



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

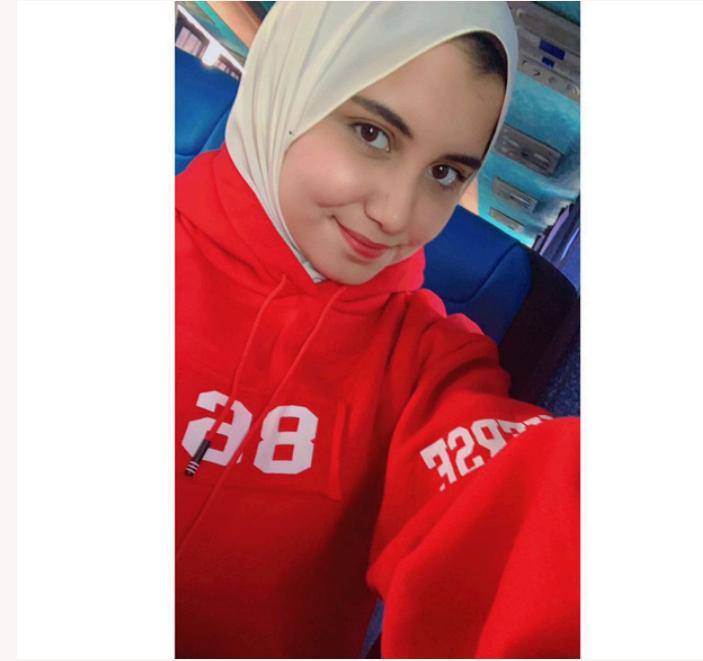
05. Exploratory Data Analysis

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.

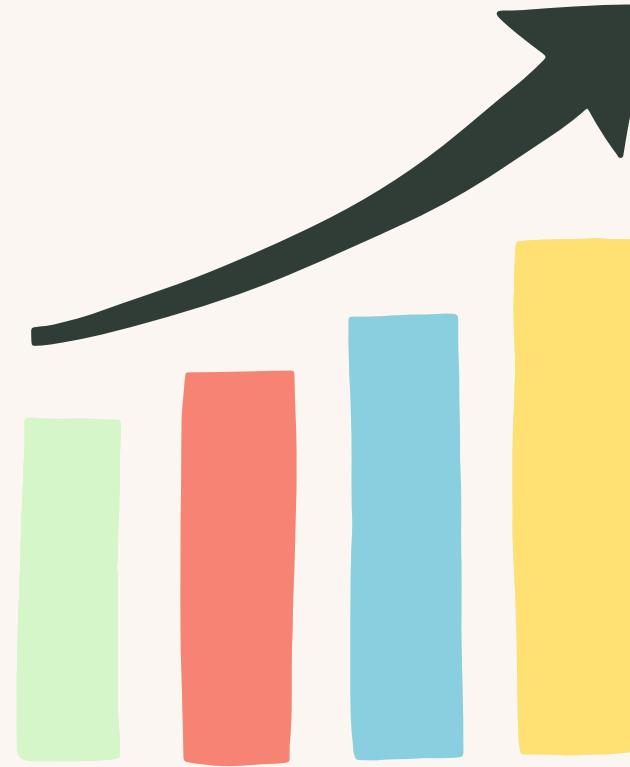
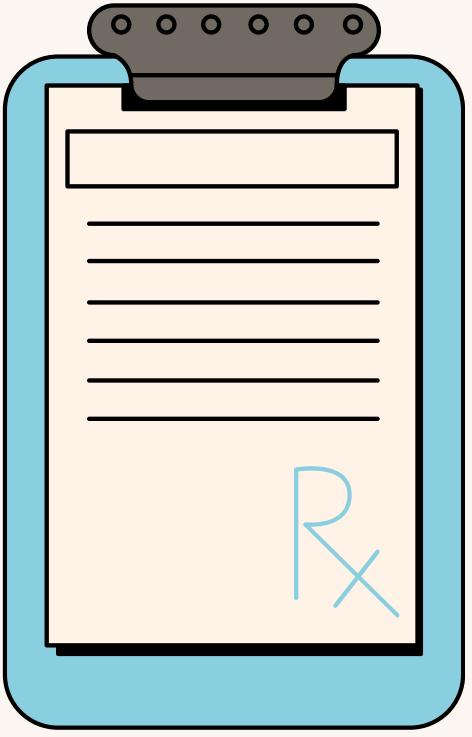


Project Overview

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.

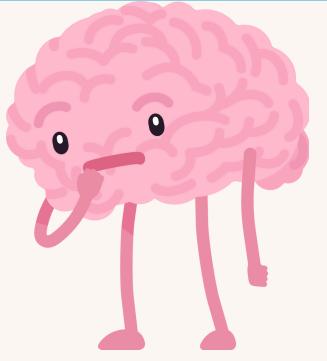


Objectives and goals



- 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

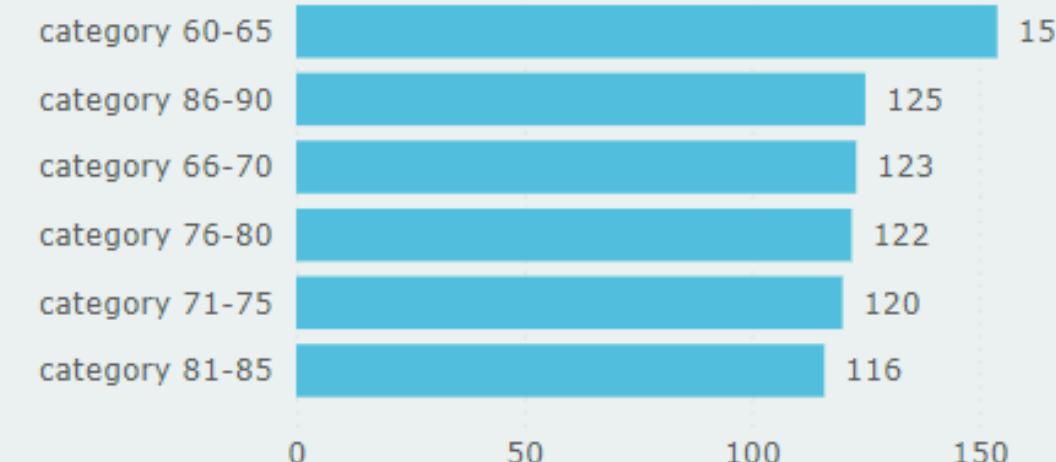
Cholesterol

Diastolic pb

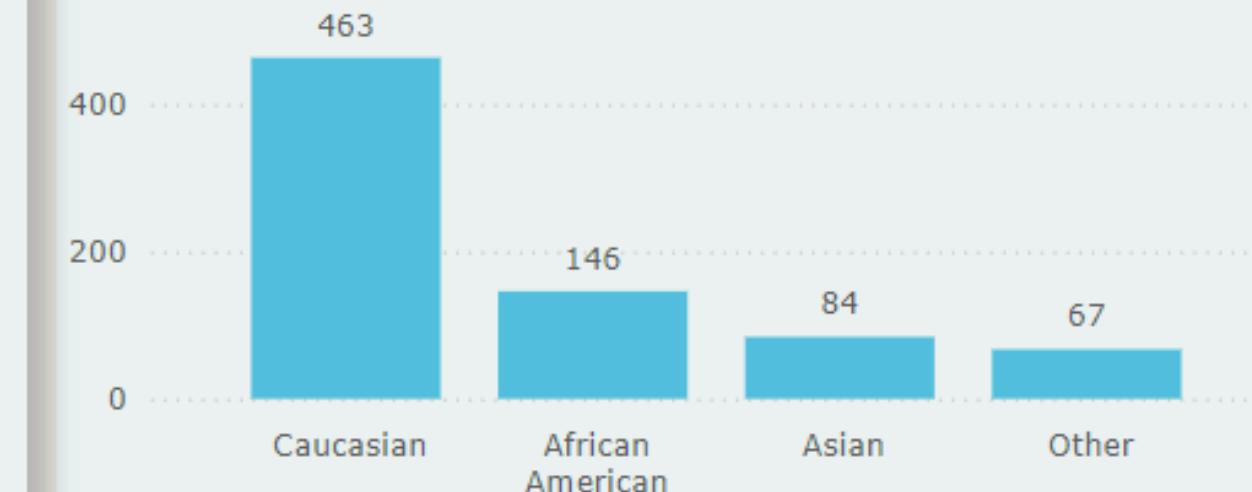
systolic bp

BMI

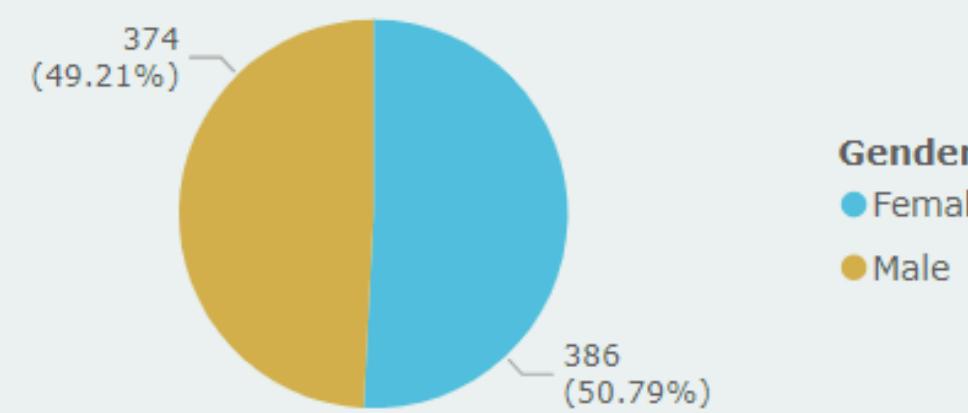
Diagnosis Distribution Across Age Groups



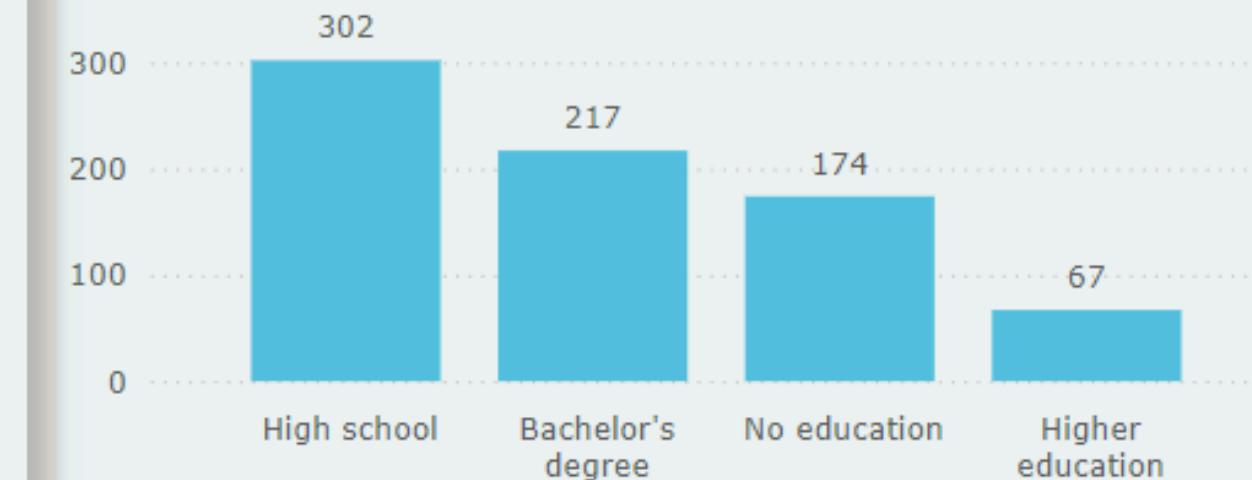
Diagnosis Frequency by Ethnicity



Diagnosis Distribution by Gender



Diagnosis Distribution by Education Level



demographic details

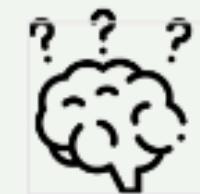
- EducationLevel
- Bachelor's deg...
 - High school
 - Higher education
 - No education

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

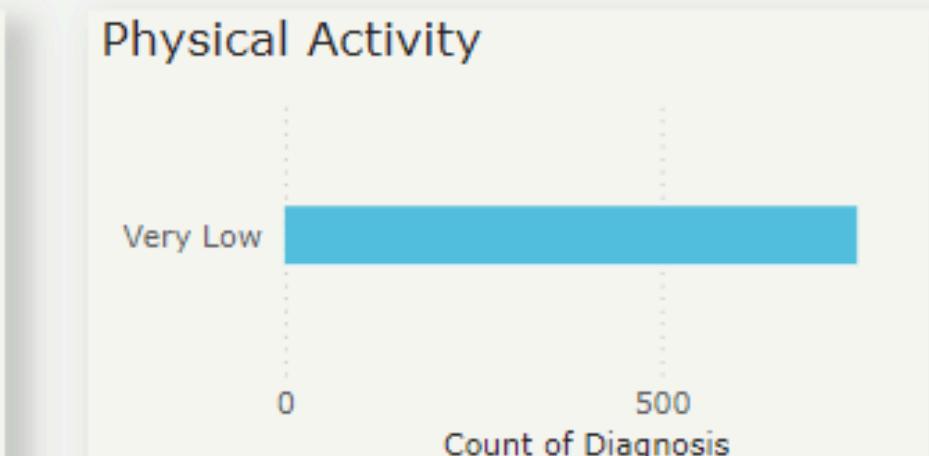
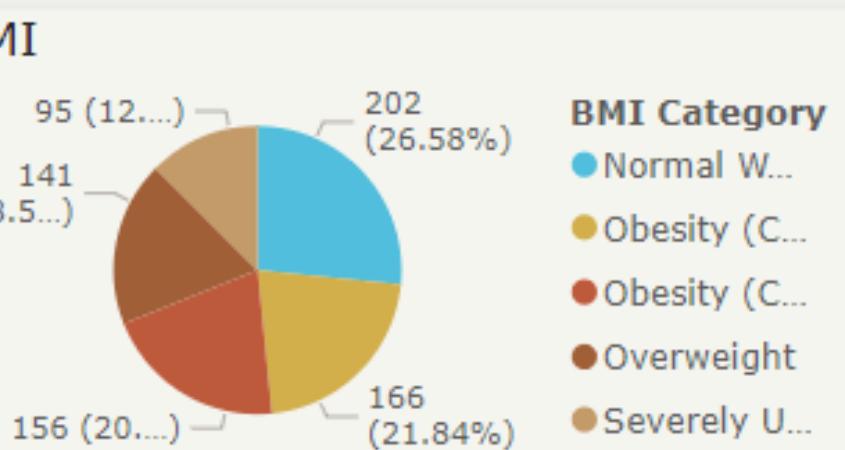
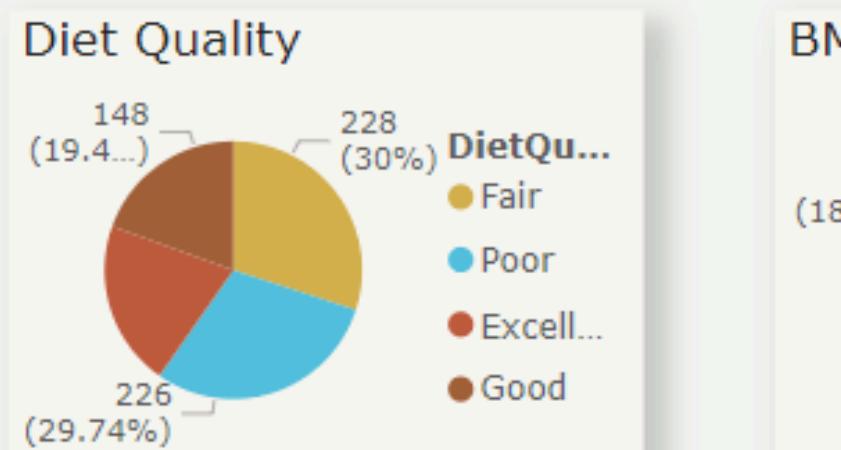
- Ethnicity
- African American
 - Asian
 - Caucasian
 - Other

- Gender
- Female
 - Male

Alzheimer's patients Dashboard



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demographic details

EducationLevel

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- No education

Age categories

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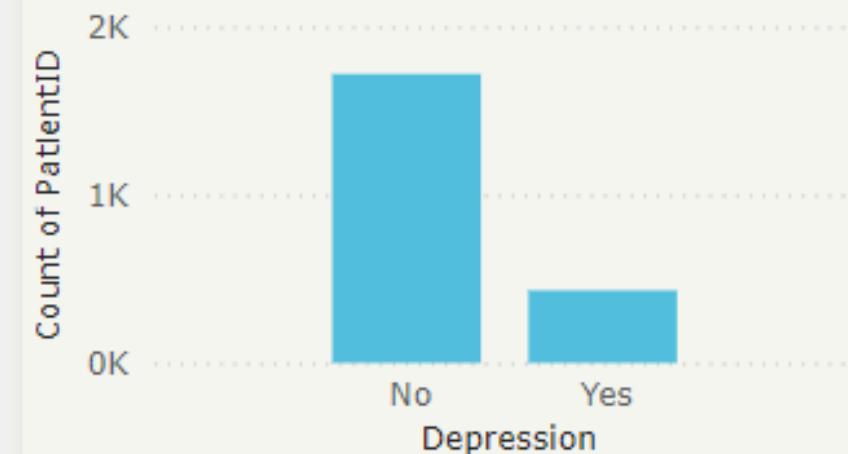
Gender

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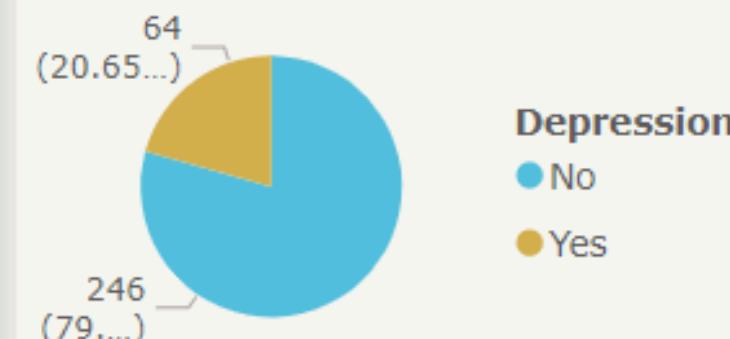
Depression Disease Dashboard



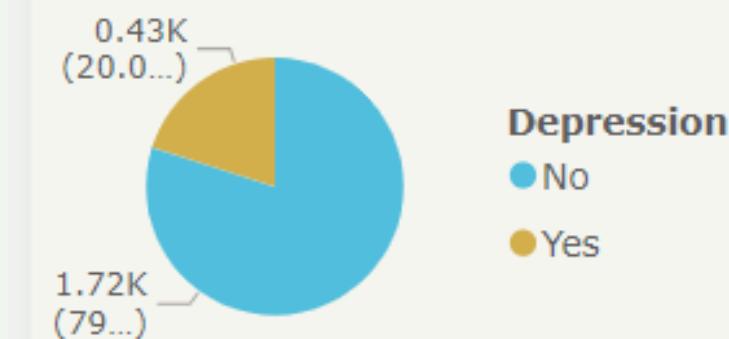
Depression Levels among Patients



Depression Levels and Cardiovascular Disease

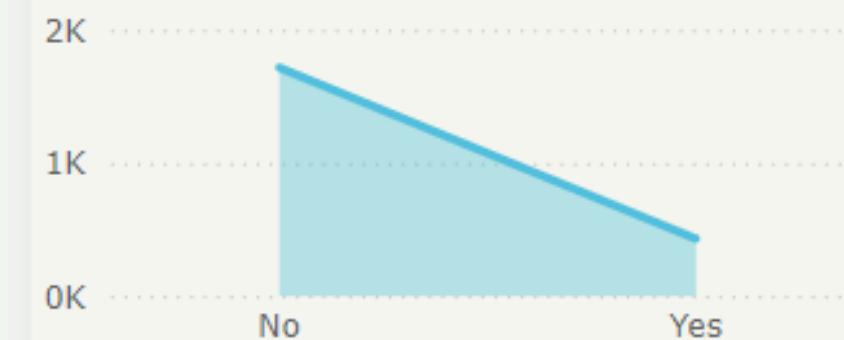


Depression Levels and Hypertension

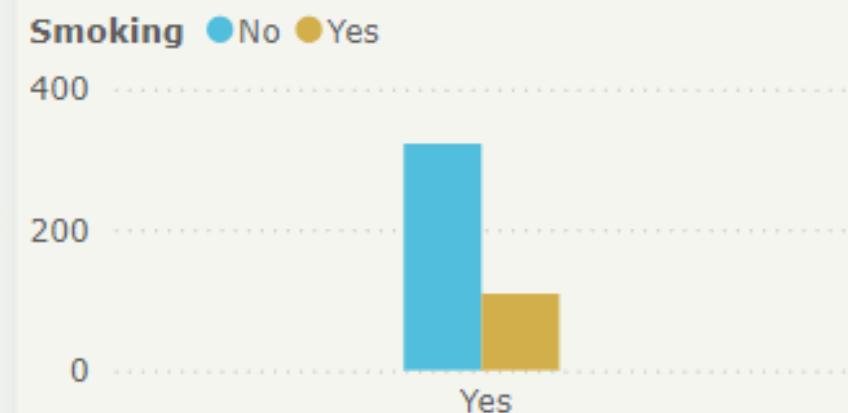


PersonalityChanges	Smoking	PhysicalActivity Category	Count of Depression
No	No	Very Low	268
No	Yes	Very Low	90
Yes	No	Very Low	54
Yes	Yes	Very Low	19

MMSE Across Depression Levels



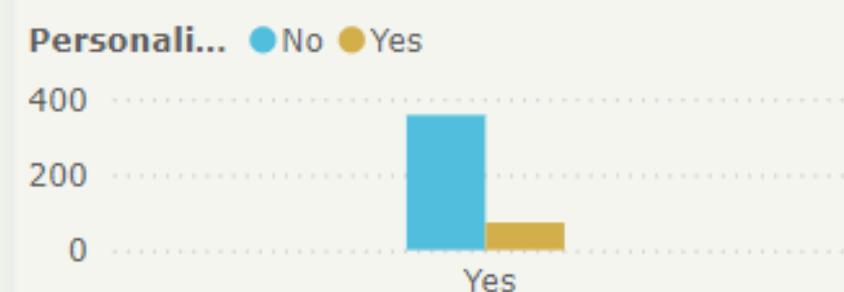
Depression Status and Smoking Habits



Depression and Physical Activity



Depression Status and Personality changes



demographic details

EducationLevel

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Age categories

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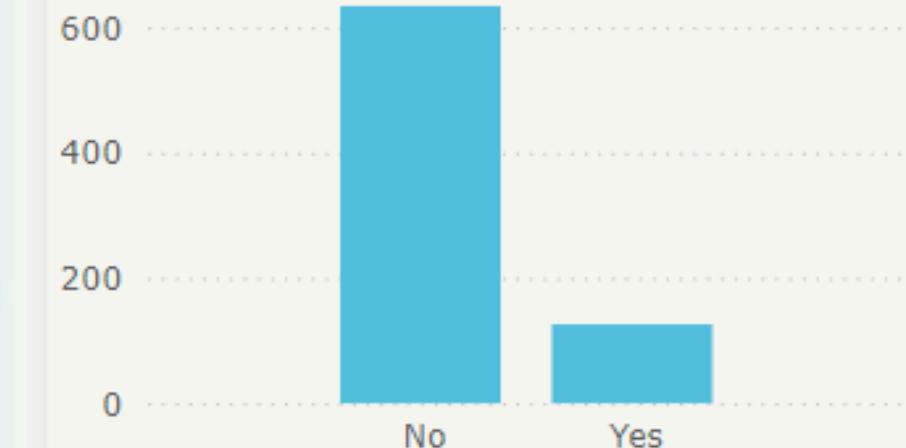
Gender

- Female
- Male

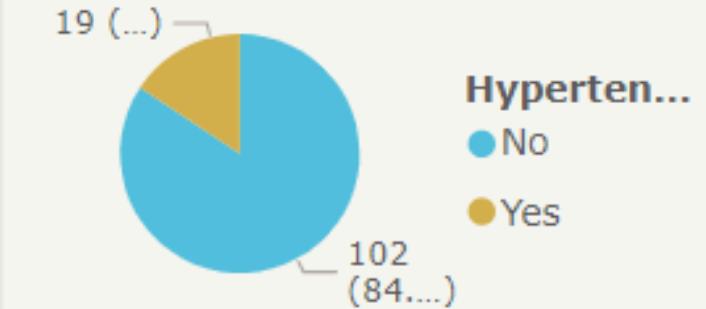
Hypertension Dashboard



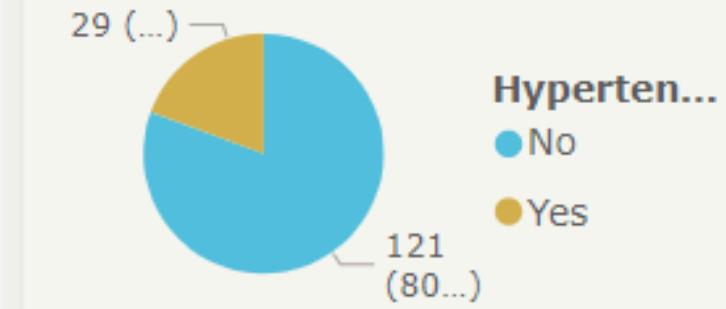
Hypertension among Patients



Hypertension and Cardiovascular Disease



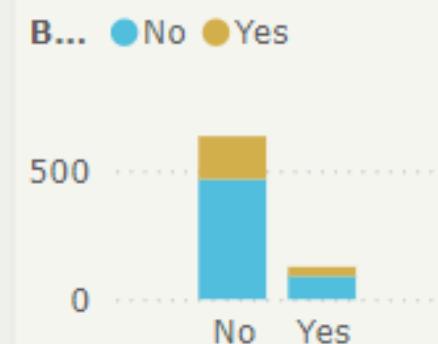
Hypertension and Depression



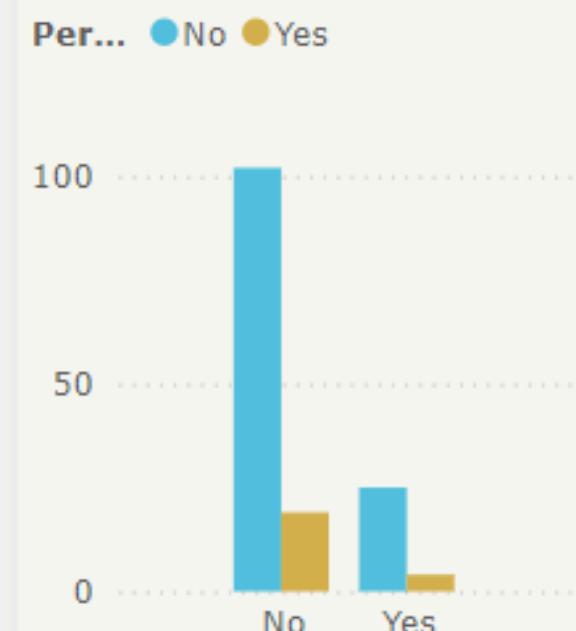
ADL with Hypertension



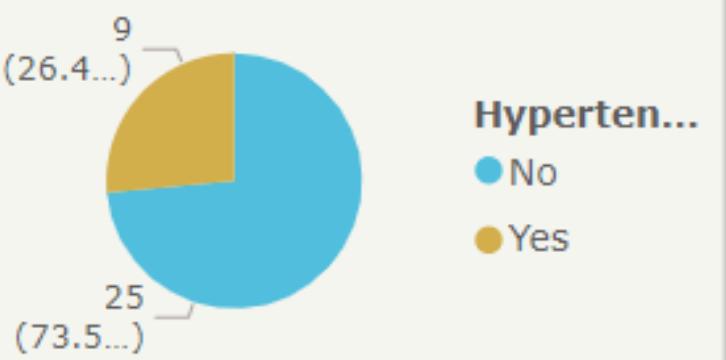
Hypertension and Behavioral Issues



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

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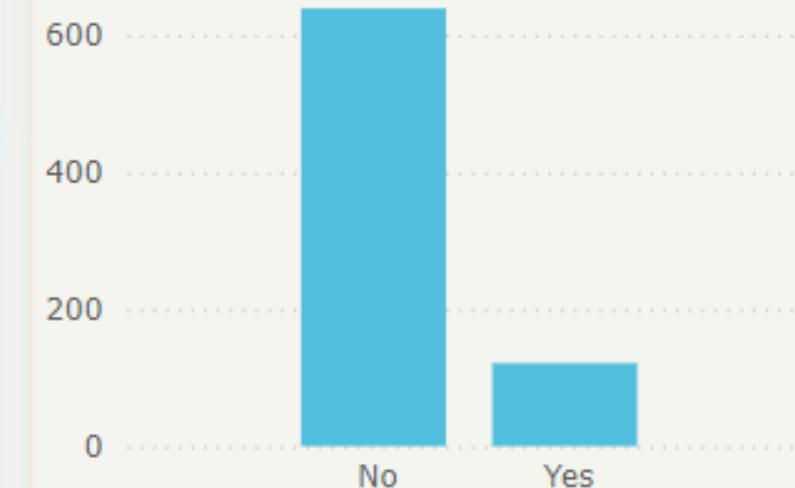
Gender

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- Male

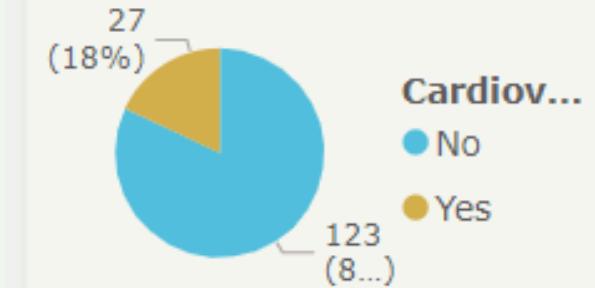
Cardiovascular Dashboard



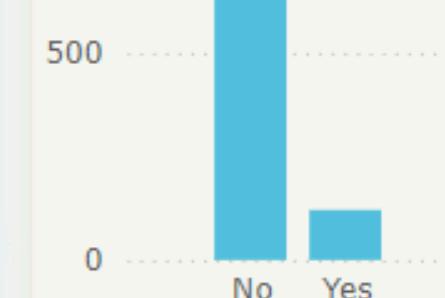
Cardiovascular Disease among patients



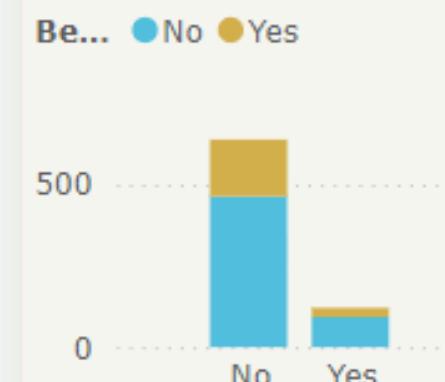
Cardiovascular Disease and Depression Status



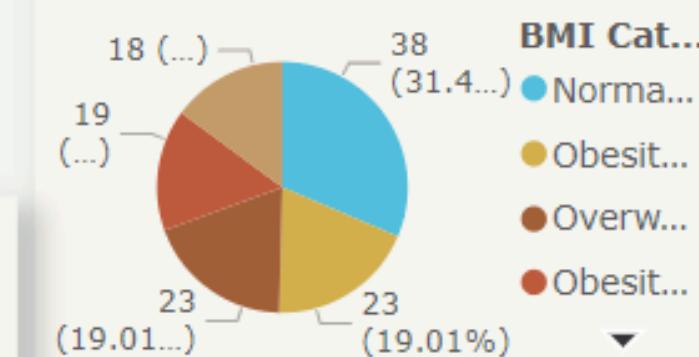
ADL with Cardiovascular Disease



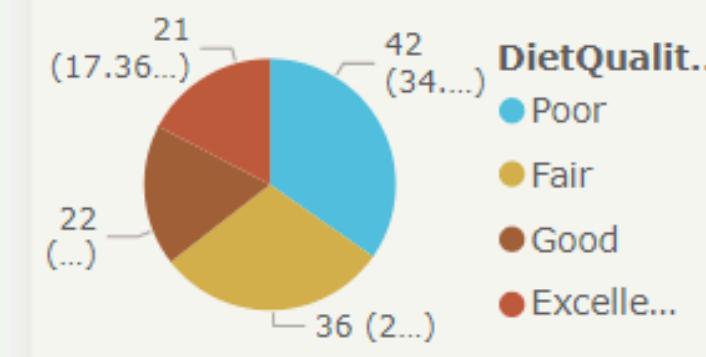
Cardiovascular Disease and Behavioral Issues



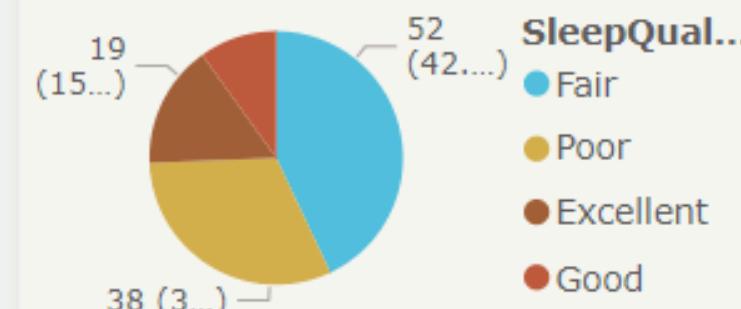
Cardiovascular Disease and BMI



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

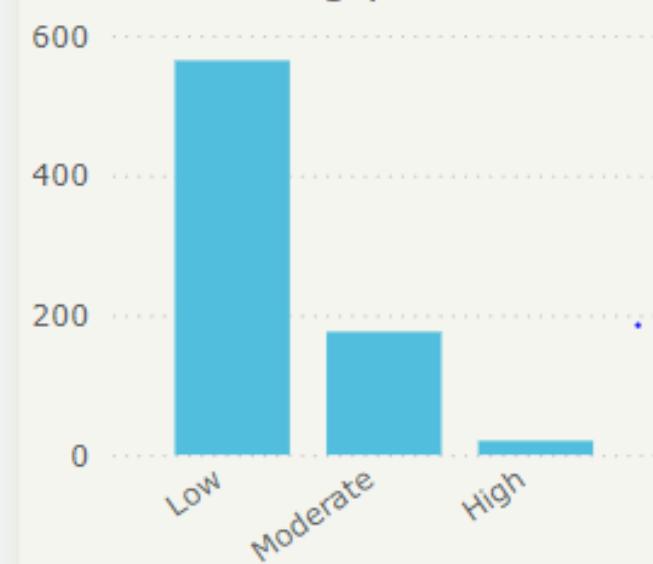
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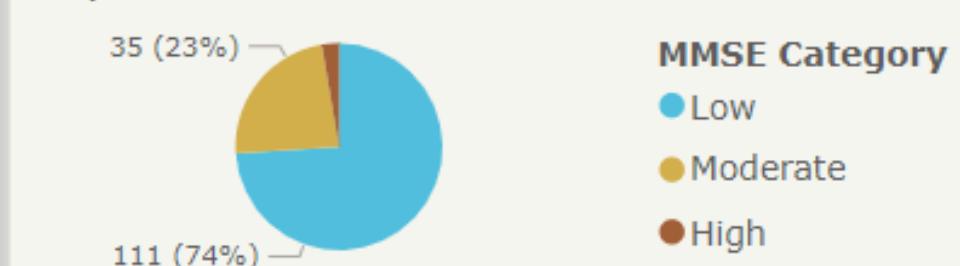
Gender

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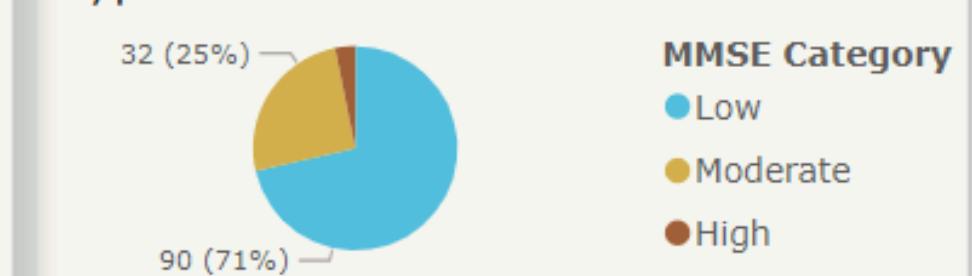
MMSE among patients



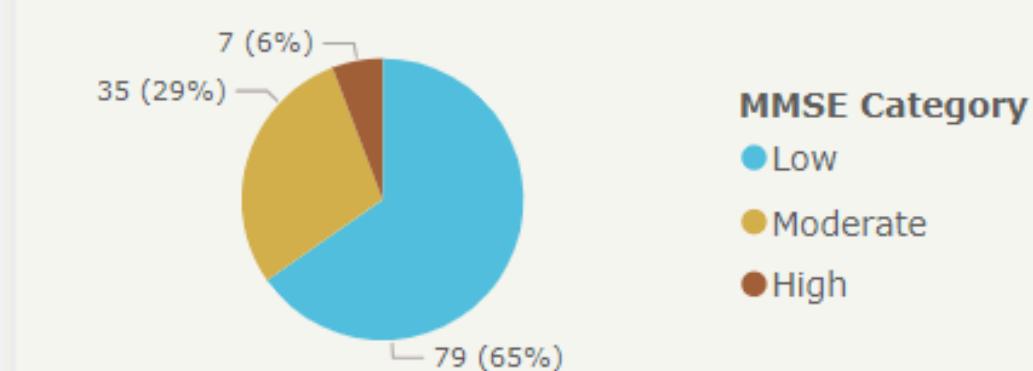
Depression and MMSE



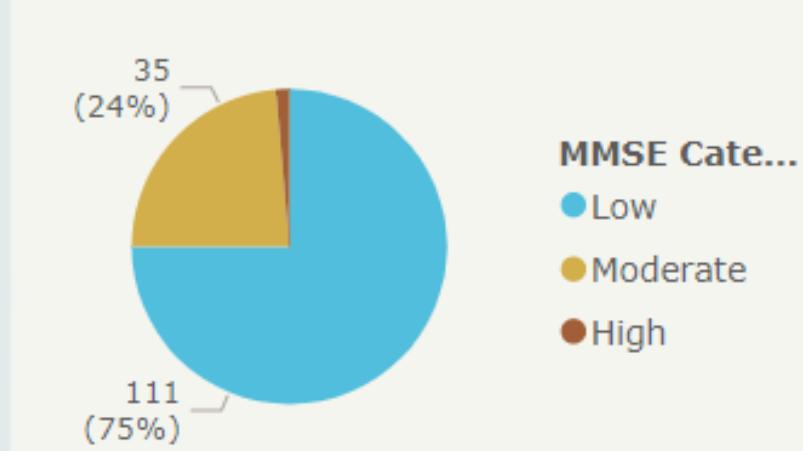
Hypertension and MMSE



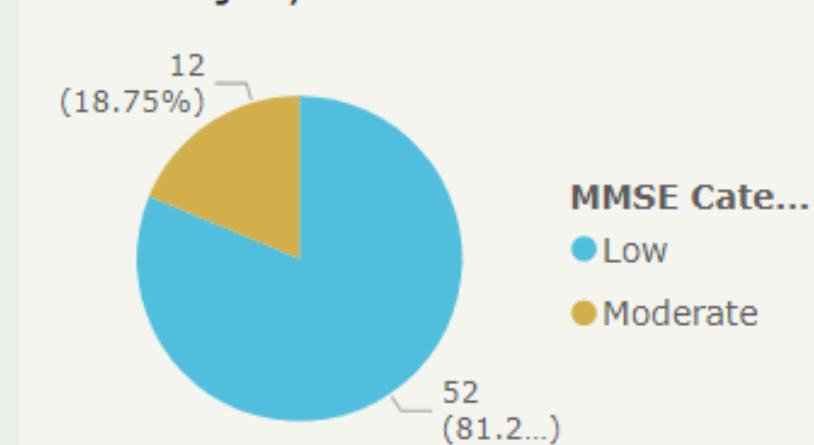
Cardiovascular and MMSE



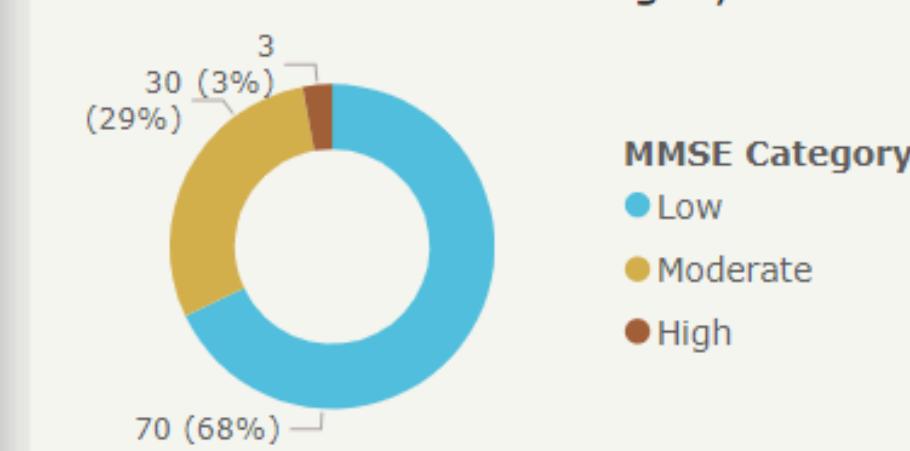
Confusion and MMSE

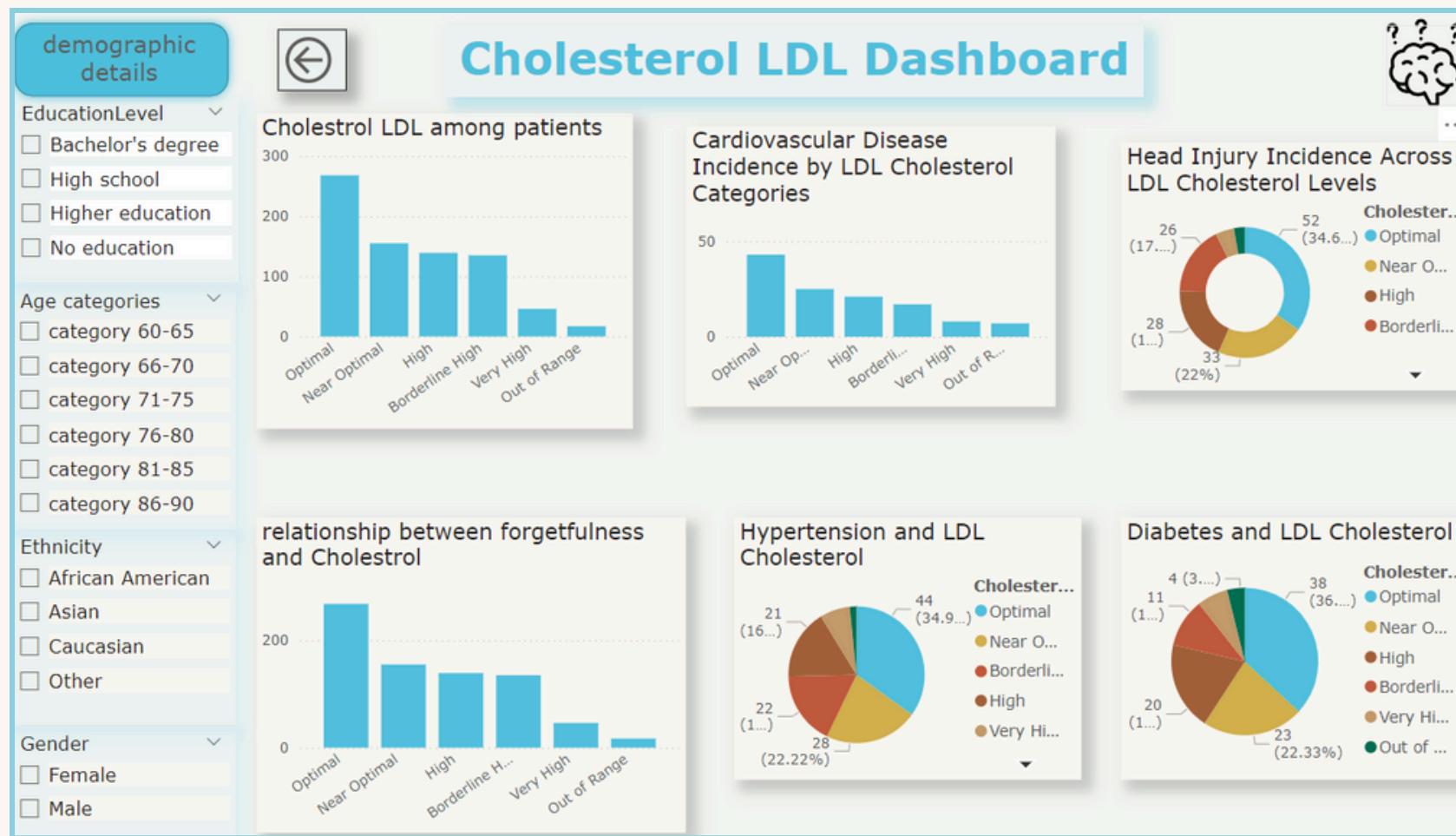
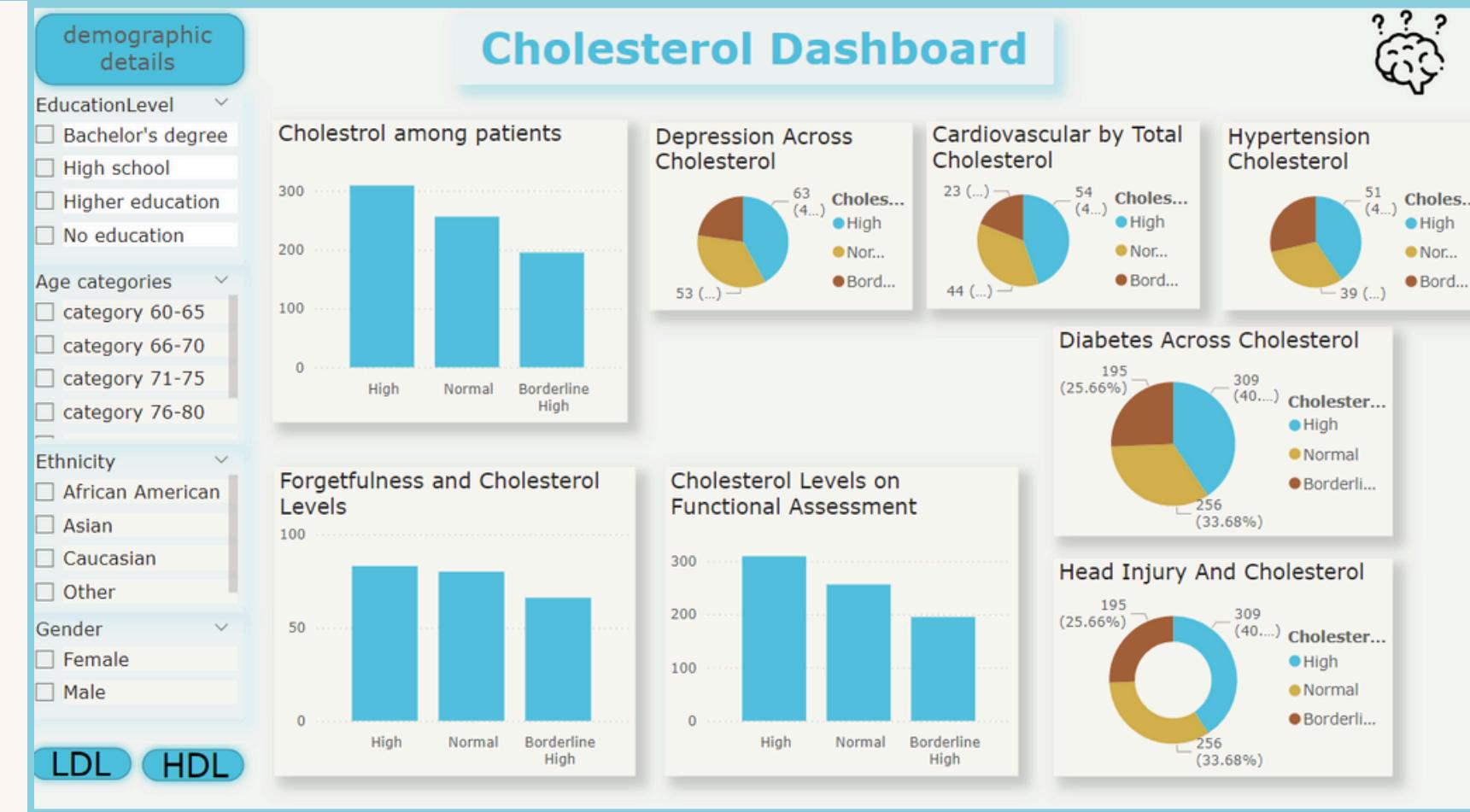


Head Injury and MMSE

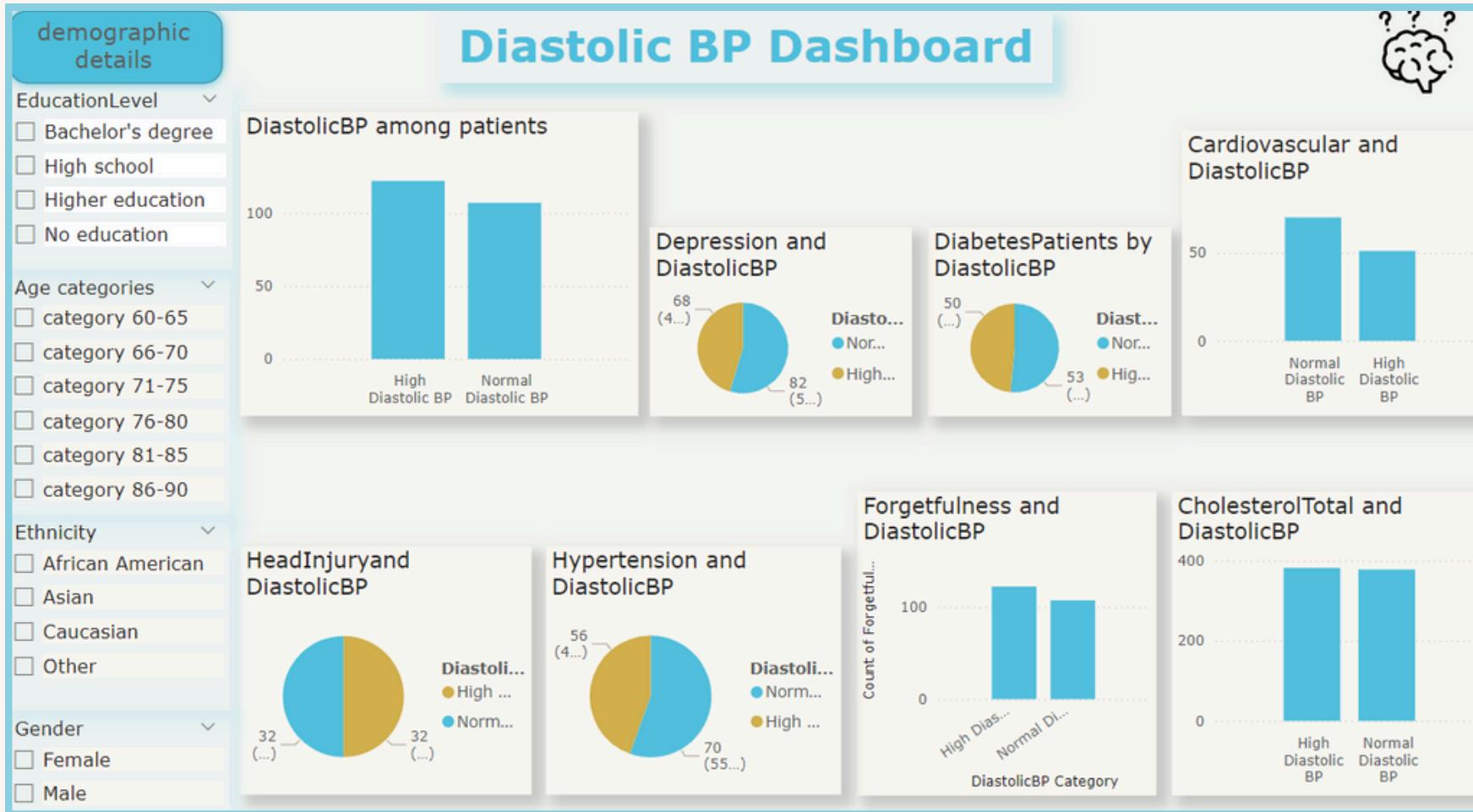


Diabetes and MMSE Category

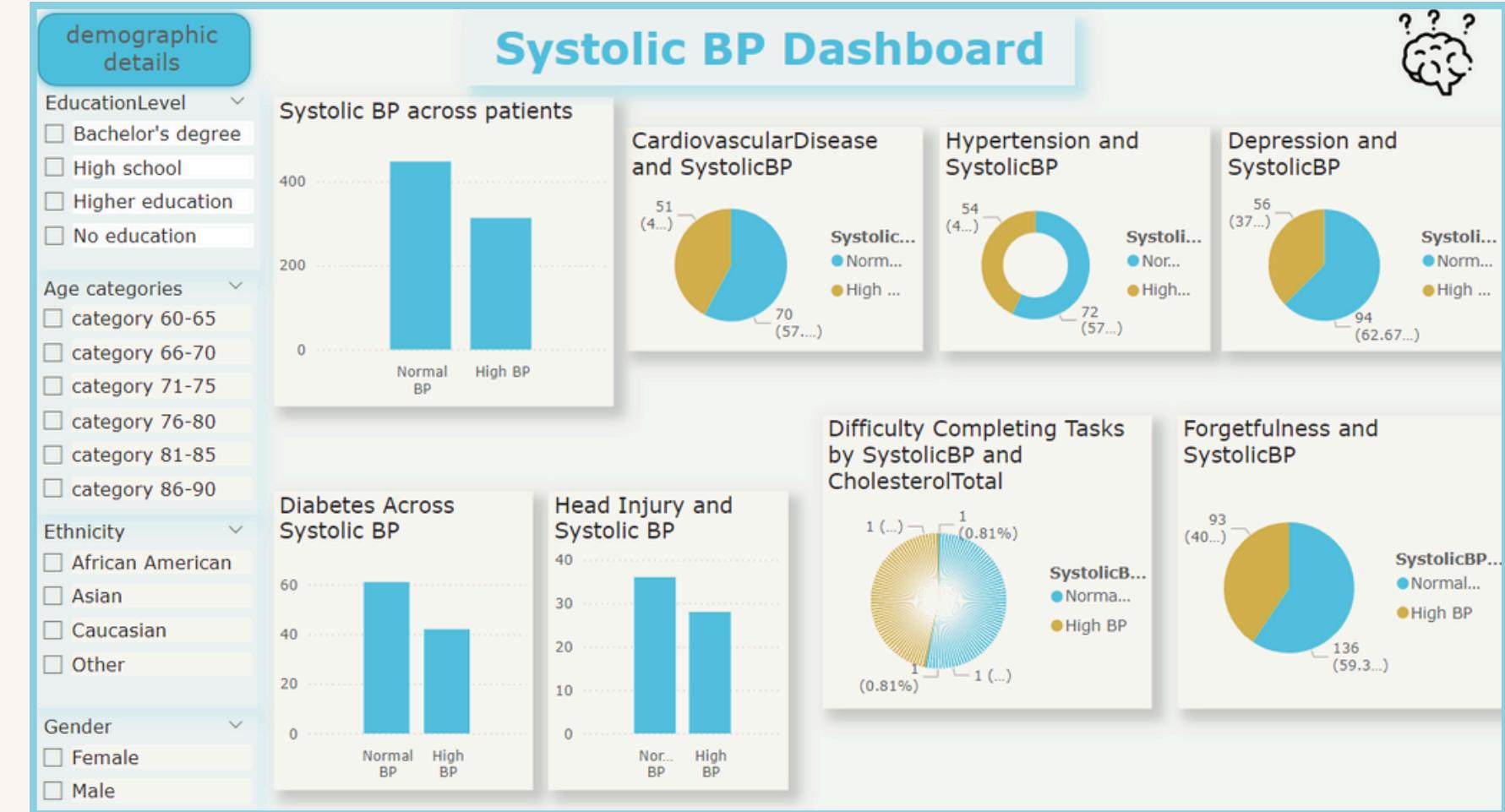




Daistolic



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

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- Caucasian
- Other

Gender

- Female
- Male

BMI Dashboard



BMI among patients



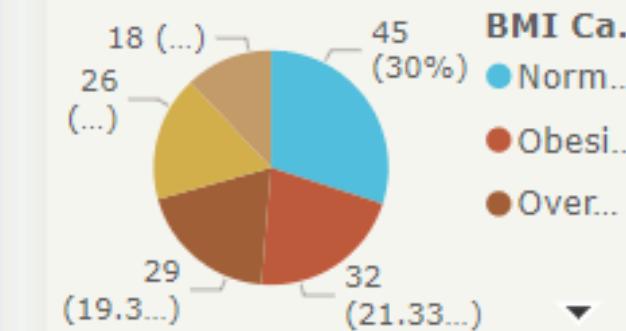
Sleep Quality

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

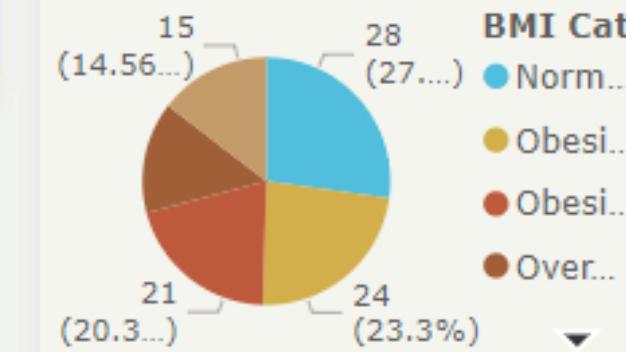
Disorientation

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

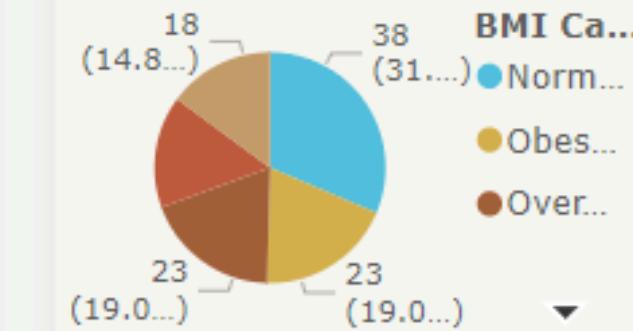
Depression and BMI



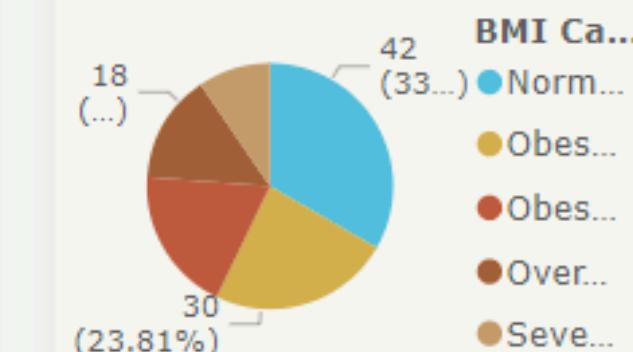
Diabetes and BMI



Cardiovascular and BMI



Hypertension and BMI



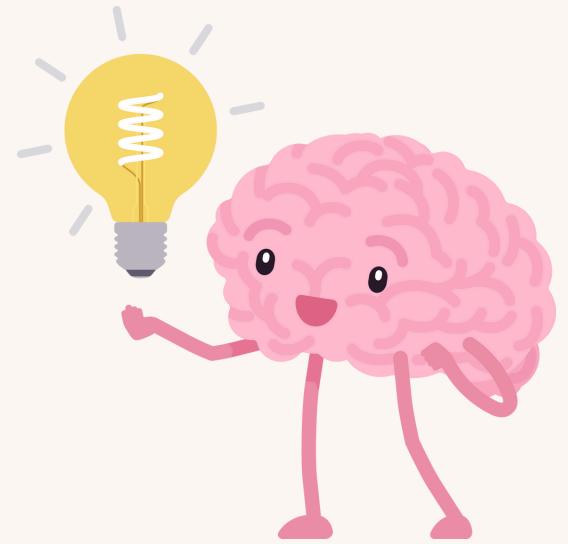
Diet Quality

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.

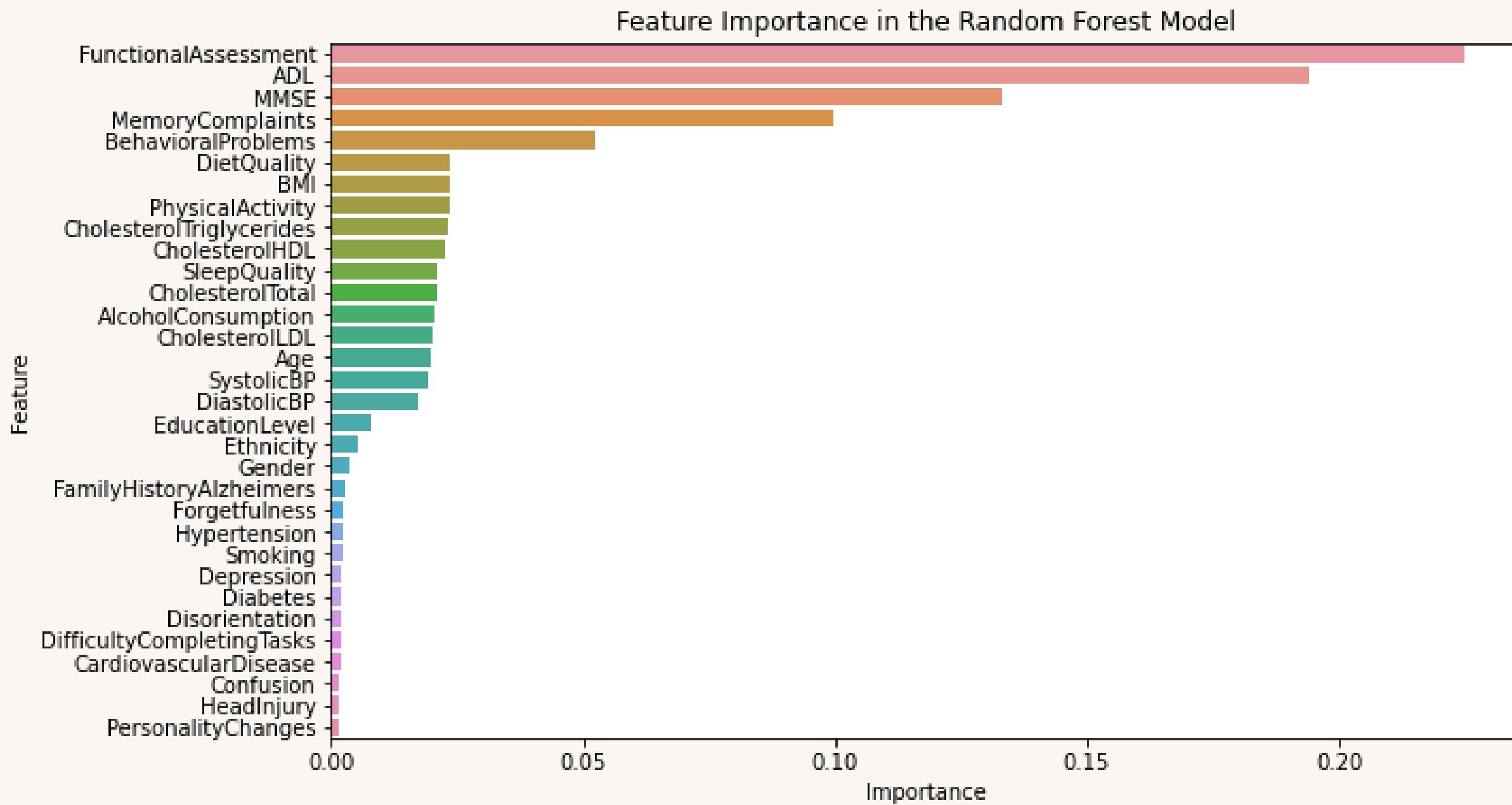
Educational and Age-Specific Interventions:

- **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.

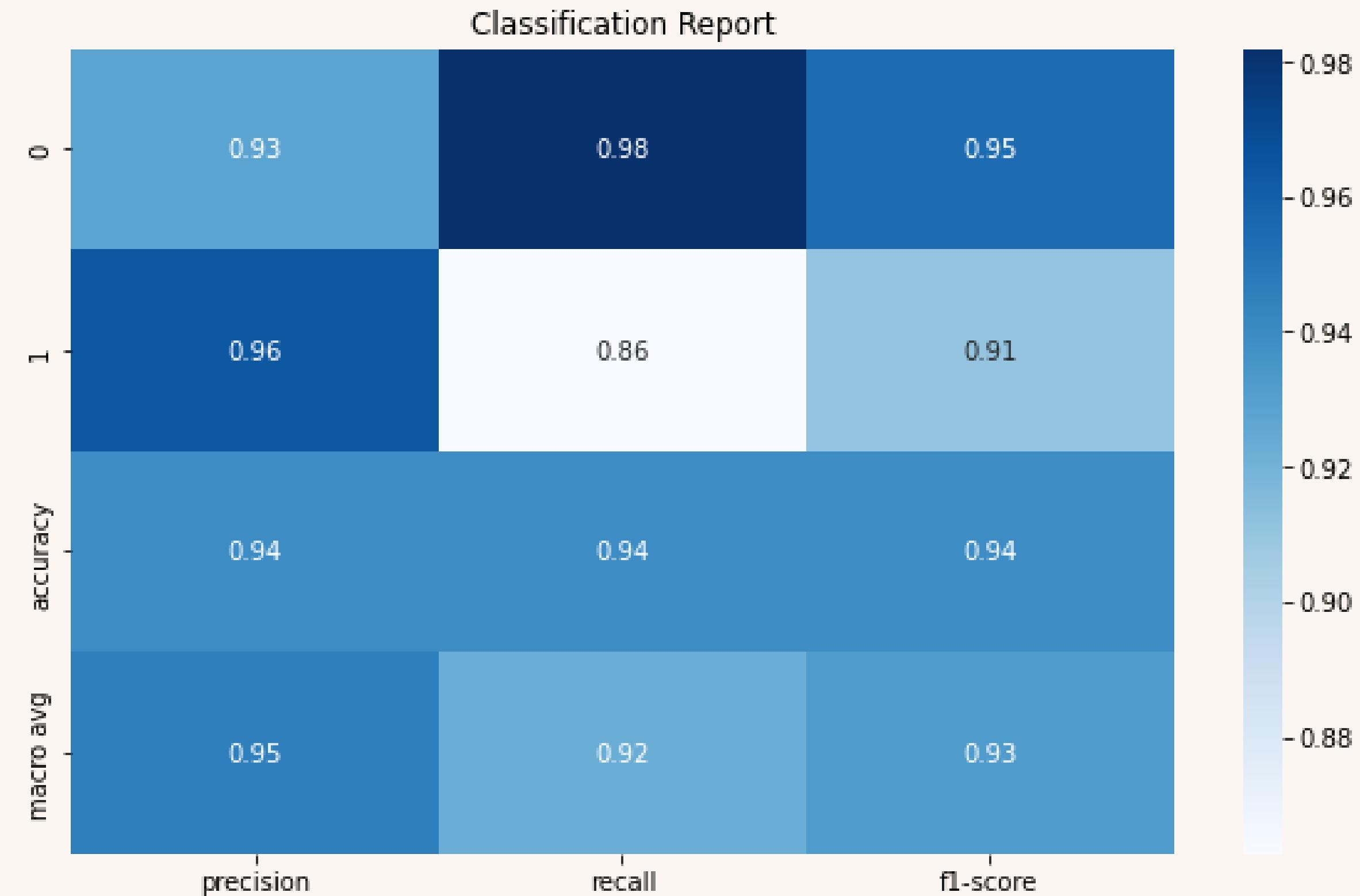
Applying Random Forest to Validate Insights

why Random
Forest

Grid Search

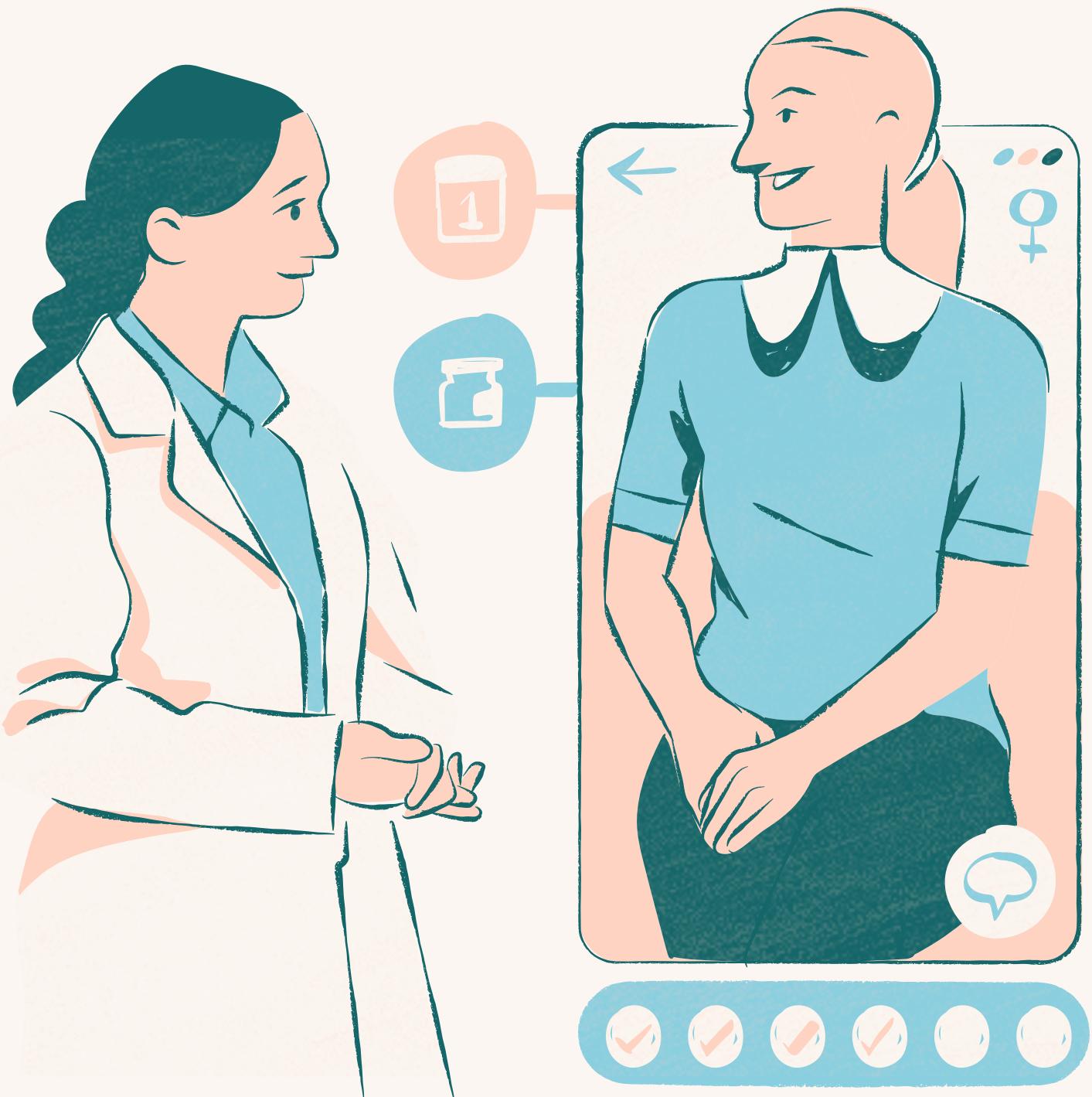


Random Forest classification Report





Thank
you very
much!



وزارة الاتصالات
وتكنولوجيا المعلومات

