# Family Micronutrient Progress Tracking and Data-Driven Analysis

## A Professional Business Research Report

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# Contents

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## Executive Summary

This project evaluated and monitored micronutrient levels over time for two individuals, Dee and Faisal, using a structured, data-driven approach. The key focus was on deficiencies in iron, vitamin D, and potassium, which were addressed through supplementation, dietary adjustments, and sun exposure.

SQL was employed for systematic data storage and analysis, while Power BI and Excel facilitated visualization of trends. Separate datasets were created for Dee and Faisal, and advanced SQL functions—including JOINs, UNIONs, Common Table Expressions (CTEs), and window functions—enabled the analysis of nutrient progression.

Results demonstrated a clear progression from deficiency to normal nutrient status within two months. Power BI line, and heat map or matrix chart illustrated the elimination of deficiencies, while Excel radar charts provided comparative final outcomes, showing both individuals achieving healthy nutrient profiles. Although supplementation provided rapid correction, diet and sun exposure were key for maintaining nutrient levels post-intervention.

This project highlights the potential of scalable, data-driven approaches in personal health management and establishes a framework for broader applications in wellness monitoring and clinical practice.

## 1. Introduction and Problem Statement

Micronutrient deficiencies are a widespread but often under-recognized health challenge. Iron deficiency can impair energy levels and immunity (Savagner et al., 2025); vitamin D deficiency affects bone health and immune function (Holick, 2024); and potassium imbalances can compromise cardiovascular health and muscular function (Jons et al., 2025). Addressing these deficiencies is crucial for both immediate well-being and long-term disease prevention.

Many individuals lack structured systems to track progress following supplementation or dietary interventions. Without systematic tracking, improvements may go unnoticed, and deficiencies may recur due to inconsistent habits. This uncertainty diminishes the ability to make informed lifestyle and health decisions.

This project addresses this gap by implementing a structured mechanism to monitor nutrient levels over multiple months using SQL, Power BI, and Excel. By observing trends, evaluating whether diet alone can sustain healthy levels post-supplementation, and translating data into actionable insights, the study demonstrates how analytics can support practical health management.

## 2. Research Objectives

The project was guided by the following objectives:

1. Track changes in micronutrient levels over time to observe progress from deficiency to normal status.
2. Assess the effectiveness of interventions—supplementation, diet, and sun exposure—in improving nutrient levels.
3. Use SQL and visualization tools to monitor progress and provide evidence for informed health decisions.
4. Evaluate whether diet alone can maintain normal nutrient levels after initial supplementation.
5. Explore correlations between different nutrients to understand interdependencies in nutrient improvement.

## 3. Research Questions

Based on these objectives, the study addressed four key questions:

1. How do nutrient levels change over time under applied interventions?
2. Can diet and lifestyle factors alone maintain normal nutrient levels after supplementation?
3. How can SQL and visualization tools support monitoring and analysis of nutrient data?
4. What correlations exist between improvements in different nutrients over time?

## 4. Methodology

### 4.1 Data Collection

Nutrient levels for Dee and Faisal were tracked over three months. Dee's dataset focused on iron and vitamin D, while Faisal's dataset focused on potassium and vitamin D. Measurements were taken monthly and categorized into three status groups: Deficient, Below Normal, and Normal.

### 4.2 Tools and Techniques

- **SQL:** Structured and analysed nutrient data using advanced functions.
- **Power BI:** Produced charts and interactive dashboard to visualize trends.
- **Excel:** Supported radar chart for comparative outcome analysis.

### 4.3 Data Structuring

Two tables were created—**Dee_Data** and **Faisal_Data**—capturing month, nutrient, level, and status.

*SQL Table: Dee_Data*

| Month | Nutrient | Level | Status |
|---|---|---|---|
| 0 | Iron | 7 | Deficient |
| 0 | Vitamin D | 20 | Deficient |
| 1 | Iron | 10 | Below Normal |
| 1 | Vitamin D | 25 | Below Normal |
| 2 | Iron | 13 | Normal |
| 2 | Vitamin D | 40 | Normal |
| 3 | Iron | 14 | Normal |
| 3 | Vitamin D | 40 | Normal |

*SQL Table: Faisal_Data*

| Month | Nutrient | Level | Status |
|---|---|---|---|
| 0 | Potassium | 2.3 | Deficient |
| 0 | Vitamin D | 18 | Deficient |
| 1 | Potassium | 3.5 | Below Normal |
| 1 | Vitamin D | 25 | Below Normal |
| 2 | Potassium | 4.5 | Normal |
| 2 | Vitamin D | 40 | Normal |
| 3 | Potassium | 4.5 | Normal |
| 3 | Vitamin D | 40 | Normal |

### 4.4 SQL Functions Applied

- **JOINs:** Combined datasets for cross-individual comparison.
- **UNIONs:** Consolidated deficiencies into a single view.
- **CTEs:** Simplified trend analysis and progression queries.
- **Window functions:** Enabled month-to-month progression tracking.

### 4.5 Visualization Strategy

- **Power BI Line Chart:** Showed elimination of deficiencies over time.
- **Power BI Matrix Chart:** Allowed nutrient-by-month comparisons between individuals.
- **Excel Radar Chart:** Presented final nutrient outcomes, demonstrating both individuals achieving normal levels by Month 3.

To enable quantitative analysis and visualization, nutrient status categories were converted into a numeric scoring system: Deficient = 0, Below Normal = 1, Normal = 2. An Average Status Score was then calculated for each nutrient per month. This scoring allowed progression to be represented visually in Power BI charts and Excel chart.

## 5. Data Analysis and Results

### 5.1 Research Question 1: How do nutrient levels change over time under applied interventions?

**SQL Analysis:** Window functions tracked monthly nutrient progression.

*SQL Table: Dee's Previous Month Nutrient Level Comparison*

| Month | Nutrient | Level | Previous Level |
|---|---|---|---|
| 0 | Iron | **7** | NULL |
| 0 | Vitamin D | **20** | NULL |
| 1 | Vitamin D | **25** | 20 |
| 1 | Iron | **10** | 7 |
| 2 | Iron | **13** | 10 |
| 2 | Vitamin D | **40** | 25 |
| 3 | Vitamin D | **40** | 40 |
| 3 | Iron | **14** | 13 |

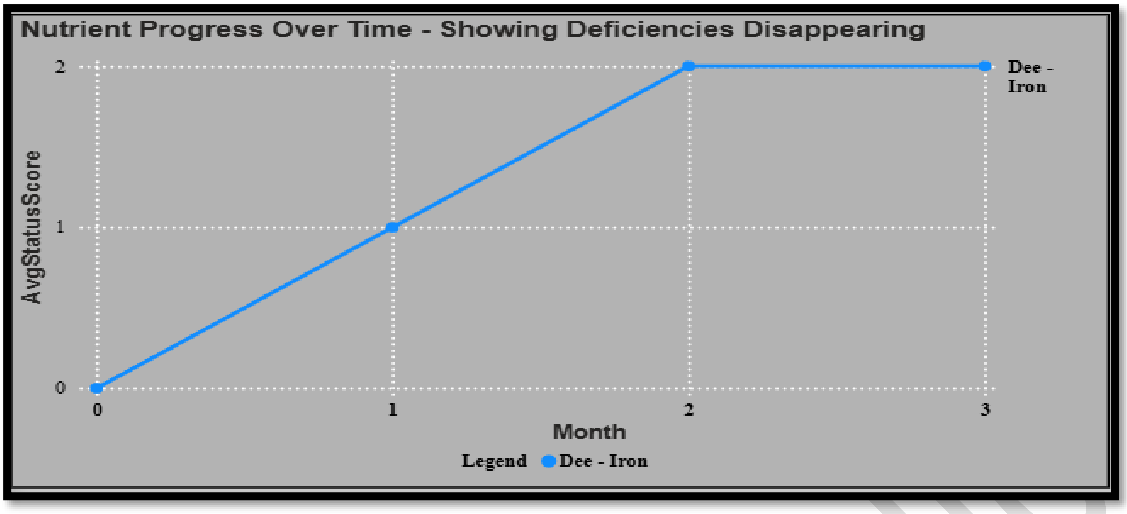
*SQL Table: Faisal's Previous Month Nutrient Level Comparison*

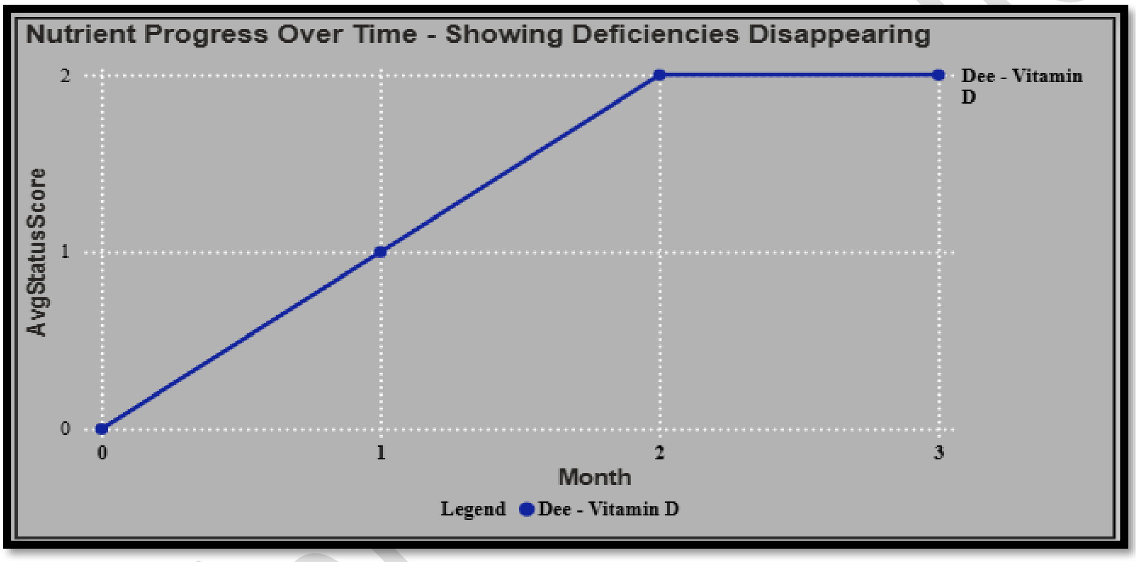
| Month | Nutrient | Level | Previous Level |
|---|---|---|---|
| 0 | Potassium | **2.3** | NULL |
| 0 | Vitamin D | **18** | NULL |
| 1 | Vitamin D | **25** | 18 |
| 1 | Potassium | **3.5** | 2.3 |
| 2 | Potassium | **4.5** | 3.5 |
| 2 | Vitamin D | **40** | 25 |
| 3 | Vitamin D | **40** | 40 |
| 3 | Potassium | **4.5** | 4.5 |

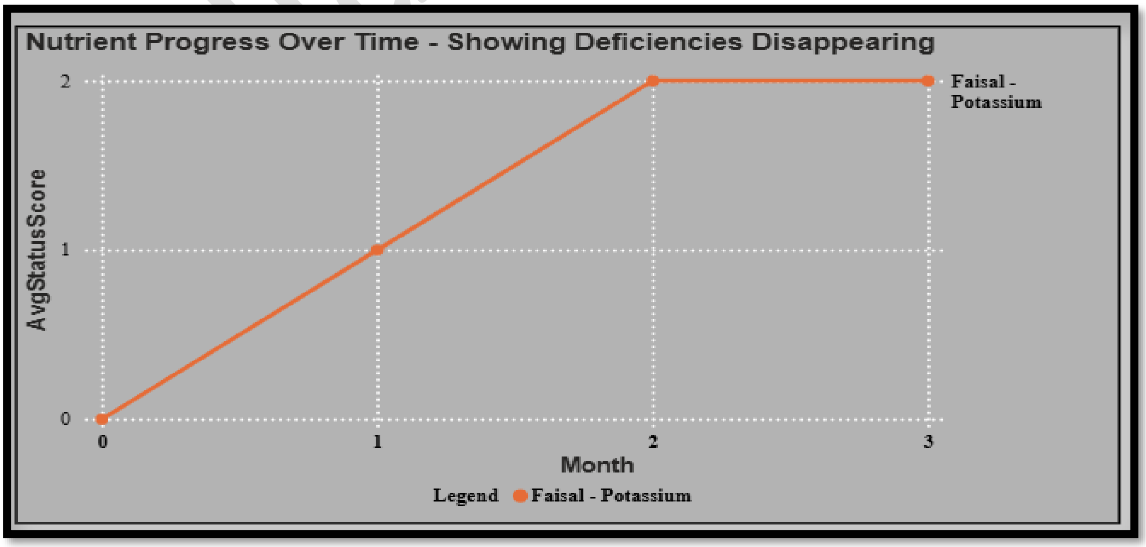
**Interpretation:**

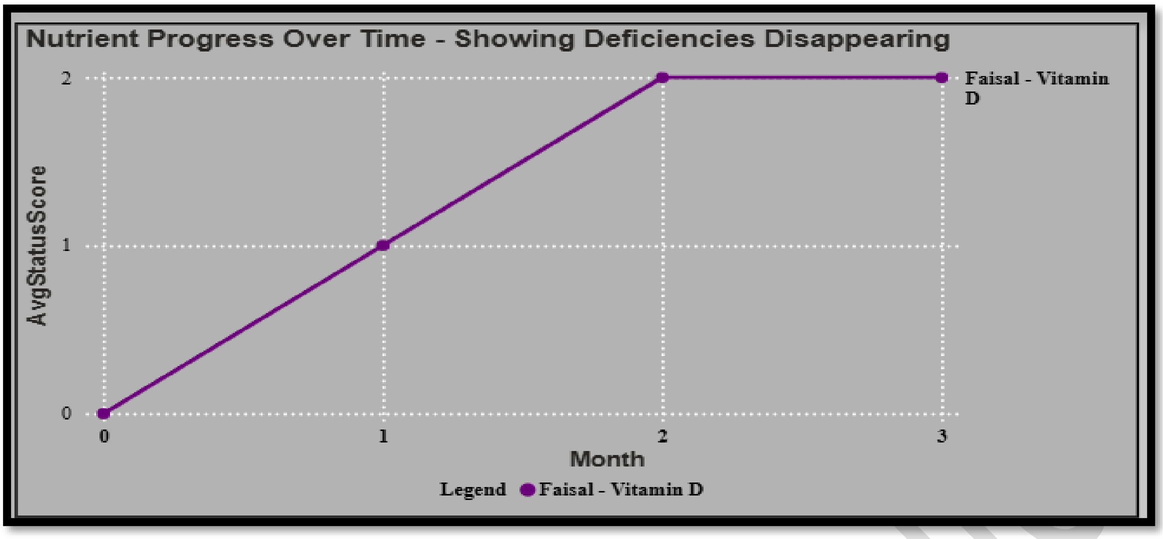
- Dee’s iron and vitamin D improved to normal levels within two months.
- Faisal’s potassium and vitamin D also normalized.
- These improvements were achieved through a combination of supplementation, diet, and sun exposure, applied in practice.

**Visualization:** Power BI Line chart illustrated progressive elimination of deficiencies.


Nutrient Progress Over Time - Showing Deficiencies Disappearing
AvgStatusScore
0
1
2
0
1
2
3
Month
Dee - Iron
Legend ● Dee - Iron


Nutrient Progress Over Time - Showing Deficiencies Disappearing
AvgStatusScore
0
1
2
0
1
2
3
Month
Dee - Vitamin D
Legend ● Dee - Vitamin D


Nutrient Progress Over Time - Showing Deficiencies Disappearing
AvgStatusScore
0
1
2
0
1
2
3
Month
Faisal - Potassium
Legend ● Faisal - Potassium



**Interpretation:**

The Y-axis represents the Average Status Score (0 = Deficient, 1 = Below Normal, 2 = Normal). As shown, both individuals progressed from 0 (deficiency) at Month 0 to 2 (normal) by Month 2, confirming complete resolution of deficiencies in both, Dee and Faisal.

### 5.2 Research Question 2: Can diet and lifestyle alone maintain normal nutrient levels after supplementation?

**SQL Analysis:** Post-supplement trends were observed in Month 3.

*SQL Table: Post-Supplement_Data*

| Month | Nutrient | Level | Status | Person |
|---|---|---|---|---|
| 3 | Iron | 16 | Normal | Dee |
| 3 | Vitamin D | 42 | Normal | Dee |
| 3 | Potassium | 4.6 | Normal | Faisal |
| 3 | Vitamin D | 42 | Normal | Faisal |

*SQL Table: Comparison of Post-Supplement Month 3 Nutrient Level with Month 2 for Dee*

| Month | Nutrient | Current Level | Previous Level | Change |
|---|---|---|---|---|
| 3 | Iron | 16 | 13 | 3 |
| 3 | Vitamin D | 42 | 40 | 2 |

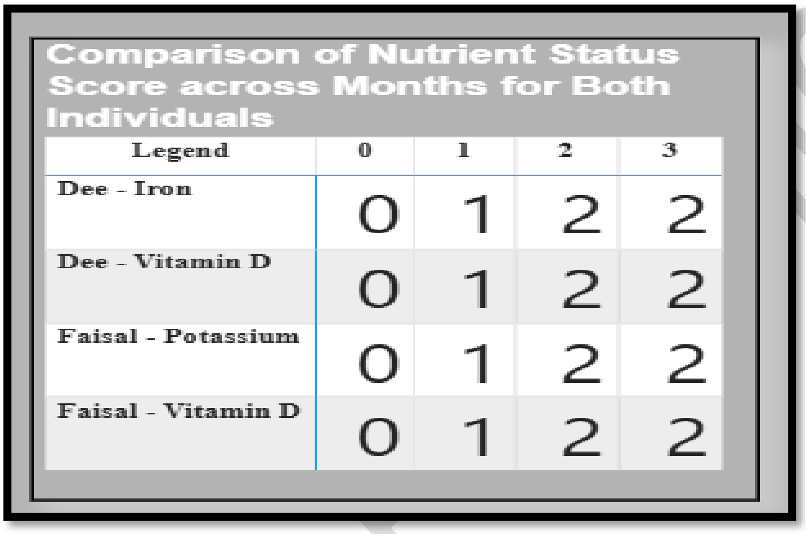
*SQL Table: Comparison of Post-Supplement Month 3 Nutrient Level with Month 2 for Faisal*

| Month | Nutrient | Current Level | Previous Level | Change |
|---|---|---|---|---|
| 3 | Potassium | 4.6 | 4.5 | 0.1 |
| 3 | Vitamin D | 42 | 40 | 2 |

**Interpretation:**

- Dee's iron and Faisal's potassium remained stable after supplementation.
- The Level of Vitamin D in both individuals is also stable after supplementation.
- This indicates that consistent diet and sun exposure can maintain nutrient levels once deficiencies are corrected.

**Visualization:** Power BI matrix chart showed nutrient stability month-to-month.



Comparison of Nutrient Status Score across Months for Both Individuals

| Legend | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| Dee - Iron | 0 | 1 | 2 | 2 |
| Dee - Vitamin D | 0 | 1 | 2 | 2 |
| Faisal - Potassium | 0 | 1 | 2 | 2 |
| Faisal - Vitamin D | 0 | 1 | 2 | 2 |

**Interpretation:**

The matrix format shows Average Status Scores across months, making it clear that after supplementation tapered, but diet and sun exposure continued, scores remained stable at 2 (normal) by month 3 for both individuals.

**5.3 Research Question 3: How can SQL and visualization tools support nutrient tracking and analysis?**

**SQL Analysis:**

- **JOINs** allowed unified progress tracking.

*SQL Table: Family Nutrient Progress (Join)*

| Month | Nutrient | Dee_Level | Dee_Status | Faisal_Level | Faisal_Status |
|---|---|---|---|---|---|
| 0 | Iron | 7 | Deficient | NULL | NULL |
| 0 | Potassium | NULL | NULL | 2.3 | Deficient |
| 0 | Vitamin D | 20 | Deficient | 18 | Deficient |
| 1 | Iron | 10 | Below Normal | NULL | NULL |
| 1 | Potassium | NULL | NULL | 3.5 | Below Normal |
| 1 | Vitamin D | 25 | Below Normal | 25 | Below Normal |
| 2 | Iron | 13 | Normal | NULL | NULL |
| 2 | Potassium | NULL | NULL | 4.5 | Normal |

| | | | | | |
|---|---|---|---|---|---|
| 2 | Vitamin D | 40 | Normal | 40 | Normal |
| 3 | Iron | 14 | Normal | NULL | NULL |
| 3 | Potassium | NULL | NULL | 4.5 | Normal |
| 3 | Vitamin D | 40 | Normal | 40 | Normal |

- **UNIONs** consolidated all deficiencies into a single table.

*SQL Table: All Deficiencies*

| Month | Nutrient | Level | Status | Person |
|---|---|---|---|---|
| 0 | Iron | 7 | Deficient | Dee |
| 0 | Potassium | 2.3 | Deficient | Faisal |
| 0 | Vitamin D | 18 | Deficient | Faisal |
| 0 | Vitamin D | 20 | Deficient | Dee |
| 1 | Iron | 10 | Below Normal | Dee |
| 1 | Potassium | 3.5 | Below Normal | Faisal |
| 1 | Vitamin D | 25 | Below Normal | Dee |
| 1 | Vitamin D | 25 | Below Normal | Faisal |

- **CTEs** simplified trend visualization and progression summaries.

*SQL Table: Dee's Month-to-Month Improvement*

| Month | Nutrient | Current Level | previous Level | Change |
|---|---|---|---|---|
| 0 | Iron | 7 | NULL | NULL |
| 0 | Vitamin D | 20 | NULL | NULL |
| 1 | Vitamin D | 25 | 20 | 5 |
| 1 | Iron | 10 | 7 | 3 |
| 2 | Iron | 13 | 10 | 3 |
| 2 | Vitamin D | 40 | 25 | 15 |
| 3 | Vitamin D | 40 | 40 | 0 |
| 3 | Iron | 14 | 13 | 1 |

*SQL Table: Faisal's Month-to-Month Improvement*

| Month | Nutrient | Current Level | Previous Level | Change |
|---|---|---|---|---|
| 0 | Potassium | 2.3 | NULL | NULL |
| 0 | Vitamin D | 18 | NULL | NULL |
| 1 | Vitamin D | 25 | 18 | 7 |
| 1 | Potassium | 3.5 | 2.3 | 1.2 |
| 2 | Potassium | 4.5 | 3.5 | 1 |
| 2 | Vitamin D | 40 | 25 | 15 |
| 3 | Vitamin D | 40 | 40 | 0 |
| 3 | Potassium | 4.5 | 4.5 | 0 |

- **Window functions** tracked nutrient improvements over time.

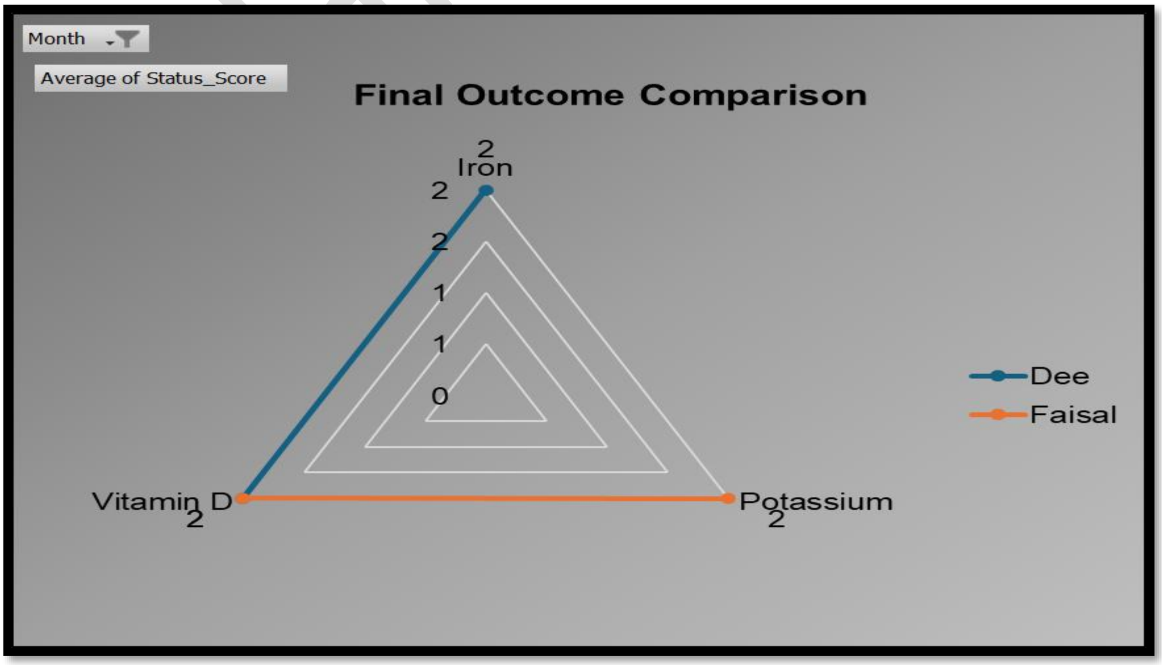
*SQL Table: Dee's Previous Month Nutrient Level Comparison*

| Month | Nutrient | Level | Previous Level |
|---|---|---|---|
| 0 | Iron | **7** | NULL |
| 0 | Vitamin D | **20** | NULL |
| 1 | Vitamin D | **25** | 20 |
| 1 | Iron | **10** | 7 |
| 2 | Iron | **13** | 10 |
| 2 | Vitamin D | **40** | 25 |
| 3 | Vitamin D | **40** | 40 |
| 3 | Iron | **14** | 13 |

*SQL Table: Faisal's Previous Month Nutrient Level Comparison*

| Month | Nutrient | Level | Previous Level |
|---|---|---|---|
| 0 | Potassium | **2.3** | NULL |
| 0 | Vitamin D | **18** | NULL |
| 1 | Vitamin D | **25** | 18 |
| 1 | Potassium | **3.5** | 2.3 |
| 2 | Potassium | **4.5** | 3.5 |
| 2 | Vitamin D | **40** | 25 |
| 3 | Vitamin D | **40** | 40 |
| 3 | Potassium | **4.5** | 4.5 |

**Visualization:** Excel radar chart illustrated final nutrient outcomes for both individuals at Month 3.



**Interpretation:**
The radar chart compares Dee and Faisal's Average Status Scores at Month 3, with all nutrients reaching 2 (normal), illustrating sustained adequacy post-intervention.

Overall, SQL provided robust structuring and querying, while visualizations translated numeric results into actionable insights, revealing improvements clearly and concisely.

### 5.4 Research Question 4: What correlations exist between improvements in different nutrients?

**SQL Analysis:** The combined UNION + CTE table provided an integrated view of both individuals' nutrient progression, allowing correlations to be observed across nutrients.

*SQL Table:*

| Month | Nutrient | DEE_Level | Faisal_Level |
|---|---|---|---|
| 0 | Iron | **7** | NULL |
| 0 | Potassium | NULL | **2.3** |
| 0 | Vitamin D | **20** | **18** |
| 1 | Iron | **10** | NULL |
| 1 | Potassium | NULL | **3.5** |
| 1 | Vitamin D | **25** | **25** |
| 2 | Iron | **13** | NULL |
| 2 | Potassium | NULL | **4.5** |
| 2 | Vitamin D | **40** | **40** |
| 3 | Iron | **14** | NULL |
| 3 | Potassium | NULL | **4.5** |
| 3 | Vitamin D | **40** | **40** |

**Interpretation:**

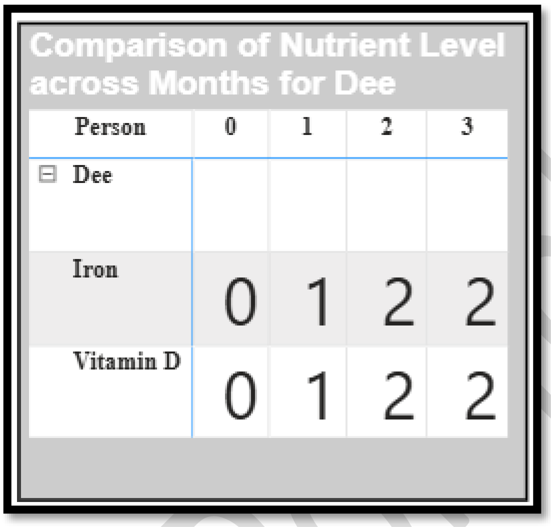
The combined results table displayed Dee's iron and vitamin D levels alongside Faisal's vitamin D and potassium levels across the observed months.

**Dee (Iron & Vitamin D):** Both iron and vitamin D showed steady recovery from deficiency to normal range within two months. This suggests a reinforcing improvement, where better vitamin D status (supported by supplementation, nutrient rich diet and sun exposure) coincided with restored iron levels, reflecting the positive effect of overall dietary and lifestyle interventions.

**Faisal (Potassium & Vitamin D):** Faisal's potassium levels normalized in parallel with vitamin D recovery. While vitamin D does not directly regulate potassium, both nutrients are linked through electrolyte and metabolic balance. The simultaneous improvements indicate that dietary adjustments and supplementation worked in tandem, producing complementary benefits.

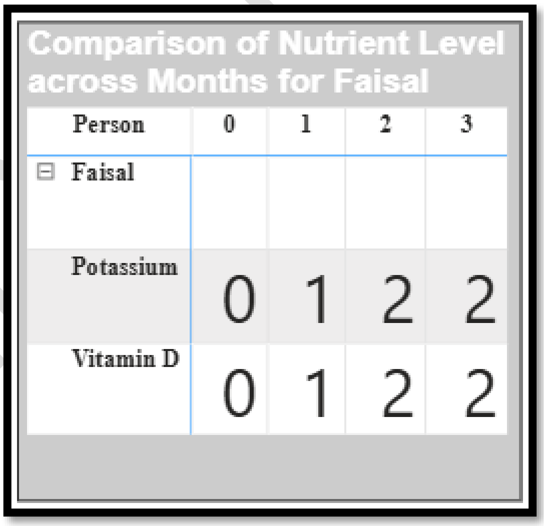
**Overall Correlation:** The combined dataset highlights that vitamin D improvements were central for both individuals and appeared correlated with the stabilization of other nutrients (iron for Dee, potassium for Faisal). This suggests that correcting one deficiency within the micronutrient system often supports or coincides with the resolution of others.

**Visualization:** Radar charts highlighted parallel nutrient improvements and both individuals achieving normal nutrient profiles.



Comparison of Nutrient Level across Months for Dee

| Person | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| ⊟ Dee | | | | |
| Iron | 0 | 1 | 2 | 2 |
| Vitamin D | 0 | 1 | 2 | 2 |



Comparison of Nutrient Level across Months for Faisal

| Person | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| ⊟ Faisal | | | | |
| Potassium | 0 | 1 | 2 | 2 |
| Vitamin D | 0 | 1 | 2 | 2 |

## 6. Discussion

The analysis demonstrates that nutrient deficiencies can be rapidly corrected with a combination of supplementation, diet, and sun exposure. Both Dee and Faisal achieved normal nutrient levels within two months, highlighting the effectiveness of applied interventions.

Once deficiencies were corrected, diet and sun exposure were sufficient to maintain nutrient levels, showing that lifestyle factors play a critical role in sustaining health outcomes. Vitamin D improvements were particularly responsive to supplementation and sun exposure, whereas iron and potassium stabilization relied heavily on diet.

The observed correlations among nutrients indicate that improving one nutrient can reinforce progress in others, reflecting the holistic nature of nutrition. SQL and visualization tools were instrumental in translating raw data into actionable insights, revealing trends that may otherwise remain hidden.

By integrating quantitative nutrient tracking with qualitative understanding of interventions, this study demonstrates how structured, data-driven monitoring can support evidence-based health decisions.

## 7. Implications and Recommendations

### For Individuals:

- Systematic nutrient tracking enhances accountability and motivation.
- Combining supplementation with diet and sun exposure delivers the strongest results.
- Once deficiencies are corrected, diet and lifestyle adjustments can sustain nutrient health.

### For Healthcare Professionals:

- SQL-based frameworks can complement clinical monitoring.
- Visualization tools communicate progress effectively, supporting patient adherence.
- Observing correlations among nutrients can inform holistic, personalized treatment strategies.

### For Future Applications:

- Scaling to larger populations can validate generalizability.
- Expanding tracked nutrients (e.g., calcium, magnesium, zinc) can improve insights.
- Predictive analytics could anticipate deficiencies and guide pre-emptive interventions.

## 8. Limitations

- **Sample size:** Only two individuals; generalizability is limited.
- **Timeframe:** Three months may not reflect long-term trends.
- **Data scope:** Nutrient intake (dietary logs, supplement dosage) was not captured in SQL.
- **External factors:** Lifestyle influences like stress or physical activity were not measured.

These limitations should be considered when interpreting results.

## 9. Conclusion

This project illustrates the value of structured, data-driven nutrient monitoring. Using SQL and visualization tools, nutrient levels were tracked, analysed, and clearly presented, demonstrating measurable improvements from deficiency to normal within two months. Supplementation enabled rapid correction, while diet and sun exposure supported sustained nutrient health.

The findings highlight the potential of combining robust analytics with practical interventions in personal health management. This approach can be scaled for broader applications in clinical monitoring and wellness programs, providing actionable insights for individuals and professionals alike.

**References:**

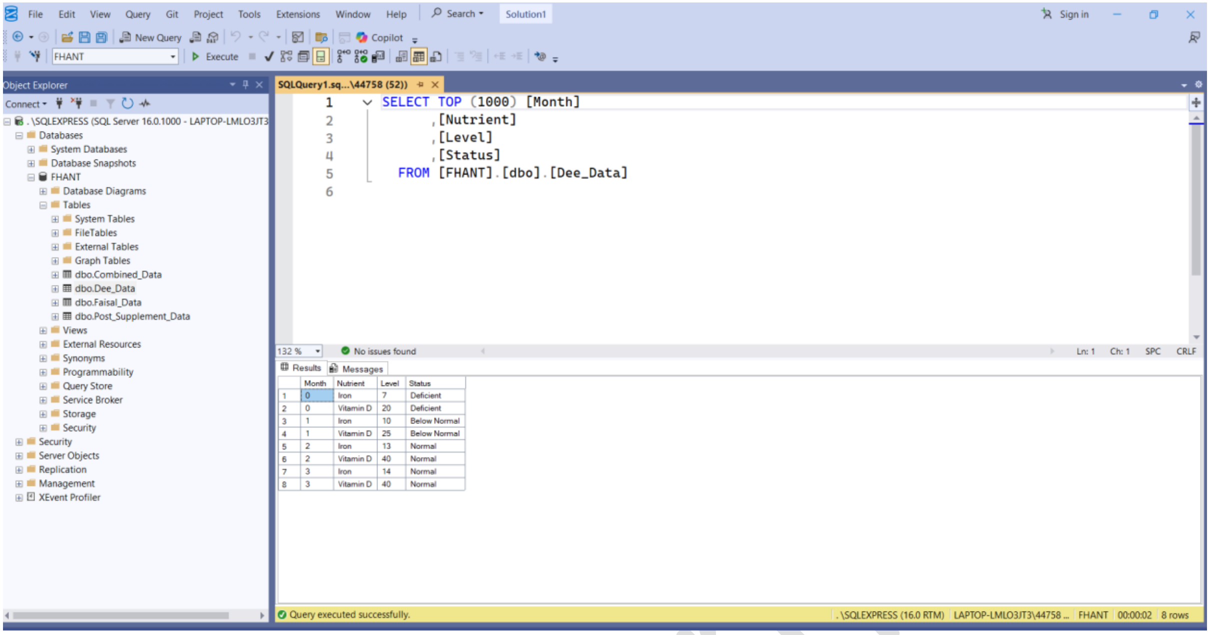
Savagner, F., Farge, T., Karim, Z. & Aloulou, M., (2025) Iron and energy metabolic interactions in Treg-mediated immune regulation. *Frontiers in Immunology*, 16, p.1554028. doi: 10.3389/fimmu.2025.1554028.

Holick, M.F., (2024) Vitamin D and bone health: What vitamin D can and cannot do. *Advances in Food and Nutrition Research*, 109, pp. 44–62.

Jøns, C., Zheng, C., Winsløw, U. C. G., et al., (2025) Increasing the Potassium Level in Patients at High Risk for Ventricular Arrhythmias. *New England Journal of Medicine*, [online]. DOI: 10.1056/NEJMoa2509542.

## Appendix-A

*SQL Table: Dee_Data*

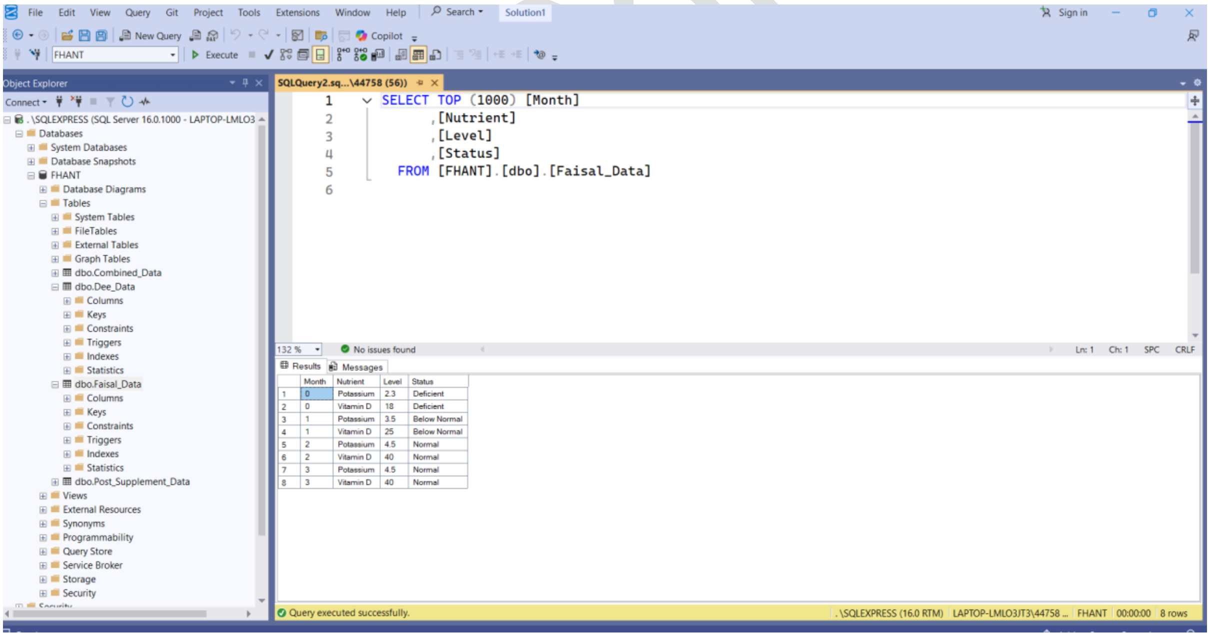


```sql
SELECT TOP (1000) [Month]
      ,[Nutrient]
      ,[Level]
      ,[Status]
  FROM [FHANT].[dbo].[Dee_Data]
```

|   | Month | Nutrient | Level | Status |
|---|---|---|---|---|
| 1 | 0 | Iron | 7 | Deficient |
| 2 | 0 | Vitamin D | 20 | Deficient |
| 3 | 1 | Iron | 10 | Below Normal |
| 4 | 1 | Vitamin D | 25 | Below Normal |
| 5 | 2 | Iron | 13 | Normal |
| 6 | 2 | Vitamin D | 40 | Normal |
| 7 | 3 | Iron | 14 | Normal |
| 8 | 3 | Vitamin D | 40 | Normal |

Query executed successfully.

*SQL Table: Faisal_Data*



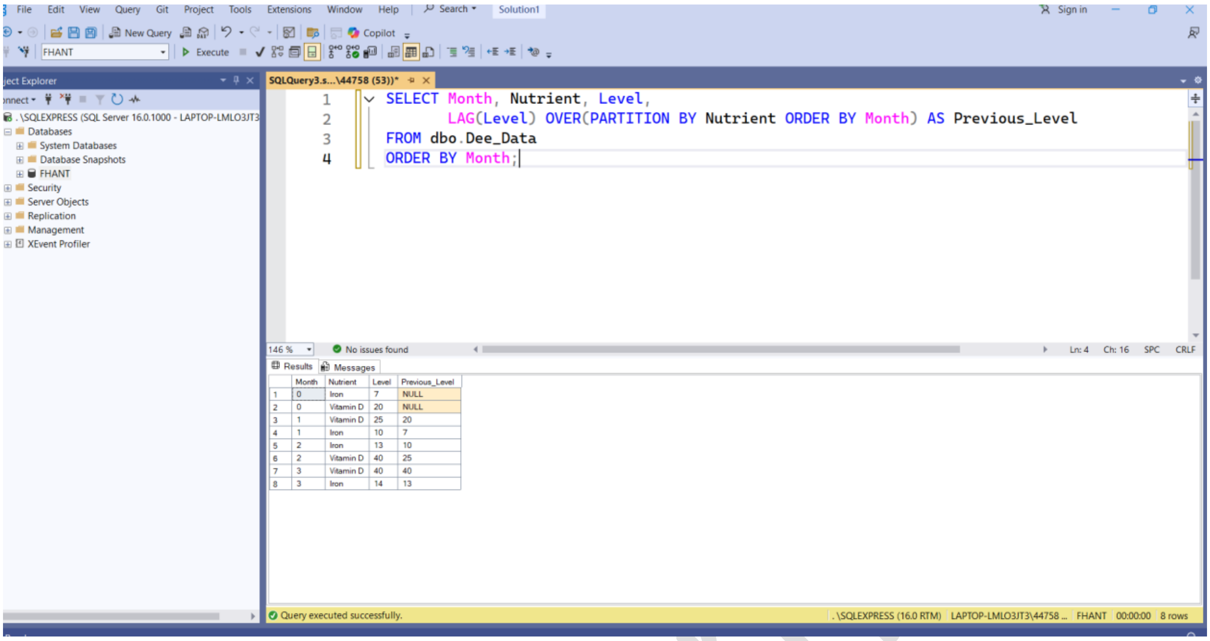
```sql
SELECT TOP (1000) [Month]
      ,[Nutrient]
      ,[Level]
      ,[Status]
  FROM [FHANT].[dbo].[Faisal_Data]
```

|   | Month | Nutrient | Level | Status |
|---|---|---|---|---|
| 1 | 0 | Potassium | 2.3 | Deficient |
| 2 | 0 | Vitamin D | 18 | Deficient |
| 3 | 1 | Potassium | 3.5 | Below Normal |
| 4 | 1 | Vitamin D | 25 | Below Normal |
| 5 | 2 | Potassium | 4.5 | Normal |
| 6 | 2 | Vitamin D | 40 | Normal |
| 7 | 3 | Potassium | 4.5 | Normal |
| 8 | 3 | Vitamin D | 40 | Normal |

Query executed successfully.

## Appendix-B

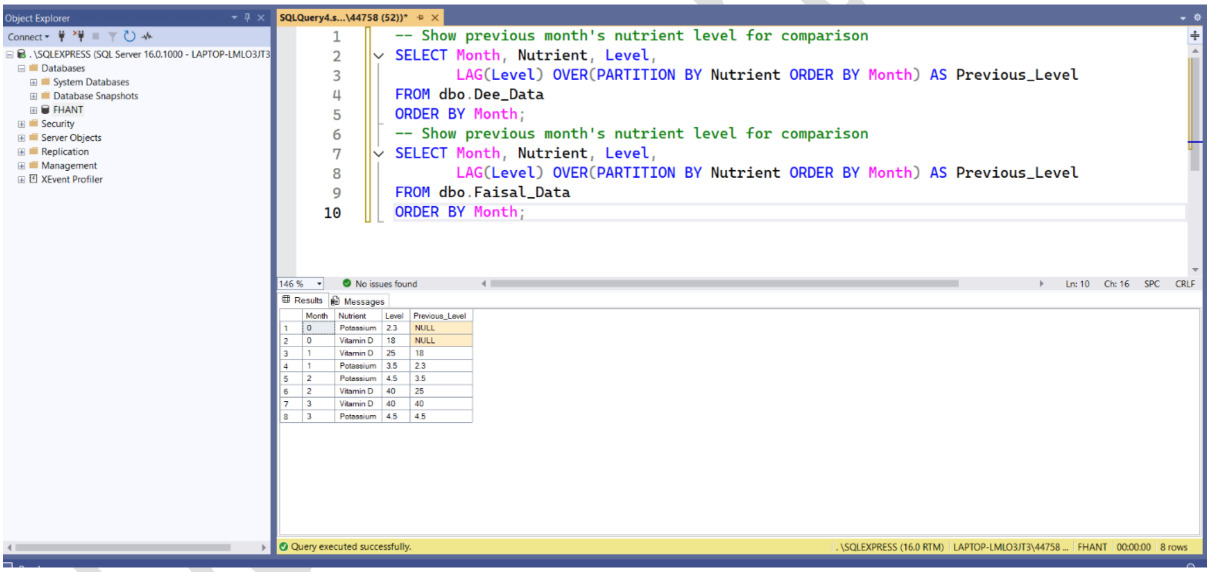
**SQL Analysis:** Window functions tracked monthly nutrient progression.



```sql
SELECT Month, Nutrient, Level,
       LAG(Level) OVER(PARTITION BY Nutrient ORDER BY Month) AS Previous_Level
FROM dbo.Dee_Data
ORDER BY Month;
```

| | Month | Nutrient | Level | Previous_Level |
|---|---|---|---|---|
| 1 | 0 | Iron | 7 | NULL |
| 2 | 0 | Vitamin D | 20 | NULL |
| 3 | 1 | Vitamin D | 25 | 20 |
| 4 | 1 | Iron | 10 | 7 |
| 5 | 2 | Iron | 13 | 10 |
| 6 | 2 | Vitamin D | 40 | 25 |
| 7 | 3 | Vitamin D | 40 | 40 |
| 8 | 3 | Iron | 14 | 13 |

Query executed successfully. .\SQLEXPRESS (16.0 RTM) LAPTOP-LMLO3JT3\44758 ... FHANT 00:00:00 8 rows



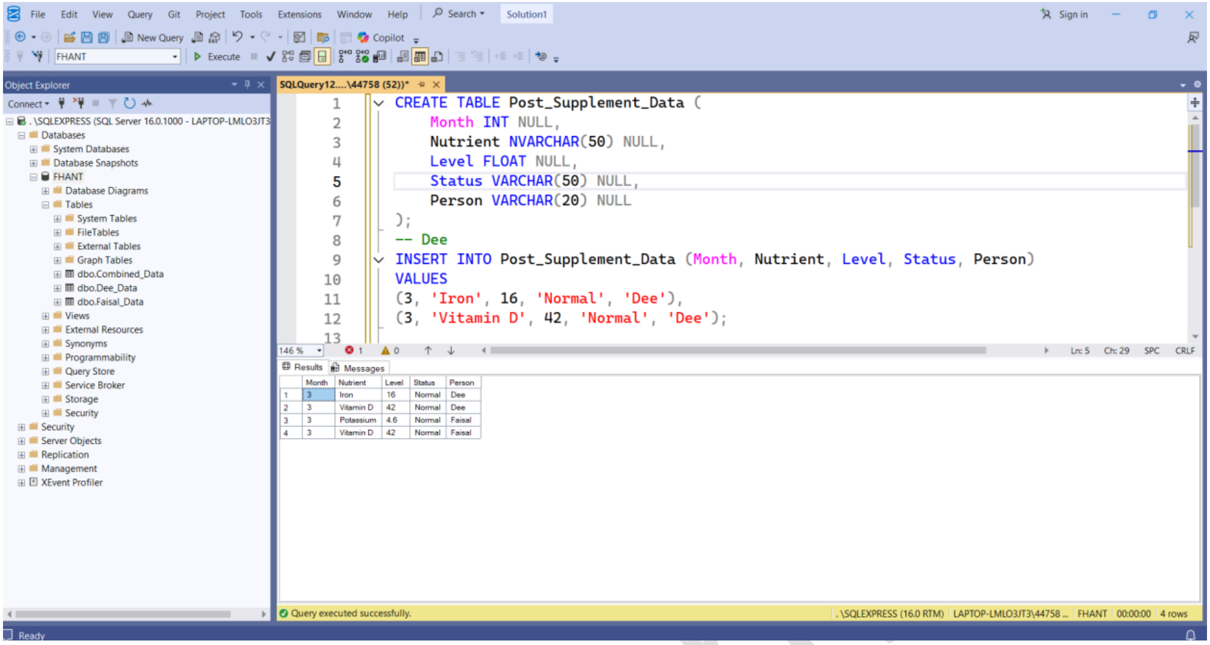
```sql
-- Show previous month's nutrient level for comparison
SELECT Month, Nutrient, Level,
       LAG(Level) OVER(PARTITION BY Nutrient ORDER BY Month) AS Previous_Level
FROM dbo.Dee_Data
ORDER BY Month;
-- Show previous month's nutrient level for comparison
SELECT Month, Nutrient, Level,
       LAG(Level) OVER(PARTITION BY Nutrient ORDER BY Month) AS Previous_Level
FROM dbo.Faisal_Data
ORDER BY Month;
```

| | Month | Nutrient | Level | Previous_Level |
|---|---|---|---|---|
| 1 | 0 | Potassium | 2.3 | NULL |
| 2 | 0 | Vitamin D | 18 | NULL |
| 3 | 1 | Vitamin D | 25 | 18 |
| 4 | 1 | Potassium | 3.5 | 2.3 |
| 5 | 2 | Potassium | 4.5 | 3.5 |
| 6 | 2 | Vitamin D | 40 | 25 |
| 7 | 3 | Vitamin D | 40 | 40 |
| 8 | 3 | Potassium | 4.5 | 4.5 |

Query executed successfully. .\SQLEXPRESS (16.0 RTM) LAPTOP-LMLO3JT3\44758 ... FHANT 00:00:00 8 rows

## Appendix-C

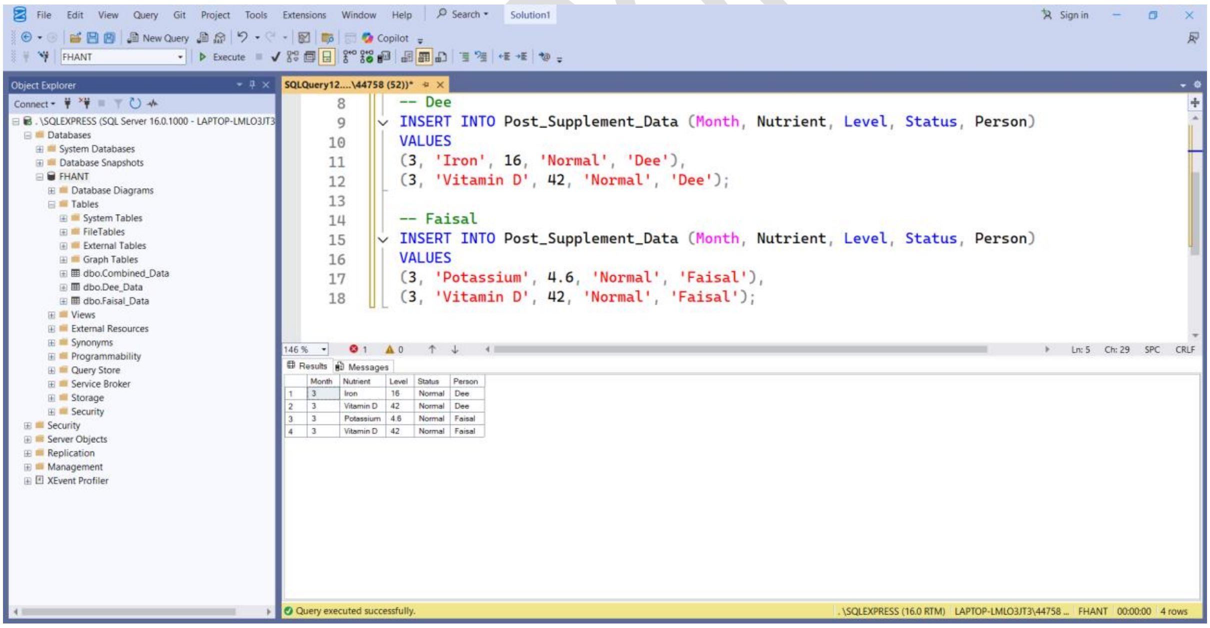
**SQL Analysis:** Post-supplement trends were observed in Month 3.



```sql
CREATE TABLE Post_Supplement_Data (
    Month INT NULL,
    Nutrient NVARCHAR(50) NULL,
    Level FLOAT NULL,
    Status VARCHAR(50) NULL,
    Person VARCHAR(20) NULL
);
-- Dee
INSERT INTO Post_Supplement_Data (Month, Nutrient, Level, Status, Person)
VALUES
(3, 'Iron', 16, 'Normal', 'Dee'),
(3, 'Vitamin D', 42, 'Normal', 'Dee');
```

| | Month | Nutrient | Level | Status | Person |
|---|---|---|---|---|---|
| 1 | 3 | Iron | 16 | Normal | Dee |
| 2 | 3 | Vitamin D | 42 | Normal | Dee |
| 3 | 3 | Potassium | 4.6 | Normal | Faisal |
| 4 | 3 | Vitamin D | 42 | Normal | Faisal |

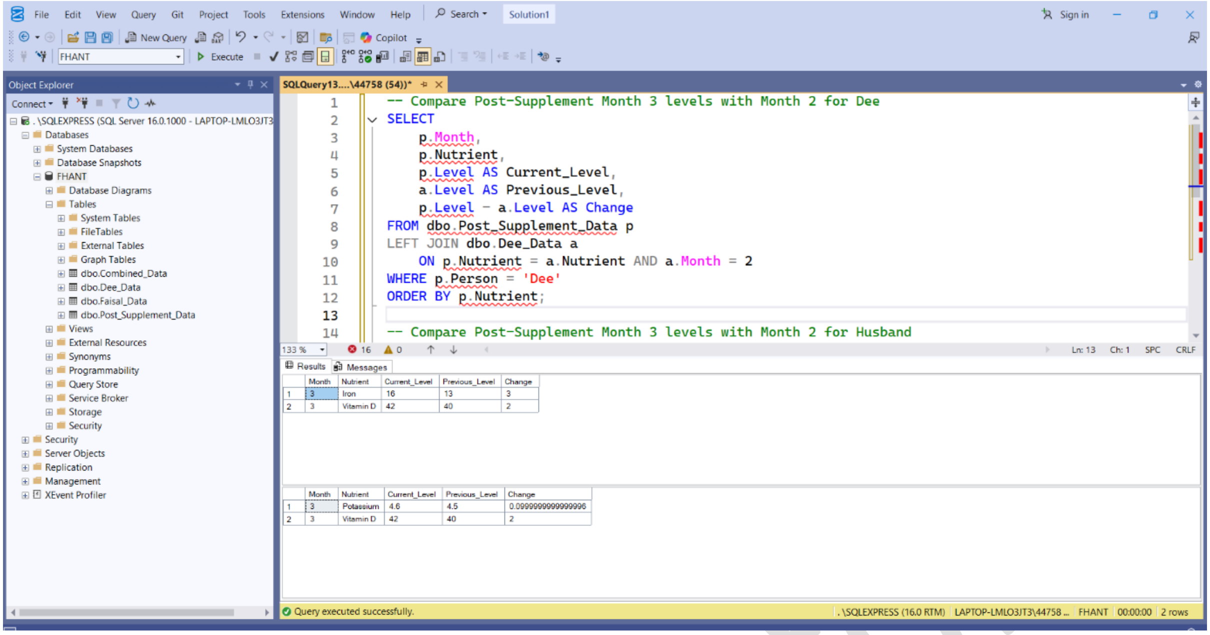
Query executed successfully.



```sql
-- Dee
INSERT INTO Post_Supplement_Data (Month, Nutrient, Level, Status, Person)
VALUES
(3, 'Iron', 16, 'Normal', 'Dee'),
(3, 'Vitamin D', 42, 'Normal', 'Dee');

-- Faisal
INSERT INTO Post_Supplement_Data (Month, Nutrient, Level, Status, Person)
VALUES
(3, 'Potassium', 4.6, 'Normal', 'Faisal'),
(3, 'Vitamin D', 42, 'Normal', 'Faisal');
```

| | Month | Nutrient | Level | Status | Person |
|---|---|---|---|---|---|
| 1 | 3 | Iron | 16 | Normal | Dee |
| 2 | 3 | Vitamin D | 42 | Normal | Dee |
| 3 | 3 | Potassium | 4.6 | Normal | Faisal |
| 4 | 3 | Vitamin D | 42 | Normal | Faisal |

Query executed successfully.

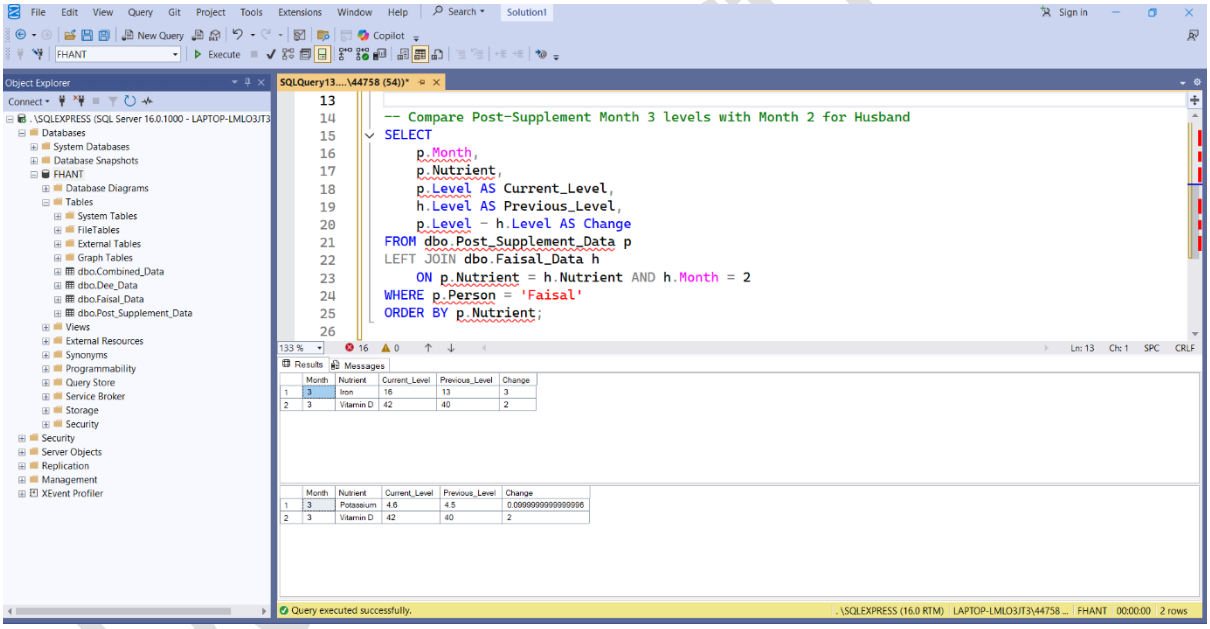


```sql
-- Compare Post-Supplement Month 3 levels with Month 2 for Dee
SELECT
    p.Month,
    p.Nutrient,
    p.Level AS Current_Level,
    a.Level AS Previous_Level,
    p.Level - a.Level AS Change
FROM dbo.Post_Supplement_Data p
LEFT JOIN dbo.Dee_Data a
    ON p.Nutrient = a.Nutrient AND a.Month = 2
WHERE p.Person = 'Dee'
ORDER BY p.Nutrient;

-- Compare Post-Supplement Month 3 levels with Month 2 for Husband
```

| | Month | Nutrient | Current_Level | Previous_Level | Change |
|---|---|---|---|---|---|
| 1 | 3 | Iron | 16 | 13 | 3 |
| 2 | 3 | Vitamin D | 42 | 40 | 2 |

| | Month | Nutrient | Current_Level | Previous_Level | Change |
|---|---|---|---|---|---|
| 1 | 3 | Potassium | 4.6 | 4.5 | 0.0999999999999996 |
| 2 | 3 | Vitamin D | 42 | 40 | 2 |

Query executed successfully. . \SQLEXPRESS (16.0 RTM) | LAPTOP-LMLO3JT3\44758 ... | FHANT | 00:00:00 | 2 rows



```sql
-- Compare Post-Supplement Month 3 levels with Month 2 for Husband
SELECT
    p.Month,
    p.Nutrient,
    p.Level AS Current_Level,
    h.Level AS Previous_Level,
    p.Level - h.Level AS Change
FROM dbo.Post_Supplement_Data p
LEFT JOIN dbo.Faisal_Data h
    ON p.Nutrient = h.Nutrient AND h.Month = 2
WHERE p.Person = 'Faisal'
ORDER BY p.Nutrient;
```

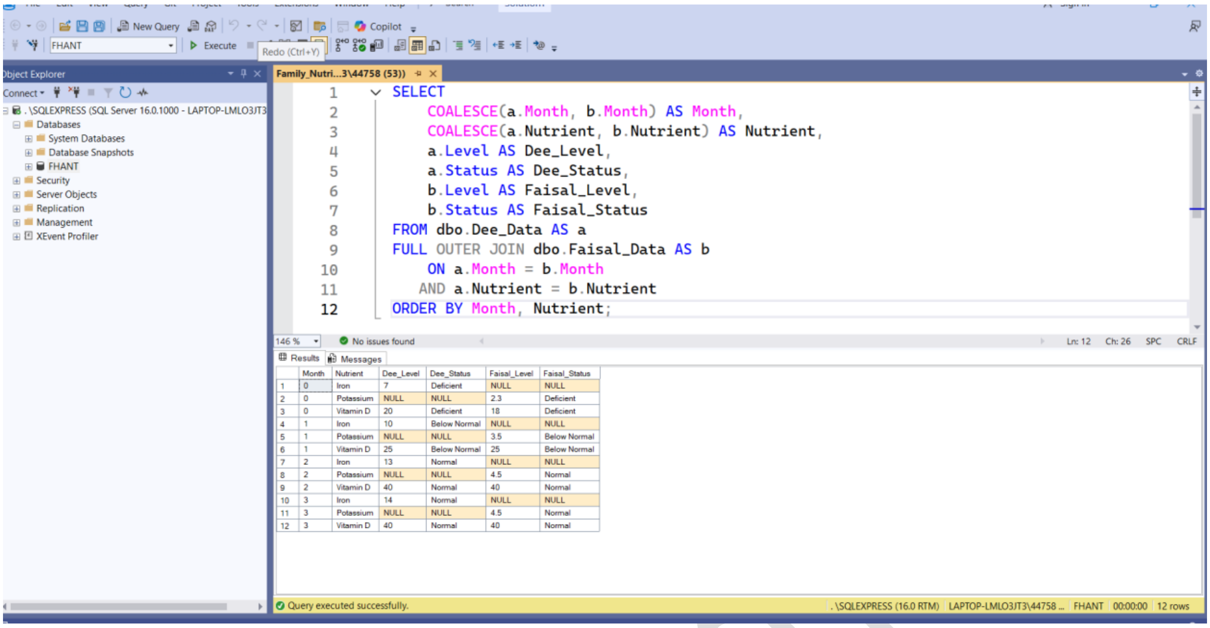
| | Month | Nutrient | Current_Level | Previous_Level | Change |
|---|---|---|---|---|---|
| 1 | 3 | Iron | 16 | 13 | 3 |
| 2 | 3 | Vitamin D | 42 | 40 | 2 |

| | Month | Nutrient | Current_Level | Previous_Level | Change |
|---|---|---|---|---|---|
| 1 | 3 | Potassium | 4.6 | 4.5 | 0.0999999999999996 |
| 2 | 3 | Vitamin D | 42 | 40 | 2 |

Query executed successfully. . \SQLEXPRESS (16.0 RTM) | LAPTOP-LMLO3JT3\44758 ... | FHANT | 00:00:00 | 2 rows

## Appendix-D

**SQL Analysis: JOINs** allowed unified progress tracking.



```sql
SELECT
    COALESCE(a.Month, b.Month) AS Month,
    COALESCE(a.Nutrient, b.Nutrient) AS Nutrient,
    a.Level AS Dee_Level,
    a.Status AS Dee_Status,
    b.Level AS Faisal_Level,
    b.Status AS Faisal_Status
FROM dbo.Dee_Data AS a
FULL OUTER JOIN dbo.Faisal_Data AS b
    ON a.Month = b.Month
   AND a.Nutrient = b.Nutrient
ORDER BY Month, Nutrient;
```

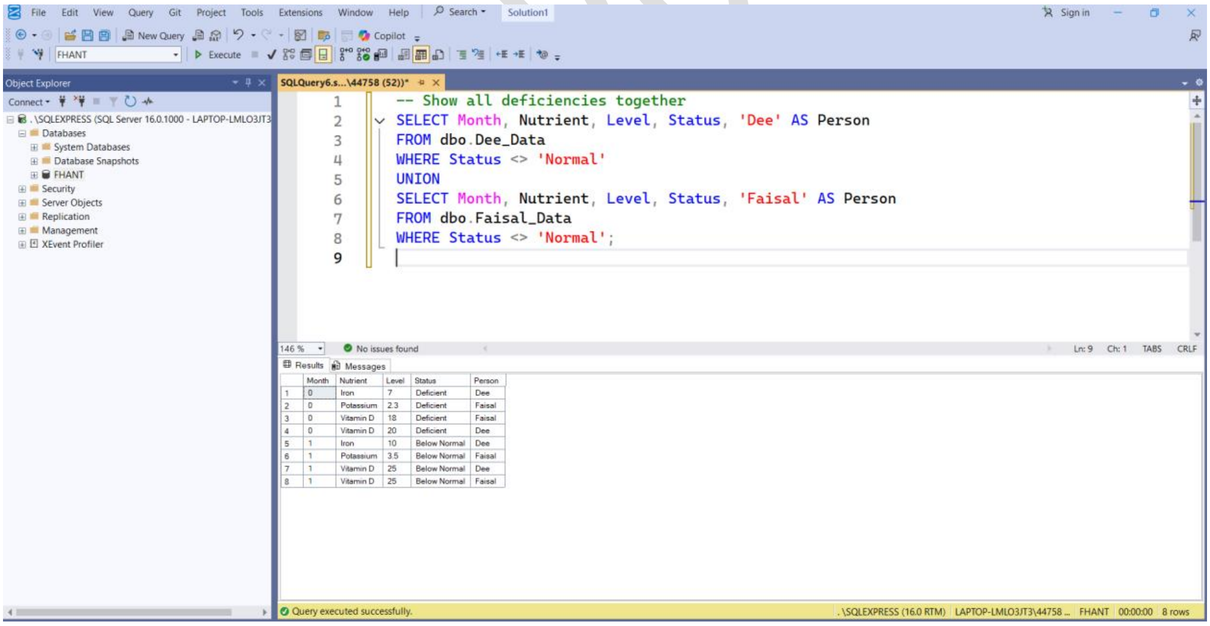
146 % No issues found Ln: 12 Ch: 26 SPC CRLF

Results Messages

| | Month | Nutrient | Dee_Level | Dee_Status | Faisal_Level | Faisal_Status |
|---|---|---|---|---|---|---|
| 1 | 0 | Iron | 7 | Deficient | NULL | NULL |
| 2 | 0 | Potassium | NULL | NULL | 2.3 | Deficient |
| 3 | 0 | Vitamin D | 20 | Deficient | 18 | Deficient |
| 4 | 1 | Iron | 10 | Below Normal | NULL | NULL |
| 5 | 1 | Potassium | NULL | NULL | 3.5 | Below Normal |
| 6 | 1 | Vitamin D | 25 | Below Normal | 25 | Below Normal |
| 7 | 2 | Iron | 13 | Normal | NULL | NULL |
| 8 | 2 | Potassium | NULL | NULL | 4.5 | Normal |
| 9 | 2 | Vitamin D | 40 | Normal | 40 | Normal |
| 10 | 3 | Iron | 14 | Normal | NULL | NULL |
| 11 | 3 | Potassium | NULL | NULL | 4.5 | Normal |
| 12 | 3 | Vitamin D | 40 | Normal | 40 | Normal |

Query executed successfully. .\SQLEXPRESS (16.0 RTM) LAPTOP-LMLO3JT3\44758 ... FHANT 00:00:00 12 rows

**SQL Analysis: UNIONs** consolidated all deficiencies into a single table.



```sql
-- Show all deficiencies together
SELECT Month, Nutrient, Level, Status, 'Dee' AS Person
FROM dbo.Dee_Data
WHERE Status <> 'Normal'
UNION
SELECT Month, Nutrient, Level, Status, 'Faisal' AS Person
FROM dbo.Faisal_Data
WHERE Status <> 'Normal';
```

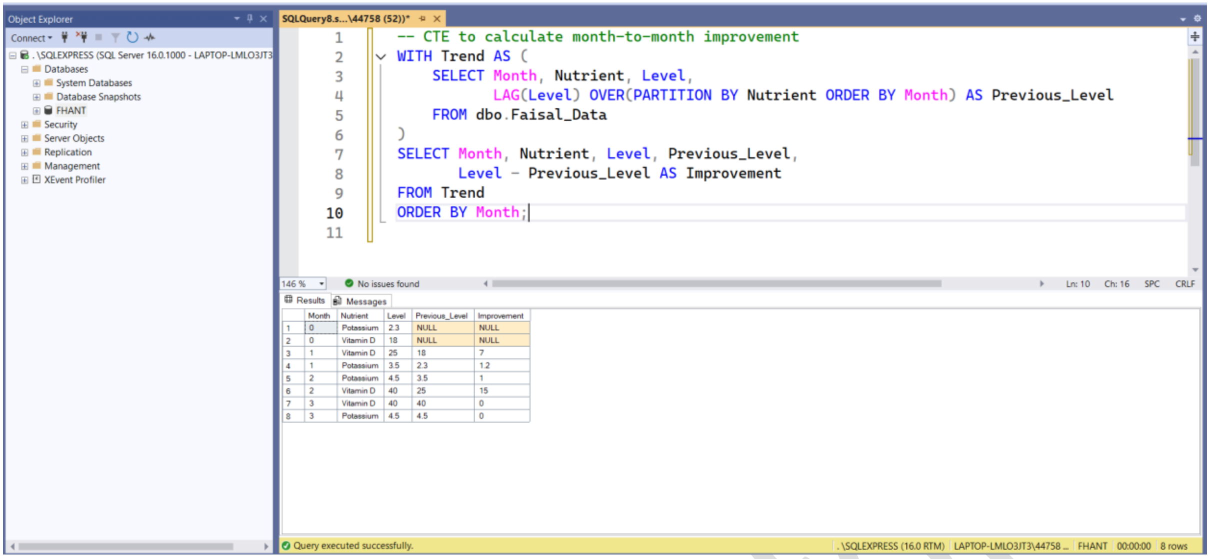
146 % No issues found Ln: 9 Ch: 1 TABS CRLF

Results Messages

| | Month | Nutrient | Level | Status | Person |
|---|---|---|---|---|---|
| 1 | 0 | Iron | 7 | Deficient | Dee |
| 2 | 0 | Potassium | 2.3 | Deficient | Faisal |
| 3 | 0 | Vitamin D | 18 | Deficient | Faisal |
| 4 | 0 | Vitamin D | 20 | Deficient | Dee |
| 5 | 1 | Iron | 10 | Below Normal | Dee |
| 6 | 1 | Potassium | 3.5 | Below Normal | Faisal |
| 7 | 1 | Vitamin D | 25 | Below Normal | Dee |
| 8 | 1 | Vitamin D | 25 | Below Normal | Faisal |

Query executed successfully. .\SQLEXPRESS (16.0 RTM) LAPTOP-LMLO3JT3\44758 ... FHANT 00:00:00 8 rows

**SQL Analysis CTEs** simplified trend visualization and progression summaries.



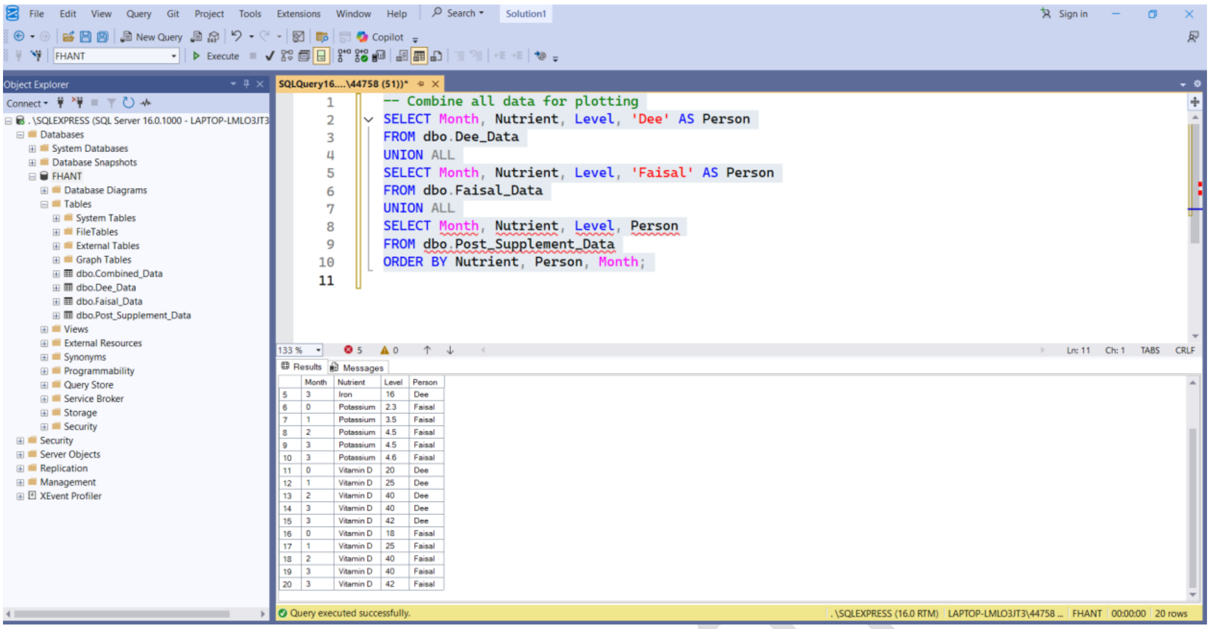
```sql
-- CTE to calculate month-to-month improvement
WITH Trend AS (
    SELECT Month, Nutrient, Level,
           LAG(Level) OVER(PARTITION BY Nutrient ORDER BY Month) AS Previous_Level
    FROM dbo.Faisal_Data
)
SELECT Month, Nutrient, Level, Previous_Level,
       Level - Previous_Level AS Improvement
FROM Trend
ORDER BY Month;
```

| | Month | Nutrient | Level | Previous_Level | Improvement |
|---|---|---|---|---|---|
| 1 | 0 | Potassium | 2.3 | NULL | NULL |
| 2 | 0 | Vitamin D | 18 | NULL | NULL |
| 3 | 1 | Vitamin D | 25 | 18 | 7 |
| 4 | 1 | Potassium | 3.5 | 2.3 | 1.2 |
| 5 | 2 | Potassium | 4.5 | 3.5 | 1 |
| 6 | 2 | Vitamin D | 40 | 25 | 15 |
| 7 | 3 | Vitamin D | 40 | 40 | 0 |
| 8 | 3 | Potassium | 4.5 | 4.5 | 0 |

Query executed successfully. | . \SQLEXPRESS (16.0 RTM) | LAPTOP-LMLO3JT3\44758 ... | FHANT | 00:00:00 | 8 rows

# Appendix-E

## SQL Analysis: Graph Table



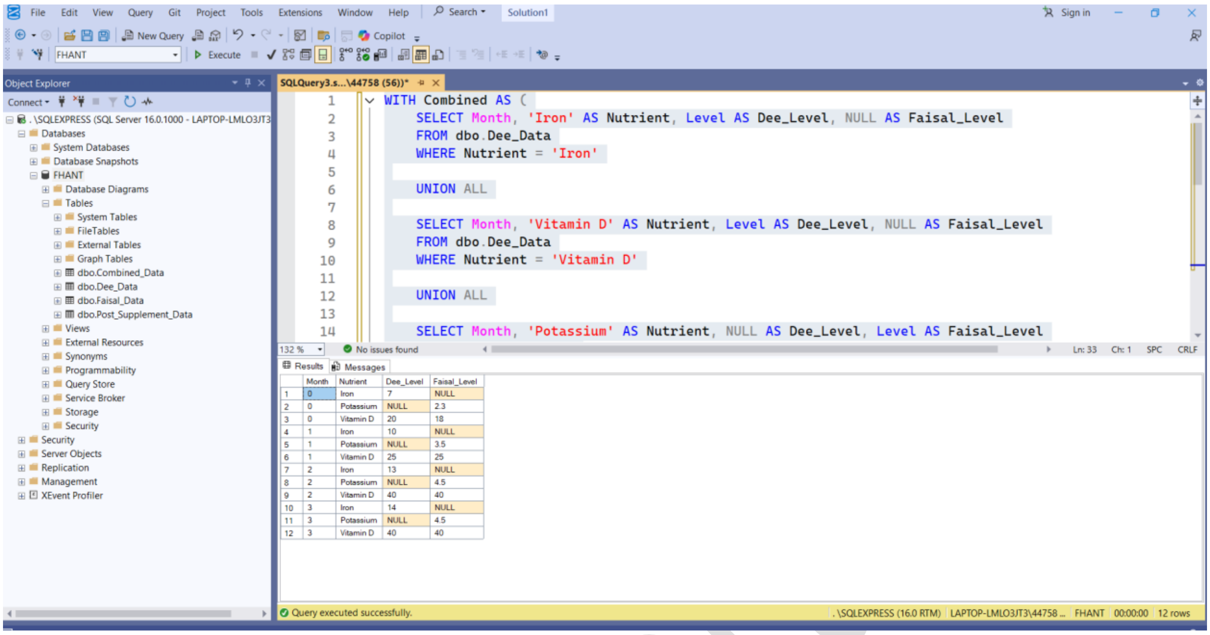
```sql
-- Combine all data for plotting
SELECT Month, Nutrient, Level, 'Dee' AS Person
FROM dbo.Dee_Data
UNION ALL
SELECT Month, Nutrient, Level, 'Faisal' AS Person
FROM dbo.Faisal_Data
UNION ALL
SELECT Month, Nutrient, Level, Person
FROM dbo.Post_Supplement_Data
ORDER BY Nutrient, Person, Month;
```

| | Month | Nutrient | Level | Person |
|---|---|---|---|---|
| 5 | 3 | Iron | 16 | Dee |
| 6 | 0 | Potassium | 2.3 | Faisal |
| 7 | 1 | Potassium | 3.5 | Faisal |
| 8 | 2 | Potassium | 4.5 | Faisal |
| 9 | 3 | Potassium | 4.5 | Faisal |
| 10 | 3 | Potassium | 4.6 | Faisal |
| 11 | 0 | Vitamin D | 20 | Dee |
| 12 | 1 | Vitamin D | 25 | Dee |
| 13 | 2 | Vitamin D | 40 | Dee |
| 14 | 3 | Vitamin D | 40 | Dee |
| 15 | 3 | Vitamin D | 42 | Dee |
| 16 | 0 | Vitamin D | 18 | Faisal |
| 17 | 1 | Vitamin D | 25 | Faisal |
| 18 | 2 | Vitamin D | 40 | Faisal |
| 19 | 3 | Vitamin D | 40 | Faisal |
| 20 | 3 | Vitamin D | 42 | Faisal |

Query executed successfully. . \SQLEXPRESS (16.0 RTM) LAPTOP-LMLO3JT3\44758 ... FHANT 00:00:00 20 rows

## Appendix-F

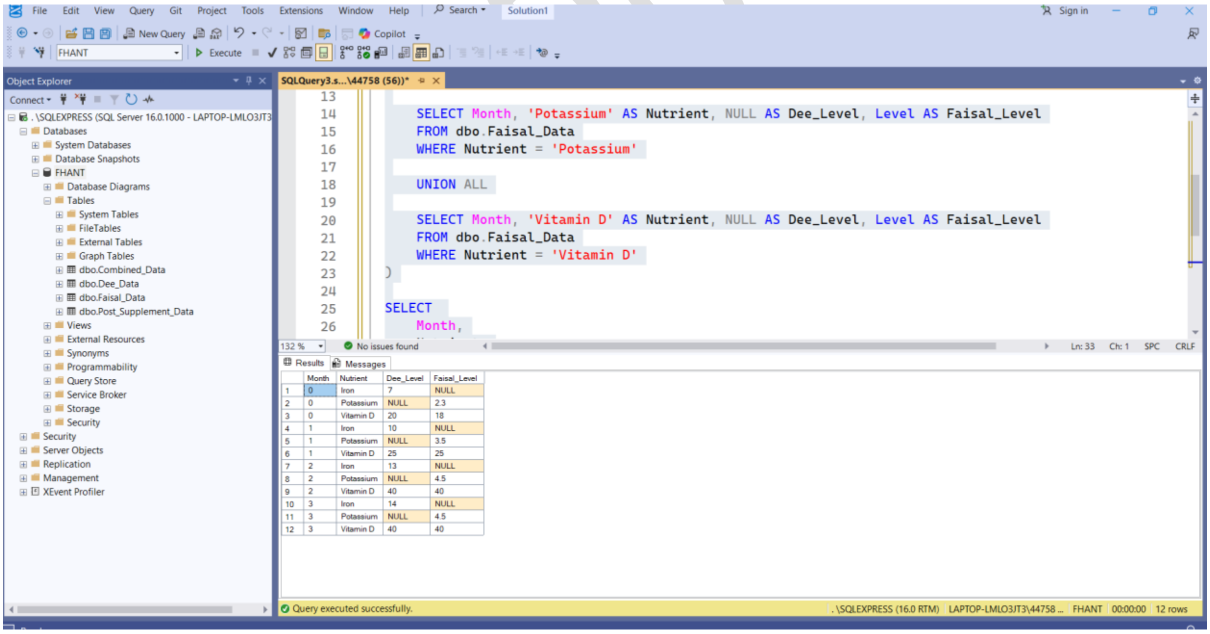
**SQL Analysis:** The combined UNION + CTE table provided an integrated view of both individuals' nutrient progression, allowing correlations to be observed across nutrients.



```sql
WITH Combined AS (
    SELECT Month, 'Iron' AS Nutrient, Level AS Dee_Level, NULL AS Faisal_Level
    FROM dbo.Dee_Data
    WHERE Nutrient = 'Iron'

    UNION ALL

    SELECT Month, 'Vitamin D' AS Nutrient, Level AS Dee_Level, NULL AS Faisal_Level
    FROM dbo.Dee_Data
    WHERE Nutrient = 'Vitamin D'

    UNION ALL

    SELECT Month, 'Potassium' AS Nutrient, NULL AS Dee_Level, Level AS Faisal_Level
```

|  | Month | Nutrient | Dee_Level | Faisal_Level |
|---|---|---|---|---|
| 1 | 0 | Iron | 7 | NULL |
| 2 | 0 | Potassium | NULL | 2.3 |
| 3 | 0 | Vitamin D | 20 | 18 |
| 4 | 1 | Iron | 10 | NULL |
| 5 | 1 | Potassium | NULL | 3.5 |
| 6 | 1 | Vitamin D | 25 | 25 |
| 7 | 2 | Iron | 13 | NULL |
| 8 | 2 | Potassium | NULL | 4.5 |
| 9 | 2 | Vitamin D | 40 | 40 |
| 10 | 3 | Iron | 14 | NULL |
| 11 | 3 | Potassium | NULL | 4.5 |
| 12 | 3 | Vitamin D | 40 | 40 |

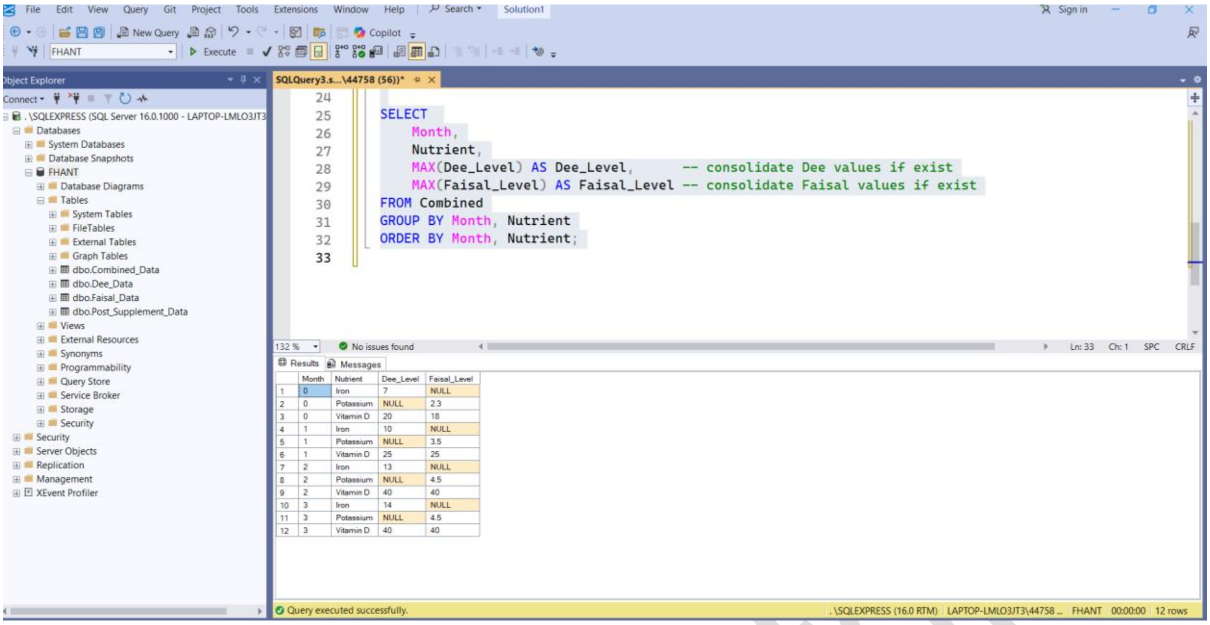
Query executed successfully. .\SQLEXPRESS (16.0 RTM) LAPTOP-LMLO3JT3\44758 ... FHANT 00:00:00 12 rows



```sql

    SELECT Month, 'Potassium' AS Nutrient, NULL AS Dee_Level, Level AS Faisal_Level
    FROM dbo.Faisal_Data
    WHERE Nutrient = 'Potassium'

    UNION ALL

    SELECT Month, 'Vitamin D' AS Nutrient, NULL AS Dee_Level, Level AS Faisal_Level
    FROM dbo.Faisal_Data
    WHERE Nutrient = 'Vitamin D'
)

SELECT
    Month,
```

|  | Month | Nutrient | Dee_Level | Faisal_Level |
|---|---|---|---|---|
| 1 | 0 | Iron | 7 | NULL |
| 2 | 0 | Potassium | NULL | 2.3 |
| 3 | 0 | Vitamin D | 20 | 18 |
| 4 | 1 | Iron | 10 | NULL |
| 5 | 1 | Potassium | NULL | 3.5 |
| 6 | 1 | Vitamin D | 25 | 25 |
| 7 | 2 | Iron | 13 | NULL |
| 8 | 2 | Potassium | NULL | 4.5 |
| 9 | 2 | Vitamin D | 40 | 40 |
| 10 | 3 | Iron | 14 | NULL |
| 11 | 3 | Potassium | NULL | 4.5 |
| 12 | 3 | Vitamin D | 40 | 40 |

Query executed successfully. .\SQLEXPRESS (16.0 RTM) LAPTOP-LMLO3JT3\44758 ... FHANT 00:00:00 12 rows



```sql
SELECT
    Month,
    Nutrient,
    MAX(Dee_Level) AS Dee_Level,       -- consolidate Dee values if exist
    MAX(Faisal_Level) AS Faisal_Level -- consolidate Faisal values if exist
FROM Combined
GROUP BY Month, Nutrient
ORDER BY Month, Nutrient;
```

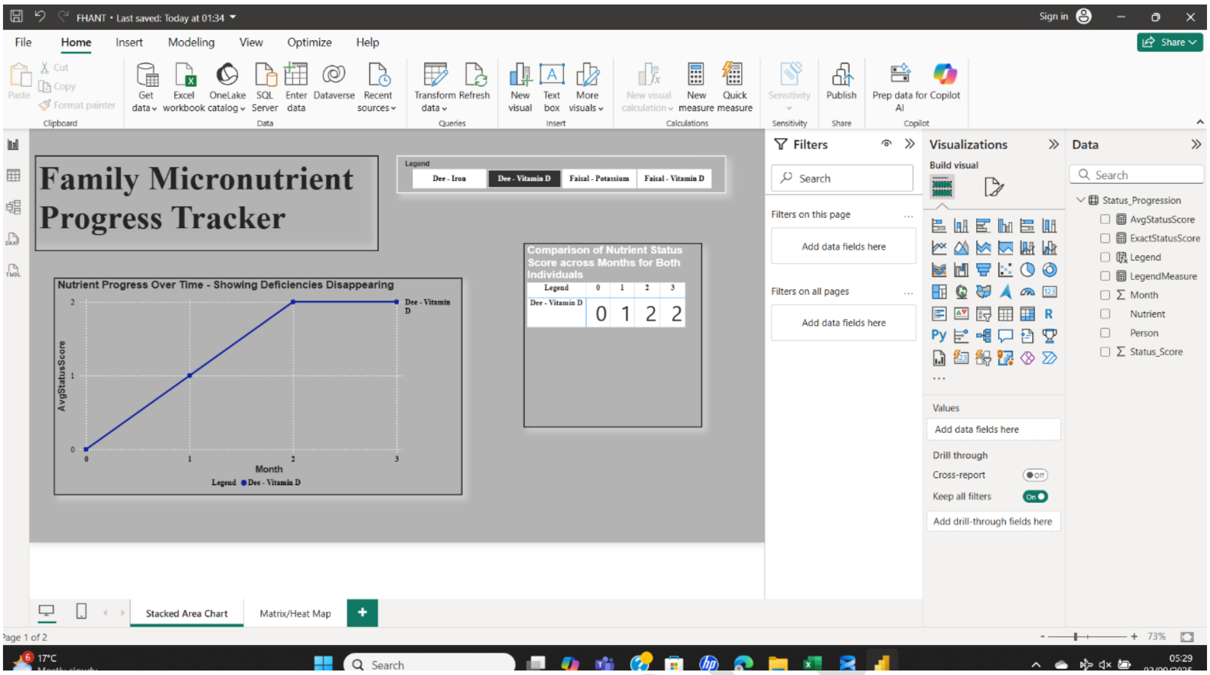
No issues found

| | Month | Nutrient | Dee_Level | Faisal_Level |
|---|---|---|---|---|
| 1 | 0 | Iron | 7 | NULL |
| 2 | 0 | Potassium | NULL | 2.3 |
| 3 | 0 | Vitamin D | 20 | 18 |
| 4 | 1 | Iron | 10 | NULL |
| 5 | 1 | Potassium | NULL | 3.5 |
| 6 | 1 | Vitamin D | 25 | 25 |
| 7 | 2 | Iron | 13 | NULL |
| 8 | 2 | Potassium | NULL | 4.5 |
| 9 | 2 | Vitamin D | 40 | 40 |
| 10 | 3 | Iron | 14 | NULL |
| 11 | 3 | Potassium | NULL | 4.5 |
| 12 | 3 | Vitamin D | 40 | 40 |

Query executed successfully.

## Appendix-G

## Power BI Dashboard: Showing the Trends



Family Micronutrient Progress Tracker

Comparison of Nutrient Status Score across Months for Both Individuals

| Legend | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| Dee - Vitamin D | 0 | 1 | 2 | 2 |