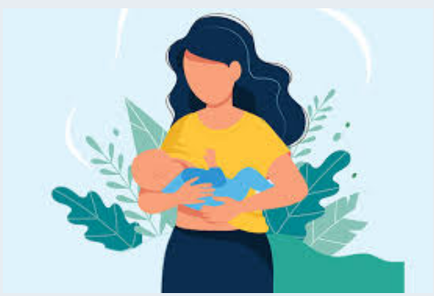
MATERNAL HEALTH PHASE 8



INTRODUCTION AND OBJECTIVE

The **Maternal Health Project** in Power BI aims to leverage data-driven insights to improve maternal health care delivery by visualizing and analyzing various indicators. It is to understand the impact of maternal fat on labor and delivery outcomes.

The primary analysis was done on visceral adipose tissue and subcutaneous adipose tissue. By analyzing these fat deposits, we aim to uncover their impact on gestational health and birth outcomes, enhancing our understanding of potential risks and improving maternal care. The primary objective is to provide actionable insights into maternal health by transforming complex data into meaningful visual reports.

DATASET LINK : Maternal Health

ORGANIZERS

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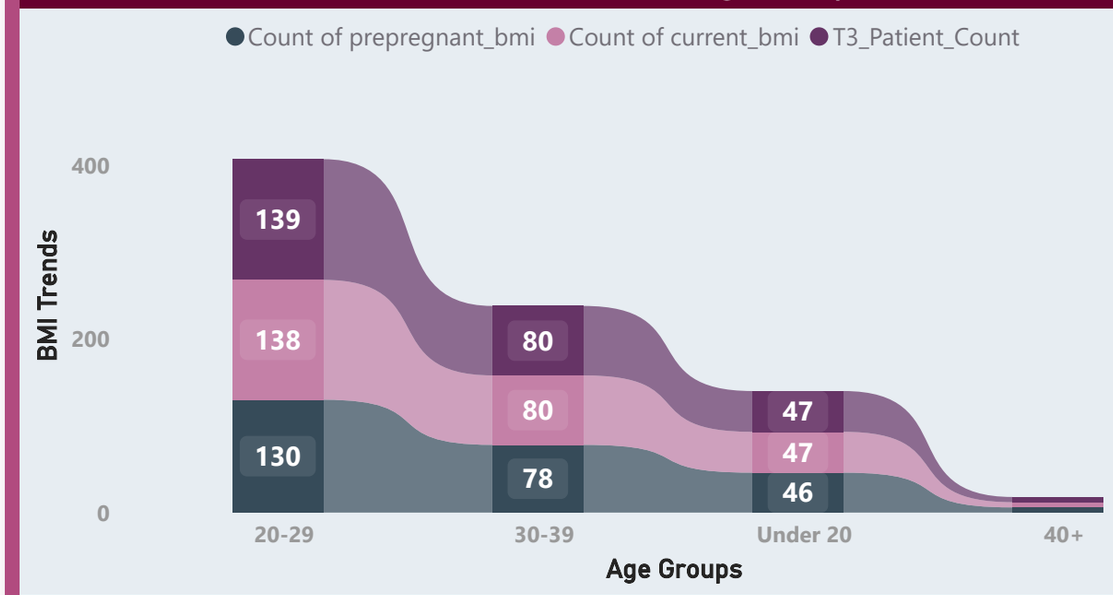
MATERNAL ANALYSIS OF DEMOGRAPHICS

Total Patients	Avg PrePregnant BMI	Average Age	Minimum Age	Maximum Age
272	27	26	15	43

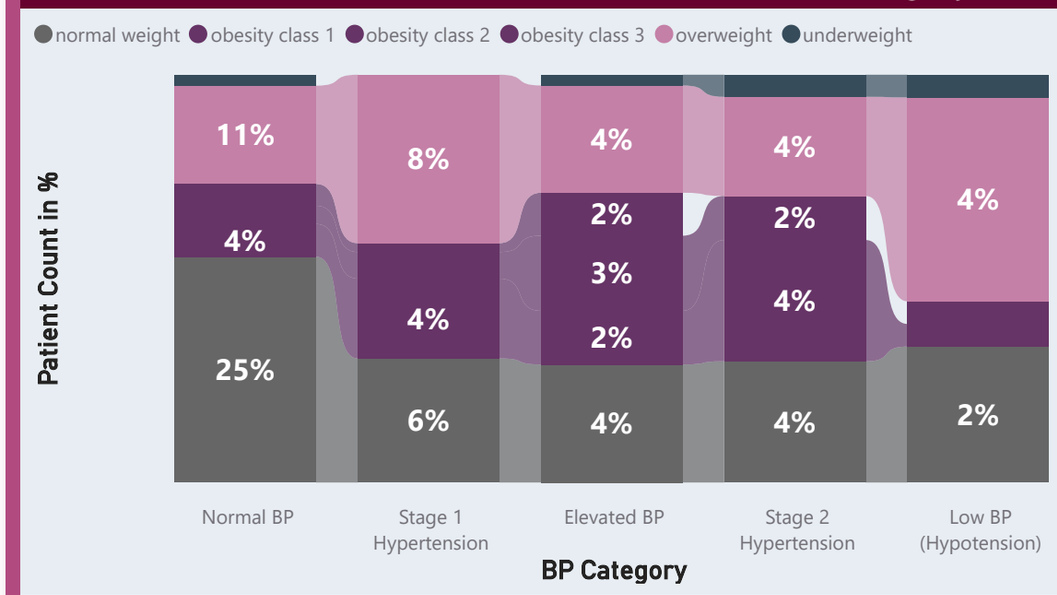
Patients Excluded	Patients Observed	Chronic Diabetes	GDM Patients	Chronic Hypertension	Gestational HTN
61	211	7%	9%	4%	13%

BMI Trends Across Age Groups



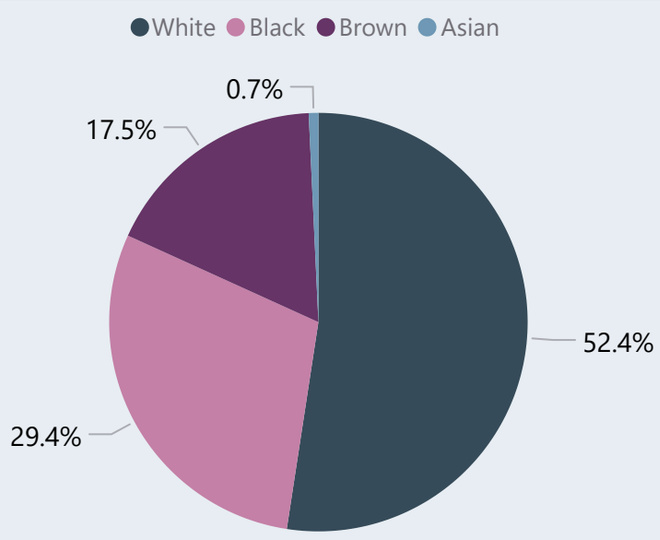
The majority (51.10%) of patients fall within the 20-29 age group, followed by 30-39 (29.41%), under 20 (17.28%), and 40+ (2.21%). This distribution shows that most pregnancies occur in the 20-29 age range, which is the most common reproductive age.

Blood Pressure distribution based on BMI Category



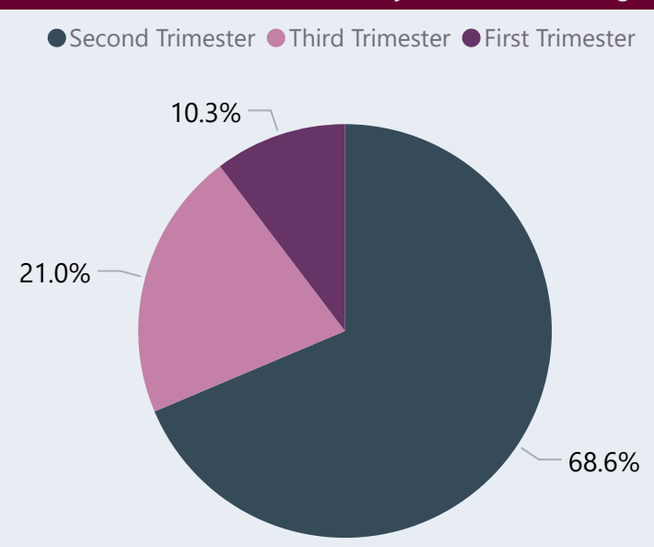
At the initial stages of Pregnancy, 11% of the Obese patients had hypertension and 7% of the Obese patients had elevated BP which implies that they are under the state of developing hypertension.

Ethnicity Distribution



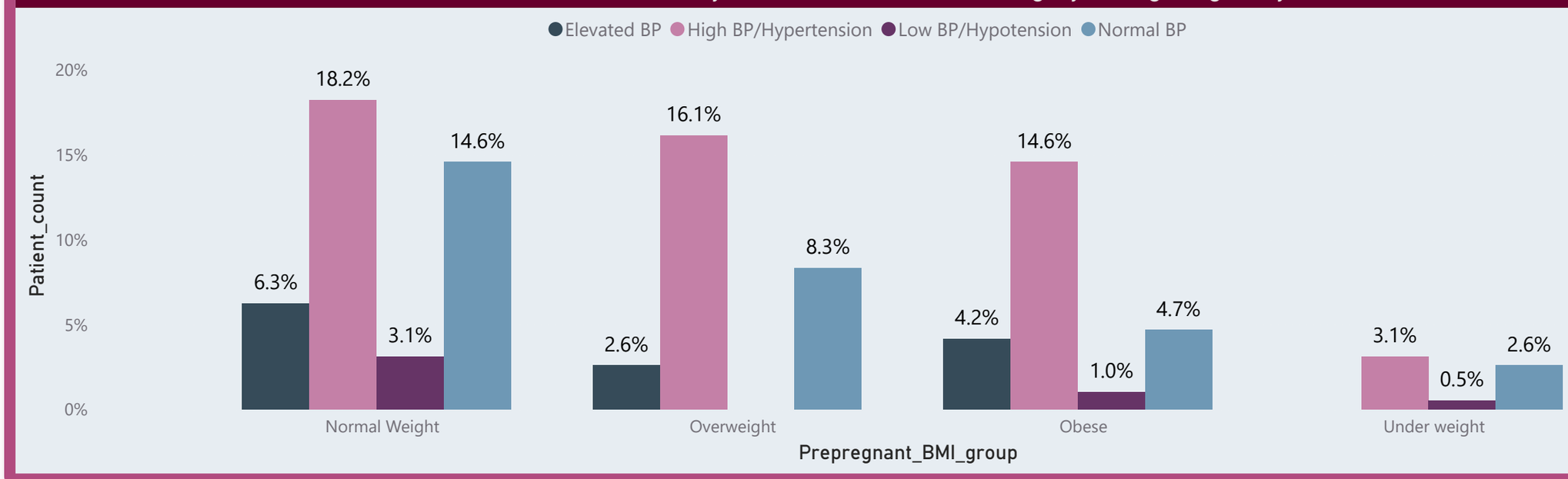
Most of the women in this dataset belong to White Ethnicity group showing 52%.

Patients Enrollment By Gestational Age



68.6% patients joined the study in the second trimester, followed by 21% in the third trimester, with few, 10.3% in the first trimester, highlighting inclusion timing during pregnancy.

Patient Distribution by BMI Classification, BP Category during Pregnancy



Number of High BP/Hypertension women are more in all BMI categories.

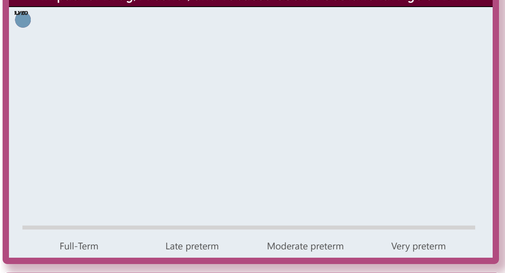
LIFESTYLE & NUTRITION

Alcohol Percentage	Tobacco Percentage	Drug Percentage	Balanced Diet
17%	19%	4%	22%

Please select the substance category

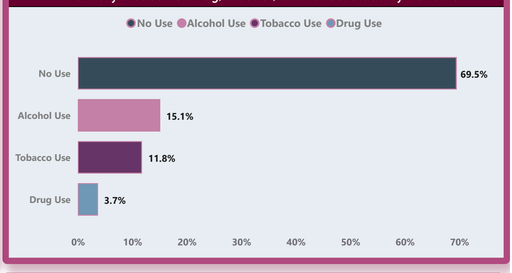
Alcohol Use | Drug Use | No Use | Tobacco Use

Impact of Drug, Alcohol, and Tobacco Use on Gestational Age at Birth



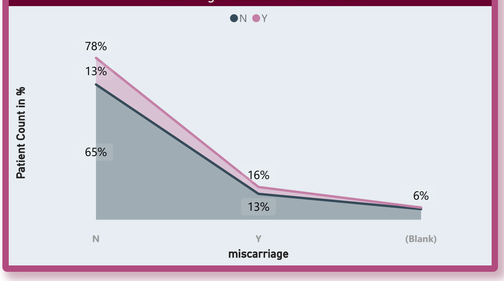
Alcohol, drug, and tobacco use significantly contributed to preterm births, with tobacco use showing the highest impact on full-term outcomes

Delivery Modes vs. Drug, Alcohol, and Tobacco Use by Patients



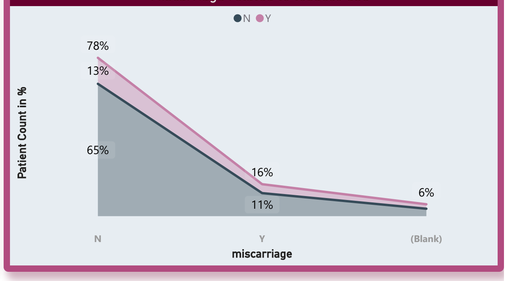
Drug use notably increasing the rate of cesarean deliveries

Miscarriage related to alcohol use



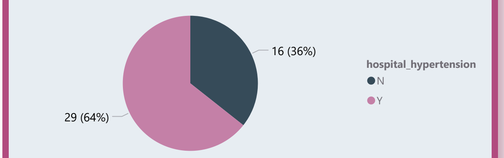
16% of the total patients had miscarriage and among this,3 % are reported to have alcohol use.

Miscarriage related to tobacco use



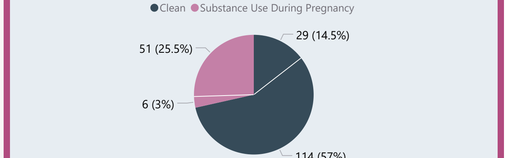
16% of the total patients had miscarriage and among this,5 % are reported to have Tobacco use

Miscarriage Percentage By Hospital Hypertension



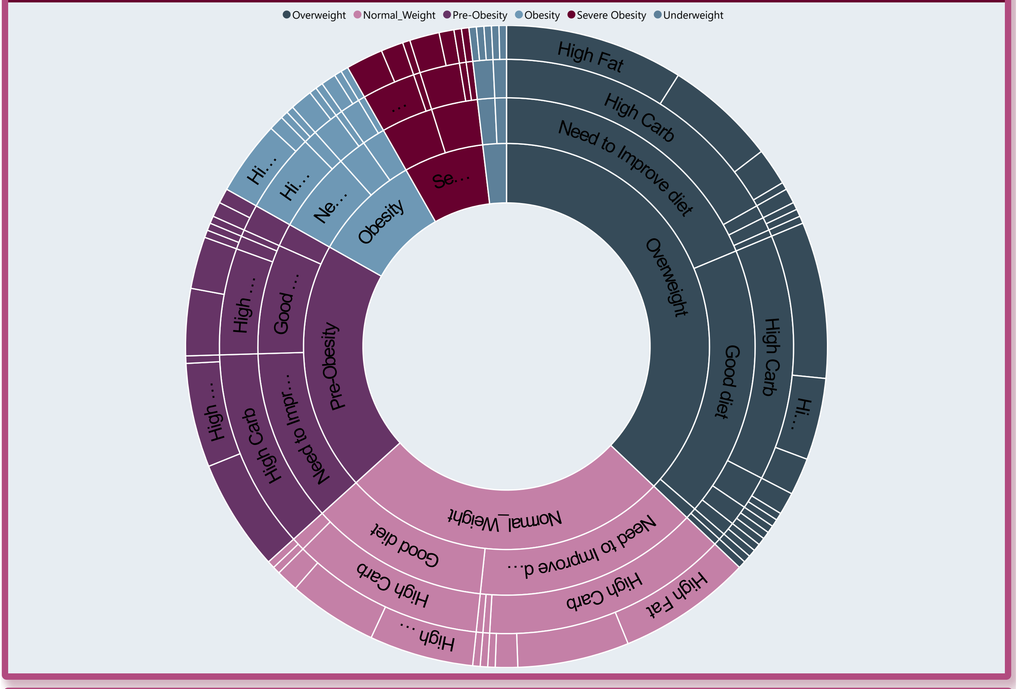
64.36 % of patient has hypertension with miscarriage. The miscarriage percentage increases significantly with the severity of hypertension

Substance Use in Mothers and Airway Aspiration in Newborns



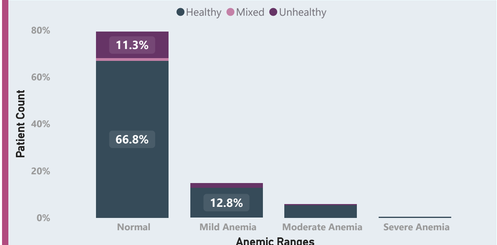
Of all the newborns with airway aspiration, 17% of them had mothers who used either alcohol or tobacco, or both during pregnancy and 87% of them had mother who were clean of substance use.

Impact of High Carb Diet On BMI and Fat



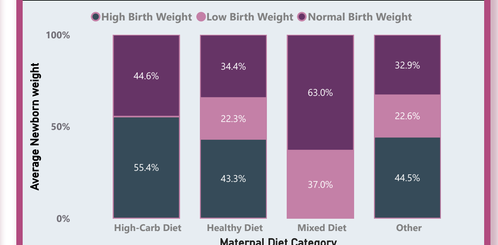
Overweight (37%) is linked to high carbohydrate intake (16%) ,increased periumbilical fat (9%) and need to improve diet (18%), highlighting the need for dietary improvements.

% of Patients by anemic_ranges and Food_Health_Category



The stacked bar chart displays the percentage of patients in different anemia categories (Normal, Mild, Moderate, Severe) and their corresponding food health categories (Healthy, Mixed, Unhealthy). It suggests a correlation between Unhealthy eating habits and anemia, particularly in the normal to mild anemia ranges, where a large percentage of patients also report healthy food choices.

Newborn_weight by Maternal_Diet_Category

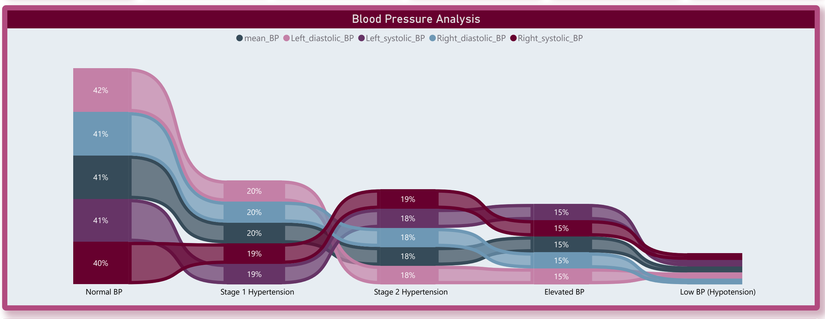


Newborns from mothers on a high-carb diet had the highest percentage of high birth weight (55.44%), while a healthy diet showed a more balanced distribution across birth weight categories.

LAB ANALYSIS

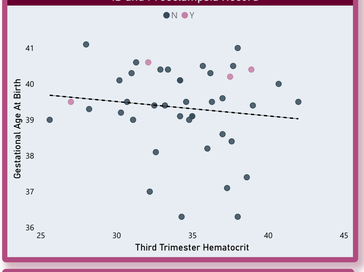
Syphillis%	Hepatitis C %	HIV %	Vaginal Deliveries	Cesarean Deliveries	Fasting Glucose
6.7	1.1	1.1	53%	22%	52%

Blood Pressure Analysis



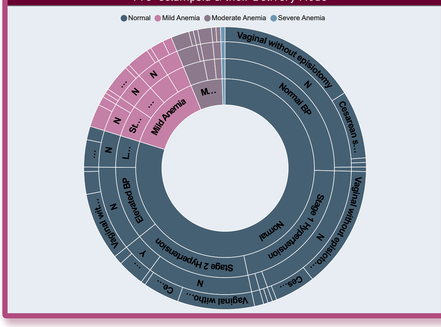
During pregnancy, the Normal Blood Pressure (BP) category is predominant among patients in this dataset, with the mean BP, systolic BP, and diastolic BP values collectively accounting for approximately 41%. Following Normal BP, the stage 1 Hypertension and Stage 2 Hypertension are observed in significant proportions

Third Trimester Hematocrit and Gestational Age At Birth by Case ID and Preeclampsia Record



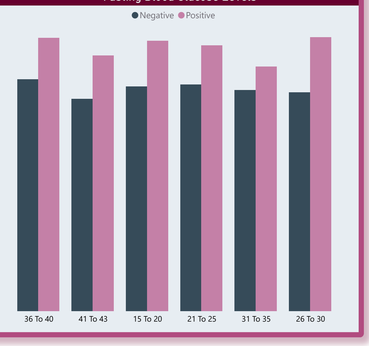
- **Hematocrit screening** is useful for early diagnosis of pre-eclampsia during pregnancy. Women with hematocrit above the cut-off of 38% should be monitored carefully for the signs of pre-eclampsia.
- **Increased hematocrit levels** in the second half of pregnancy or lack of reduction of hematocrit levels in the second half compared to the first half can estimate preeclampsia.
- **Preeclampsia** affects the arteries carrying blood to the placenta. Preeclampsia may lead to an unplanned **preterm birth**. Also, planned preterm birth is a primary treatment for preeclampsia.

Analysis of Patients on Anemic Ranges, Hospital Hypertension, Presence of Pre-eclampsia & their Delivery Mode



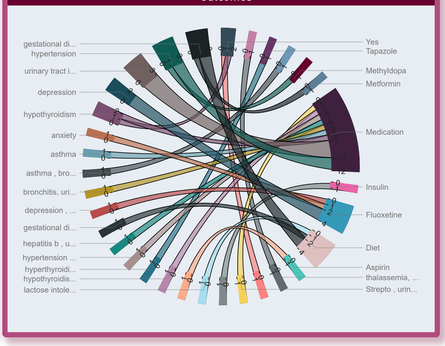
This Sunburst chart is for understanding the patients health conditions. We can understand how Anemia plays a roll in Blood pressure of a patient during labor and the occurrence of pre-eclampsia and the delivery modes of patients.

Impact of Age and Gestational Diabetes Status on First Trimester Fasting Blood Glucose Levels



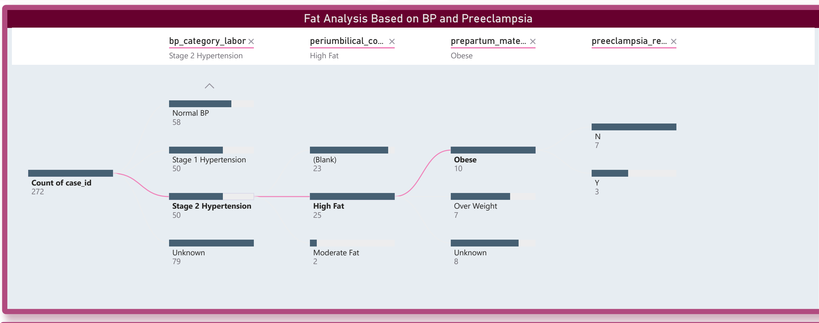
Mothers with gestational diabetes have higher average first trimester fasting blood glucose levels across all age groups compared to those without gestational diabetes, with the 26-30 age group showing the highest levels

Influence of Pregnancy-Related Diseases and Treatments on Newborn Weight Outcomes



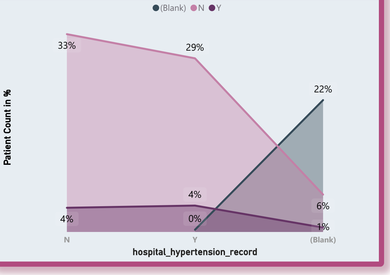
Understanding how disease diagnoses and treatments correlate with newborn weight can help healthcare providers monitor the effectiveness of interventions and adjust care for future pregnancies. It can also highlight the need for more personalized care based on maternal health status.

Fat Analysis Based on BP and Preeclampsia



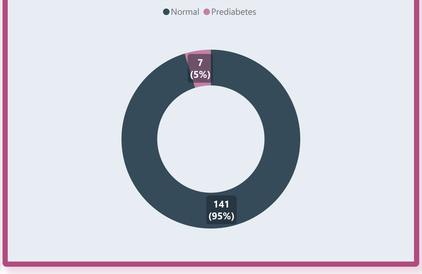
Patients with Stage 2 Hypertension had a subset with High Fat levels, some of whom were classified as Obese. Among the Obese group, 30% developed Preeclampsia. This visualization highlights potential correlations between hypertension, fat accumulation, maternal weight, and preeclampsia incidence.

Relation between Hypertension and Diabetes



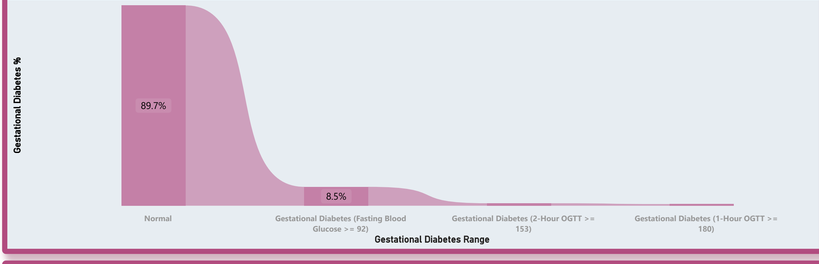
Among 9% of total diabetic patients ,half the percentage i.e around 4% had hypertension which implies a strong correlation between hypertension and diabetes.

Fasting Blood Glucose Category



7(5%) Patients are found to be Pre Diabetic in this dataset.

Patients by Gestational Diabetes Range



89.7 % of the patients were in the normal blood glucose range, 8.5% of them had elevated blood glucose levels, followed by a smaller group of people have very high levels OGTT in first and second hours.

FAT ASSESSMENT AND ANTHROPOMETRY

Avg_Waist Hip Ratio

0.88

This chart show the key influencers for obese body fat.

When considering GDM, Hypertension and Waist Hip Ratio, we get to observe that WHR increases the chances of obesity by 1.44 times.

Key influencer for body fat

Key influencers | Top segments

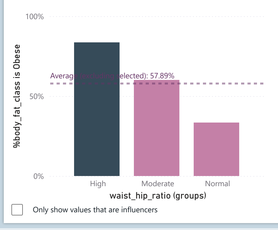
What influences body_fat_class to be Obese ?

When... ...the likelihood of body_fat_class being Obese increases by

waist_hip_ratio is High 1.44x

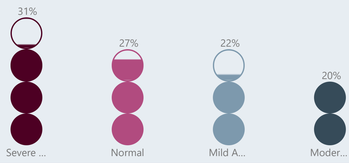
GDM_Category is GDM 1.44x

body_fat_class is more likely to be Obese when waist_hip_ratio is High than otherwise (on average).



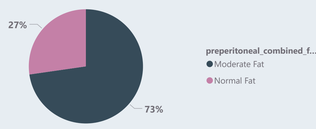
Only show values that are influencers

Effect of Fat on Hemoglobin



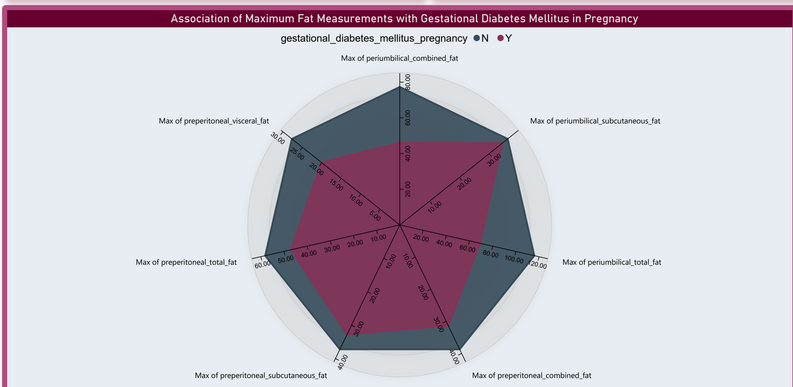
This chart highlights the relationship between maternal fat and hemoglobin. Most women with high fat levels suffer from severe anemia, while 20% maintain moderate anemia, indicating that fat accumulation worsens anemia.

Preperitoneal Combined Fat Distribution with Hypertension past reported



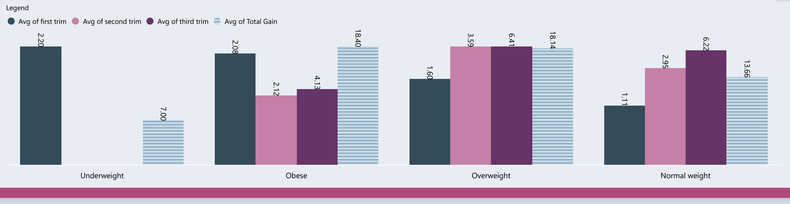
The graph assesses the effect of Preperitoneal Fat Distribution in patients reported with hypertension. It reveals that 72.73% of these patients fall into the "Moderate Fat" category, suggesting a potential link between increased preperitoneal fat and hypertension prevalence. This insight highlights the importance of managing preperitoneal fat levels as a possible strategy to reduce hypertension risk.

Association of Maximum Fat Measurements with Gestational Diabetes Mellitus in Pregnancy



The relationship between maximum fat measurements (subcutaneous, visceral, and combined) and Gestational Diabetes Mellitus provides valuable insights into how maternal fat distribution contributes to insulin resistance and the development of GDM. Recognizing these associations can help healthcare providers identify at-risk individuals and implement early interventions to improve maternal and fetal health outcomes.

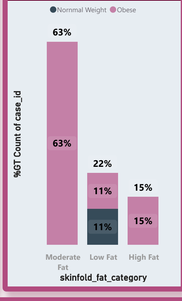
Weight Gain across every trimester



Obese individuals have the highest average weight gain, mostly in the first trimester, while normal and overweight groups gain weight more steadily; underweight individuals show the lowest overall gain.

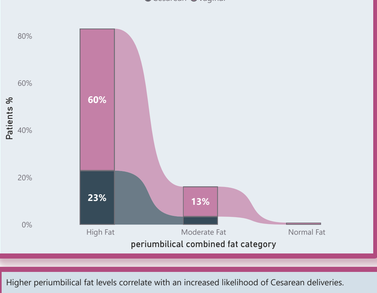
Skinfold thickness impact on babies birth

Skin fold fat thickness with BMI

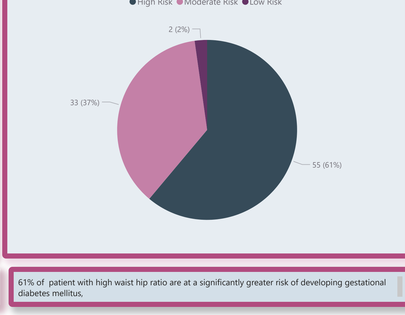


Gestational age at birth (how long the baby stays in the womb) and total skinfold thickness (a measure of body fat) are important factors in newborn health. Their relationship can provide insights into fetal growth, fat distribution, and metabolic health. With high fat distribution, it is clearly evident that it increase the preterm birth.
<30 --> Low Fat ,30-50 --> Moderate Fat,>50 --> High Fat

Periumbilical Combined Fat Impact on Delivery Mode



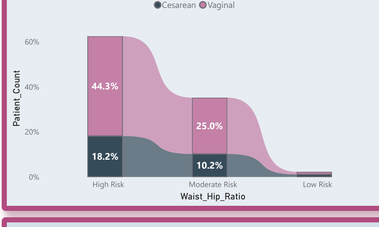
Gestational Diabetes Mellitus Pregnancy By Waist Hip Ratio Category



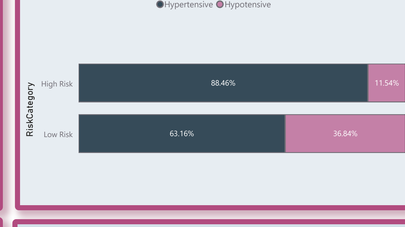
Higher periumbilical fat levels correlate with an increased likelihood of Cesarean deliveries.

61% of patient with high waist hip ratio are at a significantly greater risk of developing gestational diabetes mellitus,

Patient Count by Waist Hip Ratio Category and Delivery Modes



Skinfold Fat by Hypertension



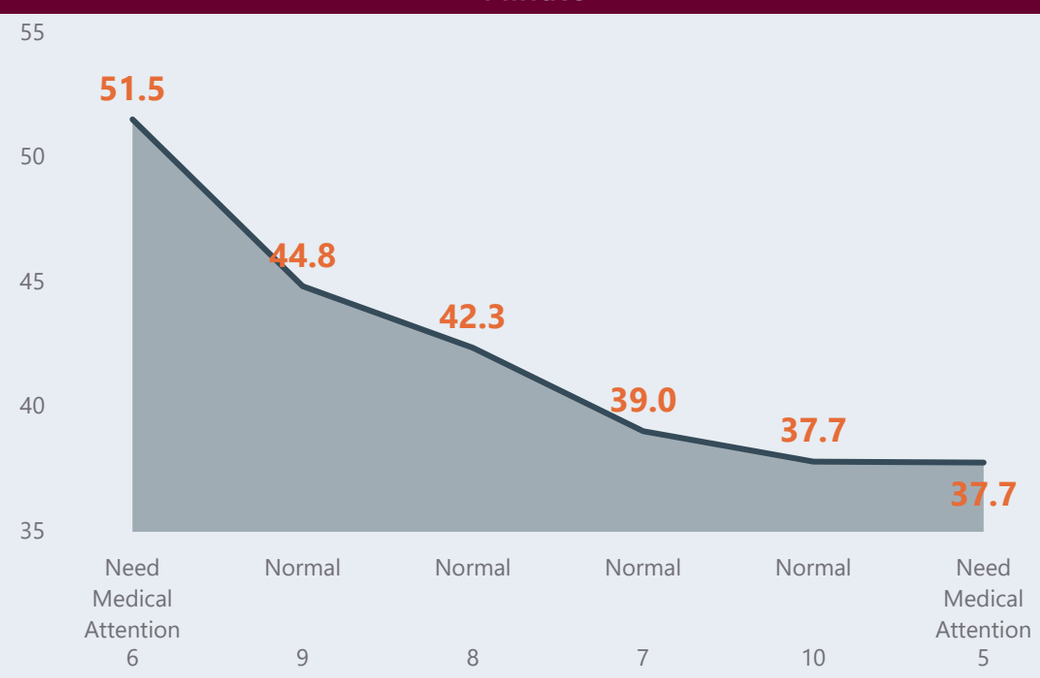
As Waist to Hip Ratio increases, the chances of having Cesarean section delivery also increase.

The Hypertension is increasing with High Risk category based on the Skin fold fat increase

LABOR & DELIVERY

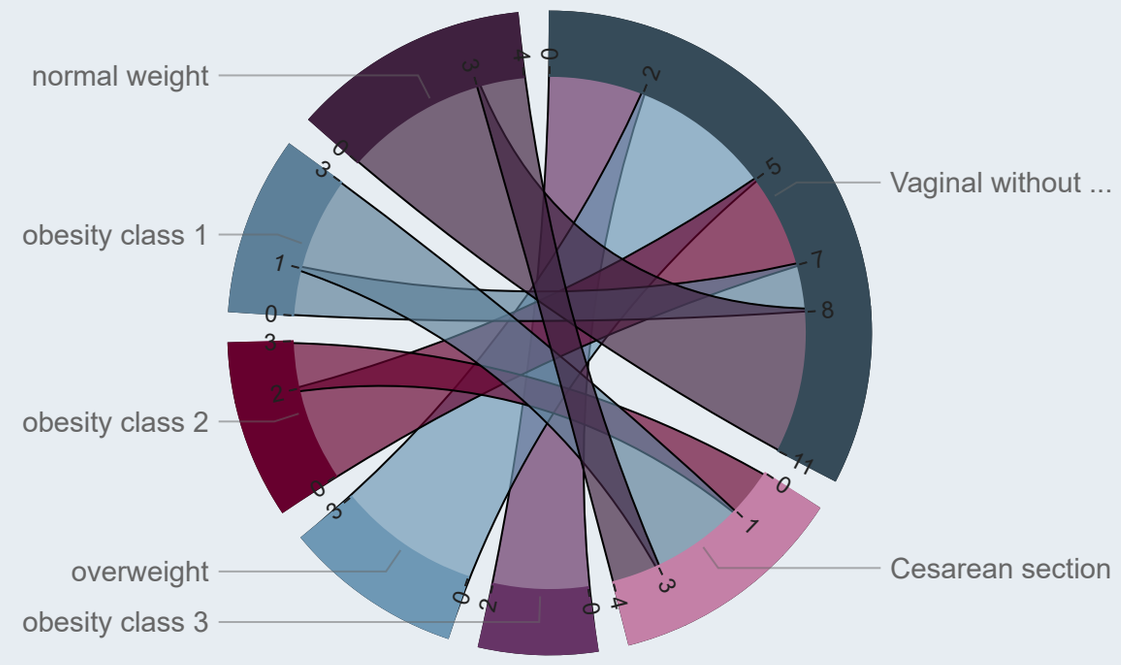
Cesarean Delivery	Vaginal Delivery	Low Birth Weight	Normal Birth Weight	Macrosomia
22%	53%	6%	89%	4%

Association Between Periumbilical Visceral Fat and Apgar Score at 1 Minute



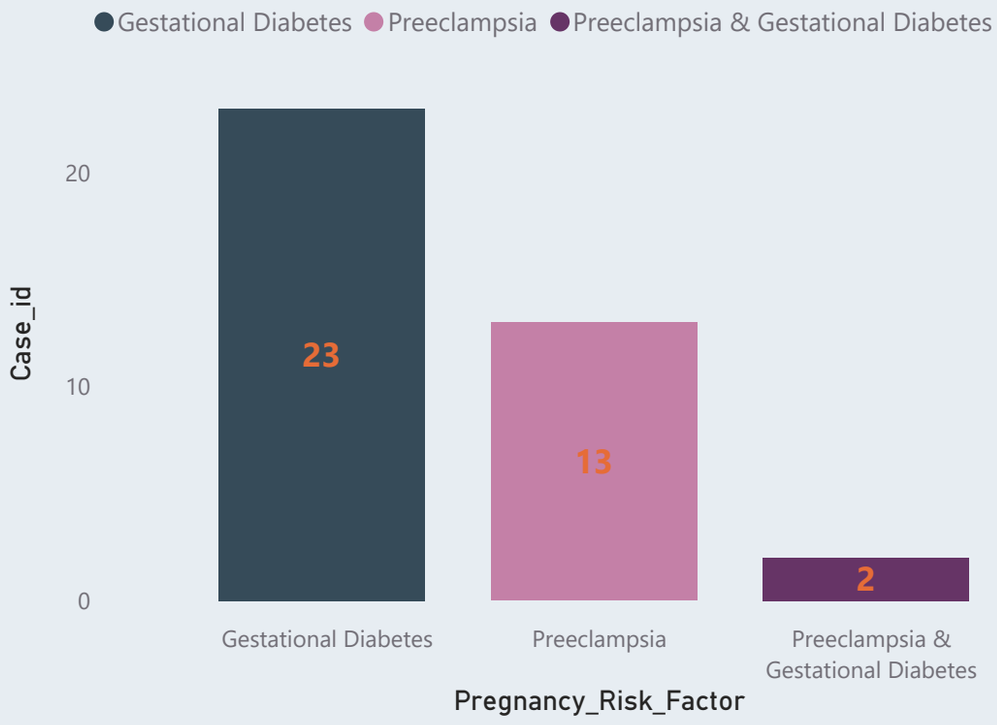
Extreme levels (above 51 and below 6) of visceral fat are linked to lower Apgar scores, emphasizing the importance of monitoring fat levels during pregnancy

Preeclampsia vs BMI vs Delivery mode



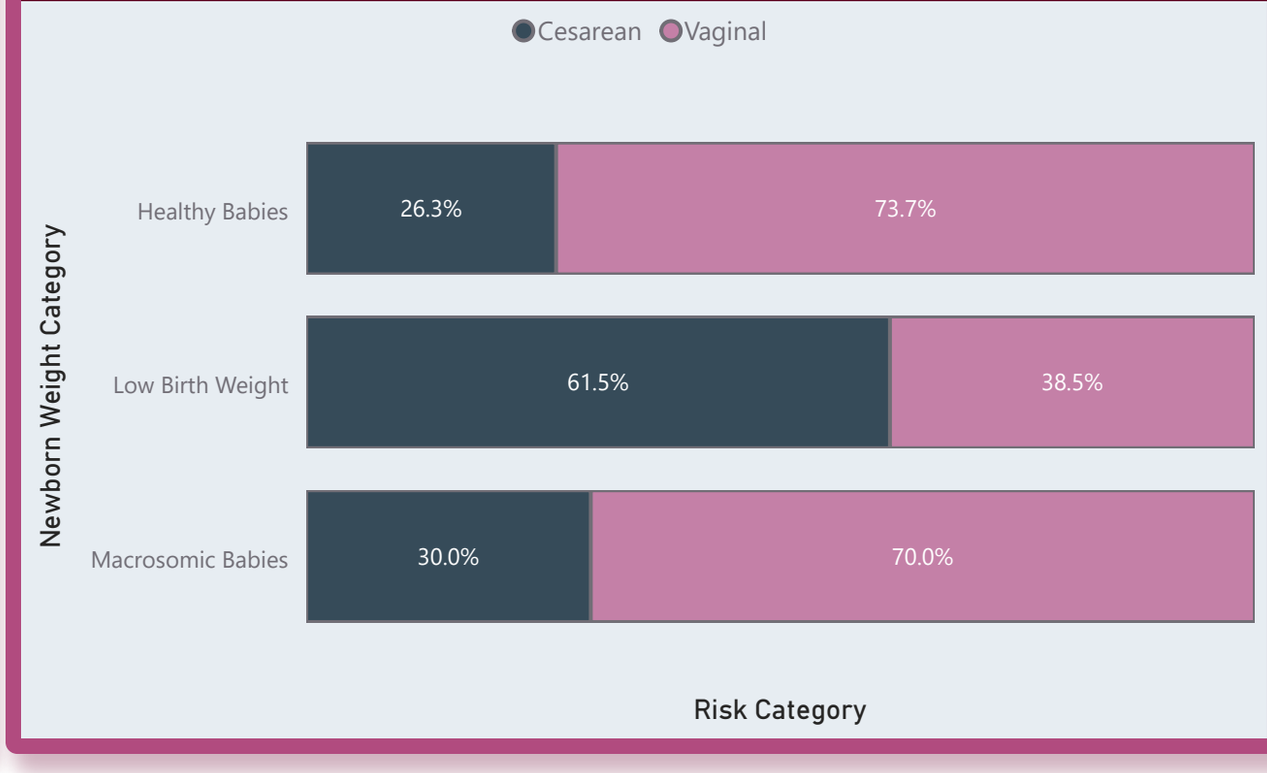
Coming to thic chord chart- A majority of preeclampsia patients fall into the overweight or obese category, reinforcing the link between excess body weight and preeclampsia risk. Also vaginal births show a higher prevalence of preeclampsia compared to cesarean deliveries

Comparison of Preeclampsia and Gestational Diabetes Incidence



This chart highlights the incidence of Gestational Diabetes and Preeclampsia. Gestational Diabetes had the highest count, with 23 cases It was significantly higher than Preeclampsia, which had 13 cases, and Preeclampsia & Gestational Diabetes combined, which had just 2 cases. This chart provides insight into the more frequent risk factor during pregnancy, helping prioritize healthcare interventions.

Risk Factors & Baby Outcome

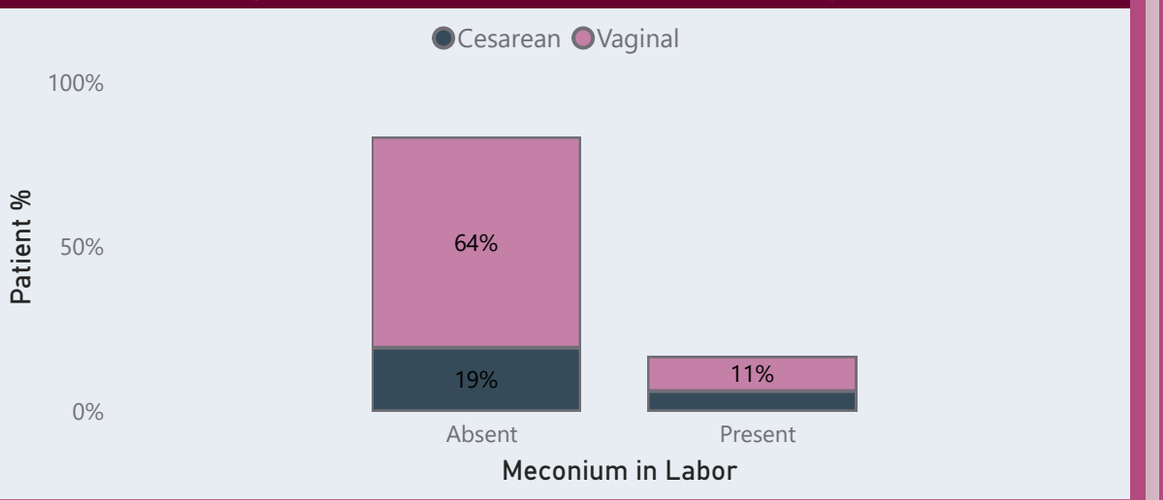


This chart examines how various risk factors, categorized by risk level, influence the choice or outcome of different delivery methods. It also includes newborn weights, categorized as macrosomia, low weight, and healthy, across different risk categories and delivery modes.

Pediatric Resuscitation Maneuvers

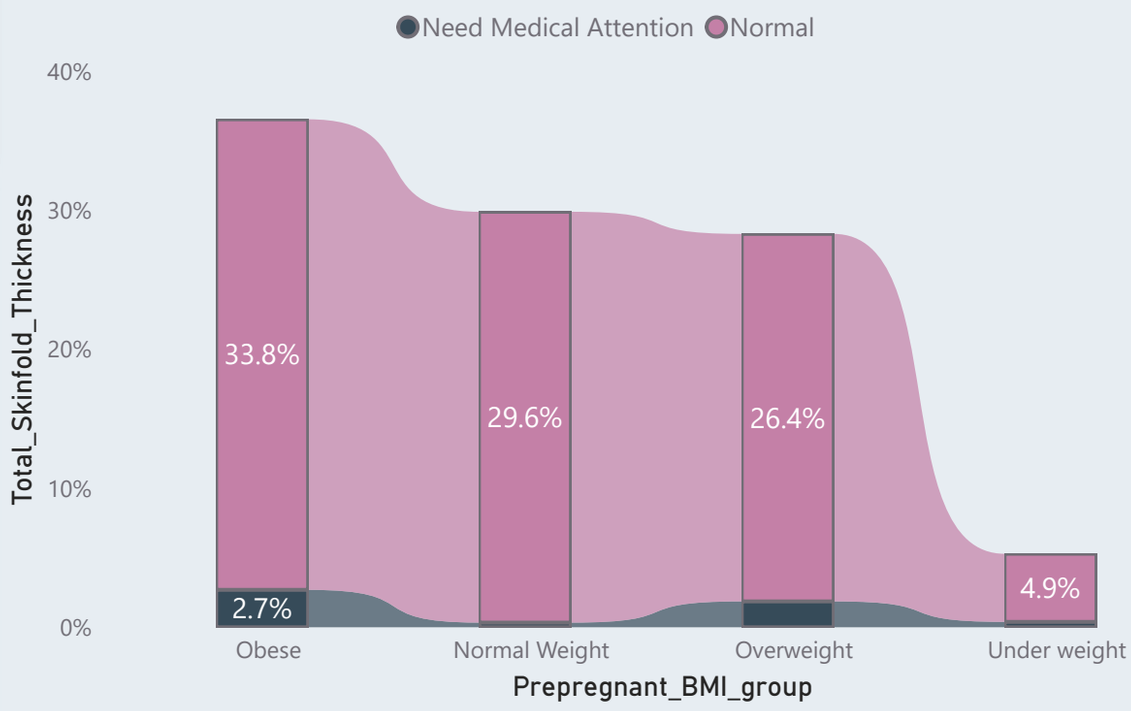
Select all	N	Y

Impact of Meconium in Labor on Delivery Mode



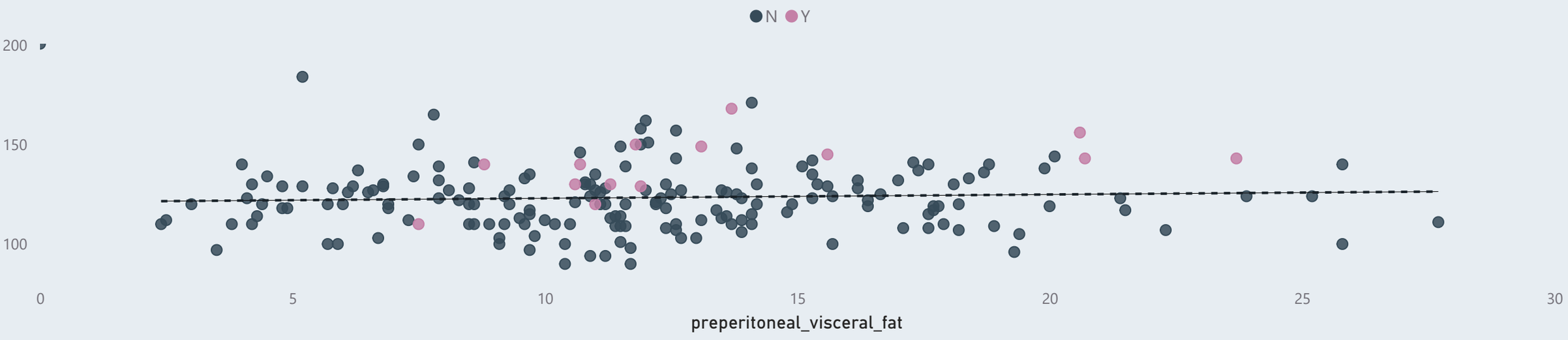
The inclusion of pediatric resuscitation maneuvers suggests that there is correlation between delivery conditions (meconium presence) and neonatal outcomes (need for resuscitation).

Impact of Pre-Pregnant BMI On Skinfold Thickness & Neonatal APGAR(1 Min)



This analysis examines the impact of pre-pregnant BMI on maternal skinfold thickness and neonatal APGAR scores at 1 minute, highlighting potential correlations between maternal body composition and newborn health outcomes

Preperitonial_Visceral_fat VS Hospital SBP



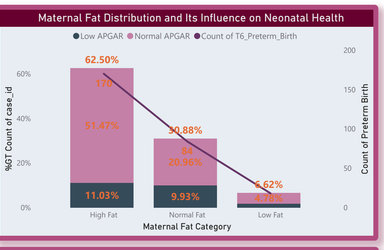
Preperitoneal visceral fat shows a positive correlation with hospital systolic blood pressure (SBP), indicating that increased visceral fat is associated with higher SBP. This suggests that fat distribution, rather than total visceral fat volume, plays a more significant role in predicting SBP in preeclampsia.

FETAL OUTCOMES

Meconium	Intubation	Newborn Airway Aspiration	Resuscitation Maneuvers
13%	2%	13%	14%

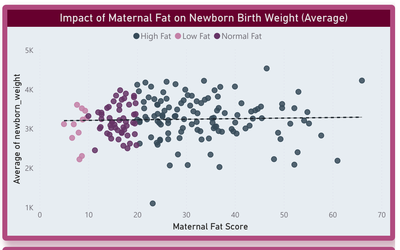
Preeclampsia	Avg. NewBorn Weight	Max of patient count on weigh fetal percentile	Hypertension Patients
5.5%	3.25Kg	62.42	13%

Maternal Fat Distribution and Its Influence on Neonatal Health



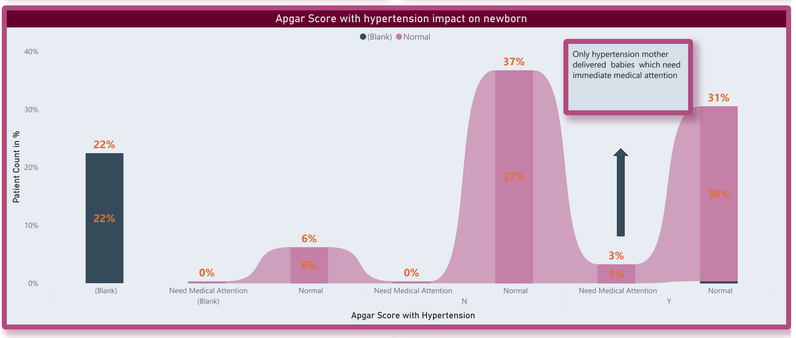
This chart examines maternal fat levels' impact on neonatal health. Normal fat levels correlate with the highest births. Higher maternal fat increases the risk of low APGAR scores (51.47% in high-fat cases) and preterm births. It also links to higher rates of gestational diabetes and C-sections, highlighting the need for maternal health monitoring to improve neonatal outcomes.

Impact of Maternal Fat on Newborn Birth Weight (Average)

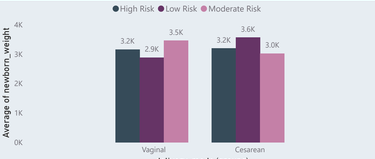


This scatter plot links maternal fat to newborn weight. Data point 4226 has the highest Maternal Fat Score (66), while 4534 has the highest Newborn Weight (4,534g), both in the High Fat category. Most newborns have a maternal fat score below 27.13 and weigh under 3,239.87g. The analysis suggests higher maternal fat may lead to larger babies, emphasizing its impact on birth weight.

Apgar Score with hypertension impact on newborn

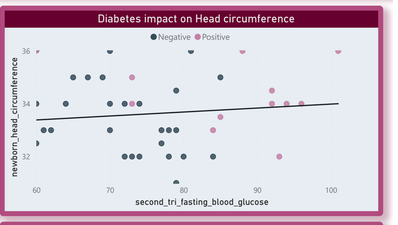


Average of Newborn Weight by delivery mode (groups) and waist hip ratio category



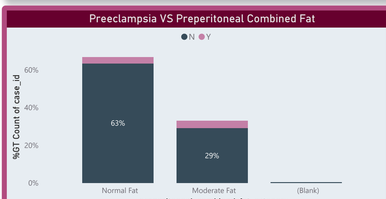
This bar graph shows there is no correlation between the new born weight and the weight -hip ratio or the delivery mode .

Diabetes impact on Head circumference



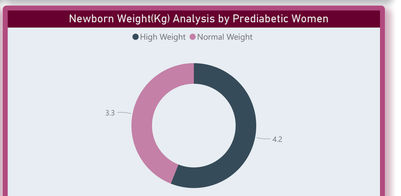
This scatter plot shows the a strong correlation between the GDM patients and Newborn Head Circumference . The patients high blood glucose levels during pregnancy ,shows a increase in the circumference of the head in Newborn.

Preeclampsia VS Preperitoneal Combined Fat



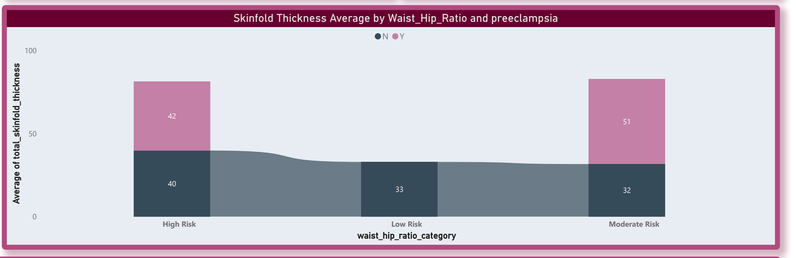
Higher preperitoneal visceral fat correlates with increased newborn weight, indicating maternal fat impact. Heavier newborns from mothers with abnormal visceral fat needed more medical attention due to low 1st-minute Apgar scores.

Newborn Weight(Kg) Analysis by Prediabetic Women



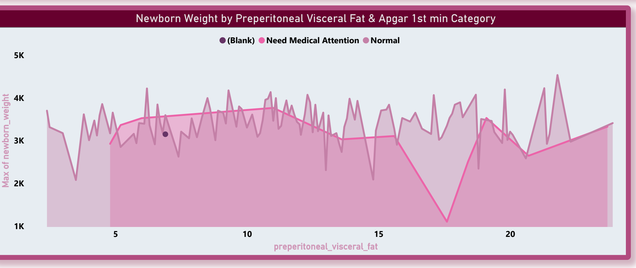
Most of the Prediabetic women tend to have Macrosomic babies where the baby weight is greater than 4kg. It can increase the risk of future gestational diabetes mellitus and maternal type 2 diabetes later in life.

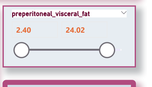
Skinfold Thickness Average by Waist_Hip_Ratio and preeclampsia



Women with preeclampsia were observed only in high and moderate risk of waist to hip ratio category and they have higher skinfold thicknesses.

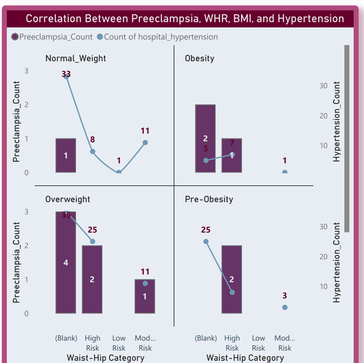
Newborn Weight by Preperitoneal Visceral Fat & Apgar 1st min Category





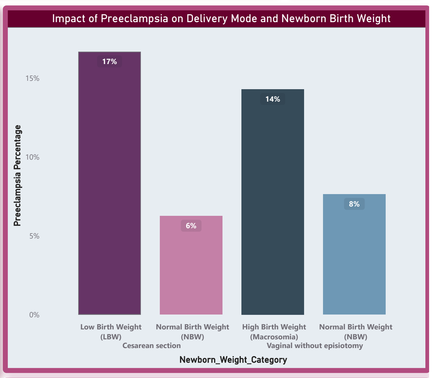
Higher preperitoneal visceral fat correlates with increased newborn weight, indicating maternal fat impact. Heavier newborns from mothers with abnormal visceral fat needed more medical attention due to low 1st-minute Apgar scores.

Correlation Between Preeclampsia, WHR, BMI, and Hypertension



The correlation between WHR risk levels, BMI categories (like overweight, obesity, etc.), and high blood pressure can affect the number of preeclampsia cases.

Impact of Preeclampsia on Delivery Mode and Newborn Birth Weight



Preeclampsia leads to low birth weight in cesarean sections and higher birth weight in normal deliveries .It's important to carefully manage preeclampsia to reduce risk for both mother and baby ,especially in sever cases.

PREDICTIVE ANALYSIS INCLUDING FAT - ECLAMPSIA

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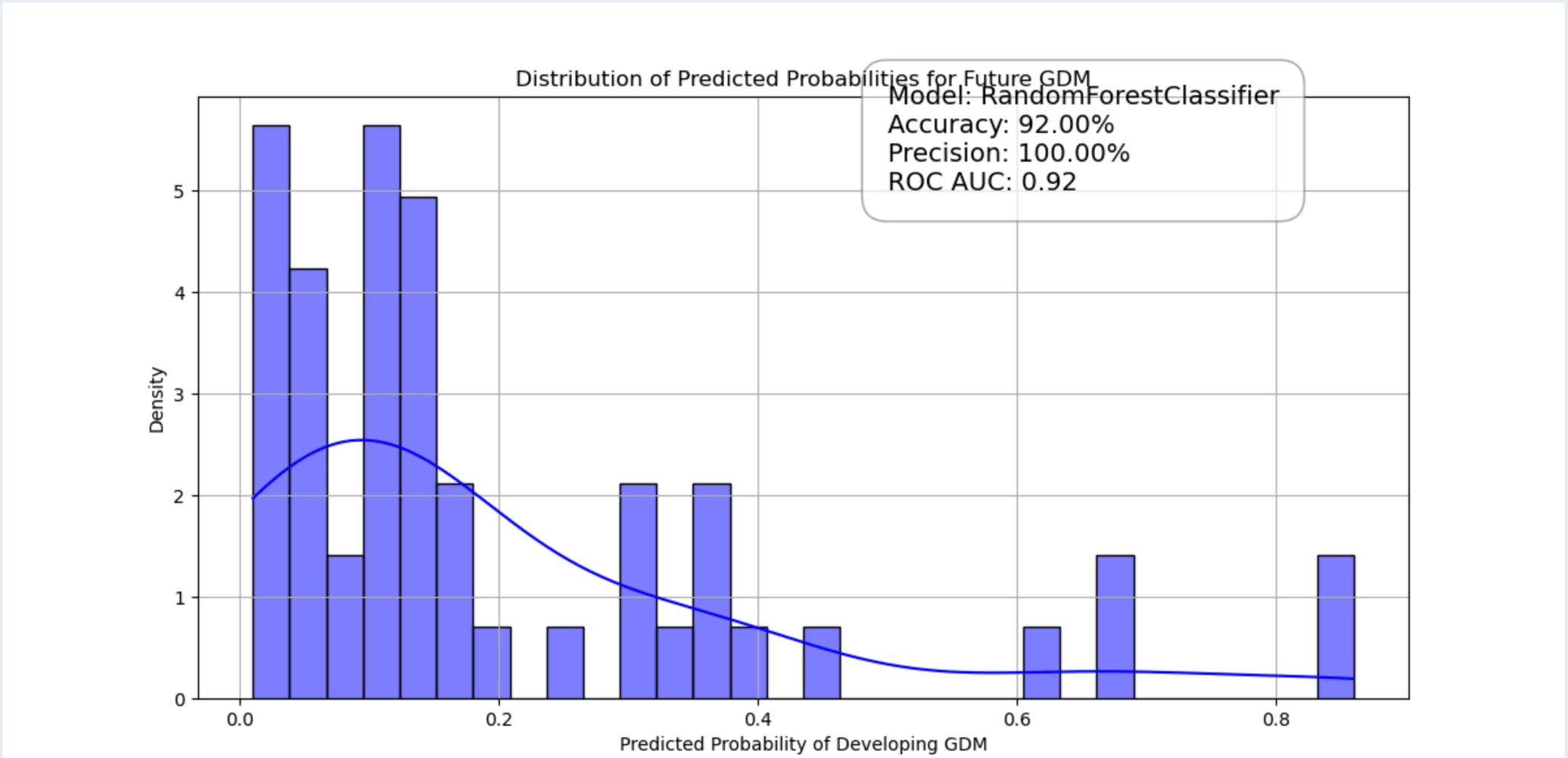
37% of patients have an extremely low (0%) probability of developing eclampsia. The remaining 63% of patients have a higher probability (ranging from 0.05 to 0.50) of developing eclampsia, spread evenly across small bins. Predicting C-section.

Accuracy 91%: This suggests that the model is correctly predicting the outcome (eclampsia vs. non-eclampsia) about 91% of the time.

ROC AUC: An AUC of 0.95 suggests the model has a **strong ability to discriminate** between positive (eclampsia) and negative (non-eclampsia) cases, meaning it's very likely to catch eclampsia cases while not making many mistakes.

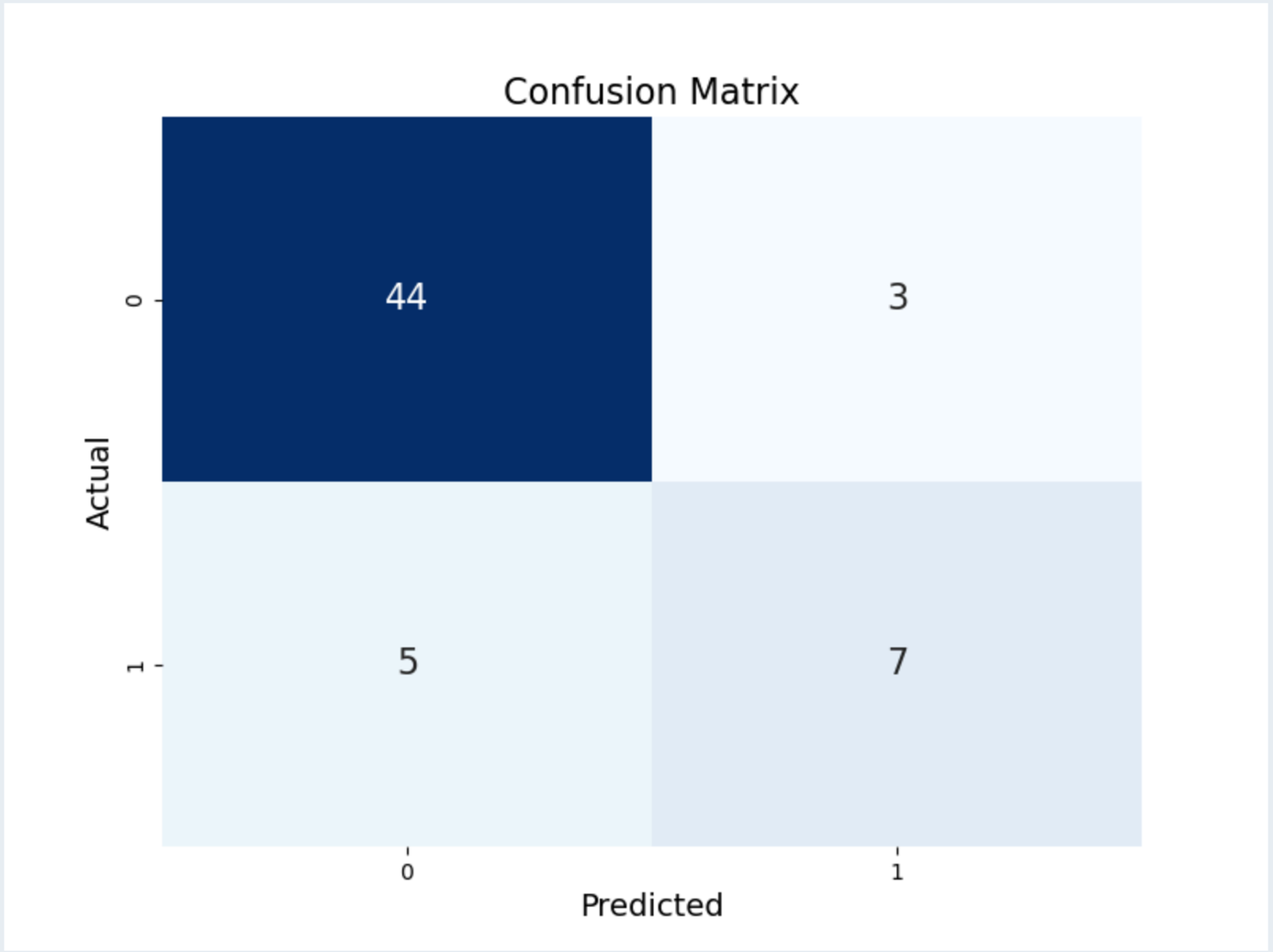
PREDICTIVE ANALYSIS INCLUDING FAT - GDM



The distribution plot shows that the model predominantly predicts low probabilities (0-0.2) for developing GDM, indicating it sees most cases as low risk. There are smaller peaks at higher probabilities (around 0.4 to 0.8), suggesting the model can identify some higher-risk cases.

Accuracy (92%): This high accuracy suggests that the model is making correct predictions most of the time.
Low False Positives: Since precision is 100%, there's a very low risk of falsely labeling someone as having GDM, which is important for avoiding unnecessary interventions or treatments.
Strong Discrimination: The ROC AUC of 0.92 indicates the model has good generalization ability and is capable of distinguishing GDM cases from non-GDM ones well.

PREDICTIVE ANALYSIS INCLUDING FAT - CESAREAN DELIVERIES



True Positives (TP)-11: 7 (The model correctly predicted "Cesarean" 7 times.)
True Negatives (TN)-00: 44 (The model correctly predicted "No Cesarean" 44 times.)
False Positives (FP)-01: 3 (The model incorrectly predicted "Cesarean" 3 times.)
False Negatives (FN)-10: 5 (The model incorrectly predicted "No Cesarean" 5 times.) - **Incorrectly identified negative cases (positive cases classified as negative). Most Important**
This Logistic Regression model Predicted delivery mode for participants with 86% accuracy and 70% Recall.
Accuracy (86%): The **86% accuracy** means that, overall, the model is making correct predictions (both True Positives and True Negatives) 86% of the time.
A confusion matrix with a **recall of 70%** means that the model correctly identified 70% of the actual positive cases in the data, indicating that out of all the true positive instances, the model successfully predicted 70% of them, while missing 30% (false negatives).

INSIGHTS

PRETERM BIRTH RATE:
The preterm birth rate is 19%, which is higher than the global average, leading to increased risks for developmental challenges and NICU admissions.

MECONIUM -STAINED AMNIOTIC FLUID:
Found in 16% cases, indicating fetal distress, with 2% requiring intubation due to severe respiratory complications.

MATERNAL BMI AND GESTATIONAL HEALTH:
In 60.47% of cases, gestational health is influenced by pre-pregnant BMI, with obesity increasing the risk of gestational diabetes (GDM) and hypertension, while low BMI is linked to fetal growth restrictions and preterm labor.

HYPERTENSION AND APGAR SCORES:
Hypertension in mothers correlates with lower Apgar scores in newborns, indicating neonatal distress and a higher need for pediatric intervention.

NUTRITION AND OBESITY:
37% of women are overweight, which is linked to high carbohydrate intake, periumbilical fat, and poor diet, all contributing to pregnancy complications.

SUBSTANCE USE IMPACT:
Substance use correlates with a higher risk of miscarriage, it affects pregnancy outcomes.

GESTATIONAL DIABETES AND CESAREAN DELIVERY:
50-70% of gestational diabetes cases result in cesarean deliveries, with obesity (higher BMI and waist-hip ratio) being a major contributor.

PRE-ECLAMPSIA:
65-85% of preeclampsia cases are linked to central obesity, with high waist-to-hip ratio (WHR) and periumbilical fat associated with higher cesarean delivery rates. Increased or unchanged hematocrit levels after mid-pregnancy may signal preeclampsia, which is linked to preterm births and requires close monitoring if above 38%

This data highlights the critical impact of maternal obesity, poor nutrition, and substance use on both maternal and fetal health, underscoring the need for targeted prenatal care and early intervention. Addressing these risk factors can significantly improve pregnancy outcomes and reduce complications for both mothers and newborns.

THANK YOU