



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

# Add 15 Years |

## Diabetes - Book 2

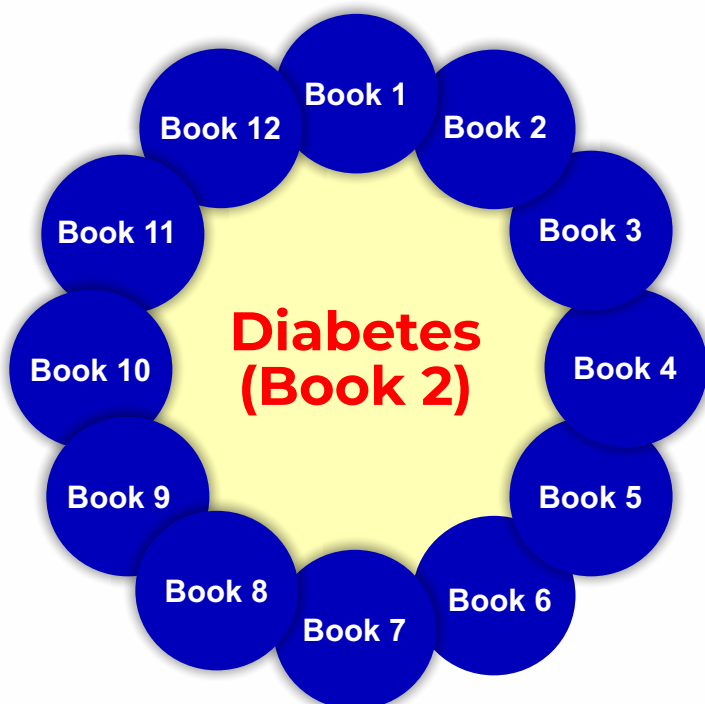
# METFORMIN

## (Biguanides group of medicine)

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

---

USA/India Edition 2021 | ENGLISH



Author:

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

From family of doctors

from AIIMS, MAMC & Delhi University

MD Medicine, USA

DM/Fellowship, USA



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

**These**  
**Medical Books**  
**can Add**  
**15 Healthier**  
**Years**  
**to**  
**Our Lifespan!**



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

# PREFACE

## ***Think About It!***

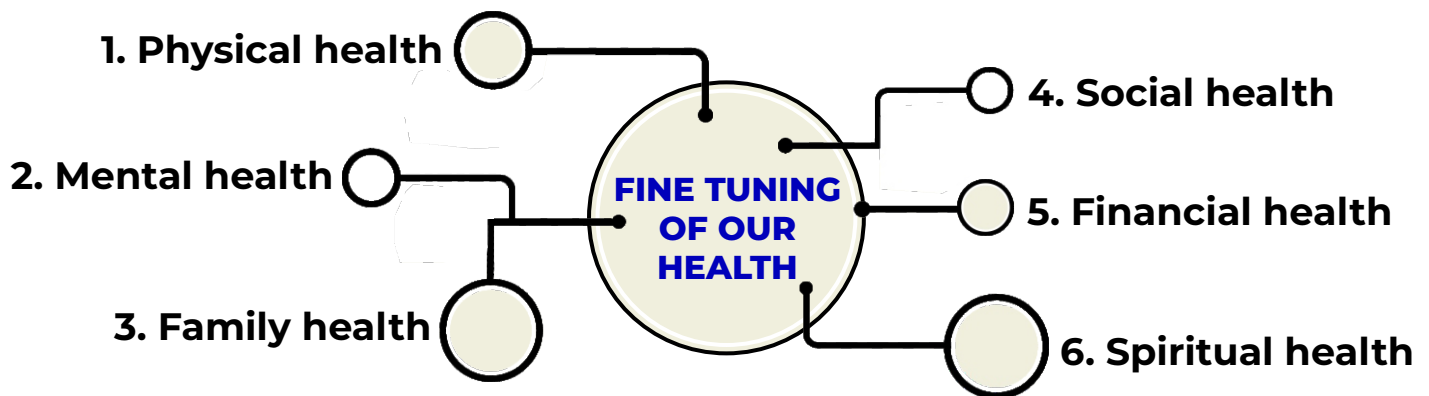
*Miracles do not happen in real life.*

At least in India (NOT very common in U.S.) we seek medical care only when we have so called “alarming symptoms” and MD/Physicians provide care with their focus on these “alarming symptoms”. We call it “Crisis Medicine”.

Personally speaking, in 2020/2021 and in the coming years, these “alarming symptoms” (called “Crisis Medicine”) should be RARE before we get into the 75 to 85 years of age group.

## **PROVIDED**

*We keep **fine tuning our health** (medical definition) and gain insight about fundamental medical knowledge, and we actively plan and pay attention to our:*



**TRUST ME ALL THE 6 TYPES OF HEALTH ARE IMPORTANT**

**Results will be dramatic.**

# DISCLAIMER

**Disclaimer**In all the books that I am writing as a physician and a MD with a lifetime of experience (along with my team)-

**I have mentioned the most common medical facts which each one of us need to know in our day to day life.**

Ignorance is never a bliss and 2020 has shown us that.

I highly recommend that anybody entering middle school (8th grade i.e. a 13-year-old) should start reading these books and try to read as many as he or she can **so that they can get an insight into the most common medical facts.**

***These books are written in basic English and several other languages as well.***

**If we get an insight into medical facts before we get into chain-smoking and excessive alcohol use or another drug abuse, then ultimately, we can live a healthy and a long life.**

All my research and common sense says that starting at the age of 13 years, (that is when we enter our teenage years, **our personality, our habits, our likings and our disliking -- all are pretty much shaped by the time we get to 26 years old or older.**

**Both India and USA are very dear to me,**

In the former I was born; I have my parents.

In the latter, I have my wife and my children.

One thing became obvious to me as I live in USA, that the population is taking advantage of the latest medical advances.

Our Indian community, all our friends and families, when we have medical issues, are really putting themselves at the mercies of government and private hospitals, and doctors (with “zero” trust).

**In India, people have to spend their own money. Realizing this, I have provided all the medical information, which is available to us doctors, so that one can make wise choices and confidently take their health in their own hands.**

**But still I sincerely request that you should not take any medications without the supervision of your own family doctors.**



The facts that I have provided in my books are available in every other medical book, but I them in very simple English or in your language **because how are you going to make right choices in relation to your health, if you do not know what the answer is.**

Our horoscope/stars are not enough, and consulting a pandit, priest or maulana is never enough.

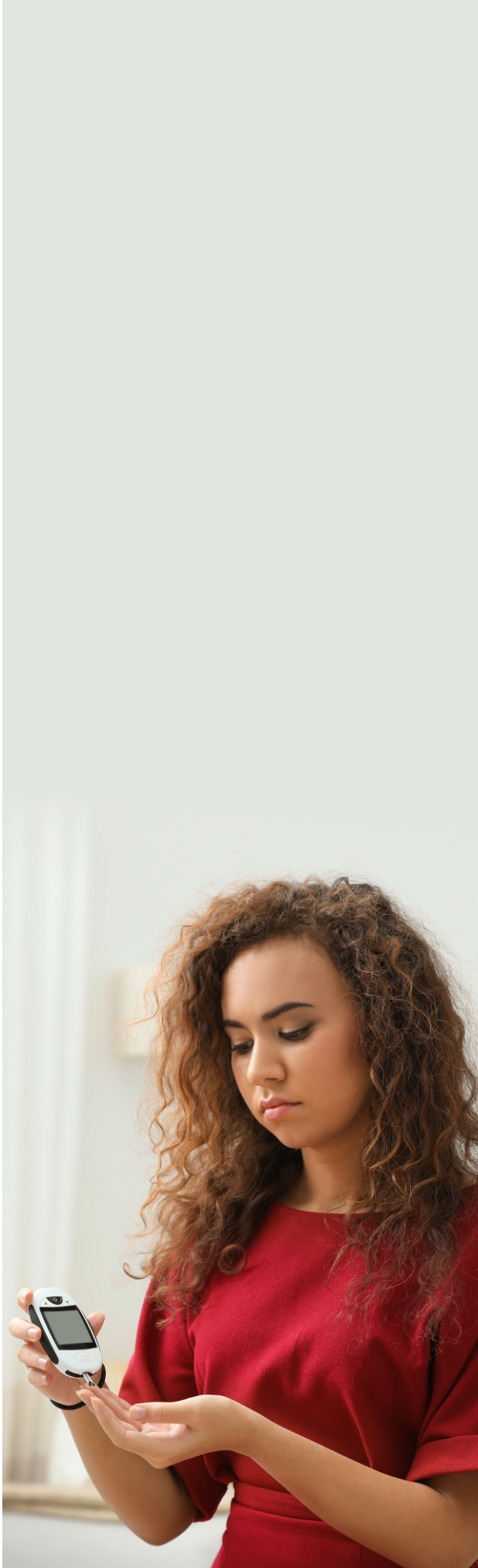
Blind faith is never an option.

Prayers help, yes! when we do not know the answer to a situation.

If our car runs out of petrol, then eventually it will not move; does not matter how much we may pray, it is never going to happen unless we fill the tank.

**If you anticipate and choose wisely, you will not have a crisis. So, our disclaimer is that we give you the insights but please always consult your physicians before starting any prescription medications.**





# TABLE OF CONTENT

## **Chapter 1**

- 1** Most common, most famous and most prescribed medicine ---Metformin

## **Chapter 2**

- 2** Metformin - Approved for - even before we have diabetes (Prediabetes)

## **Chapter 3**

- 3** Combine Metformin with Diet & Exercise

## **Chapter 4**

- 4** Metformin -A Firstline Medicine for the Treatment of Diabetes

## **Chapter 5**

- 5** Role of Metformin in Diabetes Management

## **Chapter 6**

- 6** Metformin pills

## **Chapter 7**

- 7** The Golden Principle in Management of High Blood Sugar (Diabetes)




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

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

# 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

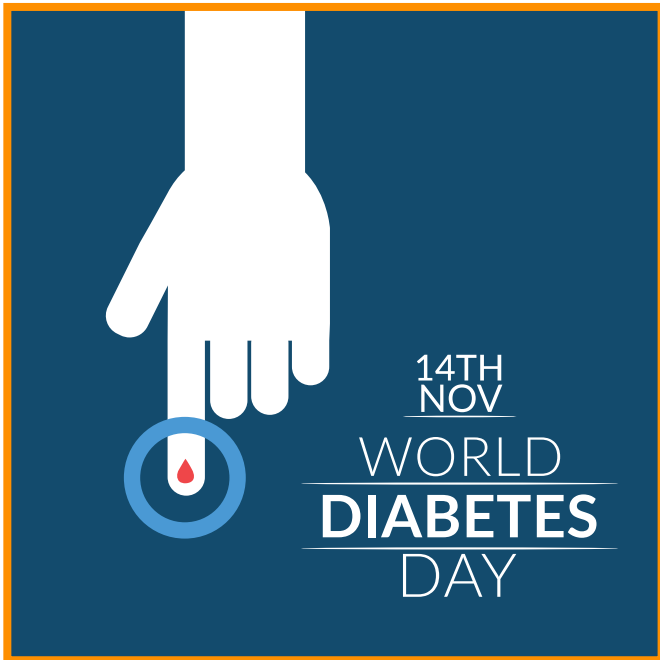
*Every child who was born with Type 1 diabetes or lack of insulin would eventually die.*

*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!!**

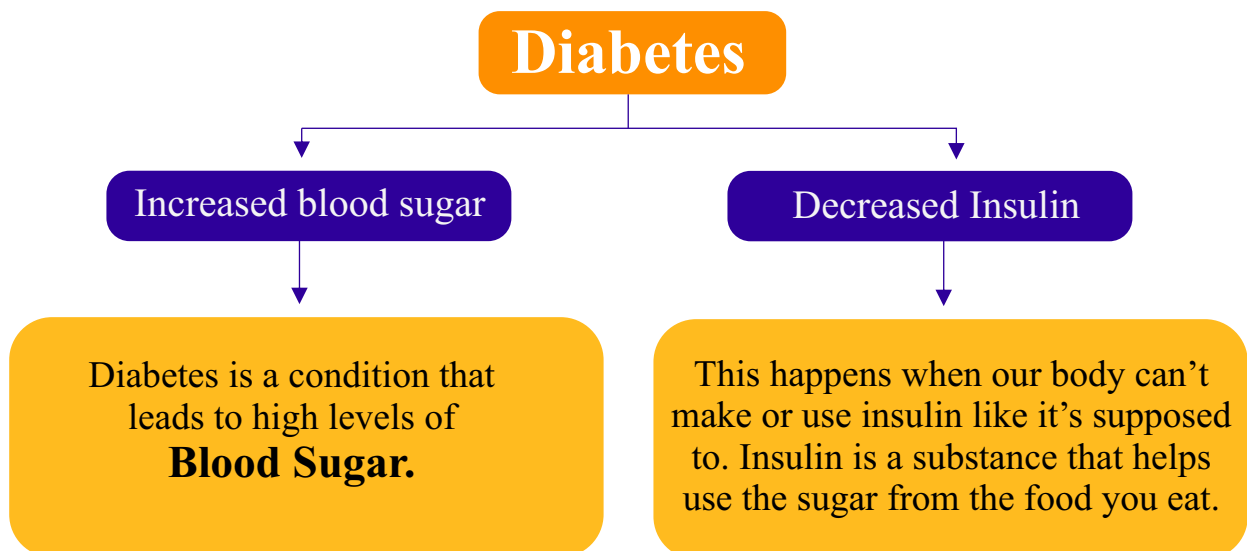


But yes, we have 12 to 13 different groups of medicines for high blood sugar.

**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

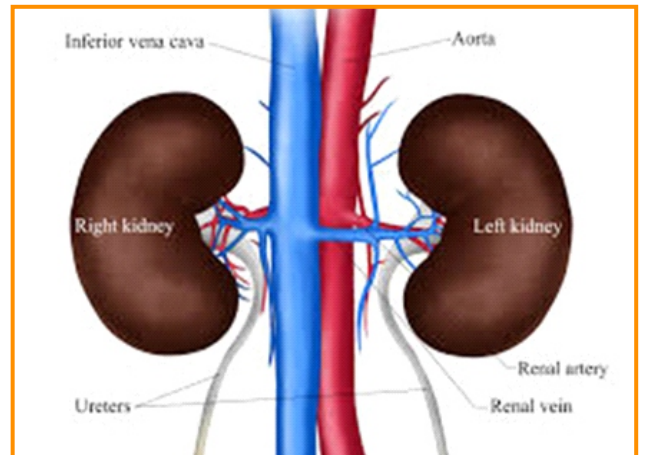


Chap3Fig2

**HbA1c**

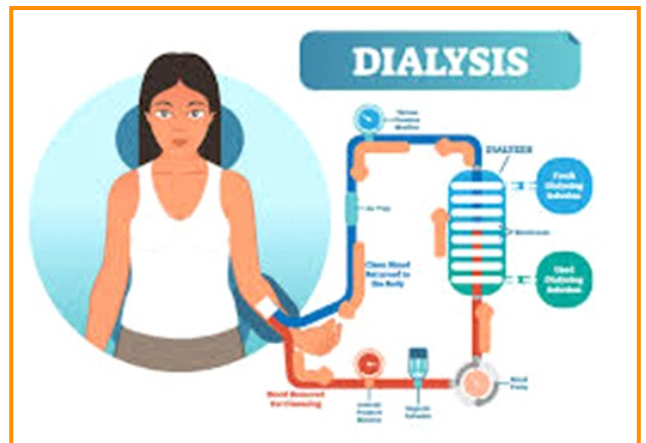
Chap3Fig3

- **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)**

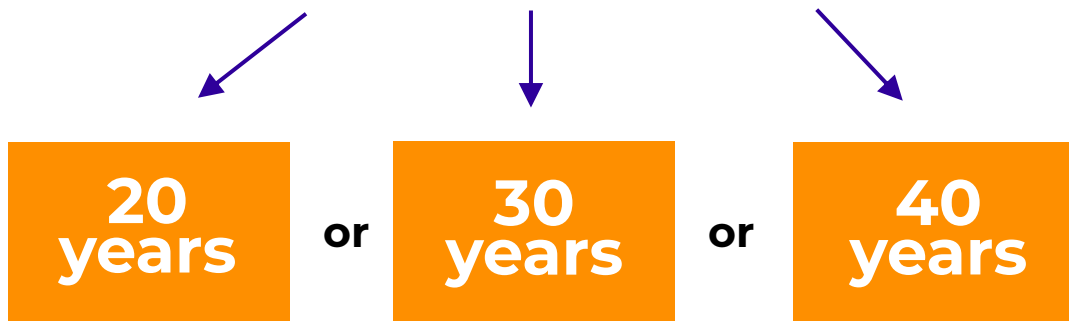


Chap3Fig9

## 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

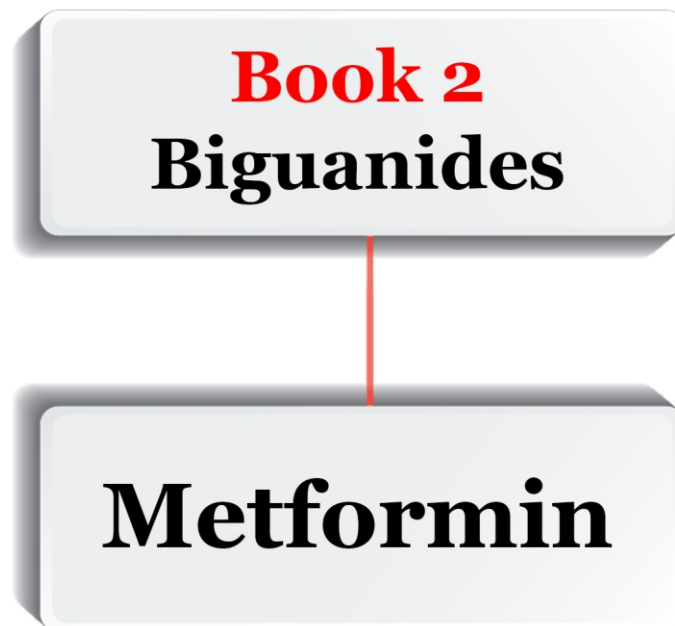
# Chapter 5

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:

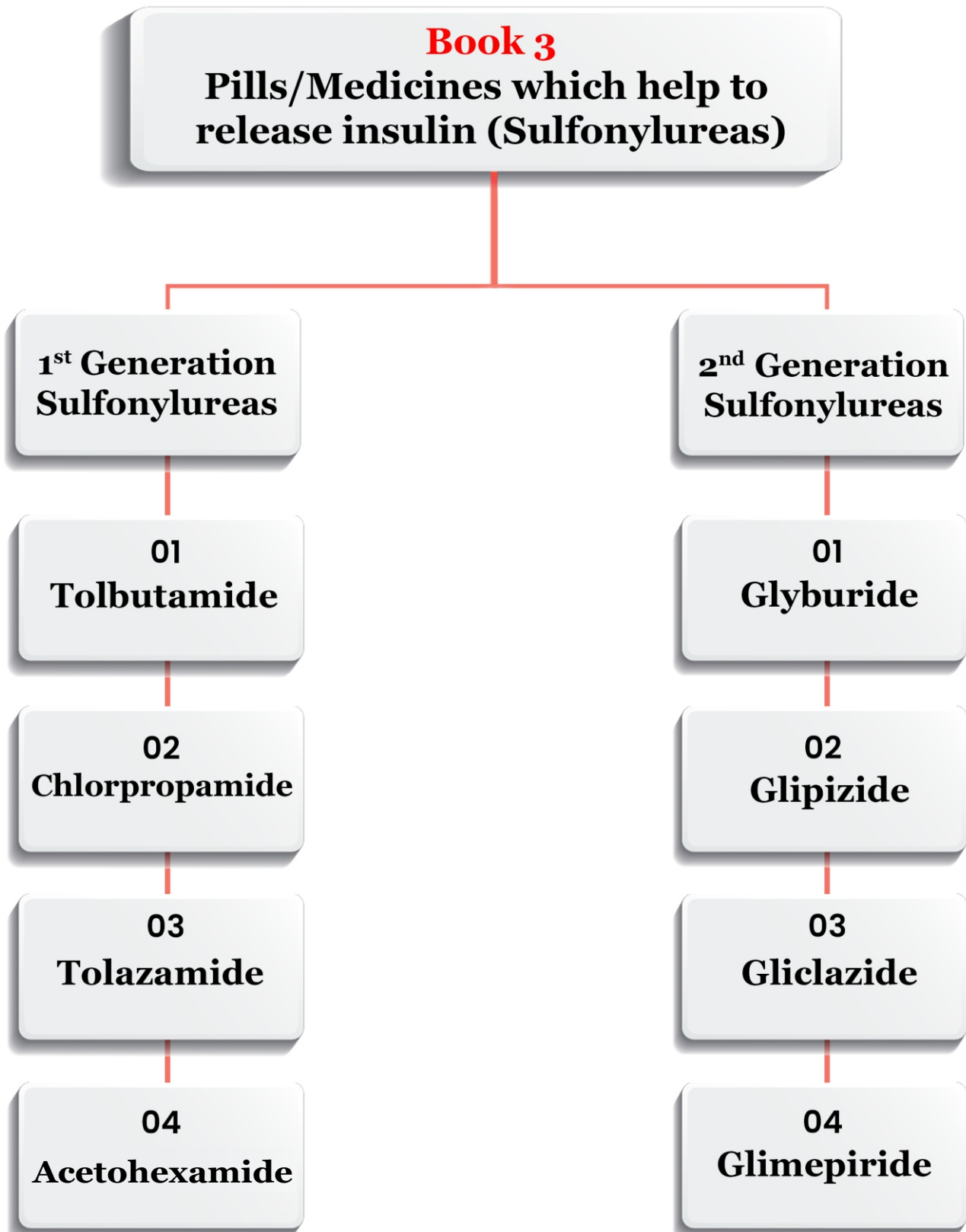
## **Book-2 Biguanides**

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

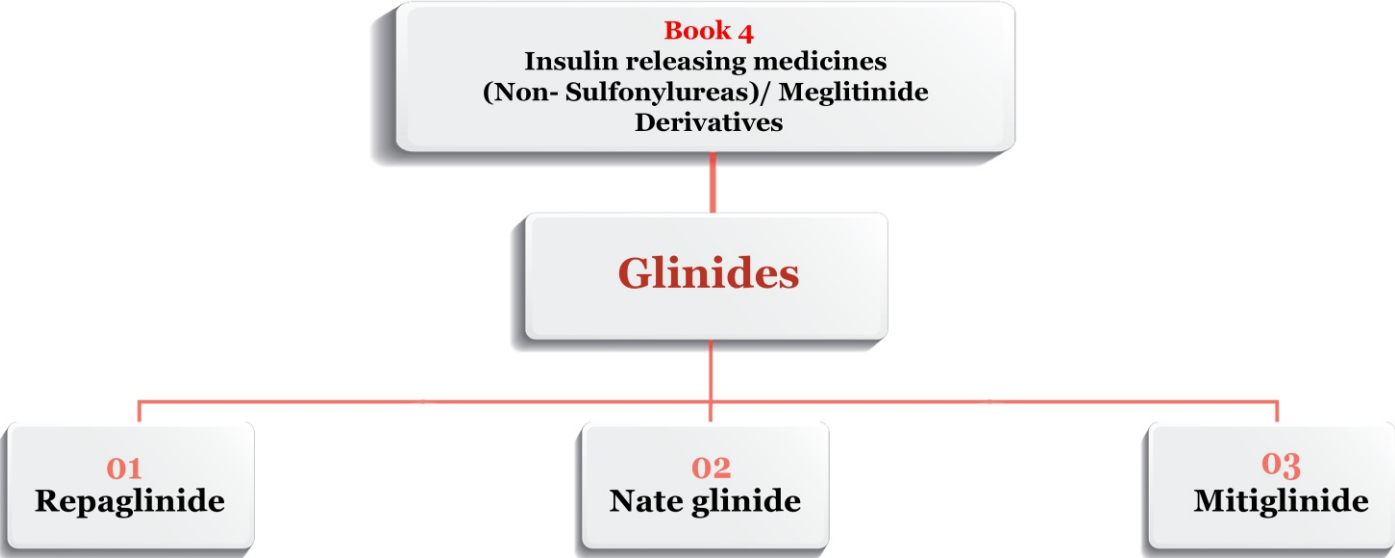




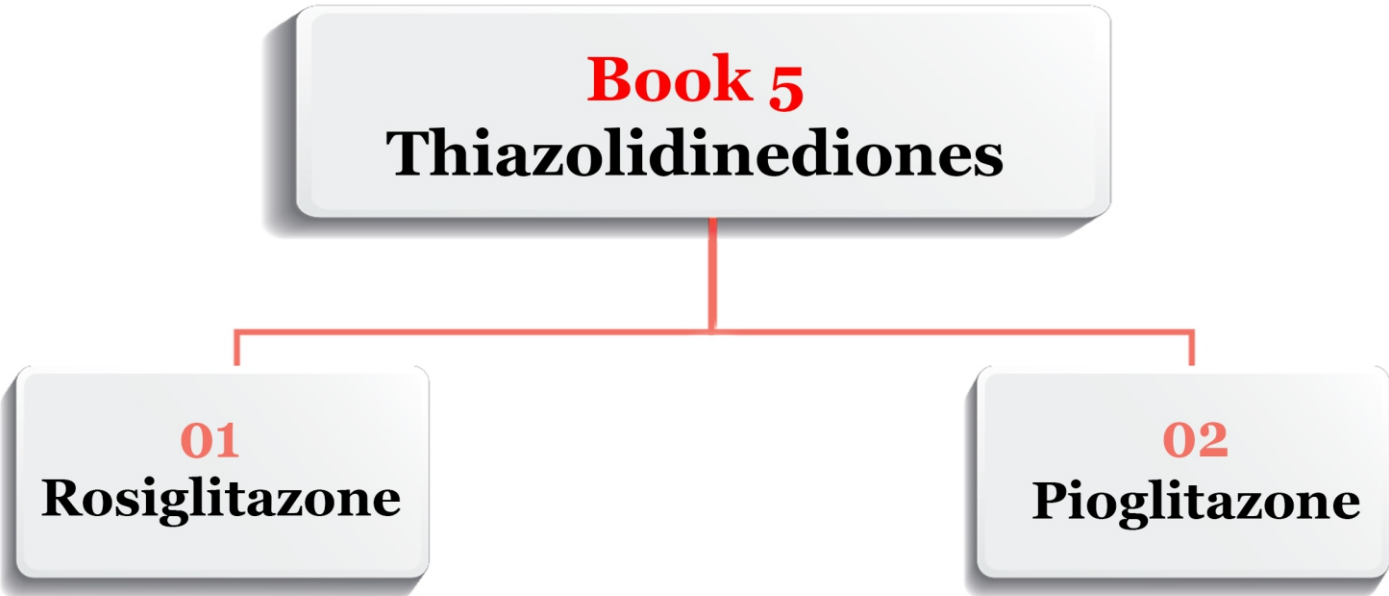
**Book-3** Pills/Medicines which help to insulin (Sulfonylureas)



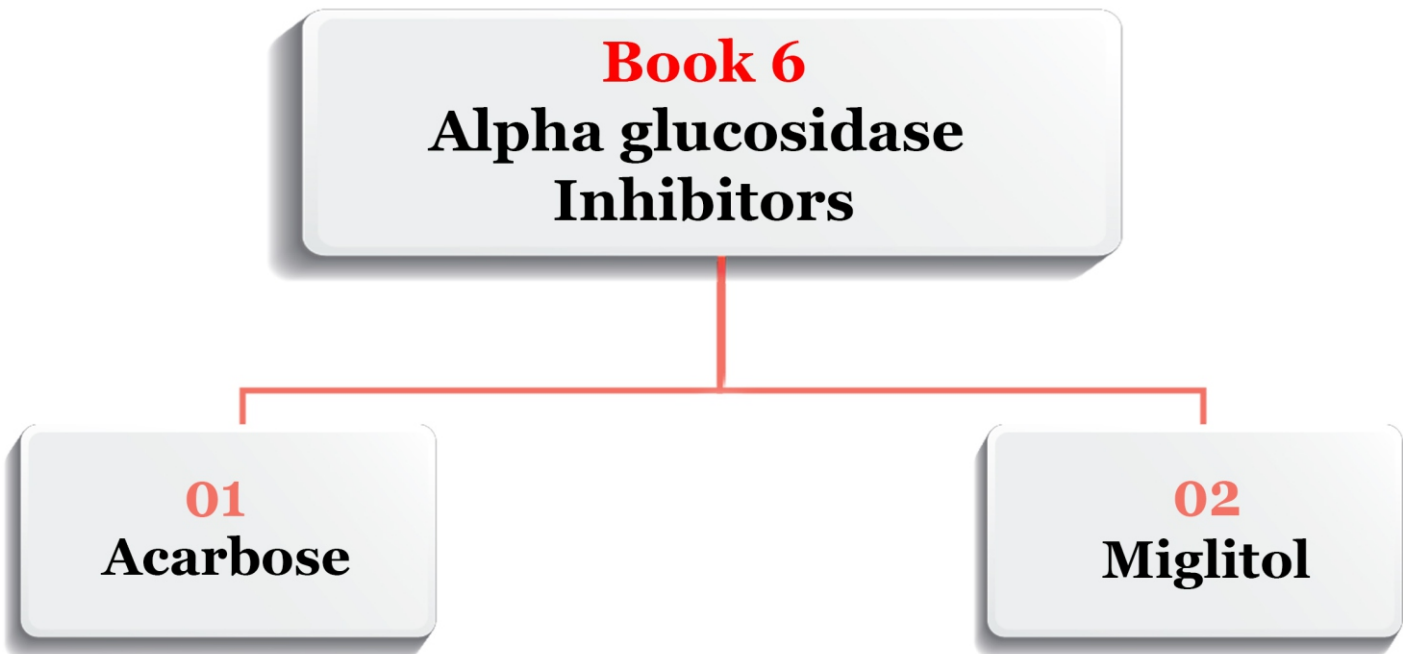
**Book-4** Insulin releasing medicines (Non- Sulfonylureas)



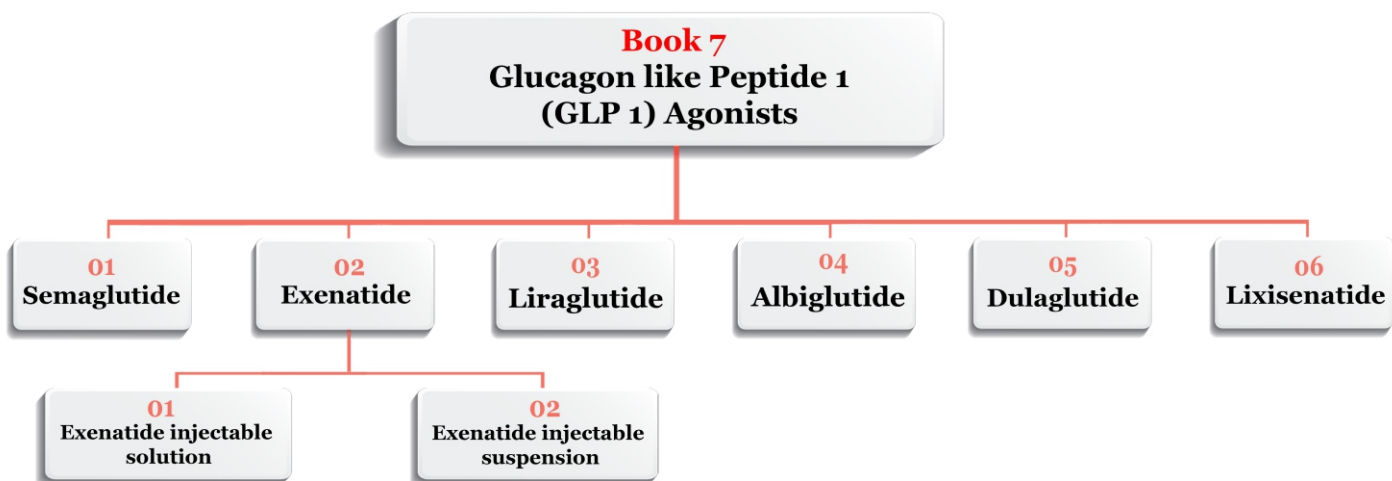
**Book-5** Thiazolidinediones



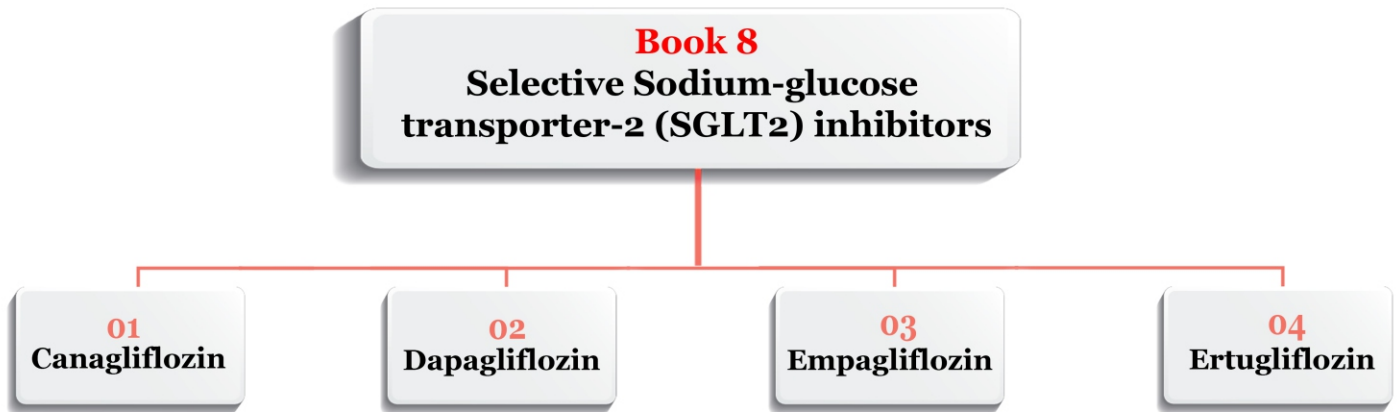
**Book-6** Alpha glucosidase Inhibitors



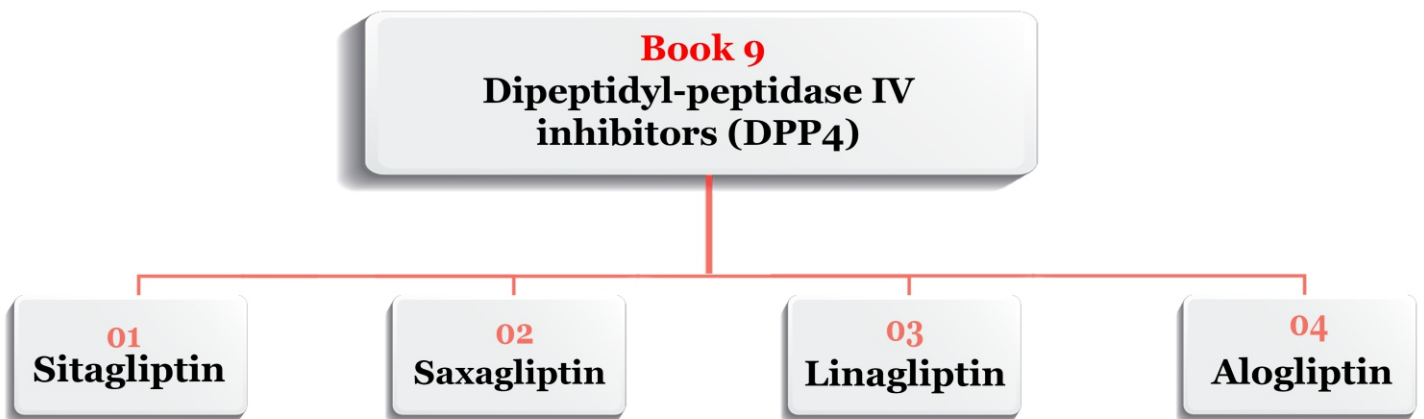
**Book-7** Glucagon like Peptide 1 (GLP 1) Agnostics



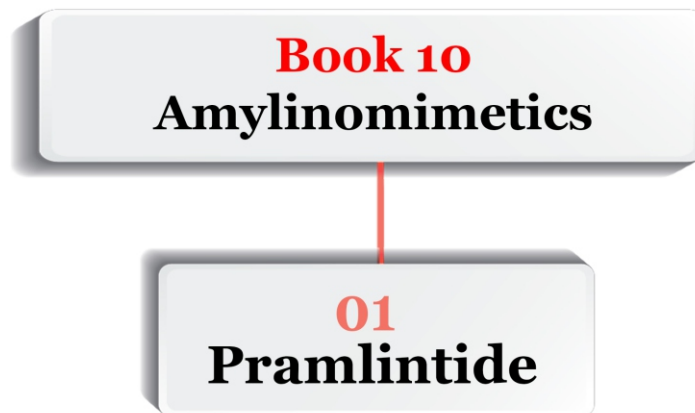
**Book-8** Selective Sodium-glucose transporter-2 (SGLT2) inhibitors



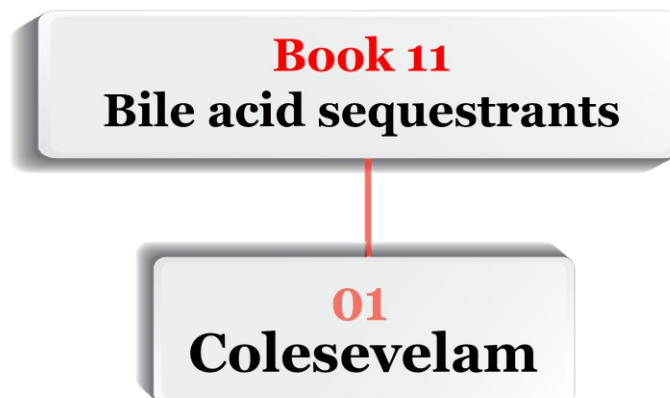
**Book-9** Dipeptidyl-peptidase IV inhibitors (DPP4)



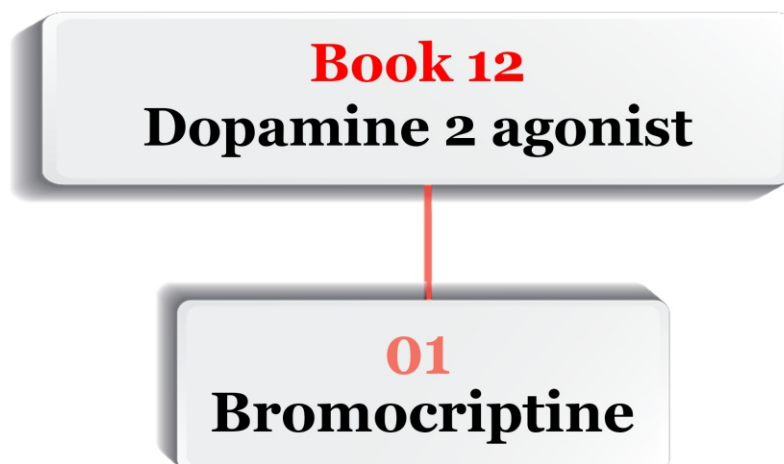
**Book-10** Amylinomimetic group



**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



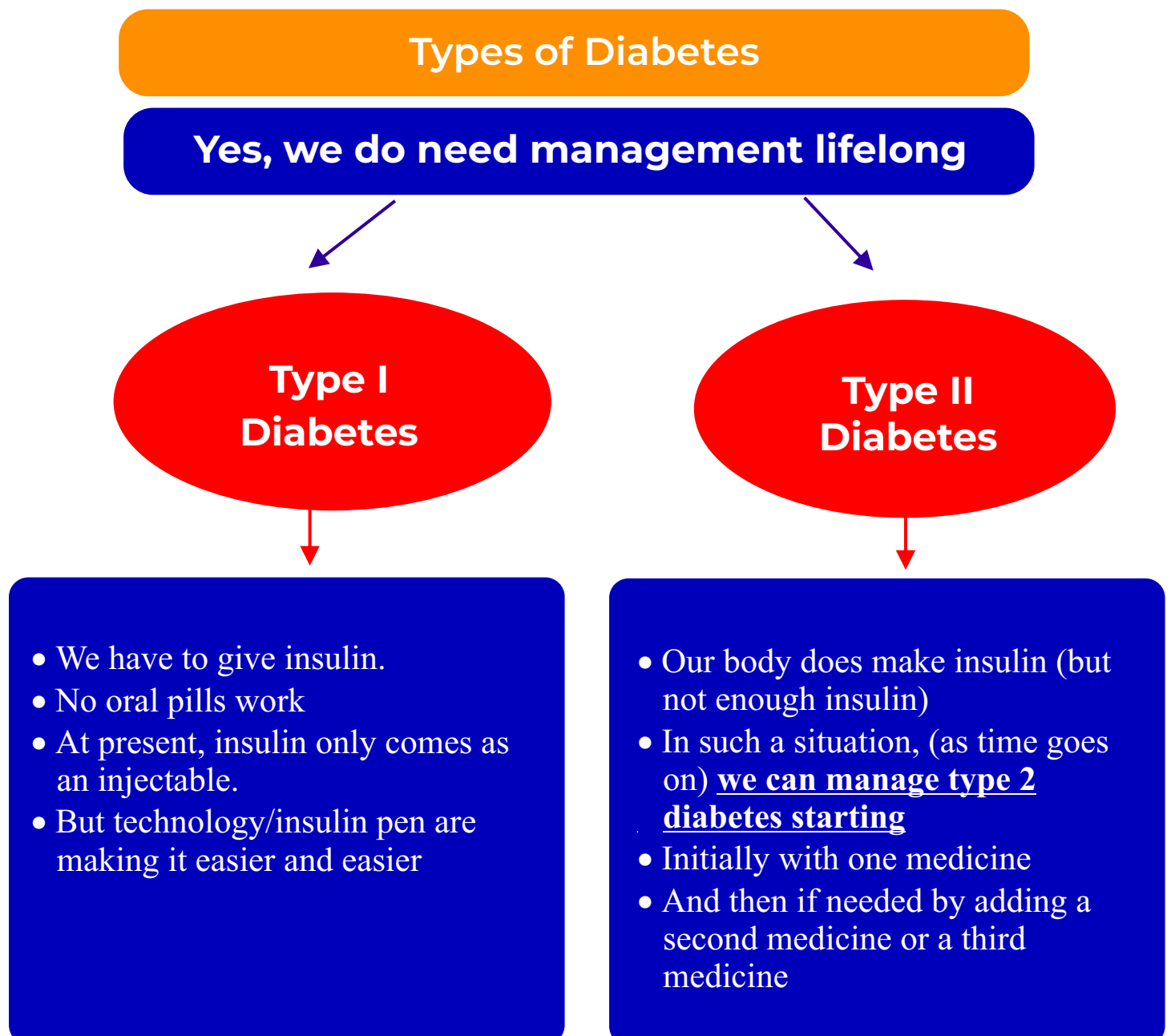
Chap6Fig2

# 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.*



# Chapter 8

## How do we decide less dose or more dose of medicines

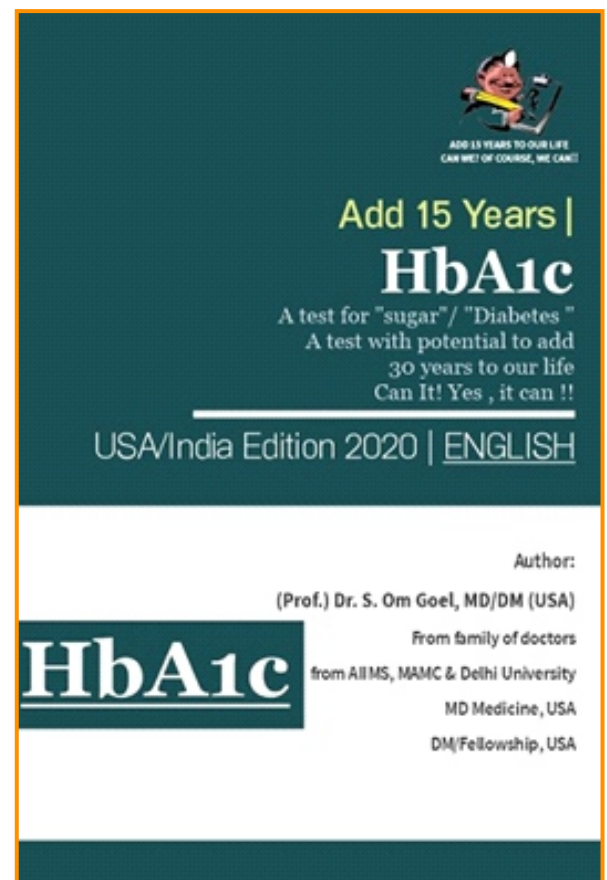
### Think About It!

*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 2

# **METFORMIN**

The most famous and used medicine  
1<sup>st</sup> medicine to start the treatment of diabetes

# Chapter 1 A

The most common, most famous and most prescribed medicine is “Metformin”

## **Think About It!**

*Few years back when I used to drop my son and daughter to high school, I used to go to the gym right after that with my friends. So, one day while I was walking and running on a treadmill, I saw a youngish Sardarji running right next to me, but he was talking to himself. He seemed very upset and angry, and I struck up a conversation with him.*

*So, I told him, I am a physician and I know as usual it is a tendency for all of us Indians to get to know each other while we are in a different country.*

*So, he told me he was 30 years old and he just found out that he has diabetes. And he was very, very angry.*

*He kept telling me, kept asking me, “Why me? Why me? Why at such a young age? Why do I have to have diabetes? My life is destroyed”.*

*I was really taken aback by his anger and his frustration. While I understand that it happened to him at 30 years of age; he was angry, and he was in denial mode. There are several things I wanted to tell in such a stage by being in denial and by not seeking treatment and not bringing balance in life, this is really going to hurt him.*

*Diabetes is something we have to deal with the rest of our life.*

*So, I reassured him, tried to talk to him. I stated to him that diabetes is very, very common. It happens now to youngish people also. It has happened to young people in my family, even younger than 30.*

*Second thing is, he definitely needed to seek counseling. His anger and frustration were understandable. But, if he stayed angry like this for days and weeks to come, it would affect his personal, social life and his health also*

*Second thing, I tried to reassure him that there are now excellent medications available and the most important medicine for early stages is Metformin. if we start it early and keep our blood sugar and even more important today is HbA1c( the gold standard ) down to normal, then we can really delay complications of diabetes by 30 to 40 years.*

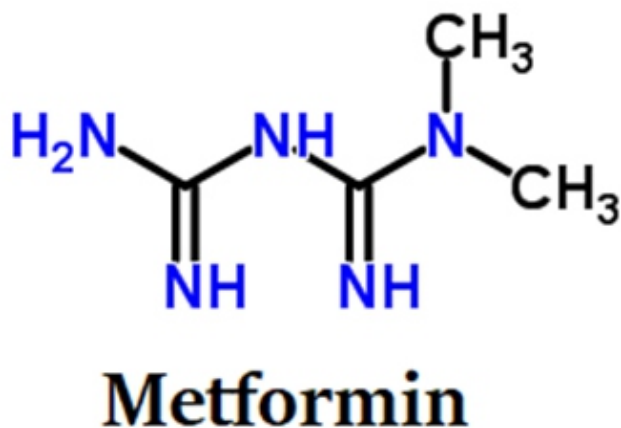
*I talked to him for some time. He did calm down, but his anger and frustrations did reflect in his eyes. I took his phone number, gave him my cell phone number and requested him to call me if he needs any further help.*

## Chapter 1 B

The most common, most famous and most prescribed medicine for the medical management of Diabetes is “Metformin”.

Metformin is on the World Health Organization’s List of Essential Medicines. It was first discovered in 1922. French physician Jean Sterne began study in humans in the 1950s. It was introduced as a medication in France in 1957 and the United States in 1995.

Metformin is a famous and well-known medicine in management of diabetes.



It is a medicine which we can take even before we have diabetes, called “Prediabetes”.  
(Approved by U.S. medical bodies)

Metformin is a very cheap/  
very safe/very effective medicine  
compared to other diabetes medicines

Chap1 BFig1

# Chapter 2

**Metformin - Approved for – even before we have diabetes (Prediabetes)**

**Metformin is approved for – even before we have diabetes (Prediabetes)**



Chap2Fig1

## Metformin

- Affordable and covered by Medicare and most insurance plans
- Minimal side effects for most people



Chap2Fig2

**Cheap**

**Very Safe**

**Very Effective**

# Chapter 3

## Combine Metformin with Diet & Exercise

**Please always combine Metformin with diet & exercise!**



Chap3Fig1

- **Metformin** is usually used as the first line medicine, in early management of Type 2 diabetes
- **Metformin comes as a pill**, which works for 12 hours, needs to be taken twice a day with meals

**Well known  
First Line Medicine**

**Needs to be taken  
twice a day with meals**



# METFORMIN

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

## All medicines continue life-long

Generic Name & Trade Name	About Metformin	Cost of Metformin for one month (in USA)	Cost of Metformin for one month (in India)
<p><b>Generic Name:</b> Metformin</p> <p><b>Trade Name:</b> Glucophage (USA) Fortamet (USA) Riomet (India) Glumetza (India)</p>	<ul style="list-style-type: none"> <li>■ <b>Usual dose:</b> 500 mg twice a day.</li> <li>■ <b>Can be increased</b> to 1000 mg twice a day.</li> <li>■ Should be <b>taken just before meals</b> or with meal.</li> <li>■ <b>Maximum dose</b> = 2000 mg per day</li> <li>■ Used as a <b>single therapy medication</b> (monotherapy)</li> </ul>	<p><b>Dose</b> = 500 mg twice a day</p> <p><b>1 month</b> = 60 tablets</p> <p><b>Cost</b> = \$105</p> <p><b>*All costs are meant for a rough estimate of one- month expense.</b></p>	<p><b>Dose</b> = 500 mg twice a day</p> <p><b>1 month</b> = 60 tablets</p> <p><b>Cost</b> = Rs 100</p> <p><b>*All costs are meant for a rough estimate of one-month expense.</b></p>

# Chapter 4

## Metformin - Firstline Medicine for the Treatment of Diabetes

**The two very important reasons - why metformin is used as a first line medicine are as follows:**

A. The first reason is that it actually helps us to lose weight



Chap4Fig1

**Actually helps us to  
lose weight**

B. And it DOES NOT cause low blood sugar which can be dangerous



Chap4Fig2

**DOES NOT cause low  
blood sugar below normal**

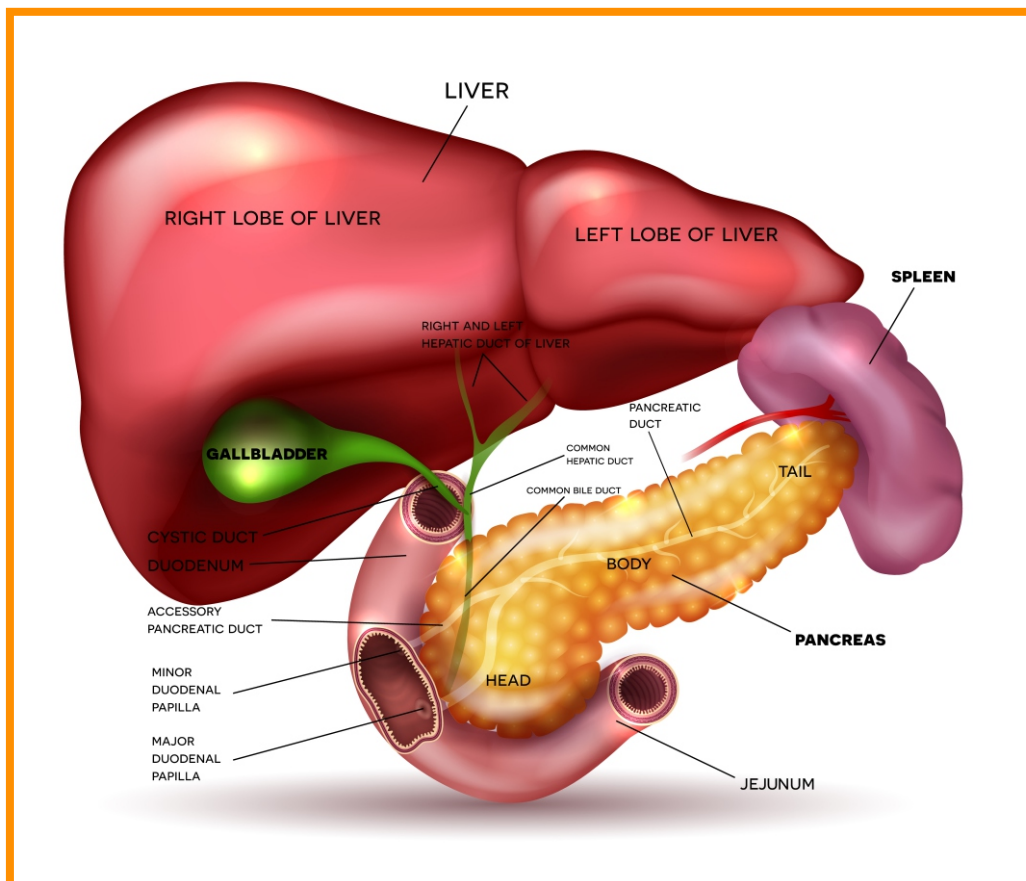
# Chapter 5

## Role of Metformin in Diabetes Management

### **Metformin:**

As years go by, we may have to add a second blood sugar medication or even a third blood sugar medicine to maintain our target HbA1c level as Diabetes needs lifelong management.

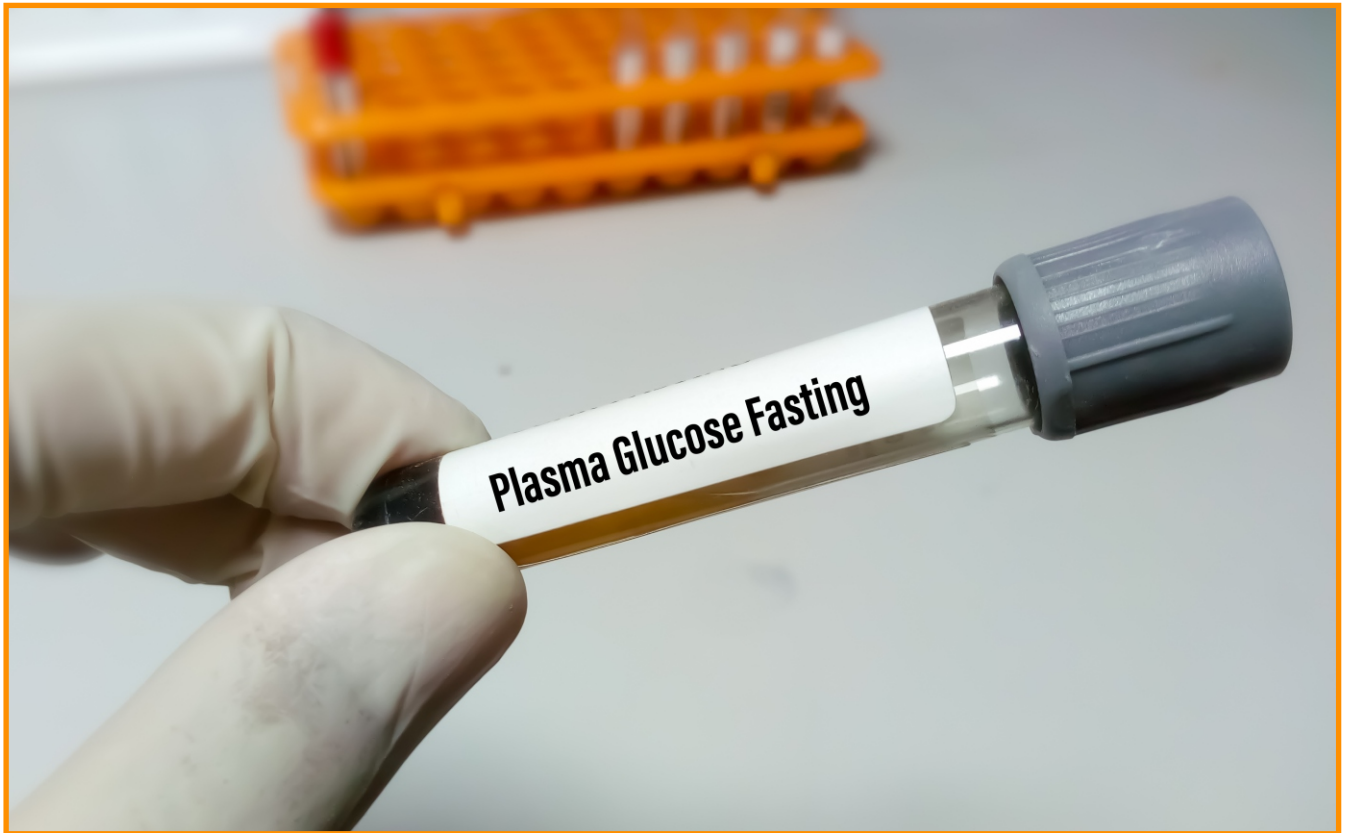
### **I. Reduces blood sugar release and production by liver.**



Chap5Fig1

**Reduces release and production by liver of sugar**

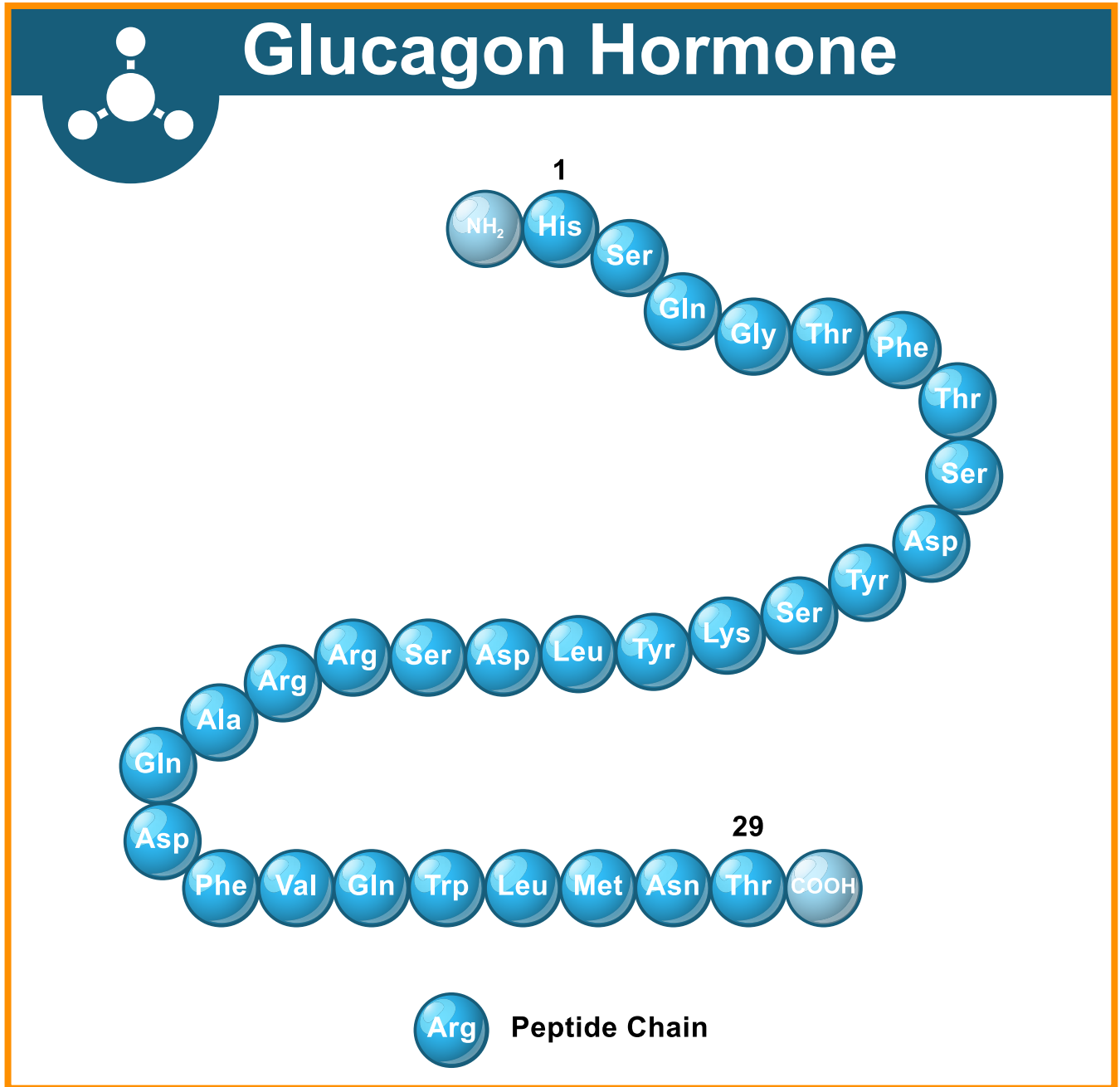
### **III. Metformin DOES NOT bring down the fasting blood glucose level.**



Chap5Fig3

**DOES NOT lower sugar below normal**

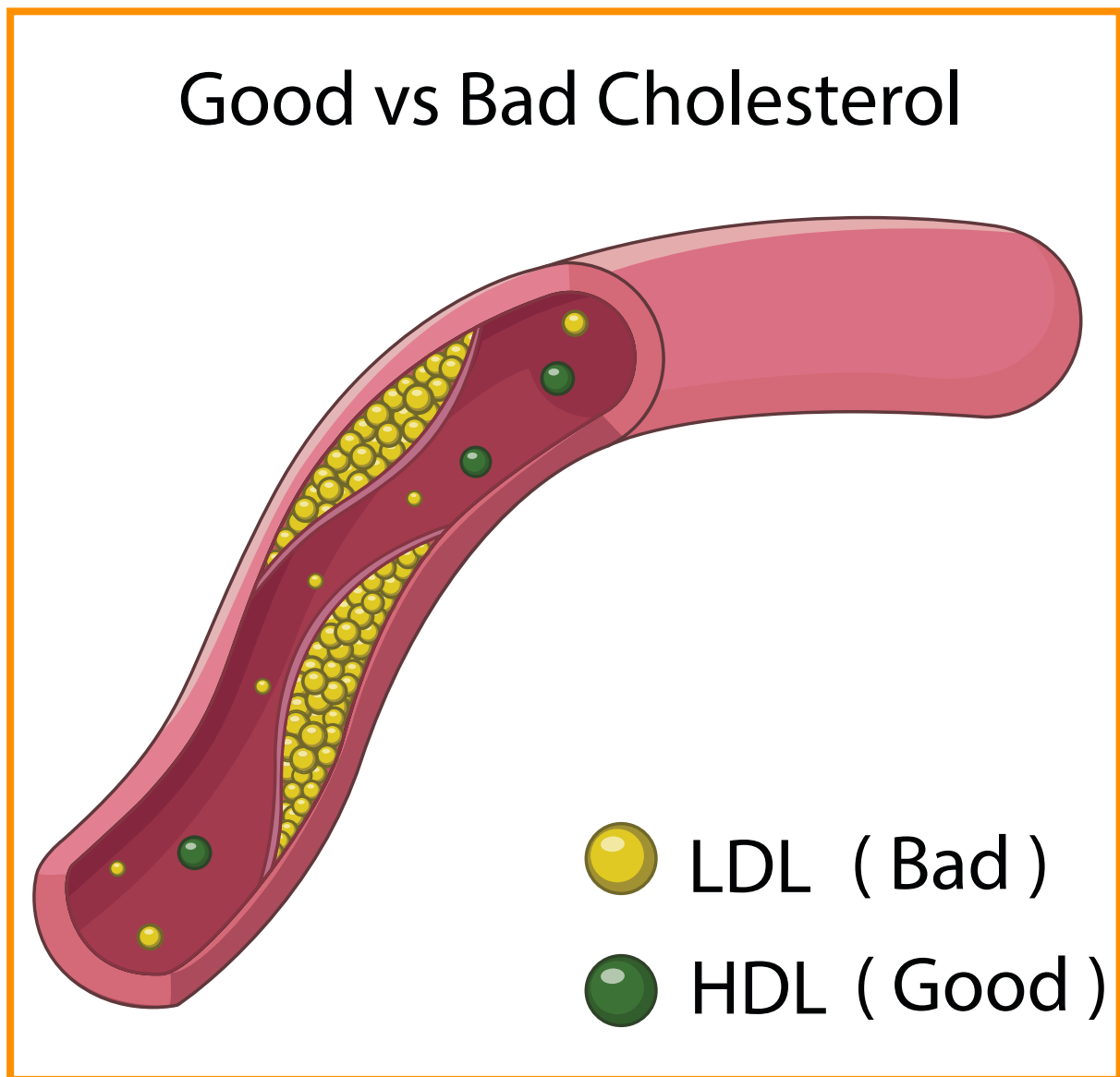
II. It does that by blocking the glucagon hormone (glucagon actually increases glucose production).



Chap5Fig2

**Blocks the glucagon hormone**

**IV. It also improves our cholesterol/lipid profile.**



Chap5Fig4

**Improves our cholesterol/lipid profile**



V. It also helps us to lose weight (as most of us with diabetes are overweight).

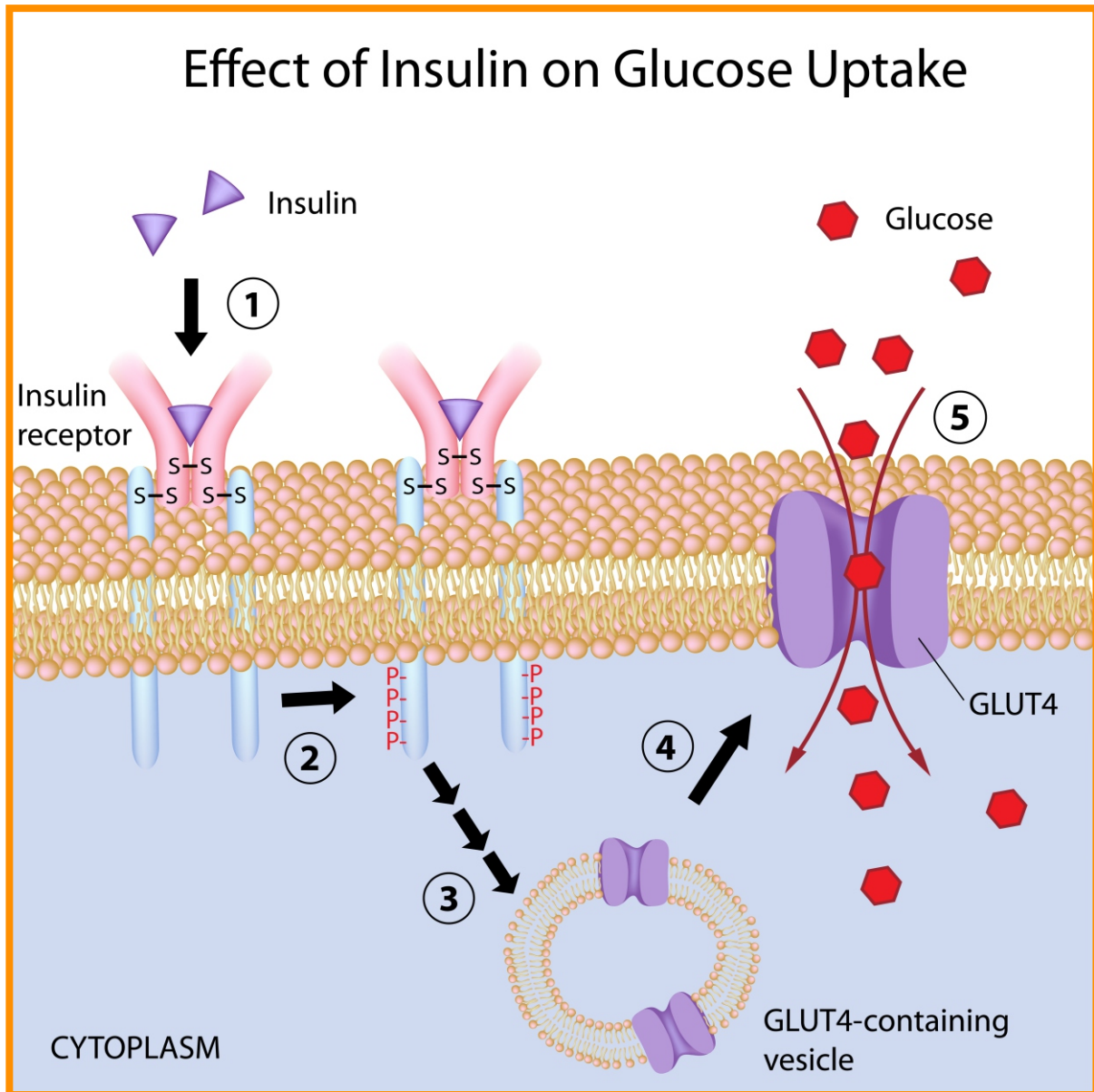


Chap5Fig5

**Helps us to lose weight**

## VI. Metformin also works by sensitizing body/target tissues to insulin.

This increases the action of insulin and increases the glucose uptake by the body tissue, leading to the lower blood sugar.



Chap5Fig6

**Increases the uptake of glucose by the body tissue**



VII. As mentioned above, Metformin helps normalizing the blood sugar, but it does not cause hypoglycemia.



Chap5Fig7

**But it DOES NOT lower BLOOD SUGAR below normal**

# Chapter 6

## Metformin Pills



Chap6Fig1

### Metformin comes as:

1. Immediate release preparation
2. Extended release preparation



Chap6Fig2

**Please remember!**

- 1) The maximum dose of metformin is 2000 mg in one day
- 2) If needed then a second medicine can be added, under the guidance of a physician, of course
- 3) **Metformin can be used as a single therapy medication**

**We always use-  
Immediate release  
preparation to start with**



Chap6Fig3

- a) When we really **want to start metformin first time**
- b) We always prefer **immediate release medicine till blood sugar level is stabilized**
- c) **It should be taken just before meals or with meals**
- d) **The usual dose is 500 mg twice a day**
- e) The dose can be **increased to 1000 mg twice a day**
- f) It is available as a **500 mg, 850 mg, and 1000 mg tablets**

**Eventually, we can switch you to extended release metformin (1000 mg) which is taken only once a day once blood sugar level and daily dose is stabilized.**

# Chapter 7

## The Golden Principle in Management of High Blood Sugar

Once again, the bottom line is:

1. We have to maintain our HbA1c targets.

**HbA1c targets to be decided by physician**

2. Maintain our blood sugar level close to normal (100 mg).

**Blood sugar close to 100mg**

3. Usual target is HbA1c < 7

**HbA1c < 7**

4. The target HbA1c level will guide us whether we want to use

- One medicine,
- Two medicines,
- Or three medicines

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

5. These days in 2020, every physician follows management and treatment of diabetes based on the targeted HbA1c level

**Every physician follows management and treatment of diabetes based on the targeted HbA1c level.**