



# Analyzing Alzheimer's and Its Risk Factors

Under supervision  
**Mohamed Abdelmawla**



# Agenda

01. Problem Statement

02. Project Overview

03. Objectives and goals

04. Data Collection and Analysis

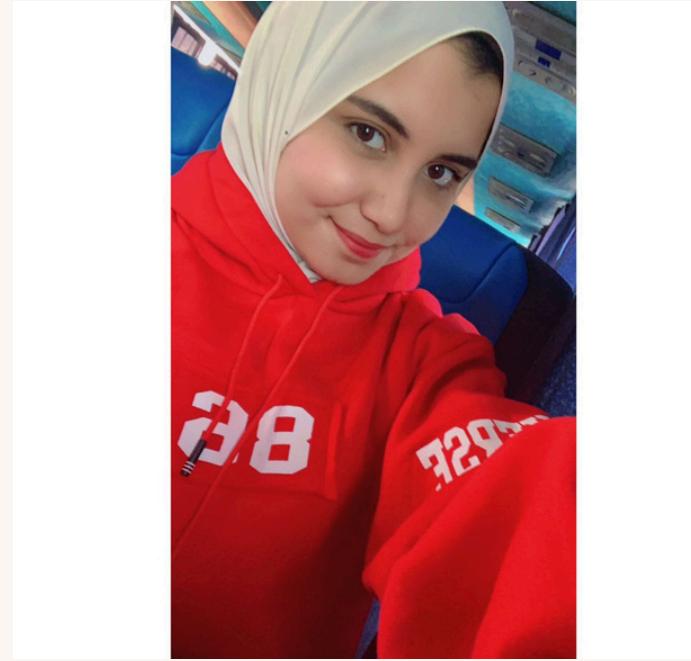
05. Exploratory Data Analysis

06. Dashboards

# Our team members:



Alaa Yasser



Menna Khaled



Fatima Alzahraa



Zaynap Ahmed



Mazen Hatem



Yahia Yasser

# Problem Statement

Alzheimer's diagnosis is complicated by factors like comorbidities, age, and lifestyle. This project aims to analyze these variables to enhance early detection and treatment.

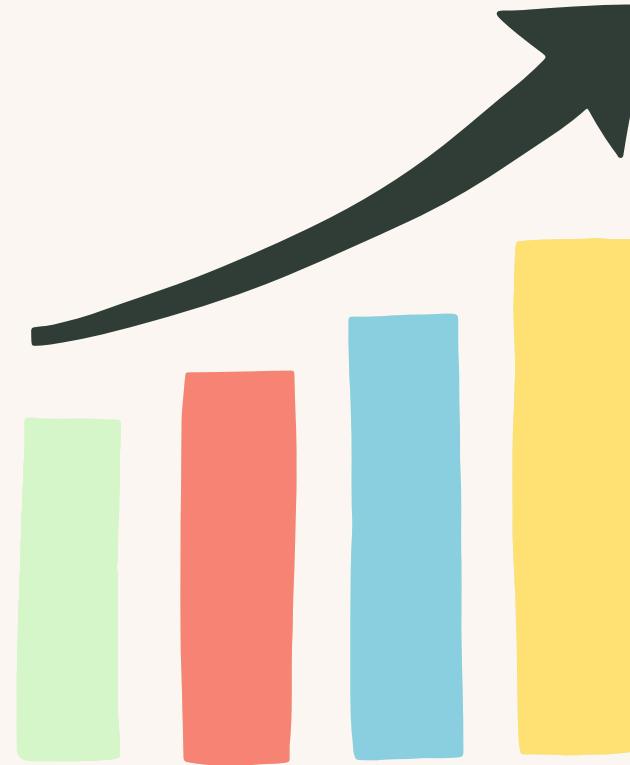
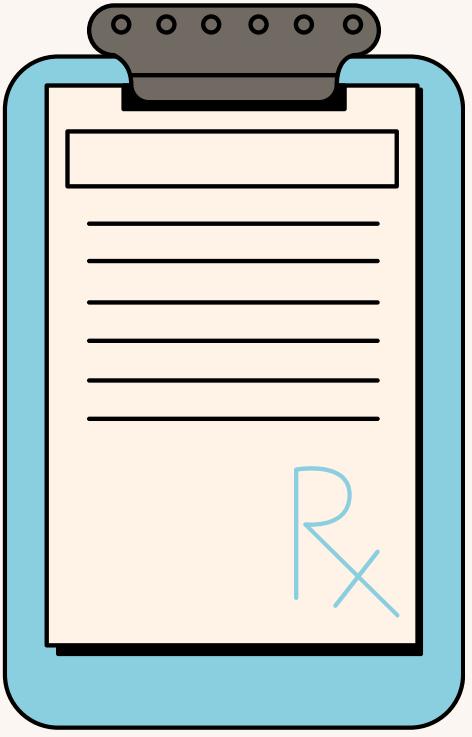


# Project Overview

This project explores Alzheimer's disease in patients from different age groups, locations, and education levels. By analyzing related conditions like hypertension and key health metrics, we aim to enhance early diagnosis and care strategies.

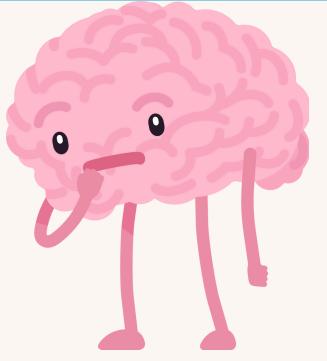


# Objectives and goals



- Objective: Analyze Alzheimer's disease data to uncover insights related to demographic factors, medical history, cognitive assessments, and lifestyle choices.
- Goal: Provide actionable insights for healthcare strategies, particularly for early intervention, risk factor management, and improving patient care.

# Data Collection and Analysis



01.

## Data Collection:

The dataset includes demographics, medical history, cognitive assessments (e.g., MMSE scores), and lifestyle choices from patient records, covering age, BMI, cholesterol, and health conditions like diabetes and cardiovascular disease.

02.

## Data Cleaning :

- 1-Removed duplicates and filled missing PatientID and Diagnosis.
- 2-Standardized formats (dates, gender, diagnosis).
- 3-Imputed missing cognitive scores using medians.
- 4-Removed outliers (e.g., unrealistic ages, BMIs).

03.

## Categorization:

- 1-Age grouped into ranges (e.g., 60-65, 66-70).
- 2-BMI categorized by standard ranges.
- 3-Cholesterol levels as "High," "Normal," or "Borderline."
- 4-MMSE scores by cognitive function (Low, Moderate, High).

# Exploratory Data Analysis



**01.** • During the Exploratory Data Analysis (EDA), significant correlations were observed between various variables and Alzheimer's disease.

**02.** • Functional Assessment (ADL) and MMSE showed negative correlations with Alzheimer's diagnosis, with coefficients of -0.36, -0.33, and -0.24. Lower scores in these assessments increase the likelihood of Alzheimer's.

**03.** • A decline in functional and cognitive abilities serves as a strong indicator of increased Alzheimer's risk.

**04.** Behavioral Problems and Memory Complaints were positively correlated with Alzheimer's, with coefficients of 0.22 and 0.30, indicating these issues increase the likelihood of the disease.

# Dashboard

## Alzheimer's Disease Overview Dashboard

760

AlzheimerPatients

150

DepressionPatients

126

HypertensionPatients

121

CardiovascularDisea...

103

DiabetesPatients

64

HeadInjuryPatients

MMSE

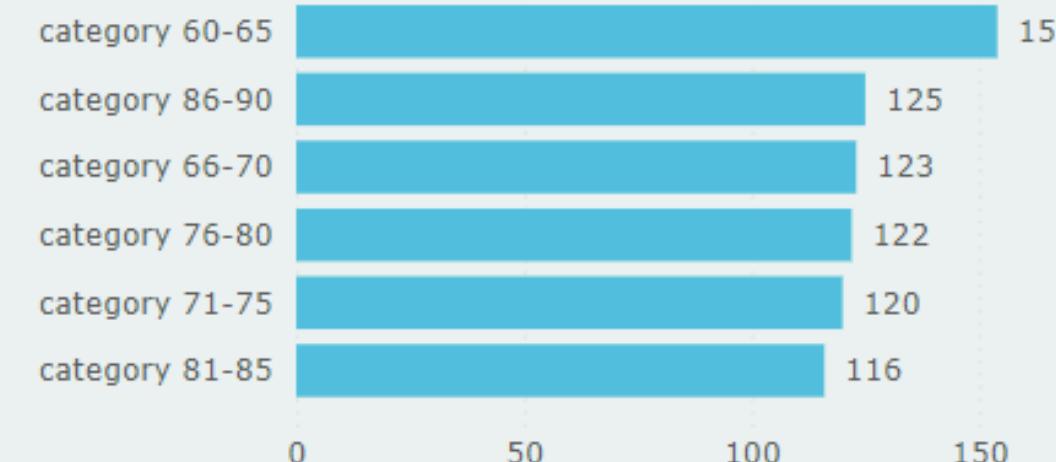
Cholesterol

Diastolic pb

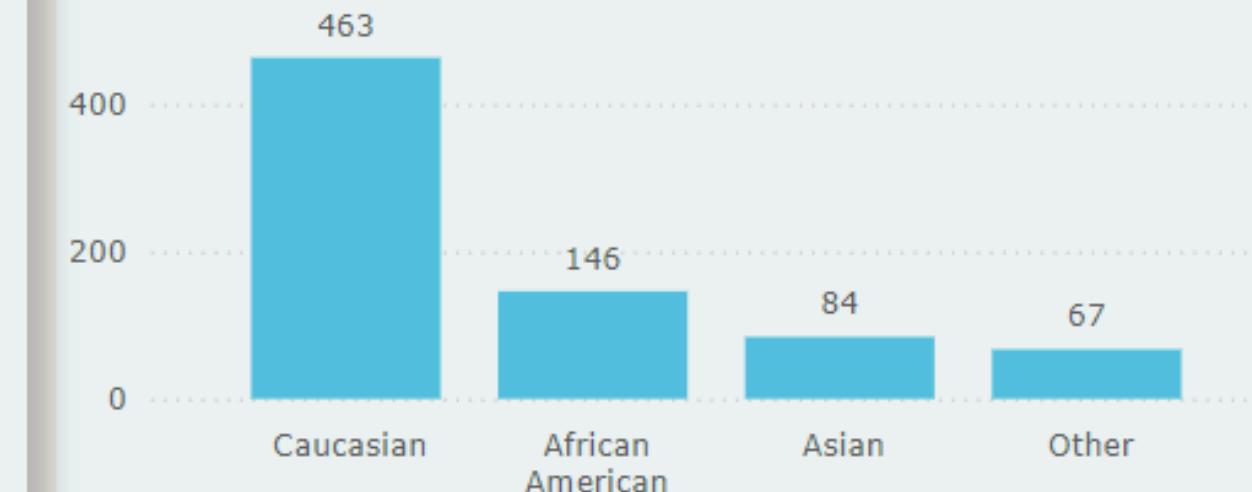
systolic bp

BMI

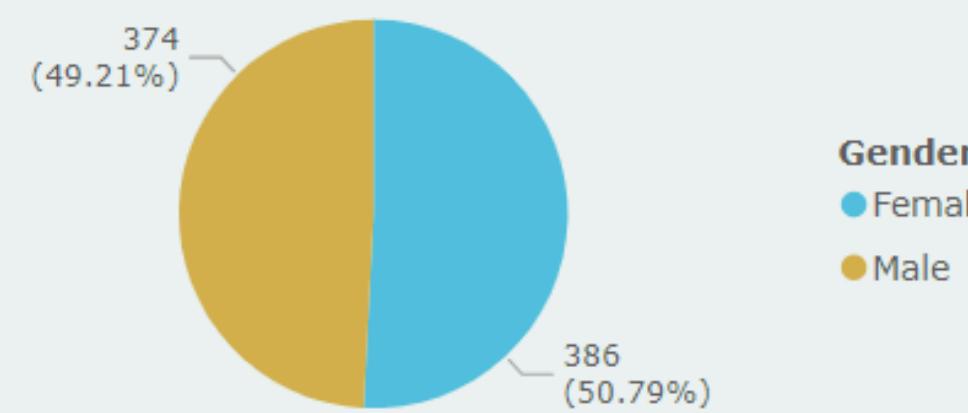
Diagnosis Distribution Across Age Groups



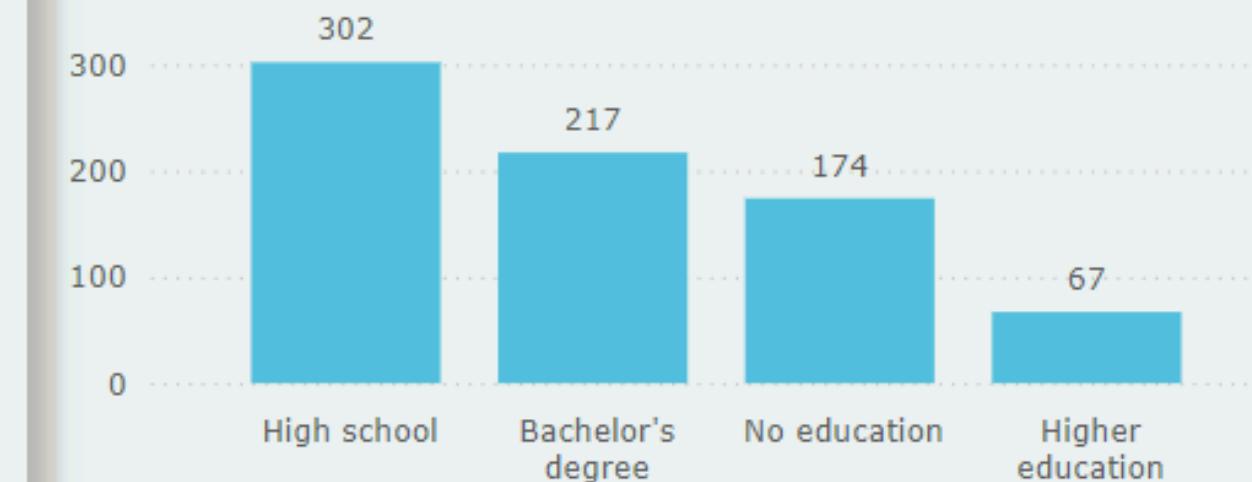
Diagnosis Frequency by Ethnicity



Diagnosis Distribution by Gender



Diagnosis Distribution by Education Level



## demographic details

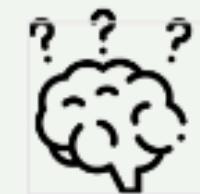
- EducationLevel
- Bachelor's deg...
  - High school
  - Higher education
  - No education

- Age categories
- category 60-65
  - category 66-70
  - category 71-75
  - category 76-80
  - category 81-85
  - category 86-90

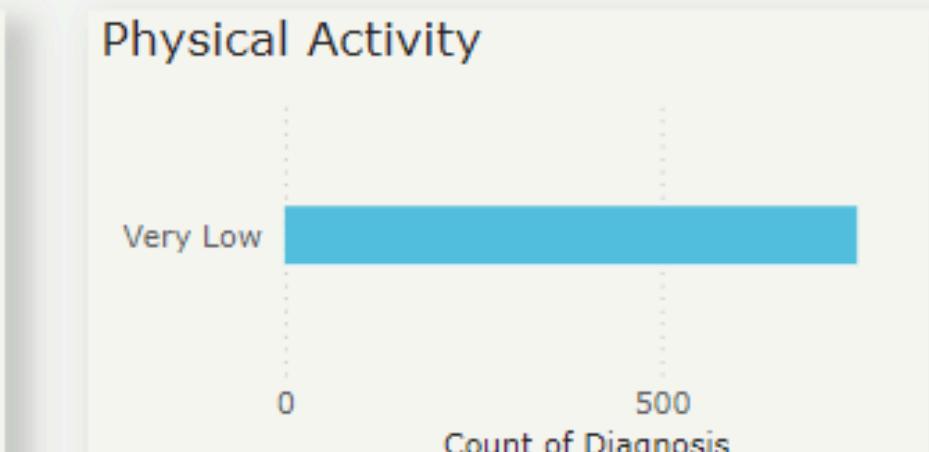
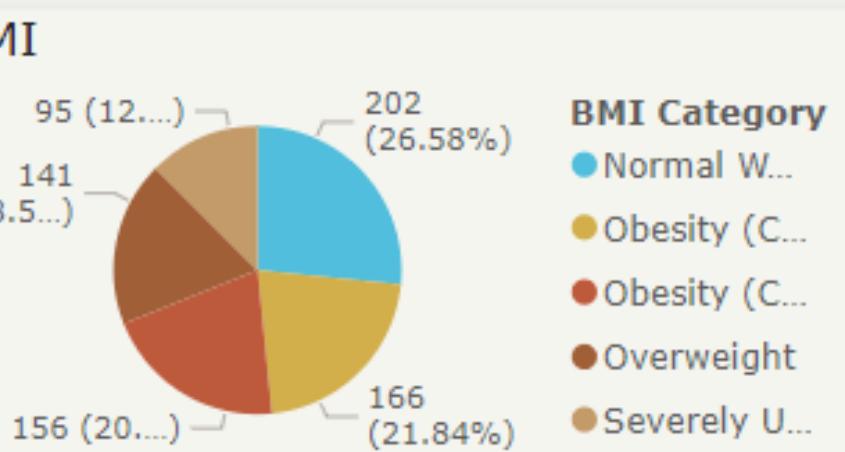
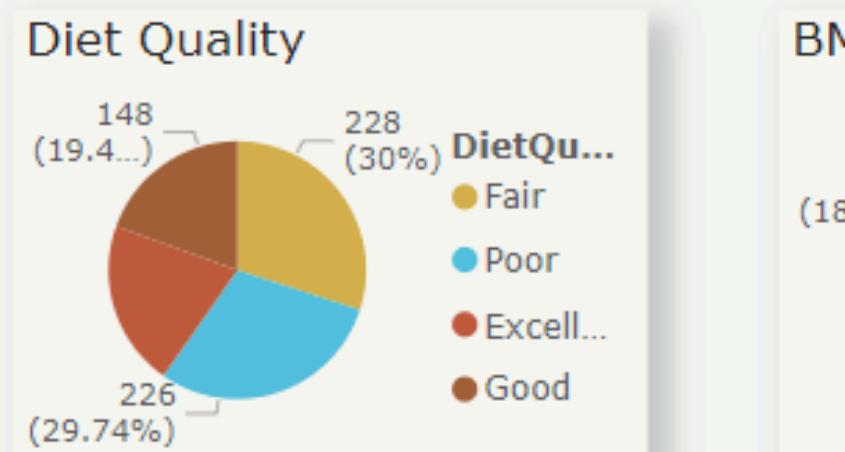
- Ethnicity
- African American
  - Asian
  - Caucasian
  - Other

- Gender
- Female
  - Male

# Alzheimer's patients Dashboard



...



## demographic details

### EducationLevel

- Bachelor's degree
- High school
- Higher education
- No education

### Age categories

- category 60-65
- category 66-70
- category 71-75
- category 76-80
- category 81-85
- category 86-90

### Ethnicity

- African American
- Asian
- Caucasian
- Other

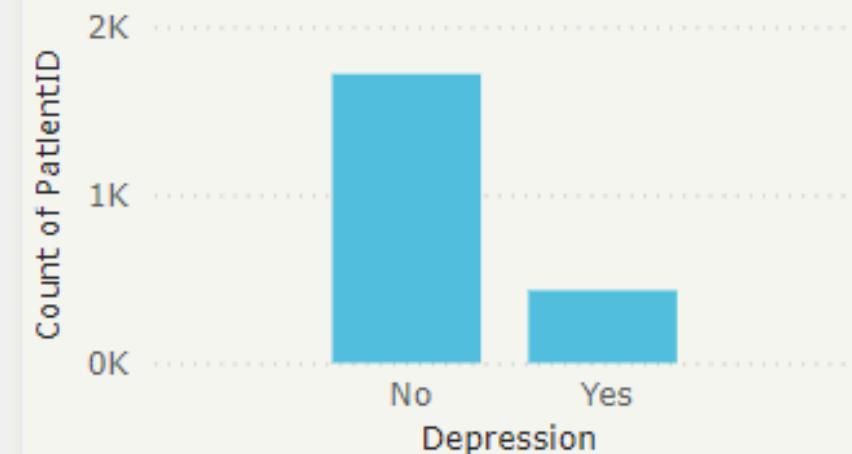
### Gender

- Female
- Male

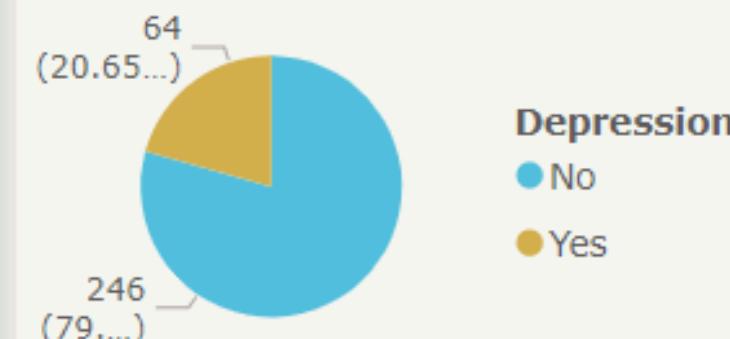
# Depression Disease Dashboard



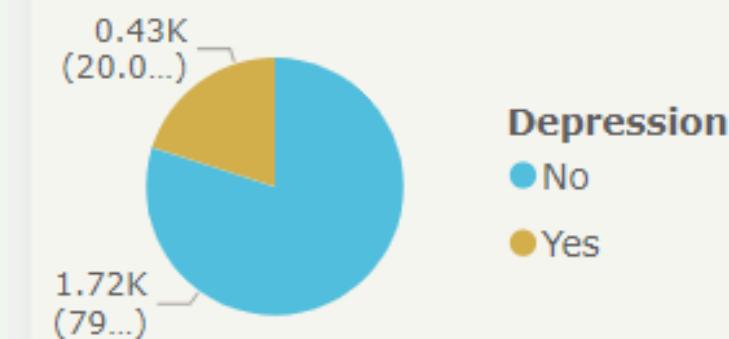
### Depression Levels among Patients



### Depression Levels and Cardiovascular Disease

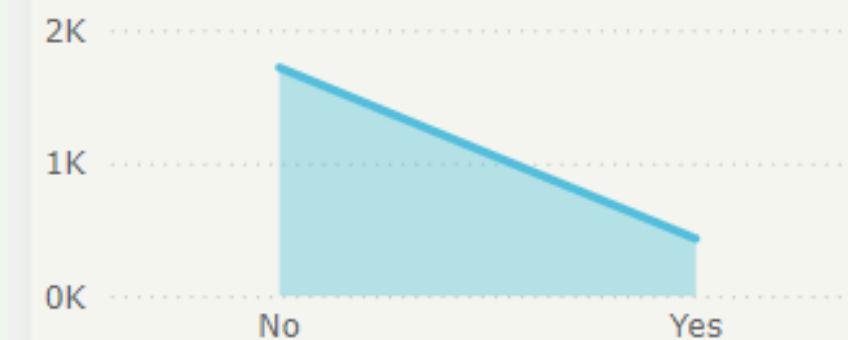


### Depression Levels and Hypertension

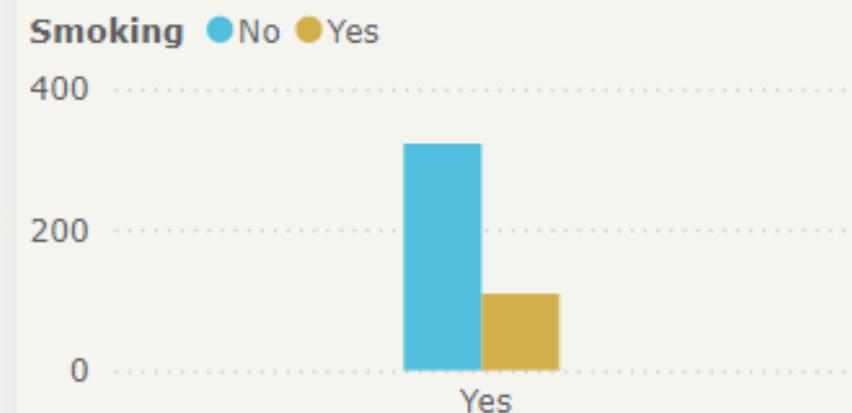


PersonalityChanges	Smoking	PhysicalActivity Category	Count of Depression
No	No	Very Low	268
No	Yes	Very Low	90
Yes	No	Very Low	54
Yes	Yes	Very Low	19

### MMSE Across Depression Levels



### Depression Status and Smoking Habits



### Depression and Physical Activity



### Depression Status and Personality changes



## demographic details

### EducationLevel

- Bachelor's degree
- High school
- Higher education
- No education

### Age categories

- category 60-65
- category 66-70
- category 71-75
- category 76-80
- category 81-85
- category 86-90

### Ethnicity

- African American
- Asian
- Caucasian
- Other

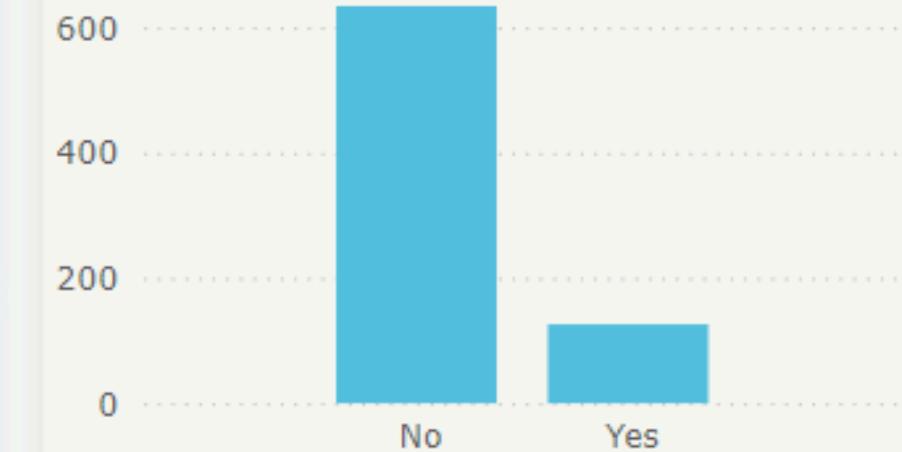
### Gender

- Female
- Male

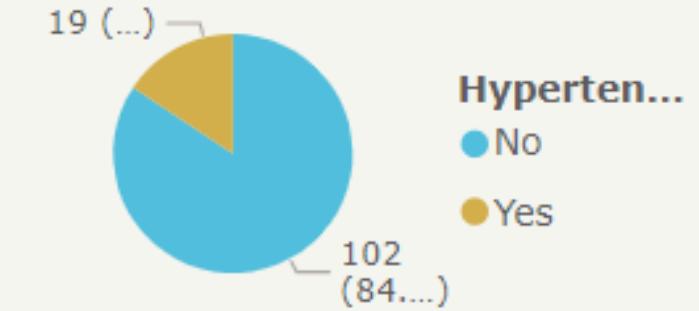
# Hypertension Dashboard



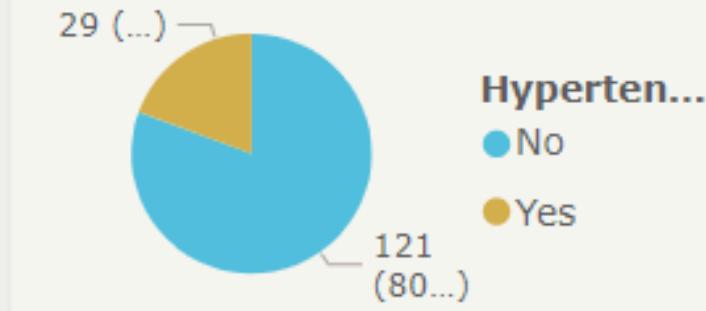
### Hypertension among Patients



### Hypertension and Cardiovascular Disease



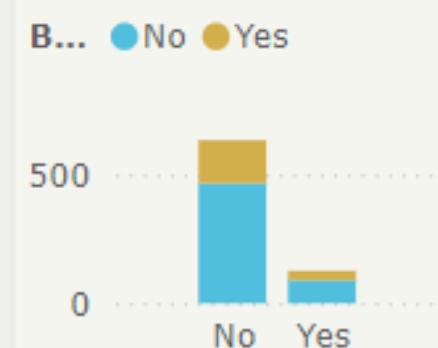
### Hypertension and Depression



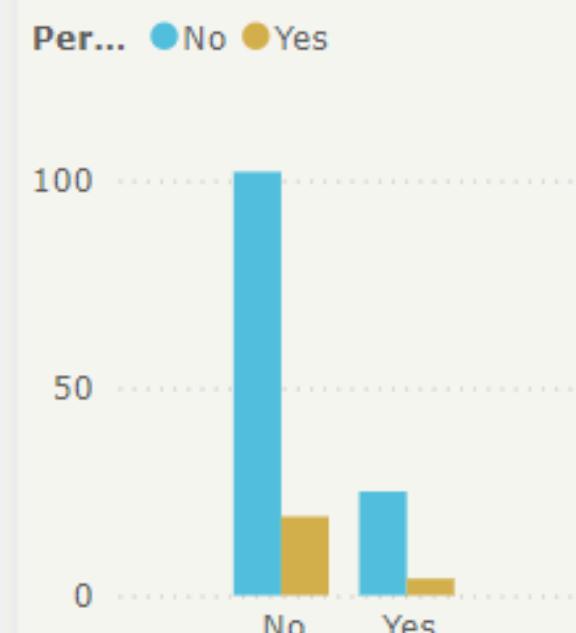
### ADL with Hypertension



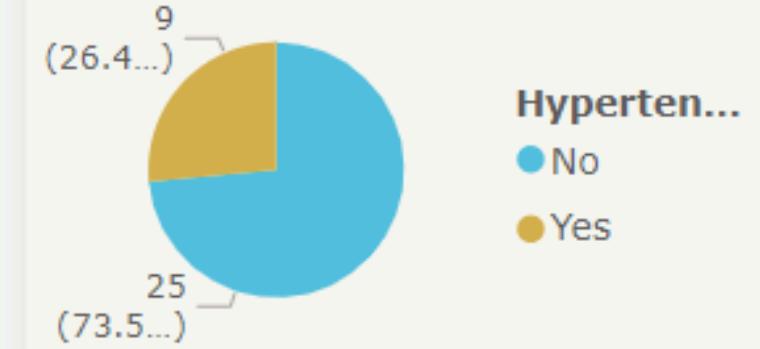
### Hypertension and Behavioral Issues



### Hypertension and Personality changes



### Hypertension and Smoking Habits



### Hypertension and Physical Activity



## demographic details

### EducationLevel

- Bachelor's degree
- High school
- Higher education
- No education

### Age categories

- category 60-65
- category 66-70
- category 71-75
- category 76-80
- category 81-85
- category 86-90

### Ethnicity

- African American
- Asian
- Caucasian
- Other

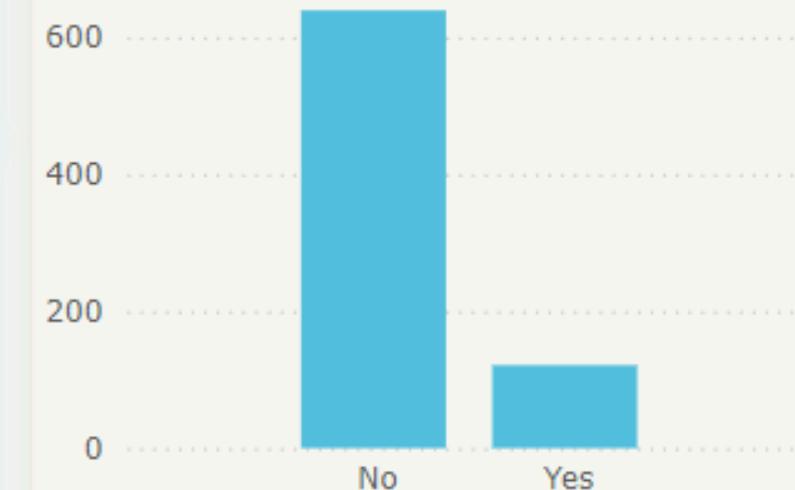
### Gender

- Female
- Male

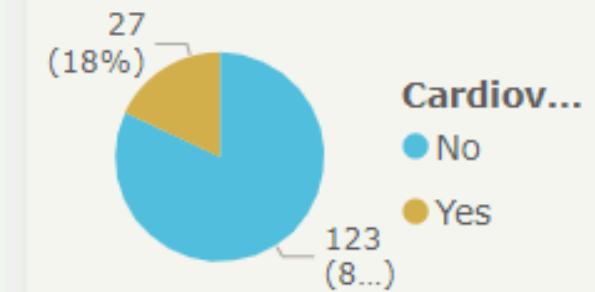
# Cardiovascular Dashboard



### Cardiovascular Disease among patients



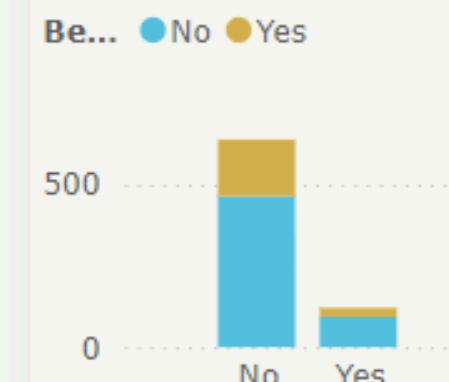
### Cardiovascular Disease and Depression Status



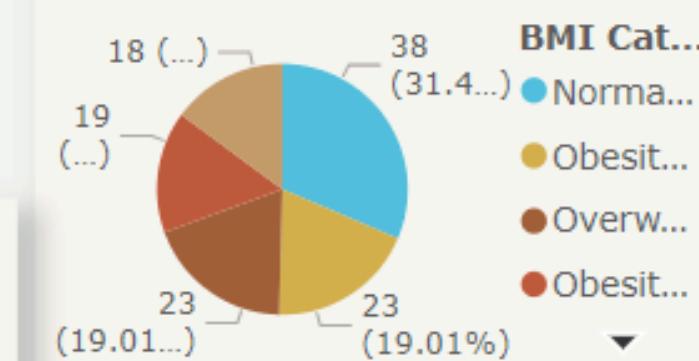
### ADL with Cardiovascular Disease



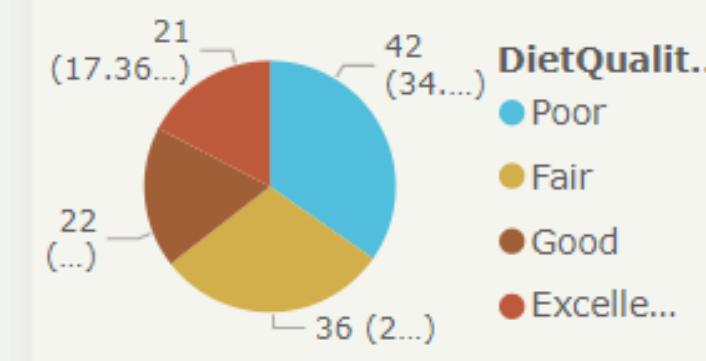
### Cardiovascular Disease and Behavioral Issues



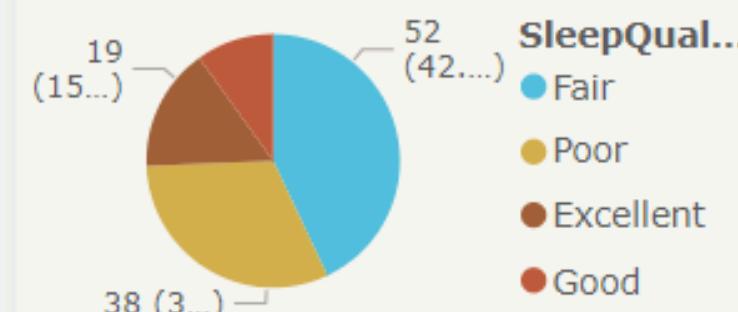
### Cardiovascular Disease and BMI



### Cardiovascular Disease and Diet



### Cardiovascular Disease and Sleep Quality





# MMSE Dashboard

## demographic details

### EducationLevel

- Bachelor's degree
- High school
- Higher education
- No education

### Age categories

- category 60-65
- category 66-70
- category 71-75
- category 76-80
- category 81-85
- category 86-90

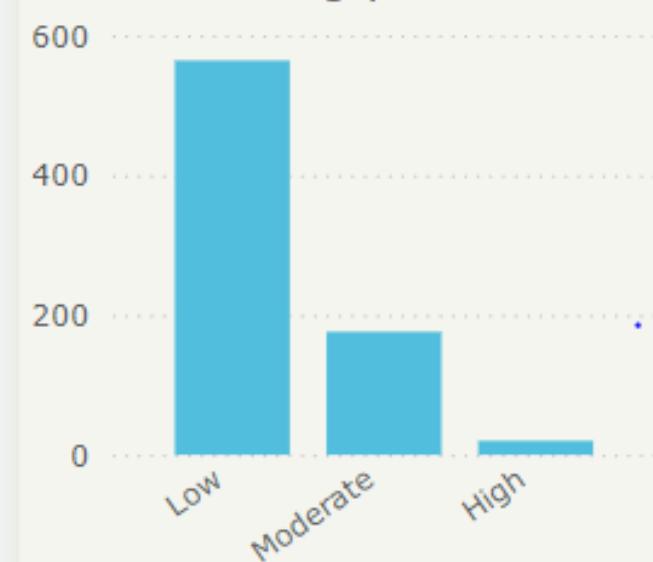
### Ethnicity

- African American
- Asian
- Caucasian
- Other

### Gender

- Female
- Male

## MMSE among patients



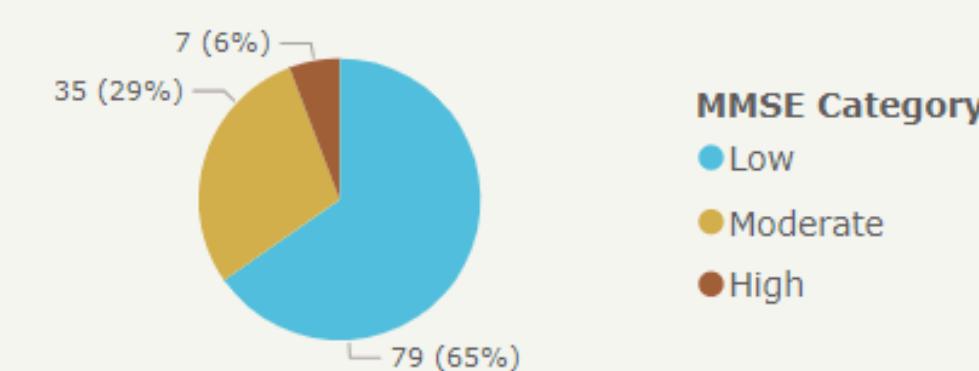
## Depression and MMSE



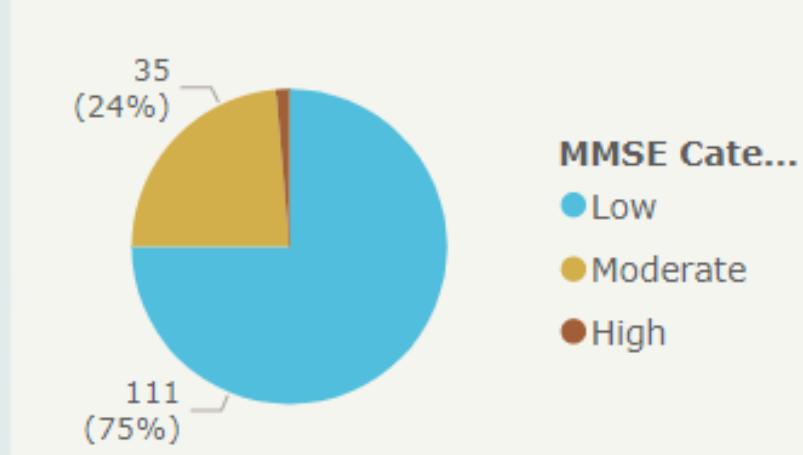
## Hypertension and MMSE



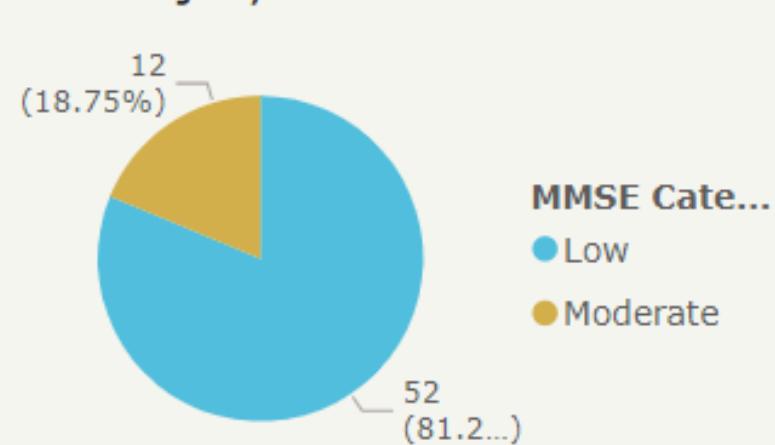
## Cardiovascular and MMSE



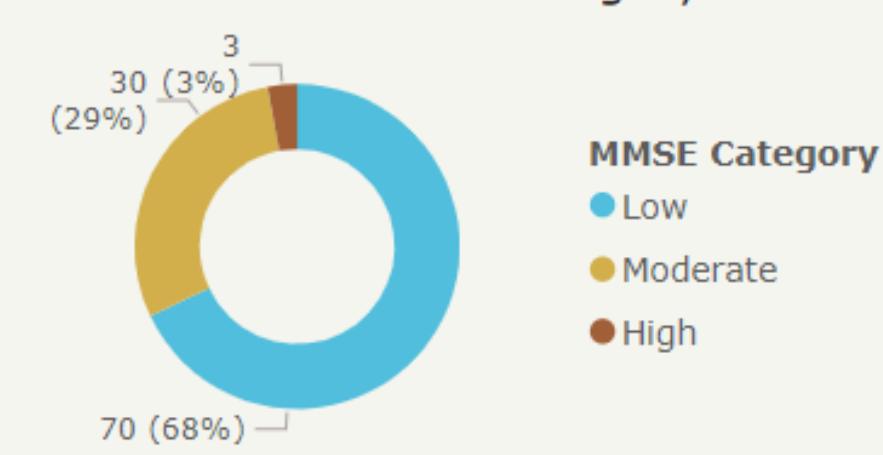
## Confusion and MMSE

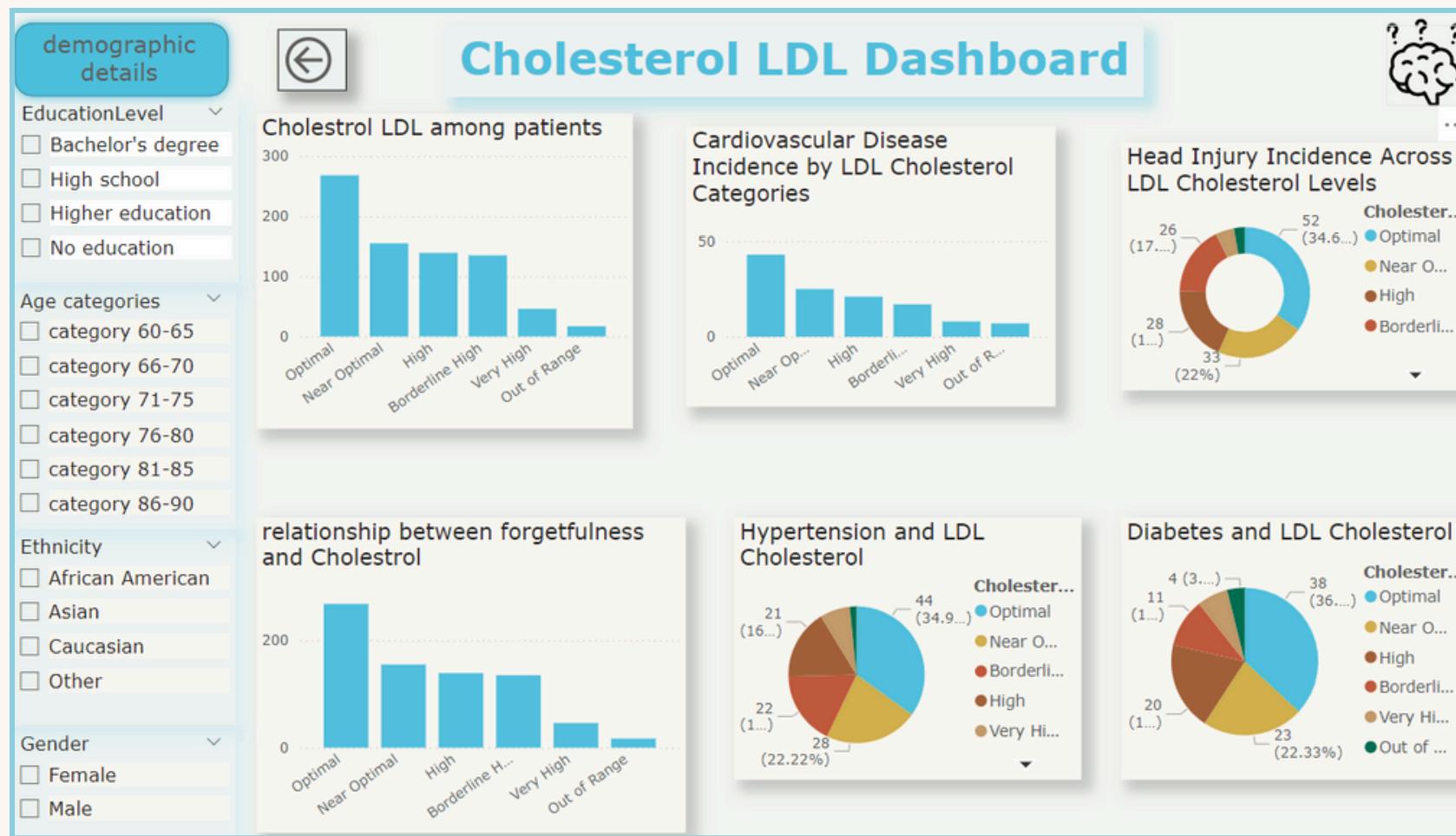
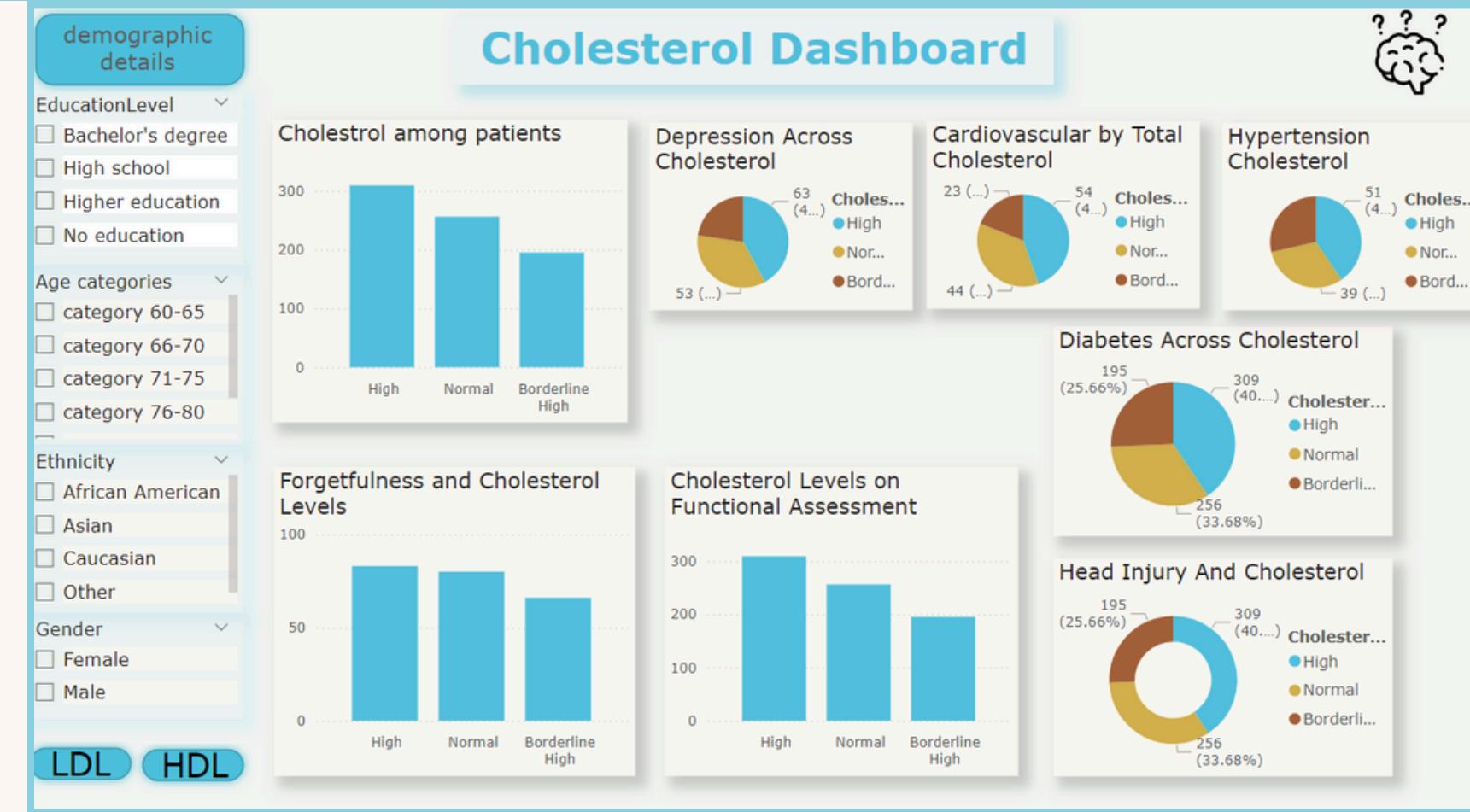


## Head Injury and MMSE

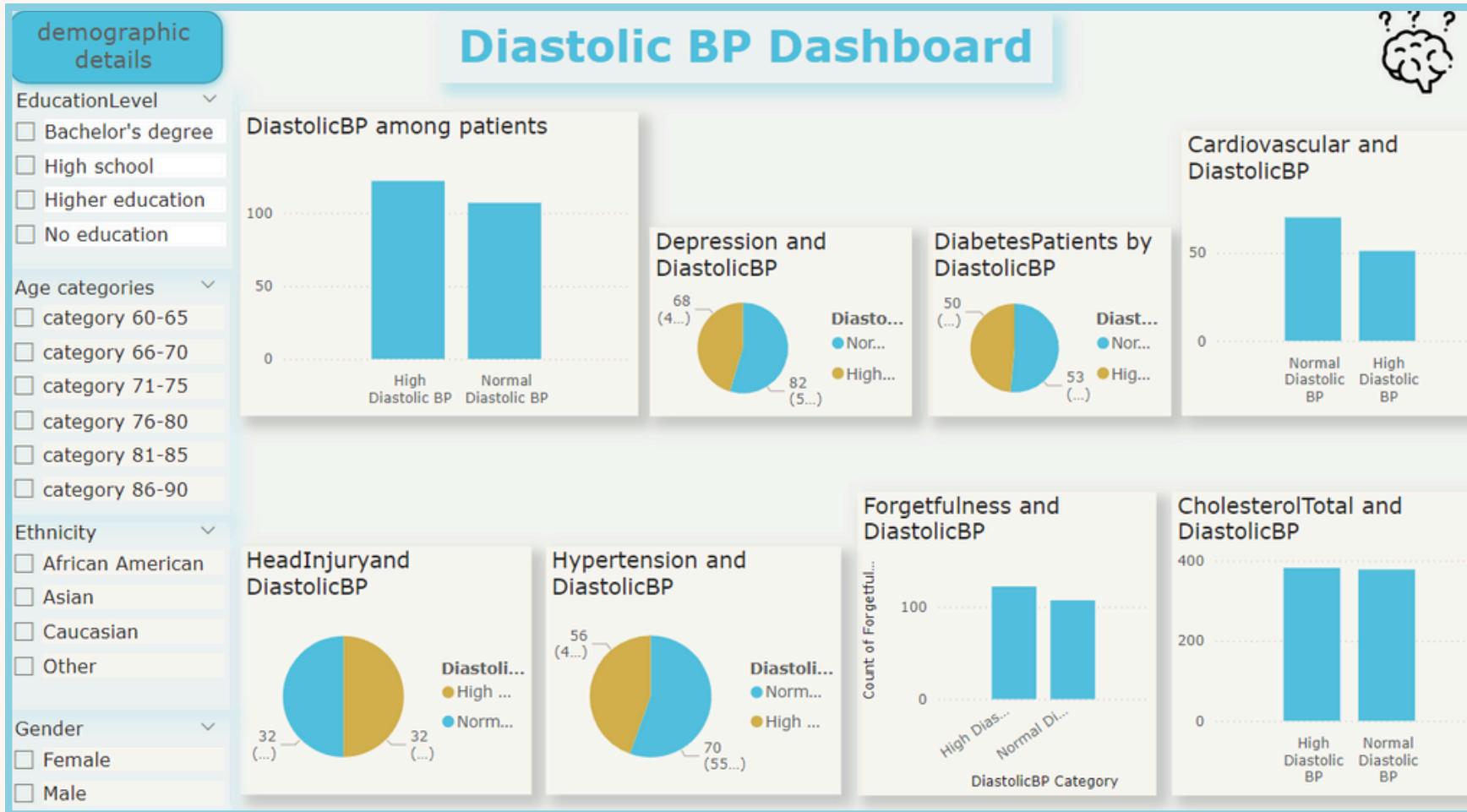


## Diabetes and MMSE Category

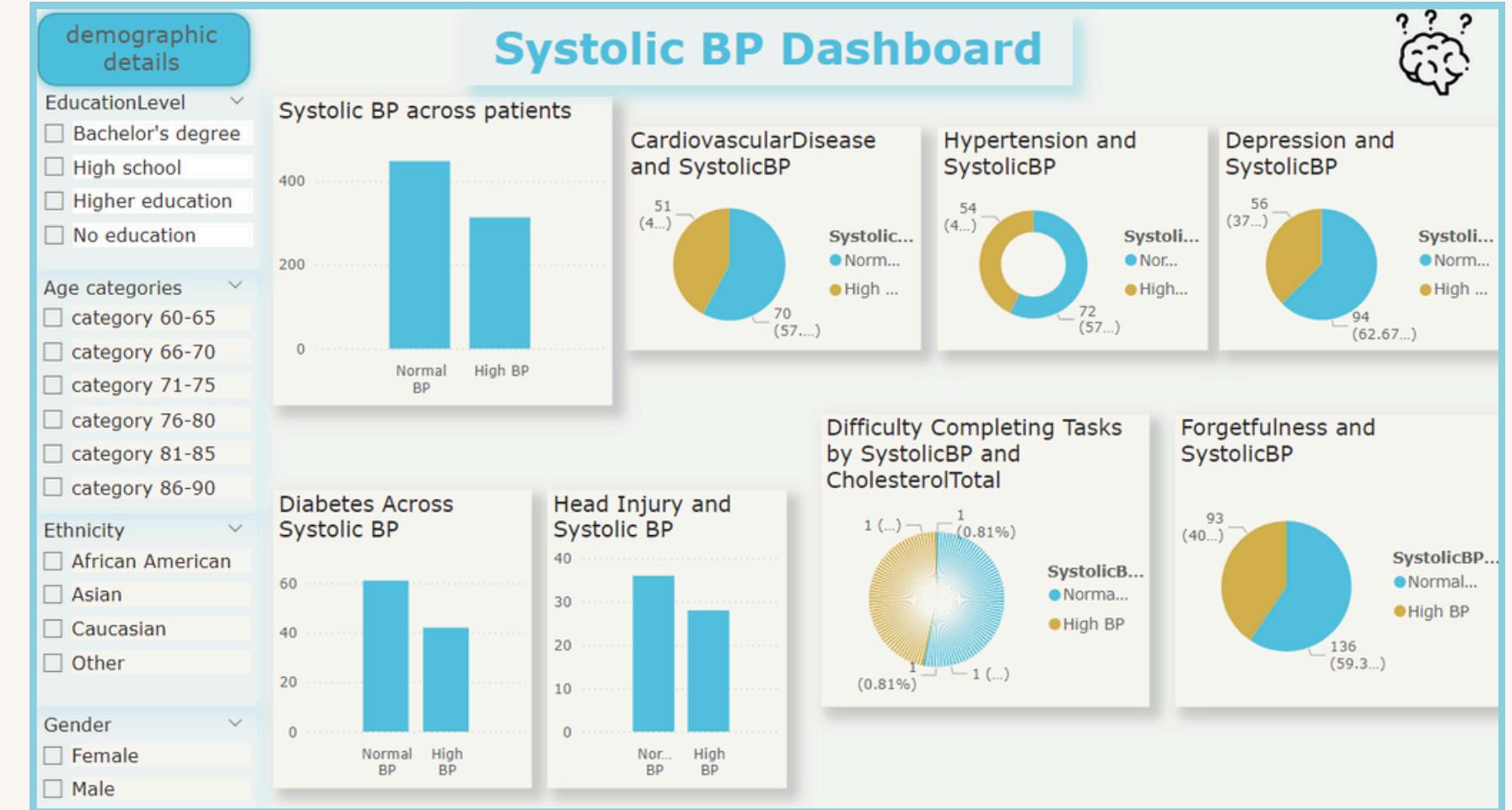




# Daistolic



# Systolic



## demographic details

EducationLevel

- Bachelor's degree
- High school
- Higher education
- No education

Age categories

- category 60-65
- category 66-70
- category 71-75
- category 76-80
- category 81-85
- category 86-90

Ethnicity

- African American
- Asian
- Caucasian
- Other

Gender

- Female
- Male

# BMI Dashboard



### BMI among patients



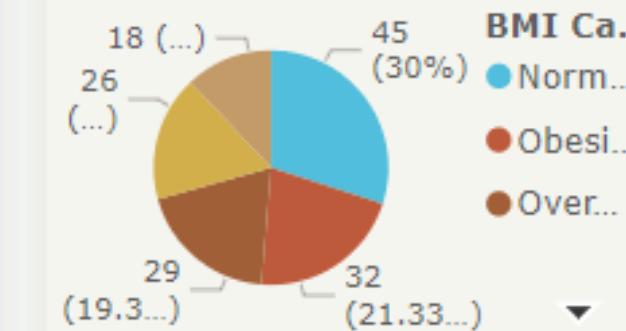
### Sleep Quality

BMI Category	Excellent	Fair	Good	Poor
Severely Underweight	11	40	18	26
Overweight	21	45	22	53
Obesity (Class 2)	23	51	32	60
Obesity (Class 1)	29	46	20	61
Normal Weight	29	67	36	70

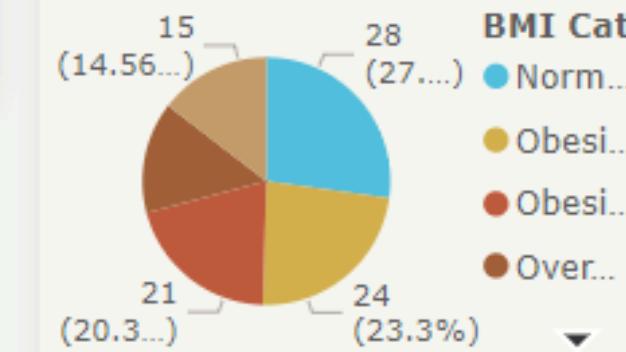
### Disorientation

BMI Category	Yes
Normal Weight	25
Obesity (Class 1)	16
Obesity (Class 2)	30
Overweight	29
Severely Underweight	11

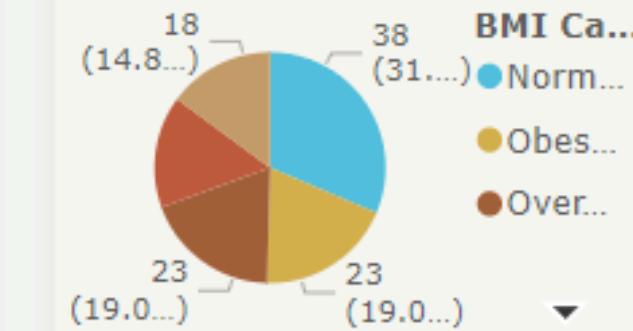
### Depression and BMI



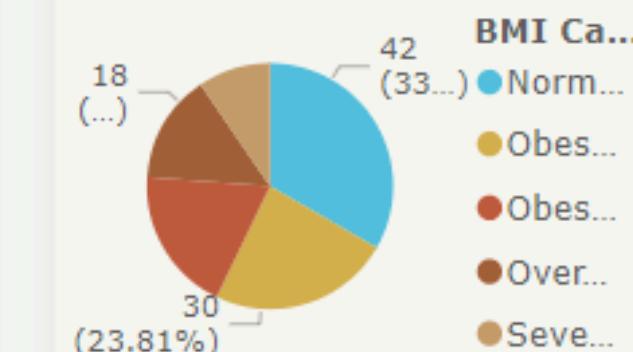
### Diabetes and BMI



### Cardiovascular and BMI



### Hypertension and BMI



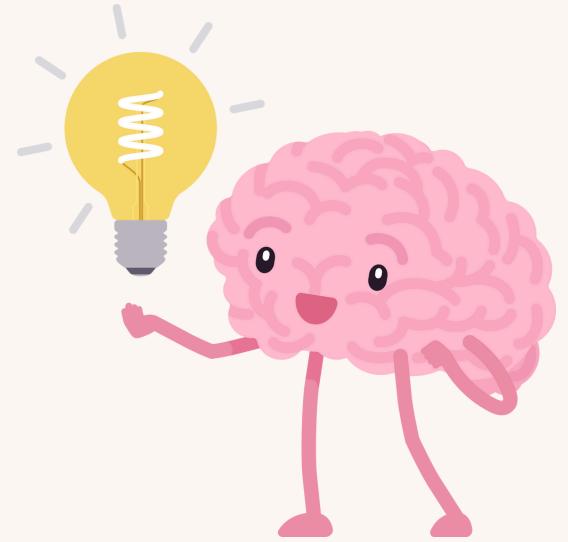
### Diet Quality

BMI Category	Excellent	Fair	Good	Poor
Severely Underweight	18	25	21	31
Overweight	29	37	27	48
Obesity (Class 2)	32	54	33	47
Obesity (Class 1)	26	55	30	45
Normal Weight	53	57	37	55

### Forgetfulness and BMI



# Insights



**Prevalence:** 16.6% of Alzheimer's patients have hypertension, highlighting the need for integrated care.

**Comorbidities:** Many have cardiovascular disease, depression (80%), and are smokers, stressing the need for smoking cessation and mental health support.

**Impact:** Hypertensive Alzheimer's patients face more daily challenges and reduced physical activity, worsening both conditions.

**Demographics:** Affects both genders equally; predominantly Caucasian. Most have high school education or less.

**Cardiovascular Disease:** 19% of Alzheimer's patients have it; 85% also have hypertension. Managing heart health and blood pressure is key.

**BMI, Diet, and Sleep:** 31.4% are obese, with poor diet and sleep common, impacting health.

**MMSE:** Low MMSE scores are common in Alzheimer's patients, particularly those with depression (74%), hypertension (71%), cardiovascular disease (65%), confusion (75%), and diabetes (68%).

**Cholesterol and Blood Pressure:** No direct link was found between cholesterol or blood pressure levels and cognitive decline.

**Disorientation and Forgetfulness:** These worsen with age, particularly in obese individuals, but are less common in those with normal weight.

**Diabetes:** Significantly impacts weight, with younger patients showing more obesity and older patients more likely to be underweight

**Health Factors:** Diabetes and depression are the primary factors influencing weight changes across all age groups.

**Depression:** Affects both normal-weight and obese individuals, with varying influence across age groups.



- **BMI Distribution:** Most patients have normal BMI, but obesity still raises Alzheimer's risk.
- **Forgetfulness & BMI:** Obesity raises forgetfulness, a key Alzheimer's symptom.

**Depression & BMI: Obesity worsens cognitive decline in depressed patients.**

**Cardiovascular Disease & BMI: Obesity increases Alzheimer's risk in heart patients.**

**Diabetes & BMI: Obesity and diabetes significantly raise Alzheimer's risk.**

**Hypertension & BMI: Obesity and high blood pressure increase Alzheimer's risk.**

**Sleep & Diet: Obesity is linked to poor sleep and diet, accelerating cognitive decline.**



# Recommendations



**Integrated Care:** Manage Alzheimer's alongside conditions like hypertension, diabetes, and cardiovascular disease to improve overall outcomes.

**Weight Management:** Prioritize reducing obesity, particularly for those with Class 2 obesity, through tailored diet, exercise, and sleep programs to lower Alzheimer's risk.

**Mental Health and Depression Support:** Provide targeted mental health support, especially for patients with depression, as it influences cognitive decline and weight management.

**Diabetes and Cardiovascular Management:** Focus on managing diabetes, high blood pressure, and heart health, particularly in obese and hypertensive patients, to reduce Alzheimer's risk.

**Physical Activity and Lifestyle Changes:** Encourage exercise, improve sleep quality, and promote healthier diets to address obesity and slow cognitive decline.

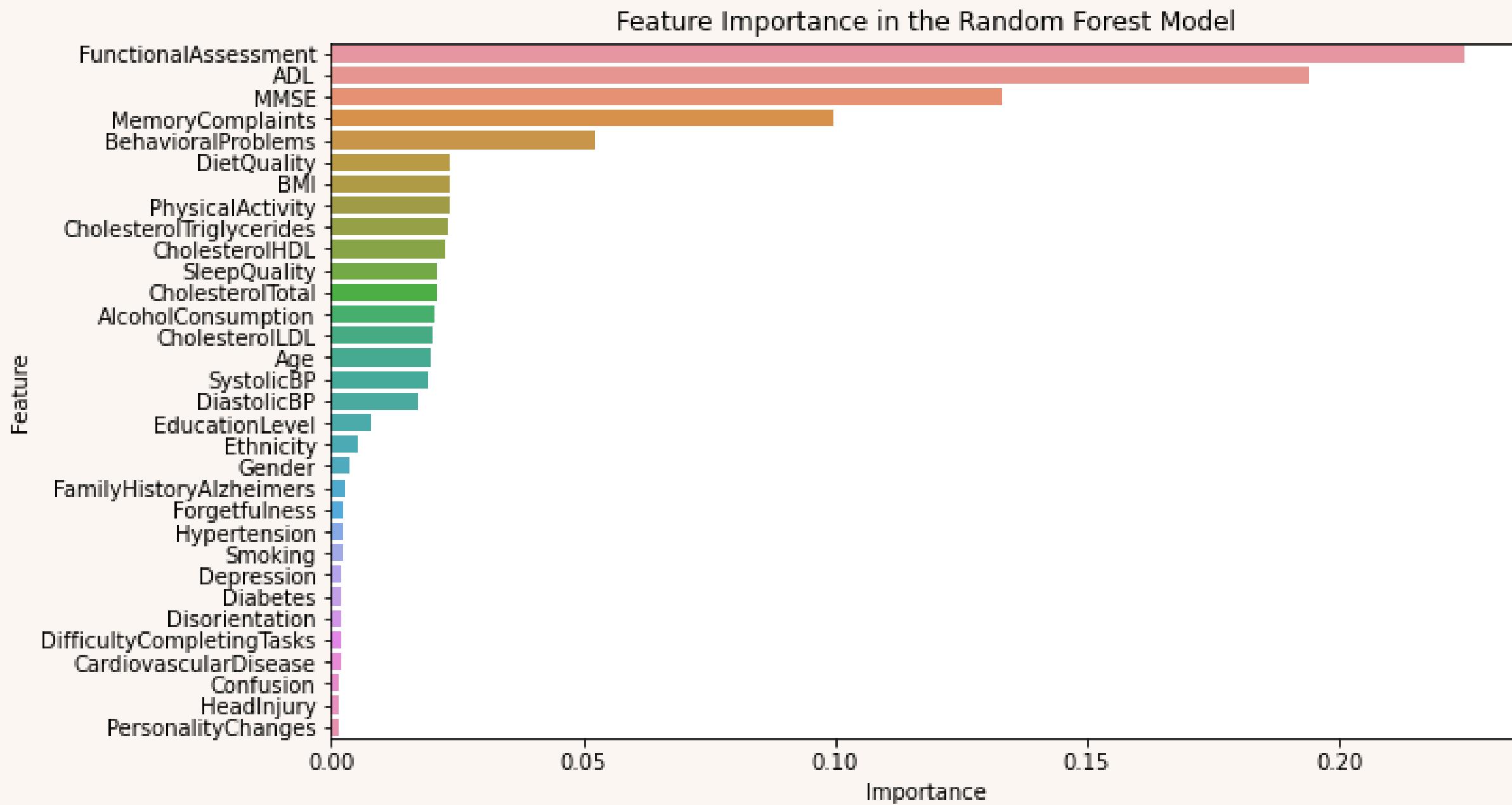
**Educational and Age-Specific Interventions:**

- **Younger Patients (60-70 years):** Emphasize diabetes management and weight reduction.
- **Older Patients (71-85 years):** Address forgetfulness and depression with cognitive therapies and lifestyle changes.

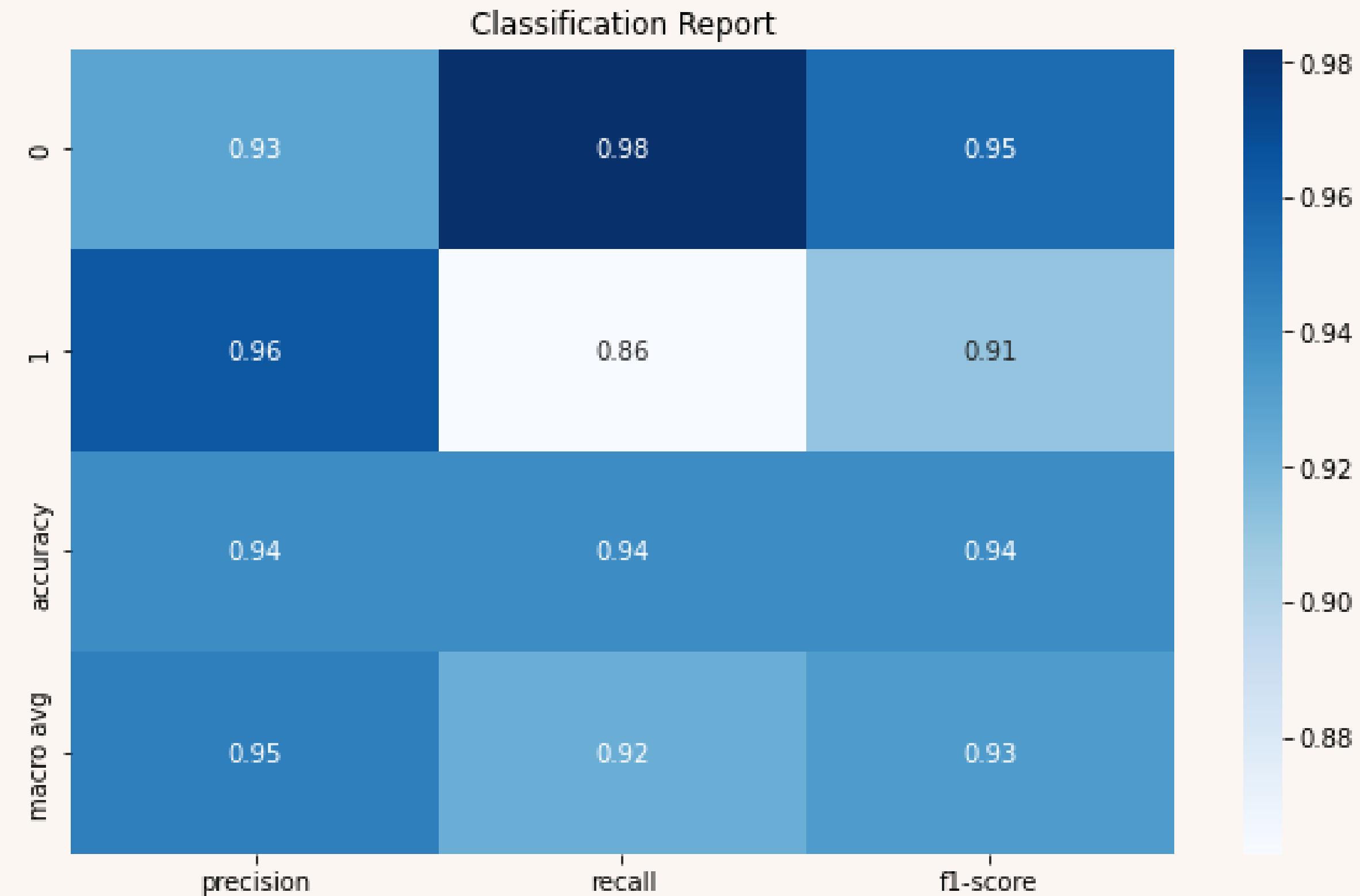
# Applying Random Forest to Validate Insights

why Random  
Forest

Grid Search

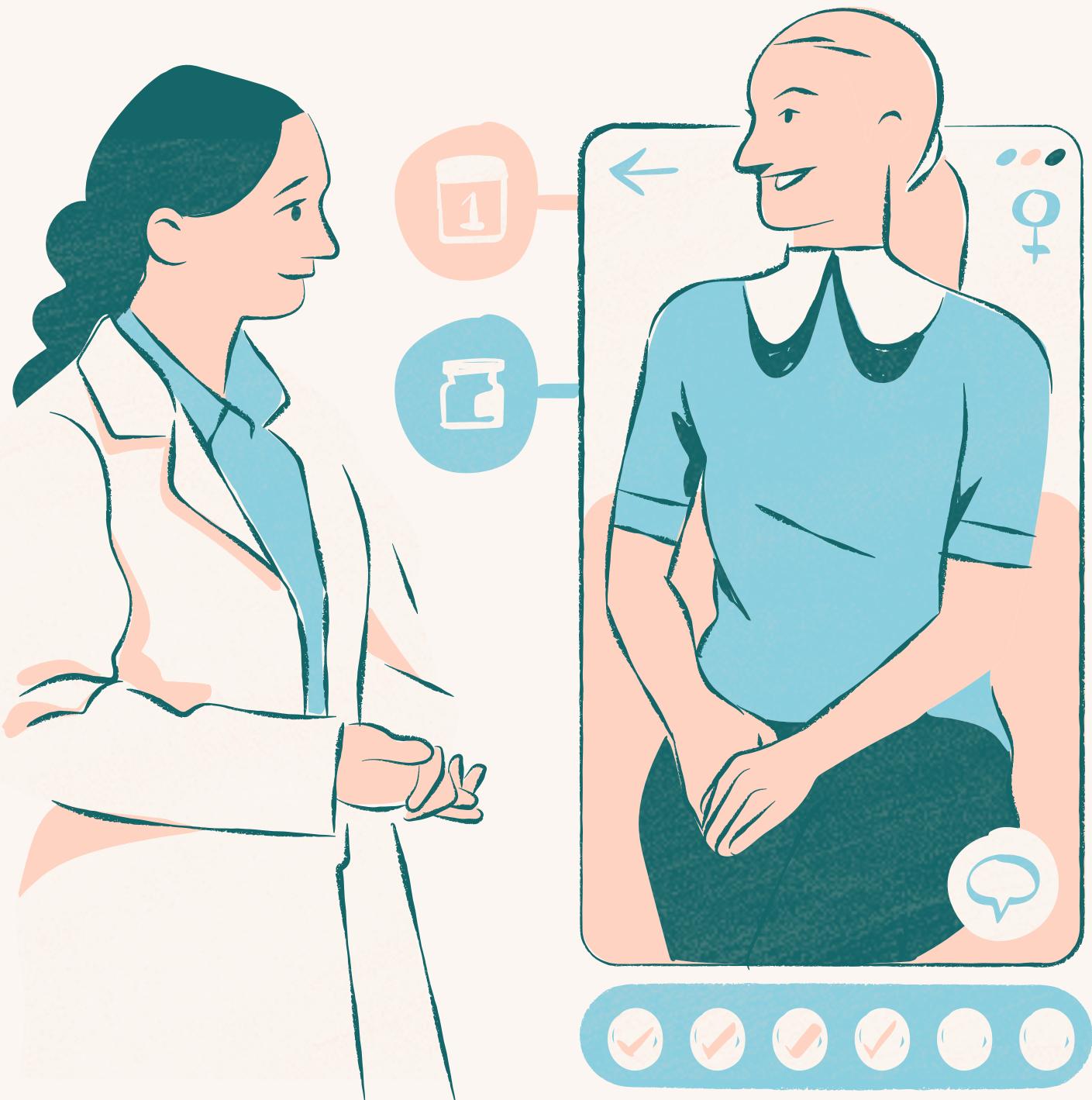


# Random Forest classification Report





Thank  
you very  
much!



وزارة الاتصالات  
وتكنولوجيا المعلومات

