**Datathon 2023**

**Team 9: Analytics Ninjas**

**Insights Report: The effect of COVID-19 on patients with Multiple Sclerosis**

## **Introduction**

* Multiple sclerosis (MS) is a long-lasting (chronic) disease of the brain and spinal cord (central nervous system).
* We are analyzing the effect of COVID on patients with Multiple Sclerosis.

## **Demographics Analysis**

* The COVID dataset contains 1141 patients with Multiple sclerosis. These details are entered by either patient (92.64%) themself or some clinicians (7.36%).
* Bubble stack chart shows that we have 904 Female and 237 male patients in our dataset with BMI Ranges from Normal (96%) to Overweight (4%).
* The custom visual Infographics shows that 328 people have comorbidities and 813 have no comorbidities.
* In our analysis cards used to analyze the following counts such as 258(Age group>50),34(Overweight),495(Smoker) and 5(Pregnancy).
* We have defined COVID scores for all the patients in our dataset based on their current symptoms and other comorbidities. The tornado chart shows that we have COVID scores ranging from 0-10. The Severity of the COVID score has been segregated as Mild, Moderate, Severe and Critical based on COVID score. Here, most of the patients have COVID score <5. 253 (201 female and 52 Male) patients having COVID score as 3 which is higher in number.
* The pie chart from python Matplot library with explode feature analyzes the COVID status of the patients. We have 45.4% mild, 24.9 % moderate,1.8% severe and 27.9% critical patients in our dataset.
* Line chart shows the effect of COVID on patients with Smoking habits, overweight and pregnancy. Analysis shows 143 smokers (out of 495), 14 overweight (out of 34) and 1 (out of 5) pregnant patient fall into critical illness of COVID.

## **Treatment Analysis :Multiple Sclerosis**

* Count of Patients by MS type and COVID\_Status: The Sunburst chart gives the count of patients with Multiple Sclerosis type and their COVID status. In our dataset 79.40% of patients have relapsing remitting type of MS and 9.11% have progressive MS.
* Count of Patients by MS\_Duration\_Year: The Aster plot gives us the patient count and how long the patient is receiving treatment for MS. 460 patients are receiving treatment for 1-10 years. 217 patients are receiving treatment for 11-20 years,74 patients are receiving treatment for 21-30 years and 21 patients are receiving treatment for more than 30 years.
* Count of PatientID by MS\_Duration\_year (groups), COVID\_Status and Current\_DMT (groups): The Violin chart Plots the patient count and the effect of DMT (Disease modifying Therapy) on covid status. The number of patients in moderate and critical stages are more in number for the On\_DMT group.
* Count of PatientID, MS\_Duration\_year and COVID\_Score(0-10): The 3D plot created using Python script gives us the insight that Patients with higher MS duration year shows high COVID score. The conclusion is that the severity of COVID increases when MS duration year increases.

## **Treatment Analysis: COVID**

* In our dataset we have 60 confirmed,223 suspected and 858 non suspected cases of COVID. Out of these 360 patients are having symptoms ,15 admitted to hospital, 4 in ICU stay, 4 in ventilation and 455 were self-isolated.
* The table chart shows the analysis of Patients in ICU. Out of 4 - ICU patients 3 of them were having critical COVID status and 1 of them fell into severe COVID status. Out of these 4, 3 patients have other comorbidities and 2 have smoking habits. So, we can conclude that other comorbidities and smoking habits may increase the severity of COVID in MS patients.
* COVID\_Status of Patients with other Comorbidities: The Strip plot was created using python visual (Seaborn library). Patients with comorbidities show critical and severe stages of COVID. Majority of Patients with no comorbidities show only the mild or moderate symptoms of COVID.
* Count of Patients by DMT\_Drug and COVID\_Status: The Ribbon chart shows the effect of glucocorticoid drug and the covid status of those patients.247 critical covid status Patients are taking glucocorticoid which is an essential drug for autoimmune disorders.

## **Other Diseases**

* The first chart multirow card displays the detailed information for multiple diseases/categories of diseases and the count of patients by each disease simultaneously. We have a total of 232 patients who have other comorbidities.
* Key Influencer chart identifies the primary key influencers as Immunodeficiency, Lung disease and cardiovascular disease. These primary key influencer diseases increase the severity of COVID on MS patients.
* Since Immunodeficiency is the primary key influencer, The Tornado chart analyzes COVID status on patients with Immunodeficiency. Out of 29 immunodeficient patients 19 shows critical illness of COVID.
* The Area chart analyzes the COVID score on patients with comorbidities. Analysis results show that patients with immunodeficiency show high COVID scores compared to other diseases.
* The Chord chart analyzes the other comorbidities based on age group and COVID status. Conclusion is that patients age group>50 and with other comorbidities show critical illness of COVID than age<50.
* The table chart shows the MS\_Duaration and age group analysis with key influencer diseases like Immunodeficiency, Lung and Cardiovascular along with the count of patients. When higher the MS duration COVID severity also increases.

## **Covid Symptoms**

* Covid Symptoms: Patient Count - This Funnel Chart shows each of the covid symptoms and the number of patients having that symptom. More patients in our dataset have experienced Fatigue symptoms and only 14 patients have Pneumonia symptoms which is one of the high-risk factors.
* Covid Score for Fatigue Symptom - This Bubble Stack Chart shows the count of Fatigue symptom patients categorized by the covid score. Each stack represents a covid score. 42% of patients have a covid score of 3 that means the covid status is moderate.
* Covid Status Vs Covid Symptoms - This Sunburst chart shows the covid status of ‘Mild’ and ‘Critical’ in the inner layer. The outer layer gives the count of ‘Symptomatic’ and ‘Asymptomatic’ patients under each status. We can infer that many patients in the ‘Critical’ status are ‘Symptomatic’.’
* Covid Score Vs Moderate Risk Factors - This Stacked area chart shows the count of patients with the moderate risk factor symptoms of ‘Fever’ and ‘Shortness of Breath’. Covid Score of 3 has the highest number of patients with both symptoms.
* Covid Status Vs Critical Risk Factor: Pneumonia - This Chord chart shows that there are 14 patients with ‘Pneumonia’, 9 have a covid score of 7 and 5 patients with covid score of 10. All 14 patients with ‘Pneumonia’ are in the ‘Critical’ covid status.

## **Conclusion**

* Most of the Patients (45%) show Mild illness of COVID. More the MS duration year, more will be the severity of COVID.
* Patients with smoking habits, overweight may show critical illness of COVID.
* The patients are showing critical illness of COVID if the Patients has other comorbidities.
* Patients with Immunodeficiency, Lung and Cardiovascular diseases are more prone to critical illness of COVID.
* Symptomatic patients show a higher percentage in the critical stage of COVID than Asymptomatic patients.

***Our Conclusion is that the severity of COVID on patients with multiple sclerosis increases depending on the MS duration year and other comorbidities.***