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Management of Diabetes Mellitus to Improve the Quality Life of Patients

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Abstract

Diabetes is non-communicable disorder that is often a result of change in lifestyle or genetic variations among individuals across the globe. Diabetes is a fatal condition and it is an unpredictable disorder hence it is regarded as a tragedy, painful, horrible and terrifying disorder. This is why this article is intended to call out readers, researchers and scientists to do whatever could be done to prevent, withstand, overcome or cure diabetes particularly type 2 which is mostly found widely. Although the cure of diabetes has not yet been found, the goal is to be able to alter diabetic patient perceptive about the disorder so that they can bear the disorder as a part of who they are bravely, instead of being affected by the disorder condition, and to gradually alert patient awareness will improve patient disorder state, tolerance and acceptance while science and technology are advancing to find the cure or vaccine. Since this chronic disorder have no cure or vaccine, the patient suffers a lot from not only health problems but also psychological, emotional and financial problems therefore it is essential to develop strength within diabetic patients to withstand the disorder state via treatment, surgery, yoga, meditation, exercise, nutrition and habitual changes. Elevating diabetic mellitus patient's attitude, knowledge, self-acceptance and strength will result into better patient compliance toward the treatment but also society's perceptive will be enhanced by care toward diabetic mellitus patients, through various seminars and Counselling.

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INTRODUCTION

Diabetes is a word that comes from a Greek word for "siphon" which signifies a lot of urine is produced, it is a metabolic disorder which is chronic involving disturbance in glucose levels of blood and diabetes have no cure and vaccine it is an irreversible health condition.

It is a metabolic disorder in which a patient suffers from elevated blood glucose levels due inability or resistance of the body cells to utilize insulin in the body hence, it is Insulin independent diabetes i.e. (NIDDM). Type 2 diabetes is often related to obesity and not enough exercising (lifestyle factors and genetic factor and hereditary origin). most symptoms in diabetic patients are frequent urination, slow healing sores, increased fatigue, blurred vision, itchy skin, irritability, increased thirst.

Firstly, insulin was discovered by JJR MacLeod, Sir Frederick G Banting and Charles H. Best in 1921 at the University of Toronto in United States of America.

Insulin is a hormone that is released into the blood by beta cells of pancreas found in islets of Langerhans when there is rise in glucose levels of the blood most often after meals, about 40 to 50 units a day. When fasting it is secreted at low dose, when eating dose is increased and prolonged released in hyperglycemia condition.

When cells resist insulin uptake or utilization of insulin it results into accumulation which is further leads to hyperglycemia (elevated blood glucose levels) hence defects in insulin secretion and actions which over time become chronic and results into diabetes mellitus. In case a patient's pancreas is unable to produce enough insulin this is known as (type l diabetes mellitus and it is insulin dependent type of diabetic mellitus or juvenile diabetes also, known as diabetes insipidus) [1].

Types of Diabetes

There are 4 types of diabetes

Type 1

It is also called diabetes insipidus or insulin dependent diabetes. It is an autoimmune disorder in which the body attacks its own pancreas and often it is a result of complete damage of pancreas, hence the body is unable to produce insulin and there is insufficient of insulin hormone. It is most commonly found at young age which is manageable by changing life style and food habits [2].

Type 2

It is also called diabetes mellitus (mellitus is a Latin word "Mel" that means honey which means the urine is sweet in this case) or non-insulin dependent diabetes in which there is an abundance of insulin due to resistance or minimal sensitivity of body to utilize the produced insulin and it is the most commonly occurs diabetes in adults [2].

About 90 to 95% of diabetic cases are type 2 diabetes in adults and change in lifestyle have a great positive significance on overall treatment of this type of diabetes.

Gestational Diabetes

It is found in pregnancy due to the circulation of blood glucose level from mother's placenta to the baby and the release of hormones such as cortisol and estrogen by placenta resulting in inhibitory functions of insulin which eventually causes increased blood glucose levels. Although it is controllable, it is risky because it attacks both the mother and the baby [3].

Pre-Diabetes

It occurs when there is a rise in blood glucose level but there is no diabetes yet (hyperglycemia condition). At this stage, most of diagnosed patient is suspected to develop diabetes mellitus and it is simply a predictable state which further develops into diabetes mellitus [3].

Cause of Diabetes Mellitus

It is caused due to complete loss of islet-cell Langerhans of pancreas resulting in impaired function and regulation of Insulin and blood glucose level balance. In some cases, deterioration of Islet cells of Langerhans is due to viral infections which is further developed into diabetes mellitus. High blood pressure often occurs as a result of life changes such obesity, consumption of alcohol and smoking habit. Sometimes it is also cause due to auto immune disorders of the body. Prolonged usage of medications like steroids and blood pressure medicaments, abnormal triglycerides, cholesterol levels and presence of other disorder which make the body immune system weak. In some cases, ageing and genetic variations are causes for one to develop diabetes mellitus naturally. Physical body stress such as accident or surgeries (example post pancreatic surgery or pancreatic injuries and inflammation [3].

Other Causes Include

1. Insulin resistance of the body.
2. Obesity and overweight due to inactivity.
3. Race, genetics and history of ancestors.
4. Pregnancy in gestational diabetes.
5. Too much or too little sleep, anxiety and depression.
6. Consumption of too much sugar does not merely general means to result into diabetes but development of teeth cavities and decay when no oral hygiene or care taken regularly [3].

Symptoms of Type-1 Diabetes

1. Polyurea- It is a condition with increased urination.
2. Polyphagia- It is characterized by increased hunger.
3. Polydipsia- It is a condition characterized by increased thirst.
4. Fatigue of the body.
5. Weight loss due to lack of energy in muscle and tissue.

6. Insulin dependent hence often parental injections are often prescribed.
7. Increased frequency of infections due to reduced immunity.
8. It is often early on set (few weeks) symptoms.

Symptoms of Type-2 Diabetes

1. Intense hunger, thirsty, fatigue and breathing difficulties causes obesity.
2. It also causes Increase in blood pressure due to over-weight.
3. Weakness and reduced energy resulting in sexual dysfunction.
4. Cut and minor injuries take long time to heal, itchy skin often happens and numbness of feet, hand is often experienced.

Management of Diabetes

Education

Diabetic patients and society in general should be educated via patient counseling and seminars respectively to elevate prevention, awareness and acceptance of diabetes and approach taken for caring individuals suffering from this disorder [3].

Change of Lifestyle (Nutrition, Exercise and Habits)

Lifestyle changes can be done by minimizing weight of patient through reducing cholesterol intake to about 300mg or less and reduced protein intake and the diet should be a balanced diet taken regularly. Patient should be fit through exercise that result in optimum and healthy weight, reduced cardiovascular disorders and decreases blood pressure and excessive salt intake should be minimized [4].

Nutrition

Diabetes patients have to eat balanced diet and also have to consume food materials that contain less triglycerides, fats and oil materials and should drink enough water. Unhealthy habit such as smoking and drinking alcohol should be avoided [5].

Exercise

Diabetic patients have to exercise regularly to enhance their metabolism, improve fitness, release sweat, and be free from obesity [6].

Habits

Addiction habits such as smoking, alcoholism, euphoric drug and drug misuse should be withdrawn since diabetes is a disorder that affect their immunity and can lead to further complication due to the usage of those various unhealthy substances and habits [7].

Effects of Diabetes on Various Aspect

Mental Health

Diabetic patients are likely twice to have Depression, anxiety, stress and serious psychological disorders hence these patients should be cared about to feel less lonely and to accept and adapt to the nature of diabetes. This will result in reduced suicide attempts, improve a positive mindset and gain hope and recovery and makes the condition bearable for the patient [7].

Lifestyle Changes

Food modification and drugs used in treatment are expensive due to more counterfeit and adultered drugs are often presented and available on market via addressing the issue to organization such as FDA (Food and Drug Administration) in USA, Medicines and Healthcare Products Regulatory Agency in UK and CDSCO (Central Drug Standard and Control organization) in India to conduct inspections and strict regulation will improve the quality of the drug and safety of patients [8].

Diabetic patients counseling on lifestyle changes, status monitoring, treatment, blood glucose level devices and novel drugs available in the market provide information to update the patients, this will also improve their knowledge regarding the equipments hence improves better patient's compliance toward treatment or surgery [9].

Patient Disorder State Acceptance

Lack of faith and strength by a diabetic patient can be improved by patient's counselling and grouping the patients into testimonials group where they can talk about their experiences with diabetes which will bring them together and resulting in enhanced acceptance and strength to withstand the disorder [10].

Meditation and Yoga Therapy

Reduced immune system and normal healing ability of the body makes the patient weak and target to attack for other disorders which can make disorder state develop into chronic diabetes hence, Use of yoga, meditation and patient introspection can enhance patient disorder acceptance, treatment compliance and improved disorder state tolerance [11].

Relationship Between Patient and Physician

Patient lifestyle guide discussion and establishing a strong relationship between patient and physician

via establishment of exercise day & examining its expected outcomes such as overcoming addiction via rehabilitation therapy and patient Counselling success [12].

Financial Adjustments and Adaptability

Financial problems, producing generic drugs with minimal cost and research of new drugs from natural origin and working with charity organization to provide free glucose meter for patients who are unable to afford these devices that allow them to monitor their chronological blood glucose levels

Research and development of drugs with therapeutic effect that can overcome antidiabetic drugs side and adverse reaction and in some case drug repurposing can be taken into consideration if it is possible hence patient ability to tolerate diabetes will be enhanced.

Insulin is the 6^{th} most expensive liquid in the world hence diabetic patients must be able to afford treatment and lifestyle adaptation in case they are not, creation or availability of diabetes associations and charitable organizations diabetic patient can be helped and further development and advancement in research of drugs is giving hope for cost minimization [13].

Diabetes: A Worldwide Disorder

According to WHO about 422 million people worldwide are suffering from diabetes, 7 % in UK, 10.5% of USA population and most are found in low-income countries about 1.5 people die every year because of diabetes.

Due to outbreak of pandemic viral disorders such as HIV, coronavirus and monkeypox virus Diabetes have lost attention and taken to be less fatal but it is not although, you can live with it for long period of time but its management is difficult, painful and expensive [8].

As diabetes is one of the most non-communicable disorder, In Africa diabetes mellitus patient exhibit type 2 diabetes mellitus and not more than 10% was found to be diabetes insipidus cases, around 25.8 million people in USA which is about 7.8% of the population in 2010 whose 90% and more was estimated in diabetes mellitus patients (Type 2). Due to changes in lifestyle there is an increase in population suffering with this disorder [14].

Diagnostic Tests and Devices Used in Diabetes

Blood Glucose Meters and Strips

These devices are used to determine blood glucose level at a specific time, a patient insert a test strip in a device, prick their finger with a lancing device or medical needle, place small amount of blood onto the test strip and finally the device display blood glucose reading in terms of mg/dl hence patient counseling regarding usage & precaution of device is required [15] diagram of blood glucose meter is shown in Figure 1.

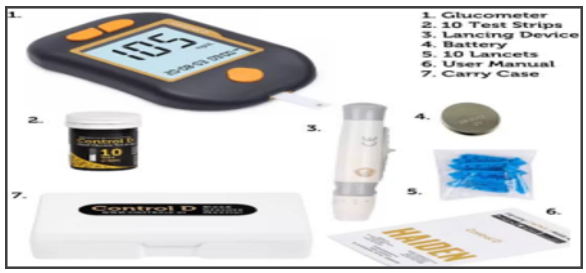

Figure 1: Blood Glucose Meter Used to Measure How Much Glucose is in the Blood

CGM (Continuous Glucose Monitoring Device)

It is a portable electronic device that can determine blood glucose levels at any time of the day, it is consist of a sensor that placed under the arm, skin or belly to determine per minutes glucose level but also some CGM can send the result on other electronic devices such as smartphone, tablet or personal computer. It consists of both data sensor, transmitter, data receiver and display of insulin delivery system. Capillary glucose (glucometer) should not be used for diagnosis of diabetes [14]. Diagram of continuous glucose meter is shown in Figure 2.

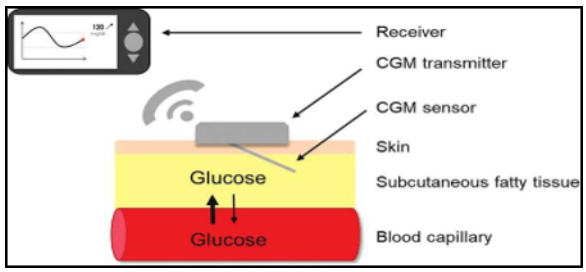

Figure 2: Continuous Glucose Monitor Used to Measure Your Glucose Levels Hourly

Real Time CGM (rtCGM)

It determines and displays blood glucose level continuously [15].

Professional CGM

These devices are clinically owned on behalf of a patient and they are placed in patient's provider office and their obtained data are used to study different glycemic trends and patterns [16].

Intermittently Scanned CGM

These devices continuously measure glucose levels and the output is displayed and stored in the electronic devices such as smartphones, tablets or personal computer [17].

Injector Pens

These are less invasive and painful device compared to syringes in delivering drug such as insulin & glucagon although they are expensive than vials and syringes but they are more dose accurate and easier to use.

KFT (Kidney Function Test)

Kidney is essential organ for infiltration of body fluid hence blood and urine are withdrawn from suspected individual and albumin levels in urine will indicate the efficiency of individual kidney functioning.

ICA (Islet Cell Cytoplasmic Auto Antibodies)

It is a diagnostic test that allows us to determine presence of autoimmune disorder in a diabetic patient

Insulin Pump

It is a device that uses glucose sensors that are attached to the body, used to determine value of insulin dose that is administered through a catheter in the abdominal fat to regulate a patient's blood glucose level and also self-regulate without the need of patient intervention. Insulin pump diagram is shown in Figure 3.

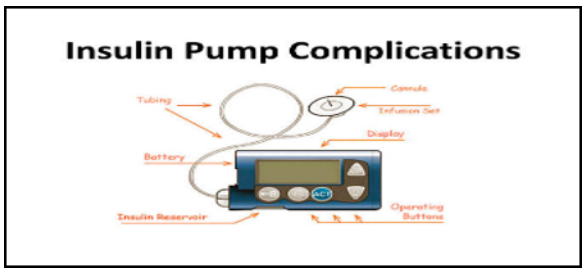

Figure 3: Insulin Pump Used by Diabetic Patients to Manage Their Blood Glucose

Lipid Profile

This test is done for fasted individual or an individual who have not eaten anything at least From (9-12) hours. High triglycerides level, presence of low-density lipoprotein cholesterol, elevated level of small dense LDL particles and low HDL cholesterol levels are used as indicators in this test to determine glucose, cholesterol and triglycerides levels present in blood.

Hba1c

This test is used to determine the average assay of blood glucose levels over a period of about 3 months and diabetic patient should take this test to know the range their blood level is estimated, normally the present glucose in the blood binds to hemoglobin and Hba1c measures the amount of glucose bound. Therefore, the more the glucose bound over the past few days result into the high Hba1c result value. It is very important to fast before blood sample is withdrawn. Hb1Ac analyzer diagram is shown in Figure 4.

Figure 4: Hb1Ac Analyzer Used to Measure Average Blood Glucose Levels Over Time

Physical Examination

Based on symptoms of diabetes, a physical examination of diabetes can be performed, example: obesity. Dryness of feet, blood pressure and hypertension and deviation from normal well-being of an individual which is often indicated by nausea (feeling sick). Physical examination of the patient with diabetes mellitus was shown in Figure 5.

Urine Test

From Long ago, they used to correct the urine from the patient and drink it to taste, if it is sugar containing or not, as for advancement in technology with aid of this test we can identify and estimate the amount of glucose levels present and sometimes glucose levels may be certainly present in urine in high level due to side effect of certain medications or other several renal conditions. Drawback of urinalysis test include that it is difficult to interpret result and method is prone to errors [18].

Oral Hypoglycemic Drugs

The drugs which are given orally in order to reduce the blood glucose level in a diabetic patient are called oral hypoglycemic drugs. They mainly used to treat diabetic patients suffering with diabetes mellitus (NIDDM).

Oral Hypoglycemic Drugs Include

1. Meglitinides such as nateglinide, repaglinide which are used to increase insulin secretion by beta cells of pancreas.
2. Biguanides like metformin (reduces Hbac1 levels) are used to inhibit glucose production in liver contraindicated in patient with liver and heart failure.
3. Thiazolidinediones are used elevated glucose

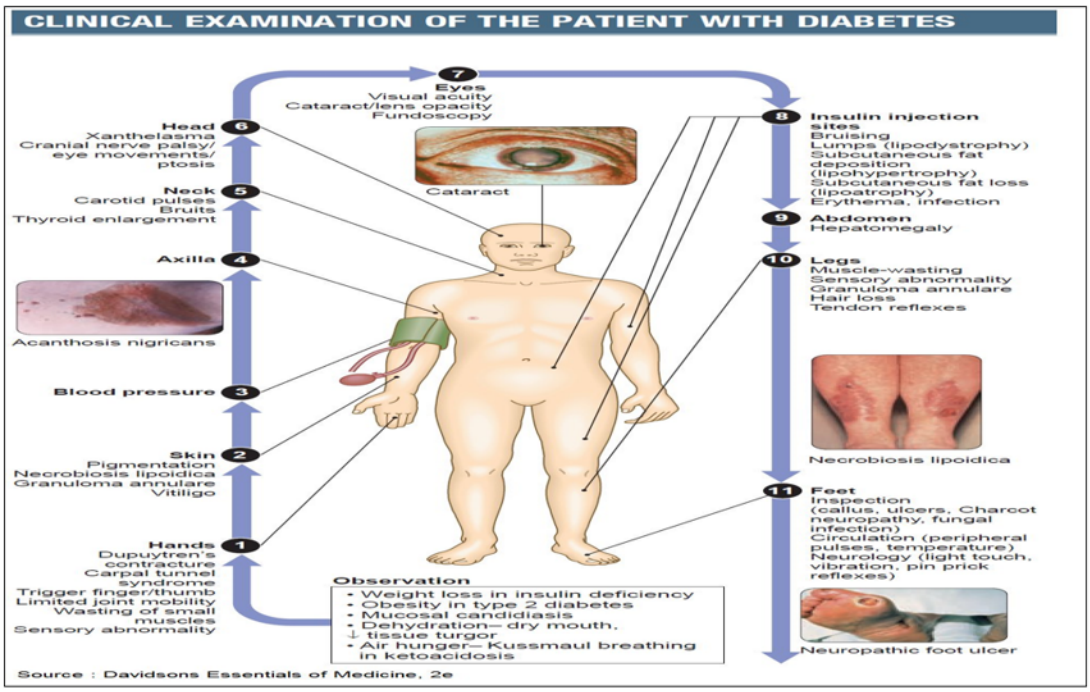

Figure 5: A Diagram of Physical Examination for a Diabetes Patient

uptake by skeletal muscles examples rosiglitazone.

4. Sulphonic ureas are used to increase insulin secretion by pancreas beta cells example glimepiride and glyburide.
5. Insulin therapy is used in treatment of type - 1 diabetes and sometimes to treat acute conditions onset type 2 diabetes.
6. Delivery through insulin syringes pen pump and jet injectors [19].

Other Activities Include

1. Conducting periodic survey
2. Study and analysis of diabetes patient's records.
3. Evaluating and study of side effects and adverse reactions to anti-diabetic drugs.
4. Pharmacology pharmacokinetics studies of antidiabetic drugs.
5. Visiting diabetic patients in hospitals.
6. Evaluating the effect of Improving friendship better patient and physician on diabetic patients.
7. To understand the life of diabetic patients and the area to improve for better quality basing statistics.
8. Conducting seminars on diabetes to prevent the outbreak of new cases and to increase.
9. Study and analysis of diabetes patient's records Collecting data and chronological analysis to publish research articles and reviews.
10. Diabetic patients counselling.
11. To improve patient's compliance and adherence to medications and lifestyle changes.
12. Evaluating and study of side effects and adverse reactions of antidiabetic drugs.
13. To draw an idea of better formulation that could overcome those drawbacks.
14. Pharmacokinetics studies (ADME parameters, these includes: Absorption, Distribution, Metabolism and Excretion) of antidiabetic drugs and also toxicology studies.
15. To determine drug safety, quality and efficacy & exercise the possibility of drug repurposing in accordance to patient's body response toward medication [20].

CONCLUSION

Diabetes often when it is not well treated it results into chronic complications such as brain strokes, cognitive impairment, sexual dysfunction, blurred vision and blindness, retinopathy, nephropathy and neuropathy hence patient should be treated early

and should be carefully monitored. Apart from this, patient's contribution to therapy is necessary to achieve a successful therapy and recovery. Although diabetes is a non-communicable disorder does not only result in death but also comes with various disturbance in terms of finance, psychology and emotional being of an individual and the state in general. Therefore, we should work hand in hand with each other to elevate every aspect that collapse as a result of diabetes and various mechanism and approaches of prevention and defense should be established. Diabetes patient should be well equipped and should have the strength to overcome all these difficulties and their acceptance, compliance to the condition is necessary hence this fundamental results into the flow of positive energy that can withstand diabetes mellitus for patients, flowing from within to outside environment and a well-educated environment with awareness with be supportive from outside to within and hence balance and patient well-being will be achieved. Furthermore Via various research and technology advancement there is hope for cure or vaccine. And we expect cost minimization for diabetic patients treatment as various research are going on and technology advancement but also various surgical procedure research (such as bariatric surge, over-weight surgery, gastrectomy) approaches are going on we can expect that in very soon, there is a possibility for treatment of this disorder. Let's create a world free from obesity, and diabetes and tolerant for those who are suffering from diabetes mellitus.

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