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Level of Awareness, Adherence to Diet, Self-monitoring and Medication Regimen among Diabetic Patients: A Basis for Improving Diabetes Specialty Clinic Services

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Abstract

The rise of Type 2 diabetes is becoming a global public health scare that needs extra attention and management. The increasingly sedentary lifestyle and westernization of diet have grown in parallel with the worldwide rise in obesity which is a major cause of Type 2 diabetes. This study focused on determining the level of awareness and adherence to medication and diet of diabetic patients at Abdi Waluyo Hospital in Jakarta Indonesia, which will be used as a basis for improving the Diabetes Specialty Clinic for the hospital. The study utilized quantitative method with descriptive correlational type of research to collect information on patients' level of awareness and their adherence to drug management, diet, exercise and level of awareness. The patients (n=20) were recruited from Abdi Waluyo Hospital. A purposive sampling was utilized to select twenty diabetic patients. A researcher-made questionnaire was utilized as the main instrument in gathering data. A focus group discussion was also done to assess the level of awareness and compliance to diabetes management. The study yielded a full extent on adherence towards medication intake. Patients have extreme awareness in diet management and moderate awareness in diet and exercise. In terms of compliance, patients adhere to some extent only, while drug management has the highest level of compliance, followed by exercise and diet. There is a low correlation between level of awareness and compliance (r=0.32, p=0.15), indicating that the moderate level of awareness of patients to Diabetes Mellitus management is not related to their compliance. It was concluded that patients' adherence or compliance to prescribed treatment regimen is the extent to which behaviours coincide with the health education to achieve a therapeutic result. Hence, educating the patients and family members is a key to Diabetes Mellitus patient management.

Keywords: Diabetes mellitus; Type 2 diabetes; Patient adherence; Patient compliance; Treatment regimen; Obesity; Patient management; Diet

Introduction

The incidence of diabetes worldwide is rising and should be a cause for alarm. In Indonesia, diabetes ranks the 3rd leading cause of death affecting more than 10 million people. The number is expected to rise substantially if the problem is not addressed. The situation warrants early aggressive intervention for diabetes mellitus prevention and management which comprise of diet, exercise and drugs to effectively manage diabetic patients according to Clinical Nutrition Specialist Dr. Nany Leksokumoro. Diabetes Mellitus is a slow, silent but ravage killer. It is still a very-much unknown and taken-for-granted disease that can play host to deadly complications such as heart attack, stroke, kidney failure, impotence, or blindness. The disease is compounded today by an emerging consumer society and a sedentary lifestyle. Although it cannot be cured completely, the disease can be controlled by careful attention to lifestyle and proper management along with intensive medical care to reduce the incidence of its acute and chronic complications. Diabetes Mellitus is one of the chronic lifestyle diseases affecting a large sector worldwide. Management studies for Diabetes Mellitus in first world countries may vary largely from management strategies applied in the third world areas because of economic and manpower factors.

Understanding Diabetes mellitus

Dr. Dyah Purnamasari, professor in the Faculty of Medicine at the University of Indonesia and a specialist in Endocrinology and Metabolism, explained the nature of Diabetes Mellitus, its causes, risks and comorbidities during the interview conducted at her office in Cipto Mangunkusumo Hospital. She describes Diabetes Mellitus, as a "condition wherein the body does not produce enough, or properly respond to insulin which causes glucose to accumulate in the blood leading to various complications such as kidney failure, cardiovascular and peripheral arterial diseases, erectile dysfunction, blindness, diabetes neuropathy, poor wound healing which can lead to gangrene and further leads to amputation". She continued that "type 1 and type 2 diabetes are considered chronic disease which requires long term treatment and medication. Pre-diabetes and Gestational are potentially reversible diabetes conditions given the proper management and discipline".

Type 1 is characterized by absolute insulin deficiency. It is the result of an autoimmune disorder, in which the immune defences that normally protect against infections turn against the body's own tissues. The causes are unclear but appear to involve both genetically defined susceptibility and environmental factors (including viral infection) that trigger the development of the disorder in susceptible individuals. Despite active research, type 1 diabetes has no cure. Treatment focuses

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on managing blood sugar levels with insulin, diet and lifestyle to prevent complications.

Type 2 is the most common form of diabetes accounting for up to 90% of all cases worldwide. Factors known to contribute to the risk of developing type 2 diabetes include genetic predisposition, obesity, lack of exercise, increasing age and treatment with certain drugs.

Other secondary types of diabetes are characterized by hyperglycemia secondary to other diseases or drugs taken. On the other hand, hypoglycemia is a condition caused by a very low level of blood sugar (glucose), which is often related to the treatment of diabetes.

The risk for diabetes increases with age, making diabetes common in older adults. In fact, approximately 25% of adults over the age of 60 years have diabetes. Extra attention and care on food consumption is a must for people suffering from the disease. Losing weight and getting healthier is a great challenge. Alas, there is no such facility in Indonesia that incorporates all facets of getting fit, at least, not yet.

Similar studies on knowledge regarding causes of diabetes, its prevention and the methods to improve health were conducted. American Diabetes Association explained that many factors are known to contribute to the risk of developing type 2 diabetes, including genetic predisposition, obesity, lack of exercise, increasing age and treatment with certain drugs. Diabetes type 2 generally develops late in life and used to be uncommon in people under 40 years of age; it used to be called "maturity-onset diabetes". This term is no longer applicable as the disease attacks even younger people nowadays. The disease develops over many years, with gradual decline in insulin sensitivity and a slow rise in blood glucose levels. The symptoms are generally milder than those of type 1 and are often absent altogether. As a result, diabetes type 2 often goes undiagnosed for many years, during which time the high blood glucose levels can cause serious damage to a range of the body's organs and tissues [1].

Gestational diabetes starts during pregnancy and can harm both the mother and child. During pregnancy, the placenta produces hormones that are essential to the baby's growth but these can also induce insulin resistance in the mother. Although blood glucose generally returns to normal after the mother gives birth, the risk of developing diabetes type 2 later in life is substantially increased [2].

Most of the patients with diabetes do not own a glucose-meter and do not consult the doctor on a regular basis. The findings may be related to the increased untreated cases of diabetes mellitus. The knowledge, attitudes and practices of diabetes patients were impaired and there is a need for health education to improve management of diabetes and prevent complications. In addition, there is also an ineffective access to diabetes care and management in Indonesia [3]. The application of standard treatment/management guidelines will be of help to encourage patients to seek and receive regular care.

Results of the study by Krousel-Wood also emphasized the importance of exercise management. Physical activity, monitoring and low calorie diet can be effective in lowering the glucose and HbA1c levels [4]. American Associations of Clinical Endocrinologists (AACE, 2007) recommended that intensive insulin therapy may reverse hypoglycemia in patients with Type-1 and maintain target glycemic level [5]. It is critical to understand the possible effects of the disease on the lives of these patients which somehow affect their compliance to the management of Type-1 diabetes [6]. Having much knowledge on the effects, anxiety and adjustments confronting these patients, it is important to empower the patients to effectively manage their own disease. For effective management and to be successful in preventing complications of this chronic and debilitating disease, patients must be equipped with necessary knowledge, skills, and attitude [7].

Medication Adherence

Adherence or compliance, as it relates to healthcare, is the extent to which a person's behavior coincides with medical or health advice [8]. Medical compliance is critical for all aspects of patients, especially in successful treatment, disease prevention, and health promotion [6]. Compliance depends on the patient's and physician's commitment to the same objectives. Osterberg and Blaschke conclude that poor adherence to medication is common, contributing to substantial worsening of disease death and increased health care costs. Practitioners should therefore look for poor adherence and can enhance adherence by emphasizing the value of patient's regimen, making it simple and customized to patient's lifestyle [9].

Kenreigh and Wagner found that adherence rates for type-2 diabetes have ranged from 65%-85% on oral medicines and 60%-80% for insulin. Influences on adherence in this population are similar to those in patients with chronic diseases: understanding of the treatment regimen, treatment regimen complexity, perception of the benefits of treatment, adverse effects, costs of medication, and emotional well-being. Patients from urban low social-economic areas are believed to be at higher risk of non-adherence [10].

Diabetic care regimen is vital to the prevention of further complications to diabetic patients. However, since there are several factors causing non adherence to treatment, an effective diabetic patient care program will help stop these complications and control the incidence of the growing population of diabetic patients in Indonesia.

Objective of the study

The study aims to determine the level of awareness and compliance to Diabetes Mellitus management of diabetic patients in Abdi Waluyo Hospital. It also finds out the relationship of the level of awareness and compliance to Diabetes Mellitus management and gives recommendations on how to make people with diabetes and health care providers aware of beneficial nutrition interventions, drug compliance and exercise. The result of the study, insights and recommendations taken from the experts will be used as guide in improving the diabetes specialty clinic services at Abdi Waluyo Hospital.

Method

Research design

The study utilized a descriptive correlational research design to describe the level of awareness and compliance to Diabetes Mellitus management of patients with diabetes. Beck and Polit stated that descriptive research is focused on understanding the causes of behavior, conditions and situations and in which data gathering is done through observation, survey and interview [11].

Study site

The study was conducted at Abdi Waluyo Hospital in Jakarta Indonesia, a private tertiary hospital well known for its advanced technology and in delivering personalized service specializing in cardiovascular health.

Participants

The participants of this study were the diabetic patients in the

research locale under study which was the Abdi Waluyo, Hospital. The researcher purposely selected 20 participants based on the following criteria:

- Must be a patient of the hospital from period March to October 2018, forty five to sixty five years old.
- Diagnosed with Diabetes Mellitus type 2.
- Organic personnel who take part in the implementation of diabetic management (Endocrinologist, clinical nutrition specialist, dietician and 2 nurses).
- Must not be experiencing mental disability such as mentally confused or disoriented.
- Must willingly consent to participate in the study.

Administration and formulation of questionnaire

The researcher made questionnaire based on the context of the disease process and the management of diabetes mellitus with the specific treatment protocols and the responses of the participants to the treatments. The validated questionnaire included the level of awareness and compliance of patients to diabetes management. Answers for every item were weighed using Likert's five point scale which ranges from extremely aware to not aware (for the level of awareness) and to a very great extent of compliance to a very small extent of compliance (for the level of compliance) to diabetes management.

A focus group discussion (FGD) was done to deepen the assessment of the level of awareness and evaluate the extent of their adherence to Diabetes Mellitus management. The Focus Group Discussion was conducted to validate the answers of the patients in the questionnaire with regards to their knowledge of the disease and compliance with diabetes management.

	Awareness to Diabetes Mellitus	Mean ± SD	Verbal Interpretation	Rank
1	Diabetes is a lifestyle disease	4.00 ± 1.30	Moderately aware	7
2	Diabetes is hereditary	3.90 ± 1.17	Moderately aware	9
3	Diabetes type 2 is non-insulin dependent diabetes	3.75 ± 1.37	Moderately aware	10
4	Obesity is one of the risk factors of diabetes	3.95 ± 1.23	Moderately aware	8
5	Blurred vision. confusion, headache are signs of hypoglycemia	4.30 ± 0.86	Moderately aware	6
6	Hyperglycemia is increased blood sugar level	4.75 ± 0.55	Extremely aware	3
7	Increased thirst, frequent urination, nausea and fatigue are signs of signs of hyperglycemia or high blood sugar level	4.85 ± 0.37	Moderately aware	2
8	Fatigue, increased thirst and urination are symptoms of diabetes	4.45 ± 1.05	Extremely aware	5
9	The management for diabetes is diet, exercise and medication	4.60 ± 0.94	Extremely aware	4
10	The key to optimal blood sugar control is to balance food, exercise, insulin and medication	5.00 ± 0.00	Extremely aware	1
	Total	4.36 ± 0.16	Moderately aware	

Table 1: Awareness level of patients with diabetes mellitus.

Diet Indicators	In-Patients	Int	Out-Patients	Int	AVR Weighted Mean	Int
Follows caloric requirements needed by the body	3.54	FE	3.47	FE	3.5	FE
Avoid food that are rich In Carbohydrates	4.03	FE	4.46	FE	4.25	FE
Considers diabetic diet when planning meals	4.53	FE	4.52	FE	4.53	FE
Refrain from eating prohibited foods	3.46	ME	3.4	ME	3.43	ME
Makes it a habit to eat at the right time	3.56	FE	2.4	LE	2.9	ME
Average Weighted Mean	3.82	FE	3.87	FE	3.85	FE

Table 2: Mean scores of the participants of their adherence towards diet.
Legend: Int: Interpretation; LE: Little Extent; ME: Moderate Extent; FE: Full Extent.

Interpretation and analysis of data

The results were analyzed using Statistical Package for Social Sciences (SPSS) version 19 software. Mean and SD was used to describe the level of awareness and compliance of the patients to diabetes management. Pearson correlation was utilized to determine relationship of the level of awareness to the extent of compliance of the patients to diabetes management (Table 1).

These participants' answers were corroborated by the FGD. Three of the participants mentioned the common factors that can contribute to an increase in blood sugar are consuming foods that are high in sugar and having a sedentary lifestyle. Patients understand that blood sugar can be controlled when there is high level of awareness about the disease, Participants' adherence towards Diet. Table 2 presents the ratings of participants to what extent they had been following prescribed diabetic diets and dietary habits.

The Table 2 above shows that the participants both at the in-patient and out-patient consider their present illness in planning for their meal to the fullest extent with a weighted mean of 4.53. Similarly, in-patients and out-patients are avoiding carbohydrate-rich food and following caloric requirement as shown in the ratings of 4.25 and 3.5 respectively. This only means that the participants both in-patient and out-patient have the highest level of awareness in the importance of diabetic diet. Eating at the right time shows compliance to a full-extent (3.56) among the in-patients since they are fed on time whereas the out-patient shows a lower mean (2.9) perhaps dues to their work schedule or daily activities that they overlook the regular mealtime.

Since, Indonesians are generally fond of sweets and sometimes could not resist the temptation of devouring into cakes and pastries, the use of low-calories sweeteners. Later developments on diabetes mellitus recommend a typical healthy diet: one that is high in fiber, with a variety of fruit and vegetables and low in both sugar and fat especially saturated fat. According to the clinical nutrition specialist of the hospital, a healthy eating is not simply a matter of "what one eats" but "when one eats." If patients check their blood glucose at bedtime and find that it is low, it is advisable that they take some long-acting carbohydrates before retiring to bed to prevent night-time hypoglycemia.

Participants' adherence towards exercise

Table 3 shows the mean score of participants on their adherence towards exercise which is a vital component of a diabetic regimen.

The participants in general have been complying to a full extent

Exercise Indicators	In-Patients	Int	Out-Patients	Int	AVR Weighted Mean	Int
It is advisable to exercise regularly	3.35	ME	3.5	FE	3.43	ME
Foot exercise should be part of the exercise routine	2.85	ME	4.3	FE	4.58	FE
If not busy, try to exercise in the morning and at nighttime	3.54	FE	4	3.77	3.77	FE
Average Weighted Mean	3.24	ME	3.9	3.9	3.59	FE

Table 3: Mean scores of the participants of their adherence towards Exercise.
Legend: Int: Interpretation; LE: Little Extent; ME: Moderate Extent; FE: Full Extent.

Self-Monitoring Indicators	In-Patients	Int	Out-Patients	Int	AVR Weighted Mean	Int
Tests urine and blood as directed	2.3	LE	3.4	ME	2.8	ME
Collects urine and blood before mealtime	1.8	LE	3.5	FE	2.65	ME
Whenever remembered, results of tests should be recorded	2.5	ME	4.3	FE	3.4	ME
Does not stop testing even if feeling well	2.6	ME	4.4	FE	3.5	FE
Average Weighted Mean	2.1	LE	3.9	FE	3	ME

Table 4: Mean scores of the participants on their adherence towards Self-Monitoring.
Legend: Int: Interpretation; LE: Little Extent; ME: Moderate Extent; FE: Full Extent.

when it comes to exercise as reflected in the overall weighted mean of 3.59. They are aware of the importance of exercise in the improvement of health especially among them, who are inflicted with diabetes. Although in-patients adhere only to a moderate extent (weighted mean=3.24) due to the fact that at the time the study was done they are confined at the hospital and are not physically fit to exercise. This only means that the participants are aware of the beneficial effects of exercise in reducing blood sugar and subsequently preventing complications due to diabetes. This was further validated in a study made by Makkiawouda et al. when they found that physical activities also alter blood lipid concentrations, increasing levels of high-density lipoproteins and decreasing total cholesterol and triglyceride levels [12].

Participants' adherence towards self-monitoring

Table 4 presents the ratings of participants in the four indications on adherence towards self-monitoring as part of the treatment regimen of diabetic patients.

As can be gleaned from the above table, patients confined in the hospital were testing blood and collecting urine and blood to a little extent as sown in the weighted mean 2.3 and 1.8 respectively. They record and continuously undertake testing and record the results to a moderate extent as shown on the weighted mean of 2.6 and 2.5 respectively. On the other hand, outpatients are collecting specimen, recording of results and complying with testing to the full extent as seen on the weighted mean of 4.3 to 4.4. The difference in the rating can be attributed to sense of security of in-patients that in case of emergency

Medication Intake Indicators	In-Patients	Int	Out-Patients	Int	AVR Weighted Mean	Int
Take diabetic medicine as directed by physician	4.52	FE	4.45	FE	4.49	FE
I bring my medicine wherever I go	3.42	ME	3.53	FE	3.48	FE
I believe that diabetic medicine must be taken at the right time	4.3	FE	3.54	FE	3.92	FE
Take only diabetic medicines that are affordable, not whole prescription	3.43	ME	3.45	ME	3.44	ME
Take medicines regularly even when I feel better	4.46	FE	2.5	ME	3.48	ME
Average Weighted Mean	4.02	FE	3.49	ME	3.76	FE

Table 5: Mean scores of the participants on their adherence towards Medication Intake.
Legend: Int: Interpretation; LE: Little Extent; ME: Moderate Extent; FE: Full Extent.

services are always available.

If done on their own, that is, without the intervention of the nurse, testing and recording of urine and blood sugar among in-patients are compiled only to a little extent since they are confined and the nurse does it regularly for them. Participants at the out-patient complied with a moderate extent even if they have to go to the hospital for sample collection since they wanted to be sure that their blood sugars are within the normal limit. The perception was further validated by Dr. Dyah Purnamasari when she mentioned that self-monitoring in diabetes gives the patient the confidence to be in control of their illness but it very challenging especially for patients who are working. Blood glucose can be controlled by either testing glucose level at home or during clinic visits. Self-monitoring to detect hypoglycemia or hyperglycemia is vital to prevent long-term effect of diabetic complications. However, self-monitoring has its disadvantages as well, especially when there is a need to calibrate the instrument regularly [13]. Among the in-patients, adherence towards self-monitoring is done only to a little extent with a weighted mean of 2.1. On the other hand, participants availing of out-patient services are complying to a moderate extent with a weighted mean of 3.1. Overall, the participants are adhering to the four indicators of self-monitoring to a moderate extent with a weighted mean of 3.1.

Participants' adherence towards medication intake

Table 5 describes the Mean Scores of the Participants on their Adherence toward Medication Intake.

Although, patients are extremely aware that individualized meal plan is necessary to control diabetes, results show that they only comply with some extent. From this research results, it revealed that there was a low correlation between diabetes level of awareness and compliance to Diabetes Mellitus management. The correlation between level of awareness and compliance was not significant to consider in the study. It indicates that the moderate awareness of patients to diabetes management is not related to their extent of compliance.

Results and Discussion

This study aims to determine the patient's level of awareness and extent of compliance to Diabetes Mellitus management. Moreover, it

sought to identify the relationship between awareness and compliance to management. Results revealed that patients have extreme awareness on blood sugar control and signs of hyperglycemia but moderate awareness only on signs of hypoglycemia. It is of primary importance in the prevention of long-term complications the maintenance of normal glucose level and awareness in the signs and symptoms of both hyperglycemia and hypoglycemia.

In the study, patient Self-Monitoring of Blood Glucose (SMBG) control is one of the effective primary techniques patients used to assess the glycemic control. However, guidelines in diabetes care suggested evidence-based approaches. Effective management of blood glucose levels have been shown to reduce the risk of diabetes complications according to American Diabetes Association (ADA) [14]. A study also recommends Continuous Blood Glucose Monitoring (CBGM) in conjunction with intensive insulin regimens to lower A1C in diabetic patients [15]. CBGM is also found effective in handling wide variability in glucose profiles before, during and after physical exercise [16].

Patients were extremely aware on diet management exclusively on individual meal plan, physical activity, cardiovascular fitness and checking of blood glucose level. Although patient's awareness in exercise management was moderate; patients are extremely aware in physical activity, cardiovascular fitness and checking of blood glucose level. They also have moderate awareness on exception in physical education classes and adjustment of insulin during exercise. However, patients are encouraged to engage in physical activities as their means of exercise.

In related studies on exercise, diet and drug management, there is increased awareness in physical activity to promote fitness and a diet that includes carbohydrate counting and decreased saturated fat intake [16]. These are recommended therapeutic modalities in the management of diabetes. However, patients have only moderate awareness on carbohydrate counting and the use of decreased saturated fat intake. Health education on carbohydrate count and use of decreased saturated fat intake may be the focus of further health education to help patients effectively manage diabetes. Patients followed the diabetes management to some extent but shows great extent of compliance on insulin management.

Moreover, the result shows that patient have some extent of compliance in monitoring blood glucose before injecting insulin and performance of exercise or physical activity. Although the nurse taught them on Self-Monitoring of Blood Glucose (SMBG), most of the patients do not own a glucose meter or some cannot afford to buy the glucose strips needed for regular monitoring of blood glucose. This may be due to lack of financial resources. ADA guidelines on diabetes management recommended that in individuals taking insulin, physical activity may cause hypoglycaemia [14]. It is recommended that regular blood glucose monitoring is important to avoid hypoglycemia during and after exercise [17]. The possibility of the occurrence of hypoglycemia after exercise or any physical activity on patients is high. Health education is necessary to teach the patients on effective blood glucose monitoring.

Patient's lowest compliance is on self-monitoring. Although patients have high level of awareness in individual meal plan they only follow the management to some extent. The health education given by the doctor may be sufficient for these patients to comply on diet management, however patients do not anymore prepare meal plan as revealed in FGD. This may be attributed to lack of motivation and support from the family. The American Diabetic Association (2012) recommended individualized meal planning and optimization of food choices to meet recommended daily allowance (RDA)/dietary reference intake (DRI) for all micronutrients in patients with diabetes [18]. The study also determined the relationship of awareness to compliance to diabetes mellitus management. Results show that there is low correlation between the patient's awareness and compliance to diabetes mellitus management.

Summary of Findings

Profile of the participants

Participants are patients of Abdi Waluyo Hospital belonging to A and B class, with monthly earnings ranging from 20 million to 45 million Indonesian Rupiah. More confined patients have acquired the disease for a longer period, that is four years or more while at the out-patient majority are inflicted with the disease for a period of one to three years.

Participants' adherence towards diabetic care regimen

Self-monitoring: The indications for self-monitoring show that in-patients adhere to a little extent. The nurses take charge of the patient's regular blood collection and screening then files the result in the patient's chart. After being discharged from the hospital, the patients tend to neglect this activity. On the other hand, out-patients adhere very well or to a full extent and believe that they should not stop taking the medication even if they already feel well.

Diet: Participants are generally aware of the diet they should follow especially in planning their meals and avoiding carbohydrate-rich foods. But refraining from eating forbidden foods somewhat shows a lower score in adherence, as they are sometimes tempted to have a little portion of these foods such as desserts and sweetened beverages. Overall adherences to diabetic diet regimen are compiled to full extent by both participants. The difference in the rating on regular eating habits out-patients are complying with a little extent due to work environment and schedule.

Exercise: Participants believe that exercise is an important factor in reducing the risks and complications of the disease. Even without being reminded, they voluntary try to exercise to the full extent. On the other hand, there is only moderate on compliance to exercise of in-patients due to their confinement in the hospital

Medication intake: Patients have the moral duty to take prescription medicines no matter how expensive and burdensome it is. Both the in-patient and out-patient think that medicines should be taken to the fullest extent.

Recommendations

The following recommendations are based on interview results from the clinical nutrition specialist, internist and endocrinologist of Abdi Waluyo Hospital and the Diabetes Care e-Journal authored by Dr. Frank Hu, published by American Diabetes Association [18].

Diet

Patients who have pre-diabetes or diabetes should receive individualized medical nutrition therapy (MNT). Such therapy is best provided by a registered dietitian familiar with the components of diabetes medical nutrition therapy. Nutrition counseling should be sensitive to the personal needs, willingness to change, and ability to make changes of the individual with pre-diabetes or diabetes.

Energy balance, overweight and obesity

Weight loss is recommended for all such individuals who have or are at risk for diabetes. Change in lifestyle is an important component and is most helpful in maintenance of weight loss. For weight loss, either low-carbohydrate or low-fat calorie-restricted diets may be effective in the short term up to one year. For patients on low-carbohydrate diets, monitor lipid profiles, renal function, and protein intake in those with nephropathy, and adjust hypoglycemic therapy as needed.

Preventing diabetes (primary prevention)

For people who are at high risk in developing type 2 diabetes, maintaining the ideal body weight and regular physical activity, at least 150 minutes per week, with dietary strategies including reduced calories and reduced intake of dietary fat, can reduce the risk for developing diabetes and are therefore recommended.

Controlling diabetes (secondary prevention)

Carbohydrate in diabetes management: It is recommended to have a dietary pattern that includes carbohydrate from fruits, vegetables, whole grains, legumes, and low-fat milk. A key strategy in achieving glycemic control is by monitoring carbohydrate intake. Sucrose-containing foods can be substituted for other carbohydrates in the meal plan or, if added to the meal plan, covered with insulin or other glucose-lowering medications. Care should be taken to avoid excess energy intake. People with diabetes are encouraged to consume a variety of fiber-containing foods.

Fat and cholesterol in diabetes management: Intake of Trans-fat should be minimized and daily dietary cholesterol should be limited to 200 mg/day. Two or more servings of fish per week provide polyunsaturated fatty acids and are recommended.

Protein in diabetes management: For diabetic patients with normal renal function, there is insufficient evidence to suggest that usual protein intake (15%-20% of energy) should be modified. Ingested protein can increase insulin response without increasing plasma glucose concentrations.

Physical activity

Epidemiologic studies proved that increased physical activity reduces risk of diabetes, whereas sedentary behaviours increase risk. Based on medical studies on diabetes management, Hu wrote that each 2 hours/day increment of time spent watching TV or glued on computer screen was associated with a 14% increase in diabetes risk. Each 2 hours/day increment of standing or walking around at home was associated with a 12% reduction in risk. Each 1 hour/day increment of brisk walking was associated with a 34% reduction in risk [18].

In view of the above study, it is highly recommended to develop a program to enhance the Diabetes Specialty Clinic services at Abdi Waluyo Hospital by creating a Team of Educators that will comprise of Internal Medicine Doctor, Endocrinologist, Clinical Nutrition Specialist, Dietician, Pharmacist, Nurses and a Diabetic Patient. The center will include management of nutrition and medication regimen and education for diabetic patients and their families. Thorough information dissemination should be implemented on the nature of diabetes mellitus to patients and their families so as to increase their awareness on possible complications and risks of the disease.

In order to ensure proper patient monitoring, systematic recording system should be implemented. In collusion with the nurse, the pharmacist assigned should monitor the patients' adherence to the prescribed medication regimen. Medication record of the patient should be monitored. Research is another factor that is important to consider in planning a program for diabetic patients. Relevant and update issues on medication adherence among diabetic patients can be proposed to help in the adherence of their medication regimen.

Conclusion

Educating patients is critical in diabetes management. It is important to increase the level of awareness and extent of compliance of patients with diabetes as well as the significance of individual meal plan and controlling blood sugar level before exercise and physical activities. While the level of awareness is important, the adherence to diabetes management is of higher importance in order to prevent long-term complications of the disease. Health education process that is more specific and appropriate to their needs can improve the compliance of the patients. The educator's role is important in educating patients with diabetes. The results of the study may only be applicable to the participants because of low statistics significance and further study with a larger population and multiple setting is recommended to achieve adequate results.

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References

1. Coon PJ, Rogus EM, Drinkwater D, Muller DC, Goldberg AP (1992) Role of body fat distribution in the decline in insulin sensitivity and glucose tolerance with age. J Clin Endocrinol Metab 75: 1125-1132.
2. DeFronzo RA, Ferrannini E, Alberti KG, Zimmet P (2015) International Textbook of Diabetes Mellitus. Chichester, West Sussex: John Wiley & Sons.
3. Soewondo P, Ferrario A, Tahapary DL (2013) Challenges in diabetes management in Indonesia: a literature review. Globalization and health 9: 63.
4. Krousel-Wood MA, Berger L, Jiang X, Blonde L, Myers L, et al. (2008) Does home-based exercise improve body mass index in patients with type 2 diabetes? results of a feasibility trial. Diabetes Res Clin Pract 79: 230-236.
5. American Association of Clinical Endocrinologists (AACE) (2007) Medical guidelines for clinical practice for the management of diabetes mellitus. Endocrine Practice: 13.
6. Ho PM, Rumsfeld JS, Masoudi FA, McClure DL, Plomondon ME, et al. (2006) Effect of medication non-adherence on hospitalization and mortality among patients with diabetes mellitus. Arch Intern Med 166: 1836-1841.
7. Kara M, Van Der Bijl JJ, Shortridge-Baggett LM, Astı T, Erguney S (2006) Cross-cultural adaptation of the diabetes management self-efficacy scale for patients with type 2 diabetes mellitus: scale development. Int J Nurs Stud 43: 611-621.
8. Burrell A, Wong P, Ollendorf D, Fuldeore M, Roy A, et al. (2005) PHP_{46} Defining compliance/adherence and persistence: ispor special interest working group. Value in Health 8: A194-A195.
9. Osterberg L, Blaschke T (2005) Adherence to Medication. N Engl J Med 353: 487-497.
10. Kenreigh CA, Wagner LT (2005) Medication adherence: a literature review. Medscape Pharmacists 6.
11. Polit DF, Beck CT (2008) Nursing Research, Edition 8, Lippincott Williams and

Wilkins, Philadelphia.

12. MakkiAwouda FO, Elmukashfi TA, Al-Tom SAH (2013) Designing an educational and training program for diabetes health educators at diabetic health centers, Khartoum State, Sudan; 2007-2010. Glob J Health Sci 5: 207-211.
13. Azura MS, Adibah HI, Juwita S (2012) Risk factor of peripheral neuropathy among newly diagnosed type 2 diabetic patients in primary care clinic. Int J Collab Res Intern Med Public Health 4: 1858.
14. American Diabetes Association (ADA) (2012) Standards of medical care in diabetes-2012. Diabetes Care 35: S11-S63.
15. Pickup JC, Freeman SC, Sutton AJ (2011) Glycaemic control in type 1 diabetes during real time continuous glucose monitoring compared with self-monitoring of blood glucose: meta-analysis of randomised controlled trials using individual patient data. BMJ 343: d3805.
16. Urgel EL, Joylyn ML, De Leon JM, Robles MSN, Catherine MG, et al. (2014) Level of awareness and compliance in diabetes mellitus management among adolescents diagnosed with type-1 diabetes. Philipp J Nurs 84: 54-60.
17. Younk LM, Mikeladze M, Tate D, Davis SN (2011) Exercise related hypoglycemia in diabetes mellitus. Expert Rev Endocrinol Metab 6: 93-108.
18. Hu FB (2011) Globalization of diabetes: the role of diet, lifestyle, and genes. Diabetes care 34: 1249-1257.