Diabetes... Silent Disease / syndrome

SYNDROME WITH DISORDERED METABOLISM

+

INAPPROPRIATE HYPERGLYCEMIA

DUE TO

INSULIN DEFICIENCY

INSULIN RESISTANCE

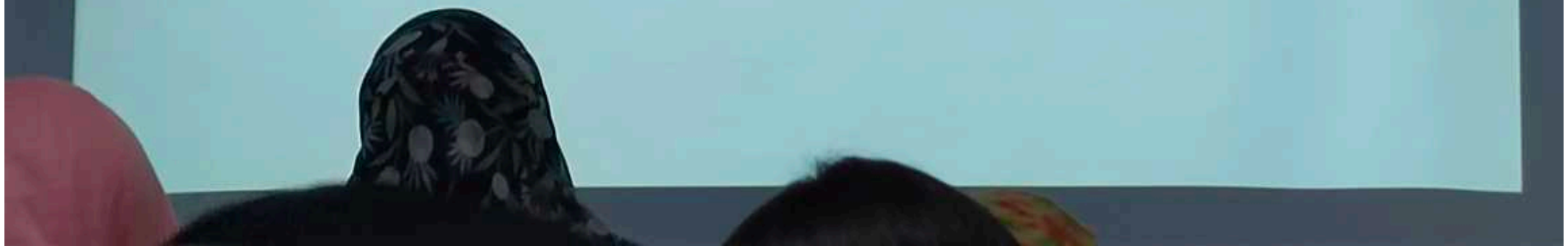
+

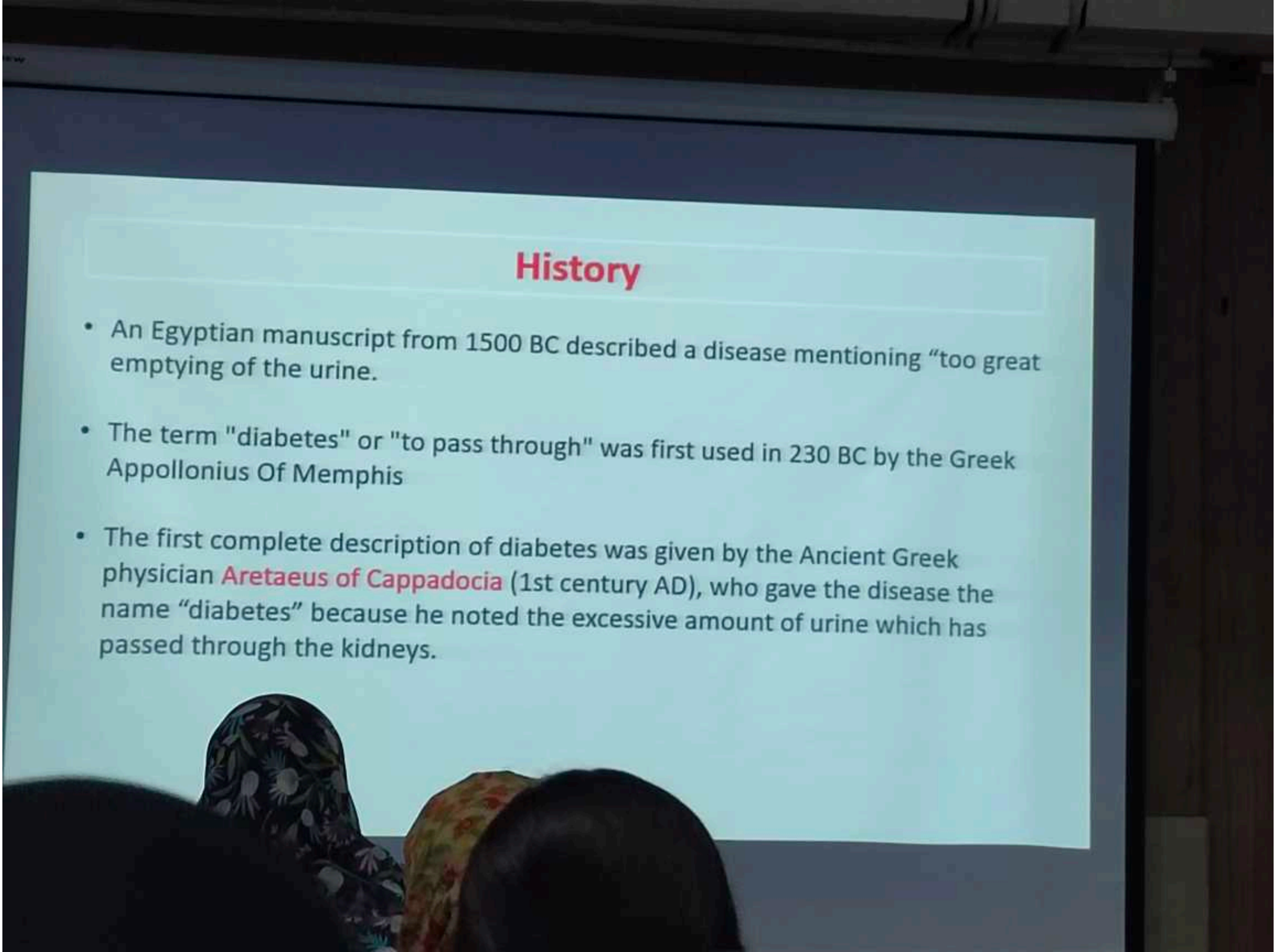
INADEQUATE INSULIN PRODUCTION

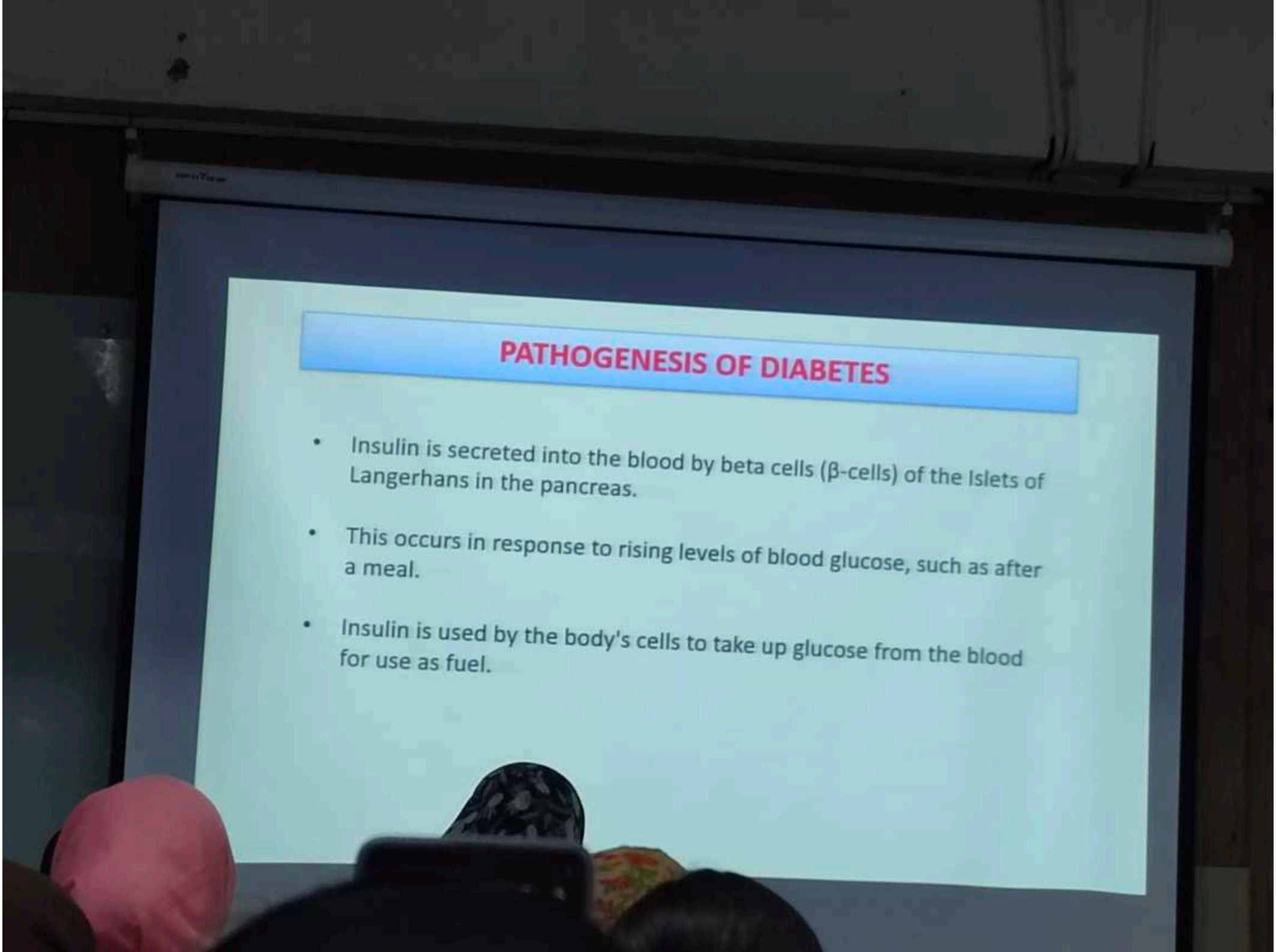
What is diabetes?

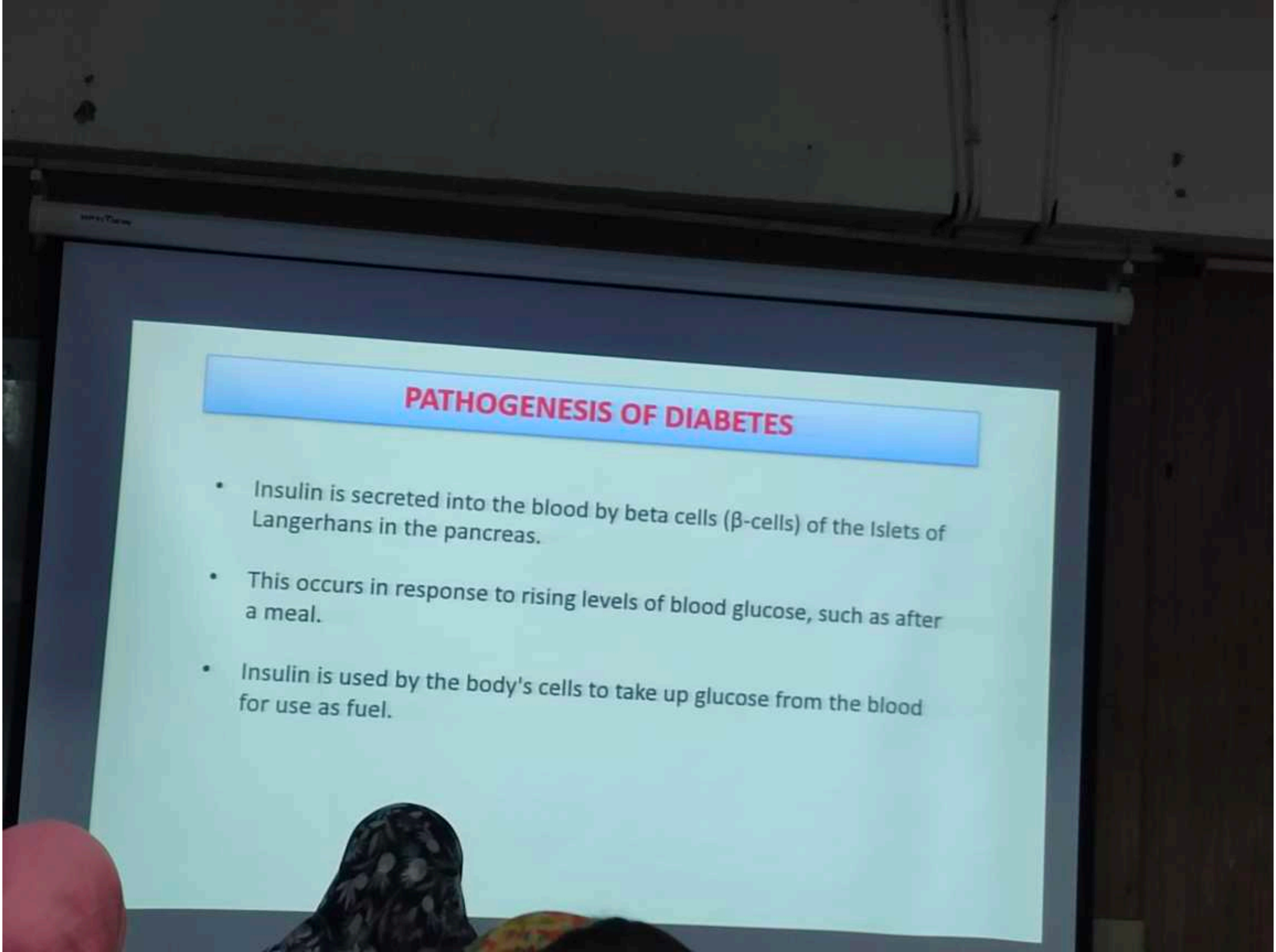
- **Type 1 diabetes**
- Type 1 diabetes (previously **IDDM** or juvenile DM
- Due to deficient insulin production & requires insulin .
- The cause is not known & is not preventable with current knowledge.

- **Type 2 diabetes**
- Type 2 diabetes (formerly **NIDDM** or adult-onset)
- Due to ineffective actions of insulin.
- Majority of diabetics, largely because of Obesity & physical inactivity.
- Type 2 DM was only in adults, now also increasing frequently in children.




History
• An Egyptian manuscript from 1500 BC described a disease mentioning “too great emptying of the urine.
• The term "diabetes" or "to pass through" was first used in 230 BC by the Greek Appollonius Of Memphis
• The first complete description of diabetes was given by the Ancient Greek physician Aretaeus of Cappadocia (1st century AD), who gave the disease the name “diabetes” because he noted the excessive amount of urine which has passed through the kidneys.


PATHOGENESIS OF DIABETES
• Insulin is secreted into the blood by beta cells (β-cells) of the Islets of Langerhans in the pancreas.
• This occurs in response to rising levels of blood glucose, such as after a meal.
• Insulin is used by the body's cells to take up glucose from the blood for use as fuel.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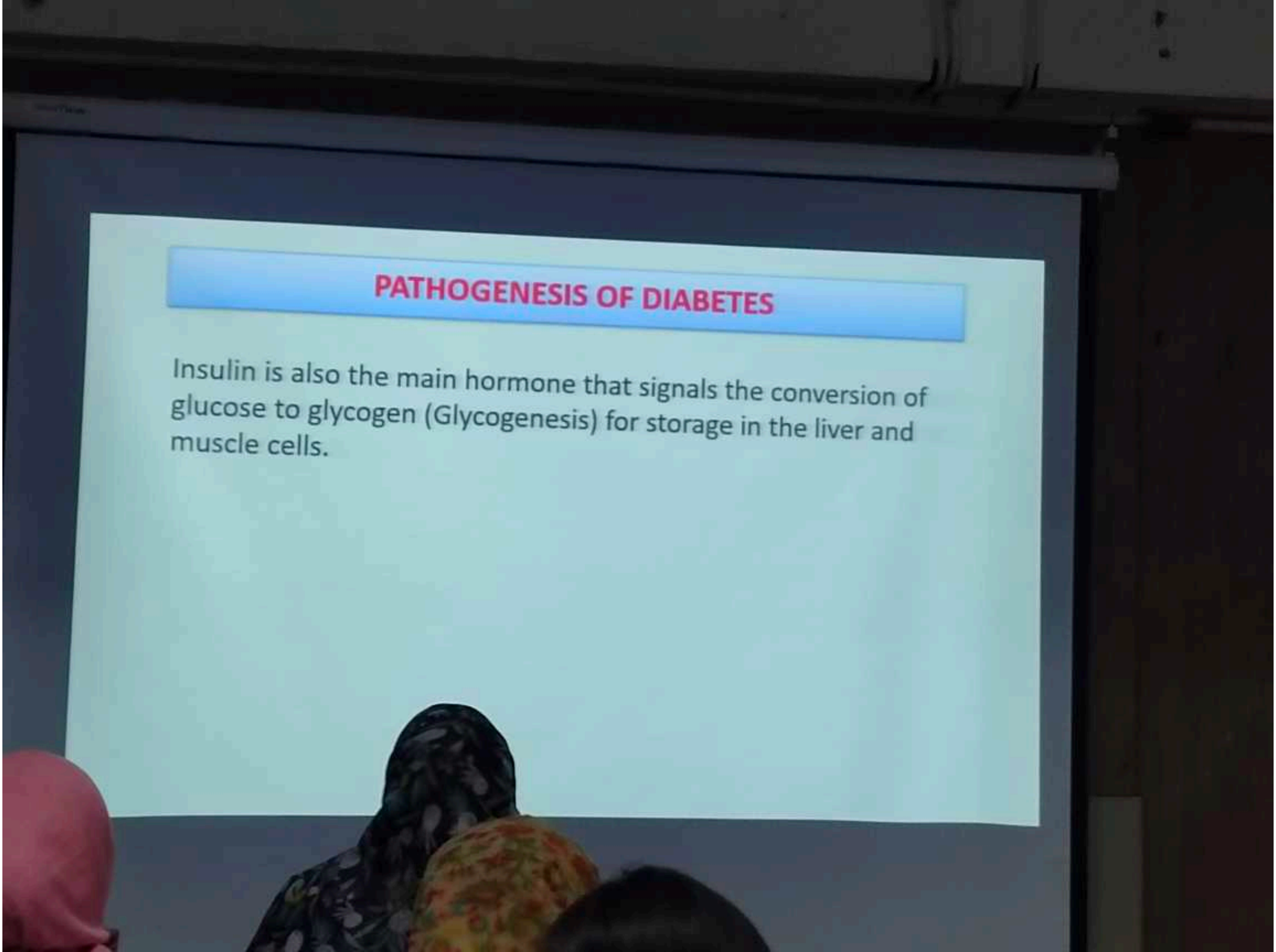
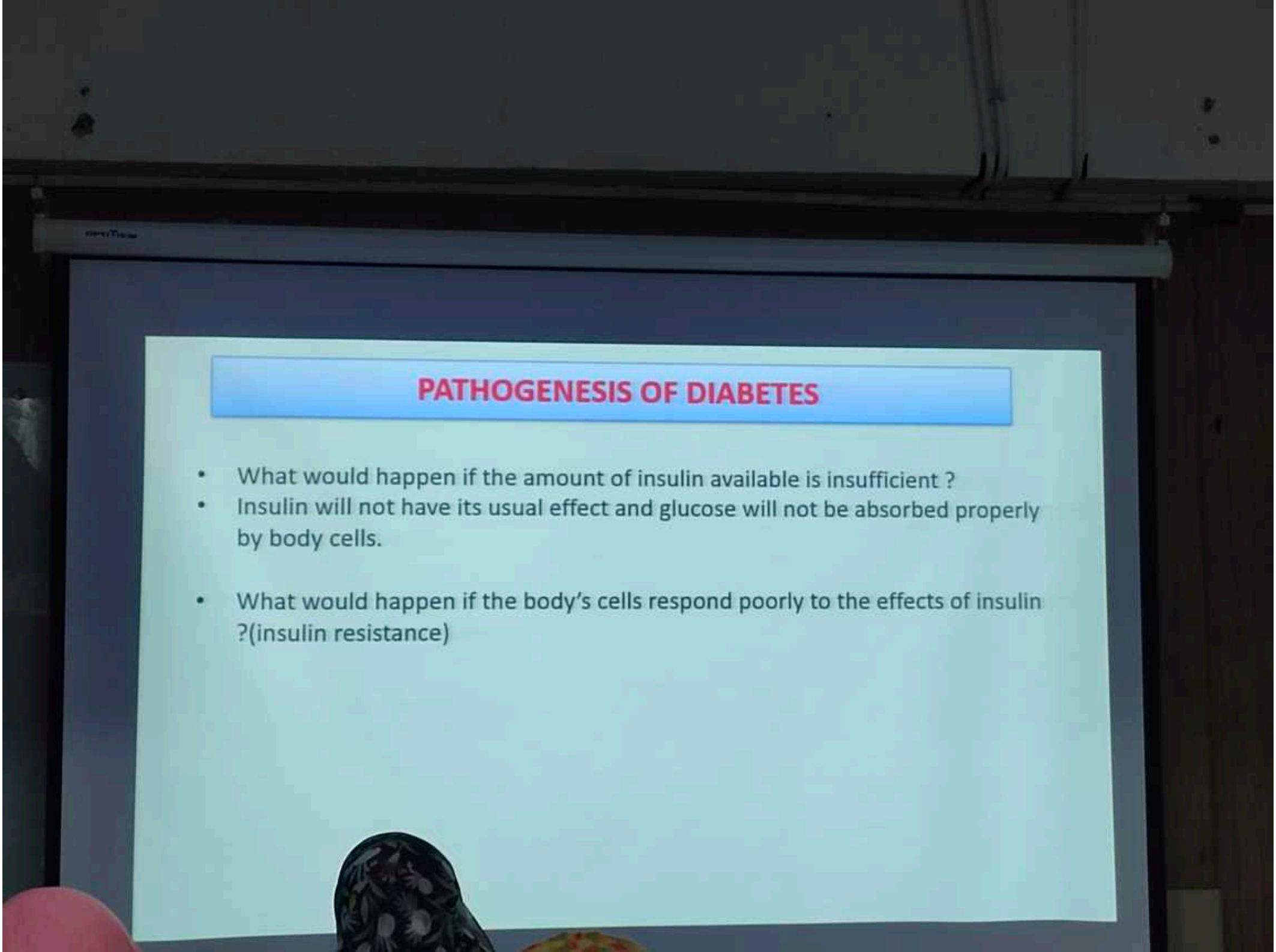
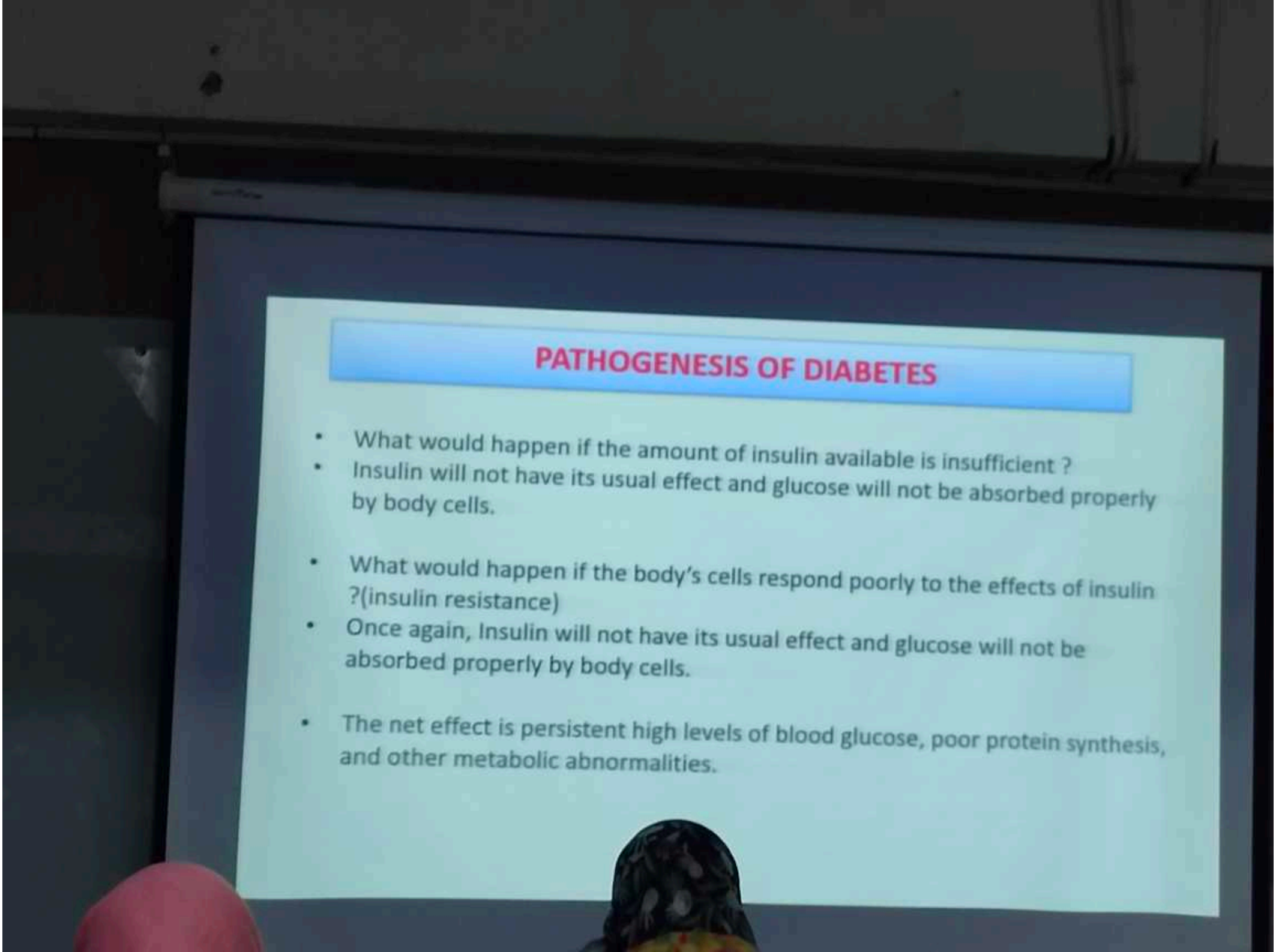
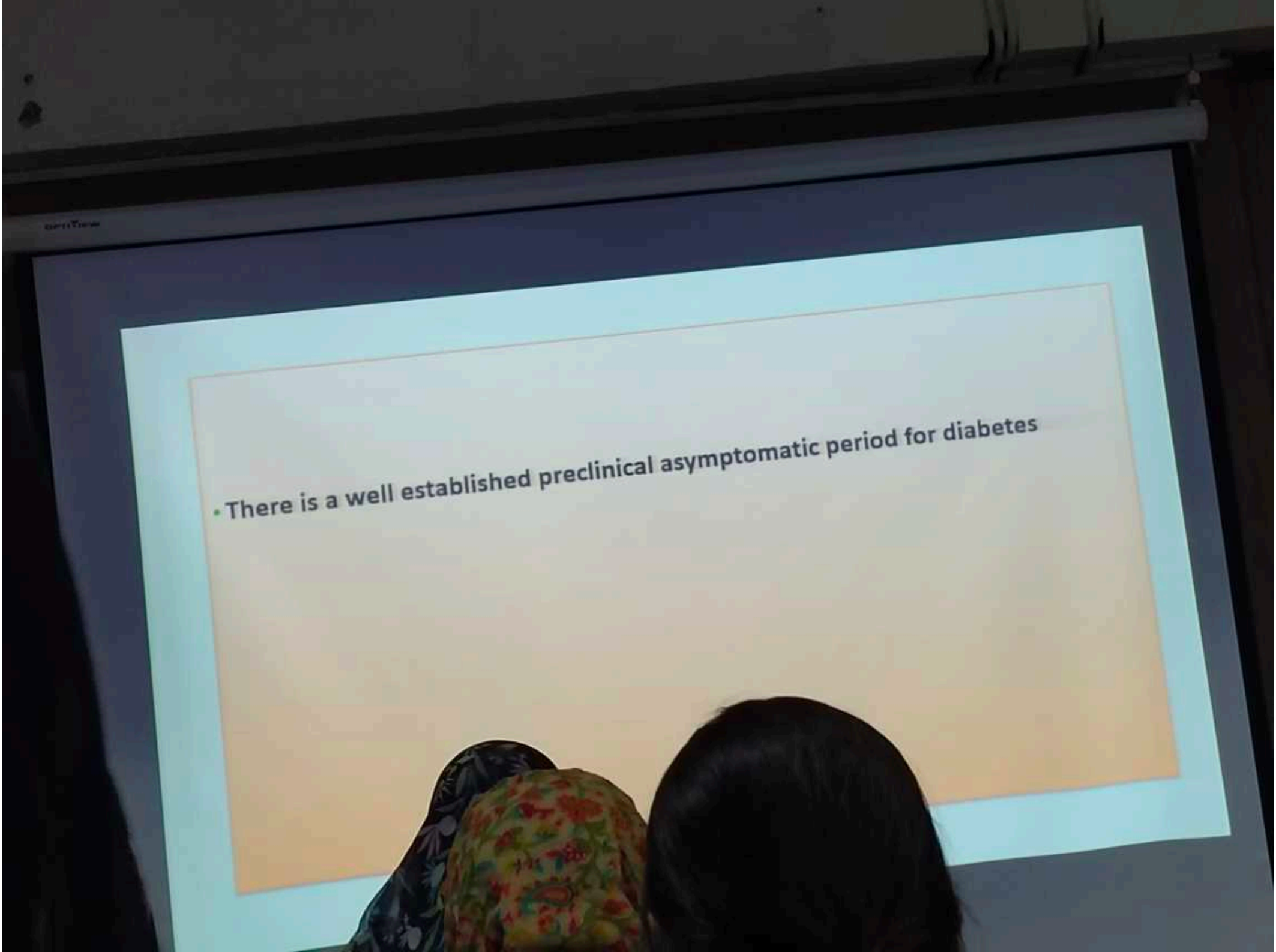
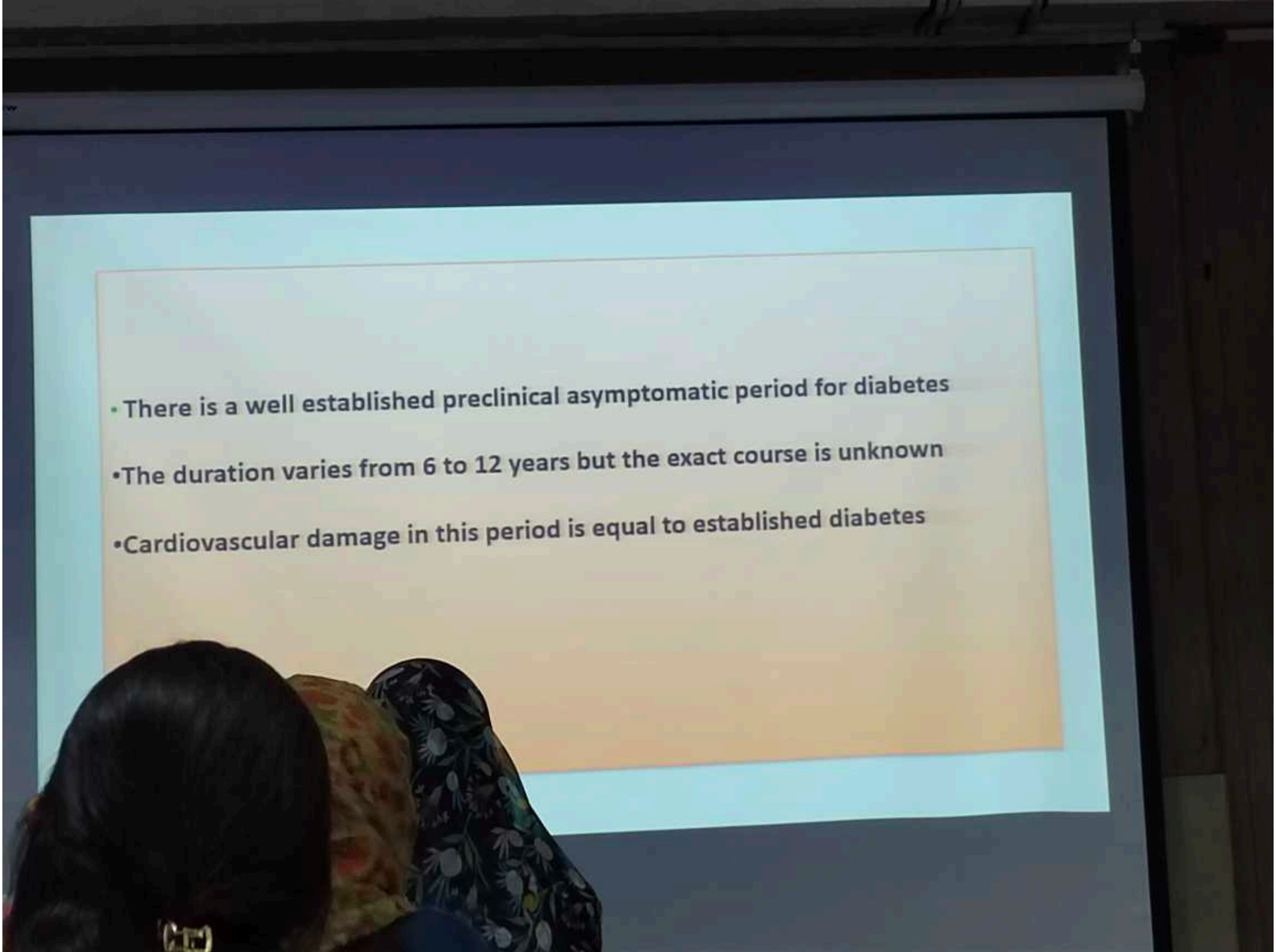
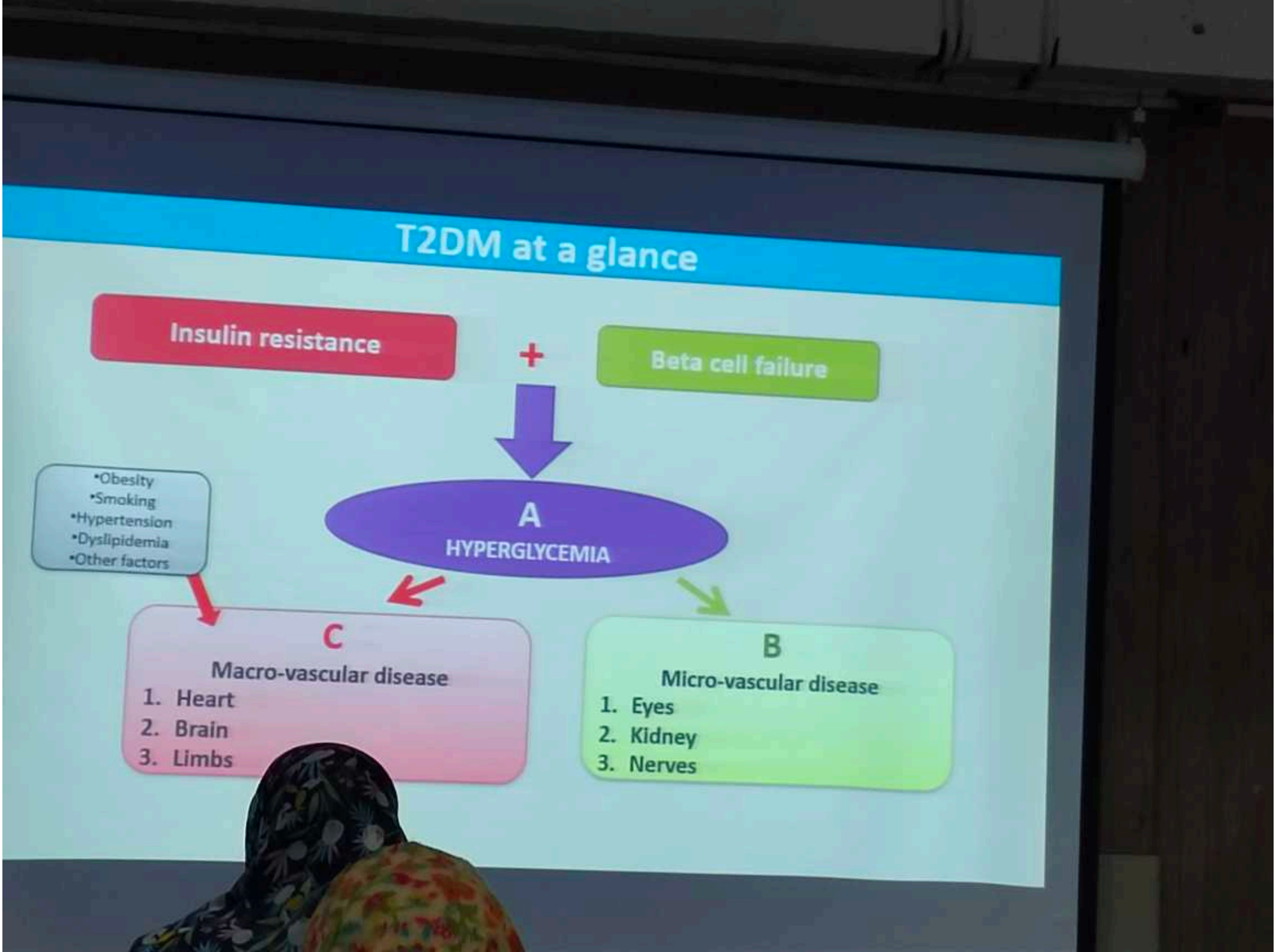

PATHOGENESIS OF DIABETES
Insulin is also the main hormone that signals the conversion of glucose to glycogen (Glycogenesis) for storage in the liver and muscle cells.


PATHOGENESIS OF DIABETES
• What would happen if the amount of insulin available is insufficient ?
• Insulin will not have its usual effect and glucose will not be absorbed properly by body cells.
• What would happen if the body's cells respond poorly to the effects of insulin ?(insulin resistance)

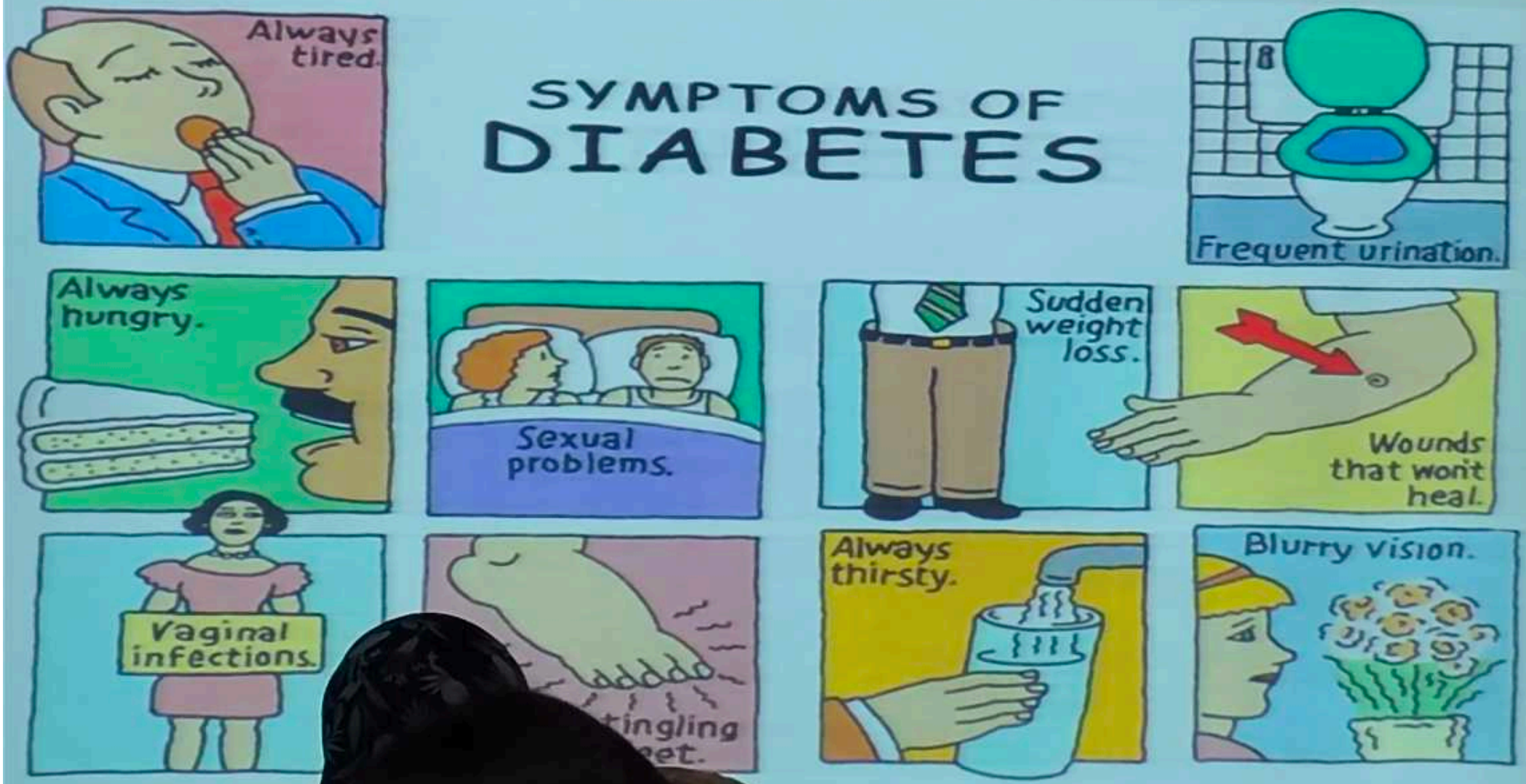

PATHOGENESIS OF DIABETES
What would happen if the amount of insulin available is insufficient ?
Insulin will not have its usual effect and glucose will not be absorbed properly by body cells.
What would happen if the body's cells respond poorly to the effects of insulin ?(insulin resistance)
Once again, Insulin will not have its usual effect and glucose will not be absorbed properly by body cells.
The net effect is persistent high levels of blood glucose, poor protein synthesis, and other metabolic abnormalities.

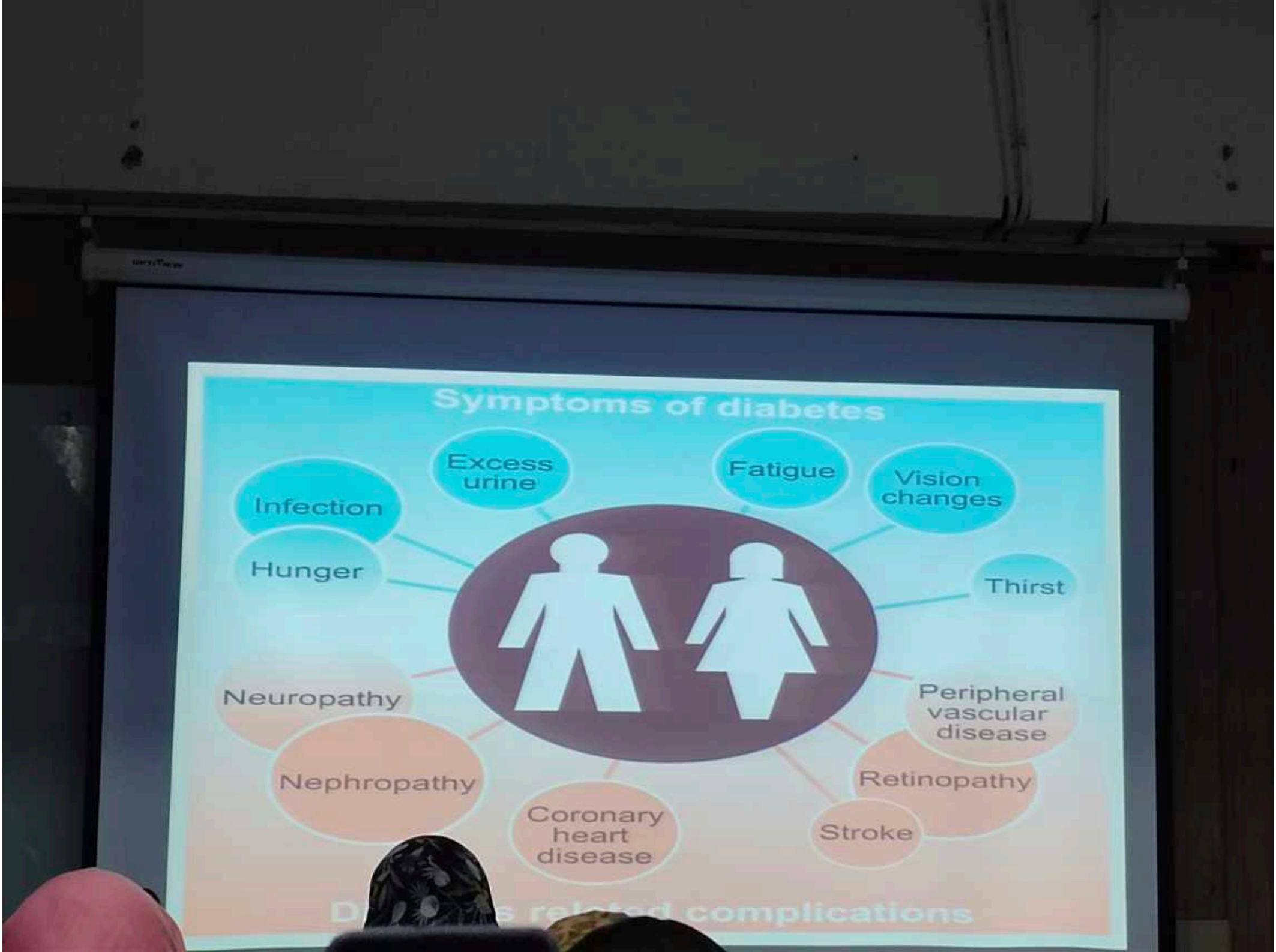

There is a well established preclinical asymptomatic period for diabetes

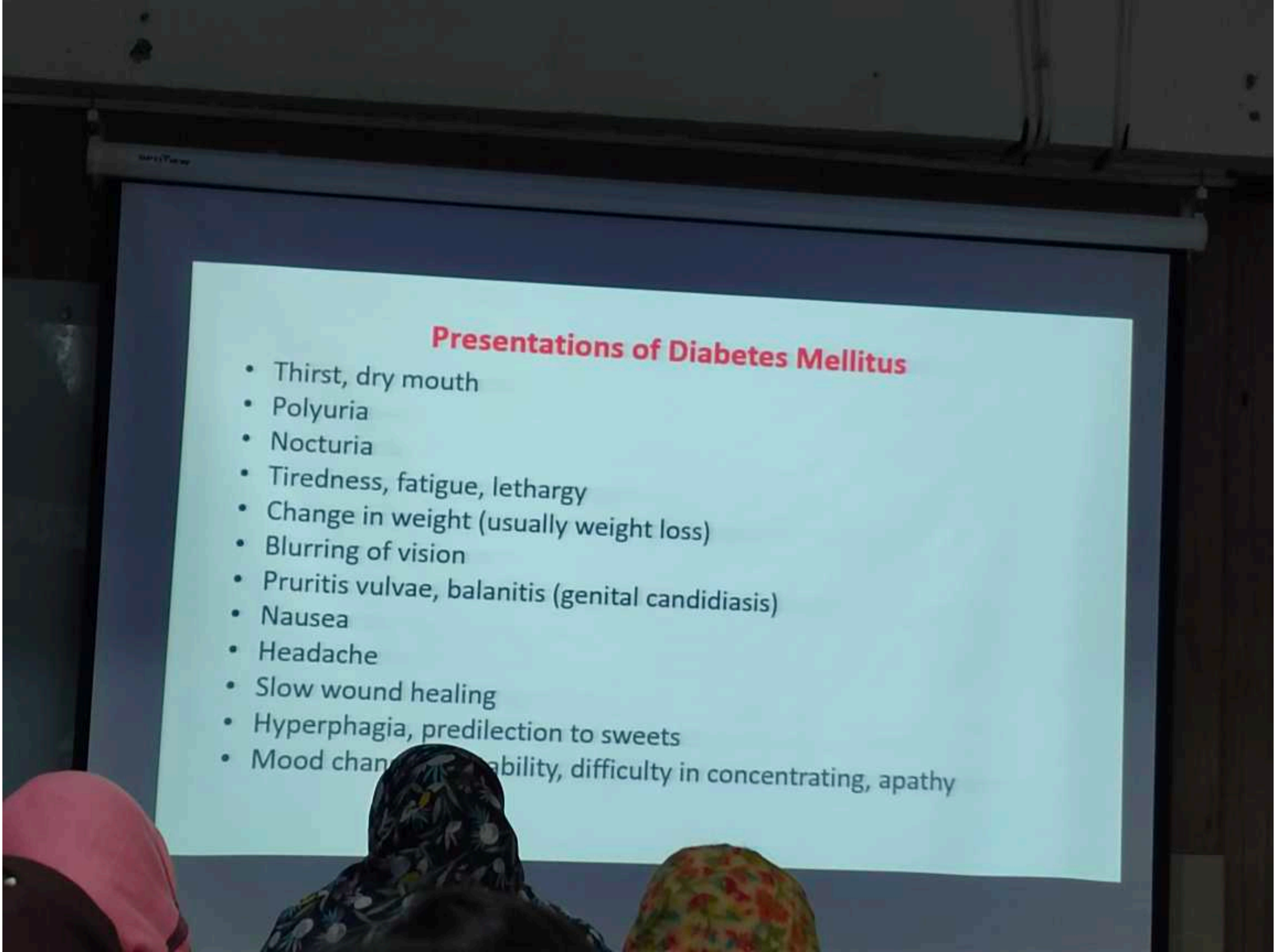

• There is a well established preclinical asymptomatic period for diabetes
•The duration varies from 6 to 12 years but the exact course is unknown
•Cardiovascular damage in this period is equal to established diabetes


T2DM at a glance
Insulin resistance
+
Beta cell failure
•Obesity
•Smoking
•Hypertension
•Dyslipidemia
•Other factors
A
HYPERGLYCEMIA
C
Macro-vascular disease
1. Heart
2. Brain
3. Limbs
B
Micro-vascular disease
1. Eyes
2. Kidney
3. Nerves

Presentations of Diabetes Mellitus




Symptoms of diabetes
Excess urine
Fatigue
Vision changes
Infection
Hunger
Thirst
Neuropathy
Peripheral vascular disease
Nephropathy
Retinopathy
Coronary heart disease
Stroke


Presentations of Diabetes Mellitus
• Thirst, dry mouth
• Polyuria
• Nocturia
• Tiredness, fatigue, lethargy
• Change in weight (usually weight loss)
• Blurring of vision
• Pruritis vulvae, balanitis (genital candidiasis)
• Nausea
• Headache
• Slow wound healing
• Hyperphagia, predilection to sweets
• Mood chan ability, difficulty in concentrating, apathy

How to perform Oral Glucose tolerance test (OGTT)

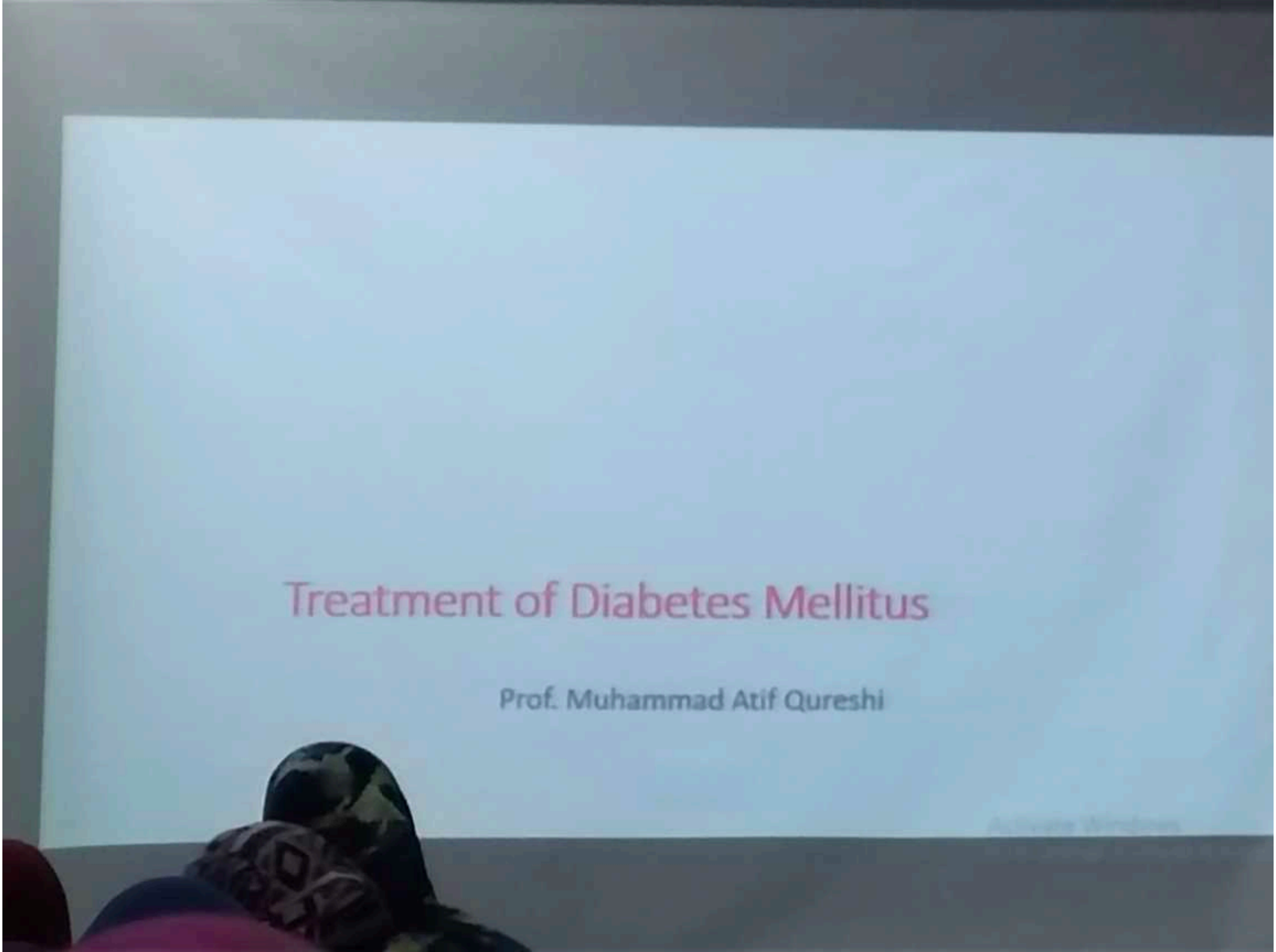
INDICATIONS:

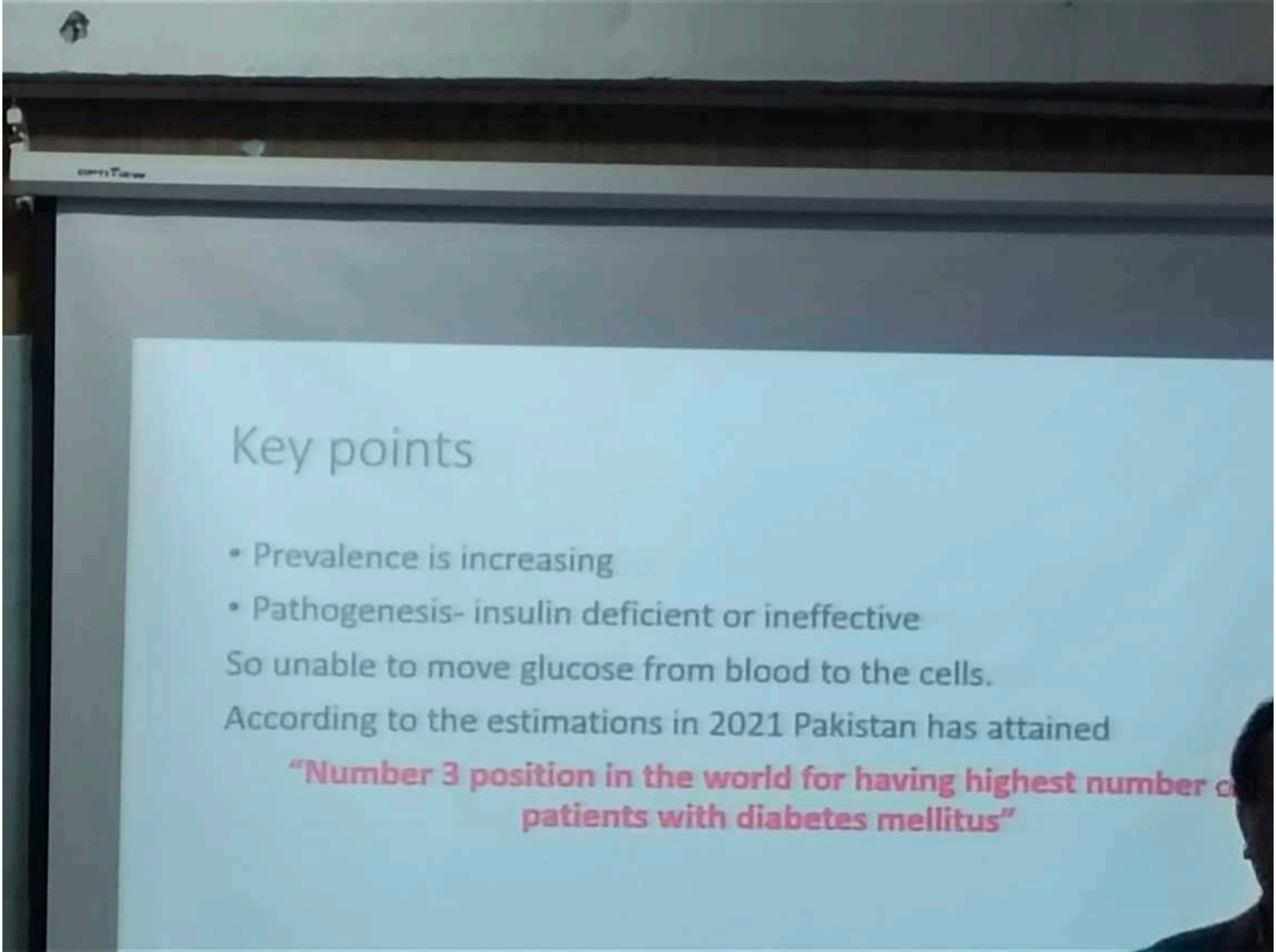
- FPG: 110-126 mg/dl
- Uncertainty about DM
- PREPARATIONS:
- Unrestricted carbohydrate diet for 3 days
- Overnight fast of at least 08 hours
- Should stay seated during the test & no smoking

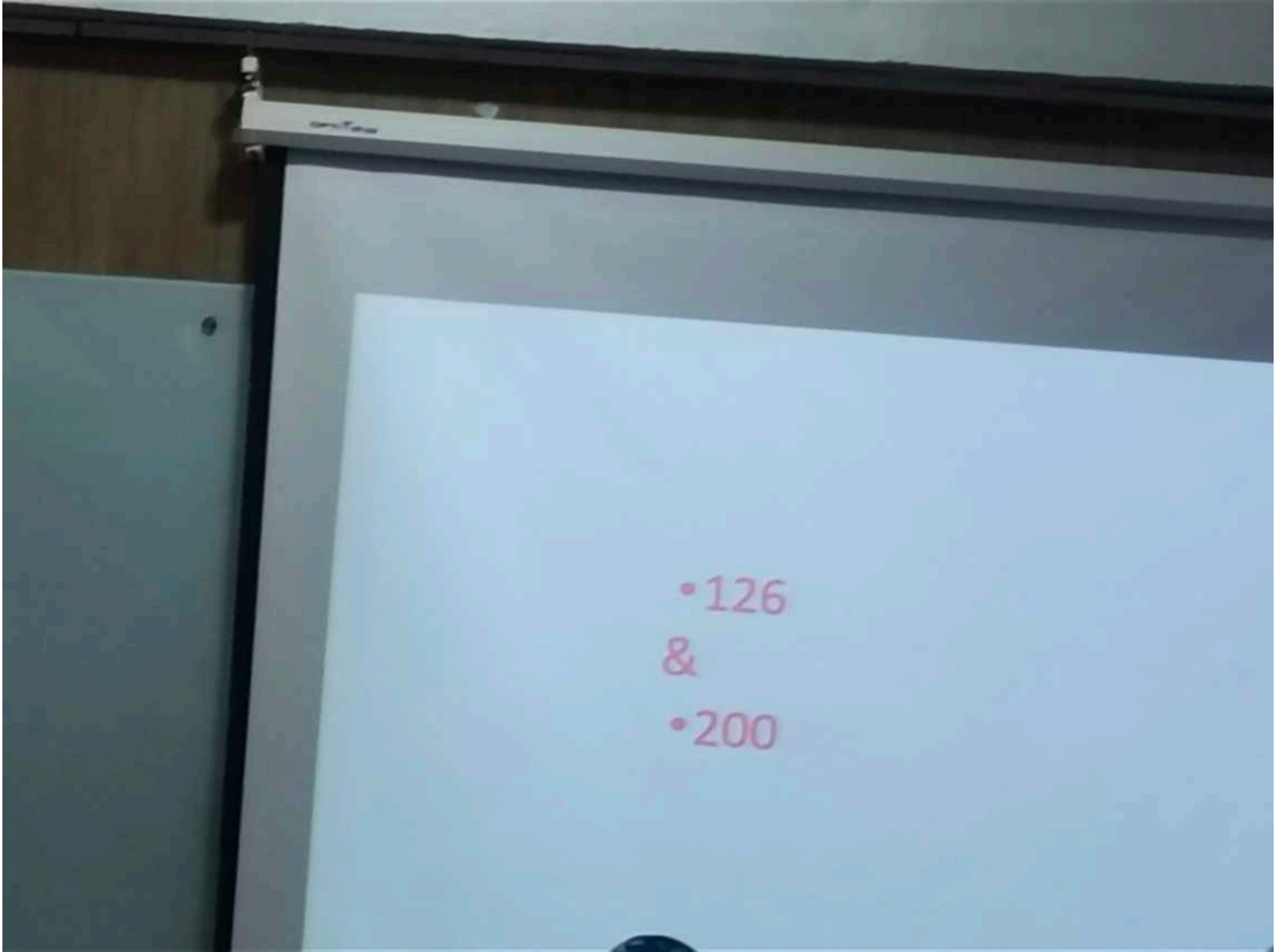
How to perform Oral Glucose tolerance test (OGTT)

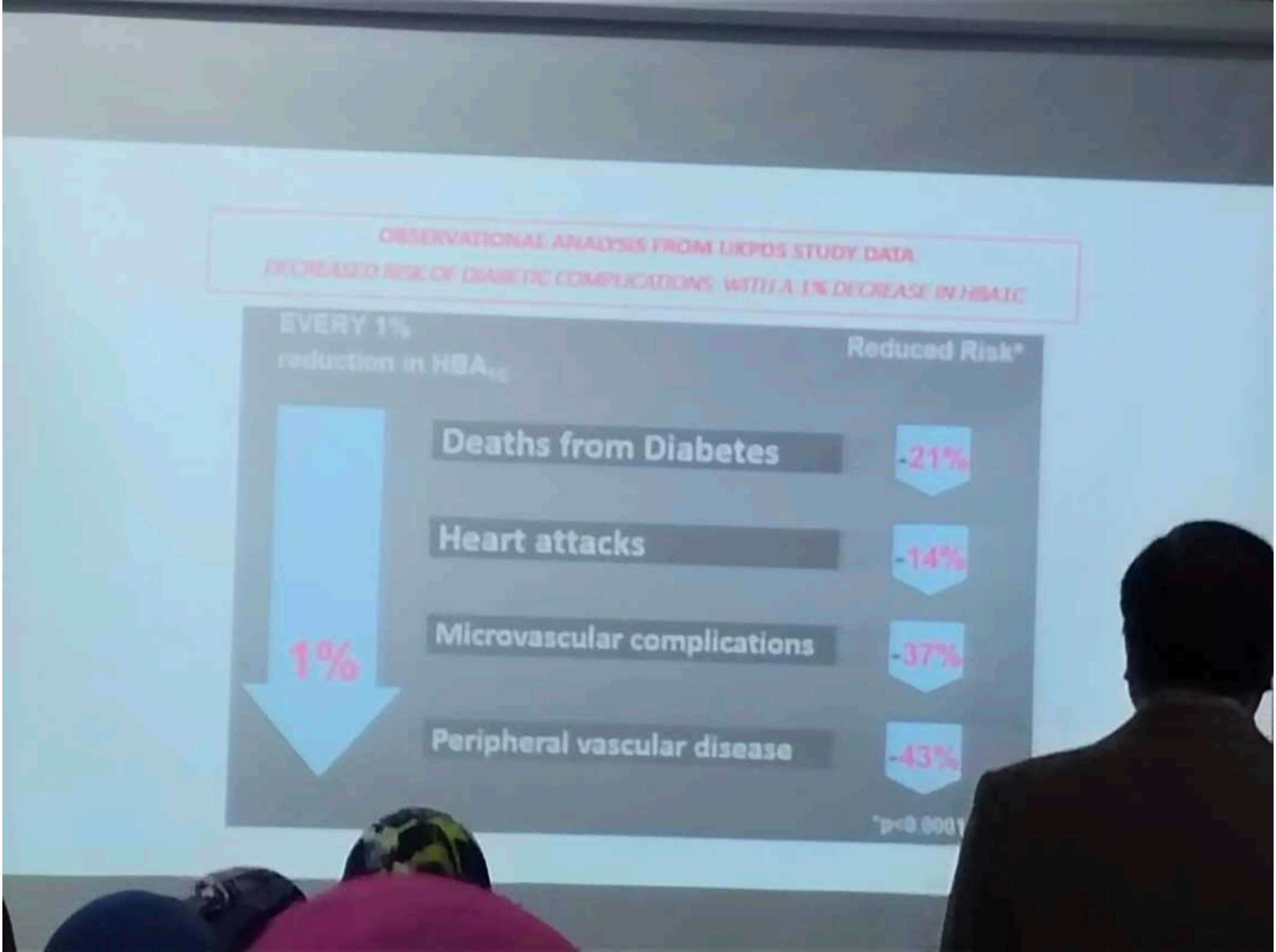
- **SAMPLING:**
- Measure PGL before and after 02 hours of 75 grams oral glucose drink
- **INTERPRETATION:**

	FASTING	02 HOURS AFTER GLUCOSE
Impaired Fasting Glucose	110-125 mg/dl	< 140 mg/dl
Impaired Glucose Tolerance	< 126 mg/dl	140-199 mg/dl
Diabetes Mellitus	> 126 mg/dl	> 200 mg/dl


Treatment of Diabetes Mellitus
Prof. Muhammad Atif Qureshi


Key points
• Prevalence is increasing
• Pathogenesis- insulin deficient or ineffective
So unable to move glucose from blood to the cells.
According to the estimations in 2021 Pakistan has attained
"Number 3 position in the world for having highest number
patients with diabetes mellitus"


•126
&
•200


OBSERVATIONAL ANALYSIS FROM UKPDS STUDY DATA
DECREASED RISK OF DIABETIC COMPLICATIONS WITH A 1% DECREASE IN HBA1C
EVERY 1%
reduction in HBA1c
Reduced Risk*
1%
Deaths from Diabetes
-21%
Heart attacks
-14%
Microvascular complications
-37%
Peripheral vascular disease
-43%

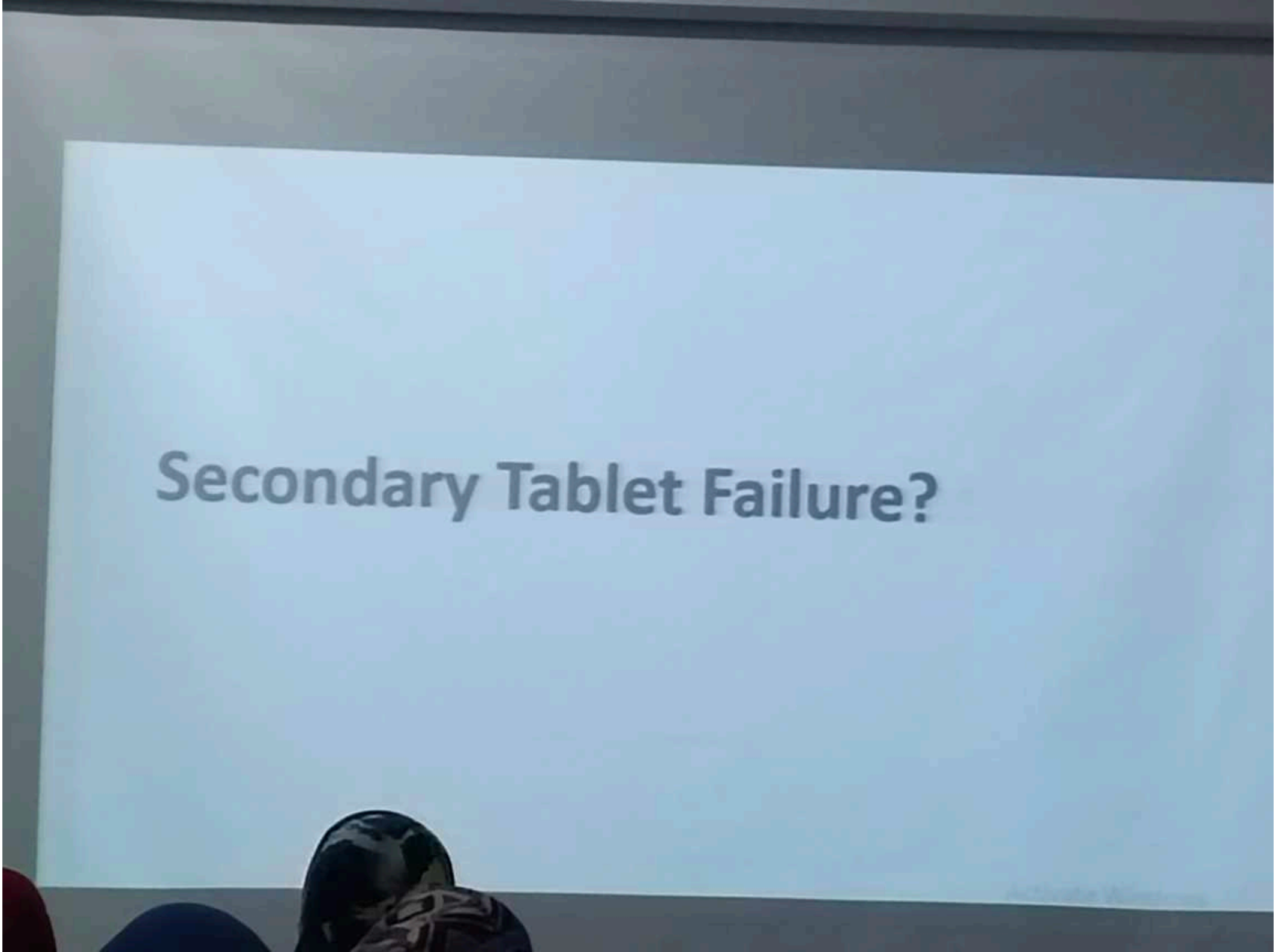
Treatment of T2DM

MAIN FOCUS TO ACHIEVE NORMOGLYCEMIA

- Increasing insulin secretion & responsiveness
- Decreasing the rate of Carbohydrate absorption

SELF MONITORING OF BLOOD GLUCOSE:

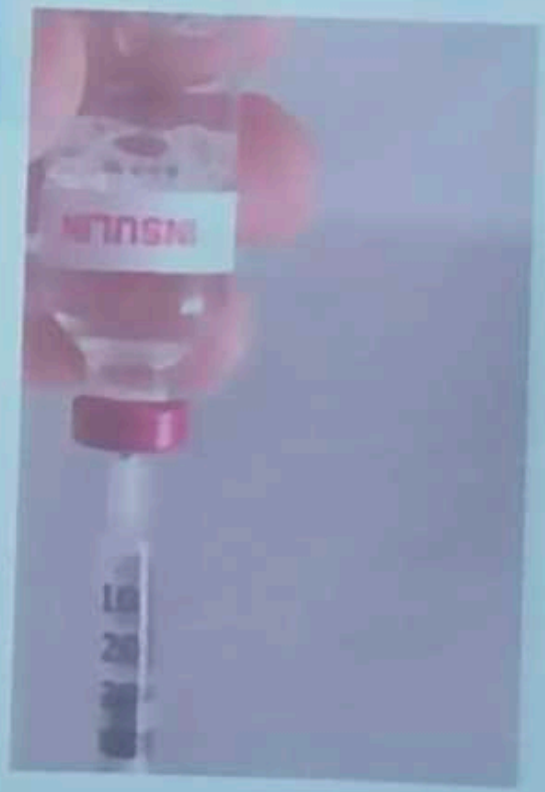
- Recommended for all especially Insulin Rx
- Useful in:
  - Brittle Diabetes
  - Those attempting "Ideal" Glycemic control such as:
    - in Pregnancy
    - having no/little early s/s of ↓ Glucose
    - with impaired Gastric Emptying


Secondary Tablet Failure?

Discovered in the early **1920s** by ***Banting, Best, Collip, and McLeod***

Indications:

- type 1 diabetes
- type 2 diabetes with poor glycemic control
- DKA
- HONK State
- Pre-operative Management of Hyperglycemia
- Hyperkalemia
- GDM



- At present, insulins available as 100 units/mL (U100). Dispensed in 10-mL vials & 3 ml cartridges.

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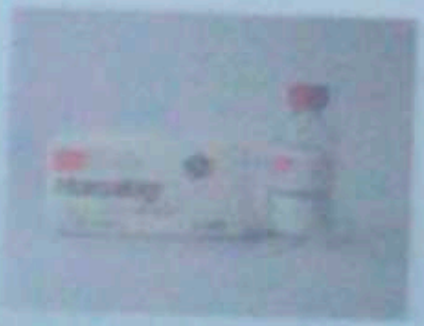
- U500 regular human insulin (Humulin R) available for rare cases of severe insulin resistance in which large quantities of insulin are required.

- **Short-acting:**
  - Regular insulin

  - Rapidly acting insulin analogs

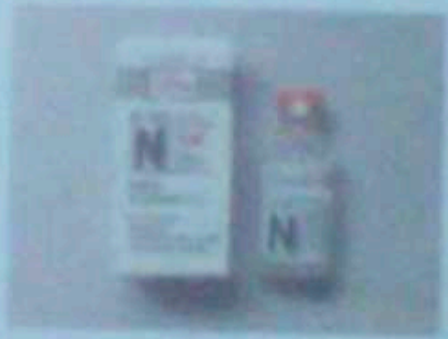


Aspart

Glulisine

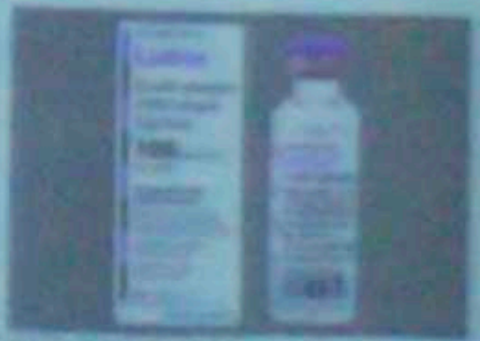
(Dispensed as clear solutions at neutral pH & contain small amounts of zinc to improve their stability and shelf life)

- Long-acting insulin:
  - NPH insulin
    - Dispensed as a turbid suspension at neutral pH with protamine in phosphate buffer



  - Long-acting insulin analogs
    (Dispensed as clear solutions)

Insulin glargine (at acidic pH) *Insulin detemir (at neutral pH)*



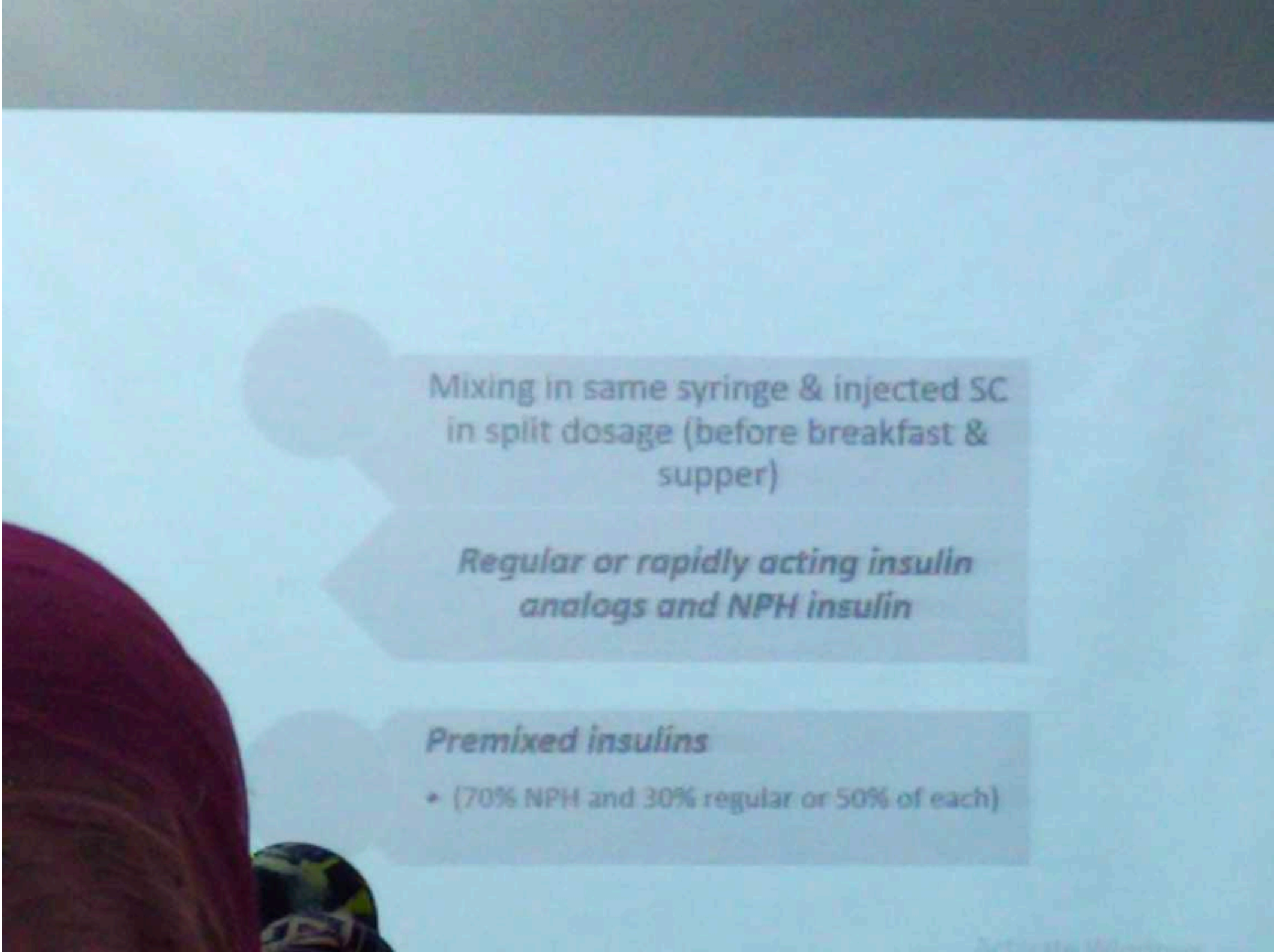
Note:

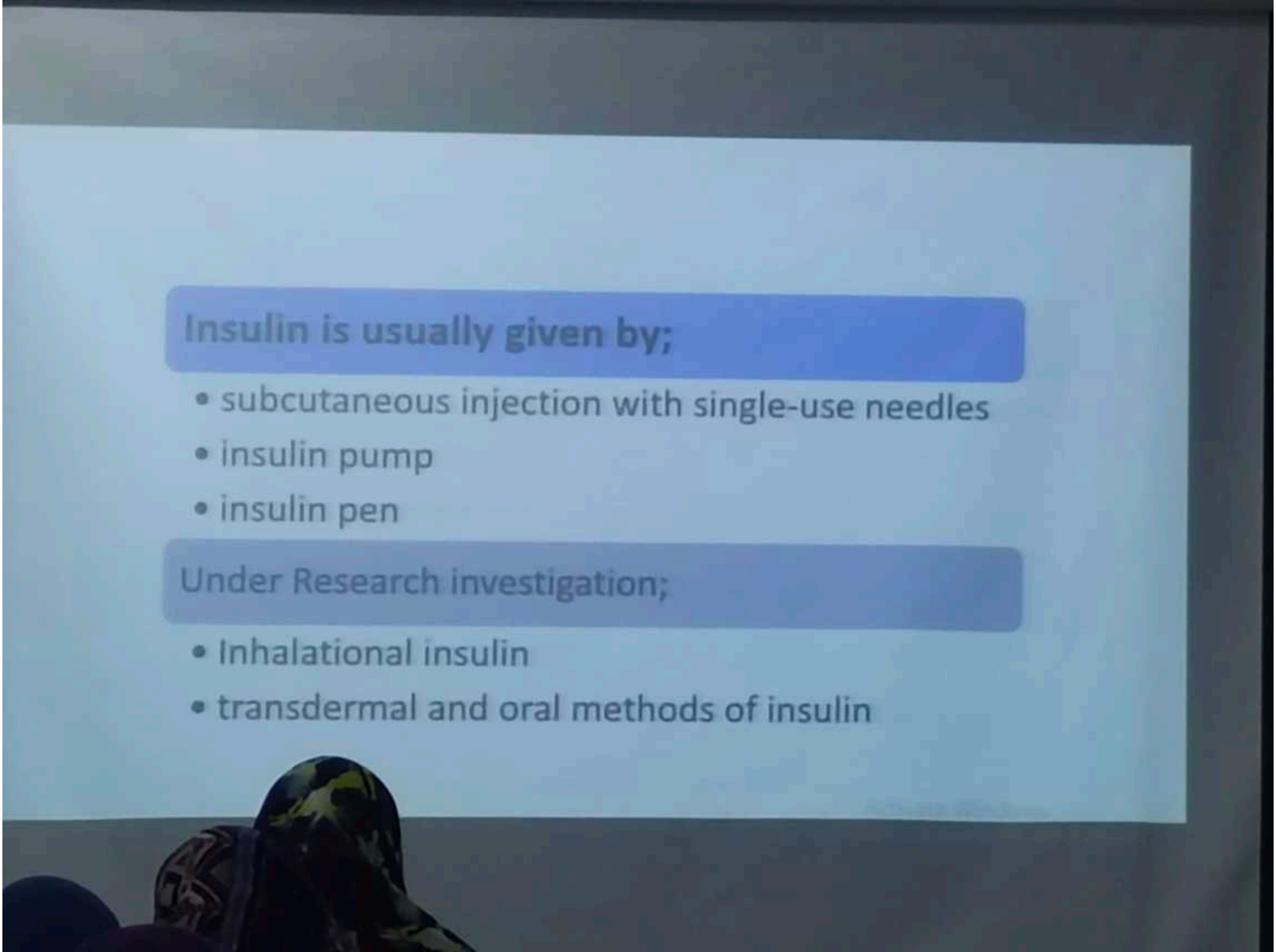
- Rapidly acting insulin analogs & long-acting insulins for subcutaneous administration

- ***Regular insulin can also be given IV***

- Commercial insulin preparations differ with respect to the time of onset and durat
their biologic action

INSULIN PREPARATIONS	ONSET OF ACTION	PEAK ACTION	DURATION
Insulins lispro, aspart, glulisine	5-15 min	1-1.5 hours	3-4 hours
Human Regular	30-60 min	2 hours	6-8 hours
Human NPH	2-4 hours	6-7 hours	10-20 hours
Insulin Glargine	1.5 hours	Flat	24 hours
Insulin Determir	1 hour	Flat	17 hours


Mixing in same syringe & injected SC in split dosage (before breakfast & supper)
Regular or rapidly acting insulin analogs and NPH insulin
Premixed insulins
• (70% NPH and 30% regular or 50% of each)


Insulin is usually given by;
• subcutaneous injection with single-use needles
• insulin pump
• insulin pen
Under Research investigation;
• Inhalational insulin
• transdermal and oral methods of insulin

INSULIN SYRINGES/ NEEDLES

- Plastic disposable syringes: 1-mL, 0.5-mL, and 0.3-mL sizes
- Two lengths of needles: short (8 mm) and long (12.7 mm)
  - Long needles preferable in obese patients to reduce variability of insulin absorption
- Ultrafine needles as small as 31 gauge reduce the pain of injections

Device that looks like a pen used to inject insulin

An insulin pen has a cartridge of insulin and a disposable needle inside of it

Types of PENS:

- Reusable __ has pre-filled cartridge replaced with another
- Disposable

Advantages of Pens:

No need to carry insulin vials and syringes

More comfortable due to the smaller & thinner needle than a syringe needle (31 G needles & 5, 6, and 8 mm long)

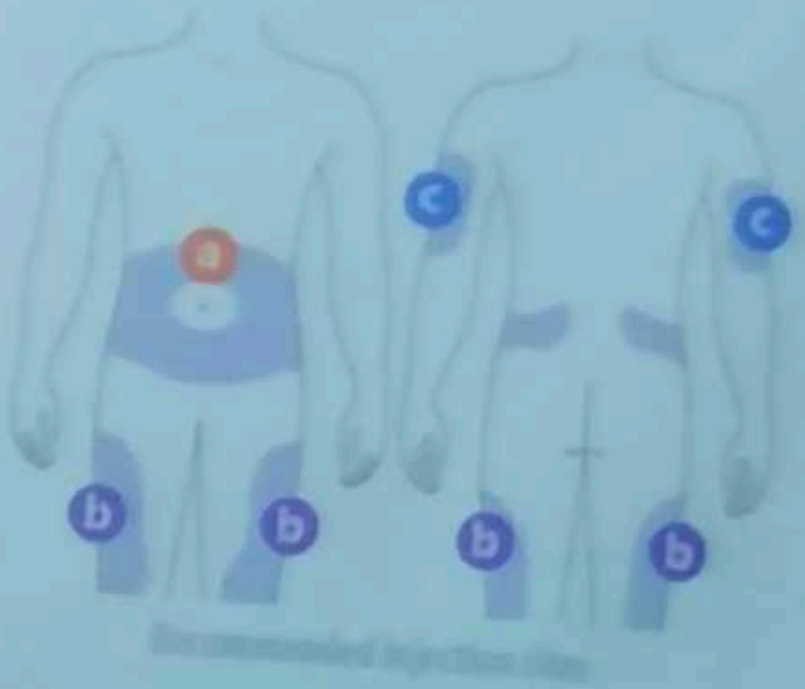
Help ensure the correct amount of insulin

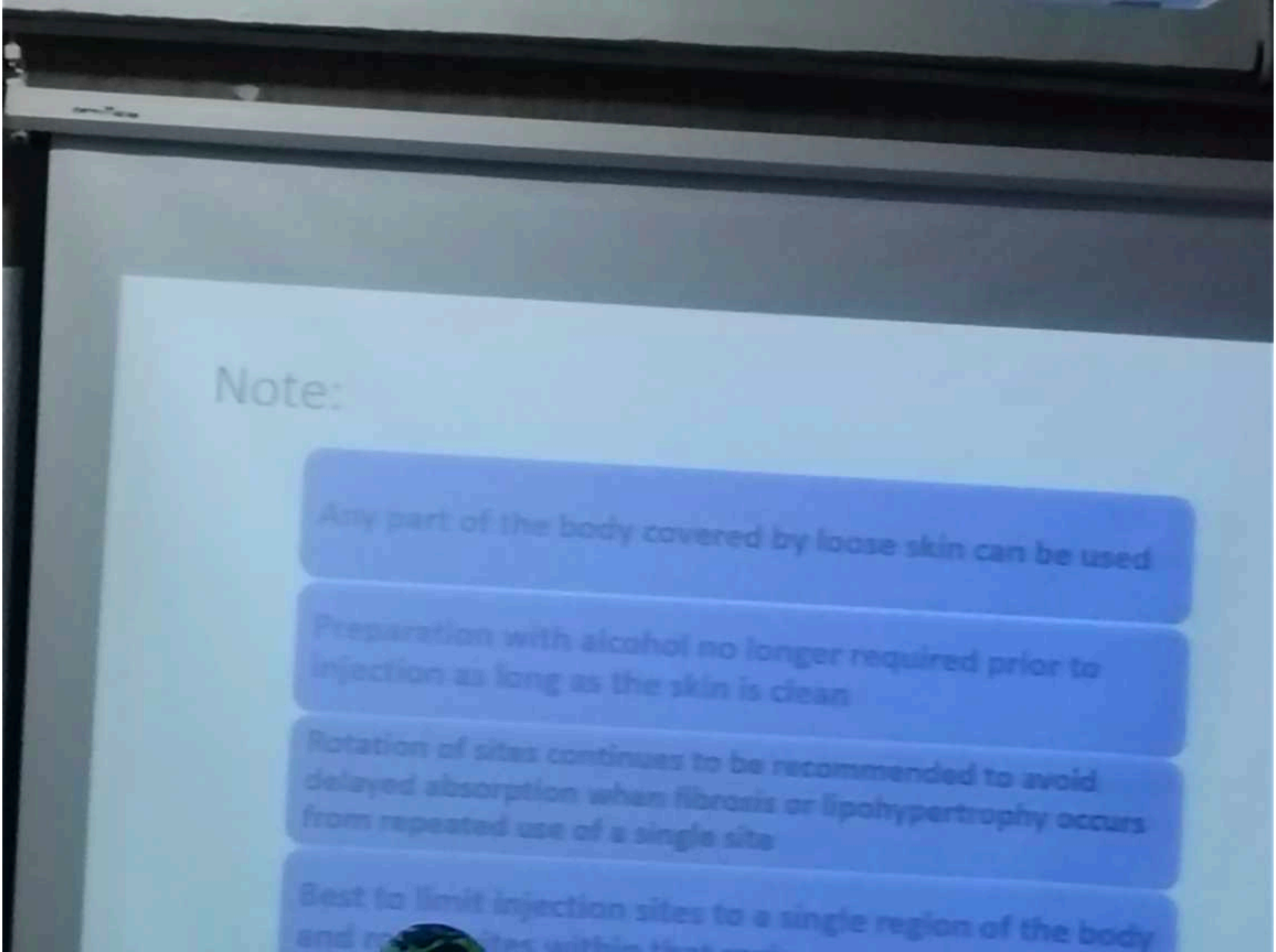
- Easy to use for those needing multiple injections each day
- Easy to use for those who have mental or physical disabilities such as poor vision or tremors

Maintains the privacy because takes little preparation time, few or no extra supplies, and can be used anywhere

Body areas for insulin injection

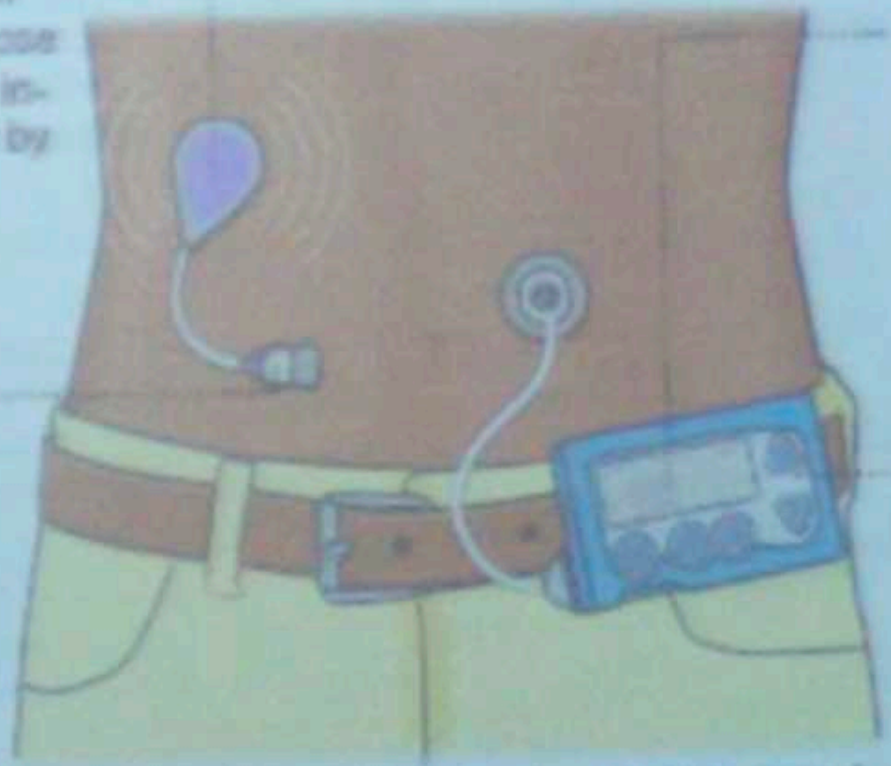
1. Abdomen (around umbilicus)
   - Avoid 2 inch around the umbilicus
   - The gap between 1st pricked sites to second prick should be 2.5 inch
   - The gap between each circle should be 2.5 inch




Note:
Any part of the body covered by loose skin can be used
Preparation with alcohol no longer required prior to injection as long as the skin is clean
Rotation of sites continues to be recommended to avoid delayed absorption when fibrosis or lipohypertrophy occurs from repeated use of a single site
Best to limit injection sites to a single region of the body

Devices ease monitoring blood sugar

New sensors help diabetics track glucose levels around the clock, closer monitoring than standby finger-prick blood tests provide.

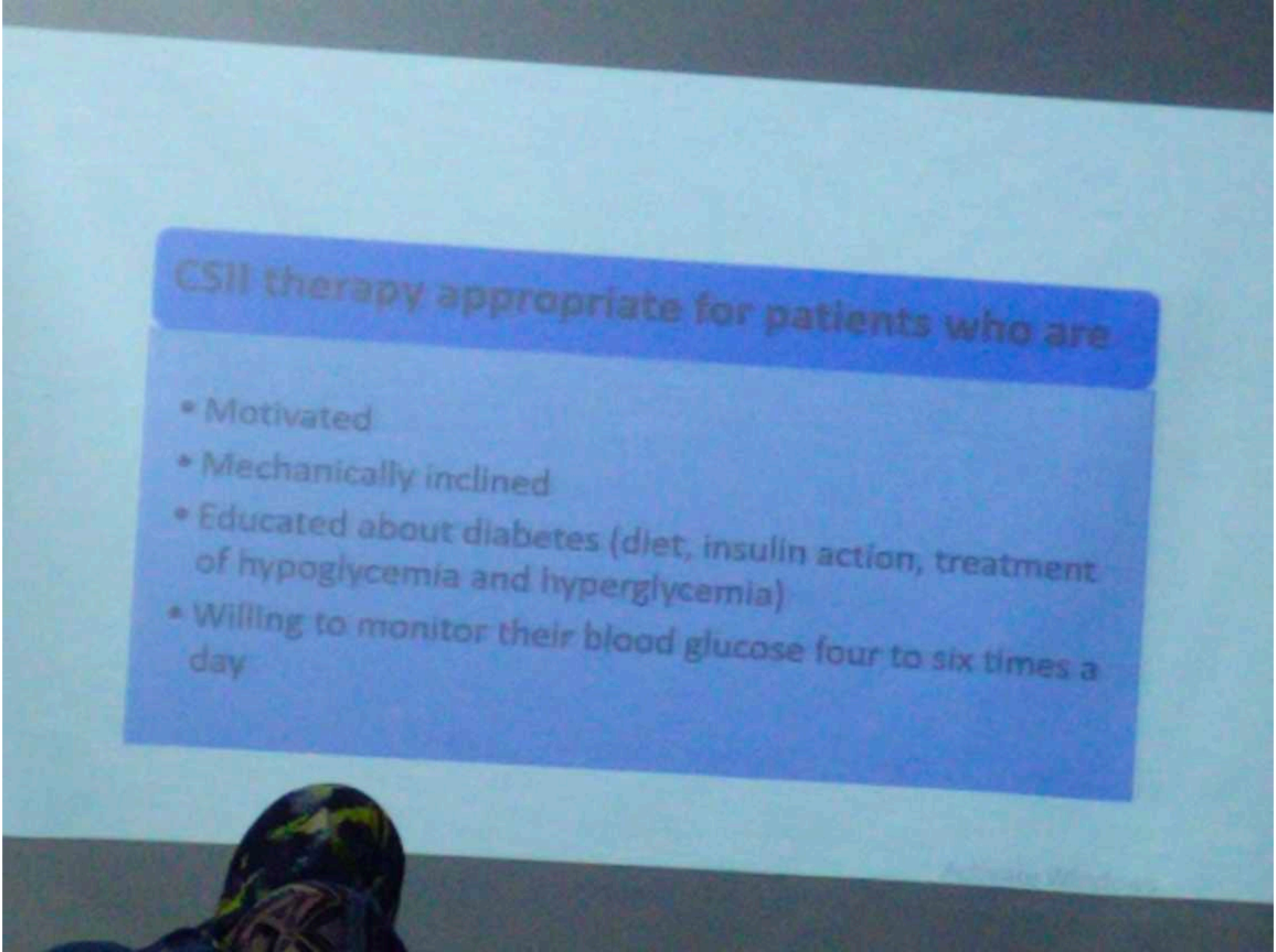


NOTE: The glucose monitor must be replaced every three days. Another sensor works for seven days, but does not have an insulin pump.

Advantage of continuous subcutaneous insulin infusion (CSII):

It allows for establishment of a basal profile tailored to the patient

The patient is able to eat with less regard to timing because the basal insulin infusion should maintain constant blood glucose between meals


CSII therapy appropriate for patients who are
• Motivated
• Mechanically inclined
• Educated about diabetes (diet, insulin action, treatment of hypoglycemia and hyperglycemia)
• Willing to monitor their blood glucose four to six times a day

Complications of CSII

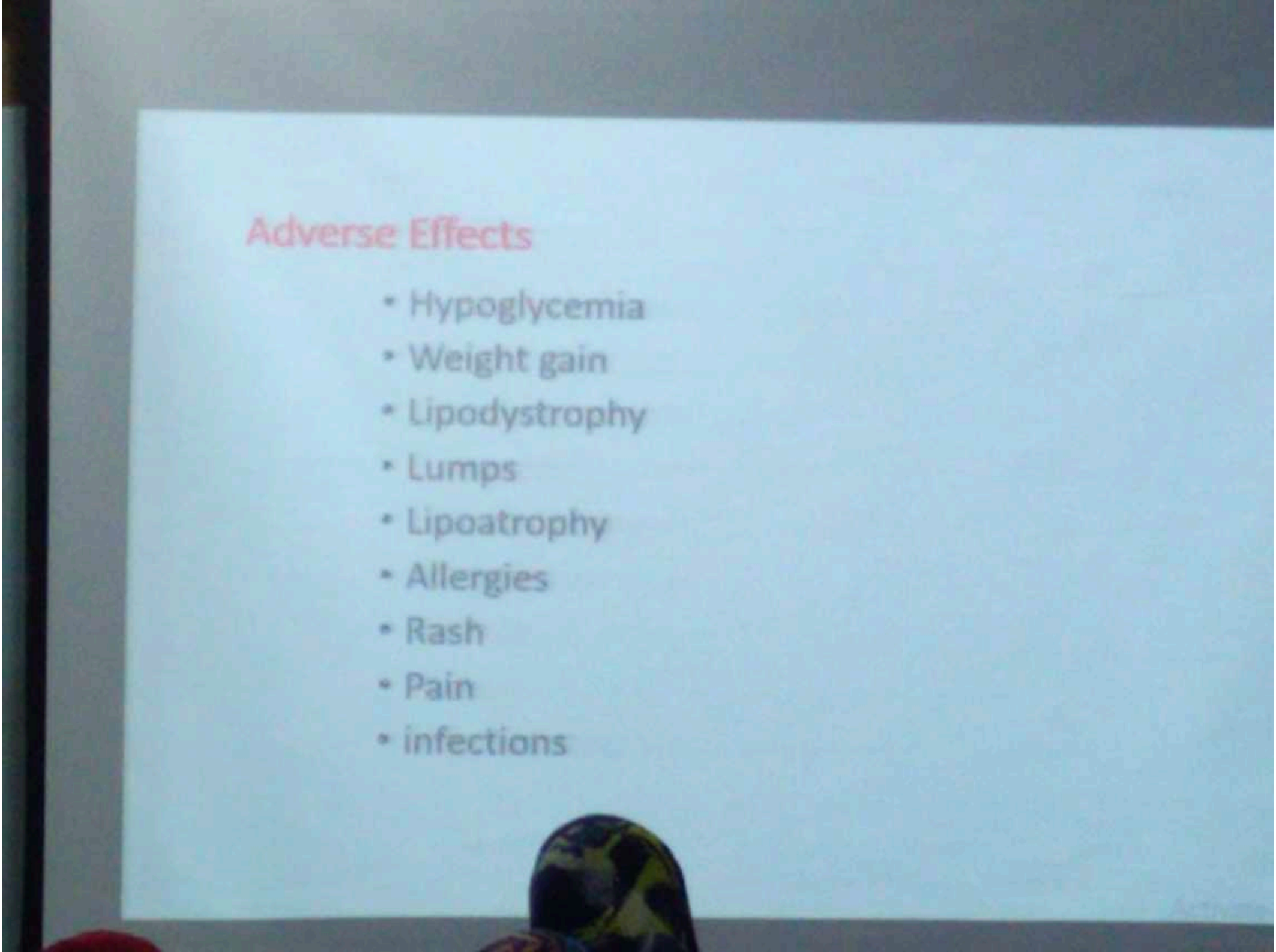
- ketoacidosis, which occur when insulin delivery interrupted
- skin infections

Disadvantage:

- Costly
- Time demanded of physicians and staff in initiating therapy

Exubera:

- First inhaled insulin preparation approved by the FDA
- No longer available
- Physicians were reluctant to prescribe Exubera for a number of reasons
  - lack of long-term safety data on pulmonary function
  - awkward dosing schedule
  - availability of other insulin delivery systems
  - cost and lack of insurance coverage


Adverse Effects
• Hypoglycemia
• Weight gain
• Lipodystrophy
• Lumps
• Lipoatrophy
• Allergies
• Rash
• Pain
• infections

How to start insulins

- 0.1-1.0 units / kg body weight

- Gradually incremental
- Gradually decremental

- One injection
- Two injections
- Three injections
- Multiple injections

Scenario 1

- A 55 years old diabetic lady is on using a combination of insulins (R+N)
- She is taking 20 units of NPH plus 10 units of regular insulin in morning.
- And 12 units of NPH and 8 units of regular insulin in evening.
- Her blood sugar remains normal except always having a high blood sugar fasting reading.
- How you will adjust the Insulin regimen.

Scenario 2

- A 55 years old diabetic lady is on using a combination of insulins (R+N)
- She is taking 20 units of NPH plus 10 units of regular insulin in morning.
- And 12 units of NPH and 8 units of regular insulin in evening.
- Her blood sugar remains normal except always having a high pre-dinner blood sugar level.
- How you will adjust the insulin regimen.

Scenario 3

- A 55 years old diabetic lady is on using a combination of insulins (R+N)
- She is taking 20 units of NPH plus 10 units of regular insulin in morning.
- And 12 units of NPH and 8 units of regular insulin in evening.
- Her blood sugar remains normal except always having a high blood sugar readings post 02 hours postparendially.
- How you will adjust the insulin regimen.

- **INCREASE MORNING & NIGHT REGULAR INSULIN**

Scenario 4

- A 55 years old diabetic lady is on using a combination of insulins (R+N)
- She is taking 20 units of NPH plus 10 units of regular insulin in morning.
- And 12 units of NPH and 8 units of regular insulin in evening.
- Her blood sugar remains normal except always having a post lunch blood sugar level.
- How you will adjust the insulin regimen.

- **ADD PRE-LUNCH REGULAR INSULIN**