



BIG Data and Business Intelligence  
In-Course Assessment

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# ACROMEGALY AND IGF ANALYSIS

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Section 2: Business Intelligence Solution

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STUDENT

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# Executive Summary

## Abstract

Acromegaly is a pituitary tumor that produces high levels of growth hormone. This research is to understand and analyze how high the IGF levels could rise. If there is any resistance to insulin and blood glucose levels and does the physical appearance and physical characteristics of patients change when affected by Acromegaly? The data set is acquired from opensource. The dataset is evaluated and preprocessed to build the appropriate data model. The transformed data model is then used to draw solutions for the mentioned business questions. From this analysis, it can be stated that Acromegaly causes a rise in IGF levels, higher insulin resistance, higher glucocorticoid levels, and does not have significant changes concerning BMI, Age, and height. Except there was a marginal increase observed in height and BMI.

## Data Model

This secondary research dataset contains the details gathered from 9 Acromegaly patients and 11 control patients. The gene sequences are generated and analyzed. The data model is a snowflake schema with a factless fact table as shown in the picture below.

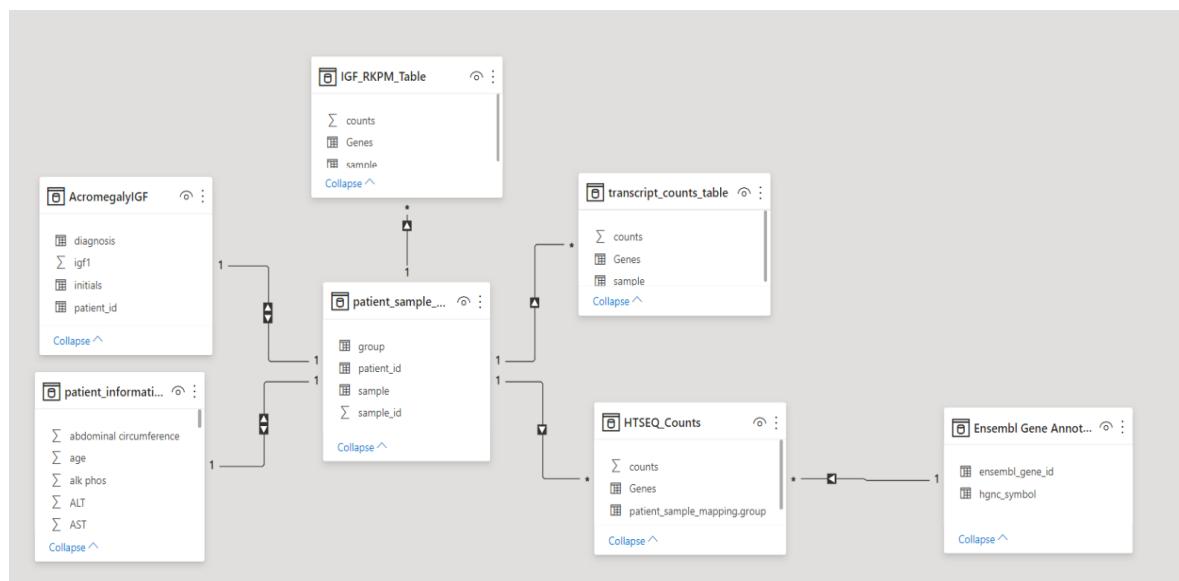
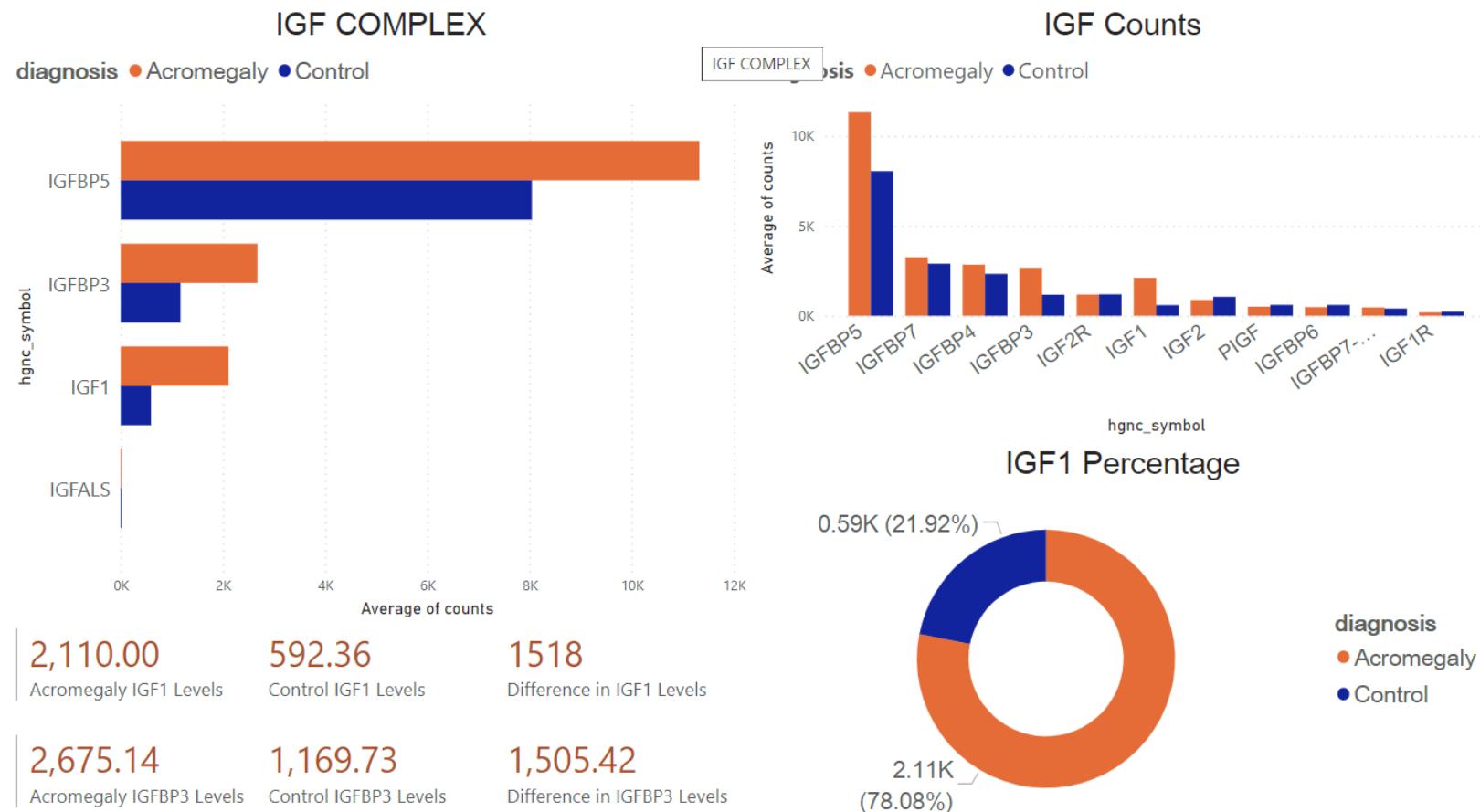


Figure 1 Data Model - Snowflake Schema

## Key Findings

Growth hormone stimulates cell reproduction, cell regeneration, and is also responsible for growth in the body. In deeper terms, the pituitary gland releases IGF1, and growth is the result of circulating this IGF1 in the body. Below are the plots between IGF components and the sequence counts.



From these plots, it is evident that the IGF levels have a rapid increase in the IGF levels. IGF complex functions show an enormous increase in IGFBP5, IGFBP3, and IGF. The donut plot shows the percentage increase, which is almost 3.5 times higher than the controls.

## Conclusions

The following observations and conclusions have been made from the research.

1. The average IGF1 levels are 3.5 times higher in Acromegaly patients.
2. Acromegaly patients have higher insulin resistance and low levels of insulin sensitivity.
3. Acromegaly patients tend to show higher averages for BMI and height.
4. The probability of Acromegaly might increase with age. Since the analyzed data is a smaller sample, this may not be true for more significant models and real-time scenarios.
5. Weight and Abdominal circumferences do not tend to change in considerable amounts according to the research dataset.

## Acknowledgments

Thanks to Professor Dr. Annalisa Occhipinti for her continual guidance, support, and advice throughout my research. I want to thank my parents Mr. Ramanachari Kamanooru, Mrs. Vijayalakshmi Kamanooru, and my husband, Mr. Santhosh Kanakam, for their continued encouragement and support in my career, and I am very grateful for everything I could learn from all the support received.

## Contents

<b>Executive Summary .....</b>	1
Abstract.....	1
Data Model .....	1
Key Findings .....	2
Conclusions .....	3
<b>Acknowledgements.....</b>	4
<b>Introduction .....</b>	7
<b>Analysis and Evaluation .....</b>	7
1. IGF Analysis.....	7
1.1. IGF Complex.....	8
1.2. IGF Levels.....	10
1.3. IGF Counts.....	12
1.4. IGF1 and IGFBP3 Measures.....	12
1.5. Analytics.....	16
1.6. Findings.....	17
2. Age Analysis.....	17
2.1. Analytics.....	20
2.2. Findings.....	21

3. Physical Characteristics Analysis.....	21
3.1. Analytics.....	23
3.2. Findings.....	23
4. BMI Analysis .....	24
4.1. Analytics.....	27
4.2. Findings.....	27
5. Insulin (HOMA-IR) Analysis.....	27
5.1. Analytics.....	33
5.2. Findings.....	34
6. Lipolysis , Glucocorticoids, and Isoforms Analysis .....	34
6.1. Lipolysis .....	34
6.2. Glucocorticoids .....	35
6.3. Isoforms .....	36
6.1. Analysis.....	37
6.2. Findings.....	37
Power BI Report View.....	38
Dashboard View .....	39
Conclusions .....	40
References .....	40

# Business Intelligence Solution

## Introduction

Acromegaly is a rare pituitary tumour that may either cause gigantism or dwarfism. Acromegaly might also result in shortening the life expectancy of a person, other symptoms and side effects vary from short-term to long-term and are good in a number. Therefore, it is vital to understand the tumour and its symptoms. In this secondary research, the analyzed data is collected from different patients with and without pituitary tumour. The gene sequence counts, observations on patients are compared between the two categories to determine any relationship or change between age, BMI, IGF, insulin levels, and the adenoma.

## Analysis and Evaluation

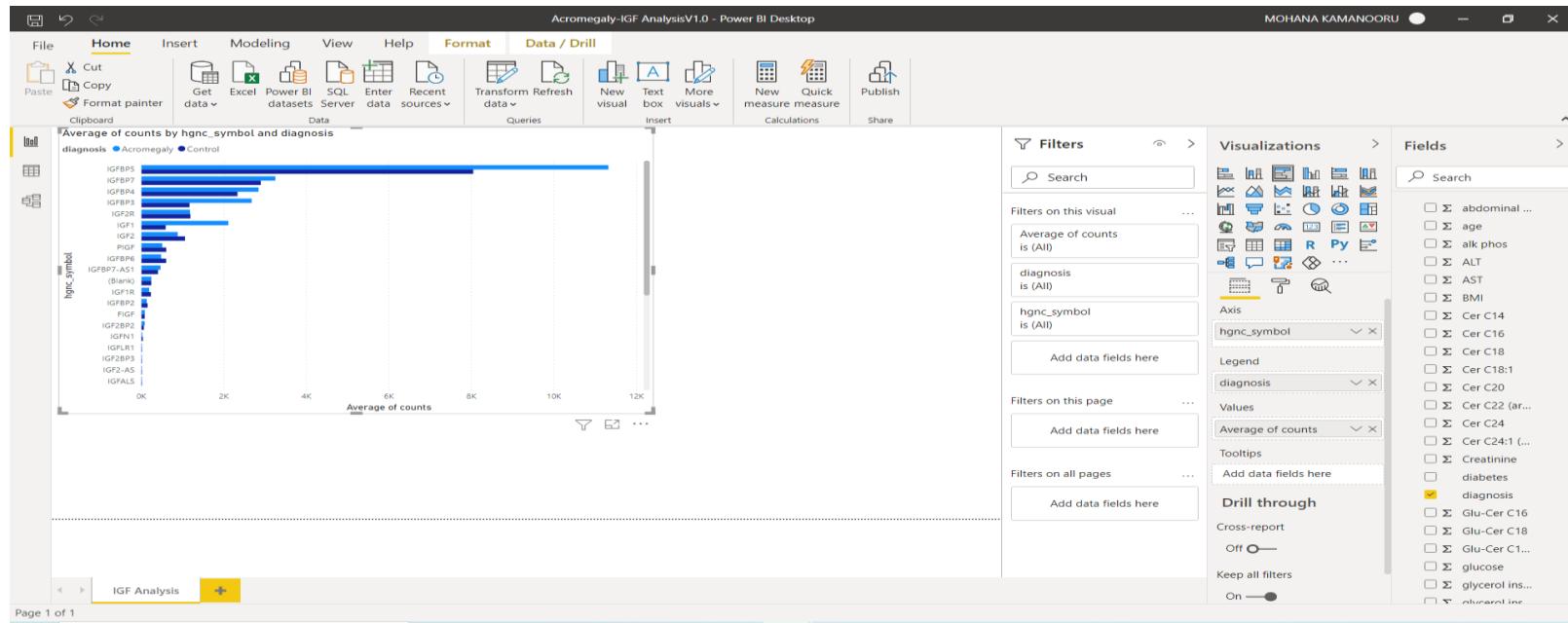
The snowflake schema with a fact-less fact table is from the data model mentioned in Business Intelligence Questions document. According to the business purposes and questions following relationships are analyzed.

### 1. IGF Analysis

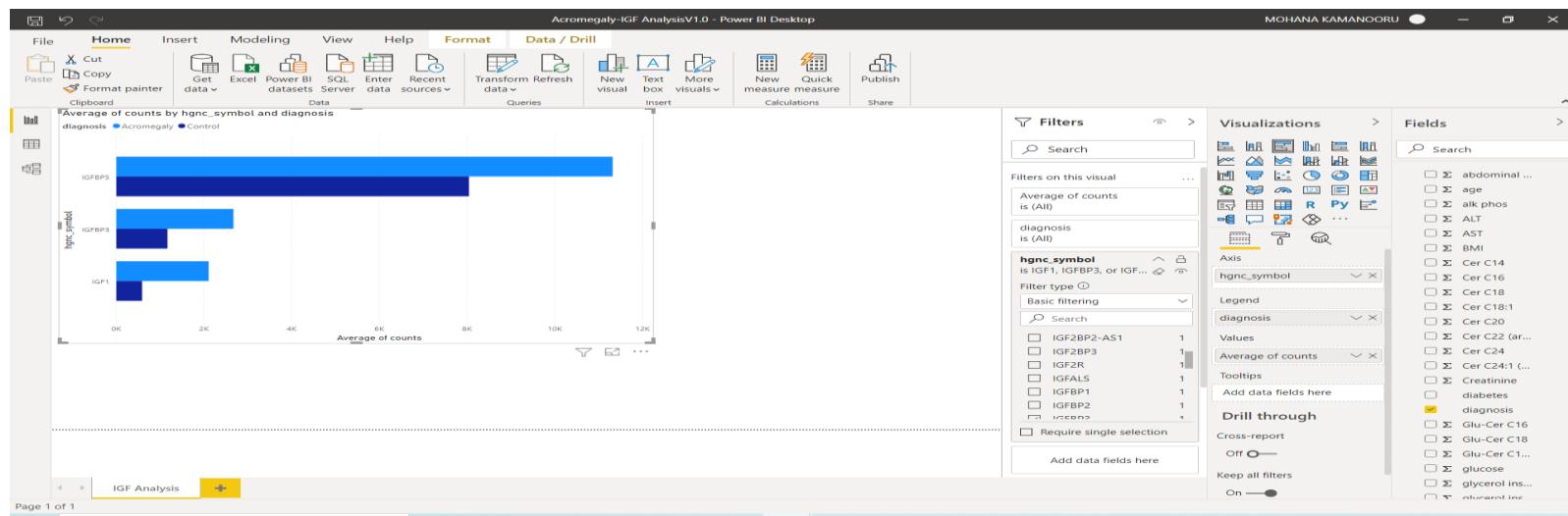
The primary symptom of Acromegaly is the secretion of excess growth hormone. To analyze this, plot graphs and evaluate IGF Complex("IGF1", "IGFBP3", "IGFBP5", "IGFALS"), IGF1 levels, IGF counts for both Acromegaly and Control patients.

### 1.1. IGF Complex

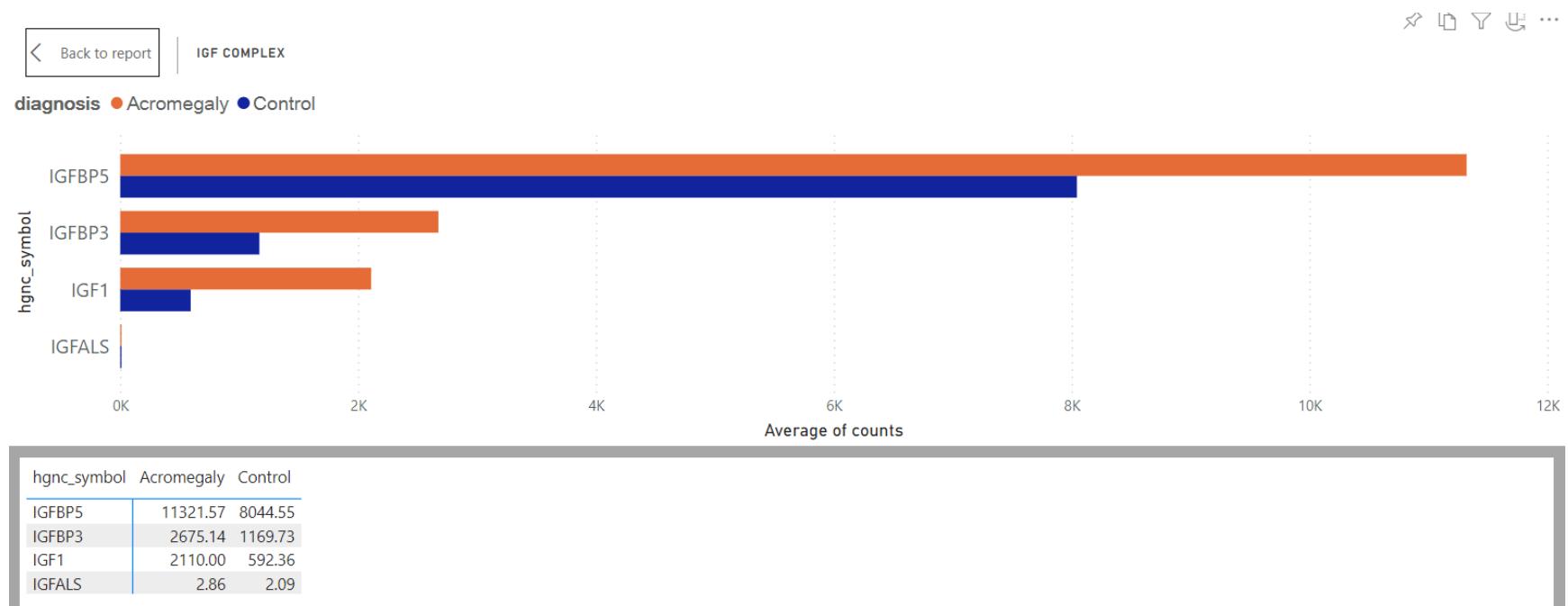
Plot Horizontal Bar graph between “hgnc\_symbol” column from Ensembl Gene Annotation Table and Average of “counts” from HTSEQ\_Counts Table. Analyze by “diagnosis” column as a legend from patient\_information Table.



From Filters pane , check the boxes for "IGF1", "IGFBP3", "IGFBP5", "IGFALS" under basic filtering for hgnc\_symbol.



And change the data color and font options from the Format section under the Visualization pane.

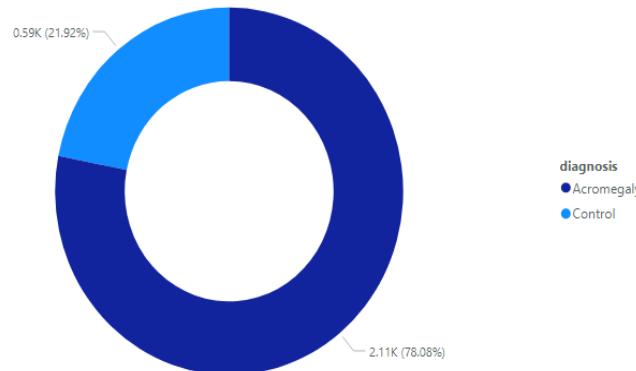


This horizontal bar graph will help to evaluate the IGF Complex function which involves selected genes and pictures the significant increase in IGF levels in Acromegaly patients compared to the control group.

## 1.2. IGF Levels

Plot donut graph to view the percentage difference between Acromegaly and Control group for IGF1 levels. Select donut graph from Visualization pane and select diagnosis column from patient\_information Table as Legend. Average of counts from HTSEQ\_Counts Table as values and hgnc\_symbol as details and select IGF1 from the Filters pane under basic filtering for hgnc\_symbol.

Average of counts by diagnosis and hgnc\_symbol



Filters

Search

Filters on this visual

- Average of counts is (All)
- diagnosis is (All)
- hgnc\_symbol is IGF1

Filter type

Basic filtering

Search

- Select all
- (Blank)
- IGF1
- IGF1R
- IGF2
- IGF2-AS

Legend

diagnosis

Details

hgnc\_symbol

Values

Average of counts

Tooltips

Add data fields here

Drill through

Cross-report

Off

Keep all filters

On

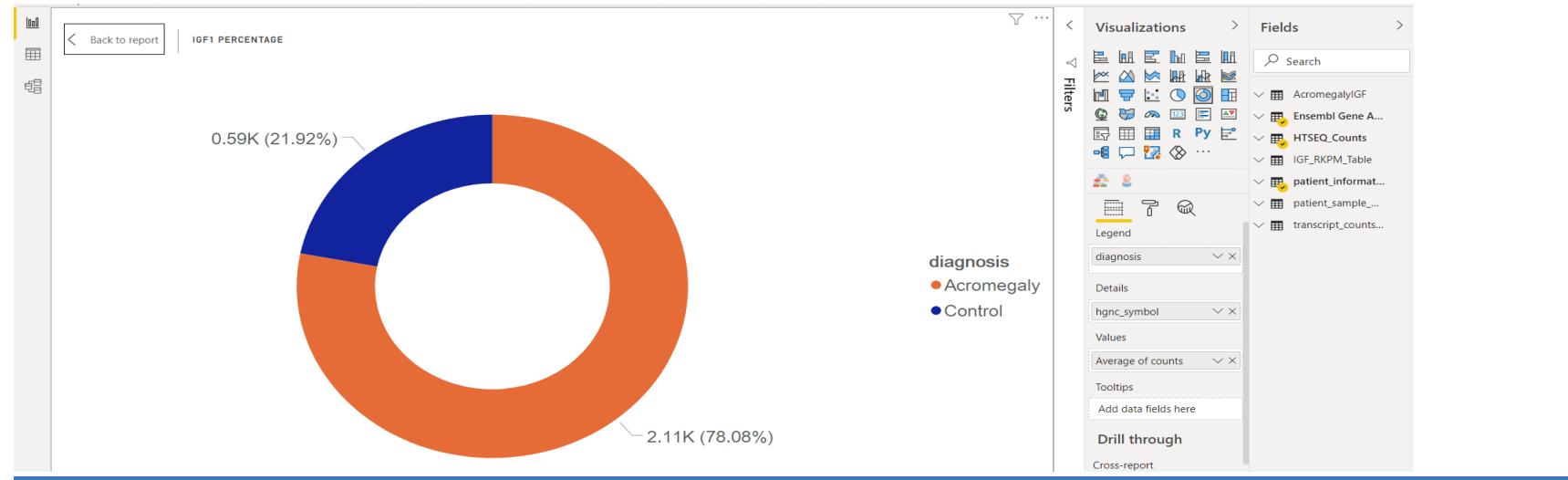
Visualizations

Fields

Search

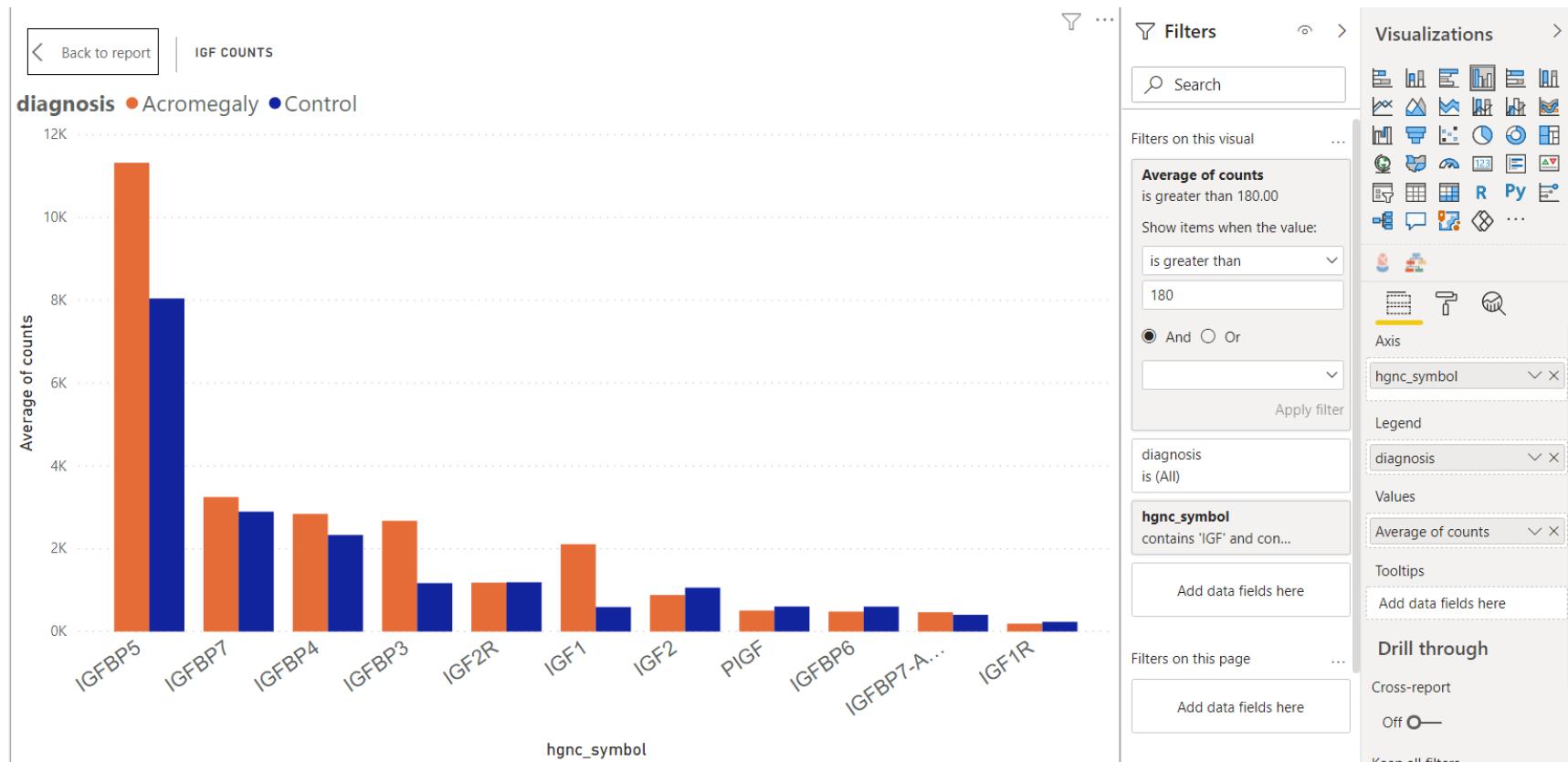
- AcromegalyIGF
- Ensembl Gene A...
- ensembl\_ge...
- hgnc\_symbol
- HTSEQ\_Counts
- Σ counts
- Genes
- patient\_sa...
- sample
- IGF\_RKPM\_Table
- patient\_informat...
- Σ abdominal ...
- Σ age
- Σ alk phos
- Σ ALT
- Σ AST
- Σ BMI
- Σ Cer C14
- Σ Cer C16
- Σ Cer C18
- Σ Cer C18:1

The plots look like the below after formatting the title, data color, and fonts from the Format section.



### 1.3. IGF Counts

Plot horizontal bar graph to understand the difference in gene sequence counts. Use the same columns and details as mentioned in the IGF Complex plot from the Visualization pane. Select the values that contain “IGF” from the filters section in Filters pane for hgnc\_symbol, and to see the highest counts filter Average of counts greater than 180. After formatting the title and axis fonts, the plots look like below.



### 1.4. IGF1 and IGFBP3 Measures

Create measures to visualize the numerical difference in the counts for Acromegaly and Control Patients’ IGF counts and respective percentage differences. DAX formula is used to calculate the IGF levels.

IGF1 – Acromegaly

The screenshot shows the Power BI Measure tools interface. The 'Name' field is set to 'Acromegaly IGF1 L...'. The 'Home table' is 'HTSEQ\_Counts'. The formula bar at the top contains the DAX code: `1 Acromegaly IGF1 Levels = CALCULATE(CALCULATE( AVERAGE(HTSEQ_Counts[counts]) , FILTER(patient_information, patient_information[diagnosis] = "Acromegaly")) , FILTER('HTSEQ_Counts','HTSEQ_Counts'[Genes]= "ENSG00000017427") )`. The Fields pane on the right lists 'Acromegaly IGF1 Levels' under the 'Acromegaly IGF1 ...' category.

Genes	sample	counts	patient_sample_mapping-group
ENSG00000002079	sample12110	0	Control
ENSG00000004809	sample12110	0	Control
ENSG00000004848	sample12110	0	Control
ENSG00000004939	sample12110	0	Control
ENSG00000005001	sample12110	0	Control
ENSG00000005421	sample12110	0	Control
ENSG00000006059	sample12110	0	Control

Acromegaly IGF1 Levels = `CALCULATE(CALCULATE( AVERAGE(HTSEQ_Counts[counts]) , FILTER(patient_information, patient_information[diagnosis] = "Acromegaly")) , FILTER('HTSEQ_Counts','HTSEQ_Counts'[Genes]= "ENSG00000017427") )`

1. `FILTER('HTSEQ_Counts','HTSEQ_Counts'[Genes]= "ENSG00000017427")`
  - Filters the HTSEQ\_counts table for IGF1 , Gene Id for IGF1 is ENSG00000017427
2. `FILTER(patient_information, patient_information[diagnosis] = "Acromegaly")`
  - Filters the patient\_information table for Acromegaly patients
3. `AVERAGE(HTSEQ_Counts[counts])`
  - Calculates the average of counts column from HTSEQ\_Counts table.
4. `CALCULATE( AVERAGE(...), FILTER(...))`
  - Calculates the (HTSEQ\_Counts) counts average for Acromegaly patients.
5. `CALCULATE(CALCULATE( ....), FILTER(...))`
  - Calculates the sequence counts for IGF1 genes.

Therefore, the DAX formula returns the average of sequence counts for Acromegaly patients for the IGF1 gene. Similarly, to calculate IGFBP3 genes count for both Acromegaly and Control patients use the following formulae.

IGF1 – Control

`X ✓ 1 Control IGF1 Levels = CALCULATE(CALCULATE( AVERAGE(HTSEQ_Counts[counts]) , FILTER(patient_information, patient_information[diagnosis] = "Control")), FILTER('HTSEQ_Counts','HTSEQ_Counts'[Genes]= "ENSG00000017427") )`

Genes	sample	counts	patient_sample_mapping.group
ENSG00000002079	sample12110	0	Control
ENSG00000004809	sample12110	0	Control
ENSG00000004848	sample12110	0	Control
ENSG00000004939	sample12110	0	Control
ENSG00000005001	sample12110	0	Control
ENSG00000005421	sample12110	0	Control

Control IGF1 Levels = CALCULATE(CALCULATE( AVERAGE(HTSEQ\_Counts[counts]) , FILTER(patient\_information, patient\_information[diagnosis] = "Control")), FILTER('HTSEQ\_Counts','HTSEQ\_Counts'[Genes]= "ENSG00000017427") )

IGFBP3 – Acromegaly

`X ✓ 1 Acromegaly IGFBP3 Levels = CALCULATE(CALCULATE( AVERAGE(HTSEQ_Counts[counts]) , FILTER(patient_information, patient_information[diagnosis] = "Acromegaly")), FILTER('HTSEQ_Counts','HTSEQ_Counts'[Genes]= "ENSG00000146674") )`

Genes	sample	counts	patient_sample_mapping.group
ENSG00000002079	sample12110	0	Control
ENSG00000004809	sample12110	0	Control
ENSG00000005001	sample12110	0	Control

Acromegaly IGFBP3 Levels = CALCULATE(CALCULATE( AVERAGE(HTSEQ\_Counts[counts]) , FILTER(patient\_information, patient\_information[diagnosis] = "Acromegaly")), FILTER('HTSEQ\_Counts','HTSEQ\_Counts'[Genes]= "ENSG00000146674") )

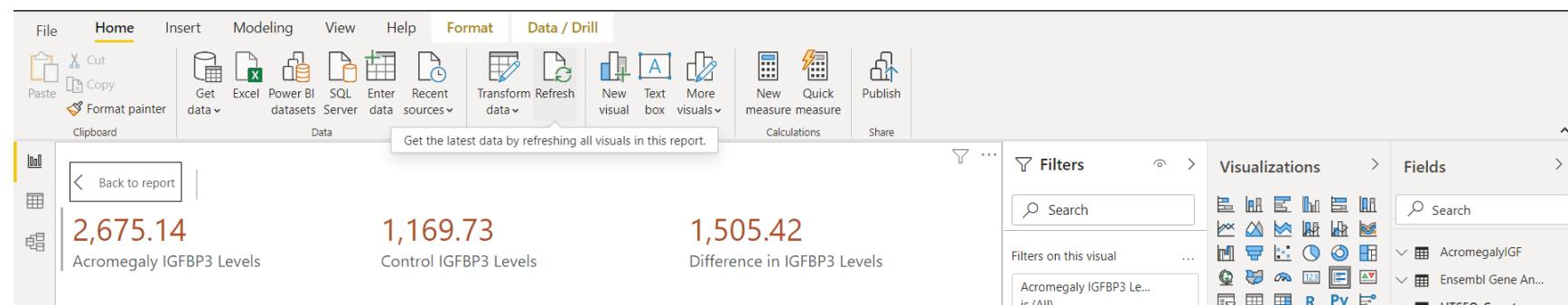
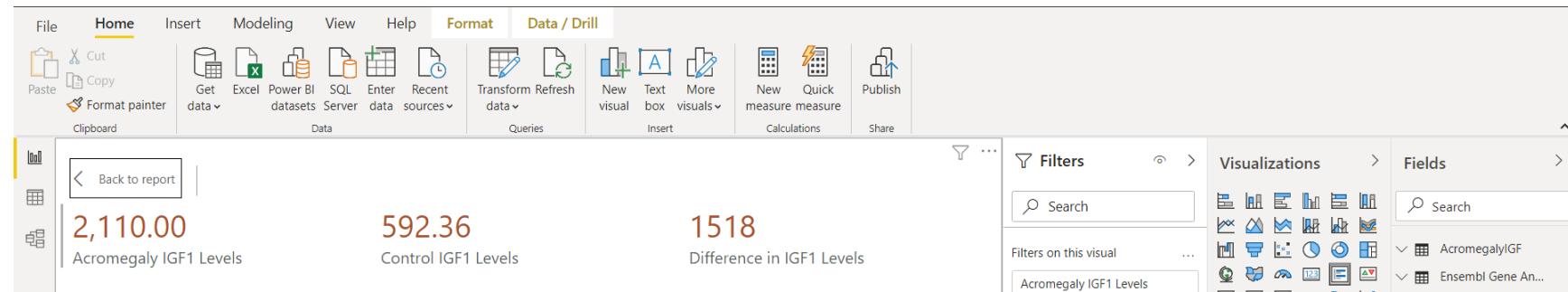
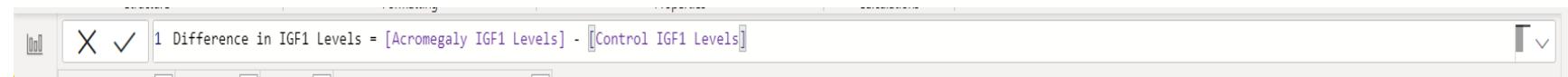
IGFBP3 - Control

`X ✓ 1 Control IGFBP3 Levels = CALCULATE(CALCULATE( AVERAGE(HTSEQ_Counts[counts]) , FILTER(patient_information, patient_information[diagnosis] = "Control")), FILTER('HTSEQ_Counts','HTSEQ_Counts'[Genes]= "ENSG00000146674") )`

Genes	sample	counts	patient_sample_mapping.group
ENSG00000002079	sample12110	0	Control
ENSG00000004809	sample12110	0	Control
ENSG00000004848	sample12110	0	Control
ENSG00000004939	sample12110	0	Control
ENSG00000005001	sample12110	0	Control
ENSG00000005421	sample12110	0	Control

```
Control IGFBP3 Levels = CALCULATE(CALCULATE( AVERAGE(HTSEQ_Counts[counts]) , FILTER(patient_information, patient_information[diagnosis] = "Control")), FILTER('HTSEQ_Counts','HTSEQ_Counts'[Genes]= "ENSG00000146674" ) )
```

### Difference in IGF1 and IGFBP3 levels



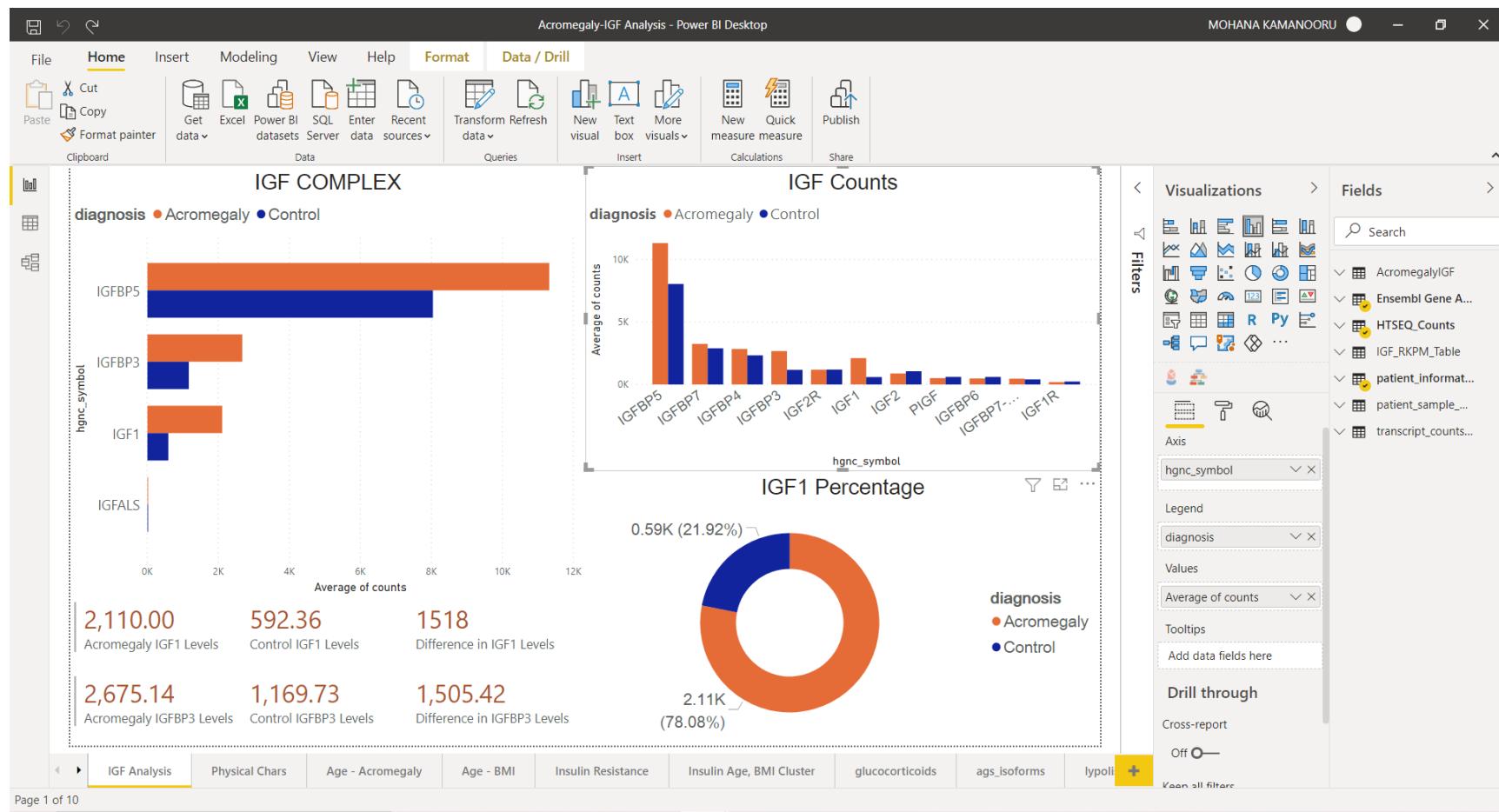


Figure 2 IGF Analysis Plots

### 1.5. Analytics

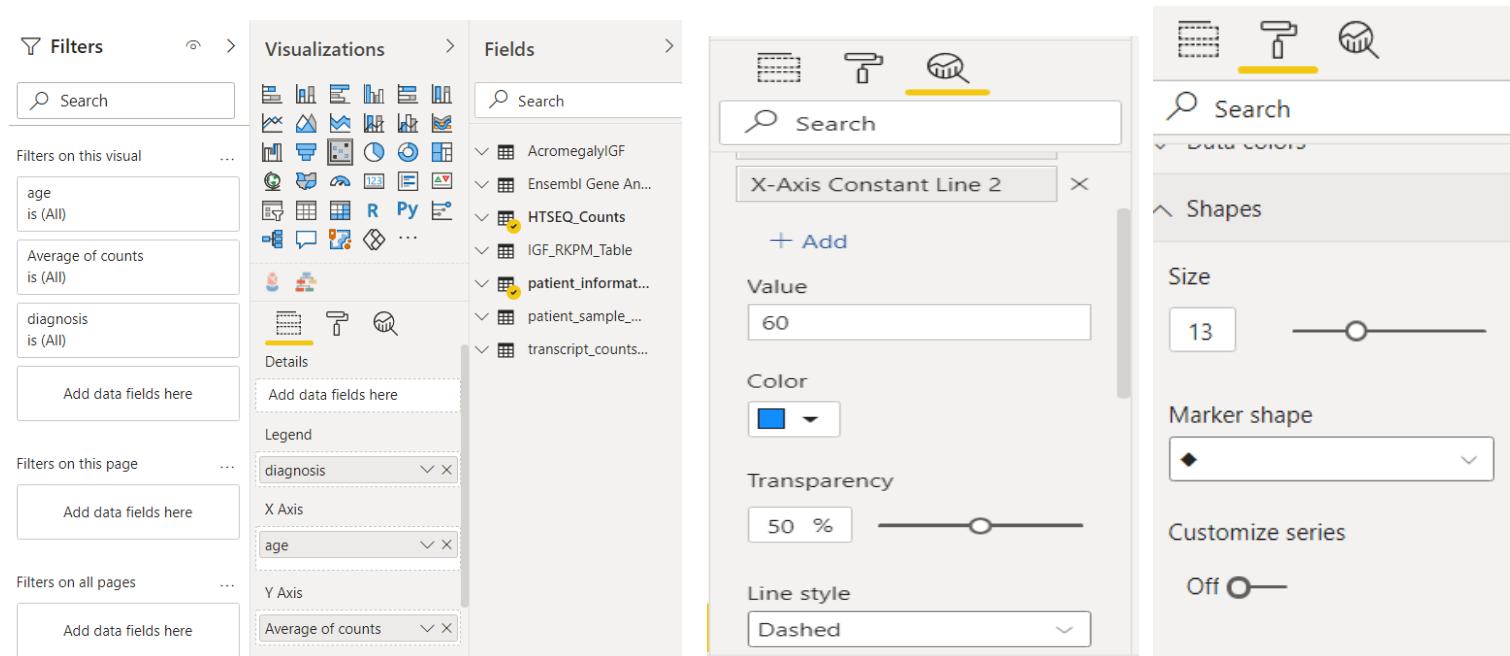
From the plots, IGF Complex and IGF Count, it is evident that the levels of Growth Hormone are very high in Acromegaly patients compared to the Control group. The percentage of IGF1 is 78% in Acromegaly and 22% in Controls.

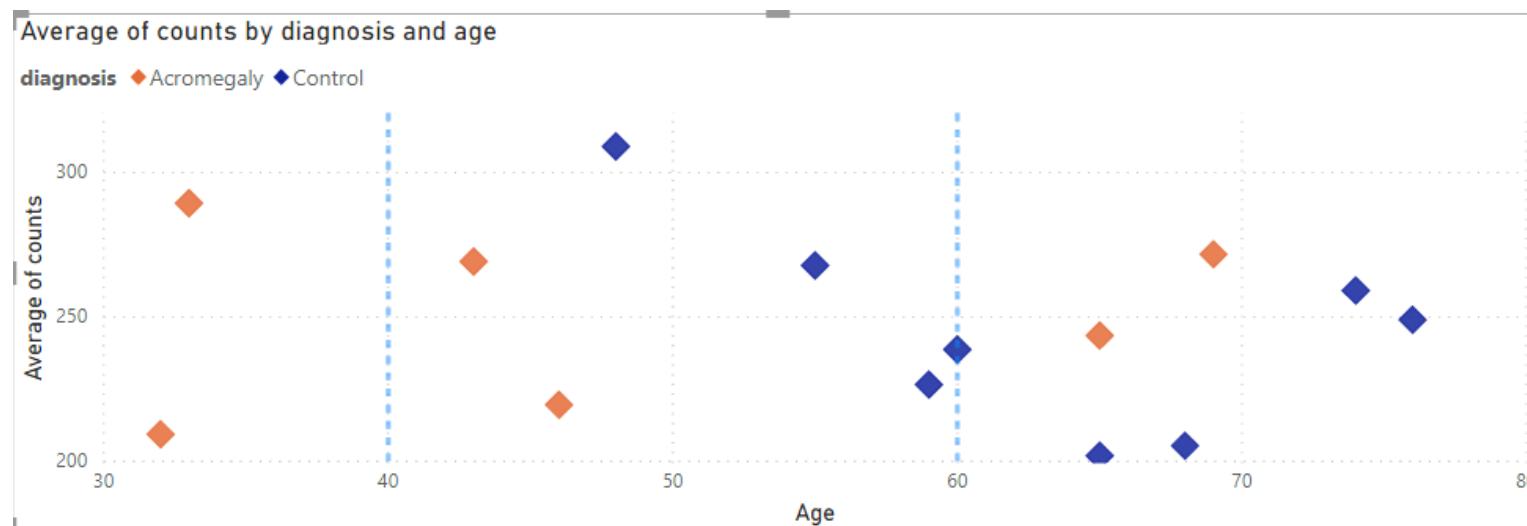
### 1.6. Findings

From analytics and observations, If the pituitary gland is affected by the tumor and if it releases high levels of growth hormone then the probability of having Acromegaly could be quite high in the patient.

## 2. Age Analysis

To analyze if Acromegaly is age affected or not, plot the scatter graph between Age of all patients and the average of HTSEQ\_Counts. From the Analytics tab add two constant lines on the x-axis, to view age in three blocks.





Since the data is not very clear in the plot to draw more information, divide the Age column into two blocks Above 60 and Below 60 using M language. Click on the Transform Data tab and select the patient\_information table from the Power Query Editor. Click on Advanced Editor.



The screenshot shows the Advanced Editor window with the title "patient\_information". The code in the editor is:

```

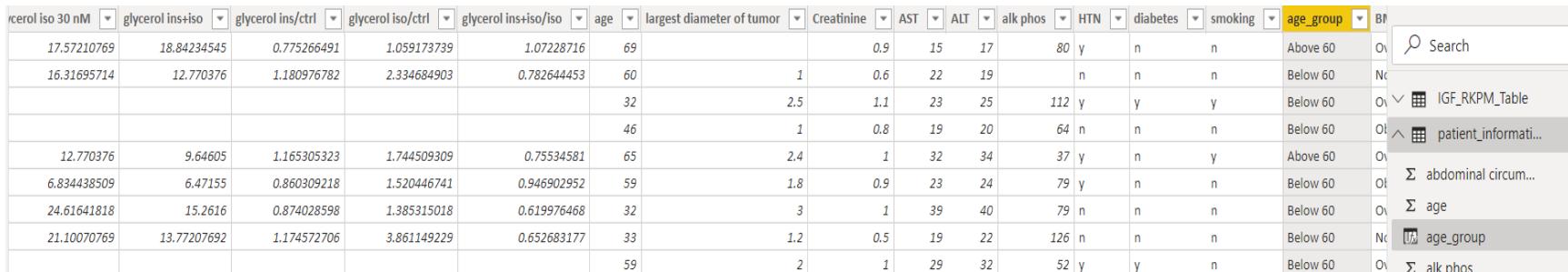
let
    Source = Csv.Document(File.Contents("D:\Power BI\Assessment\BridgesLab-CushingAcromegalyStudy-820e332\data\raw\patient_table.csv"),[Delimited]),
    #"Promoted Headers" = Table.PromoteHeaders(Source, [PromoteAllScalars=true]),
    #"Changed Type" = Table.TransformColumnTypes(#"Promoted Headers",{{"id", Int64.Type}, {"diagnosis", type text}, {"height", type number}, {"weight", type number}, {"age", type number}, {"largest_diameter_of_tumor", type number}, {"Creatinine", type number}, {"AST", type number}, {"ALT", type number}, {"alk_phos", type number}, {"HTN", type number}, {"diabetes", type number}, {"smoking", type number}, {"age_group", type text}),
    #"Renamed Columns" = Table.RenameColumns(#"Changed Type",{{"id", "patient_id"}}),
    #"Replaced Value" = Table.ReplaceValue(#"Renamed Columns","acromegaly","Acromegaly",Replacer.ReplaceText,{"diagnosis"}),
    #"Replaced Value1" = Table.ReplaceValue(#"Replaced Value","non secreting adenoma","Control",Replacer.ReplaceText,{"diagnosis"}),
    #"Replaced Value2" = Table.ReplaceValue(#"Replaced Value1","cushing's","Cushing",Replacer.ReplaceText,{"diagnosis"}),

    AddAgeGroup = Table.AddColumn(#"Added Custom", "age_group", each if([age]<=60) then "Below 60"
else "Above 60")
in
    AddAgeGroup

```

A blue box highlights the DAX code for adding the "age\_group" column. A green checkmark icon and the text "No syntax errors have been detected." are visible at the bottom left. At the bottom right are "Done" and "Cancel" buttons.

Click Done, Now the new column age\_group is created in the table. Click on Apply and Close.



The screenshot shows the Power BI Data View with the "patient\_table" loaded. The columns include glycerol iso 30 nM, glycerol ins+iso, glycerol ins/ctrl, glycerol iso/ctrl, glycerol ins+iso/iso, age, largest diameter of tumor, Creatinine, AST, ALT, alk phos, HTN, diabetes, smoking, and age\_group. The "age\_group" column has two categories: "Above 60" and "Below 60". The Data View interface shows various filters and search options on the right side.

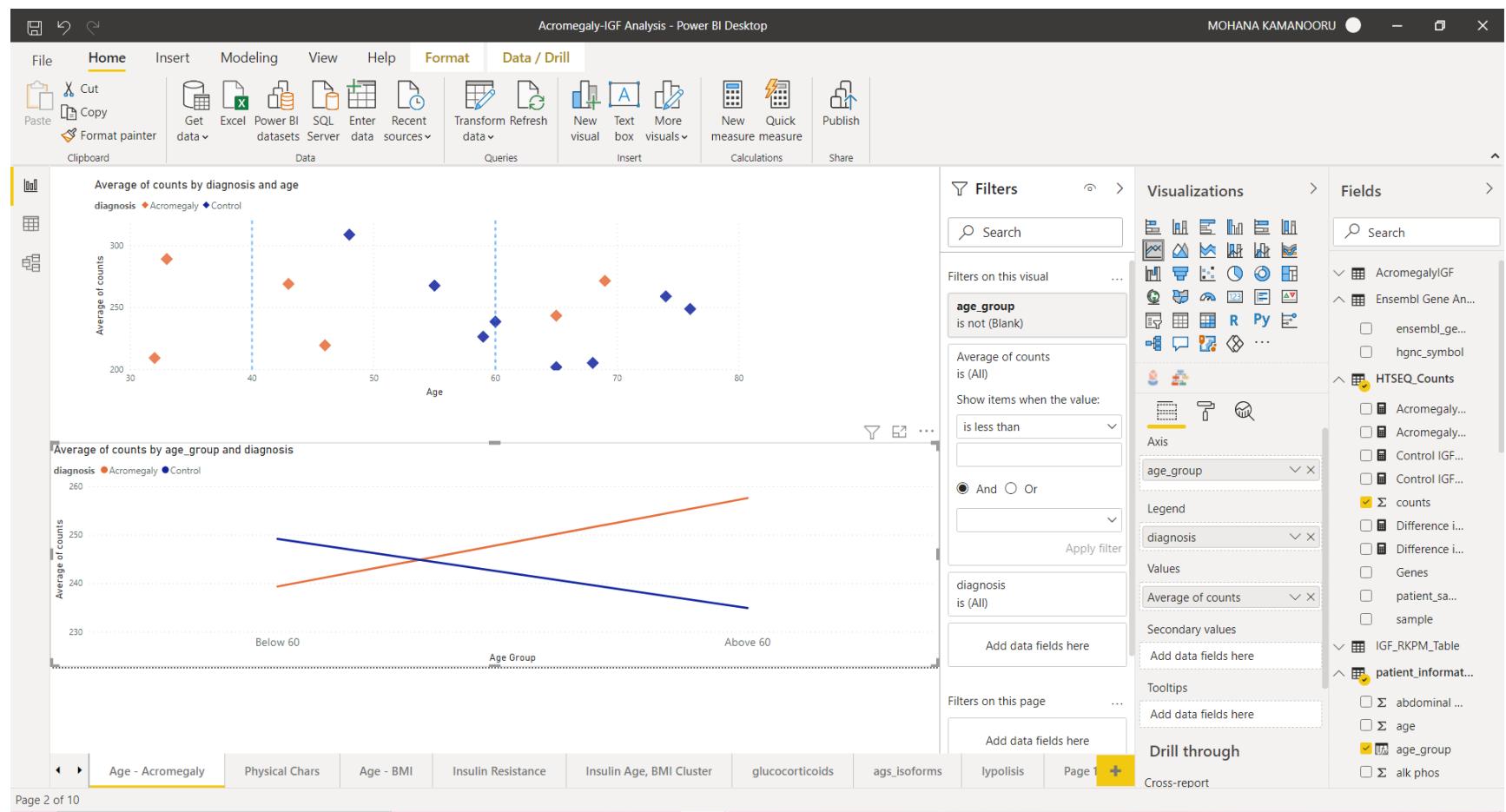


Figure 3 Age Analysis Plots

## 2.1. Analytics

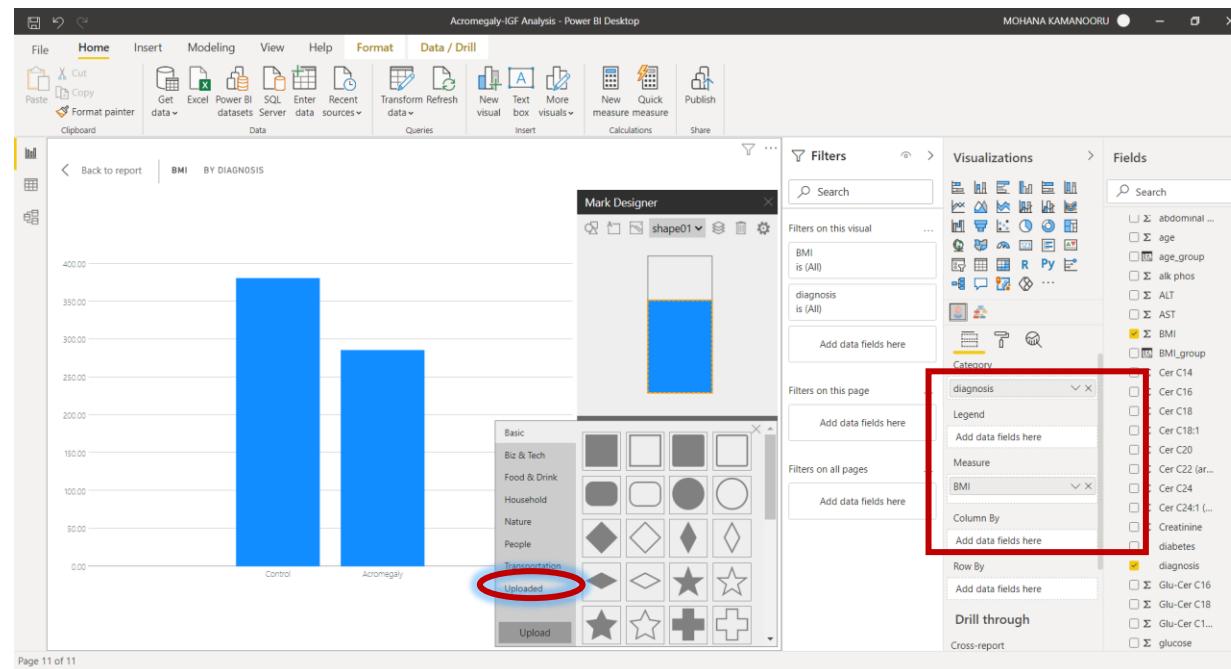
From the plot, the average counts for Acromegaly patients tend to be higher, there are three patients above 60 years and 6 patients below 60 years among a total of nine Acromegaly patients. This implies the elevation in gene levels occurs as the patient gets older and gets adapted to the illness.

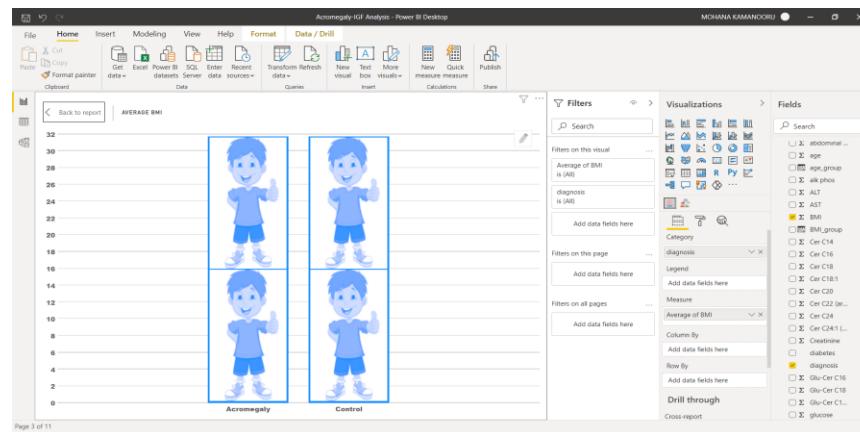
## 2.2. Findings

Considering the sample size of this secondary research, the difference in counts is observed to be marginal. There might be slightly considerable effects of age on Acromegaly but cannot be decided if this could be appropriate for a larger sample size.

## 3. Physical Characteristics Analysis

Draw a vertical bar plot with infographics for both groups of patients as shown in screenshots below. Select BMI from Patient\_information table and diagnosis column as a legend. Select the bar plot and click on infographics, choose to upload a new custom image, and select it.





Repeat the same steps for different columns ( height, weight, and abdominal circumference) in the patient\_information table. The plots are shown below in the screenshot.

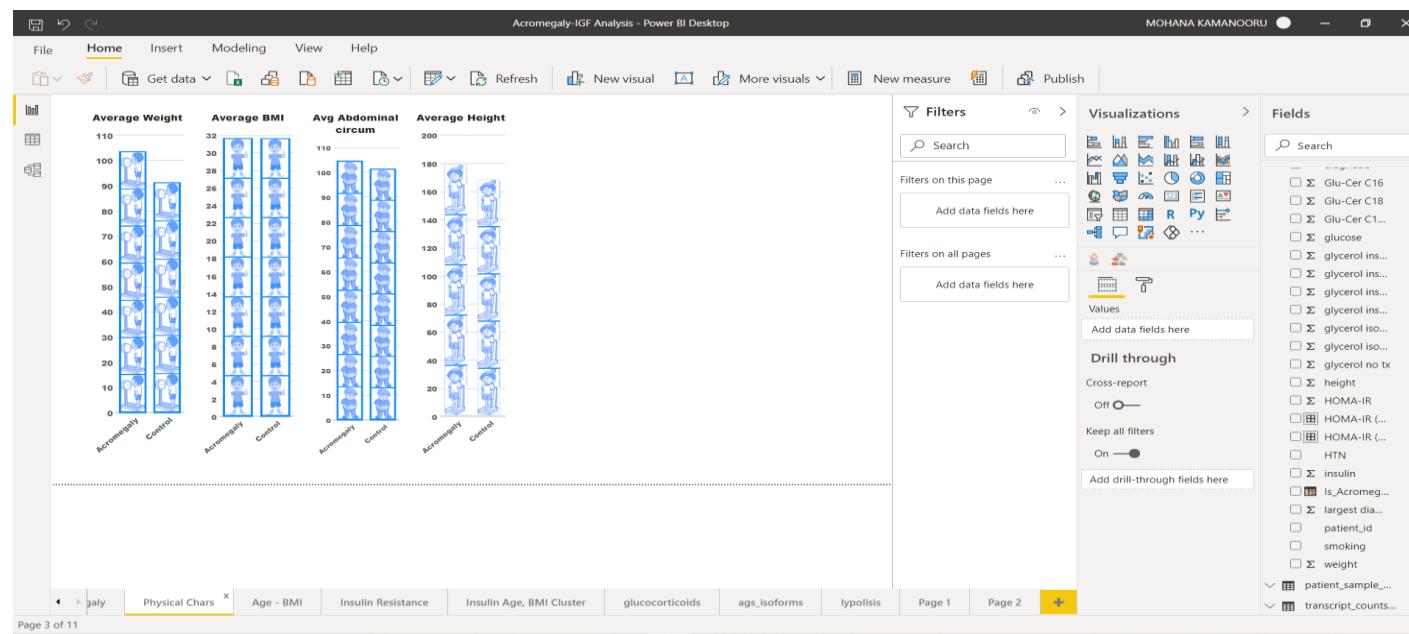


Figure 4 Physical Chars Analysis Plots

### 3.1. Analytics

No significant differences are found in physical characteristics between patient groups while analyzing BMI and abdominal circumferences. Except the Acromegaly patients were taller and weighed more with an average difference of 10kgs.

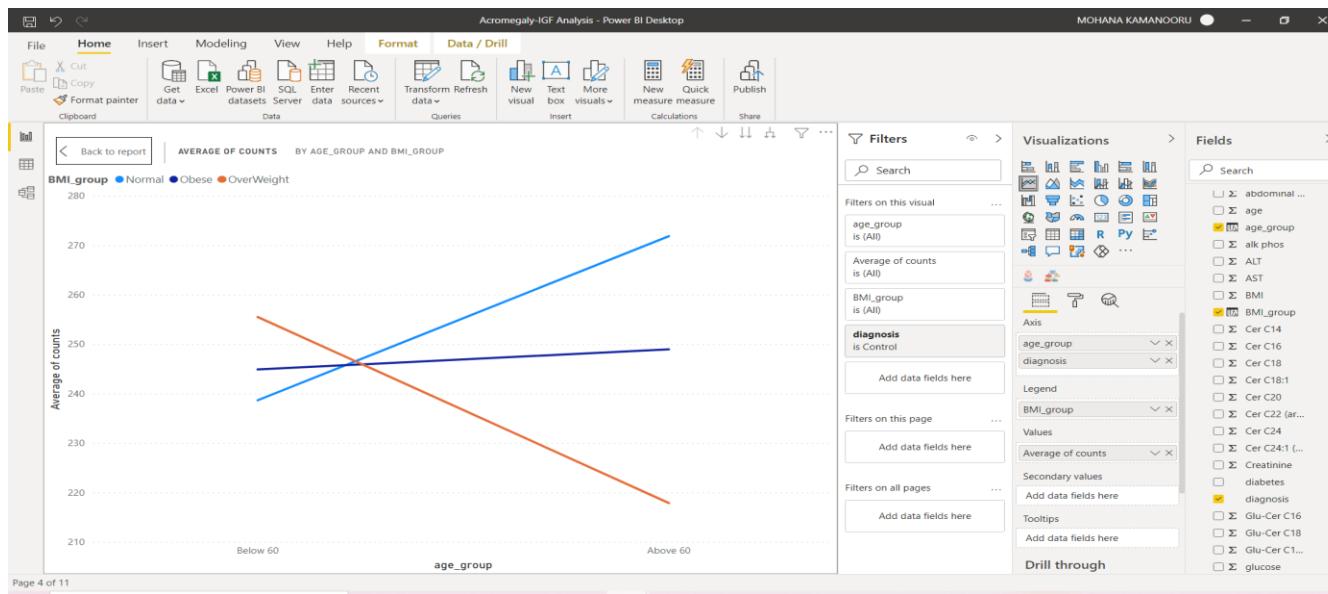
### 3.2. Findings

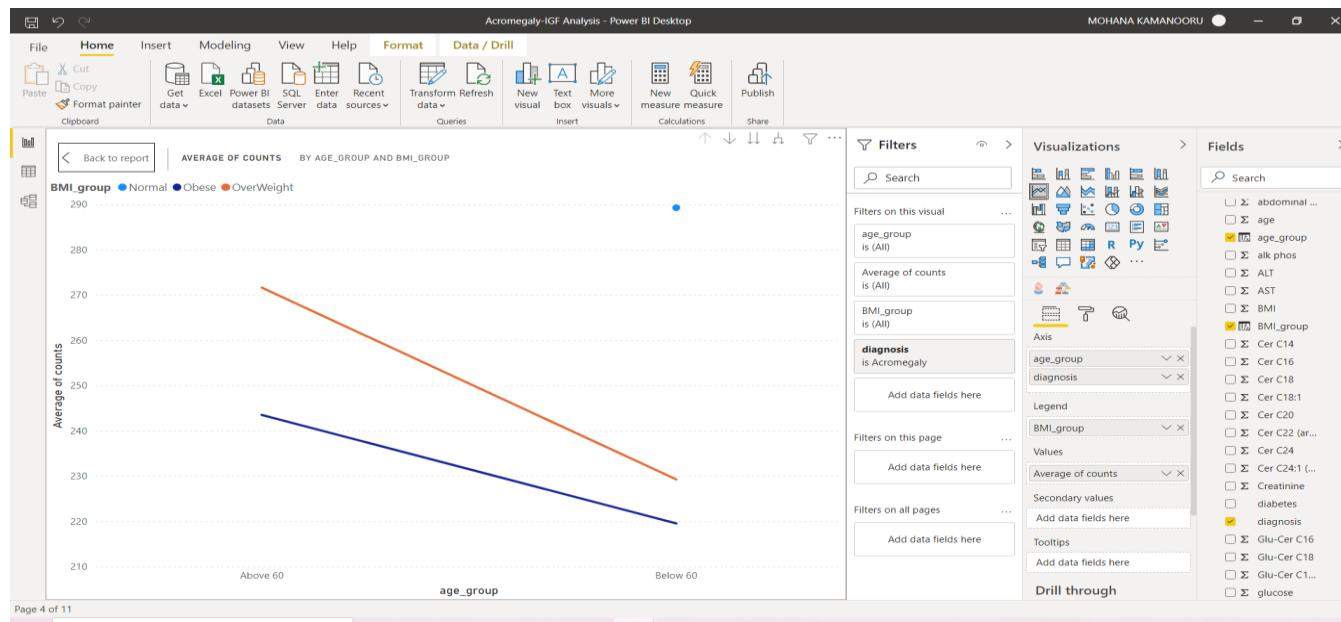
There are many studies and research papers available on the physical characteristics of Acromegaly patients and are mostly related to the face, hands, tongue, and feet. Since there is no data recorded in the current dataset, these characteristics could not be analyzed in this research. The physical characteristics (height, weight, BMI, and abdominal circumferences) do not tend to change in considerable amounts. This can be ignored for the sample size and magnitude of the differences.

#### 4. BMI Analysis

Plot the line graph between Age, BMI, and the counts. To analyze the relation for both patient groups if any. Firstly, categorize the BMI column into three blocks Normal (< 25), Obese (25 to 30), Overweight (>30) using the DAX formula as below.

The screenshot shows the Power BI Data Editor interface. At the top, there's a ribbon with tabs like 'Name', 'Format', 'Summarization', 'Sort by column', 'Data groups', 'Manage relationships', and 'New column'. Below the ribbon is a table with various columns: 'glycerol ins+iso/iso', 'age', 'largest diameter of tumor', 'Creatinine', 'AST', 'ALT', 'alk phos', 'HTN', 'diabetes', 'smoking', 'age\_group', 'BMI\_group', 'is\_Acromegaly', 'HOMA-IR (clusters)', and 'HOMA-IR (clusters) 2'. A DAX formula is visible in the 'BMI\_group' column header: `BMI_group = IF ( patient_information[BMI] < 25 , "Normal" , (IF (patient_information[BMI] <= 30 , "Obese" , "OverWeight")) )`. The table contains several rows of patient data. On the right side, there's a 'Fields' pane with a search bar and a list of fields categorized under 'IGF\_RKPM\_Table' and 'patient\_informat...'. The 'BML\_group' field is highlighted in the list.





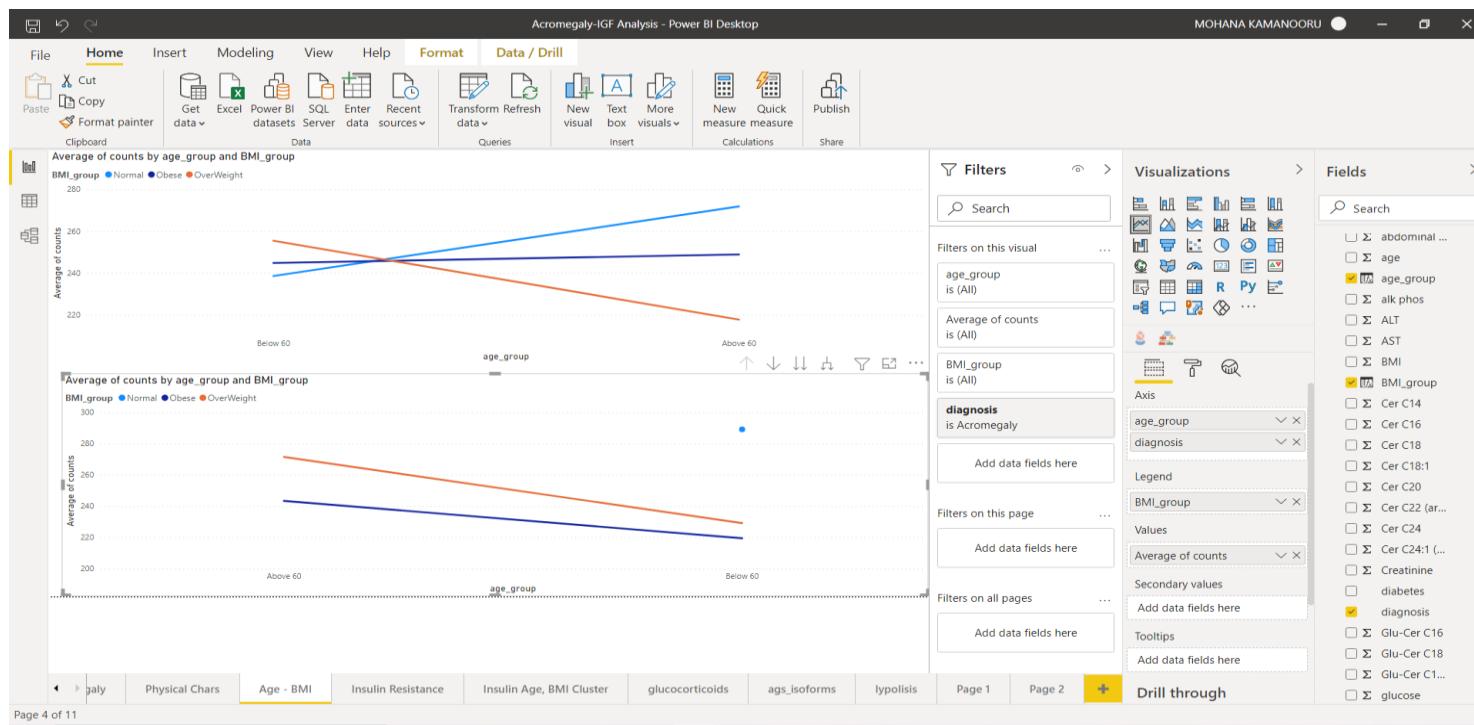


Figure 5 Age and BMI Analysis Plots

#### 4.1. Analytics

No significant trends, patterns, or differences could be observed that could help analyze the illness.

#### 4.2. Findings

No major observations.

### 5. Insulin (HOMA-IR) Analysis

To comprehend the insulin resistance and insulin sensitivity in both patient groups. Plot the below bar and line graphs between Age, BMI, and HOMA-IR values from patient\_information Table.

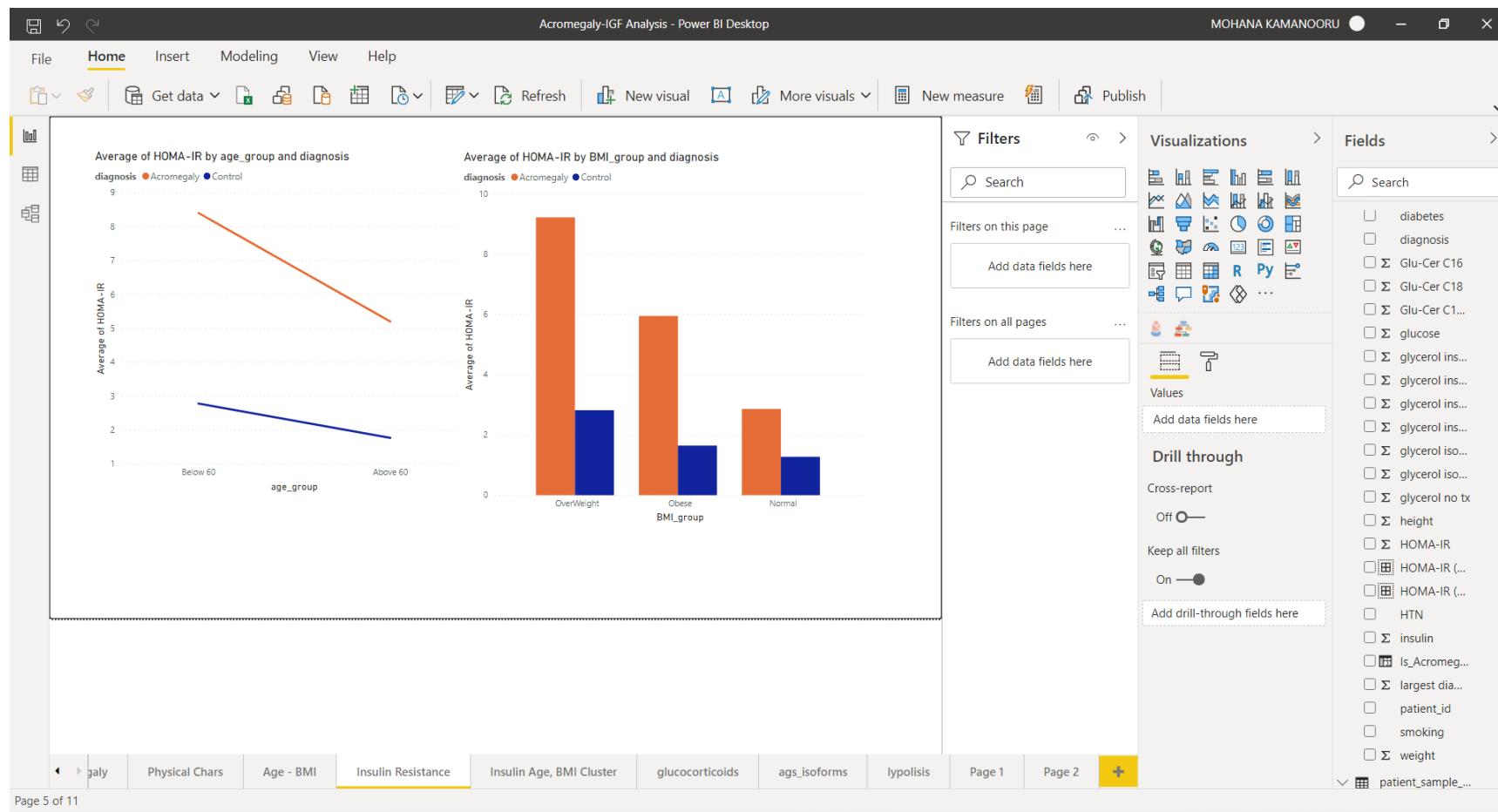


Figure 6 Insulin Resistance Plots

Acromegaly patients have higher insulin resistance and lower insulin sensitivity. Analyzing the plots, the insulin resistance is higher in patients below 60 years, and patients with higher BMI have higher insulin resistance.

Identifying Acromegaly patients with HOMA-IR, Age, and BMI using Artificial Intelligence (Clustering Algorithm) in power BI. Add a new column in Patient\_information table “is\_Acromegaly”, which holds a numeric value, 1 if True, 0 if False using DAX formula as shown in the screenshot below.

The screenshot shows the Power BI Desktop interface with the title "Acromegaly-IGF Analysis - Power BI Desktop". The ribbon is visible with "Table tools" selected. A DAX formula is being edited in the formula bar:

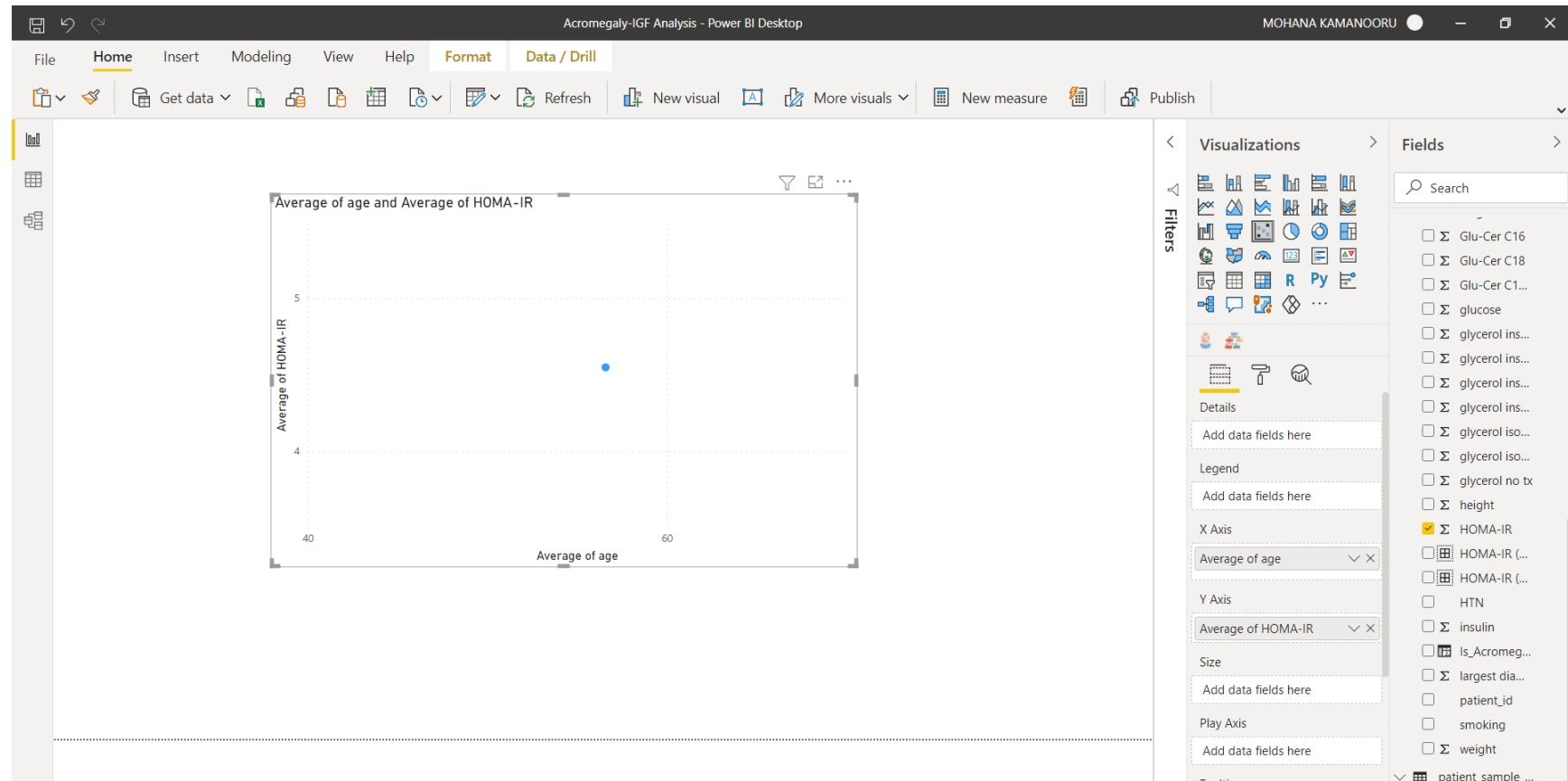
```
1 Is_Acromegaly = IF([patient_information[diagnosis]= "Control" , 0 ,1]
```

The table view displays 21 rows of patient data. A new column "Is\_Acromegaly" has been added, showing values 1 or 0 based on the diagnosis. The "Fields" pane on the right lists various columns and their data types, including "IGF\_RKPM\_Table" and "patient\_informati...".

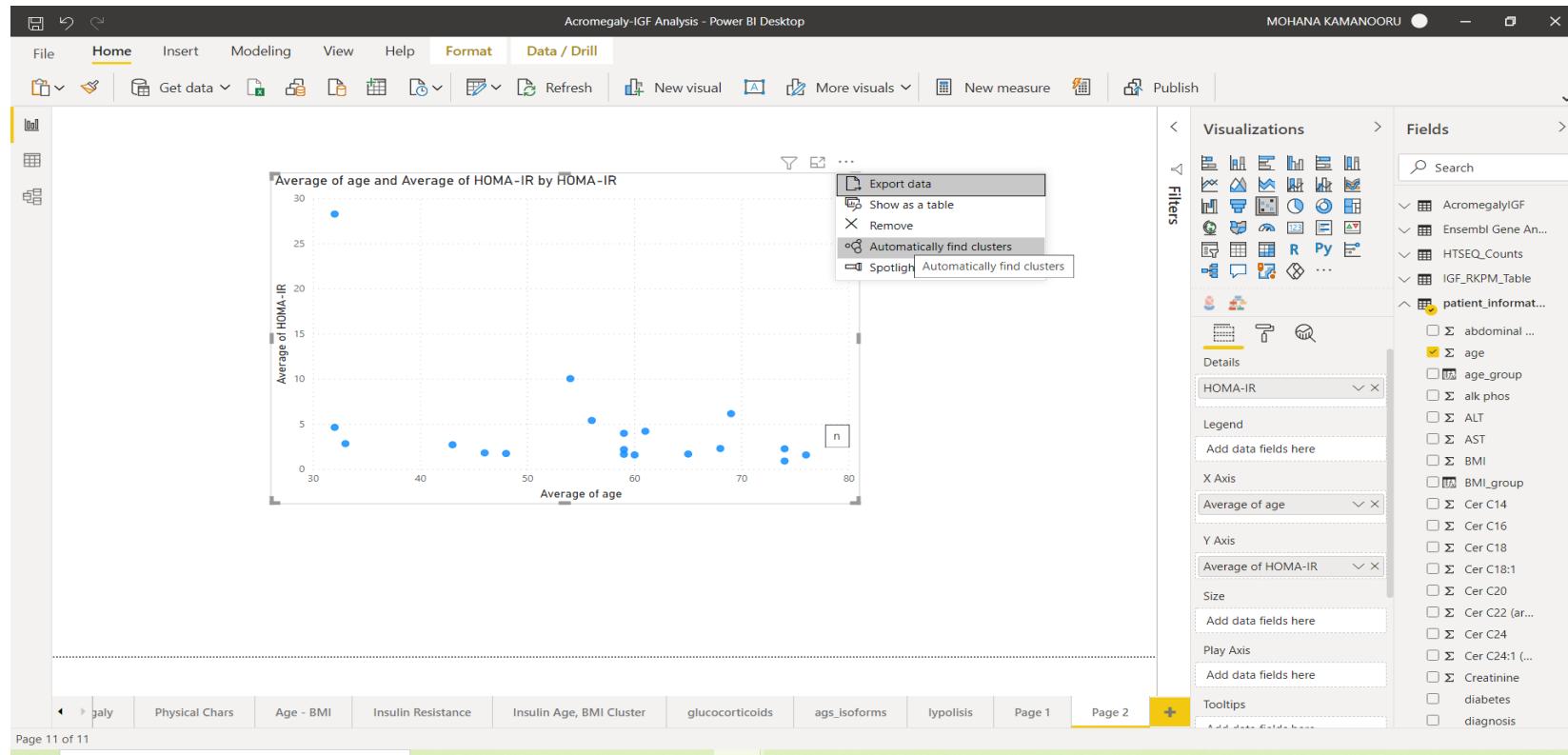
glycerol ins+iso/iso	age	largest diameter of tumor	Creatinine	AST	ALT	alk phos	HTN	diabetes	smoking	age_group	BMI_group	Is_Acromegaly	HOMA-IR (clusters)	HOMA-IR (clusters) 2
1.07228716	69		0.9	15	17	80	y	n	n	Above 60	OverWeight	1	Cluster2	Cluster2
0.782644453	60		1	0.6	22	19	n	n	n	Below 60	Normal	0	Cluster1	Cluster1
	32		2.5	1.1	23	25	112	y	y	Below 60	OverWeight	1	Cluster2	Cluster2
	46		1	0.8	19	20	64	n	n	Below 60	Obese	1	Cluster2	Cluster2
0.75534581	65		2.4	1	32	34	37	y	n	Above 60	OverWeight	0	Cluster1	Cluster1
0.946902952	59		1.8	0.9	23	24	79	y	n	Below 60	Obese	0	Cluster1	Cluster1
0.619976468	32		3	1	39	40	79	n	n	Below 60	OverWeight	1	Cluster2	Cluster2
0.652683177	33		1.2	0.5	19	22	126	n	n	Below 60	Normal	1	Cluster2	Cluster2
	59		2	1	29	32	52	y	n	Below 60	OverWeight	0	Cluster1	Cluster1
1.033741989	59		1.8	0.9	23	24	79	y	n	Below 60	OverWeight	0	Cluster1	Cluster1
0.880649822	43		1	0.8	28	30	73	y	n	Below 60	OverWeight	1	Cluster2	Cluster2
1.228220473	76		0.8	18	15	51	n	n	y	Above 60	Obese	0	Cluster1	Cluster1
1.10132318	65		1.6	0.9	15	14	68	n	n	Above 60	Obese	1		
0.478272458	68		2.3	0.9	31	21	79	y	n	Above 60	OverWeight	0	Cluster1	Cluster1
1.362869507	55		1.3	22	19	81	y	n	n	Below 60	Obese	0		
1.146416669	74		2.1	1.2	19	15	94	y	n	Above 60	OverWeight	0	Cluster1	Cluster1
0.663301288	74		2.6	0.8	21	24	63	y	n	Above 60	Normal	0	Cluster1	Cluster1
	48		1.6	0.8	19	32	68	n	n	Below 60	OverWeight	0	Cluster1	Cluster1
4.473100646	54		1.3	0.8	21	37	125	y	n	Below 60	Obese	1	Cluster2	Cluster2
	61			0.6	20	22	135	y	n	Above 60	OverWeight	1	Cluster2	Cluster2
	56		4							Below 60	OverWeight	0	Cluster1	Cluster1

Table: patient\_information (21 rows) Column: Is\_Acromegaly (2 distinct values)

Plot a scatter plot with the Average age column and Average of HOMA-IR column in patient\_information Table.



Now, drag and drop HOMA\_IR in the Details tab under Visualization Pane.



**Clusters**

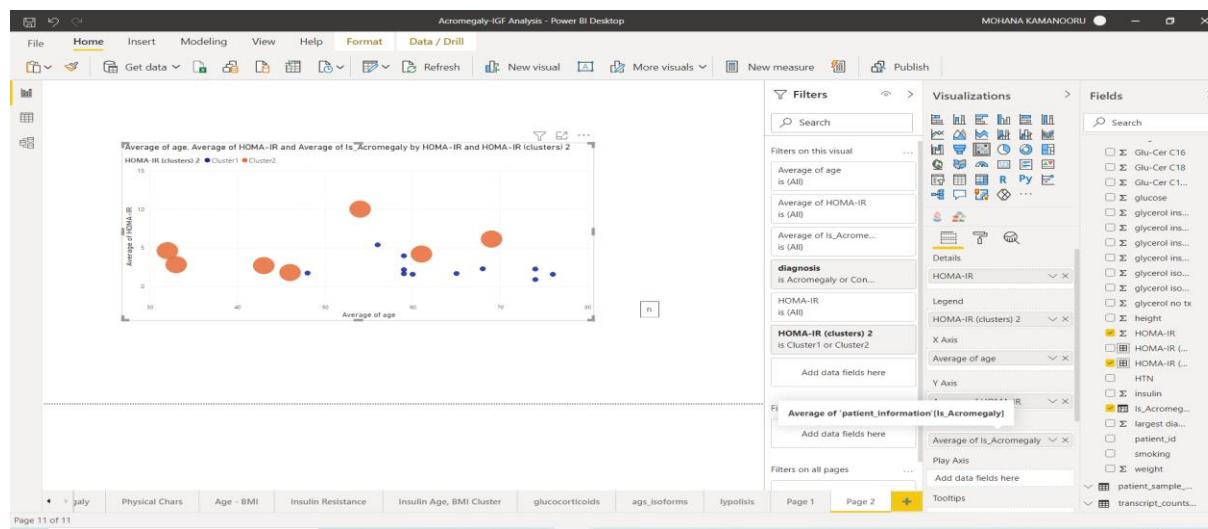
Name: Age\_Cluster

Field: HOMA-IR

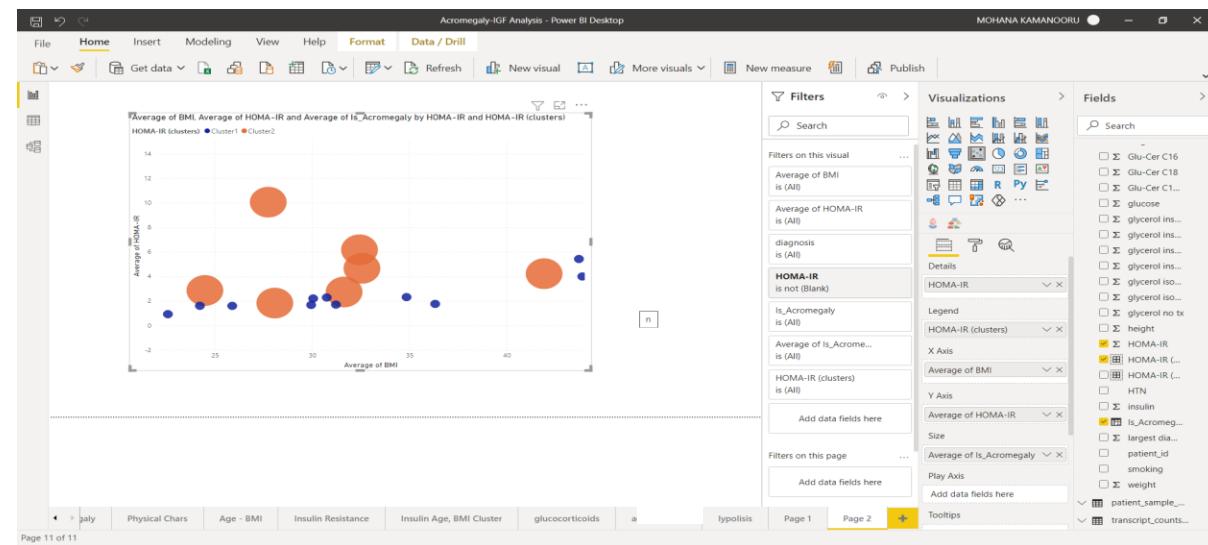
Description: Clusters for HOMA-IR

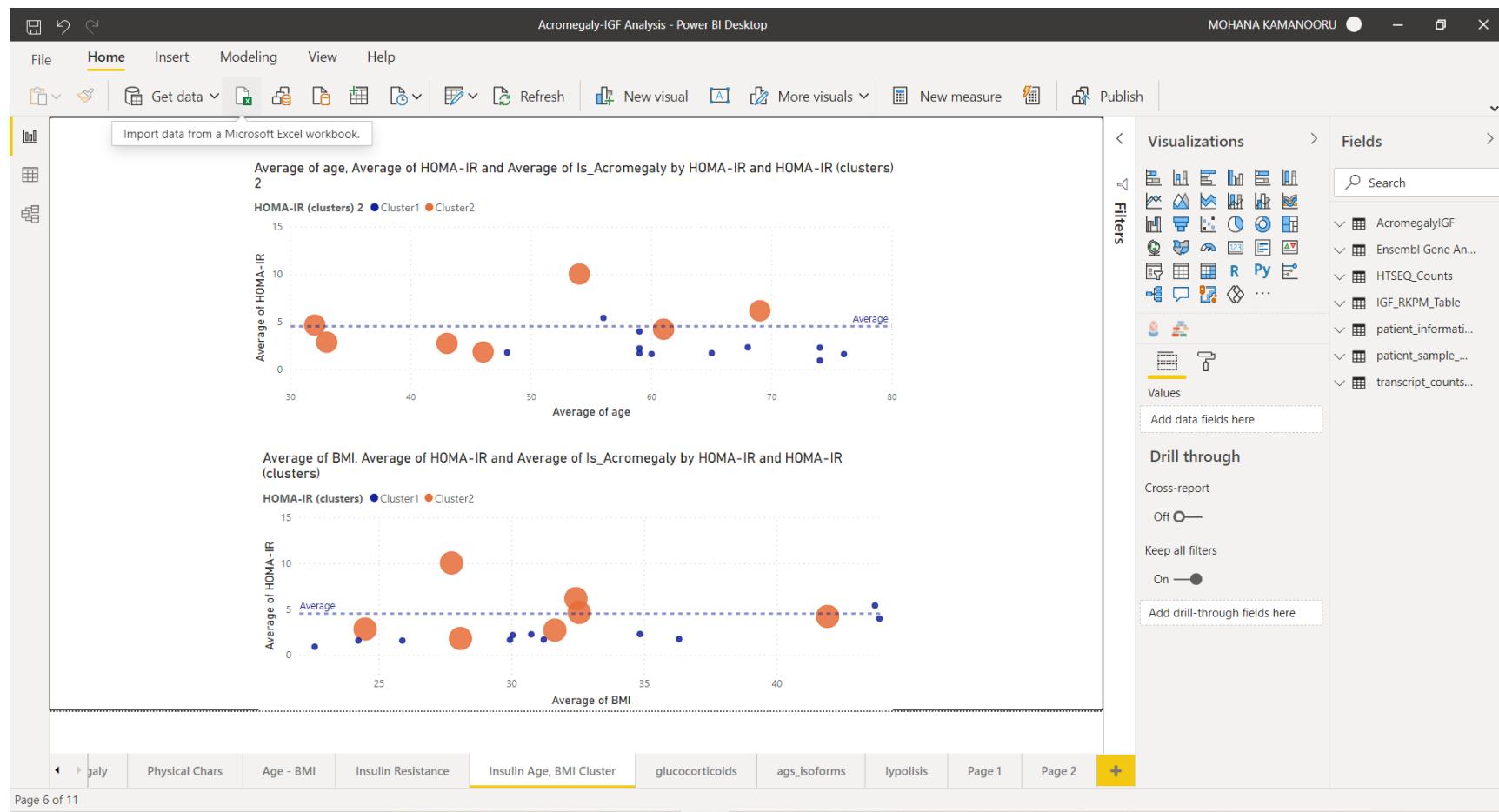
Number of clusters: 2

Drag and drop the newly created column **is\_Acromegaly** in size and select Average.



Follow the same process to plot the graph with BMI from the patient\_information Table.





## 5.1. Analytics

From both the scatterplots, the clustering algorithm seems to be more appropriate. The algorithm sectioned two clusters, where cluster 2 resembles the Acromegaly patient group and cluster1 represents the Control group.

## 5.2. Findings

Acromegaly patients' data has different characteristics and Control patients' data has different characteristics. These are more accurately predicted by the machine learning algorithm for the current dataset sample.

## 6. Lipolysis, Glucocorticoids, and Isoforms Analysis

### 6.1. Lipolysis

Also, plot the Treemap and Stacked area chart to examine the Lipolysis Genes and Regulators among the patient groups. For Lipolysis Regulators select 'CIDEA', 'CIDEB', 'CIDEc', and 'GOS2' from Filters Pane for hgnc\_symbol under basic filtering. For Lipolysis Genes select "ABHD5", "NRIP1", "ADRB1", "ADRB2", and "ADRB3".

The image displays two side-by-side screenshots of the Microsoft Power BI 'Filters' pane, which is part of the 'Fields' section of the ribbon.

**Left Screenshot (Basic filtering):**

- hgnc\_symbol:** Set to 'is CIDEA, CIDEB, CIDEc...'.
- Filter type:** Set to 'Basic filtering'.
- Values:** Shows a list of genes: A1BG (1), A1BG-AS1 (1), A1CF (1), A2M (1).
- Drill through:** Set to 'Average of counts'.

**Right Screenshot (Advanced filtering):**

- hgnc\_symbol:** Set to 'is ADRB2, ABHD5, NRIP1...'.
- Group:** Set to 'hgnc\_symbol'.
- Details:** Set to 'diagnosis'.
- Values:** Shows a list of genes: Glu-Cer C16, Glu-Cer C18, Glu-Cer C1..., glucose, glycerol ins..., glycerol ins..., glycerol ins..., glycerol iso..., glycerol iso..., glycerol iso..., glycerol iso..., height, HOMA-IR, HOMA-IR (...), HOMA-IR (...), HTN, insulin, Is\_Acromeg..., largest dia...
- Drill through:** Set to 'Average of counts'.

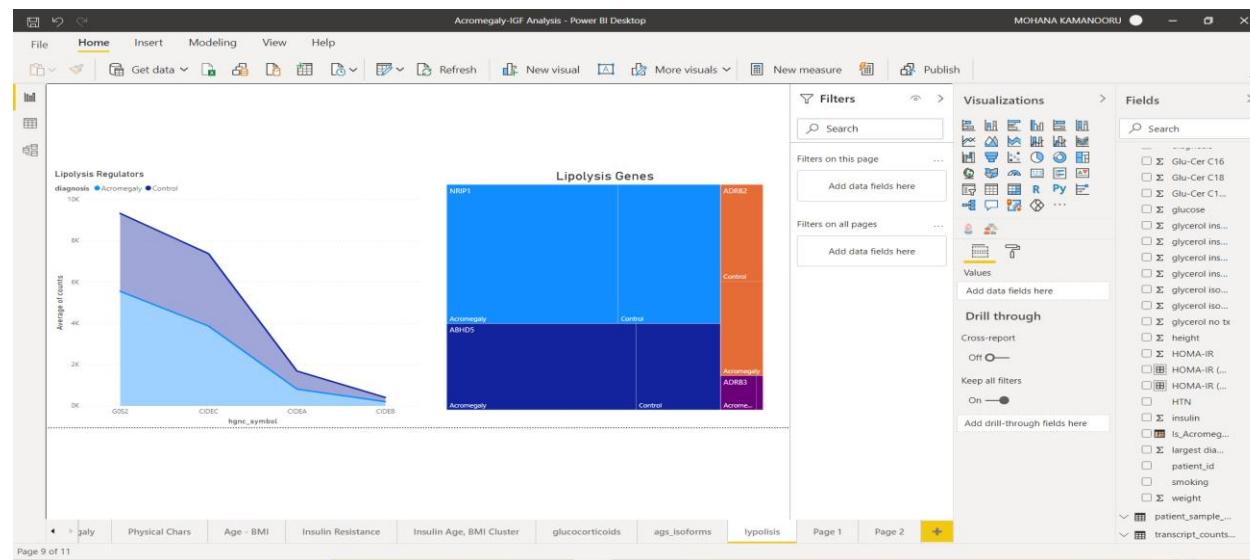


Figure 7 Lipolysis Plots

## 6.2. Glucocorticoids

Create a horizontal plot for an average of “counts” from HTSEQ\_Counts table by “diagnosis” column from patient\_information Table, and filter by hgnc\_symbol column with values (“HSD11B1”, “HSD11B2”, “NR3C1”, “NR3C2”) to evaluate glucocorticoids relativity if any between patient groups.

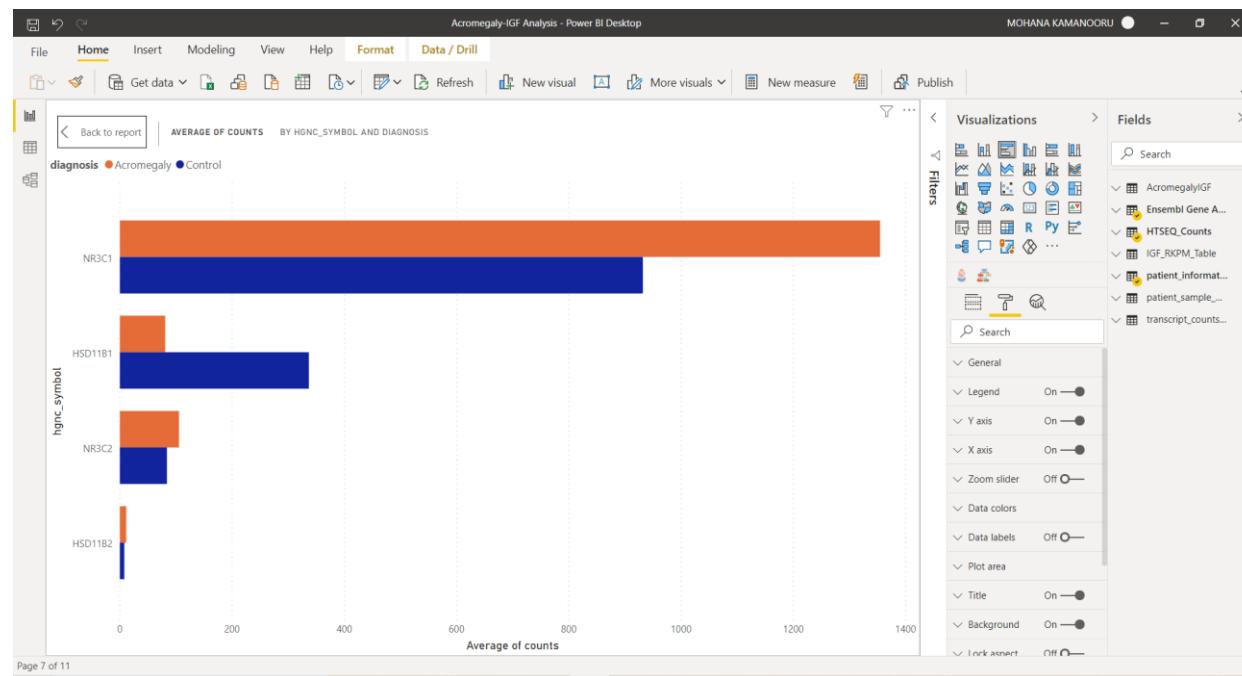


Figure 8 Glucocorticoids Analysis Plot

### 6.3. Isoforms

Similarly, plot the vertical bar graph for an average of “counts” from HTSEQ\_Counts table by “diagnosis” column from patient\_information Table, and filter by hgnc\_symbol column with values (“GPSM2”, “GPSM1”, “GPSM3”) to evaluate AGS protein isoforms in both patient groups.

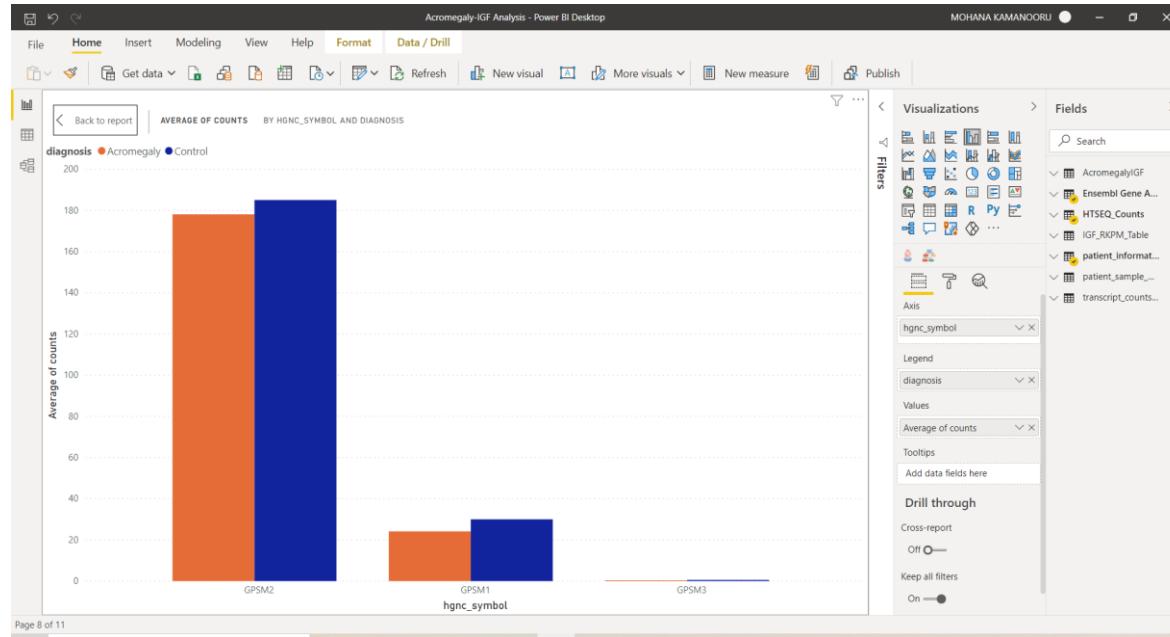


Figure 9 Isoforms Analysis plot

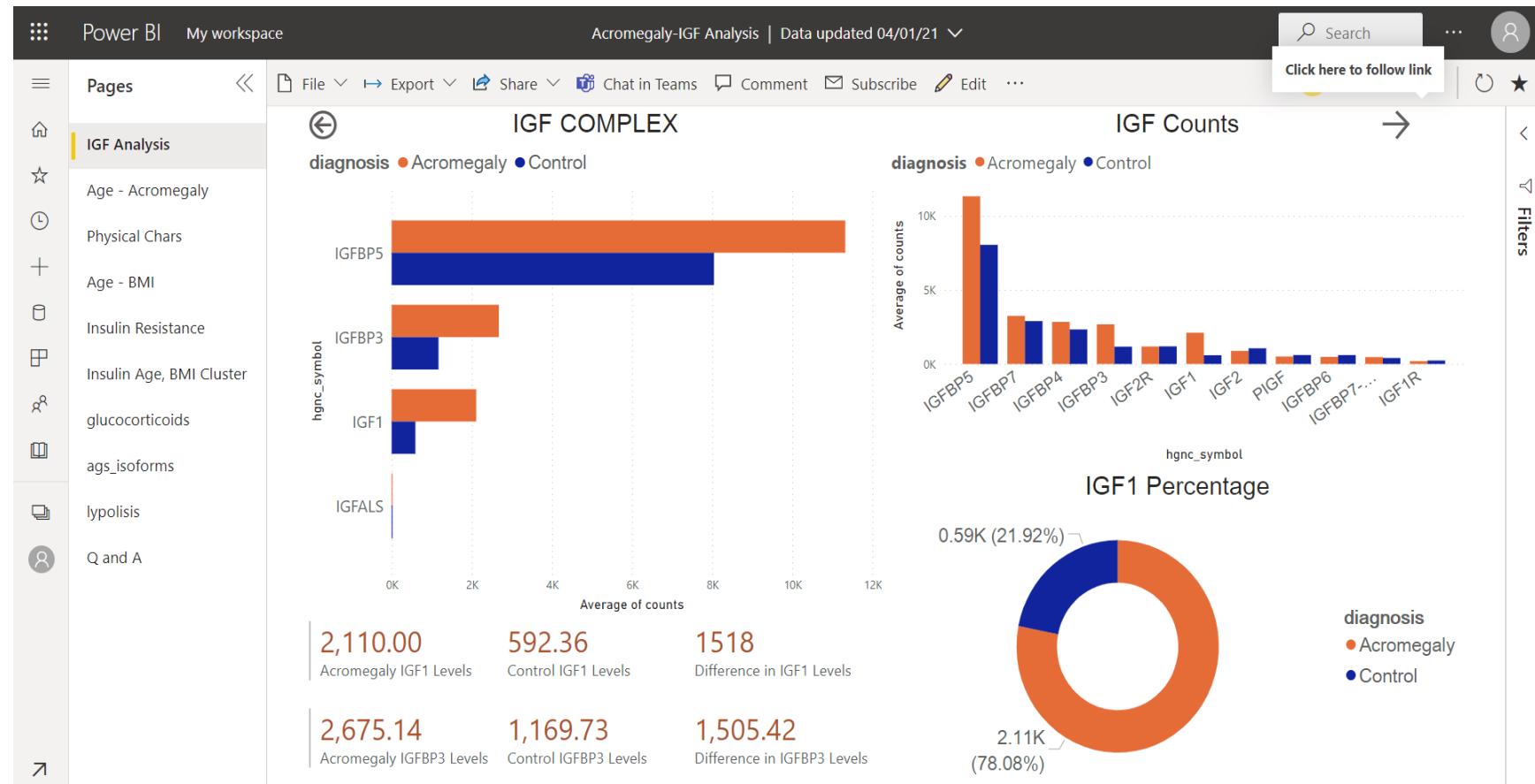
## 6.1. Analysis

From the plots above, an increase in gene counts has been observed for acromegaly. Changes in the Lipolysis gene and regulators are related to insulin absorption levels. Glucocorticoids increase affect the glucose levels and decrease in AGS protein isoform in patient groups.

## 6.2. Findings

In this research, it is observed that the patients with Acromegaly have high glucose and insulin resistance, also have low insulin sensitivity. This also supports the high HOMA-IR score in patients and the observations in the insulin analysis section.

## Power BI Report View



## Dashboard View



## Conclusions

Analyzing Acromegaly and IGF from the dataset captured from [opensource](#). The average IGF1 levels are 3.5 times higher in Acromegaly patients. IGF1 percentage is 78% for Acromegaly and 22% for control patients. Also, Acromegaly patients have higher insulin and higher lipolysis. Acromegaly patients tend to show higher averages for BMI and height. The probability of Acromegaly might increase with age. Since the analyzed data is a smaller sample, this may not be true for more significant models and real-time scenarios. Weight and Abdominal circumferences do not tend to change in considerable amounts according to the research dataset.

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