

Book 2

Edition 2024 | English



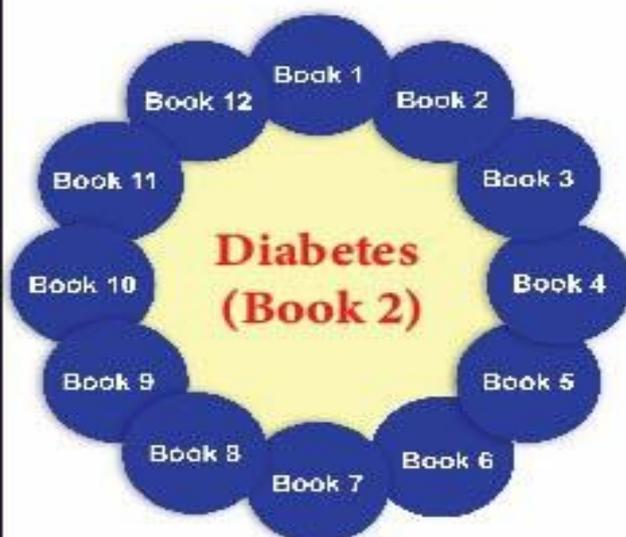
NEXT STEP LIVING LONGER BOOKS

Diabetes - Book 2

METFORMIN

(Biguanides group of medicine)

The most famous and well known medicine
1st medicine to start even before we have diabetes



Author:

(Prof.)Dr.S. Om Goel, MD/DM (USA)

From family of doctors

from AIIMS, MAMC & Delhi University

MD medicine, USA

DM/Fellowship, USA

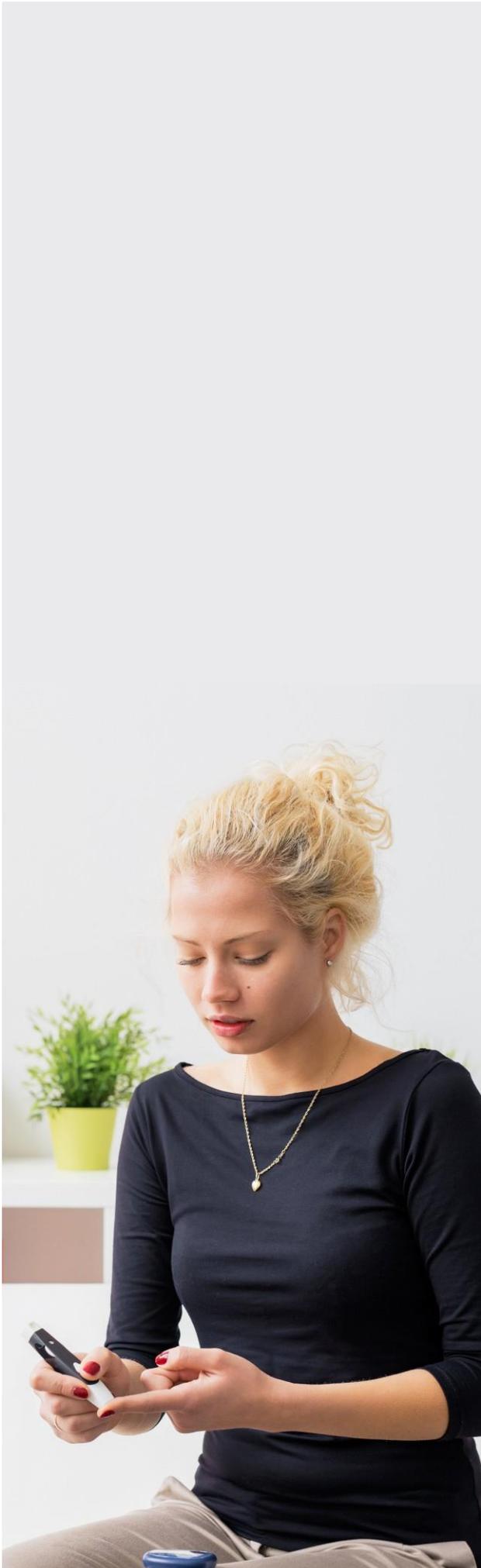


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HIGH BLOOD SUGAR
IN 2021: No reason for kidneys to fail!!
Before 1921: Yes, You would have died.
(year of Nobel Prize for Insulin)
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Chapter 1

Introduction



Frederick Grant Banting

John James R. Macleod

- The Nobel Prize in Physiology or Medicine 1923 was awarded jointly to Frederick Grant Banting and John James Rickard Macleod "for the discovery of **insulin**" in 1916.

Chap1Fig1

Insulin was discovered in 1921 leading to a nobel prize. In 2021 we have 12 groups of medicines for medicine diabetes.

Think About It!

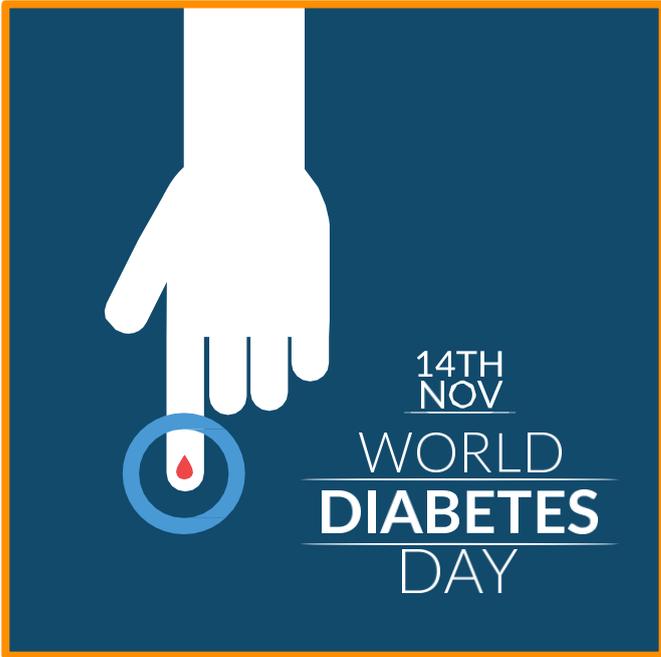
Before 1921

Every child who was born with Type 1 diabetes or lack of insulin would eventually die.

The discovery of insulin or should we say the discovery of insulin as a medicine has changed the history of diabetes and its treatment.

In 2021

We can now have a healthy life with functioning kidneys till very end!!

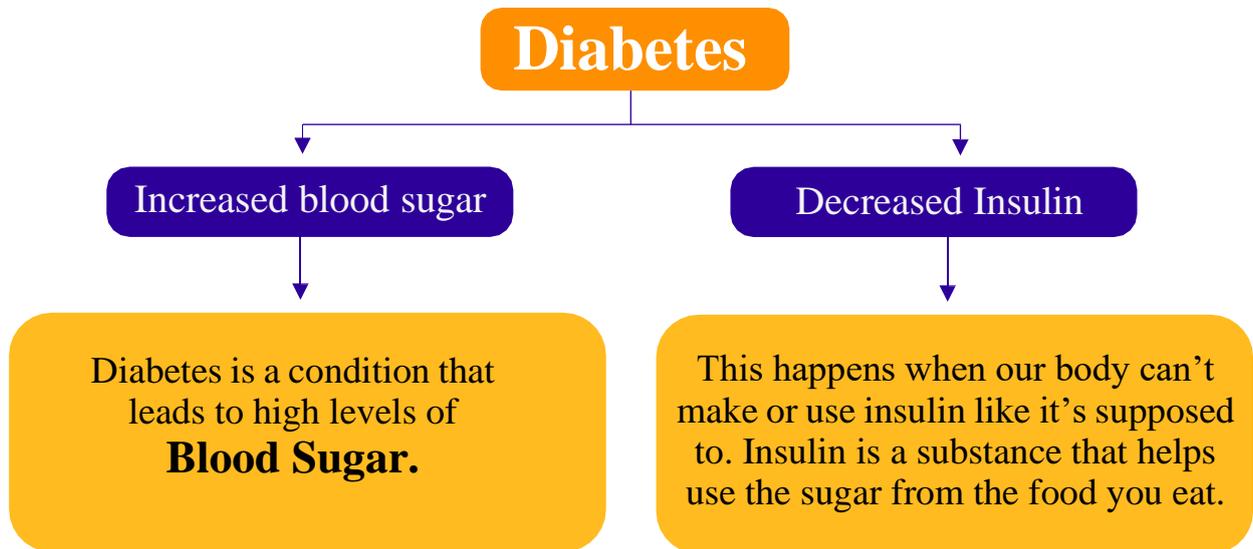


But yes, we have 12 to 13 different groups of medicines for high blood sugar.

The golden principle of the medicinal treatment of diabetes is that we start with one medication early in the course of treatment of diabetes.

We keep adding medicines as needed to control our blood sugar (along with diet & exercise)

Chap1Fig1



Chapter 2

The Golden Principle in Management of high blood sugar (Diabetes)

The golden principle of the medical treatment of diabetes is that Once we have high blood sugar (Diabetes) – exercise and diet management are needed life-long.

Together diet, exercise and medications – all will help!!

Risk of taking medications are minimal as compared to the benefits that we receive from these medicines!

1. We start with one medication early in the course of treatment of diabetes

Start with one medication

2. Targets for blood sugar control is decided by physician.

Decide Targets

3. Usual target is HbA1c < 7

HbA1c < 7

4. As youngish we are more, we want to keep blood sugar is close to 100mg

Blood sugar close to 100mg

Continued

The golden principle of the medical treatment of diabetes is that Once we have high blood sugar (Diabetes) – exercise and diet management are needed life-long.

5. Today in 2021 are several groups of excellent medicines are available:

a) which can bring down our blood sugar by different mechanisms of action.

b) As a golden rule, what we should start with one medicine if our blood sugar is not extremely high.

c) And as time goes on. We can add a second medicine.

Start with one medicine, if blood sugar is not very high

Start with one medicine, Add a second medicine, if needed And add a third medicine, if necessary

d) Or we can even add a third medicine which works by a different mechanism.

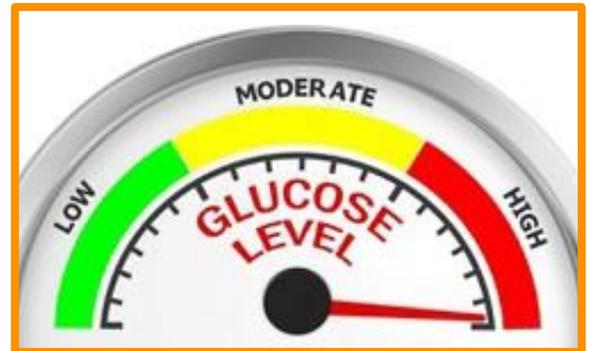
Chapter 3

Diet and exercise are an integral part of high blood sugar management!

[Diet and exercise are an integral part of high blood sugar management!]

Purpose of medical management and medicines for diabetes is:

- To manage our blood sugar
- As close to 100mg as possible
- And HbA1c < 7



Chap3Fig1

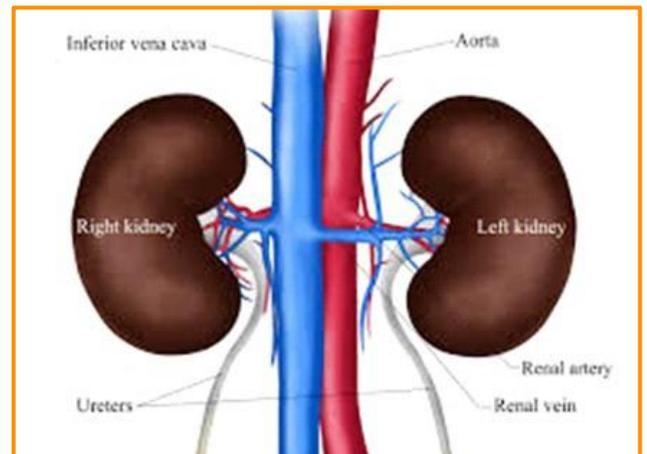


Chap3Fig2

HbA1c

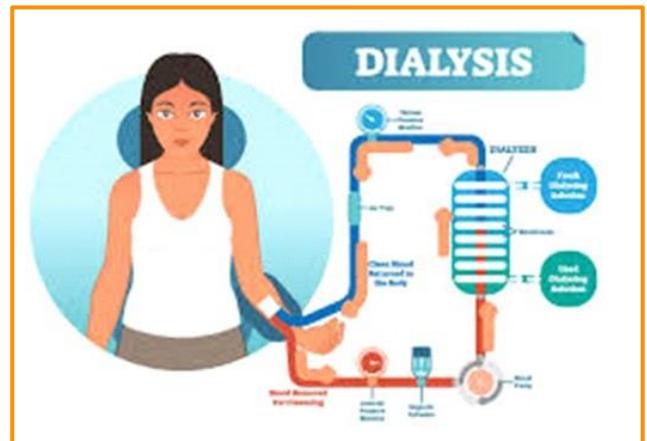
Chap3Fig3

- **To prevent kidney failure**



Chap3Fig4

- **And no dialysis**



Chap3Fig5

- **No heart attack (Diabetes is literally one of the reasons)**



Chap3Fig7

- **No blindness (Diabetes is one of the reasons)**



Chap3Fig8

- **No amputation of leg (Diabetes is one of the reasons)**



Chap3Fig9

Chapter 4

Yes, Diabetes management can really reduce complications

If we manage diabetes from day one or even before we have actual diabetes (called prediabetes),
Complication are dramatically delayed by



Is it true?

✓ Really Yes! it is True

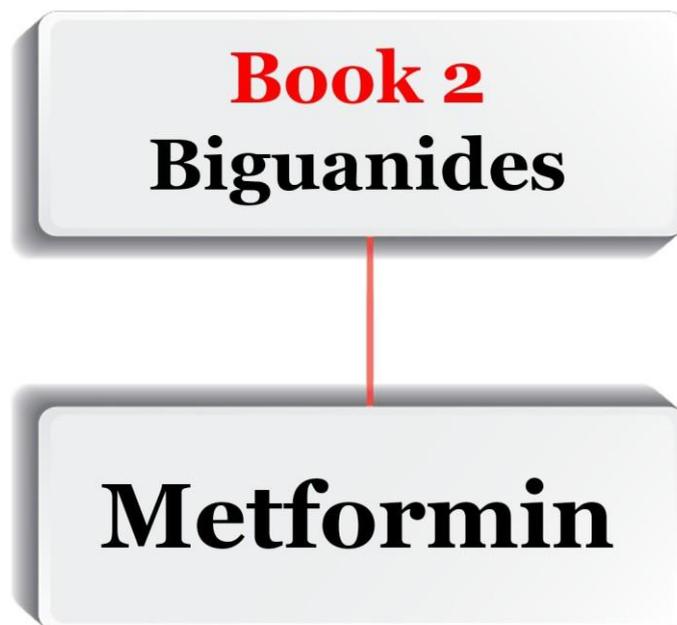
Chapter 5

Today in 2020/2021 we have excellent medicines available

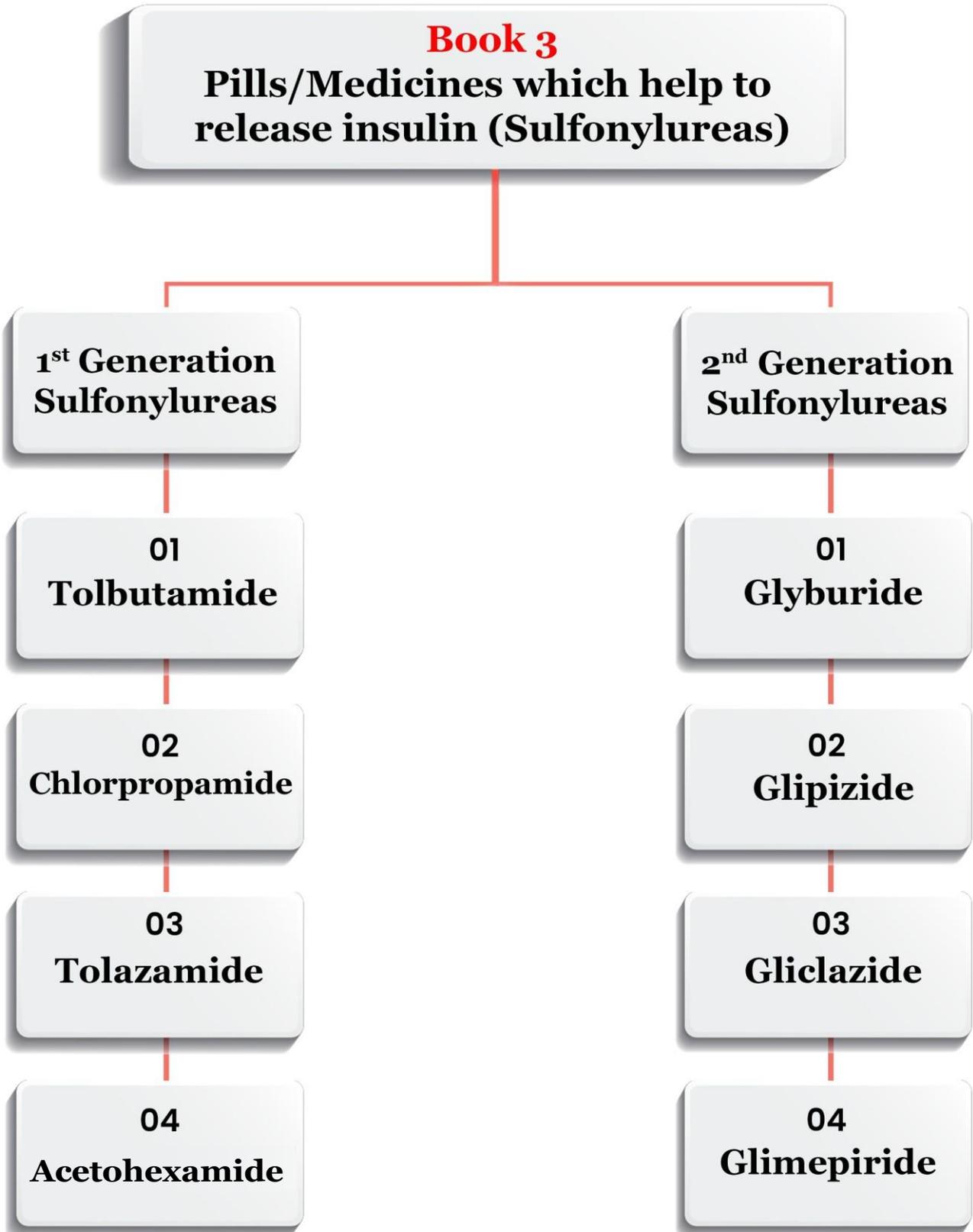
There are a number of medicines available in the market today for the treatment of Diabetes. The main groups which these medicines belong to are:

Book-2 Biguanides

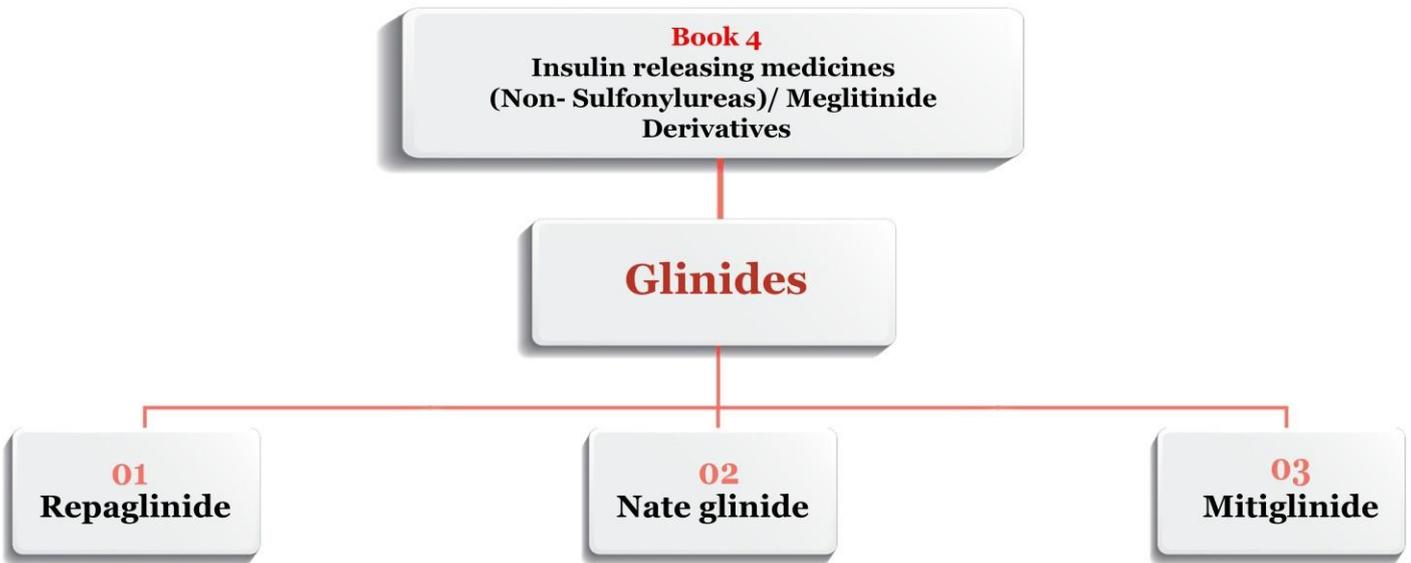
Metformin: The most famous and most used medicine and 1st medicine to start the treatment of diabetes.



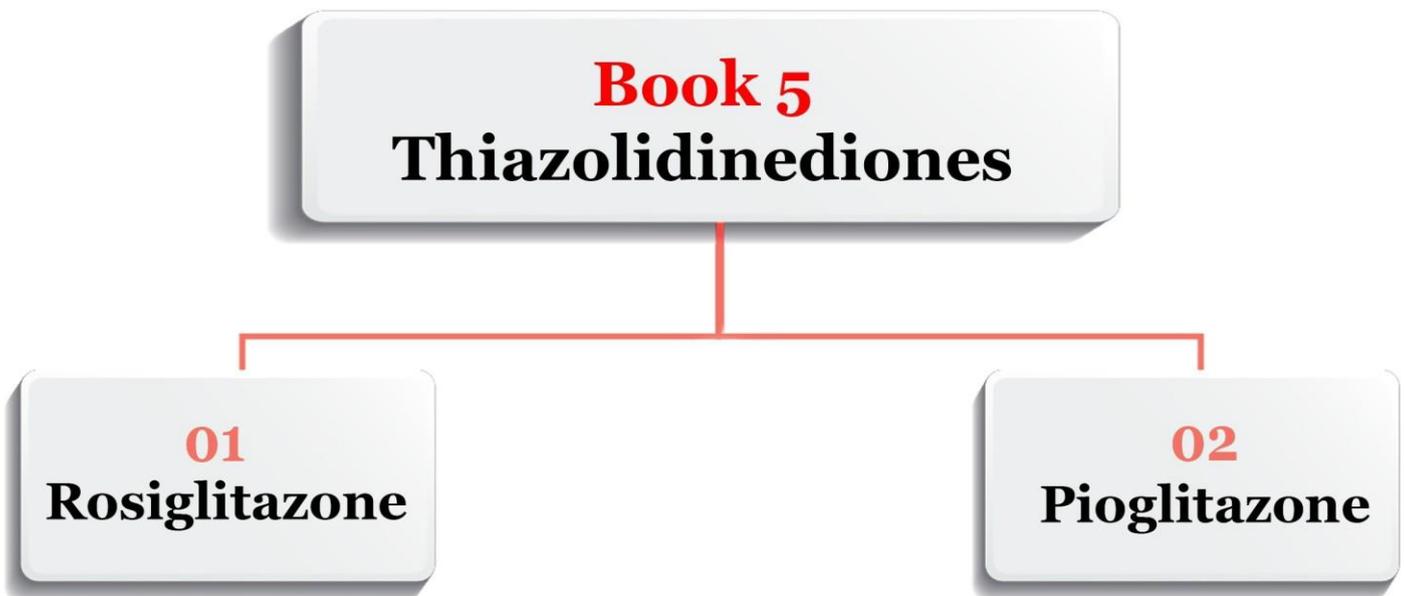
Book-3 Pills/Medicines which help to insulin (Sulfonylureas)



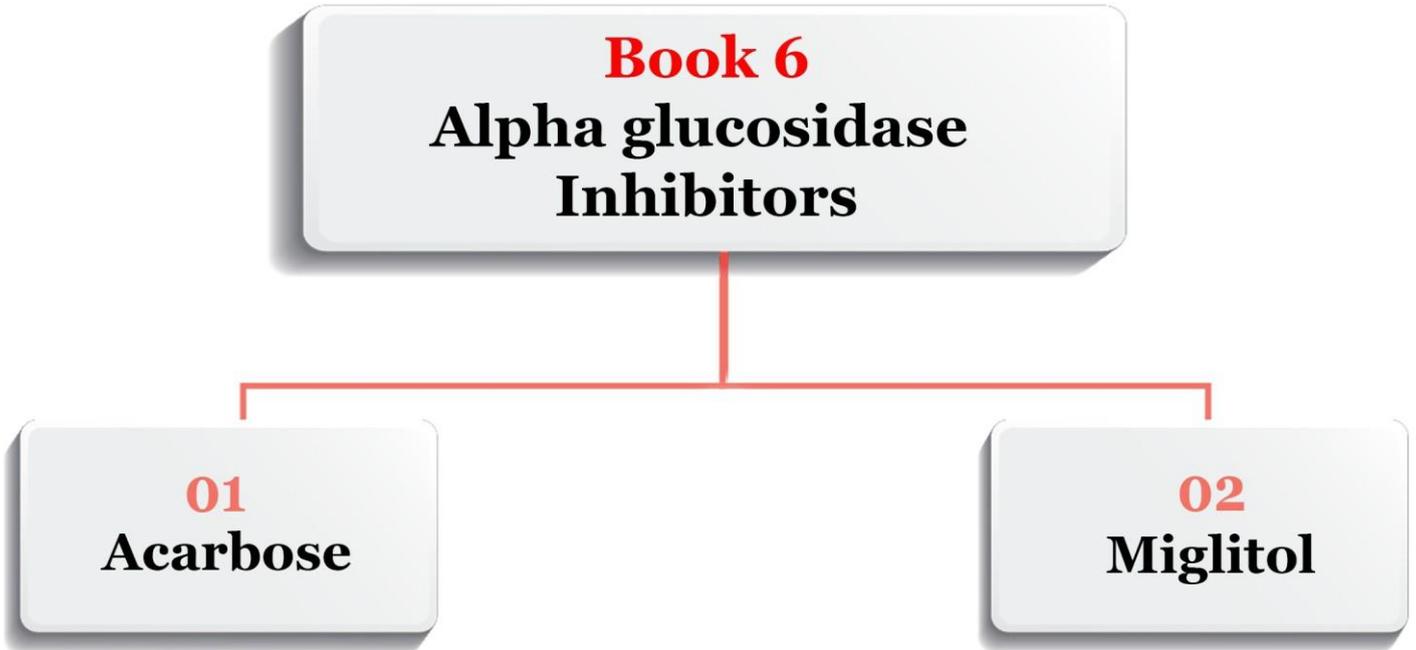
Book-4 Insulin releasing medicines (Non- Sulfonylureas)



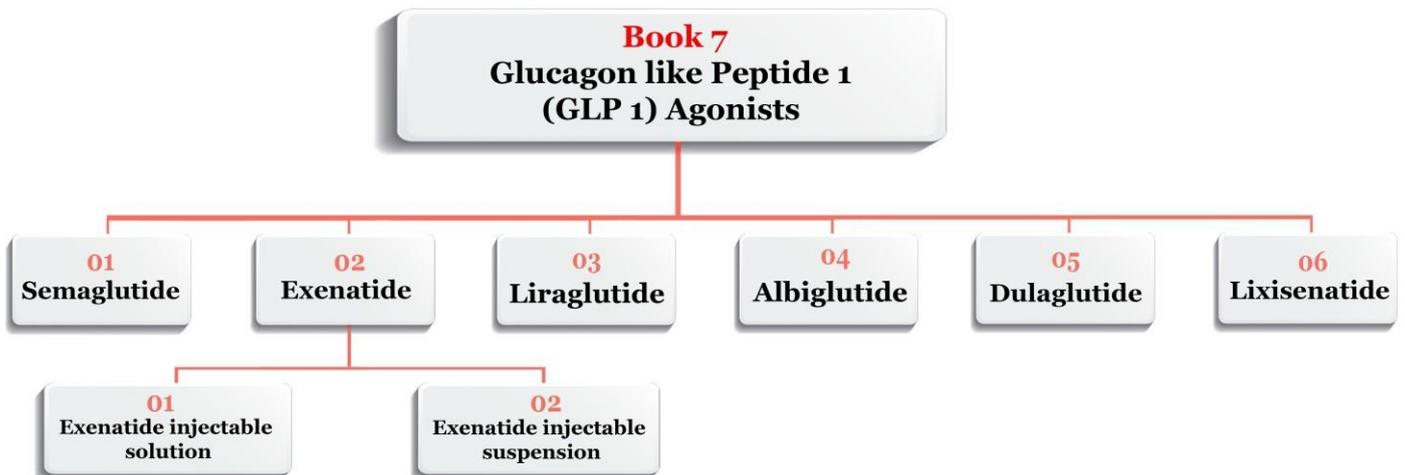
Book-5 Thiazolidinediones



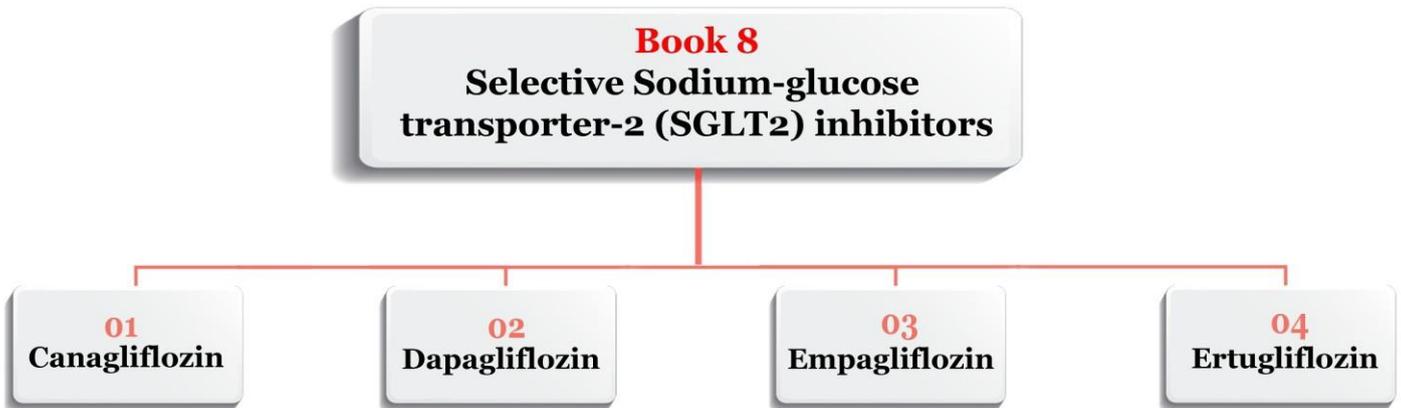
Book-6 Alpha glucosidase Inhibitors



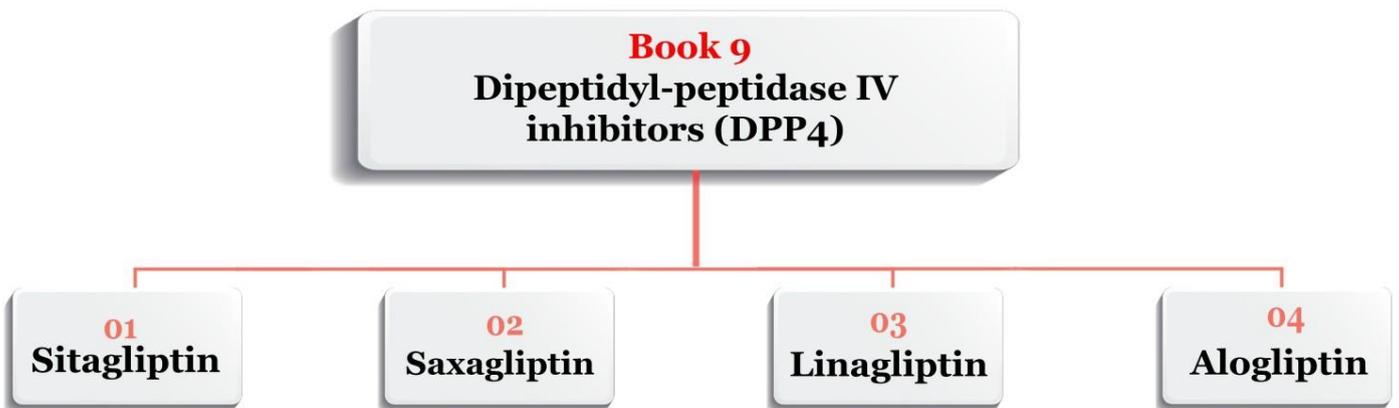
Book-7 Glucagon like Peptide 1 (GLP 1) Agonistics



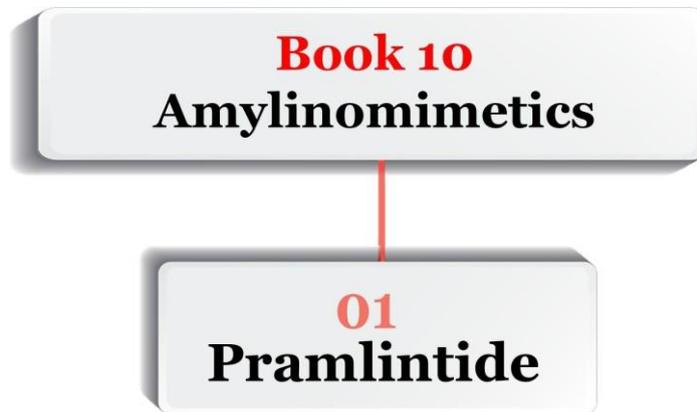
Book-8 Selective Sodium-glucose transporter-2 (SGLT2) inhibitors



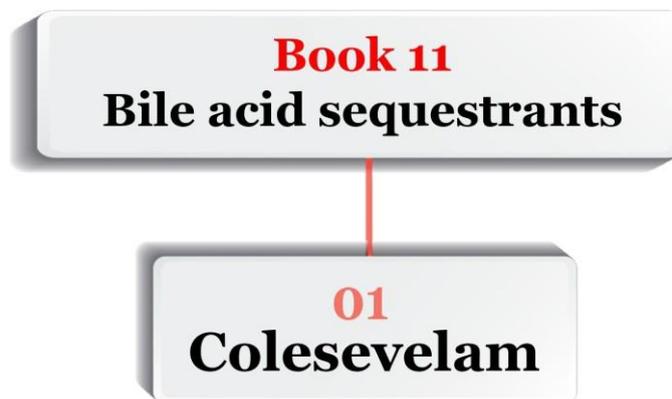
Book-9 Dipeptidyl-peptidase IV inhibitors (DPP4)



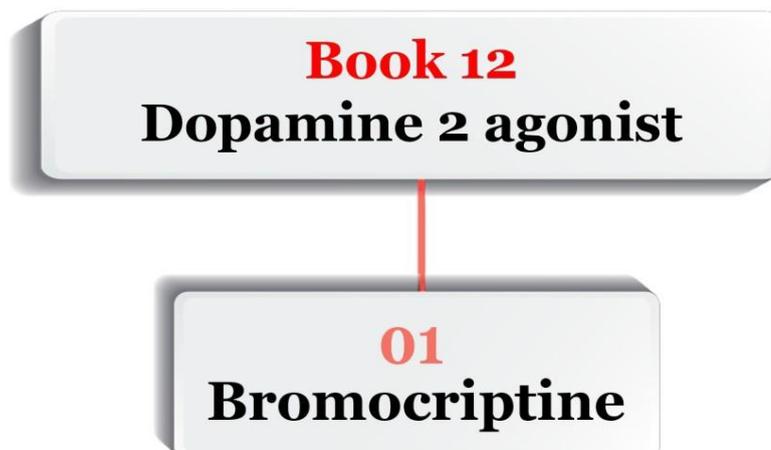
Book-10 Amylinomimetic group



Book-11 Bile acid sequestrants



Book-12 Dopamine 2 agonist



Chapter 6

There are dramatic advances in treatment of diabetes today in 2021

Think About It!

We are **NOT** perfect; we don't need to be. But we **CANNOT** quit trying either.

Every high sugar management prescription always includes:

1. *Medicine(s),*
2. *Diet, and*
3. *Exercise*

Without these, it is impossible to achieve our targets.

In our medical world, medicines can be given by

By mouth/oral medication

or

**By Injection below our skin
(very easy to learn)**



Chap6Fig1



Chap6Fig2

Chapter 7

Type 1 vs Type 2 Diabetes

Think About It!

We were always scared of needles and injection needs some degree of training so that it does not lead to any infection on the injected place. We have to follow the sterile techniques that do not lead to any infection of the injection sites.

Types of Diabetes

Yes, we do need management lifelong

Type I Diabetes

- We have to give insulin.
- No oral pills work
- At present, insulin only comes as an injectable.
- But technology/insulin pen are making it easier and easier

Type II Diabetes

- Our body does make insulin (but not enough insulin)
- In such a situation, (as time goes on) we can manage type 2 diabetes starting
- Initially with one medicine
- And then if needed by adding a second medicine or a third medicine

Chapter 8

How do we decide less dose or more dose of medicines

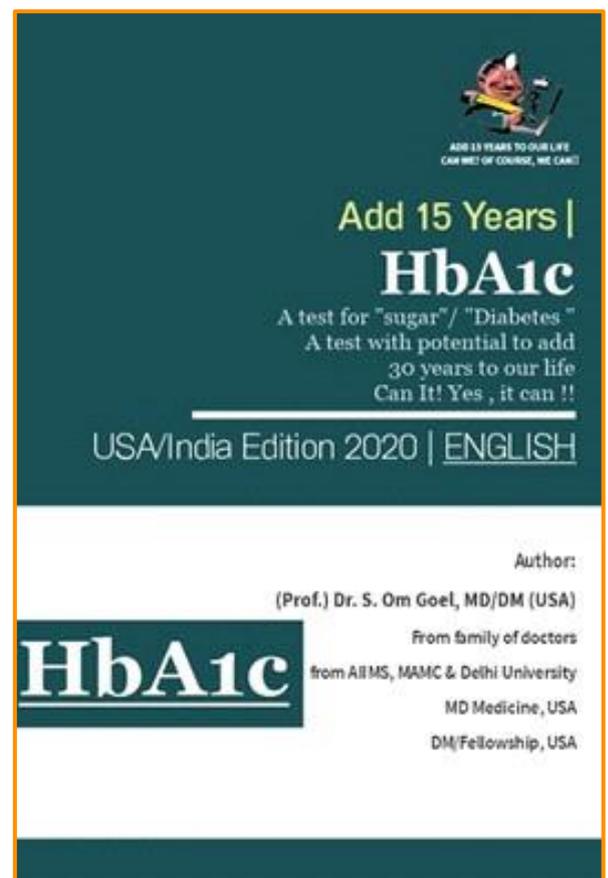
Think About It!

Our blood sugar changes all day based on

- *Our meals,*
- *Level of activity etc.*
- *HbA1c remains stable over three months.*

How do we decide less dose or more dose or combination of medicines?

I. We actually use HbA1c as our guideline for the treatment of diabetes.



Chap8Fig1

II. We set up a target for HbA1c in diabetic management and we want that the HbA1c always remains 7 or less than 7.

HbA1c < 7

III. If we met our target, we can lower the dose.

Start with one medicine, if blood sugar is not very high

IV. If our HbA1c is high, then we can give the increased dose or add a 2nd pill or add even a 3rd pill.

Start with one medicine, Add a second medicine, if needed And add a third medicine, if necessary

Chapter 9

Early diagnosis and early treatment: an absolute necessity in 2021

Think About It!

Every mom knows how her baby will start walking around in 1 year of age.

Every physician knows how to diagnose diabetes (called Prediabetes) year before you have any “symptoms”.

Actually, if we can diagnose Diabetes, even before it happens to us (called as Prediabetes), we can really delay complications as mentioned and it will be a very wise thing to do.

Most important thing we have to understand is that if medicines are taken early in the diagnosis of high blood sugar/diabetes then it can delay complications related to diabetes by





ADD 15 YEARS TO OUR LIFE CAN
WE? OF COURSE, WE CAN!!

Diabetes - Book 3.2

SULFONYLUREAS

(2nd generation medicine)

IN 2021: No reason for kidneys to fail!!

Before 1921: Yes, You would have died.
(year of Nobel Prize for Insulin)

Chapter 1

Introduction to Sulfonylureas



Sulfonylureas

Chap1Fig1

Think About It!

Sulfonylureas Insulin secretagogues are a group of medicines which every doctor is very familiar with.

These medicines have been used for years and years.

When we were young back in 1970s-80s, we were using the 'first generation of sulfonylureas.'

As years went by, drug companies/pharmaceutical companies manufactured better acting medicines belonging to this group which we call 'second generation of sulfonylureas.'

Sulfonylureas

How do they work?

1. They **work by directly stimulating the release of insulin** from beta cells of Langerhans which lie in the pancreas
2. You can take these medicines with food or before food. They **lead to the lowering of blood glucose level** indirectly by stimulating the release of the insulin
3. They are **only useful for type 2 diabetes** where our beta cells in pancreas make some degree of insulin
4. These medicines do **lead to weight gain** which is the effect of the insulin released
5. And **they are very good medicines in lowering our blood sugar**

Release Insulin directly in Pancreases.

Lower the blood glucose level.

Only useful for Type 2 Diabetes.

Lead to weight gain.

Excellent medicines to lower blood sugar.

If we miss our meal or we take too much of the medicine, then it can lead to actually lower blood sugar than the normal and we have to be really careful about very low blood sugar.

Chapter 2

How to treat type 2 Diabetes?

Treatment of the type 2 diabetes always includes

So, we must educate as much as we can, the patient giving him as much insight into diabetes (high blood sugar).

- It is very important we talk about the lifestyle changes



Chap2Fig1

- We talk about the importance of diet



Chap2Fig2

- We talk about **the importance of exercising**



Chap2Fig3

- **Weight loss** always helps



Chap2Fig4

Chapter 3

Complications of suffering from Diabetes

Complications of diabetes

What are the complications of diabetes?

**Diabetes #1 cause of
Kidney Damage**

Because Diabetes is so common



Chap3Fig1

**Diabetes #1 cause of
Blindness**

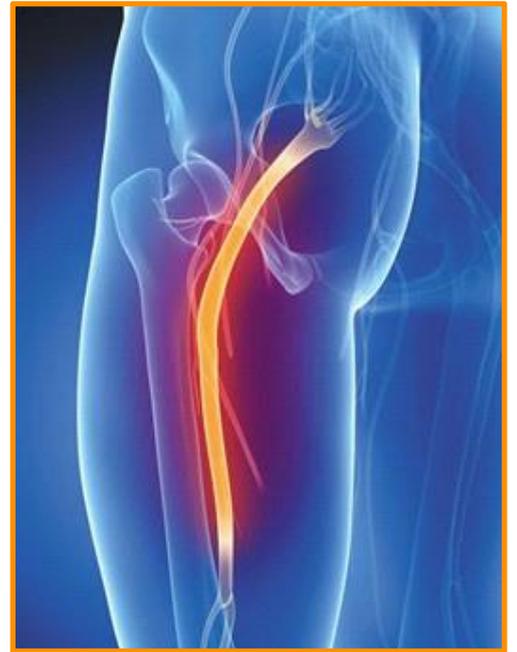
Because Diabetes is so common



Chap3Fig2

**Diabetes #1 cause of
Nerve Problem**

Because Diabetes is so common



Chap3Fig3

**Diabetes #1 cause of
Loss of Limbs**

Because Diabetes is so common



Chap3Fig4

**Diabetes #1 cause of
Sexual Dysfunction**

Because Diabetes is so common



Chap3Fig5

**Diabetes #1 cause of
Increased Risk of Heart Attack**

Because Diabetes is so common



Chap3Fig6

Chapter 4

How to minimize the risk of Low Blood Sugar?

Sulfonylureas work by releasing insulin. Insulin lowers blood sugar but if our blood sugar is already low, it can make our sugar levels very, very low which is not safe for us.

It is important to know how to minimize risk of low blood sugar

- **Exercise which increases the utilization of the blood sugar.** If we take the medicine with heavy exercise, it can further lower the blood sugar



Chap4Fig1

- **We miss our meal.** We still take the medicine, but we do miss our meal. (We take our food, it raises the blood sugar and the medicines bring it down.)



Chap4Fig2

- Another thing is when **our medication starts**, we start with smaller doses and we carefully raise the medicine as needed.

These are long acting medicines which keep working for a long time



Chap4Fig3

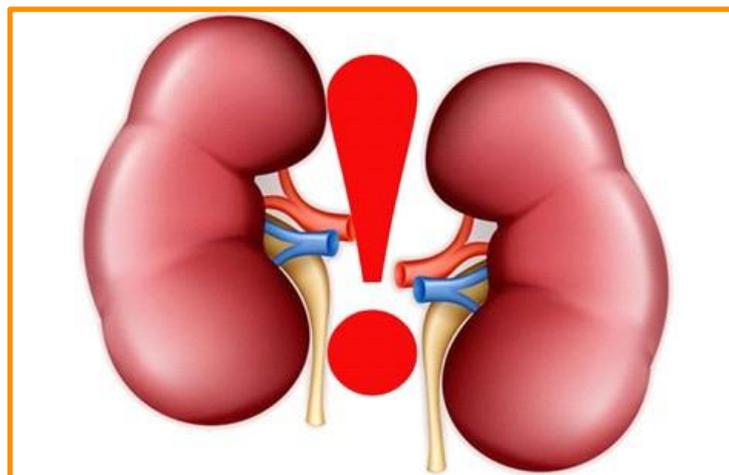
- If patients consume **too much alcohol then it leads to poor nutrition status** and affects the liver.

This affects the storage of glucose in our liver and one becomes very sensitive to low blood sugar



Chap4Fig4

- We have to understand that people with **kidney failure actually need less insulin** (as insulin stays longer in the blood.)



Chap4Fig3

- **Some medication can cause drug interaction** which decreases the effect of the medication. There is a risk of high blood sugar. If we take higher dose of medication once admitted to the hospital, then we must monitor our blood sugar levels and balance future doses



Chap4Fig4

Chapter 5

Introduction to First and Second Generation Sulfonylureas

All the second-generation sulfonylureas and first-generation sulfonylureas, are very potent (they lower blood sugar)

I. They are all metabolized by liver.

Metabolized By Liver

II. All medicines should be taken before meals

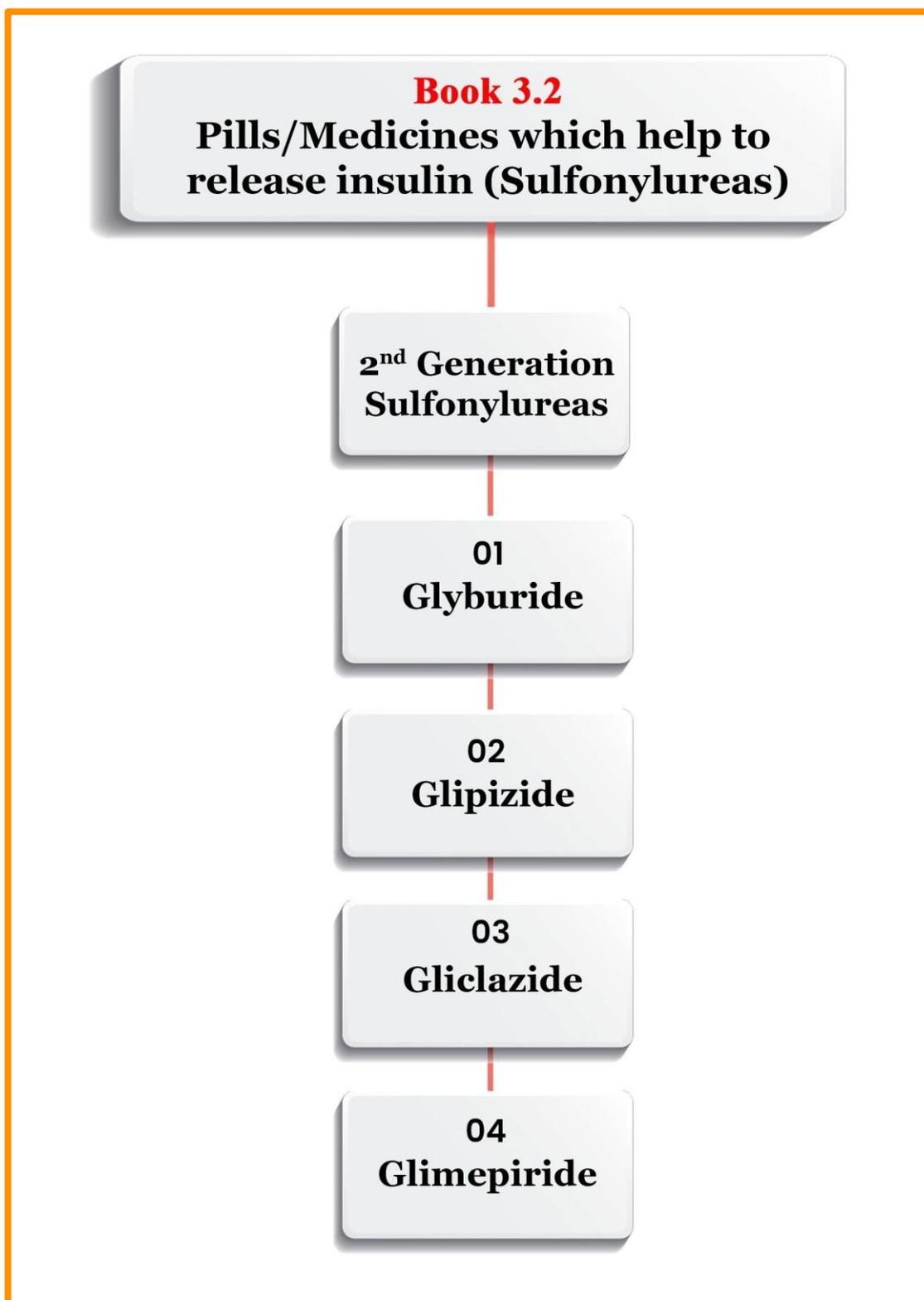
Taken Before Meals

III. All these medicines have a potential of causing low blood sugar if you miss your meal (as they keep lowering blood sugar)

Causes Low Blood Sugar if Meal Missed

IV. Usually, we are careful while giving these to older people because older people are less tolerant to low blood sugar

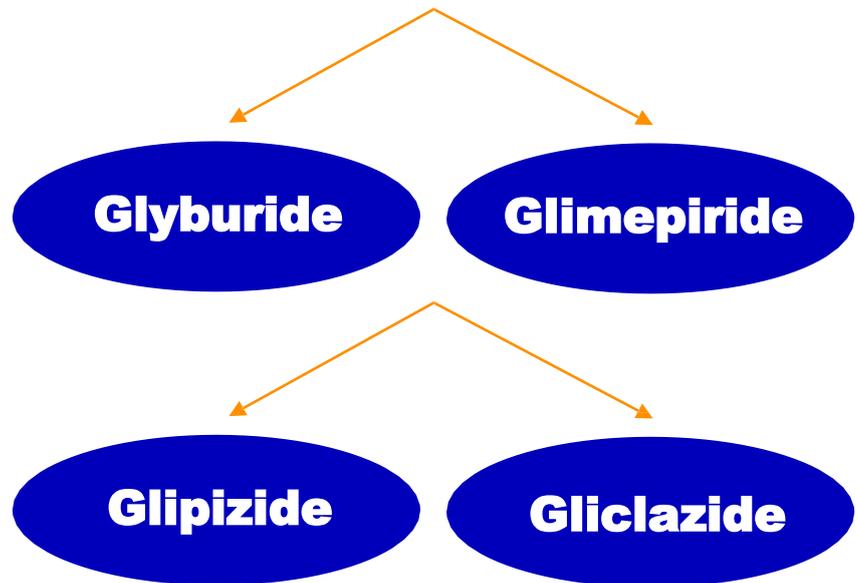
Careful While Giving to Older People



Chap6Fig1

There are 4 medicines in this group:

1. Glyburide
2. Glipizide
3. Gliclazide
4. Glimepiride



The best sulfonylureas to be used are usually glipizide and glimepiride.
(Gliclazide is also good sulfonylureas to use, but it is not available in US.)

These medicines (second generation) are very effective.

Glyburide

- I. All diabetes medicines should be taken before meals as a golden rule.
- II. We start on a low dose and increase the dose if needed
- III. We should usually take medication at the same time every day.

Glyburide FDA Approval History

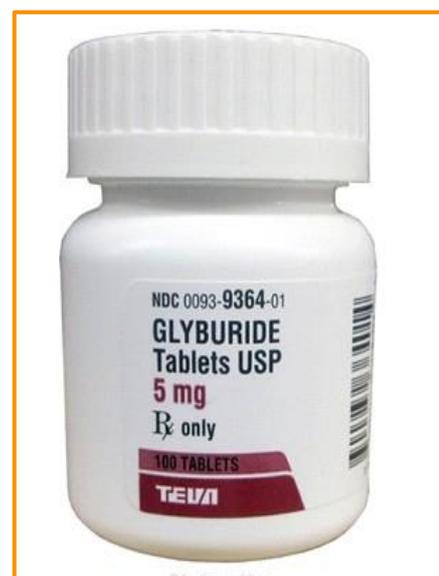
FDA Approved: Yes (Approved In September, 2002)

Brand name: Diabeta (India), Glicron (India), Glynase (USA), Micronase (USA)

Generic name: Glyburide

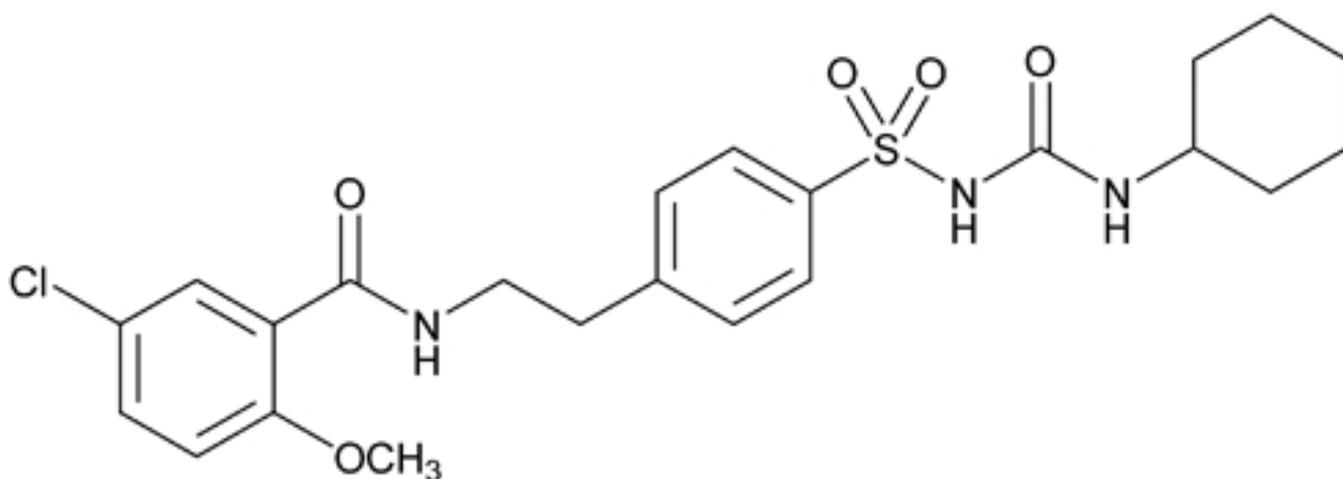
Dosage form: Tablets

Treatment for: [Diabetes - Type 2](#)



Chap6Fig2

Glybuide



Chap6Fig3

What we need to know about Glyburide:

- Usual Dose: **2.5mg to 10mg**

Usual dose: 2.5 mg

- We can give it **once a day or we can give it in divided doses**.
As a physician, I will prefer divided doses i.e. 2.5 mg in morning with breakfast and 2.5mg with lunch, and 5 mg with dinner

Once a day or in divided doses

- There is a long-acting formulation of glipizide, also **glipizide XL which obviously we give once a day only**

Glipizide XL is given once a day

- Maximum Dose: **20mg**

Maximum Dose: 20mg

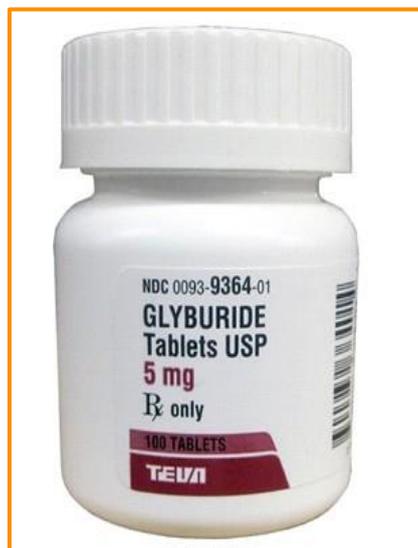
Trade Name- Dose- Cost in USA- Cost in India

GLYBURIDE

Please always combine any blood sugar medicine with diet and exercise.

All medicines continue life-long

Generic Name & Trade Name	About Glyburide	Cost of Glyburide for one month (in USA)	Cost of Glyburide for one month (in India)
<p>Generic Name: Glyburide</p> <p>Trade Name: Diabeta (India) Glycron (India) Glynase (USA) Micronase (USA)</p>	<ul style="list-style-type: none"> ■ Usual dose: 2.5-5mg once a day ■ Can be increased to 20 mg once a day ■ As a Golden Rule – before starting any medicine, liver functions and kidney functions should be screened. 	<p>Dose = Once a day (5mg)</p> <p>1-month = 100 tablets</p> <p>Cost = \$20</p> <p>*All costs are meant for a rough estimate of one-month expense.</p>	<p>Dose = Once a day (5mg)</p> <p>1-month = 100 tablets</p> <p>Cost = Rs 80</p> <p>*All costs are meant for a rough estimate of one-month expense.</p>



Chap6Fig4

Glipizide

- I. All diabetes medicines should be taken before meals as a golden rule.
- II. We start on a low dose and increase the dose if needed
- III. We should usually take medication at the same time every day.

Glipizide FDA Approval History

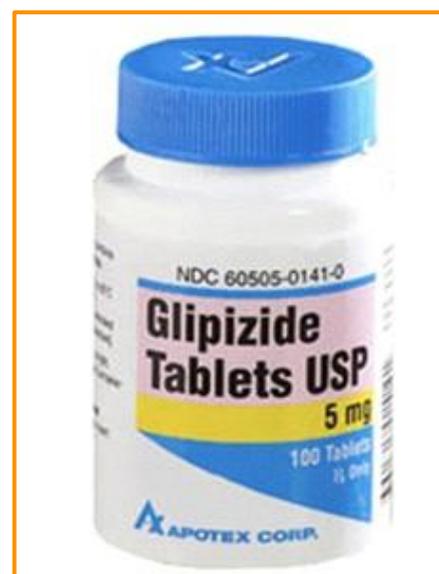
FDA Approved: Yes (Approved In October, 2002)

Brand name: Diabeta (India), Glycron (India), Glynase (USA) , Micronase (USA)

Generic name: Glipizide

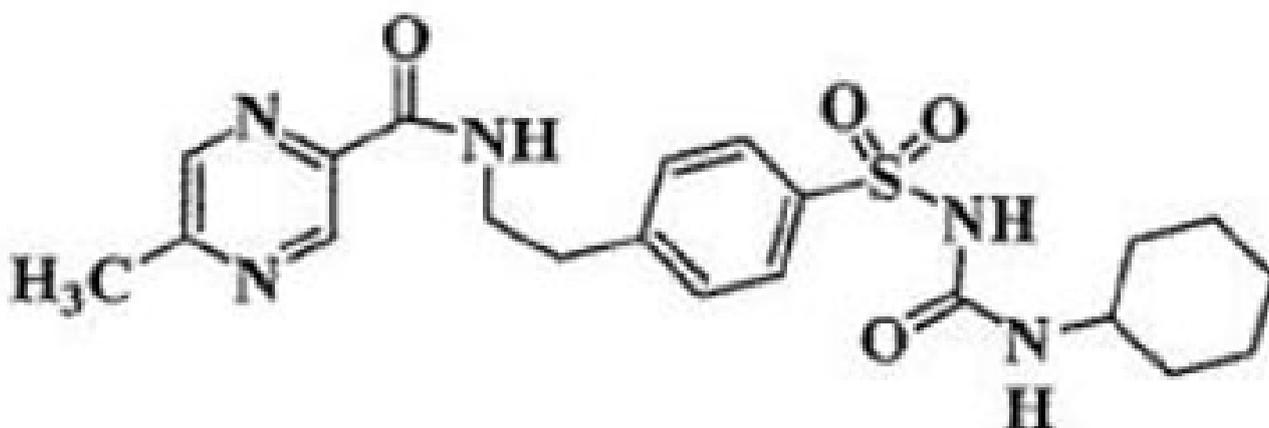
Dosage form: Tablets

Treatment for: [Diabetes - Type 2](#)



Chap6Fig5

Glipizide



Glipizide

Chap6Fig6

What we need to know about Glipizide:

- Usual Dose: **10mg**

Usual dose: 10 mg

- We can give it **once a day or we can give it in divided doses if the patient is consuming more than 20 mg.**

Once a day or in divided doses if more than 20 mg

- Maximum Dose: **20mg**

Maximum Dose: 20mg

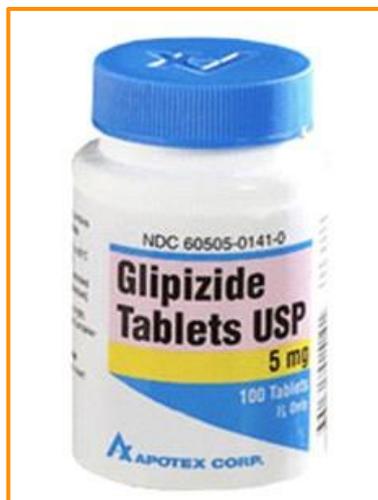
Trade Name- Dose- Cost in USA- Cost in India

GLIPIZIDE

Please always combine any blood sugar medicine with diet and exercise.

All medicines continue life-long

Generic Name & Trade Name	About Glipizide	Cost of Glipizide for one month (in USA)	Cost of Glipizide for one month (in India)
<p>Generic Name: Glipizide</p> <p>Trade Name: Glucotrol (USA) Glucotrol XL (USA) Diacon (India) Dibizide (India)</p>	<ul style="list-style-type: none"> ■ Usual dose: 5 mg twice day ■ Can be increased to 20 mg ■ As a Golden Rule – before starting any medicine, liver functions and kidney functions should be screened. 	<p>Dose = Once a day (10 mg)</p> <p>1-month = 60 tablets</p> <p>Cost = \$228</p> <p>*All costs are meant for a rough estimate of one-month expense.</p>	<p>Dose = Once a day (10 mg)</p> <p>1-month = 60 tablets</p> <p>Cost = Rs 85</p> <p>*All costs are meant for a rough estimate of one-month expense.</p>



Chap6Fig7

Gliclazide

- I. All diabetes medicines should be taken before meals as a golden rule.
- II. We start on a low dose and increase the dose if needed
- III. We should usually take medication at the same time every day.

Gliclazide FDA Approval History

FDA Approved: Yes (Approved In 1972)

Brand name: Diamicon (USA) Bilxona (USA)

Vamju (India) Zicron (India)

Generic name: Gliclazide

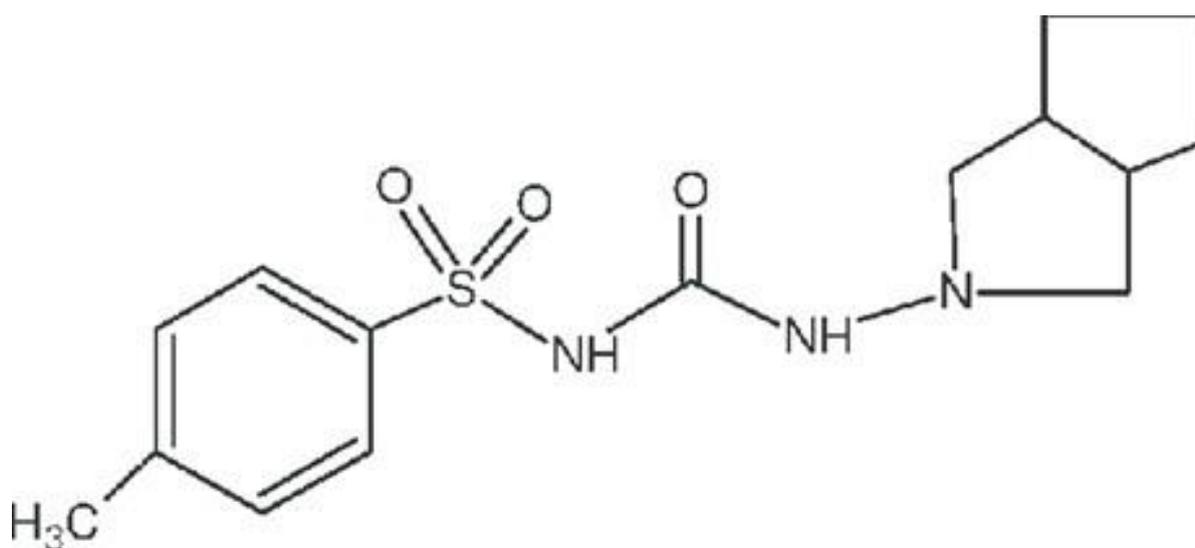
Dosage form: Tablets

Treatment for: [Diabetes - Type 2](#)



Chap7Fig8

Gliclazide



Chap7Fig9

What we need to know about Gliclazide:

- Usual Dose: **40mg**

Usual dose: 40mg

- We can give it **once a day or twice a day**

Given once or twice a day

- Maximum Dose: **320mg**

Maximum Dose: 320mg

Trade Name- Dose- Cost in USA- Cost in India

GLICLAZIDE

Please always combine any blood sugar medicine with diet and exercise

All medicines continue life-long

Generic Name & Trade Name	About Gliclazide	Cost of Gliclazide for one month (in USA)	Cost of Gliclazide for one month (in India)
<p>Generic Name: Gliclazide</p> <p>Trade Name: Diamicron (USA) Bilxona (USA) Vamju (India) Zicron (India)</p>	<ul style="list-style-type: none"> ■ Usual dose: 40 mg twice a day ■ Can be increased to 320 mg once a day ■ As a Golden Rule - before starting any medicine, liver functions and kidney functions should be screened. 	<p>Not available in USA</p> <p><i>*All costs are meant for a rough estimate of one-month expense.</i></p>	<p><u>Dose</u> = 40 mg</p> <p><u>1 month</u> = 30 tablets</p> <p><u>Cost</u> = Rs 210</p> <p><i>*All costs are meant for a rough estimate of one-month expense</i></p>



Chap6Fig10

Glimepiride

- I. All diabetes medicines should be taken before meals as a golden rule.
- II. We start on a low dose and increase the dose if needed
- III. We should usually take medication at the same time every day.

Glimepiride FDA Approval History

FDA Approved: Yes (Approved In Febuary, 1999)

Brand name: Amaryl(USA), Dexasone(USA)

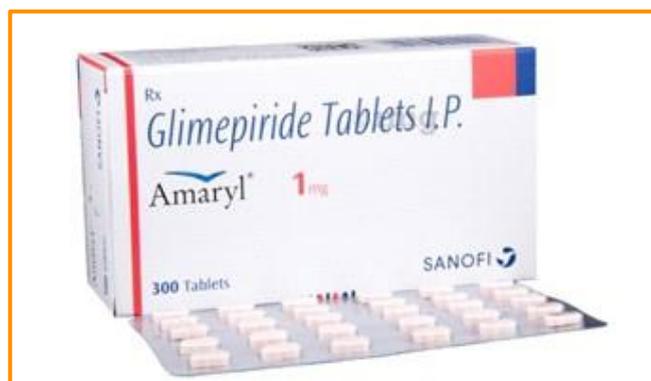
Decdan (India), Dexona (India)

Generic name: Glimepiride

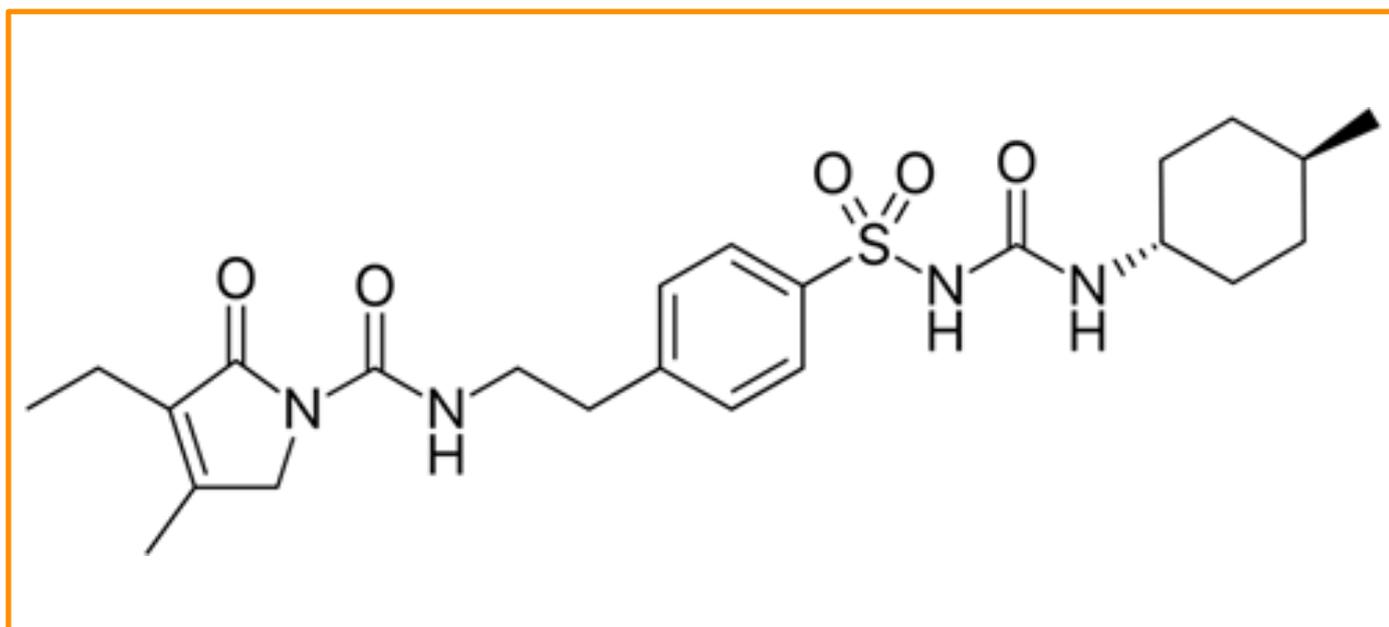
Dosage form: Tablets

Treatment for: [Diabetes - Type 2](#)

Glimepiride



Chap6Fig11



Chap6Fig12

What we need to know about Glimepiride:

- Usual Dose: **2-4 mg**

Usual dose: 2 mg

- We can give it **once a day or we can give it in divided doses if the patient is consuming till 8 mg**

Once a day or in divided doses if more than 8 mg

- Maximum Dose: **8 mg**

Maximum Dose: 8 mg

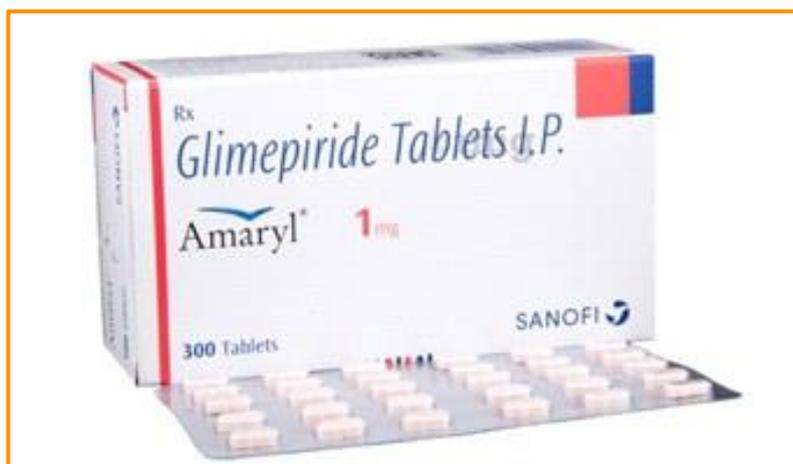
Trade Name- Dose- Cost in USA- Cost in India

GLIMEPIRIDE

Please always combine any blood sugar medicine with diet and exercise.

All medicines continue life-long

Generic Name & Trade Name	About Glimepiride	Cost of Glimepiride for one month (in USA)	Cost of Glimepiride for one month (in India)
<p>Generic Name: Glimepiride</p> <p>Trade Name: Amaryl(USA) Dexasone(USA) Decdan (India) Dexona (India)</p>	<ul style="list-style-type: none"> ■ Usual dose: 1 mg twice a day ■ Can be increased to 8 mg ■ As a Golden Rule – before starting any medicine, liver functions and kidney functions should be screened. 	<p>Dose = Once a day (2mg)</p> <p>1-month = 60 tablets</p> <p>Cost = \$66</p> <p>*All costs are meant for a rough estimate of one-month expense.</p>	<p>Dose = Once a day (2mg)</p> <p>1-month = 60 tablets</p> <p>Cost = Rs 660</p> <p>*All costs are meant for a rough estimate of one-month expense.</p>



Chap6Fig13