition: 18(4), 649–658

58. Maffeis C and Pinelli L .(2008). Teaching children with diabetes about adequate dietary choices, British Journal of Nutrition (2008), 99, doi: 10.1017/S0007114508892495.

59. Al-Rasheedi, A. A. S. (2014). The Role of Educational Level in Glycemic Control among Patients with Type II Diabetes Mellitus. International Journal of Health Sciences, Qassim University, 8(2),177-187.

60. Sunguya BF.; Poudel KC.; Mlunde LB, et al. (2013).Effectiveness of nutrition training of health workers toward improving caregivers' feeding practices for children aged six months to two years: a systematic review. Nutr J. 12(1):66. doi:10.1186/1475-2891-12-66.

61. Bhati K and Goyal M. (2013). Nutritional and health status of diabetic patients. Stud Home Comm Sci, 7(1): 45–48. DOI:10.1080/09737189.2013.11885392

62. El-Qudah J M.F. (2016). Dietary Knowledge Among Female Diabetic Patients in Amman, Jordan, Current Research in Nutrition and Food Science Vol. 4(2), 107-113. DOI: https://dx.doi.org/10.12944/CRNFSJ.4.2.04.

63. Zhang P.; Zhang X.; Brown J.;Vistisen D, et al.(2010). Global healthcare expenditure on diabetes for 2010 and 2030. Diabetes Res Clin Pract. ; 87(3): 293-301. https://doi.org/10.1016/j.diabres.2010.01.026.

64. Finucane MM.; Stevens GA.; Cowan MJ.; Danaei G.; Lin JK, et al.(2011). National, regional, and global trends in body-mass index since 1980: systematic analysis of health examination surveys and epidemiological studies with 960 country-years and 9.1 million participants. Lancet.; 377(9765): 557-567. DOI: 10.1016 / S0140-6736 (10) 62037-5.

65. Stallwood L.(2006). Relationship between caregiver knowledge and socioeconomic factors on glycemic outcomes of young children with diabetes. J Spec Pediatr Nurs. 11(3):158–165. doi:10.1111/ j.1744-6155.2006.00062.x

66. Dehayem MY.; Takogue R.; Choukem SP, et al.(2016). Impact of a pioneer diabetes camp experience on glycemic control among children and adolescents living with type 1 diabetes in sub-saharan africa. BMC Endocr Disord;16:5. doi:10.1186/s12902-016-0086-x

67. Al-Wafi A and Said Z . (2004). Growth from the Bean to Adolescence: Al-Khansa for Publishing and Distribution, Algeria.

68. American Psychiatric Association. (2013). Diagnostic and Statistical Manual of Mental Disorders . (5th ed.), DSM.5 Washington ,DC :Author.

69. Muhammad A N I . (2017). A healthy food education program and its impact on improving nutritional awareness for people with intellectual disabilities: Assiut Journal of Physical Education Sciences and Arts, (44)2 1-50. doi :10.21608/JPRR.2017.73597.

70. Lutfi T M R.; Hassan A H and Shams El-Din, M S A. (2019). Designing an electronic nutrition education program to develop nutritional awareness using moodle education management system: Journal of Research in Specific Arts and Sciences, (11) 3, 120-157. http://search.mandumah.com/Record/1187407

71. Ndahura N B.; Munga J.; Kimiywe J and Mupere E.(2021). Effectiveness of a Structured Nutrition Education Course for Caregivers of Children and Adolescents with Type 1 Diabetes in Improving Glycemic and Dietary Outcomes: A Cluster-Randomized Controlled Trial Protocol: Open Access Journal of Clinical Trials, 13 ,1—10 https://doi.org/10.2147/OAJCT.S304290