

REVIEW ARTICLE

Complications Associated with Diabetes: Review

Zebunnesa Ahmed*

Lecturer, Department of Pharmacy, Southeast University, Banani, Dhaka, Bangladesh.

Email: Zebunnesa_ahmed@hotmail.com

ABSTRACT

Diabetes is being a huge health problem. Many people suffer from diabetes and the other medical side effects it cause. An early diagnosis of diabetes can help a person to avoid serious related diseases. The earlier diabetes is caught the easy it is for doctors to monitor the patients overall health, thus preventing any further medical problems. Diabetes is when the pancreas does not function properly and glucose levels fall outside the normal range. A normal glucose reading is lower than 110 mg/dL upon waking in the morning and lower than 140 mg/dL two hours after eating. There are simple blood tests that are used to diagnose diabetes. Once diagnosed a person will work with their doctor to determine a treatment. Treatments can include diet changes, pills, or injections. Any history, family history and people in certain ethnic groups may be at elevated risk for developing diabetes. There are different types of diabetes. Some start in childhood, some start in adulthood and another form occurs during pregnancy. All can cause harmful effects on the body if not taken care of.

Keywords: Diabetes, complications, insulin, management, treatment.

Received 11.04.2016 Accepted 25.06.2016

© 2016 AELS, INDIA

INTRODUCTION

Knowing how diabetes affects your body can help you look after your body and prevent diabetic complications from developing. Many of effects of diabetes stem from the same guilty parties, namely high blood pressure, high cholesterol levels and a lack of blood glucose control. Diabetes can damage the blood vessels in your eyes. This damage can lead to glaucoma, cataracts, structural changes to your retina, even blindness. When blood vessels are damaged, nerve signals can't reach your eyes. In addition, having diabetes can lead to a buildup of pressure from fluid, which can compress nerves and other structures in your eyes. Too much glucose circulating in the blood can damage any of the nerves in your body. This can lead to numbness, tingling and pain, especially in the legs and feet. If you develop cuts or sores you may not feel them, and they may heal very slowly. You may lose sensation in these areas, and if the damage is severe enough, amputations may be necessary. According to the National Diabetes Information Clearinghouse, "If you have diabetes, you are at least twice as likely as someone who does not have diabetes to have heart disease or a stroke." As with the above conditions, this occurs as blood vessels are damaged and become more narrow. Having a high level of blood sugar makes your kidneys work harder to filter your blood, and they can become overworked. This can lead to chronic kidney disease and complete failure. Your doctor can do a simple urine test to determine how well your kidneys are working. She can detect and treat a problem long before symptoms occur. Having diabetes can also cause damage to your liver and cause a condition called nonalcoholic fatty liver disease. This means your liver is having difficulty processing fats. You may develop scar tissue on your liver and a condition called cirrhosis. A relatively common complication of diabetes is diabetic retinopathy. As with all complications, this condition is brought on by a number of years of poorly controlled or uncontrolled diabetes. Diabetic retinopathy has a number of symptoms. Retinopathy is caused by blood vessels in the back of the eye (the retina) swelling and leaking. High blood pressure is also a contributing factor for diabetic retinopathy. Diabetic retinopathy can be treated so it's best to catch it as early as you can. The best way to do this is to attend a retinopathy screening appointment, provided free on the NHS, once each year. diabetes is one of the world's oldest diseases, described in historical records of civilizations such as those found in ancient Egypt, Persia, and India [1-3]. Type 1 diabetes is considered as a "disease of wealth" given that rates in westernized societies are increasing [4-5].

THE EFFECTS OF DIABETES

Long term effects of diabetes are usually due to a patient letting their glucose levels remain elevated for long periods of time. That is why early detection is important. Excess blood sugar levels have a horrible effect on the body. Some common effects from diabetes include vision problems, kidney damage, nerve damage, heart and circulation problems. Other chronic complications of diabetes include depression [6], dementia [7], and sexual dysfunction 8-9]. A person with diabetes is at a higher risk for these types of conditions, but a person who does not control their diabetes is even more likely to develop one of these conditions. Diabetes is a disease that does not have a cure. Diagnosing and treating diabetes have evolved into easier processes. A person with diabetes can normally live life as they did before their diagnosis. Living with diabetes is a matter of taking control over the disease and preventing complications. Diabetes has both short term and long term effects on the body. The short term effects of diabetes on the body are the symptoms of diabetes, namely:

- Becoming very thirsty
- Needing to urinate frequently
- Tiredness and lethargy
- Blurred vision

The damage that diabetes can cause in the long term is termed as 'complications of diabetes'. Some of the more common long term complications of diabetes include:

- Retinopathy - eye damage
- Nephropathy - kidney disease
- Neuropathy - nerve damage
- Heart disease
- Stroke

The effect of diabetes on the nerves and blood vessels can also lead to problems including:

- Trouble with digestion
- Sexual dysfunction
- Slow wound healing

People with diabetes have an increased risk of developing complications but not everyone does. People with normal blood pressure, cholesterol and well controlled diabetes have a better chance of avoiding or significantly delaying long term damage to the body. To reduce the chances of developing problems associated with diabetes, people are advised to take steps to improve their health and blood sugar levels. A good diet and regular activity is an important step in helping to reduce blood pressure and cholesterol and improve blood sugar levels. Medication can also play a part where lifestyle changes are not sufficient. With type 1 diabetes, or other diabetes types where not enough insulin is being produced, insulin will need to be administered by injection or insulin pump.

Effect of diabetes on the kidneys

The kidneys are another organ that is at particular risk of damage as a result of diabetes and the risk is again increased by poorly controlled diabetes, high blood pressure and cholesterol. Diabetic nephropathy is the term for kidney disease as a result of diabetes. Damage to the kidneys takes place over a period of years and can be picked up by nephropathy screening before it gets too serious. Treatment includes lifestyle changes and may include medicine to treat high blood pressure and cholesterol.

Diabetes and its effects on the nerves

The effects of diabetes on the nerves can be serious as the nerves are involved in so many of our bodily functions, from movement and digestion through to sex and reproduction.

The presence of nerve damage (neuropathy) is commonly noticed by:

- Numbness or tingling in the hands or feet
- Lack of arousal in the penis or clitoris
- Excessive sweating or
- Diagnosis of delayed stomach emptying

Treatments for neuropathy concentrate on reducing pain but medication such as blood pressure lowering drugs may also be prescribed to help prevent development of the condition.

Diabetes and its effect on digestion

Diabetes can affect digestion in a number of ways. If diabetes has caused nerve damage, this can lead to nausea, constipation or diarrhoea. An alternative cause of disturbed digestion can be the result of diabetes medication. Some type 2 diabetes medications for instance are prone to causing digestive issues, although these tend to settle down after the body gets used to them.

Diabetes and Cardiovascular Disease

Cardiovascular disease is one of the leading causes of deaths related to diabetes. Diabetics have a 2 to 4 time greater risk for developing cardiovascular disease because of the added risk factors listed below:

- Disorders with Lipid
- Blood pressure which is high
- High LDL or bad cholesterol
- Smoking
- High triglycerides
- Low HDL or good cholesterol
- Obesity
- No physical activity
- Poor control of blood glucose levels

Cardiovascular Disease & Diabetes

The following statistics speak loud and clear that there is a strong correlation between cardiovascular disease (CVD) and diabetes.

- Heart disease and stroke are the No. 1 causes of death and disability among people with type 2 diabetes. In fact, at least 65 percent of people with diabetes die from some form of heart disease or stroke.
- Adults with diabetes are two to four times more likely to have heart disease or a stroke than adults without diabetes.
- The American Heart Association considers diabetes to be one of the six major controllable risk factors for cardiovascular disease.

Why are people with diabetes at increased risk for CVD?

Diabetes is treatable, but even when glucose levels are under control it greatly increases the risk of heart disease and stroke. That's because people with diabetes, particularly type 2 diabetes, often have the following conditions that contribute to their risk for developing cardiovascular disease. Individuals with insulin resistance or diabetes in combination with one or more of these risk factors are more likely to fall victim to heart disease or stroke. However, by controlling these risk factors, diabetes patients may avoid or delay the development of heart and blood vessel disease. Your health care provider will do periodic testing to assess whether you have developed any of these risk factors associated with cardiovascular disease. Another risk factor is emerging and it is a dysfunction of the core metabolism for those with Type-2 diabetes. That is insulin resistance. The condition of Insulin resistance is the where the cells of the body does not efficiently respond to the insulin it secretes. This affects approximately sixty-million people in the US alone. 1 out of every 4 will probably be diagnosed with Type-2 diabetes eventually as their bodies unable to maintain normal glucose and insulin levels. Below are the conditions which are normally found in persons suffering from Type-2 diabetes as well as the reason each condition contributes to a diabetic's risk of developing cardiovascular disease:

Obesity

Is a key risk factor for developing cardiovascular disease and is strongly related to resistance to insulin. Resistance to insulin can be a means by which obesity can lead to cardiovascular disease. The loss of this weight will improve risk of cardiovascular disease, decrease concentrations of insulin and increase insulin sensitivity. Resistant's to insulin and obesity have also been linked with some other risk factors, one example being blood pressure that is too high.

Little Physical Activity

Is one other key risk factor for cardiovascular disease as well as insulin resistance. Losing weight and exercising can delay or stop the onset of Type-2 diabetes by reducing blood pressure and also helping reduce the risk for stroke and heart disease. It is possibly that any kind of physical activity, whether gardening, sports, housework, or physical activities related to work are similarly helpful.

Hypertension (high blood pressure)

Hypertension is recognized as another key risk factor for cardiovascular disease. Research does report a relationship between insulin resistance and hypertension. If a person has hypertension as well as diabetes, which is a frequent combination, the danger of cardiovascular problems doubles.

Dyslipidemia

Dyslipidemia or diabetic dyslipidemia in those with diabetes is a state linked with insulin resistance. Dyslipidemia is marked by high levels of triglycerides, small LDL particles and low levels of HDL. This is known as "lipid triad" which often is found in those with coronary heart disease which is premature. Now this is mounting evidence suggesting that all of these components in the "lipid triad" do add to the increase in atherosclerosis which is the buildup in artery walls of fat and is also viewed as a risk factor. Although most diabetics don't have marked LDL cholesterol elevation, the evidence shows that the high levels are enough to allow the growth of atherosclerosis.

Diabetes and Kidney Failure

Diabetes has been named as the cause for the majority of cases of failure of kidneys or severe kidney disease. But there are many things which can be done to stop the kidneys from developing into severe kidney disease. Among these are to stop smoking and keep under control your blood pressure. Very intense management of diabetes can also decrease the risk of developing kidney disease or problems by 50%. This intense management includes testing levels of blood glucose frequently, basing the amount of insulin intake on exercise as well as diet, following a healthy diet as well as regular plan of exercise, and regular checkups with your doctor. High blood pressure (hypertension) is considered the major factor in kidney problems developing in those persons with diabetes. A family history of hypertension as well as the presence of hypertension seems to increase the chance of developing kidney disease. It also accelerates the progress of kidney disease which already exists. There are 5 stages of diabetic kidney problems with the final stage being failure of the kidneys. It takes an average of about twenty years to get to the final stage. Type-1 diabetes and Type-2 diabetes both can cause kidney disease but Type-1 diabetes is most expected to lead to kidney failure in the end-stage. 40% of those with Type-1 diabetes will develop a severe problem with kidney disease and kidney failure in the end-stage by the age of 50. The solution to preventing kidney disease in diabetics is:

- Not smoking,
- Checking blood pressure regularly
- Getting protein urine tests
- Preventing high levels of glucose in the blood.

When symptoms of kidney disease begin it is already in late stages. There will be no symptoms in the beginning of this disease. When symptoms appear they consist of:

- Fatigue
- Insomnia
- Weakness
- Swelling
- Vomiting

Diabetic Retinopathy

What is diabetic retinopathy and what causes it? It is a very serious complication of the retina in the eye which often occurs in those who have diabetes. Diabetic retinopathy is characterized by a spectrum of lesions within the retina and is the leading cause of blindness among adults aged 20–74 years [10-11]. It can happen with any diabetic whether they have Type-1 or Type-2 diabetes. It usually occurs in diabetics who do not maintain control of their blood glucose levels or who have had diabetes for many years. Normally as diabetic retinopathy first begins, there are usually no problems noticed or the symptoms are very mild. This is the reason that anyone who has diabetes needs to schedule regular appointments with an eye doctor to have a complete eye exam including dilation of eyes, because by the time there are symptoms, the disease may already be out of control.

As this condition progresses, these are some of the symptoms that can develop:

- Vision that is blurred
- Dark spots or strings may be noticed floating in the vision field– these are commonly known as “floaters”.
- Empty or dark areas in vision field.
- Fluctuating vision
- Color vision impaired
- Night vision is poor
- Vision loss

These symptoms usually affect both eyes.

The cause of this complication happens because of too much glucose in the blood system which damages the smallest blood vessels in the body called capillaries. These capillaries deliver nutrition to the retina in the eye. When the levels of glucose remain high over a long period, the lenses in the eye will swell causing vision to be blurred.

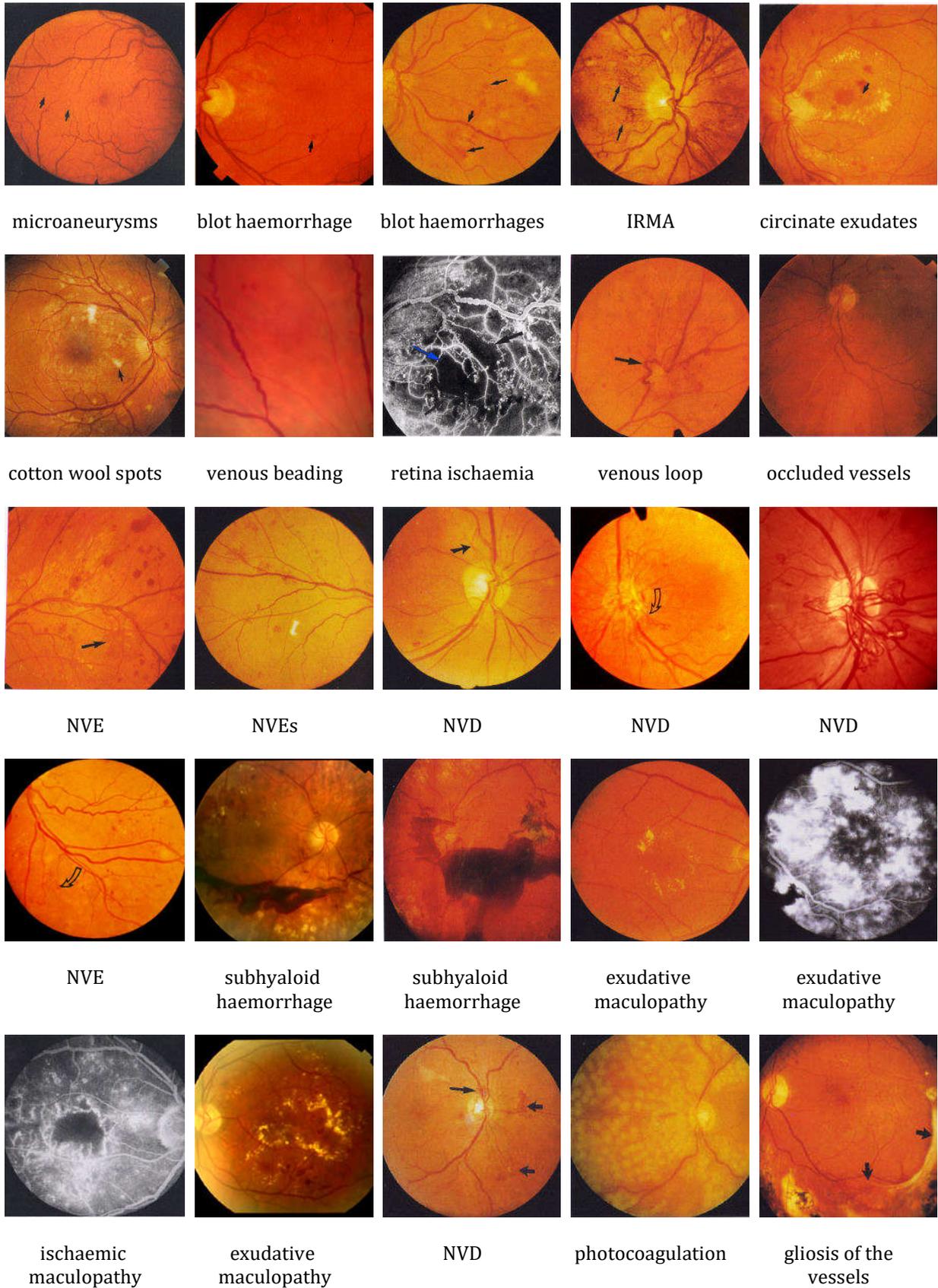


Figure: Diabetic Retinopathy

Diabetes and Skin Problems

Diabetics because of high glucose in their blood especially for a long time do develop many complications and that includes problems with skin. It is believed that 1/3 of those with diabetes have skin conditions that are because of their diabetes. But, the good news is that these conditions of the skin are preventable and can be treated successfully when found early. When not found early, those skin problems which are not properly cared for in a diabetic can cause minor problems to turn into serious problems with some severe consequences.

Diabetes and Urinary Incontinence

Diabetes is often associated with the early onset and increased severity of urinary incontinence. Women with diabetes usually have up to a 70% greater risk of developing this condition. This seems to be a progressive condition which involved many symptoms including:

- Urinary urgency – strong pressure to void
- Frequent daytime and nighttime voiding
- Incontinence

The exact way that diabetes causes incontinence is not known. But, it is known that high blood glucose can cause an increase in the amount of urine produced which results in urgency, frequent urination and possible incontinence. It is also theorized that autonomic neuropathy damages the nerves of the bladder which possibly causing incontinence to some extent.

The ability to control urination may be affected by several diabetes-related factors:

- Chronic high blood glucose levels may create the need for frequent urination
- Vaginitis, or vaginal yeast infections
- Nerve damage can cause the bladder to empty irregularly with episodes alternating between sudden loss of urine to the inability to void.

It is also believed that in people with diabetes, obesity (in particular abdominal fat) may be a factor in urinary incontinence.

Diabetes Foot Care

Primary foot care intervention for diabetes is an important part of the diabetic's overall health care. The diabetic will need to learn all they can about foot health care as they have the most difficulties with their feet. This is caused by two problems:

- Narrowing of blood vessels in the legs

These two problems can cause an insignificant cut for most people to become extremely infected for a diabetic. Because of the nerve damage, they might not be able to tell when they have skin damage or a small cut and an infection can rage before it is even noticed. And with poor circulation, when there is a cut or any damage, there is not enough blood flowing to the foot to fight the infection. This can quickly lead to gangrene of the foot which is when the tissue begins to die. Gangrene can then lead to amputation of the foot or leg. But the good news is that all these problems can be prevented. First and most important, if a diabetic have toes or feet that are pale or blue – this is a symptom of poor circulation. And if they feel tingling or numbness in the toes or feet these are symptoms of nerve damage. If a diabetic has any of these symptoms, it is important to talk with their primary care physician or visit with a podiatrist immediately. Diabetic foot ulcers are open wounds or sores that commonly develop on the bottom of the feet. Approximately 5 to 6 percent of diabetics who develop foot ulcers will need to be hospitalized because of infections. Up to 25 percent of these patients will eventually need amputation. The primary goal in the treatment of foot ulcers is to obtain healing as soon as possible. The appropriate treatment of these wounds must include the prevention of infection, relieving pressure off of the wound, debridement or removing of dead skin and tissue, applying dressings with medications, and of course, managing blood glucose levels.



There have been significant strides made in the last decade in the science of wound care. Many decades ago the prevailing wisdom was to let the air get to the wound but we now know that can be detrimental to the healing of wounds. Foot ulcers heal better and with less infection when the ulcers are covered and kept moist with topical medications. Other effective treatments are cleaning with normal saline solution and advanced treatments involving skin substitutes. There also must be sufficient circulation to the ulcerated areas and your physicians can determine if the circulation is sufficient for proper healing. If a diabetic notices that a foot looks red or feels hot or if they are running a fever they must contact their physician as quickly as possible. Infections in the foot can get worse quickly and gangrene can develop quickly also. So, for diabetics, these foot care tips are especially important.

CONCLUSION

The International Diabetes Federation (IDF) projects that without effective preventive action, the number of individuals with diabetes will increase from 285 million in 2010 to 439 million in 2030, of whom T2DM accounts for approximately 85–95% of cases in high-income countries and possibly a higher proportion in less affluent populations. The largest increase is expected in low- and middle income countries, which already bear some 70% of the total global burden of diabetes. In Asia, as elsewhere, healthy lifestyle modifications are the keystone of effective T2DM prevention and management. Despite great progress in the pharmacological management of T2DM in past decades, the side effects of all current conventional therapies limit their uses and although they yield short-term improvements, none effectively arrest or reverse the inexorable worsening of the disease. In this context, a pan-Asian panel of experts from China, India, Hong Kong, Indonesia, Malaysia, Philippines, Singapore, South Korea, Taiwan, Thailand and Vietnam, convened to review current standards and challenges in the management of T2DM. They discussed diverse aspects of T2DM care including the epidemiological burden and challenges in preventing complications; gaps between guidelines and ‘real-world’ clinical practice; diagnosis and management of patients with or at risk of renal impairment; and the current and future role of new therapeutic modalities in clinical practice, in particular the use of dipeptidyl peptidase-IV (DPP-IV) inhibitors to enhance the action of incretin hormones.

REFERENCES

1. Ahmed AM (2002). History of diabetes mellitus. *Saudi Med J* **23**: 373–378.
2. Dobson M (1976). Nature of urine in diabetes. *Medical Observations Inquiries* **5**: 298–310.
3. Eknoyan G, Nagy J (2005). A history of diabetes mellitus or how a disease of the kidneys evolved into a kidney disease. *Adv Chronic Kidney Dis* **12**: 223–229.
4. Humpert PM, Papadopoulos G, Schaefer K, Djuric Z, Konrade I, Morcos M, Nawroth PP, Bierhaus A. (2007). sRAGE and esRAGE are not associated with peripheral or autonomic neuropathy in type 2 diabetes. *Horm Metab Res* **39**: 899–902.
5. Taplin CE, Craig ME, Lloyd M, Taylor C, Crock P, Silink M, Howard NJ (2005). The rising incidence of childhood type 1 diabetes in New South Wales, 1990–2002. *Med J Aust* **183**: 243–246.
6. Nouwen A, Nefs G, Caramlau I, Connock M, Winkley K, Lloyd CE, Peyrot M, Pouwer F (2011). Prevalence of depression in individuals with impaired glucose metabolism or undiagnosed diabetes: a systematic review and meta-analysis of the European Depression in Diabetes (EDID) Research Consortium. *Diabetes Care* **34**:752–762.
7. Cukierman T, Gerstein HC, Williamson JD (2005). Cognitive decline and dementia in diabetes—systematic overview of prospective observational studies. *Diabetologia* **48**: 2460–2469.
8. Adeniyi AF, Adeleye JO, Adeniyi CY (2011). Diabetes, sexual dysfunction and therapeutic exercise: a 20 year review. *Curr Diabetes Rev* **6**: 201–206.
9. Thorve VS, Kshirsagar AD, Vyawahare NS, Joshi VS, Ingale KG, Mohite RJ (2011). Diabetes-induced erectile dysfunction: epidemiology, pathophysiology and management. *J Diabetes Complications* **25**: 129–136.
10. Gauguin L, Klapproth B, Sajid W, Andersen AS, McNeil KA, Forbes BE, De Meyts P (2008). Structural basis for the lower affinity of the insulin-like growth factors for the insulin receptor. *J Biol Chem* **283**: 2604–2613.
11. Hirai FE, Tielsch JM, Klein BE, Klein R (2011). Ten-year change in vision-related quality of life in type 1 diabetes: Wisconsin epidemiologic study of diabetic retinopathy. *Ophthalmology* **118**: 353–358.

CITE THIS ARTICLE

Zebunnesa Ahmed. Complications Associated with Diabetes: Review. *Res. J. Chem. Env. Sci.* Vol 4 [4] August 2016. 01-07