

PHC

432 Team

TBL DIABETES MELLITUS



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COLOR GUID: Doctor's Notes Team Notes slides Not important Important 431 team work

Objectives

- Epidemiology in brief of Diabetes in Saudi Arabia and over the world
- Diagnosis of diabetes, Recent guidelines for diagnosis and classification
- Screening for Diabetes
- Highlight on Pre-diabetes and how to prevent development of diabetes

How to approach a diabetic patient in clinic?

- Role of Diabetic team in management and **Goals** to be achieved (HbA1C, LDL, HDL and Trig.) and for BP.
- Important aspects of clinical examination, focus on LL examination, Eye,..
- Essential Investigations (regular visits and annual checkup)
- Update in Management especially for Type 2 Diabetes including education, Life style modification, Role of Diet and Exercise
 - Highlight on oral medications like Biguanides, Sulphonylurea, Glitazones, Incretins, DPP 4 inhibitors, Meglitinides, Referral to eye clinic, ...
 - Highlight on Insulin types
- Annual checkup (what to do)
- **Practical: Examination of the lower limbs in a diabetic patient, How to do?**

Epidemiology

Worldwide:

- A. 382 million people have diabetes in 2013; by 2035 this will rise to 592 million (5% of the world).
- b. Diabetes deaths occur in low and middle-income countries.
- c. WHO projects that diabetes will be the 7th leading cause of death in 2030.

Saudi Arabia:

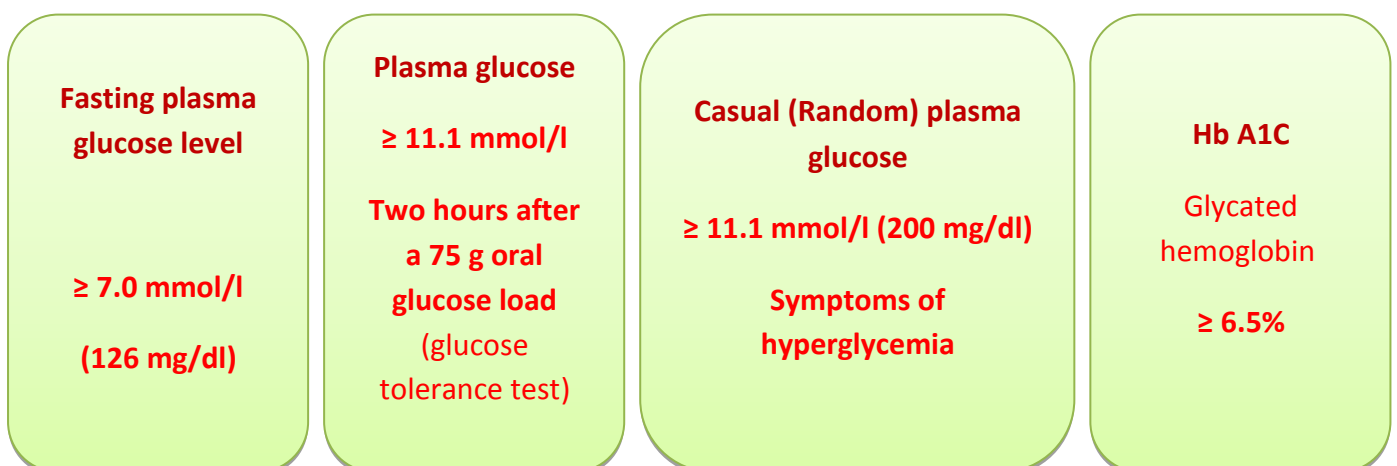
- a. Around 20% of the population by now (2.8 M)
- b. The Kingdom has the 7th highest rate in the world in terms of diabetes incidence.

Definition

A metabolic disease associated with glucose metabolism abnormalities as **a result of insulin deficiency or insulin resistance** that is also related to chronic complications affecting nerves, vessels, kidneys, etc.

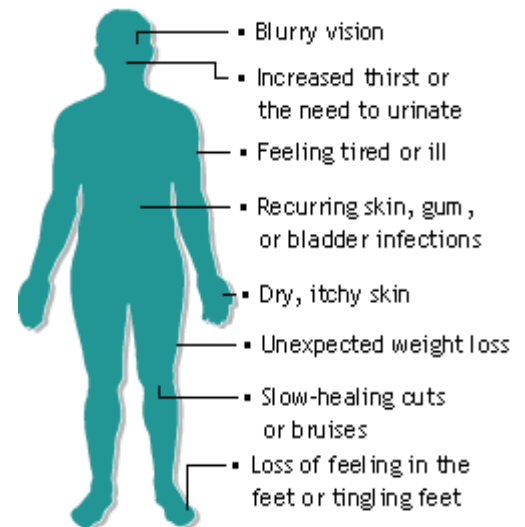
Diagnosis

Diabetes mellitus is characterized by **recurrent or persistent hyperglycemia**, and is diagnosed by demonstrating any one of the following:



Symptoms of DM:

1. Weight loss
2. Polydipsia
3. Polyuria
4. Lethargy
5. Irritability
6. **Blurred vision**



Screening tests:

- 1) Fasting plasma glucose (FPG).
- 2) 2-hour plasma glucose during an oral glucose tolerance test (2-h OGTT).
- 3) Glycated hemoglobin (A1C).

	Type 1	Type 2
Onset	Sudden	Gradual
Duration of symptoms	Weeks	Months to years
Age	Any age (typically young)	Mostly adults
Body habitus	Usually thin	Obese
Ketosis	Common	Rare
Rapid death without insulin	Yes	No
Diabetic complications at diagnosis	No	25%
Autoantibodies	Present	Absent
Endogenous insulin	Low or absent	Normal, low and increased
HLA association	Yes (HLA -DQ/DR)	No
Genetic factors	Concordance rate between identical twins is 50%	Concordance rate between identical twins is 90%
Family history	Uncommon	Common
Other autoimmune diseases	Common	Uncommon

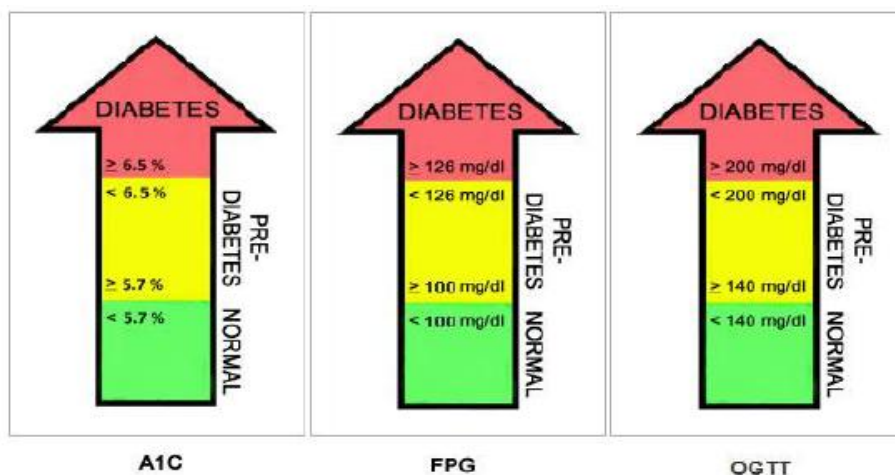
Secondary causes of DM

- **Drugs:** Steroids, thiazides.
- **Pancreatic disease:** Pancreatitis, surgery, cancer, hemochromatosis, and cystic fibrosis.
- **Endocrine disease:** Cushing's disease, acromegaly, thyrotoxicosis, pheochromocytoma
- **Others:** Glycogen storage diseases, insulin receptor antibodies.

	2 hour glucose mmol/l(mg/dl)	Fasting glucose mmol/l(mg/dl)	HbA1c %
Normal	<7.8 (<140)	<5.6(<100)	<5.7
Impaired fasting glycaemia	<7.8 (<140)	≥ 5.6(≥100) &<7.0(<126)	5.7–6.4
Impaired glucose tolerance	≥7.8 (≥140)	<7.0 (<126)	5.7–6.4
Diabetes mellitus	≥11.1 (≥200)	≥7.0 (≥126)	≥6.5

Screening for diabetes:

1. Routine screening for type 1 diabetes cannot be recommended except for research purposes.
2. We screen people with risk factors for Type 2 Diabetes Mellitus, and those are:
 - a. Age **≥45 years**.
 - b. Overweight (body mass index **≥25 kg/m²**).
 - c. **Family history** of diabetes mellitus in a first-degree relative.
 - d. **Habitual physical inactivity**.
 - e. **History of gestational diabetes** mellitus.
 - f. **Hypertension** (blood pressure **≥140/90 mmHg**).
 - g. **Dyslipidemia** (defined as a serum HDL concentration **≤35 mg/dL (0.9 mmol/L)** and/or a serum triglyceride concentration **≥250 mg/dL (2.8 mmol/L)**).
 - h. Previously identified **A1C ≥5.7 percent**, impaired glucose tolerance or impaired fasting glucose.
 - i. Polycystic ovary syndrome.
 - j. History of vascular disease.



Pre-diabetes and how to prevent development of diabetes

- 1. Pre-diabetes:** when a person's blood glucose levels are higher than normal but not high enough for a diagnosis of diabetes.
- Before people develop type 2 diabetes, **they almost always have "pre-diabetes"**
- It is sometimes referred to as impaired glucose tolerance (IGT) or impaired fasting glucose (IFG), depending on what test was used when it was detected.
- This condition **puts** the patient **at a higher risk for developing type 2 diabetes and cardiovascular disease.**
- Patients with **IGT, IFG, or an A1C of 5.7–6.4%** (pre-diabetic) should be:
 - Referred to an effective ongoing support program targeting **weight loss and increasing physical activity.**
 - Metformin** therapy for prevention of type 2 diabetes.
 - At least **annual monitoring** for the development of diabetes.

Statin therapy should be added to lifestyle therapy, regardless of baseline lipid levels, for diabetic patients:

- 1) With overt CVD**
- 2) Without CVD who are over the age of 40 years and have one or more other CVD risk factors (family history of CVD, hypertension, smoking, dyslipidemia, or albuminuria).**

*When to add Metformin **in pre-diabetes?***

- 1. Hypertension.**
- 2. Low HDL** cholesterol.
- 3. Elevated triglycerides.**
- 4. Family history** of diabetes (first-degree relative).
- 5. Obese.**
- 6. Under 60 years** of age.

Goals to be achieved in terms of managing and controlling a diabetic patient:

1. HbA1C:

1. Lowering **A1C to below or around 7%** has been shown to **reduce microvascular complications of diabetes**. Therefore, a reasonable A1C goal for many nonpregnant adults is <7%.
2. More **stringent** A1C goals (such as **<6.5%**) for selected individual patients, if **this can be achieved without significant hypoglycemia** or other adverse effects of treatment. Appropriate patients might include those with **short duration** of diabetes, **long life expectancy**, and **no significant CVD**.
3. Less stringent A1C goals (**such as <8%**) may be appropriate for patients with a history of **severe hypoglycemia**, limited life expectancy, advanced microvascular or macrovascular complications, extensive comorbid conditions, and those with long-standing diabetes in whom the general goal is difficult to attain despite diabetes self-management education (DSME), appropriate glucose monitoring, and effective doses of multiple glucose-lowering agents including insulin.

2. Blood pressure:

1. People with diabetes and hypertension should be treated to a **systolic blood pressure goal of <140 mmHg**.
2. Patients with diabetes should be treated to a **diastolic blood pressure <80 mmHg**.
3. Lower systolic targets, such as <130 mmHg, may be appropriate for certain individuals, such as younger patients, if it can be achieved without undue treatment burden.

3. Triglyceride: <150 mg/dL (1.7 mmol/L)

4. LDL:

- a. In individuals **without** overt CVD, the goal is LDL cholesterol **<100 mg/dL (2.6 mmol/L)**.
- b. In individuals **with** overt CVD, a lower LDL cholesterol goal of **<70 mg/dL (1.8 mmol/L)**, using a high dose of a statin, is an option.

5. HDL:

- a. **>40 mg/dL (1.0 mmol/L)** for men.
- b. **>50 mg/dL (1.3 mmol/L)** for women

Management Modalities

1. Education 2. Diet. 3. Exercise. 4. Lifestyle modification.

1. Type 1 Diabetes Mellitus:

Insulin is the only treatment of choice in Type 1 Diabetes.

2. Type 2 Diabetes Mellitus:

Three methods of treatment are available for diabetic patients:

- 1) Diet, Exercise and lifestyle advice alone
- 2) Oral hypoglycemic agents
- 3) Insulin.

Oral Hypoglycemic Agents:

1. First line Agents:

a. Sulfonylurea:

- 1) MOA: They **stimulate the release of insulin** from the pancreatic B cells (insulin secretagogue)
- 2) Effective only if there is **some residual endogenous insulin production**
- 3) **Weight gain**
- 4) Be careful of hypoglycemia!! (Educate the patient*)

b. Biguanide (Metformin):

- 1) In the absence of contraindications, metformin is the **first choice for oral treatment of type 2 diabetes**
- 2) MOA: it **decreases** gluconeogenesis by the **liver and increases peripheral utilization of glucose.**
- 3) **No weight gain, No hypoglycemia**
- 4) GI side effects are common with metformin.
- 5) The most serious side effect is lactic acidosis (rare).
- 6) Contraindications: **Impaired Renal Function.**

2. Second Line Agents:

a. Glitazones: E.g. (rosiglitazone and pioglitazone)

- 1) **Increase** insulin **secretion** and **increase** insulin **sensitivity**.
- 2) They cause fluid retention, so do not use if **know/suspected heart failure**.

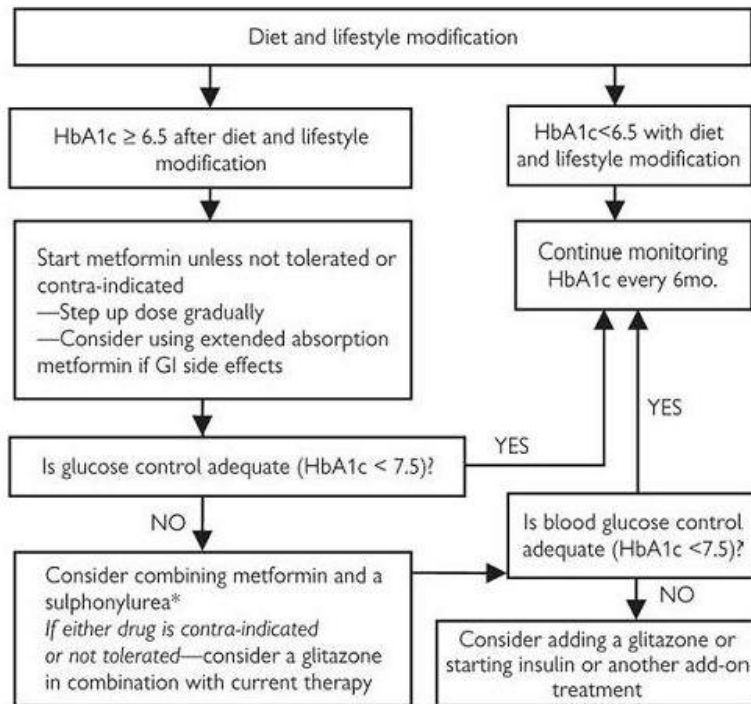
b. Incretins: A group of gastrointestinal hormones that cause an **increase in the amount of insulin released from the beta cells** of the after eating, before blood glucose levels become elevated.

c. Meglitinides: E.g. (Repaglinide and nateglinide) Stimulate insulin release.

d. Insulin:

- 1) Insulin is the preferred second-line medication for patients with **A1C >8.5 percent** or with symptoms of hyperglycemia **despite metformin titration**.
- 2) After maximum metformin and sulphonylurea, you should consider adding Insulin and taper the Sulphonylurea.

Insulin type	Onset of action	Peak effect	Duration of action
<u>Lispro, aspart, glulisine</u>	5 to 15 minutes	45 to 75 minutes	Two to four hours
Regular	About 30 minutes	Two to four hours	Five to eight hours
NPH	About two hours	4 to 12 hours	18 to 28 hours
Insulin <u>glargine</u>	About two hours	No peak	20 to >24 hours
Insulin <u>detemir</u>	About two hours	Three to nine hours	6 to 24 hours*
NPL	About two hours	Six hours	15 hours
Insulin <u>degludec</u>	About two hours	No peak	>40 hours



* A rapid-acting insulin secretagogue is an alternative for those with poor control and erratic lifestyle

Fig. 12.1 Using oral hypoglycaemic agents in type 2 DM

Annual checkups - Investigations	
Eyes	At optometrist Refer to Ophthalmology
Feet, with instructions for self-care	Visual Inspection → each visit Circulation and feeling (Comprehensive) → Annually
Diet	Advice yearly; more often e.g. if overweight and trying to lose weight
Weight	2 weekly if trying to lose weight
Tests for neuropathy	Motor, sensory and autonomic
Blood pressure, thyroid, electrolytes, cholesterol, tests	Statin treatment for most non-pregnant patients, especially if cholesterol is more than 5.
Full blood count	type 1 diabetes
If fluctuating blood sugars (insulin users)	Test for thyroid disease, Addison's, Cushing's, coeliac disease. Consider depression and needle phobia.
Kidneys	protein in urine (microalbuminuria) Albumin to creatinine ratio / 24 hr. urine collection for protein / Creatinine Clearance

Important aspects of clinical examination:

- Amputation and foot ulceration, consequences of diabetic neuropathy and/or peripheral artery disease (PAD) are common.

Risk of ulcers or amputations is increased in people who have the following risk factors:

- Previous amputation
- Past foot ulcer history
- Peripheral neuropathy
- Foot deformity
- Peripheral vascular disease
- Visual impairment
- Diabetic nephropathy (especially patients on dialysis)
- Poor glycemic control
- Cigarette smoking

Vascular Examination:

- Palpation of pulses - Doppler (ABI) - Skin/Limb color changes - Edema - Temperature (Dermal Thermometry) - Atrophy.

Neurologic Examination

- Vibration (128Hz) - Pressure Semmes-Weinstein 10 gram monofilament - Light touch (cotton) - Two-point discrimination - Pain (pin-prick) - Temperature - Reflexes (patella & achilles) - Clonus testing - Romberg test - Babinski test - Gait

<https://www.youtube.com/watch?v=vwIyu1PnXcg>

Key components of the diabetic foot exam

Inspection
Dermatologic
Skin status: color, thickness, dryness, cracking
Sweating
Infection: check between toes for fungal infection
Ulceration
Calluses/blistering: hemorrhage into callus?
Musculoskeletal
Deformity, eg, claw toes, prominent metatarsal heads, Charcot joint
Muscle wasting (guttering between metatarsals)
Neurological assessment
10-g monofilament + one of the following four
Vibration using 128-Hz tuning fork
Pinprick sensation
Ankle reflexes
VPT
Vascular assessment
Foot pulses
ABI, if indicated

Diabetic eye disease may include: (They all increase the risk of visual loss among diabetic patients)

- Diabetic retinopathy
- Cataract
- Glaucoma
- Refractive Error

Summary

- Glucose needs insulin to be metabolized
- In Diabetes Mellitus type II there is insulin resistant which will lead to hyperglycemia
- At first, Insulin insensitivity (resistant) alone will not cause any problems since the
- Pancreas will compensate by secreting more insulin until it can't make enough insulin.
- Diabetics t2 are fatigued because they can't utilize the glucose.
- Diet and exercise (lifestyle modifications) is the first line treatment in DM type II, Oral Hypoglycemic agent (Metformin) is the best initial drug therapy for T2.
- Advanced cases of type-two diabetes might present with weight loss and DKA.
- T1DM is not curable yet.
- T1DM is a clinical diagnosis. Cardinal symptoms are **weight loss, polyuria, polydipsia, and polyphagia**.
- Autoimmune destruction of beta cells result in absolute insulin deficiency. **Patients are insulin dependent**.
- T1DM is a t-cell mediated **autoimmune disease** that involves destruction of beta cells resulting in absolute insulin deficiency.
- **DIAGNOSIS:**
 - Symptomatic patient plus casual plasma glucose
 - ≥ 11.1 mmol/L or **FPG** ≥ 7.0 mmol/L.
 - During an OGTT 2-hr post 75 gm-glucose ≥ 11.1 mmol/L.
 - **HbA1C $\geq 6.5\%$**
 - **If two different tests (such as A1C and FPG) are both above the diagnostic thresholds the diagnosis of diabetes is confirmed.**
- **Screening for DM in asymptomatic :All individuals at age 45 years or above, At younger age if with risk factors.**

TEAM BASED LEARNING (GROUP)
DIABETES MELLITUS (Dr Hussein Saad)

Name of Student: ~~2~~ 2 Comp. No.

Single Best Answer

1. A 55-year-old man with hypertension. He has no symptoms that suggest diabetes, but blood tests produced two random plasma glucose, of 11.4 and 12.3 mmol/l. His body mass index (BMI) is 29.5 and his HbA1c is 9.4%.

Type II

What is the most appropriate management strategy to start with beside life modification?

- a. Gliclazide (sulphonylurea)
- b. Incretin
- c. Insulin
- d. Metformin *best as first line + life style modification*

2. You are evaluating a 36-year-old obese woman who complains of fatigue. She denies polydipsia, polyuria, polyphagia, or weight loss.

Asymptomatic

Which of the following laboratory reports confirms the diagnosis of diabetes?

- a. One fasting glucose measurement of 7.8 mmol/L
- b. One random glucose of 12.1 mmol/L
- c. Random glucose of 11.3 mmol/L, and another of 11.7 mmol/L
- d. Reading of 2 hours after a 75 g glucose load, of 8.9 mmol/L

← we need two readings!

3. According to ADA guidelines, Which of the following readings for HbA1C you should consider for the diagnosis of diabetes?

- a. 5.5 %
- b. 6.0 %
- c. 6.5 %
- d. 7.0 %

cut off

← Goal of treatment

4. Incretin secretion is impaired in patients with type 2 diabetes.

Which one of the following is the most appropriate statement regarding the action of Glucagon-like peptide-1 (GLP-1)?

- a. Act on alpha cells to stimulate glucagon secretions.
- b. Enhance the gastric emptying.
- c. Its secretions decrease in a patient with insulin resistance.
- d. Stimulate sensitivity of insulin receptors.

5. A 28-year-old woman with type 1 diabetes mellitus for 15 years.

She was taking twice daily premixed insulin. BP 132/76

The following investigations are shown:

HbA1C: 6.8 %

Albumin / Creatinine ratio: 289 (< 30 mg)

What is the most appropriate step in management for this patient?

- a. Add amlodipine (CCB)
- b. Add Lisinopril (ACEi)
- c. Increase dose of insulin
- d. Restriction of dietary protein *→ if macroalbuminuria or Renal failure*

6. You are thinking about starting a type 2 diabetic on insulin to improve his blood glucose. His post prandial readings are always high ranging between 248 – 312 mg/dl while his fasting glucose ranges between 106 – 130 mg/dl.

PostPrandial

Which of the following insulin types is appropriate to control his diabetes?

- a. Insulin Glargine *→ long act*
- b. Insulin NPH *←*
- c. Insulin Aspart *← short act*
- d. Insulin Detemir *←*

7. A 52-year-old man is diagnosed with type 2 diabetes mellitus.

When should you refer him to eye clinic for screening?

- a. After one year of diagnosis
- b. After two years of diagnosis
- c. After five years of diagnosis
- d. In the same visit

*IS type 1 we can wait
but type 2 In the same visit*

#1

8. A 42-year-old man known case of diabetes. HbA1C 8.7%.

BMI 37

Which of the following is the best combination for management of his diabetes?

- a. Gliclazide and strict dieting
- b. Insulin glargine and aspart
- c. Metformin and glibenclamide
- d. Metformin and pioglitazone → *best cuz he is obese increase the insulin sensitivity*
First choice for T2

9. Which of the following investigation are requested for a 45-year-old man discovered recently to have type 2 diabetes.

- a. CBC, urea and creatinine, cortisol and TSH
- b. HbA1C, urea and creatinine and lipid profile
- c. HbA1C, bone profile and lipid profile
- d. A/C ratio, TSH and liver function test

10. Whom you should screen for diabetes?

- a. A pregnant woman who has 5 children or more
- b. A patient discovered incidentally to have high BP.
- c. A patient with premature ovarian failure.
- d. Normal persons who are 35 years and above

[Metformin, ACEI, Aspirin, Statins]

Case 1

A 48-year-old man presents to your office for routine checkup for hypertension. Asymptomatic.

On Bisoprolol 5 mg a day.

FH: his father is diabetic

BMI 36 Bp: 148/92

FPG: 10.3 mmol/L U and E: normal

Cholesterol: 5.8 mmol/L LDL: 3.78 HDL: 0.88

Trig. 3.46 mmol/L

How are you going to manage this man?

~~Continue~~

- Confirm the diagnosis by repeating the test
- manage his BP by adding other medication like Ace
- if the diagnosis of diabetes is confirmed, give metformin and lifestyle modification

- Ayesha Khalaf Alanri => 432100427

ECG => in patient with HTN
+ DM (risk of silent ACS)

- Aspirin => 2 risk

- Statin

+ Ace-I
- metformin

Questions

1) Which of the following is a true regarding DM type II?

- a. Absent endogenous insulin.
- b. Ketosis is common.
- c. Has HLA –DQ/DR association.
- d. Patients usually obese.

2) The most important risk factor for Diabetes Mellitus T2 is?

- a. Smoking.
- b. Male Gender.
- c. Obesity.
- d. High sugar diet.

3) Which of the following drugs doesn't cause weight gain?

- a. Metformin.
- b. Sulphonylurea.
- c. Thiazolidinedione.
- d. Insulin.

432 PHC Team Leader

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Answers:

- 1st Questions: D
- 2nd Questions: C
- 3rd Questions: A