Effect of Nursing Intervention on the Supportive Role Played by Peers on Glycemic Control Among Diabetic School Students in Tanta City.

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Abstract:

Diabetes mellitus is one of the most common metabolic and chronic diseases of school age children. The main aim of diabetes management for diabetic teenage is to achieve optimal glycymic control. Peer support may help achievement of this aim. Aim: is to investigate the effect of nursing intervention on the supportive role played by peers on glycymic control among diabetic school students in Tanta city. Research design: Quasi-experimental research design. Material and method: The study was conducted at the outpatient medical clinics of all school health units (I, II, and III) affiliated to the students' health insurance serving Tanta city as well as governmental schools. A convenient sample of diabetic school children were selected from the previous settings representing fifty percent of the total subjects. The study sample was divided into two equal groups (control& study). The control group received an individual program for glycemic control. The study group received the same glycemic control program in addition to peer support sessions. An interview questionnaire and anthropometric measurements sheets were used to collect data and for evaluation. They were used three times during the study period; before the program, immediate, and three months post program. Results: the result of this study showed that before implementation of the program the study and control groups showed poor glycemic control, low scores of knowledge, self care practices and perceived peer support. After implementation of the program, the two groups showed significant glycemic control and improvement in their knowledge and self care practices. This improvement was highly significant among the study group who received peer support than the control one.

Conclusion and recommendation: peer support approach is a predictor of glycemic control among school age children. Therefore, the school health nurse could do her best effort to make peer support available to every diabetic student, in particular, those with poor glycemic control or newly diagnosed.

Introduction

Diabetes mellitus is one of the most common metabolic and chronic diseases of school age children [1]. There are two main types of diabetes mellitus. Type 1 diabetes also called insulin dependent diabetes or juvenile diabetes. The average age of its onset is 10 to 14 years. It is autoimmune disorder in which the body destroys the insulin- producing islet cells in the pancreases of those who are genetically vulnerable. Environmental and genetic factors are strongly implicated. This is the most prevalent type among children [2, 3].

The International Diabetes Federation (IDF) reported that, every day more than 200 children are diagnosed with type 1 diabetes. It is increasing at a rate of 3% each year among children and rising even faster in pre-school children at a rate of 5% per year. Currently, over 500,000 children under the age of 15 live with diabetes[4].Approximately 5% of children have a first or second degree relative with DM type 1. In the United States, surveys indicated the prevalence of type1 DM to be 14.9 per 100000 in 2004. The frequency increases with age (2).

The International Diabetes Federation (IDF) mentioned that, Egypt is in the world's top 10 in terms of highest number of people with diabetes in 2003 (3.9 million) and highest projected number of people with diabetes in 2025 (7.8 million). Also, the prevalence rate of diabetes is as high as 20% in the United Arab Emirates, 16% in Qatar and 15% in Bahren(5). In Egypt (2005) the prevalence of diabetes among children aged 10 to 18 was 0.7 per cent. The frequency was higher among females than males and equal in urban and rural areas. Children with fasting blood glucose levels between 100mg and 125mg were considered pre-diabetic; they represented 16.4 per cent of the total sample [6].

Type 1 diabetes is a challenging disease,

with a daily regimen that include multiple insulin injections, monitoring of blood glucose level, and a special diet and exercise regimen. Treatment management is very difficult, especially for school age children who are experiencing a series of social, psychological, emotional and physiological changes[7,8]. Diabetes management is complicated because it must occur across different settings such as at home and in school. Consequently, diabetes management should be facilitated by the support of both family members and peers[9].Peer support among patients with the same chronic health problem may be a particularly potent intervention, combining the benefits of both receiving and providing social support. "Peer support" is defined as "support from a person who has experiential knowledge of a specific behavior or stressor and similar characteristics as the target population". Peer support helps reduce problematic health behaviors, depression, and contribute to improve diabetes management, including improving behaviors related to medication adherence, diet, exercise, and blood glucose monitoring. The success of peer support

appears to be due to the nonhierarchical, reciprocal relationship that is created through the sharing of similar life experiences[10].The child's concept of self is shaped by relationship with others. Peers play an important role in the approval and critiquing of skills of school-age children. Continuous peer relationship provide the most important social interaction for school age children. Valuable information are learned from interaction with children of their own age[11].

Working with groups is an important community nursing skill. Groups are an effective and powerful way to initiate and implement changes for individuals, families, organization, and community. Moreover, groups can be used to disseminate health information in a cost-effective way to a number of clients who meet together: for instance, individuals with diabetes can brought together to consider diet management, physical care and to share in problem- solving remedies[12]. The nurse's role with this support group is to facilitate group interaction and to serve as a role model of acceptance [13].

Aim of the study The aim of this study is to:- Identify the effect of nursing intervention on the supportive role played by peers on glycym control among diabetic school students in Tanta city.

Subjects and methods :

Study design:-This study was a quazi experimental study.

Subjects:- A convenient sample of diabetic school children was selected from health units affiliated to the students' health insurance serving Tanta city. The study was conducted at the out patient medical clinic of the all school health units (I, II, and III) in Tanta city, representing half of the diabetic students in the school health units.

Study population and sampling: The field work of this study was done in nine months starting from March to November 2010. Each student of the studied sample was informed about the program objectives, as well as the time schedule in order to obtain their active participation and cooperation during implementation of the intervention. Then the pretest was fulfilled from each student. The program sessions were 11 sessions for group I with two additional sessions for group II. The duration of each session was 30-60 minutes. Inclusive criteria: Age from 10- 18

years, had no other chronic disease. The child was enrolled in governmental school in Tanta city.

The total study sample was 40 diabetic school children. The study sample was divided into two equal groups (20 students each). *Group I (control group):-* Each student in this group will receive an individual program for glycemic control. Group II (study group):- This group was divided into 4 subgroups (5 students in each). Each group received the glycemic control program in addition to additional two sessions for social group support for each other.

Ethical consideration: 1- Official permission to conduct the study will be obtained from the responsible authorities (Ministry of Education and Health Insurance).\Consent of the diabetic children and their parents were obtained. The researcher meet with the diabetic children at their schools according to the convenient time. All participants was informed about the purpose, benefits, and procedure of the study.

A pilot study was carried out on four diabetic students(10% of the study sample) Tools of the study:-

Tool I:- An Interview Questionnaire Schedule: It included four parts:-

Part 1: Sociodemographic characteristics of the diabetic children: This included three items as follows:- (a)- Personal data about the diabetic students, (b)- Students' parents data, and (c)- Past medical history of students and their family.

Part 2: Diabetic Educational Assessment Tool (DEAT):- This tool was developed by the researcher to assess diabetic children's knowledge and practice about diabetes. It will cover the following areas; definition of diabetes mellitus and its manifestations, complications, management such as diet, exercise, medications, medical follow up and health promotion, how to prevent injuries and activities of daily living.

3Part 3: Diabetic Support Assessment (DSA):-

This tool was adapted from "Medical Outcomes Study Social Support Survey Instrument", for the Advancing Diabetes Self Management Project at the clinic of Raza[14]. It assess the availability for social support for diabetic patients. It was modified by the researcher to suit school children. It was used to assess children's needs for support in dealing with diabetes.

Part 4: Self- Care Inventory (SCI):

The self care inventory, is a 13 items self report measure. It was developed by La Greca (1988) [15] to assess patient perceptions of the degree to which they adhere to treatment recommendations for their diabetes self care. The instrument was subsequently revised and now consists of 14 items. The SCI is a likert type scale ranged from 1-5. It includes items that focus on blood glucose testing, insulin and food regulation, exercise and emergency precautions. The researcher translated this scale into Arabic language to introduce it to the study subjects.

Tool II: Measurement sheet:- This consisted of two parts:-

Part 1: Anthropometric measurements : It included height, and weight and then calculation of body mass index. These measures were done at the beginning of the study. Then, weight was measured every month for three months after the application of the intervention. The body

mass index (BMI) was calculated as follows:

Part 2: Fasting blood glucose test:- The fasting blood glucose level of each participant student was tested by using him/ her own one touch apparatus.

Developing the nursing intervention program

1- Preparatory phase:-

–Rational: Studies carried out on Egyptian diabetic adolescents at Alexandria city revealed that, although they had a good knowledge about DM they showed partial adherence to diabetes self care [16,17]. About 74.8% of diabetic students had uncontrolled diabetes and 7.4% of them developed complications [17].

-Analysis of the resources:

Human resources:- The program was totally carried out by the researcher.

Non human resources (audiovisual material).It included booklet, power point sides, doll, and real material (e.g. one touch blood glucose check apparatus and its strips, syringe, cotton, and alcohol) to demonstrate procedures related to DM management like insulin injection and blood glucose test. The booklet and power point were prepared by the researcher

based on literature review. The booklets were distributed to the studied sample at the end of sessions and the power point was presented according to students' level during each session as needed.

2- Planning phase:-

1- General objectives:

The general goal of the nursing intervention is to enable the diabetic students to control their diabetes.

2- Specific objectives:-

The program sessions was 11 sessions as follows for group I with two additional sessions for group II. Specific objectives of the intervention and its sessions was as follows:- Session 1:The aim of this session was to orient the students about the importance of the program, its sessions and expectation of each session. Session 2:- The aim of this session was to increase students' knowledge about the disease related to its causes and manifestations. Session 3:This session aimed to allow students to identify steps of how to calculate the diabetic diet and how to improve it. Session 4The goal of this session was to increase students' awareness about how to mange diabetes through exercise. Session 5:- The purpose

of this session was to inform the participants about diabetic medication, its type and its administration. Session 6:- The objective of this session was to enable students manage insulin administration and site rotation. Session 7:- The aim of this session was to enable students practice blood glucose testing & interpret its normal and abnormal values. Session 8:- The goal of this session was to increase the students' awareness about signs and symptoms of hypoglycemia and hyperglycemia and proper dealing with them. Session 9:- The aim of this session was to discuss with the group the probable complications that may arise from uncontrolled diabetes (short term& long term). Session 10:- The purpose of this session was to help the participants to identify the behaviors and activities that promote their health and prevent injuries. Session 11:-The objective of this session was to encourage the diabetic students to deal constructively with decisions related to their disease and glycemic control.

The sessions for group II was as sessions for group I, in addition to the following two sessions. These two sessions will be given to the students after the orientation session.

Session 1:- The aim of this session is to help the individual student and all group members to establish relationship with each other and with the researcher. Session 2:-:The purpose of it is to enable the participants to develop social support skills that help them to manage their diabetes properly.

Implementation of the program:-

The implementation of the program was as follows:-

Group I (control group):- Implementation of the program was based on providing individual instructions to each student and discussing problems encountered during management of the disease. Group II (study group):- Instructions was provided in a form of group discussions. Each student in the group will be encouraged to express oneself, share problems, concerns and way of management. The researcher will act as a facilitator for the group interaction by providing support, clarification, interpretation and positive re-enforcement. discussion, simulation and demonstration will be used as a teaching

strategy. Hand outs, booklets and power point presentation will be used as a teaching aid

Result

Table 1 showed the distribution of the studied sample regarding to their sociodemographic characteristics. The table revealed that the mean age of the study group was 15.75±1.74 years while the mean age of control group was 14.40 ±2.91 years. The table also illustrated that 50% and 55% of the study group and control group respectively were females. As regard to the educational level, 70% of the study group and 50% of control group were students at secondary schools compared to 30% of both groups were from preparatory schools.

Concerning birth order, the table showed that those who were the first or the second child in the family constituted the highest percentage of the study and control group 70% and 60% respectively. This is followed by 20% and 30 % respectively of both groups who were the third on birth order. Half of the students of the study group had five or more siblings compared with the majority of the control group. The

highest percentage of students (85%) of both groups was from urban areas.

As regard fathers' education, 35% of the study group and 25% of the control group their fathers were university graduates, and 30% of the students from both groups their fathers had secondary education. In relation to mothers' education, the same table revealed that (40%) of the study group their mothers were university graduates, compared with 25% of the control group. More than half (55%) of the control group their mothers had secondary education, compared with 35% of the study group. About two thirds (65%) of both groups their mothers were housewives. In addition, the table revealed that only one quarter (25%) of the study group and one fifth of the control group had consanguinity between their mothers and fathers.

Table (2) showed the distribution of the studied sample regarding personal and family history of disease. It was observed that, three quarters (75%) of both groups had a family history of diabetes mellitus. Concerning the duration of diabetes mellitus among students, the mean duration

of disease among the study group was 4.20±3.05 years compared with 4.07± 2.36 years for the control group. Three quarters (75%) of both groups admitted previously to hospital because of diabetes mellitus. However, one quarter (25%) of the study group reported complications of diabetes. Table (3) showed the mean score & standard deviation of knowledge of the studied sample about diabetes mellitus. It was observed that there was a significant improvement in the mean score of knowledge of the study group and control groups about diabetes mellitus (definition, predisposing factors, manifestation, accurate blood glucose level, complications, hypoglycemia, and hyperglycemia) (P< 0.05).The highest total mean score of knowledge of the study and control groups was noticed immediately post program (42.95±6.19 and 41.45±5.86 respectively). There was a significant difference between the two groups at three months post program as regard the definition, accurate blood glucose level, and complications of diabetes, as well as the total mean score ($X^2 = 2.787$,

Table (4) showed the mean score and standard deviation of knowledge of the

studied sample about management of diabetes mellitus. There was a significant improvement of the mean score of knowledge of the study and control groups for all the studied items (P< 0.05). There was a significant difference between the two groups at three months post intervention as regard treatment of diabetes (t=2.127), types of insulin (t=3.793), importance of adherence to diabetic diet (t=2.494), and the importance of exercise (t=2.494).The study group had a higher means score of knowledge than the control group about diabetes management immediately post program (25.95±2.56 and 24.55±4.65 respectively) and three months post program (26.59±1.87 and 23.90±4.40 respectively). There was a significant difference between the two groups through the study (pre, immediate, and three months post program) (P<0.05).

Table (5) showed the total mean score of knowledge of the studied sample about diabetes mellitus. The table revealed that, there was a significant improvement in the total mean score of knowledge for both groups through the study period. However, the study group gained higher mean score than the control group

immediately post program (68.9±8.75 and 65.89±10.51respectively) and three months post program (69.14±6.43 and 62.3±12.51 respectively). There was a significant difference between the two groups through the study periods (pre, immediate, and three months post program (P< 0.05).

Table (6) showed the mean score & standard deviation of the studied sample regarding self care inventory through the study. There was a significant improvement in the mean score of self care items among the study and control group in relation to blood glucose testing(P=0.009 and P=0.010 respectively), recording(P=0.008 and P=0.007 respectively), changing insulin dose according to blood glucose level (P=0.001 and P=0.006 respectively) adherence to diabetic diet (P=0.044 and P=0.012 respectively), carrying sweaty foods to manage hypoglycemia (P=0.001 and P=0.017respectively), and practicing exercise regularly (P=0.044 and P=0.037 respectively). Moreover, the table illustrated that, there was a significant improvement in the mean score of the study group regarding eating snakes

regularly(P=0.001), while the improvement of the control group was not significant(P=0.273). On the other hand, there was a non significant improvement in the mean score of self care items among the study and control group in relation to talking accurate insulin dose (P=0.102 and P=0.130 respectively), talking accurate insulin dose on the right time, eating meal at times(P=0.317 and P=0.052 respectively), medical follow up (P=0.170 and P=0.186 respectively), and practicing exercise strenuously(P=0.058 and P=0.141 respectively). It was also observed that there was no significant improvement in the mean score of ketones testing among the study and control group (P=0.946 and P=0.530 respectively).

Moreover, there was a significant difference between the two groups regarding all self care inventory items three months post program except for ketones testing (P= 0.206). Table (7) showed the correlation between knowledge, Self- Care Inventory, diabetic peer support, performed steps in measuring blood glucose level and injecting insulin by pen among the studied sample (study and control groups) immediately post-test. The table illustrated

that, there was positive correlation between the knowledge of the study group and Self-Care Inventory (P=0.019), measuring blood glucose level(P=0.044), injecting insulin by pen(P=0.012) and fasting blood glucose level(P=0.04 Table (8) showed correlation between knowledge, Self- Care Inventory, diabetic peer support performed steps in measuring blood glucose level and injecting insulin by pen among the studied sample (study and control groups) 3 months post-test. The table revealed that, there was a significant positive correlation between the knowledge of the study group

and Self- Care Inventory (P=0.001), diabetic peer support (P=0.026), measuring blood glucose level(P=0.038), injecting insulin by pen(P=0.023) and fasting blood glucose level(P=0.005). There was also a positive correlation between the same group's Self- Care Inventory and diabetic peer support (P=0.041)& measuring blood glucose level(P=0.019). Moreover, a positive correlation was found between injecting insulin by pen and diabetic peer support (P=0.047)& measuring blood glucoselevel(P=0.001)

Table 1: Distribution of the studied sample regarding to their sociodemographic characteristics

Socio-demographic characteristics	The studied diabetic school children (n=40)				X^2	P
	The study group (n=20)		The control group (n=20)			
	n	%	N	%		
Age:					10.048	0.007*
10-	0	0	7	35.0		
13-	9	45.0	3	15.0		
16-19	11	55.0	10	50.0		
Range	13-18		10-18			
Mean±SD	15.75±1.74		14.40±2.91			
t-test **P**	1.780 0.083					
Sex:					0.100	0.752
Males	10	50.0	9	45.0		
Females	10	50.0	11	55.0		
Education level:					4.667	0.097
Primary school	0	0	4	20.0		
Preparatory	6	30.0	6	30.0		
Secondary	14	70.0	10	50.0		

Birth order:					5.738	0.333
1	5	25	2	10		
2	9	45	10	50		
3	4	20	6	30		
4 and more	2	10	2	10		
No. of siblings:					8.725	0.121
3	3	15	0	0		
4	7	35	2	10		
5 and more	10	50	18	90		
Place of residence:					0.00	1.00
Urban	17	85.0	17	85.0		
Rural	3	15.0	3	15.0		
Fathers' educational level:					0.833	0.934
-Illiterate Or read & writs	3	15.0	3	15.0		
-Basic education	4	20.0	6	30.0		
-Secondary	6	30.0	6	30.0		
-Univesity educ.	7	35.0	5	25.0		
fathers' occupation:					2.105	0.147
-Working:	**18**	**90.0**	**20**	**100**		
skilled workers	8	44.4	11	55.0		
Employee	3	16.7	4	20.0		
Professional	7	38.9	5	25.0		
-Not working	**2**	**10.0**	**0**	**0**		
Mothers' educational level:					2.581	0.630
-Illiterate Or read & writs	3	15.0	3	15.0		
-Basic education	2	10.0	1	5.0		
-Secondary	7	35.0	11	55.0		
- Univesity educ.	8	40.0	5	25.0		
Mothers' occupation:					0.00	1.00
-Working:	**7**	**35.0**	**7**	**35.0**		
skilled workers	0	0	0	0		
Employee	3	42.9	3	42.9		
Professional	4	57.1	4	57.1		
-House wife	**13**	**65.0**	**13**	**65.0**		
Presence of consanguinity between parents:					0.143	0.705
Yes	5	25.0	4	20.0		
No	15	75.0	16	80.0		

Table (2): Distribution of the studied sample regarding personal and family history of disease.

| History of disease | The studied diabetic school children (n=40) | | | | X^2 P |
| | The study group (n=20) | | The control group (n=20) | | |
	N	%	n	%	
Family history of DM:					
Yes	15	75.0	15	75.0	1.00
No	5	25.0	5	25.0	0.00
Duration of DM (years):					
-<3	8	40.0	5	25.0	3.69
3-	4	20.0	9	45.0	0.297
6 and more	8	40.0	6	30.0	
Mean±SD	4.20±3.05		4.07±2.36		
t-test	0.145				
P	0.885				
Previous admission to hospital due to DM:					
Yes	15	75.0	15	75.0	1.00
No	5	25.0	5	25.0	0.00
Presence of DM complications:					
Yes	5	25.0	14	70.0	0.004*
No	15	75.0	6	30.0	8.120

*Significant (P<0.05)

Table (3): Means & standard deviation of knowledge of the studied sample about diabetes mellitus

Knowledge items about diabetes mellitus	The study group (n=20)				The control group (n=20)				Study versus control group		
	Pretest	Immediate post test	3 months post test	F-test P	Pretest	Immediate post test	3 months post test	F-test P	t-test		
	Mean± SD	Mean± SD	Mean± SD		Mean± SD	Mean± SD	Mean± SD		Pretest	Immediate post test	3 months post test
Definition of DM	2.90±1.29	5.75±0.44	5.75±0.44	78.538 0.0001*	2.00±1.62	5.55±0.76	4.70±1.62	35.239 0.0001*	1.940 0.060	1.017 0.316	2.787 0.008*
Predisposing factors of DM:	1.00±0.65	2.85±0.59	2.65±0.49	61.526 0.0001*	0.95±0.89	2.70±0.47	2.50±0.51	43.311 0.0001*	0.203 0.840	0.892 0.378	0.946 0.350
Manifestations of DM:	4.25±1.71	6.55±0.60	6.75±0.44	33.111 0.0001*	4.35±1.81	6.65±0.67	6.25±1.07	18.540 0.0001*	0.179 0.859	0.492 0.623	1.930 0.061
Accurate blood glucose level:	0.20±0.41	2.00±0.00	1±0.00	155.17 0.0001*	0.20±0.41	0.95±0.22	0.65±0.49	18.672 0.0001*	0.00 1.00	21.00 0.0001*	3.199 0.003*
Complications of DM	2.85±1.72	6.40±0.88	6.65±0.59	66.110 0.0001*	2.30±1.78	6.15±0.93	5.65±0.99	52.424 0.0001*	0.992 0.327	0.870 0.390	3.891 0.0001*
Hypoglycemia manifestations	3.65±1.98	6.95±0.94	7.55±0.76	49.072 0.0001*	4.00±2.47	7.35±0.99	7.15±1.27	24.380 0.0001*	0.494 0.624	1.309 0.198	1.210 0.234
Causes of hypoglycemia	2.05±0.94	2.85±0.49	2.85±0.49	9.336 0.0001*	1.40±0.99	2.90±0.31	2.80±0.41	33.689 0.0001*	2.119 0.041*	0.387 0.701	0.350 0.728
Hyperglycemia manifestations	2.85±1.63	6.35±1.09	6.70±.86	59.187 0.0001*	2.15±1.84	6.35±1.14	6.10±1.25	53.221 0.0001*	1.272 0.211	0.000 1.000	1.763 0.086
Causes of hyperglycemia	1.65±0.74	3.25±1.16	2.65±0.49	18.233 0.0001*	1.30±0.73	2.85±0.37	2.60±0.50	44.983 0.0001*	1.498 0.142	1.466 0.151	0.319 0.752
Total	**21.40±11.07**	**42.95±6.19**	**42.55±4.56**	**134.80 0.0001***	**18.65±12.54**	**41.45±5.86**	**38.40±8.11**	**50.344 0.0001***	**1.199 0.238**	**0.142 0.888**	**2.952 0.005***

*Significant (P<0.05)

Table (4) Mean score and standard deviation of knowledge of the studied sample about management of diabetes mellitus.

Knowledge items about management of diabetes mellitus	The study group (n=20)				The control group (n=20)				Study versus control group		
	Pretest	Immediate post test	3 months post test	F-test P	Pretest	Immediate post test	3 months post test	F-test P	t-test		
	Mean± SD	Mean± SD	Mean± SD		Mean± SD	Mean± SD	Mean± SD		Pretest	Immediate post test	3 months post test
Insulin management: **Treatment of DM**	3.90±0.45	4.00±0.00	4.00±0.00	1.000 0.374	2.35±1.22	3.85±0.67	3.50±1.05	12.083 0.0001*	5.312 0.0001*	1.000 0.324	2.127 0.040*
Types of insulin	0.80±0.41	1.65±0.49	1.90±0.31	39.691 0.0001*	0.75±0.44	1.65±0.49	1.40±0.50	18.782 0.0001*	0.370 0.714	0.000 1.000	3.794 0.001*
Different, sites of insulin injection	2.80±0.61	3.95±0.22	3.95±0.49	31.941 0.0001*	2.40±0.68	3.20±1.44	3.35±0.49	5.658 0.006*	1.949 0.059	2.307 0.027*	1.939 0.060
Diet management: **Importance of adherence to diabetic diet**	1.40±0.60	1.95±0.22	1.95±0.22	13.213 0.0001*	1.15±0.49	1.80±0.41	1.65±0.49	10.736 0.0001*	1.447 0.156	1.435 0.159	2.494 0.017*
No of meals /day for diabetic child	0.45±0.51	1.85±0.37	1.80±0.41	25.783 0.0001*	1.00±0.65	1.80±0.41	1.80±0.41	16.889 0.0001*	6.892 0.0001*	0.406 0.687	0.000 1.000
Types of food that increase blood glucose level	3.15±1.09	4.95±0.22	5.00±0.00	53.887 0.0001*	3.25±1.07	4.95±0.22	4.95±0.22	46.436 0.0001*	0.293 0.771	0.000 1.000	1.000 0.324
Exercise management: **Importance of exercise for diabetics**	2.00±1.26	3.80±0.52	3.95±0.22	37.133 0.0001*	0.95±0.76	3.65±0.49	3.65±0.49	138.16 0.0001*	3.199 0.003*	0.936 0.355	2.494 0.017*
Foot mamagement: **Importance of foot car for diabetics**	1.95±1.14	3.80±0.52	3.95±0.22	45.484 0.0001*	1.20±0.106	3.80±0.52	3.60±0.75	64.151 0.0001*	2.152 0.038*	0.000 1.000	1.990 0.054
Total knowledge	**16.45±6.07**	**25.95±2.56**	**26.59±1.87**	**111.73 0.0001***	**13.05±5.41**	**24.55±4.65**	**23.90±4.40**	**116.64 0.0001***	**3.798 0.001***	**2.177 0.036***	**3.168 0.003***

*Significant (P<0.05)

Table (5): Total mean score of knowledge of the studied sample about diabetes mellitus.

Total Knowledge scores	The studied diabetic school children (n=40)							
	The study group (n=20)			F-test P	The control group (n=20)			F-test P
	Pretest	Immediate post test	3 months post test		Pretest	Immediate post test	3 months post test	
Range	22-61	57-76	66-74		20-61	51-76	42-74	
Mean±SD	37.85±17.14	68.9±8.75	69.14±6.43	157.933	31.7±17.95	65.89±10.51	62.3±12.51	92.860
Median	40.00	71.50	71.00	0.0001*	33.50	68.00	66.00	0.0001*
Study vs Control:								
T-test	2.153	2.240	3.261					
P	0.038*	0.031*	0.002*					

*Significant (P<0.05)

Table (6): Mean score & standard deviation of the studied sample regarding self care inventory through the study.

self care inventory items	The study group (n=20)				The control group (n=20)				Study versus control group		
	Pretest	Immediate post test	3 months post test	F-test P	Pretest	Immediate post test	3 months post test	F-test P	t-test P		
	Mean± SD	Mean± SD	Mean± SD		Mean± SD	Mean± SD	Mean± SD		Pretest	Immediate post test	3 months post test
1- Blood glucose testing	2.6±1.37	3.65±1.04	3.95±0.89	5.146 0.009*	2.50±0.76	3.30±0.86	3.00±0.79	5.005 0.010*	1.710 0.095	1.157 0.254	3.567 0.001*
2- Rrecording blood glucose level	2.30±1.75	3.90±1.21	3.9±1.02	5.841 0.008*	1.40±0.94	2.35±0.87	2.05±1.00	5.345 0.007*	2.026 0.050	1.648 0.108	2.662 0.011*
3-Ketones testing	1.45±0.94	1.55±1.23	1.55±1.10	0.055 0.946	1.50±1.10	1.50±1.15	1.20±0.52	0.643 0.530	0.154 0.878	0.133 0.895	1.286 0.206
4- Talking accurate insulin dose	3.5±1.12	4.50±0.51	4.55±0.51	1.789 0.102	3.60±1.14	4.15±0.74	4.05±0.76	2.113 0.130	1.398 0.170	1.730 0.092	2.444 0.019*
5- Talking accurate insulin dose right time	4.20±0.89	4.50±0.61	4.50±0.61	1.171 0.317	3.45±1.05	4.10±0.72	3.90±0.72	3.116 0.052	2.432 0.020*	1.902 0.065	2.854 0.007*
6- Change insulin dose according blood glucose level	2.90±1.42	4.20±0.01	4.30±0.70	7.465 0.0001*	2.40±1.27	3.95±1.07	3.25±1.05	6.102 0.006*	3.051 0.004*	3.133 0.003*	4.715 0.0001*
7- Adherence to diabetic diet	3.15±1.35	3.65±0.99	4.00±0.72	3.297 0.044*	2.60±1.43	3.65±1.23	3.40±1.26	5.002 0.012*	1.252 0.218	1.697 0.098	3.997 0.0001*

Table 6   continue

8- Eat meal at times	2.95±1.32	3.30±0.86	3.60±0.75	2.082 0.134	2.50±1.23	3.25±1.21	2.65±1.18	2.155 0.125	1.115 0.272	0.150 0.881	3.030 0.004*
9- Eat snakes regularly	2.65±1.39	3.50±1.00	3.90±0.64	7.33 0.001*	2.95±0.89	3.50±1.19	3.20±1.10	1.327 0.273	0.815 0.420	0.000 1.000	2.451 0.019*
10-Carry sweaty foods to manage hypoglycemia	2.70±1.87	3.85±1.14	4.60±0.60	10.703 0.0001*	2.55±1.73	3.70±1.22	3.60±1.05	4.367 0.017*	0.263 0.794	0.403 0.689	3.711 0.001*
11-Medical follow up	2.80±1.54	3.35±1.35	3.60±1.14	1.826 0.170	2.25±1.16	2.85±0.93	2.55±0.94	1.732 0.186	1.273 0.211	1.363 0.181	3.168 0.003*
12-Carry identification card	1.70±1.45	2.20±1.32	2.35±1.22	1.295 0.282	1.05±0.22	1.45±0.60	1.20±0.41	4.194 0.020*	1.975 0.056	2.307 0.027*	3.978 0.0001*
13-Practice exercise regularly	2.85±1.69	3.30±1.30	3.95±1.00	3.298 0.044*	1.55±0.76	2.20±1.00	2.15±0.81	3.493 0.037*	3.131 0.003*	2.991 0.005*	6.252 0.0001*
14- Practice exercise strenuously	2.75±1.68	3.30±1.26	3.80±1.06	2.990 0.058	1.55±0.89	2.15±1.04	1.95±0.94	2.029 0.141	2.822 0.008*	3.147 0.003*	5.839 0.0001*

Figure (1) showed means of the studied sample regarding to the total score of Self Care Inventory throughout the study period. The there was a si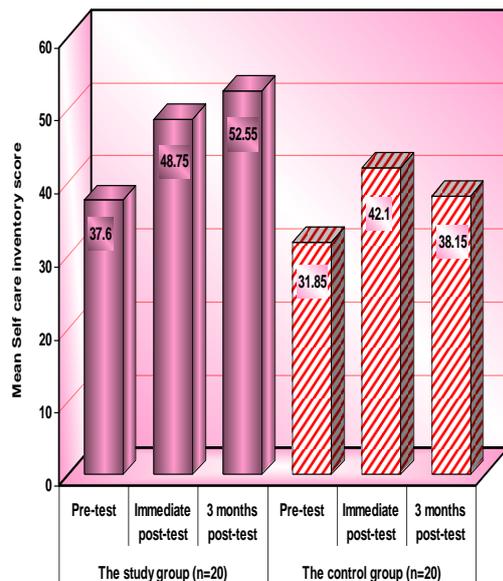gnificant improvements in the mean score of self care inventory of both groups (study & control) from preprogram, immediate program, and three months post program with a significant between the two groups throughout the study.

Figure (1): means of the studied sample regarding to the total score of Self Care Inventory throughout the study period.

Figure (2) showed the total mean score and standard deviation of students regarding to Diabetic Support Assessment (DSA) throughout the study period. There was a significant improvement in the mean total score of diabetic support of the study group through the study period, as the total mean score increased from 36.15 ± 21.46 preprogram, to 49.00 ± 18.97 immediate post program, and 54.65 ± 18.09 three months post program ($P < 0.05$). Meanwhile, a slight change was observed among the control group. There was a significant difference between the study and control group in relation to the total mean score of diabetic support at immediate post program and three months post program ($t = 4.391$ & $t = 6.759$) respectively.

Figure (2): Diabetic Support Assessment (DSA) scores of the studied diabetic school children (study and control groups) .
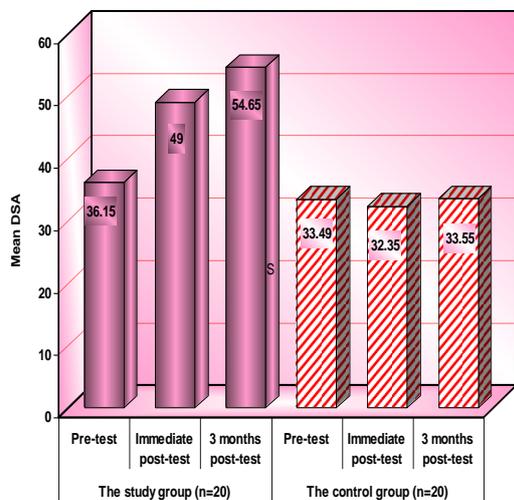

Figure 3 shows mean fasting blood sugar (FBS) of the studied diabetic school children (study and control groups). The table showed that, there was a significant improvement of glycemic control among the study and control groups throughout the study period. The mean fasting blood sugar of the study group was 263, 193 and 125ml/dl respectively at preprogram, immediate, and 3 months post program. While the mean fasting blood sugar of the control group was 351.90, 285.85 and 206.25 ml/dl respectively at preprogram, immediate, and 3 months post program. A significant difference was found between the two groups in relation to their fasting blood sugar from preprogram, immediate, to 3 months post program.

Figure (3): Mean fasting blood sugar (FBS) of the studied diabetic school children (study and control groups).
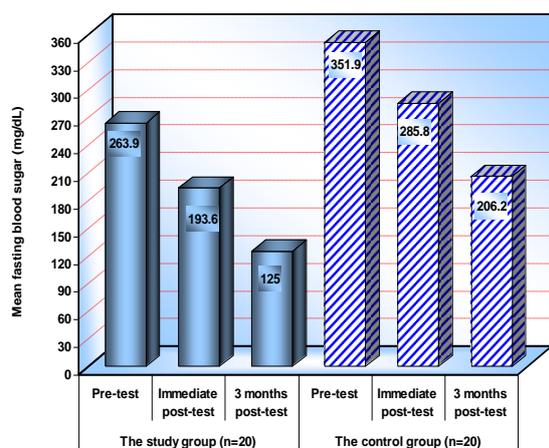
Table (7): Correlation between knowledge, Self- Care Inventory, diabetic peer support performed steps in assuring blood glucose level and injecting insulin by pen among the studied sample (study and control groups) immediately post-test.

Variables	The study group (n=20)					The control group (n=20)				
	Knowledge	Self- Care Inventory (SCI)	Diabetic Support Assessment (DSA)	Measuring blood glucose level	Injecting insulin by pen (n=18)	Knowledge	Self- Care Inventory (SCI)	Diabetic peer support	Measuring blood glucose level	Injecting insulin by pen (n=18)
	R P	r P	r P	r P	r P	r P	R P	r P	r P	r P
Self- Care Inventory (SCI)	0.518 0.019*	-	-	-		0.490 0.049*	-	-	-	
Diabetic peer support	0.040 0.869	0.410 0.072	-	-		0.365 0.113	0.126 0.597	-	-	
Measuring blood glucose level	0.454 0.044*	0.165 0.486	0.430 0.059	-		0.005 0.984	0.080 0.736	0.315 0.176	-	
Injecting insulin by pen (n=18)	0.501 0.012*	0.246 0.325	0.153 0.545	0.346 0.159		0.486 0.041*	0.499 0.025*	0.404 0.096	0.344 0.162	
Fasting Blood Glucose	0.454 0.044*	0.165 0.486	0.430 0.059	0.325 0.163	0.346 0.159	0.113 0.635	0.066 0.783	0.097 0.683	0.682 0.001*	0.383 0.117

*Significant (P<0.05)

r=Correlation coefficient

Table (8): Correlation between knowledge, Self- Care Inventory, performed steps in injecting insulin by pen and by syringe among the studied diabetic children (study and control groups) 3 months post-test.

Variables	The study group (n=20)					The control group (n=20)				
	Knowledge	Self- Care Inventory (SCI)	Diabetic Support Assessment (DSA)	Measuring blood glucose level	Injecting insulin by pen (n=18)	Knowledge	Self- Care Inventory (SCI)	Diabetic peer support	Measuring blood glucose level	Injecting insulin by pen (n=18)
	r P	r P	r P	r P	r P	r P	r P	r P	r P	r P
Self- Care Inventory (SCI)	0.673 0.001*	-	-	-		0.454 0.044*	-	-	-	
Diabetic peer support	0.497 0.026*	0.486 0.041*	-	-		0.414 0.070	0.347 0.134	-	-	
Measuring blood glucose level	0.467 0.038*	0.518 0.019*	0.311 0.181	-		0.216 0.362	0.047 0.844	0.149 0.530	-	
Injecting insulin by pen (n=18)	0.532 0.023*	0.433 0.073	0.475 0.047*	0.890 0.0001*		0.524 0.018*	0.271 0.277	0.038 0.880	0.297 0.231	
Fasting Blood Glucose	0.598 0.005*	0.139 0.558	0.282 0.228	0.392 0.088	0.569 0.014*	0.210 0.375	0.490 0.028*	0.043 0.858	0.552 0.012*	0.737 0.0001*

*Significant (P<0.05)   r=Correlation coefficient

Discussion

Type 1 diabetes mellitus (T1DM) is a lifelong metabolic disorder for which no cure is known. The management of T1DM is a complex regimen of multiple daily insulin injections, frequent monitoring of blood glucose level and life style adjustment such as meal planning and exercise. TIDM presents a unique challenge to health care provider, diabetic school children and their families [18,19].

The main aim of diabetes management of diabetic teenage is to achieve optimal glycymic control as it prevents long term complications. Glycymic control usually deteriorates during adolescence [20].

Peer support helps reduce problematic health behaviors, depression, and contribute to improve diabetes management, including improving behaviors related to medication adherence, diet, exercise, and blood glucose monitoring. The success of peer support appears to be due to the nonhierarchical, reciprocal relationship that is created through the sharing of similar life experiences [21].

At the begaining of this study, the pretest was applied to students of both the study and control groups to analyze their sociodemographic data, knowledge, self care practices, glycemic control, and availability of peer support of the diabetic school children in order to develop specifically targeted comprehensive guidelines on diabetes self-management according to their needs, knowledge and practices deficit.

In this context, the result of this study showed that before implementation of the program the study and control groups showed poor glycemic control, low scores of knowledge, self care practices and perceived peer support. After implementation of the program, the two groups showed significant glycemic control and improvement in their knowledge score and self care practices. This improvement was highly significant among the study group who received peer support than the control one.

Maintaining glycemic levels is an extremely difficult task for most school- age children and their families [22]. Preprogram, the two groups showed poor glycemic control as they had high means of fasting blood glucose levels. Immediately and three months after applying the program, a significant progressive reduction in the means of the fasting blood glucose levels was found among the two groups. However, the reduction was more obvious

among the study group than the control one. This could be due to that students included in the peer support group were more motivated and supported each other to adhere to diabetic diet, regular exercise in the form of walking, regular monitoring of blood glucose level and adjust insulin injection dose according to the results. Such support was mainly through telephone call or meeting during school day break to discuss daily events related to diabetes. This result is in agreement with the result of Deakin et. al., (2005), who reported that group based training significantly improved fasting blood glucose level of diabetic people at both short- and long- term follow up[23].

As regard students' knowledge about diabetes, the present study showed that, results of pretest showed that only a few percent of both the study and control groups reported correct and complete knowledge about diabetes as well as its management. This result may be attributed to unavailability of an organized-structured health education program about diabetes to those diabetic students. The present result is in agreement with El Rafay SS(2004)[24],who reported that the diabetic children had improper knowledge of diabetes including its meaning, types and causes.

The importance of knowledge in health education must not be ignored as improvement in knowledge is the first step toward health behavior modification. After applying the program, the two groups in this study showed a significant improvement in their mean score of total knowledge about diabetes, its management and all its aspects immediately and 3 months post program. This improvement was relatively higher among the group who received peer support than the control group. This reflects the importance of continuous education of diabetics in conjunction with peer support to refresh their knowledge as some details may be forgotten, so peers can review them together. In accordance with the present study Coleman et. al., (2011) [25] reported that peer education had a significant increase in diabetic students' knowledge related to diabetes. The result also is in agreement with the finding of Hassan S(2007) [16], El zubier (2001) [26], and Norris et. al., (2001) [27] who found significant improvement in knowledge of diabetic children after health education program. El Rafay (2004) [24], mentioned that diabetic adolescent reported appropriate understanding about the difference between the traditional and the unfamiliar symptoms of hypoglycemia after health education.

Concerning Self Care Inventory (SCI), the pretest in this study revealed that the two groups had low frequency of practicing most of its items e.g. blood glucose testing, recording, ketones testing, changing insulin dose according to result of blood glucose test, eating meals at times, having snacks regularly, carry sweaty foods to manage hypoglycemia, medical follow up, carrying identification card, and practicing of exercise. This finding may be due to many facts as lack of their knowledge about DM and its management, negligence, as well as their desire for not to be different from their colleagues or friends. After applying the program, there was a significant improvement in all items of SCI for both groups immediately post program except for testing of ketones, taking accurate insulin dose, taking it at right time, and eating meals at times. This improvement was higher and significant among the study group than the control one through the study period especially three months post intervention. Moreover, the overall score of SCI was higher among the study than the control with significant difference between the two groups either, immediate, and post test. These results may be attributed to the core element of peer support which depends on sharing and exchanging of experiences related to diabetes

among the study group. Peer support may improve self-management among millions of people with diabetes around the world[28].

The realization of the importance and effectiveness of peer support among adolescents has encouraged its implementation in various health problems as engaging peer support to help adolescent and child to deal with public health problems such as smoking[29]. A assessed the influence of peer relationships on adjustment to cystic fibrosis during adolescence by D'Auiria et. al., (2000) [30], showed that, peer support help adolescents to incorporating cystic fibrosis into their developing ideas of who they are and who they will become, gave them a greater perspectives of illness, its consequences, coping and the importance of believing in a positive future.

Therapy of T1DM involves greater and earlier use of intensive insulin regimens in order to achieve better control of blood glucose level[31]. The result of the present study revealed that, study group showed high compliance with insulin dose and adjusting it according to results of blood glucose test more than the control one. This result may be attributed to their influence by familial experiences as three quartres of the studied sample had family history of diabetes mellitus in particular among first degree relati

relatives (father mother, sister and brother). Moreover, every student in the peer support group competed to be more compliant than his peers. In agreement with the current result, La Greca (2004), reported that most people with diabetes report compliance with insulin management very often[15]. This result is contradicted with Abdel Gaffar (2003)[17] who found that only thirty percent of the diabetic students had good self care practice scores in the area of insulin injection therapy.

The American Diabetes Association (ADA) (2005) [32] recommended that patients with DM perform self monitoring blood glucose at least 3 times/day especially before meals. In the present study before implementation of the program a varied percentage of the study and control groups used to test blood glucose level before meals, two hours after meal, or at any time. Immediately after applying the program, the majority of the two groups tested their blood glucose level before meals and two hours after meals. At three months post program, all the study group reported that they test their blood glucose at such times while the control group showed slight decrease than this percentage. Their scores regarding recording of the result of blood glucose test increased through the study period especially among the study group. These

results may be explained by the role played by peers as they reminded each other about adherence to testing blood glucose at time through a mobile telephone call at morning and at night before sleeping. Moreover, the health insurance provided each diabetic student with an apparatus for blood glucose testing that makes blood glucose testing available for the student at any time.

Although insulin therapy is the cornerstone of treatment for type 1 DM, a dietary plan is important in maintaining near-normoglycemia without wide swings in blood glucose levels. Long term adherence to the dietary plan is probably the most difficult aspect of the diabetic regimen [33]. The results of the present study denoted that preprogram more than half of the two groups showed improper practices regarding diabetic diet (adhered to wrong diet regimen, take no action if they want to eat sweaty foods, had few meals /day, ate inappropriate snacks, and did not weight body regularly).

Poor dietary regimen adherence could be also attributed to both inadequate patients' knowledge of dietary management, and that food habits are the most difficult habit to change[34]. Immediately post program, the majority of the study group and more than half

of the control group showed improvement in their practice regarding diabetic diet. This improvement was maintained among the study group at three months post program more than the control group. This result as mentioned by the study group is related to the presence of a peer who helped them to select appropriate food and encourage them to eat proper snacks e.g., one peer supporter had previous health education sessions about diabetes and its suitable diet at Abo El-Resh hospital and the students usually search net wipe site for diabeteic diet and intern they benefit their peers. Such peers were not available to the control group. In agreement with the present results El Saleet (2000), assessed the effect of improving knowlegde and practice among diabetic children and their mothers in Tanta city and reported improved adherence to diet control among diabetic children[35]. On the other hand results of Hassan (2007) [16], are contradicted with this result as it revealed that there was a significant reduction in the mean score of adolescents' adherence to diabetic diet after implementation of the intervention.

Regular physical activity is associated with immediate and long-term health benefits[36]. According to American Diabetic Association (ADA) guidelines, all patients with diabetes should be given the opportunity to benefit from the effect of exercise[37]. At the pretest more than half of the study group and only more than one tenth of the control practiced physical exercise. This finding is in agreement with many researches that assessed self- care and physical practices of diabetics which denoted poor physical exercise practices among diabetic children[17,32,38]. Immediately and 3 months after implementation of the program, there was a significant improvement in the practice of physical exercise of the two groups, but it was more significant among study group than the control one. This finding may be related to the influence of peers as peers encouraged each other to practice exercise. Friends' support in this study consisted primarily of companionship behaviors, such as sharing various activities (e.g. they go to biking or walking together).

Although circulatory problems of the feet are less common in children, proper foot hygiene habits need to be established[39]. The current study denoted that a varied percentage ranged from 50% to 80% of both groups had improper practices. Immediately and 3 months after implementation of the program, the majority of both groups showed improvement in all items of foot care practices, but with no

significant differences between the two groups. This result may be attributed to improvement of their knowledge related to foot care. The students reported that they adhered to foot care practices fearing of foot complications especially diabetic foot and amputation. Findings of El Sallet (2000)[35], are in agreement with this results.

Adolescents and children tend to have difficulty adherence to diabetic regimens[40]. Negative social attributions have a role in adherence difficulties, so intensive psychosocial support may be indicated [41]. Peer support falls within the social model, which is defined as the process through which social relationships might promote health and well-being[42]. The results of the present study denoted that, preprogram, the majority of the two groups reported that their parents were the resource persons for diabetes social support. Immediately and 3 months post program, the majority of the study group reported that peers and parents were the resource persons for diabetic social support, while the majority of the control group reported parents only. Furthermore, it was also observed that, immediately and 3 months post program, students exposed to peer support, reported peers with high score than parents as a resource for support. Finding of a study done by Greco P et.

al., (2001)[43], about peer group intervention for adolescents with type 1 diabetes and their best friends is in agreement with the result of the present study and added that parents reported that including peers in treatment has been associated with decreased parent- child diabetes conflict.

Concerning peer support, the present study revealed that, pre-intervention the study and control groups had nearly the same mean scores on the diabetes peer support assessment scale regarding all the studied items. Immediately and 3 months post program, the study group showed a significant continuous increase in their total mean score of diabetes peer support and for all the items. On the other hand, the control group showed no improvement. This result is in agreement with Pendley et. al., (2002), who studied peer and family support in children and adolescents with type 1 diabetes and mentioned that adolescents reported significantly more peer support for various management tasks in every category of peer support[44]. These results may be justified that, as adolescent experience more intimacy and disclose information, as it is typical in normative development, and they may also share more disease-related information and, in

turn, perceive their peers as offering more support for their diabetes[45].

The present study showed a positive correlation between the knowledge of the study group and Self- Care Inventory, peer support, measuring blood glucose level, injecting insulin by pen and fasting blood glucose level at 3 months post program Self- Care Inventory was also correlated with peer support and injecting insulin. This correlation may be related to the success of peer supporters in persuading the diabetic student to correct their diabetic knowledge and enhance their adherence to self care practices. In relation to the control group, a significant positive correlation was found between the group's knowledge and Self- Care Inventory, and injecting insulin by pen immediately and 3 months post program. This correlation is similar to that of Norris et. al., (2001)[46],who reported that self management training was associated with improvement of knowledge, frequency or accuracy of blood glucose self monitoring, self-reported dietary habits and glycemic control.

Three months post program there was also a positive correlation between Self- Care Inventory of study group and diabetic peer support & measuring blood glucose level. Moreover, a positive correlation was found between injecting insulin by pen and diabetic peer support & measuring blood glucose level. In addition, there was a positive correlation between fasting blood glucose level and diabetic knowledge & injecting insulin by pen. This correlation is clarifying that every student in the study group gained benefit from the practical experience of each other which intern improve their self care practices and glycemic control.

Continuous effort should be made to help diabetic school students achieving gylcemic control and adhering to the management of the disease. This can be achieved through organization and implementation of diabetic peer support group within the school. Proper glycemic control will help students enhancing their academic performance and relations with the outside environment.

Recommendations

1- School health nurses should be informed about the importance of peer support for diabetic students and encouraged to do their best effort to make peer support available to every diabetic student in particular those of poor glycemic control or newly diagnosed.

2-The school health nurse should conduct periodic and continuous training programs for

the diabetic students to enhancing their diabetes self care and glycemic control.

3- School health insurance needs to specify a certain day and name it "day of diabetic student". This day give the chance for meeting of all diabetic students and doing recreational and physical activities that enhance their social support to each other.

4- School health insurance should provide every diabetic student with a booklet with simple instructions and diagrams about diabetes and its management.

5- Mass media programs about type 1 diabetes and peer support need to be prepared and introduced by diabetic teenagers.

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