- ## Does Diabetes depend on pregnancy?

-> Let us analyze a dataset to figure out whether diabetes depends on pregnancy or not.

- **This dataset is taken from Kaggle.**
  You can get it at :-
  https://www.kaggle.com/datasets/salihacur/diabetes

- **Using Sql and Google Colab to do so.**

- ## How to control Blood sugar control during pregnancy?

Blood sugar control during pregnancy is important for your health and the health of your baby. The following tips will help you control your blood sugar levels during pregnancy. Carbohydrates in food turn into sugar (also called glucose) when digested. Glucose is important for you and your baby, but too much glucose in your blood can lead to problems. It is important to eat the right amount of carbohydrate and to choose healthy foods. Carbohydrates are found in starches, fruits, vegetables, milk and yogurt so these food portions should be

measured. Sweets and desserts should be avoided as they may lead to high blood sugar levels.

● About Dataset

- **Number of times pregnant**
- **Plasma glucose concentration a 2 hours in an oral glucose tolerance test**
- **Diastolic blood pressure (mm Hg)**
- **Triceps skin fold thickness (mm)**
- **2-Hour serum insulin (mu U/ml)**
- **Body mass index (weight in kg/(height in m)^2)**
- **Diabetes pedigree function**
- **Age (years)**
- **Class variable (0 or 1)(class value 1 is interpreted as "tested positive for diabetes")**

● Important Definition

Blood Pressure :-

Blood pressure (BP) is the pressure of circulating blood against the walls of blood vessels. Most of this pressure results from the heart pumping blood through the circulatory system.

#Skin Fold Thickness :-

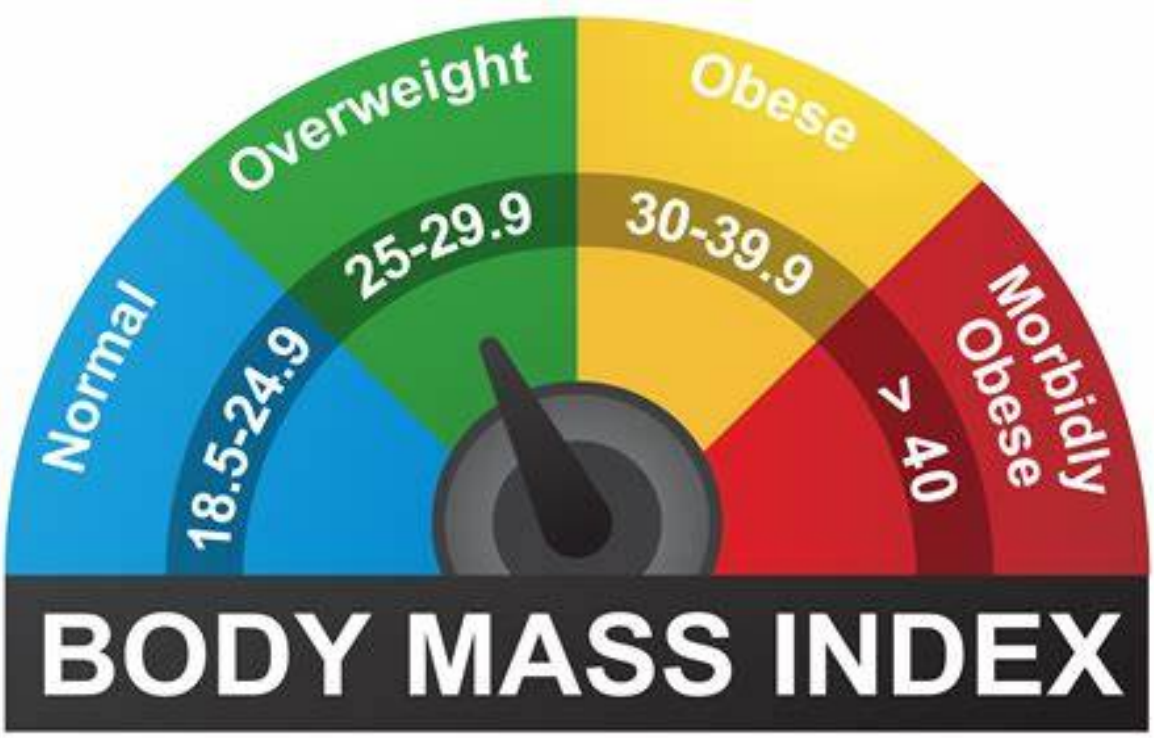
Skinfold thickness describes the amount of subcutaneous fat when the fold is lifted and its thickness measured by specialized calipers. The sum of skinfolds (generally from eight sites in the standard ISAK protocol) provides data for comparison with population norms, or for monitoring changes over time within the same individual.

Insulin :-

Insulin (from Latin insula, 'island') is a peptide hormone produced by beta cells of the pancreatic islets encoded in humans by the INS gene. It is considered to be the main anabolic hormone of the body. It regulates the metabolism of carbohydrates, fats and protein by promoting the absorption of glucose from the blood into liver, fat and skeletal muscle cells.

#Body Mass Index :-

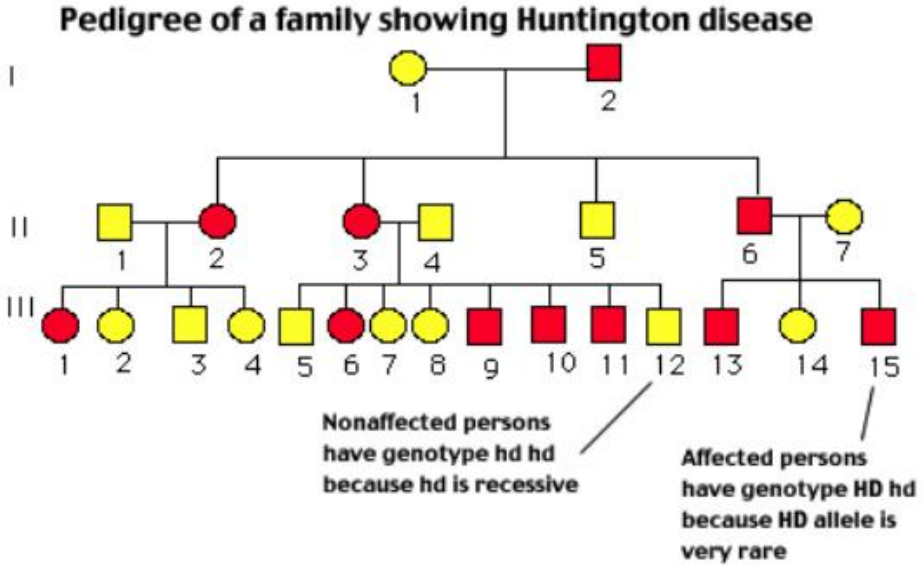
Body Mass Index (BMI) is a person's weight in kilograms divided by the square of height in meters. A high BMI can indicate high body fatness. BMI screens for weight categories that may lead to health problems, but it does not diagnose the body fatness or health of an individual.



#Diabetes pedigree function :-

Diabetes pedigree function indicates the function which scores likelihood of diabetes based on family history.

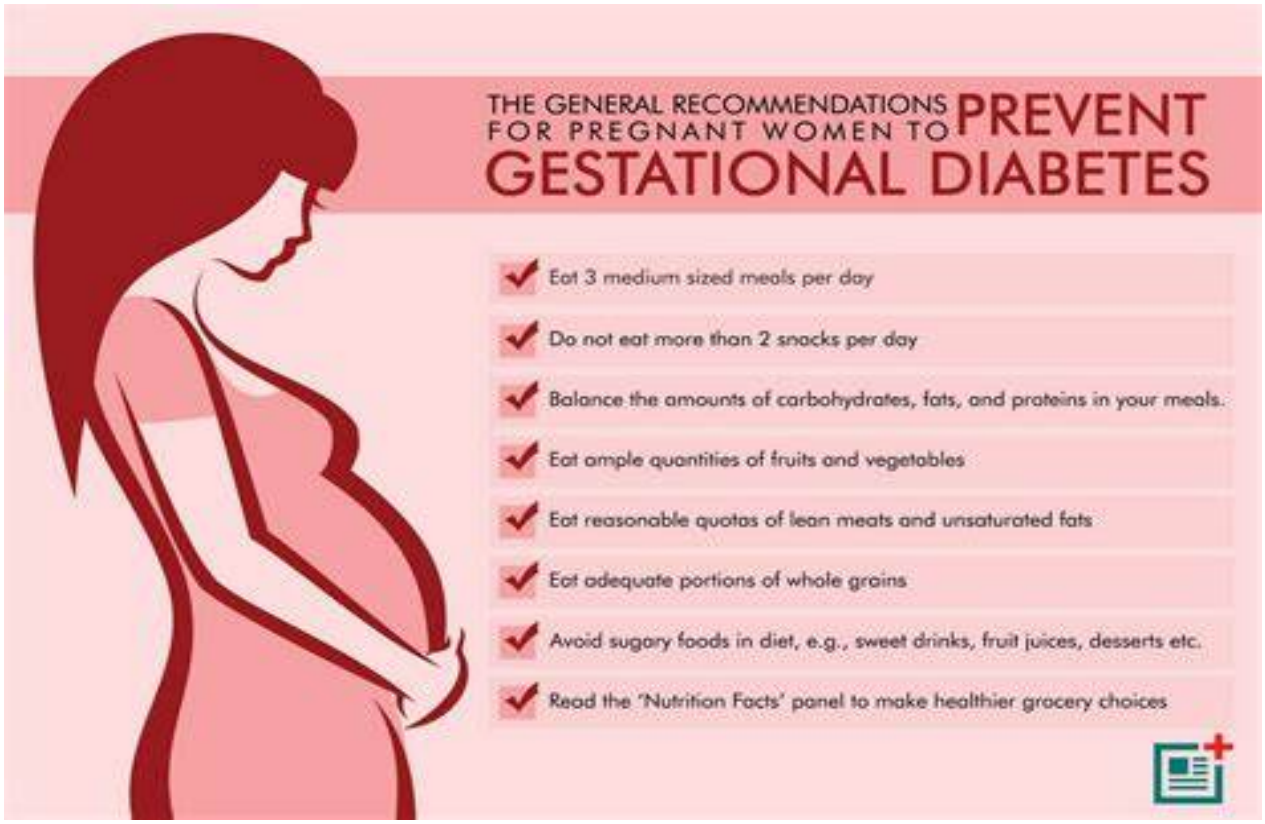
Pedigrees & Genetic Analysis



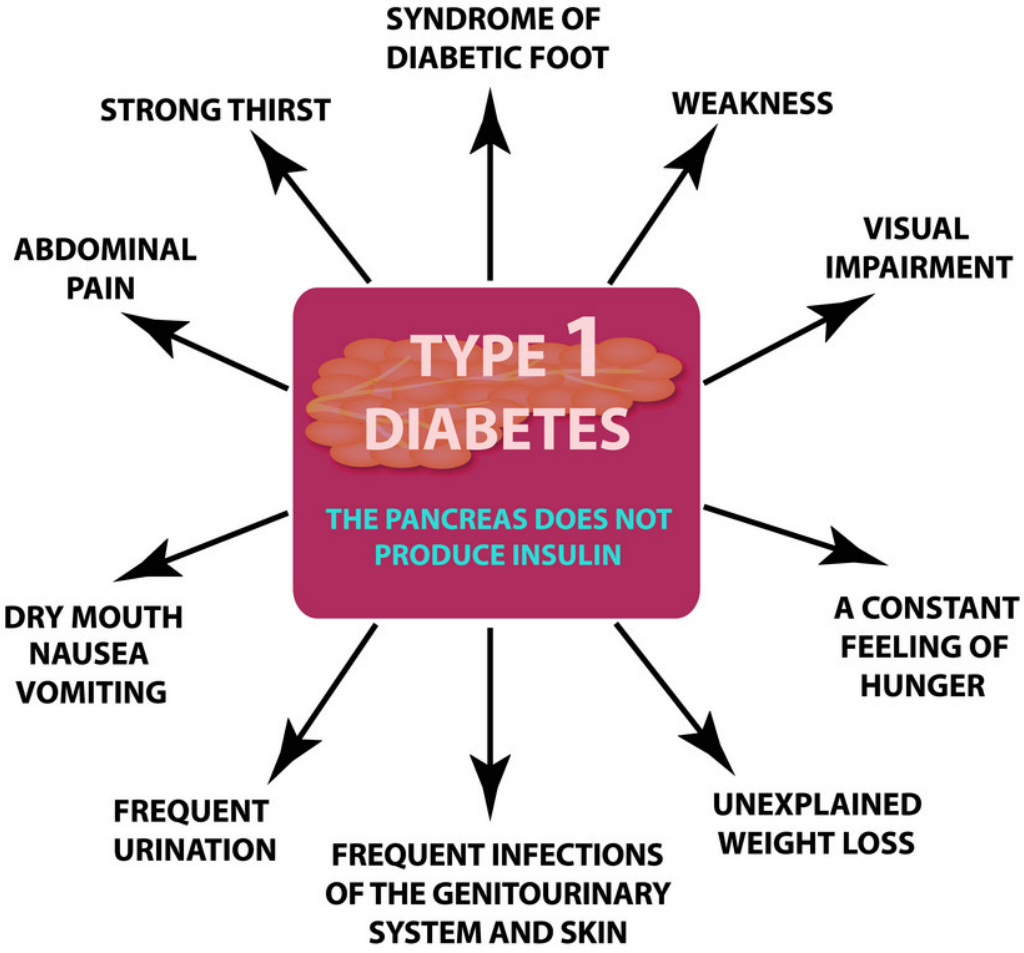
#Diabetes :-

Diabetes mellitus refers to a group of diseases that affect how the body uses blood sugar (glucose). Glucose is an important source of energy for the cells that make up the muscles and tissues. It's also the brain's main source of fuel.

The main cause of diabetes varies by type. But no matter what type of diabetes you have, it can lead to excess sugar in the blood. Too much sugar in the blood can lead to serious health problems.


THE GENERAL RECOMMENDATIONS FOR PREGNANT WOMEN TO PREVENT GESTATIONAL DIABETES
Eat 3 medium sized meals per day
Do not eat more than 2 snacks per day
Balance the amounts of carbohydrates, fats, and proteins in your meals.
Eat ample quantities of fruits and vegetables
Eat reasonable quotas of lean meats and unsaturated fats
Eat adequate portions of whole grains
Avoid sugary foods in diet, e.g., sweet drinks, fruit juices, desserts etc.
Read the 'Nutrition Facts' panel to make healthier grocery choices

SYMPTOMS OF TYPE 1 DIABETES



Analysis

```
create database NewProject;
use NewProject;
create table Diabetes(Pregnancies int,
                      Glucose int,
                      Bp int,
                      SkinThickness int,
                      Insulin int,
                      BMI float,
                      Diabetes_pedigree_function float,
                      Age int,
                      Outcome int);
```

```
select * from Diabetes;
```

Pregnancies	Glucose	Bp	SkinThickness	Insulin	BMI	Diabetes_pedigree_function	Age	Outcome
6	148	72	35	0	33.6	0.627	50	1
1	85	66	29	0	26.6	0.351	31	0
8	183	64	0	0	23.3	0.672	32	1
1	89	66	23	94	28.1	0.167	21	0
0	137	40	35	168	43.1	2.288	33	1
5	116	74	0	0	25.6	0.201	30	0
3	78	50	32	88	31	0.248	26	1
10	115	0	0	0	35.3	0.134	29	0
2	197	70	45	543	30.5	0.158	53	1
8	125	96	0	0	0	0.232	54	1
4	110	92	0	0	37.6	0.191	30	0
10	168	74	0	0	38	0.537	34	1
10	139	80	0	0	27.1	1.441	57	0
1	189	60	23	846	30.1	0.398	59	1
5	166	72	19	175	25.8	0.587	51	1
7	100	0	0	0	30	0.484	32	1
0	118	84	47	230	45.8	0.551	31	1
7	107	74	0	0	29.6	0.254	31	1
1	103	30	38	83	43.3	0.183	33	0

	1	115	70	30	96	34.6	0.529	32	1
	3	126	88	41	235	39.3	0.704	27	0
	8	99	84	0	0	35.4	0.388	50	0
	7	196	90	0	0	39.8	0.451	41	1
	9	119	80	35	0	29	0.263	29	1
	11	143	94	33	146	36.6	0.254	51	1
	10	125	70	26	115	31.1	0.205	41	1
	7	147	76	0	0	39.4	0.257	43	1
	1	97	66	15	140	23.2	0.487	22	0
	13	145	82	19	110	22.2	0.245	57	0
	5	117	92	0	0	34.1	0.337	38	0
	5	109	75	26	0	36	0.546	60	0
	3	158	76	36	245	31.6	0.851	28	1
	3	88	58	11	54	24.8	0.267	22	0
	6	92	92	0	0	19.9	0.188	28	0
	10	122	78	31	0	27.6	0.512	45	0
	4	103	60	33	192	24	0.966	33	0
	11	138	76	0	0	33.2	0.42	35	0
	9	102	76	37	0	32.9	0.665	46	1

```
select avg(Pregnancies) as Average_Number_of_times_women_get_pregnant from Diabetes;
```

	Average_Number_of_times_women_get_pregnant_having_Diabetes
▶	3.8451

```
select avg(Glucose) as Average_Glucose from Diabetes;
```

	Average_Glucose
▶	120.8945

```
select avg(Bp) as Average_Blood_pressure from Diabetes;
```

	Average_Blood_pressure
▶	69.1055

```
select avg(SkinThickness) as Average_Skin_Thickness from Diabetes;
```

	Average_Skin_Thickness
▶	20.5365

```
select avg(Insulin) as Insulin from Diabetes;
```

	Insulin
▶	79.7995

```
select avg(BMI) as Average_Body_Mass_Index from Diabetes;
```

	Average_Body_Mass_Index
▶	31.99257813890775

```
select avg(Diabetes_pedigree_function) as Average_Diabetes_pedigree_function_value from Diabetes;
```

 # Pedigree Function :-

A particularly interesting attribute used in the study was the Diabetes Pedigree Function, pedi. It provided some data on diabetes mellitus history in relatives and the genetic relationship of those relatives to the patient. This measure of genetic influence gave us an idea of the hereditary risk one might have with the onset of diabetes mellitus. Based on observations in the proceeding section, it is unclear how well this function predicts the onset of diabetes.

	Average_Diabetes_pedigree_function_value
▶	0.4718763029280429

```
select avg(Age) as Average_Age from Diabetes;
```

	Average_Age
▶	33.2409

```
select count(Outcome) as Number_of_People_suffering_from_Diabetes from Diabetes where Outcome=1;
```

	Number_of_People_suffering_from_Diabetes
▶	268

```
select avg(Pregnancies) as Average_Number_of_times_women_get_pregnant_having_Diabetes from Diabetes where Outcome=1;
```

	Average_Number_of_times_women_get_pregnant_having_Diabetes
▶	4.8657

```
select avg(Pregnancies) as Average_Number_of_times_women_get_pregnant_With_No_Diabetes from Diabetes where Outcome=0;
```

	Average_Number_of_times_women_get_pregnant_With_No_Diabetes
▶	3.2980

```
select avg(Glucose) as Average_Amount_of_Glucose_in_women_With_Diabetes from Diabetes where Outcome=1;
```

	Average_Amount_of_Glucose_in_women_With_Diabetes
▶	141.2575

-> For a 2 hour GTT with 75 g intake, a glucose level below 7.8 mmol/L (140 mg/dL) is normal, whereas higher levels indicate hyperglycemia . Blood plasma glucose between 7.8 mmol/L (140 mg/dL) and 11.1 mmol/L (200 mg/dL) indicate

"impaired glucose tolerance", and levels at or above 11.1 mmol/L at 2 hours confirm a diagnosis of diabetes

```
select avg(Glucose) as Average_Amount_of_Glucose_in_women_With_no_Diabetes from Diabetes where Outcome=0;
```

Average_Amount_of_Glucose_in_women_With_no_Diabetes
109.9800

```
select avg(Bp) as Average_Blood_Pressure_of_women_With_Diabetes from Diabetes where Outcome=1;
```

Average_Blood_Pressure_of_women_With_Diabetes
70.8246

```
select avg(Bp) as Average_Blood_Pressure_of_women_With_no_Diabetes from Diabetes where Outcome=0;
```

Average_Blood_Pressure_of_women_With_no_Diabetes
68.1840

```
select avg(BMI) as Average_BMI_of_women_With_Diabetes from Diabetes where Outcome=1;
```

Average_BMI_of_women_With_Diabetes
35.14253733763054

```
select avg(BMI) as Average_BMI_of_women_With_no_Diabetes from Diabetes where Outcome=0;
```

Average_BMI_of_women_With_no_Diabetes
30.304200008392336

What's the Best Age To Get Pregnant?

If you want to become a young parent, you might be worried about judgment from people who think you're not ready. On the other hand, as you get older, you might be worried about how your age will impact your ability to conceive.

So, is there really an ideal age to become pregnant? Yes and no, says reproductive endocrinologist Stephen B. Mooney, MD. He talks about the age-related factors that may impact your ability to conceive.

How fertility changes with age

You were born with all of the eggs you'll have during your entire reproductive lifetime — and the quality of those eggs declines over time. If you start trying for pregnancy at the age of 35 or 40, you're working with eggs that have been housed in the ovaries for decades.

"Biologically, we can't expect those eggs to be quite as high-quality as they were years ago," Dr. Mooney explains. Though the same is true for sperm count, people with male reproductive organs don't typically experience diminished quality until later in life — in their mid-40s or 50s.

Is 35+ too old to get pregnant?

The term that's often thrown around for pregnancy in someone age 35 and up is "geriatric pregnancy," which, frankly, doesn't inspire a lot of positive feelings. But rest assured that just because you're getting older (aren't we all?!) doesn't mean you won't be able to get pregnant — or even that you'll have a hard time conceiving.

"There's nothing magic about the exact age of 35," Dr. Mooney says, "but your pregnancy risks do increase as you age. For many people, it becomes more difficult to achieve pregnancy, and miscarriage rates go up, as well."

It’s not impossible or even unusual to get pregnant beyond age 35. In theory, you may be able to get pregnant right up until you reach menopause, which marks the end of your reproductive years.

```
select avg(Age) as Average_Age_of_women_With_Diabetes from Diabetes where Outcome=1;
```

	Average_Age_of_women_With_Diabetes
▶	37.0672

```
select avg(Age) as Average_Age_of_women_With_no_Diabetes from Diabetes where Outcome=0;
```

	Average_Age_of_women_With_no_Diabetes
▶	31.1900

```
select avg(SkinThickness) as Average_Skin_thickness_women_With_Diabetes from Diabetes where Outcome=1;
```

	Average_Skin_thickness_women_With_Diabetes
▶	22.1642

```
select avg(SkinThickness) as Average_Skin_thickness_women_With_no_Diabetes from Diabetes where Outcome=0;
```

	Average_Skin_thickness_women_With_no_Diabetes
▶	19.6640

♀ 23 mm triceps skin-fold thickness A value used to estimate body fat, which is measured on the right arm halfway between the olecranon process of the elbow and the acromial process of the scapula ; normal: ♂ 12 mm; ♀ 23 mm; Cf Body-mass index, Mid-arm muscle mass, Obesity.

```
select count(*) as Under_Weight_Women from Diabetes where BMI<18;
```

	Under_Weight_Women
▶	11

```
select count(*) as Healthy_Weight_Women from Diabetes where BMI>=18 and BMI<25;
```

	Healthy_Weight_Women
▶	106

```
select count(*) as Over_Weight_Women from Diabetes where BMI>=25 and BMI<30;
```

	Over_Weight_Women
▶	179

```
select count(*) as Obese_Women from Diabetes where BMI>=30 and BMI<35;
```

	Obese_Women
▶	224

```
select count(*) as Severely_Obese_Women from Diabetes where BMI>=35 and BMI<40;
```

	Severely_Obese_Women
▶	150

```
select count(*) as Morbidly_Obese_Women from Diabetes where BMI>=40;
```

	Morbidly_Obese_Women
▶	98

```
select count(*) as Over_Weight_With_Diabetes from Diabetes where BMI>=25 and Outcome=1;
```

	Over_Weight_With_Diabetes
▶	259

```
select avg(Diabetes_pedigree_function) as
Average_Diabetes_Pedigree_function_Value_for_UnderWeight_Diabetes_Function
from Diabetes where BMI<25 and Outcome=1;
```

	Average_Diabetes_Pedigree_function_Value_for_UnderWeight_Diabetes_Function
▶	0.3448888858159383

```
select avg(Diabetes_pedigree_function) as
Average_Diabetes_Pedigree_function_Value_for_OverWeight_Diabetes_Function
from Diabetes where BMI>=25 and Outcome=1;
```

	Average_Diabetes_Pedigree_function_Value_for_OverWeight_Diabetes_Function
▶	0.557644790117575

```
select avg(Pregnancies),age from Diabetes group by age order by age asc;
```

	avg(Pregnancies)	age
▶	1.0794	21
	1.5556	22
	1.5789	23
	1.8913	24
	1.7708	25
	1.9697	26
	2.5625	27
	3.0286	28
	3.3103	29
	3.6190	30
	3.8750	31
	4.4375	32
	4.0588	33
	5.8571	34
	5.0000	35
	5.1875	36
	5.2632	37
	6.8750	38
	7.4167	39

	6.2308	40
	6.5000	41
	6.8889	42
	7.7692	43
	7.2500	44
	7.3333	45
	6.3846	46
	8.3333	47
	8.8000	48
	7.6000	49
	6.7500	50
	8.6250	51
	4.6250	52
	5.4000	53
	7.0000	54
	5.5000	55
	8.0000	56
	8.8000	57
	7.1429	58
	2.3333	59
	6.0000	60
	5.5000	61
	3.7500	62
	5.5000	63
	8.0000	64
	3.3333	65
	5.0000	66
	4.0000	67
	8.0000	68
	5.0000	69
	4.0000	70
	2.0000	72
	9.0000	81

```
select avg(Bp),age from Diabetes group by age order by age asc;
```

	avg(Bp)	age
▶	65.9365	21
	63.7222	22
	64.3158	23
	64.9565	24
	59.6667	25
	64.1818	26
	73.5000	27
	68.3143	28
	68.2414	29
	64.8571	30
	64.3750	31
	70.0625	32
	65.6471	33
	74.0000	34
	75.6000	35
	69.1250	36
	75.9474	37
	71.1250	38
	72.6667	39
	69.2308	40
	67.5909	41
	73.3889	42
	78.4615	43
	61.7500	44
	83.0667	45
	76.0000	46
	78.3333	47
	78.4000	48
	81.4000	49
	78.2500	50
	84.5000	51
	81.5000	52
	79.0000	53
	89.3333	54
	70.2500	55
	76.3333	56
	76.8000	57
	78.2857	58

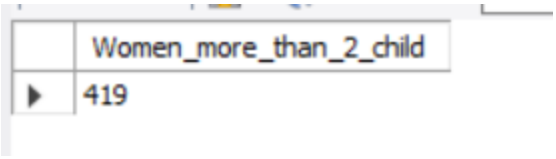
74.0000	59
80.0000	60
76.0000	61
71.5000	62
78.0000	63
78.0000	64
78.6667	65
86.0000	66
72.6667	67
82.0000	68
81.0000	69
82.0000	70
0.0000	72
74.0000	81

```
select avg(Outcome),age from Diabetes group by age order by age asc;
```

avg(Outcome)	age
0.0794	21
0.1528	22
0.1842	23
0.1739	24
0.2917	25
0.2424	26
0.2500	27
0.2857	28
0.4483	29
0.2857	30
0.5417	31
0.5625	32
0.5882	33
0.2857	34
0.5000	35
0.6250	36
0.3158	37
0.6250	38
0.2500	39

	0.4615	40
	0.5909	41
	0.3889	42
	0.8462	43
	0.6250	44
	0.5333	45
	0.5385	46
	0.6667	47
	0.2000	48
	0.6000	49
	0.6250	50
	0.6250	51
	0.8750	52
	0.8000	53
	0.6667	54
	0.2500	55
	0.6667	56
	0.2000	57
	0.4286	58
	0.6667	59
	0.4000	60
	0.5000	61
	0.5000	62
	0.0000	63
	0.0000	64
	0.0000	65
	0.5000	66
	0.3333	67
	0.0000	68
	0.0000	69
	1.0000	70
	0.0000	72
	0.0000	81

```
select count(*) as Women_more_than_2_child from Diabetes where Pregnancies>2;
```



	Women_more_than_2_child
▶	419

What Causes Gestational Diabetes?

Gestational diabetes occurs when your body can't make enough insulin during your pregnancy. Insulin is a hormone made by your pancreas that acts like a key to let blood sugar into the cells in your body for use as energy.

During pregnancy, your body makes more hormones and goes through other changes, such as weight gain. These changes cause your body's cells to use insulin less effectively, a condition called insulin resistance. Insulin resistance increases your body's need for insulin.

All pregnant women have some insulin resistance during late pregnancy. However, some women have insulin resistance even before they get pregnant. They start pregnancy with an increased need for insulin and are more likely to have gestational diabetes.

Colab Analysis

```
[ ] np.mean(data['Pregnancies'])
```

```
3.8450520833333335
```

```
[ ] np.mean(data["BMI"])
```

```
31.992578124999998
```

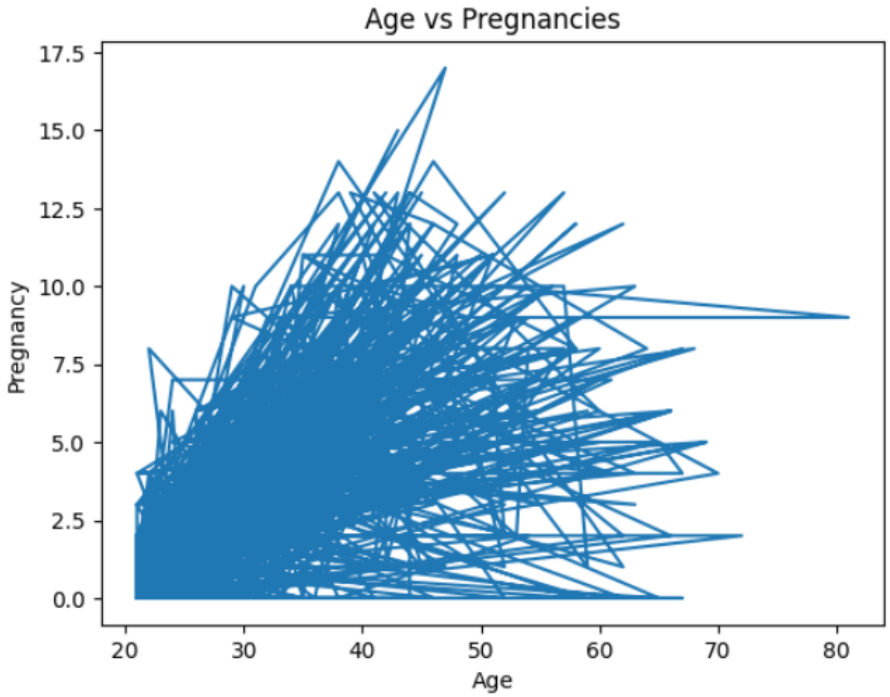
```
[ ] np.mean(data['BloodPressure'])
```

```
69.10546875
```

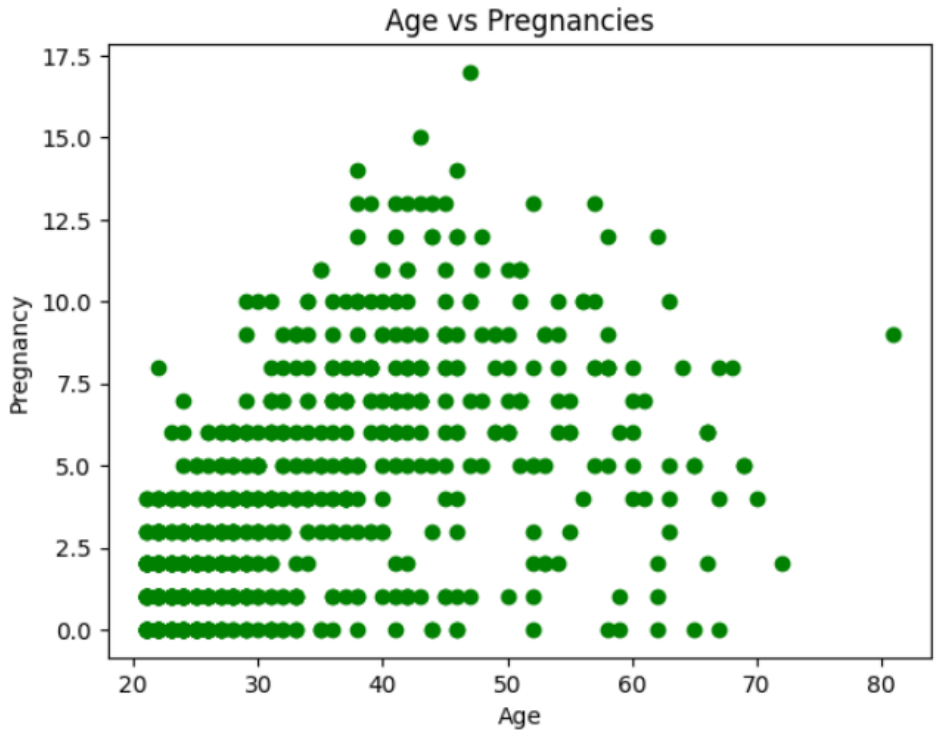
```
[ ] np.mean(data['Glucose'])
```

```
120.89453125
```

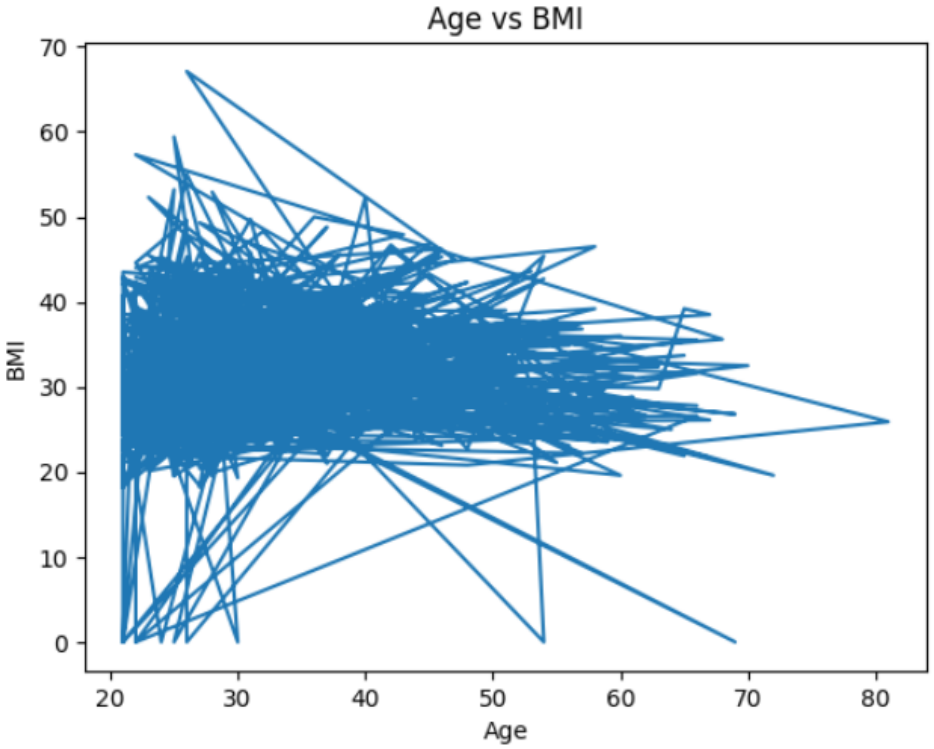
```
plt.plot(data['Age'],data['Pregnancies'])
plt.title("Age vs Pregnancies")
plt.xlabel("Age")
plt.ylabel("Pregnancy")
plt.show()
```



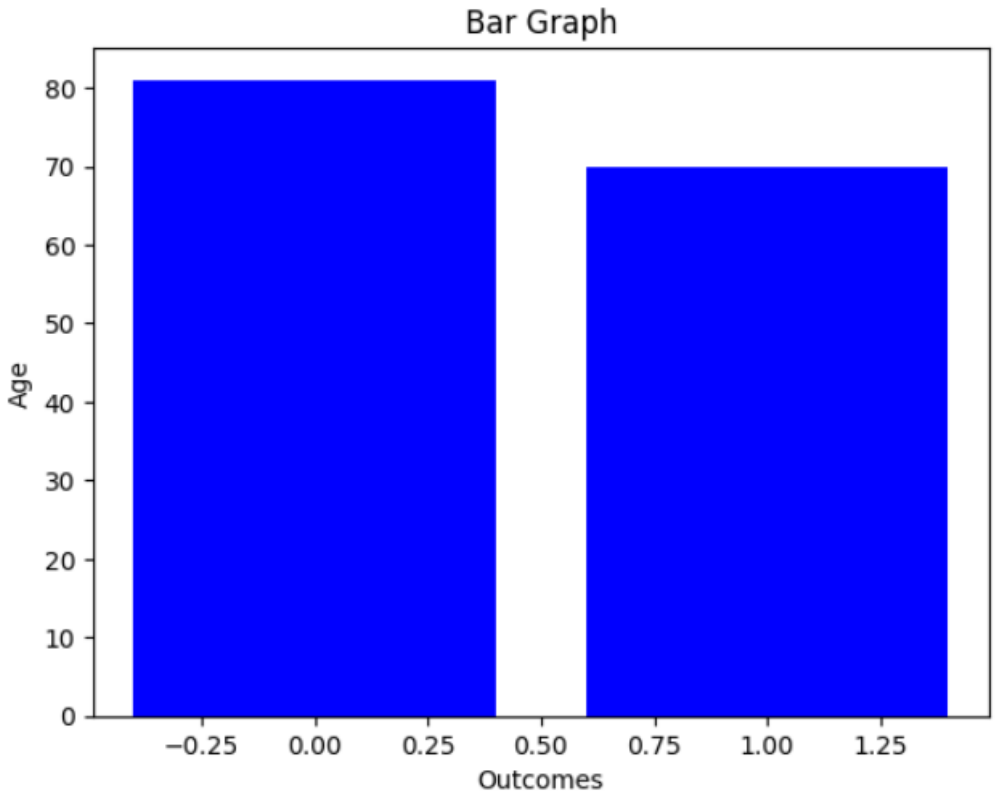
```
[ ]  plt.plot(data['Age'],data['Pregnancies'],"go")
     plt.title("Age vs Pregnancies")
     plt.xlabel("Age")
     plt.ylabel("Pregnancy")
     plt.show()
```



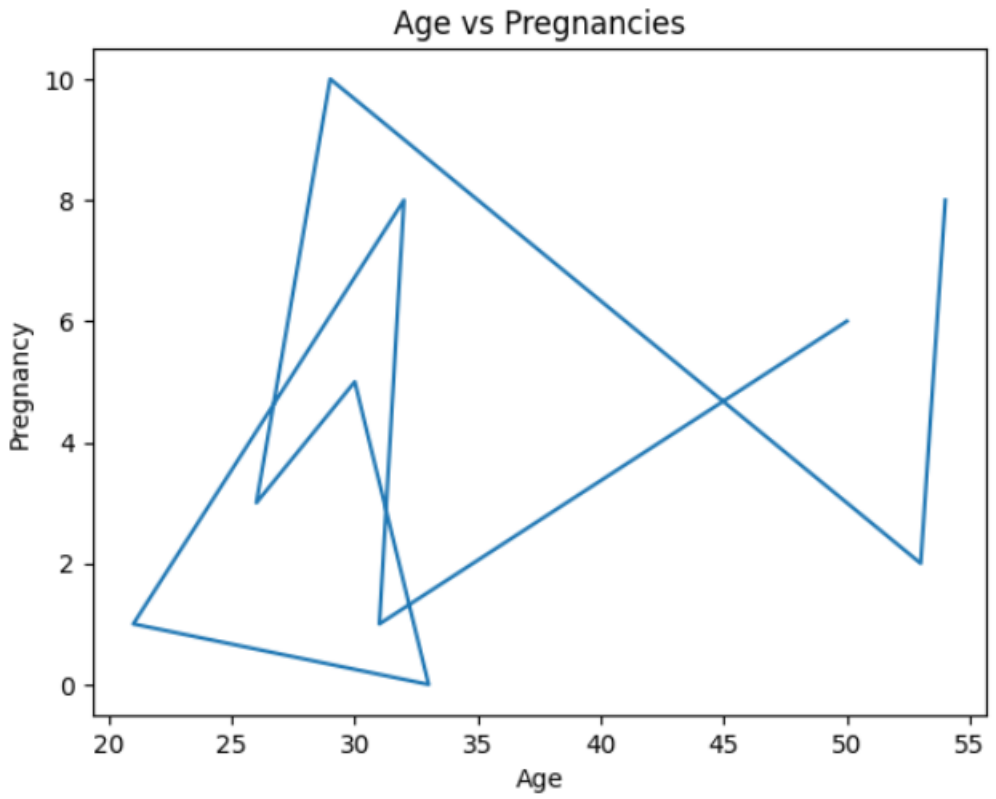
```
[ ]  plt.plot(data['Age'],data['BMI'])
     plt.title("Age vs BMI")
     plt.xlabel("Age")
     plt.ylabel("BMI")
     plt.show()
```



```
[ ]  divisions=data['Outcome']
     division_scores=data['Age']
     plt.bar(divisions,division_scores,color='blue')
     plt.title("Bar Graph")
     plt.xlabel("Outcomes")
     plt.ylabel("Age")
     plt.show()
```



```
plt.plot(data.head(10)['Age'],data.head(10)['Pregnancies'])
plt.title("Age vs Pregnancies")
plt.xlabel("Age")
plt.ylabel("Pregnancy")
plt.show()
```



Precaution to avoid Gestational Diabetes:-

Not everyone will be able to prevent gestational diabetes, but there are ways you can reduce the risk of developing the disease. First, get healthy before conceiving by losing weight, incorporating a well-balanced diet and exercise

regimen in your routine, and eliminating smoking. Once pregnant, be sure to have your blood glucose testing done as prescribed and maintain a healthy lifestyle. Ensuring you get enough sleep can also help reduce your risk of gestational diabetes.