Enhancing Operational Efficiency and Customer Satisfaction: A Data-Driven Approach for MS Medical Store

A Final-Term Report for the BDM Capstone Project

Submitted by

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Declaration Statement

I am working on a Project titled “Enhancing Operational Efficiency and Customer Satisfaction: A Data-Driven Approach for MS Medical Store”. I extend my appreciation to **MS Medical Store**, for providing the necessary resources that enabled me to conduct my project.

I hereby assert that the data presented and assessed in this project report is genuine and precise to the utmost extent of my knowledge and capabilities. The data has been gathered from primary sources and carefully analyzed to ensure its reliability.

Additionally, I affirm that all procedures employed for the purpose of data collection and analysis have been duly explained in this report or upcoming reports. The outcomes and inferences derived from the data are an accurate depiction of the findings acquired through thorough analytical procedures.

I am dedicated to adhering to the principles of academic honesty and integrity, and I am receptive to any additional examination or validation of the data contained in this project report.

I understand that the execution of this project is intended for individual completion and is not to be undertaken collectively. I thus affirm that I am not engaged in any form of collaboration with other individuals and that all the work undertaken has been solely conducted by me. In the event that plagiarism is detected in the report at any stage of the project's completion, I am fully aware and prepared to accept disciplinary measures imposed by the relevant authority.

I understand that all recommendations made in this project report are within the context of the academic project taken up towards course fulfilment in the BS Degree Program offered by IIT Madras. The institution does not endorse any of the claims or comments.

Signature of Candidate:

Name: Aryan Bhardwaj

Date: 13/11/2024

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1 Executive Summary

MS Medical Store, founded around **15 years ago** by **Mr. Prashant Sharma (Sonu Sharma)** near **Nirphad Eye Hospital** in **Mathura, Uttar Pradesh**, specializes in eye-care products, including lubricating drops, antibiotic eye drops, anti-inflammatory gels, and ointments. Known for high-quality products and personalized service, the store operates with minimal staff, consisting of **only one employee** aside from the owner. Despite its reputation, the store faces significant operational challenges related to **inventory management, peak-hour service efficiency,** and **revenue optimization**. These issues include overstocking, understocking, prolonged wait times during peak hours, and limited marketing for high-margin items.

This report examines these challenges by analyzing **4,500 sales transactions** recorded from **April 1, 2024, to August 5, 2024**, covering **169 unique products**. Data preprocessing involved **cleaning to remove inconsistencies, handling missing values,** and **standardizing product names**. Sales trends were then analyzed using **Python (Pandas, NumPy)** and **Excel** to provide actionable insights for optimizing operations. Key analyses included **Hourly Sales Analysis, Revenue Share Analysis, Profit Margin Analysis,** and **Market Basket Analysis**, each yielding insights critical to improving the store's **financial performance** and **customer service**.

The **Hourly Sales Analysis** revealed that the **peak hours are 10 AM to 12 PM**, generating **29.82% of total daily revenue**, closely aligned with the nearby hospital's consultation hours. Another period of steady revenue occurs between **2 PM and 5 PM**, capturing an additional **18.5% of sales**. Staffing adjustments based on this data could reduce wait times and improve customer service. With an estimated hourly revenue of **₹95,000** during peak hours, a part-time assistant could be hired at a modest rate of **₹200–₹300 per hour**, enhancing customer satisfaction at a low operational cost.

The **Revenue Share Analysis** and **Profit Margin Analysis** revealed that high-demand products in the "**DROP**" category, such as "**RHOOS DROP, MIXEE LP,** and **RHOOS GEL**," contribute nearly **40%** of the store's total revenue. A **Pareto analysis** confirmed that **20%** of the products account for **84%** of revenue, emphasizing the importance of consistently stocking top-performing items. Further, items in the "**OINTMENT**" category yielded the highest profit margins **(24.36%)**, while **o**ptimal discounts of around **3%** were shown to maximize both revenue and profit. These findings allow the store to prioritize stocking high-demand, high-margin items and strategically set discounts to drive sales without reducing profitability.

Market Basket Analysis identified strong product pairings, such as "**OLOCET KT**" and "**RHOOS DROP**," which have a **lift of 1.99** and **confidence of 68.4%**, indicating frequent co-purchases in **5.6%** of transactions. Additionally, "**RHOOS DROP**" and "**MIXEE LP**" have a **lift of 1.51** with **9.6% support and 28.1% confidence**, suggesting a profitable bundling opportunity. Cross-category associations, like those between **capsules and drops**, also reveal opportunities for targeted promotions to enhance sales of complementary products.

Recommendations based on these findings include **prioritizing inventory** for **high-revenue items** like "**RHOOS DROP**" and "**MIXEE LP**" to prevent stockouts and **implementing predictive restocking** for high-demand categories such as **drops** and **capsules**. To further **optimize customer service**, a **part-time assistant during peak**

hours could greatly **reduce wait times at minimal cost**. **Marketing strategies** should also leverage findings from the discount analysis by **focusing on 2-4% discounts during promotions** and **special offers** for popular items. Additionally, **offering incentives**, such as **free eye checkups** with purchases over a specified amount, could **increase customer engagement** and strengthen the store's **market presence**.

Overall, the insights and recommendations from these analyses provide **MS Medical Store** with a **roadmap to improve inventory efficiency, enhance customer satisfaction,** and **drive profitability** through **targeted marketing strategies** and **optimized operational decisions**.

2 Detailed Explanation of Analysis Process/Method

➢ Data Collection and Preprocessing Overview

The dataset for this project was collected directly from **Marg ERP** software, which the **MS Medical Store** uses for managing sales, inventory, and customer transactions. I personally visited the store to retrieve the latest sales data and gain insight into daily operations. The data spans four months of sales transactions, from **April 1, 2024, to August 5, 2024**, covering the financial year **2024-2025**. This period represents the most recent data available, as previous years' records are locked and securely stored, making them inaccessible for this analysis.

In total, the dataset consists of approximately **4,500** invoices and **169** unique products. Each invoice includes details on items sold, item type, applied discounts, and other financial specifics. Because my analysis involved evaluating peak-hour service efficiency, I required timestamps for each bill. However, the standard invoice export in Marg ERP doesn't provide timestamps. To obtain this crucial data, I emailed the store owner, who provided the timestamp and cost price data extracted through a different option in the software.

The data that I collected was formatted similarly to a sales statement, with each invoice listing multiple item entries. For instance:

	SALES STATEMENT FROM 01-04-2024 TO 05-08-2024									
BILL NO.	PARTY NAME					AMOUNT	DISCOUNT	NET AMT	TAX PAYABLE	DR/CR NET AMOUNT
01-04-2024										
MS000001	CASH					155.00	4.65	150.35	0.00	0.00 150.00
RHOOS GEL	1		23EH18P		1	155.00	4.65	150.35	0.00	155.00
MS000002	CASH					512.50	32.29	480.21	0.00	0.00 480.00
MIXEE LP	DROP	1	D03H018C		1	160.00	10.08	149.92	0.00	160.00
OLOCET KT	DROP	1	D02095		1	140.00	8.82	131.18	0.00	140.00
RHOOS DROP	1		D03G016A		1	130.00	8.19	121.81	0.00	130.00
FEXTRO	120*TAB	1*10	F28117		0:5	82.50	5.20	77.30	0.00	165.00
MS000003	CASH					272.25	2.72	269.53	0.00	0.00 270.00
PCORT DROP	1		HCLE30032		1	32.25	0.32	31.93	0.00	32.25
LUBETEARS	DROP	1	BE240-28		1	120.00	1.20	118.80	0.00	120.00
MIXEE KT	DROP	1	DO3H020B		1	120.00	1.20	118.80	0.00	120.00
MS000004	CASH					155.00	4.65	150.35	0.00	0.00 150.00
RHOOS GEL	1		23EH18P		1	155.00	4.65	150.35	0.00	155.00
MS000005	CASH					130.00	10.40	119.60	0.00	0.00 120.00
RHOOS DROP	1		D03G016A		1	130.00	10.40	119.60	0.00	130.00

Fig 2.1 Data before cleaning

Each invoice included the **bill number, date, and details** for each item sold, such as **selling price, discount applied, net amount and** one column that contains the **item code, quantity sold** and **package type**.

I used **Python** and **Excel** for preprocessing and feature extraction to build a usable dataset.

I began by isolating each bill number along with its associated date. Next, I focused on capturing item-specific details, such as selling price, discount, and relevant financial amounts. This step involved processing and storing each item's sale details from every transaction.

Since item details were recorded under the "Party Name" column, I used Excel's **split-into-columns** feature to isolate these specific features, including **item code, quantity**, and **package type** for each entry. This is what the dataset looks like after feature extraction and preprocessing:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Date	Bill Number	Party Name	Item Name	Item Type	Item Package	Item Code	Quantity	Unit Cost	Unit Price	Total MRP	Discount	Net Amount	Timestamp
2	01-04-2024	MS000001	CASH	RHOOS GEL	GEL	1	23EH18P	1.00	122.53	155.00	155.00	4.65	150.35	2024-04-01 09:03:43
3	01-04-2024	MS000002	CASH	MIXEE LP	DROP	1	D02045	1.00	126.74	160.00	160.00	10.08	149.92	2024-04-01 10:46:58
4	01-04-2024	MS000002	CASH	OLOCET KT	DROP	1	D02095	1.00	103.74	140.00	140.00	8.82	131.18	2024-04-01 10:46:58
5	01-04-2024	MS000002	CASH	RHOOS DROP	DROP	1	D03G016A	1.00	95.09	130.00	130.00	8.19	121.81	2024-04-01 10:46:58
6	01-04-2024	MS000002	CASH	FEXTRO	TAB	1*10	F28117	5.00	12.92	16.50	82.50	5.20	77.30	2024-04-01 10:46:58
7	01-04-2024	MS000003	CASH	PCORT DROP	DROP	1	HCLE30032	1.00	25.22	32.25	32.25	0.32	31.93	2024-04-01 11:11:51
8	01-04-2024	MS000003	CASH	LUBETEARS	DROP	1	BE240-28	1.00	84.41	120.00	120.00	1.20	118.80	2024-04-01 11:11:51
9	01-04-2024	MS000003	CASH	MIXEE KT	DROP	1	D03H020B	1.00	84.47	120.00	120.00	1.20	118.80	2024-04-01 11:11:51
10	01-04-2024	MS000004	CASH	RHOOS GEL	GEL	1	23EH18P	1.00	122.53	155.00	155.00	4.65	150.35	2024-04-01 11:21:00
11	01-04-2024	MS000005	CASH	RHOOS DROP	DROP	1	D03G016A	1.00	95.09	130.00	130.00	10.40	119.60	2024-04-01 11:31:08
12	01-04-2024	MS000006	CASH	RHOOS GEL	GEL	1	23EH18P	1.00	122.53	155.00	155.00	4.65	150.35	2024-04-01 11:36:57
13	01-04-2024	MS000007	CASH	MIXEE DROP	DROP	1	D02092	1.00	62.23	85.00	85.00	2.13	82.87	2024-04-01 11:47:20
14	01-04-2024	MS000007	CASH	RHOOS DROP	DROP	1	D03G016A	1.00	95.09	130.00	130.00	3.25	126.75	2024-04-01 11:47:20
15	01-04-2024	MS000008	CASH	PCORT DROP	DROP	1	HCLE30032	1.00	25.22	32.25	32.25	1.35	30.90	2024-04-01 12:07:07
16	01-04-2024	MS000008	CASH	LUBETEARS	DROP	1	BE240-28	1.00	84.41	120.00	120.00	5.04	114.96	2024-04-01 12:07:07
17	01-04-2024	MS000008	CASH	MOXSEF-KT	DROP	1	BE2312-85	1.00	92.01	130.00	130.00	5.46	124.54	2024-04-01 12:07:07
18	01-04-2024	MS000009	CASH	RHOOS GEL	GEL	1	23EH18P	1.00	122.53	155.00	155.00	4.65	150.35	2024-04-01 12:12:34
19	01-04-2024	MS000010	CASH	RHOOS DROP	DROP	1	D03G016A	1.00	95.09	130.00	130.00	9.10	120.90	2024-04-01 12:25:39
20	01-04-2024	MS000010	CASH	CHLOROZOX H	TAB	1	S138	1.00	71.71	100.00	100.00	7.00	93.00	2024-04-01 12:25:39
21	01-04-2024	MS000010	CASH	LCX 5MG TAB	TAB	1*10	TG23-03431	10.00	3.50	5.00	50.00	3.50	46.50	2024-04-01 12:25:39
22	01-04-2024	MS000011	CASH	RHOOS DROP	DROP	1	D03G016A	1.00	95.09	130.00	130.00	5.20	124.80	2024-04-01 12:36:41
23	01-04-2024	MS000011	CASH	MIXEE KT	DROP	1	D03H020B	1.00	84.47	120.00	120.00	4.80	115.20	2024-04-01 12:36:41

Fig 2.2 Data after cleaning

Dataset: Click Here

➢ Analysis Methods

A. Revenue and Profit Contribution Analysis

In this part of the analysis, I wanted to understand which items and categories drive the store's revenue and profit. This helps to shape inventory, promotion, and stocking strategies. I started by examining each item's contributions, moving on to analyse broader categories. Through these stages, I was able to identify items that generate high revenue and profits.

Top Revenue-Generating Items by Type

To begin, I calculated the Revenue and Profit for each item. This allowed me to see which individual items stand out in terms of profitability and revenue generation.

Revenue for each item was calculated by summing the Net Amount for each item, using the formula:

$$\textbf{Revenue} = \sum(\textbf{Net Amount})$$

Grouping by **Item Type** and **Item Name** ensures we can attribute the total revenue to each item type.

I sort the results to highlight the highest contributors and select the top 5 items within each type. This enables me to focus on key revenue drivers within each category.

```
top_items_by_type = df.groupby(['Item Type', 'Item Name'])['Net
Amount'].sum().sort_values(ascending=False).reset_index()

top_items_by_type = top_items_by_type.groupby('Item Type').head(5)
```

Fig 2.A.1 Python Script for *Top Revenue-Generating Items by Type*

A **Bar Plot** was plotted, having the **Net Amount** on the x-axis and **Item Name** on the y-axis, with different colours representing different **Item Types**, visually distinguishing the top revenue items.

Revenue and Profit Contribution per Item (Parato Analysis)

Calculating revenue and profit contributions of individual items helps evaluate each item's impact on the store's total revenue and profit. This insight aids in identifying items that not only sell well but also provide a significant profit margin, which is critical for prioritizing products that maximize financial returns.

Profit is calculated by subtracting the total cost (calculated as **Quantity** × **Unit Cost**) from the **Net Amount**, providing a clear picture of each item's profitability.

$$\textbf{Profit} = \textbf{Net Amount} - (\textbf{Quantity} \times \textbf{Unit Cost})$$

```
df['Revenue'] = df['Net Amount']
df['Profit'] = df['Net Amount'] - (df['Quantity'] * df['Unit Cost'])
total_revenue = item_revenue_profit['Total_Revenue'].sum()
total_profit = item_revenue_profit['Total_Profit'].sum()
item_revenue_profit['Revenue_Percent'] = (item_revenue_profit['Total_Revenue'] / total_revenue) * 100
item_revenue_profit['Profit_Percent'] = (item_revenue_profit['Total_Profit'] / total_profit) * 100
```

Fig 2.A.2 Python Script for *Revenue and Profit Contribution per Item (Parato Analysis)*

A **Bar chart** showing **Revenue_Percent** and **Profit_Percent** for the top 20 % items provides a straightforward view of which items contribute most significantly. and a Cumulative Percentage Line Plot determining if the **Pareto Principle** applies, revealing whether a small percentage of items generate the majority of revenue and profit. This aids in focusing attention on these top-performing items.

Category-Level Revenue and Profit Contribution Analysis

Analyzing revenue and profit at the category level allows for a macro view of the store's income sources. Understanding which item types generate the most revenue and profit helps with higher-level inventory and sales strategies, ensuring resources are focused on categories with the greatest financial impact.

These Revenue and Profit calculations are similar to those for individual items but are aggregated by **Item Type** to capture revenue and profit at the category level.

```
category_revenue_profit = category_revenue_profit.sort_values(by='Revenue_Percent',
ascending=False).reset_index(drop=True)
```

Fig 2.A.3 Python Script for Category-Level Revenue and Profit Contribution Analysis

A **Twin Bar Chart** was plotted displaying **Revenue Percent** and **Profit Percent** out of total revenue and total profit side-by-side for each category enabling easy comparison. This visualization highlights categories that excel in both revenue and profit, guiding inventory and marketing focus. And a **Stacked Bar chart** displaying Revenue amount and Profit amount.

Profit Percentage Analysis by Item and Category

Analyzing profit percentages by item and category helps pinpoint products with the highest profitability. Items with high-profit percentages are critical for maximizing store profit, even if their revenue contribution is lower.

$$\text{Profit Percent} = (\text{Total Profit} / \text{Total Revenue}) \times 100$$

This formula provides a clear profit margin percentage, showing how much profit each rupee of revenue generates. High-profit items or categories can be prioritized for promotions and marketing efforts to enhance overall profitability.

```python
# Calculate Revenue and Profit per item
df['Revenue'] = df['Net Amount']
df['Profit'] = df['Net Amount'] - (df['Quantity'] * df['Unit Cost'])

# Aggregate profit by item and calculate profit percentage
item_profit_percent = df.groupby('Item Name').agg(
    Total_Profit=('Profit', 'sum'),
    Total_Revenue=('Revenue', 'sum')
).reset_index()
item_profit_percent['Profit_Percent'] = (item_profit_percent['Total_Profit'] /
item_profit_percent['Total_Revenue']) * 100

# Aggregate profit by category and calculate profit percentage
category_profit_percent = df.groupby('Item Type').agg(
    Total_Profit=('Profit', 'sum'),
    Total_Revenue=('Revenue', 'sum')
).reset_index()
category_profit_percent['Profit_Percent'] = (category_profit_percent['Total_Profit'] /
category_profit_percent['Total_Revenue']) * 100
```

Fig 2.A.4 Python Script for Profit Percentage Analysis by Item and Category

A **Bar chart** displaying **Profit_Percent** for top items and categories highlights which products provide the most significant profit margins

Discount Impact Analysis on Profit and Revenue

This analysis examines how varying discount levels affect both revenue and profit. Understanding the impact of discounts helps the store set optimal discount levels, balancing increased sales with sustainable profitability.

$$\textbf{Discount\%} = (\textbf{Discount} / \textbf{Total MRP}) \times 100$$

```python
df['Discount_Percent'] = (df['Discount'] / df['Total MRP']) * 100

discount_analysis = df.groupby(df['Discount_Percent'].round()).agg(
    Total_Revenue=('Revenue', 'sum'),
    Total_Profit=('Profit', 'sum'),
    Average_Quantity=('Quantity', 'mean')
).reset_index()

total_revenue = discount_analysis['Total_Revenue'].sum()
total_profit = discount_analysis['Total_Profit'].sum()
discount_analysis['Revenue_Percent'] = (discount_analysis['Total_Revenue'] / total_revenue) * 100
discount_analysis['Profit_Percent'] = (discount_analysis['Total_Profit'] / total_profit) * 100
```

Fig 2.A.5 Python Script for Discount Impact Analysis on Profit and Revenue

A **Scatter plot** was plotted showing the relationship between discount percentage and profit illustrating how varying discounts impact profit margins with a **Bar chart** displaying **Revenue Percent** and **Profit Percent** by discount range allows one to see the effect of discounts across various discount brackets

B. Time-Based Sales Analysis

This analysis investigates the revenue and profit contributions at different times of the day and across days of the week. By understanding hourly and daily sales patterns, the store can identify peak business hours, optimize staffing, and enhance inventory management based on demand patterns.

Hourly Revenue and Profit Analysis by Item Type

The data is grouped by the hour and item type to calculate total revenue contributions for each hour. This allows for a detailed examination of hourly trends in sales performance across different product categories.

```python
df['Timestamp'] = pd.to_datetime(df['Timestamp'])
df['Hour'] = df['Timestamp'].dt.hour

# Calculate Revenue and Profit for each hour
df['Revenue'] = df['Net Amount']
df['Profit'] = df['Net Amount'] - (df['Quantity'] * df['Unit Cost'])

# Aggregate by hour
hourly_revenue_profit = df.groupby('Hour').agg(
    Total_Revenue=('Revenue', 'sum'),
    Total_Profit=('Profit', 'sum')
).reset_index()
```

Fig 2.B.1 Python Script for Hourly Revenue and Profit Analysis by Item Type

Stacked bar chart and **Line chart** were plotted to highlights revenue and profit contributions for each hour, showing the total earnings and profit margins during the day along with the concentration of revenue and profit by hour for each item type, helping identify which product categories perform well at different times.

Day-wise Analysis

By extracting the day of the week and grouping the data by day and item type, we gain insights into daily revenue, profit and Quantity contributions. This helps the store identify high-demand days for each item type and adjust marketing or inventory strategies accordingly.

```python
# Extract day of the week from Date
df['Day of Week'] = df['Date'].dt.day_name()

# Calculate revenue by day for each item type
daily_revenue = df.groupby(['Day of Week', 'Item Type'])['Net Amount'].sum().reset_index()

# Order days of the week for better readability in the plot
days_order = ["Monday", "Tuesday", "Wednesday", "Thursday", "Friday", "Saturday", "Sunday"]
daily_revenue['Day of Week'] = pd.Categorical(daily_revenue['Day of Week'], categories=days_order,
ordered=True)
ue=('Revenue', 'sum'),
    Total_Profit=('Profit', 'sum')
).reset_index()
```

Fig 2.B.2 Python Script for Day-wise Analysis

Bar charts and **Heatmaps** were plotted based on Item Type to gain insights into daily revenue, profit and Quantity contributions

C. Market Basket Analysis

The Market Basket Analysis aims to identify patterns in customer purchasing behavior, helping the store optimize product placement, enhance cross-selling strategies, and increase revenue through strategic item bundling. The analysis uses frequent itemset mining and association rule generation to uncover insights at both the item and category levels. The results will help the store address key issues, including inventory optimization and targeted marketing.

Frequent Itemsets by Item and Category

This analysis determines items or items within the same category that are frequently purchased together, such as commonly bought medicines in the DROP category.

Transactions are grouped by unique **Bill Number** and transformed into a pivot table where each item within the category is encoded as a binary value (1 if purchased, 0 if not).

The Apriori algorithm is then applied to this pivot table with a low support threshold to capture frequently purchased item pairs within the same category.

Frequent itemsets with strong associations in specific categories are identified, focusing on high-occurrence item pairs that could represent essential or complementary items within each category.

A bar chart was plotted displaying the top category pair associations by lift, showing commonly bought categories together to suggest strategic placement or bundling by category.

The Lift, Support and Confidence values were calculated like this:

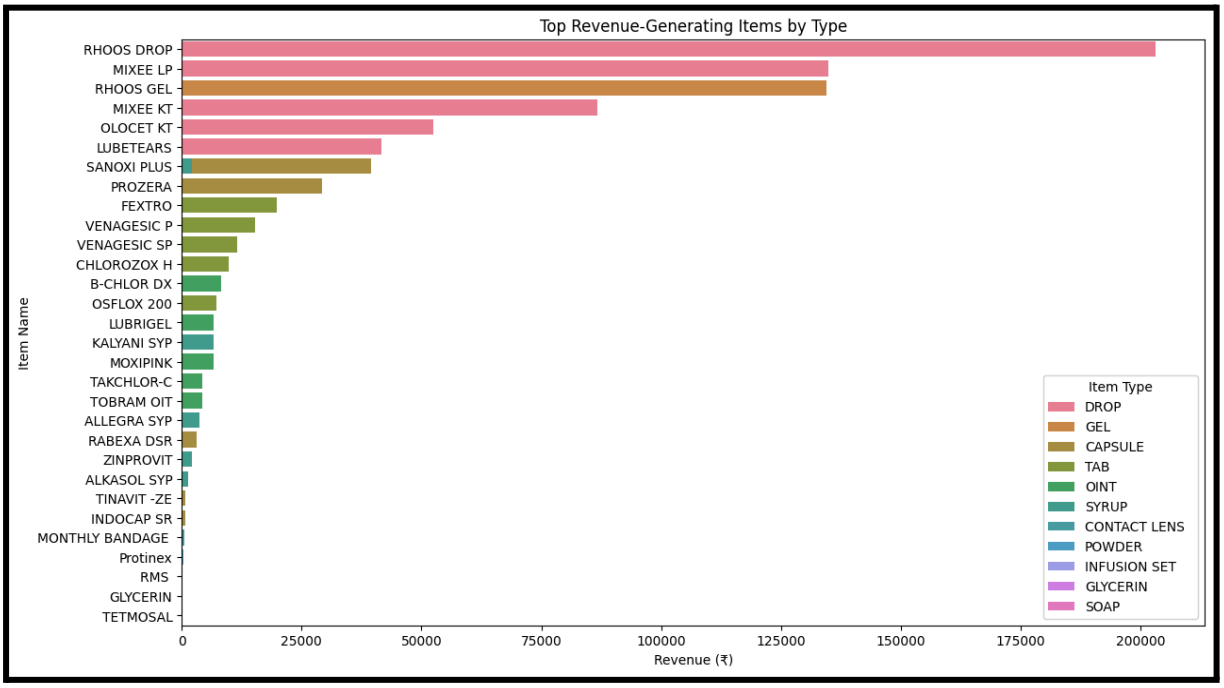
$$\text{Support (Item I)} = \frac{(Total\ Number\ of\ transactions\ with\ Item\ I)}{(Total\ number\ of\ transactions)}$$

$$\text{Confidence (Item } I_1 \rightarrow \text{Item } I_2) = \frac{No.\ of\ transactions\ with\ I_1\ and\ I_2}{No.\ of\ transactions\ with\ I_1}$$

$$\text{Lift (Item } I_1 \rightarrow \text{Item } I_2) = \frac{Confidence(Item\ I_1 \rightarrow I_2)}{Supprt(Item\ I_2)}$$

3 Results and Findings

A. Revenue and Profit Contribution Analysis



The top revenue-generating items in this table are primarily from the **DROP** category, with products like "RHOOS DROP" and "MIXEE LP" generating exceptionally high revenue, exceeding ₹200,000 and ₹130,000, respectively.

Drops make up several of the top items overall in the store's revenue, indicating a strong demand in this category.

Gels are another significant contributor to revenue, with "RHOOS GEL" being the highest earner in this type with ₹134498.19, close to the revenue generated by top-performing drops.

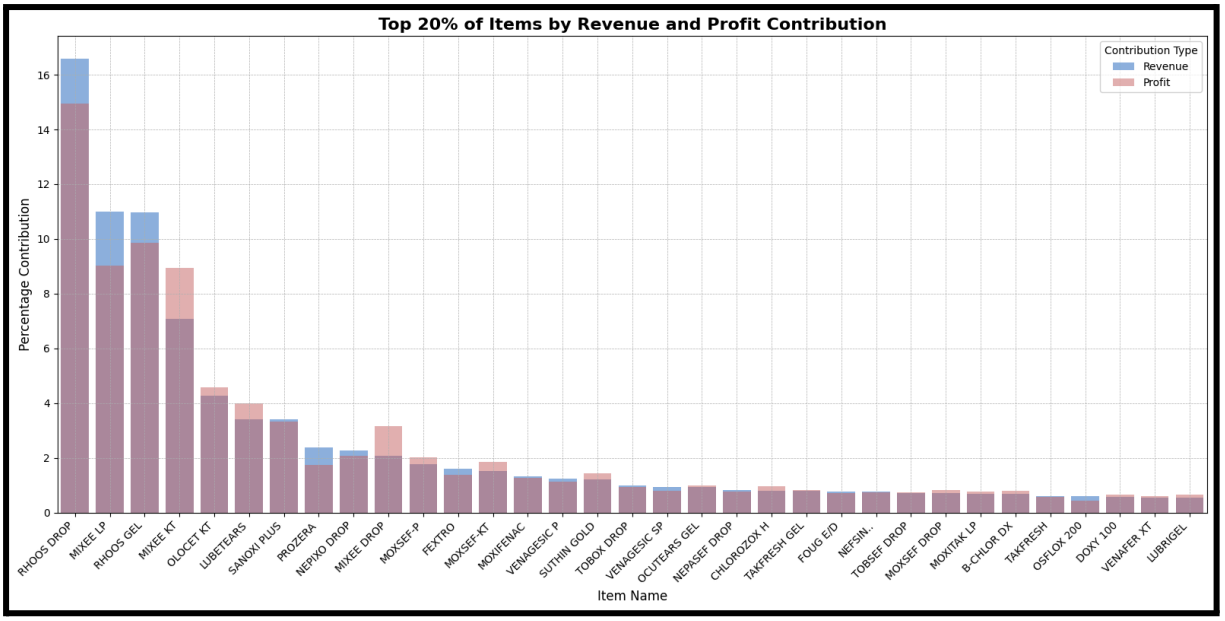
Capsules like "SANOXI PLUS" and "PROZERA" are also notable contributors, with revenues of around ₹39,000 and ₹29,000, respectively. This highlights capsules as another key product type, possibly due to their specific therapeutic uses or commonality in prescriptions.

Tablets and **Ointments** show moderate revenue contributions, with "FEXTRO" leading tablets at about ₹19,800 and "B-CHLOR DX" leading ointments at about ₹8,300. Although they do not reach the high revenue levels of drops or gels, these products still have consistent revenue, indicating stable demand.

For tablets, items like "VENAGESIC P" and "VENAGESIC SP" also appear in the top five, showing a steady but lower revenue stream.

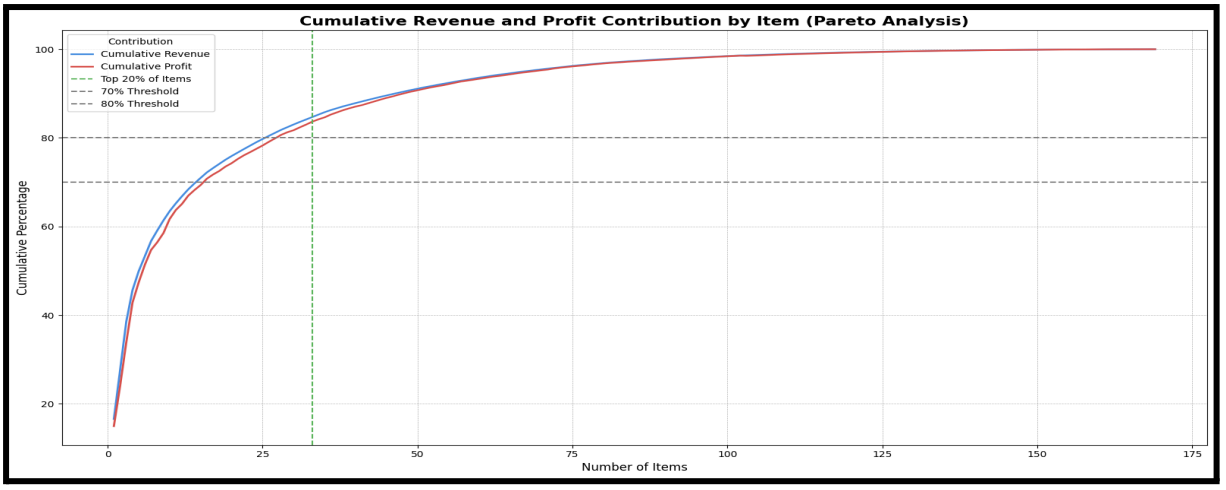
Syrups such as "KALYANI SYP" and "ALLEGRA SYP" contribute less to overall revenue, with amounts ranging from ₹6,700 to ₹2,200. While they have a presence in sales, they are not major revenue drivers.

Powder and **Infusion Set** items show minimal revenue, with "Protinex" at ₹373 and "RMS" at ₹193, suggesting that these items may be lower-demand products or items that generally do not sell at the store.



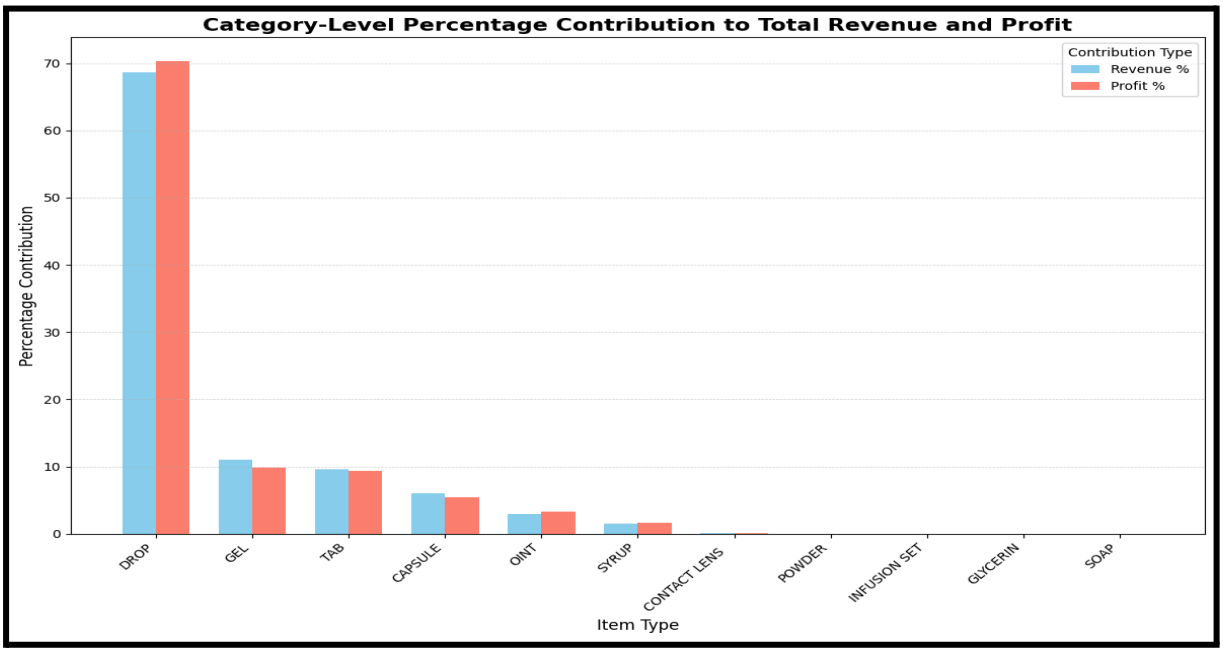
Items like "RHOOS DROP," "MIXEE LP," and "RHOOS GEL" contribute significantly to both revenue and profit, highlighting them as top performers.

This pattern suggests that these items are essential to the store's financial performance and could be prioritized for inventory and marketing.



Approximately 84.7% of total revenue and 83.64% of total profit are generated by the top 20% of items. This aligns with the Pareto principle, where a small percentage of items contribute the most to outcomes.

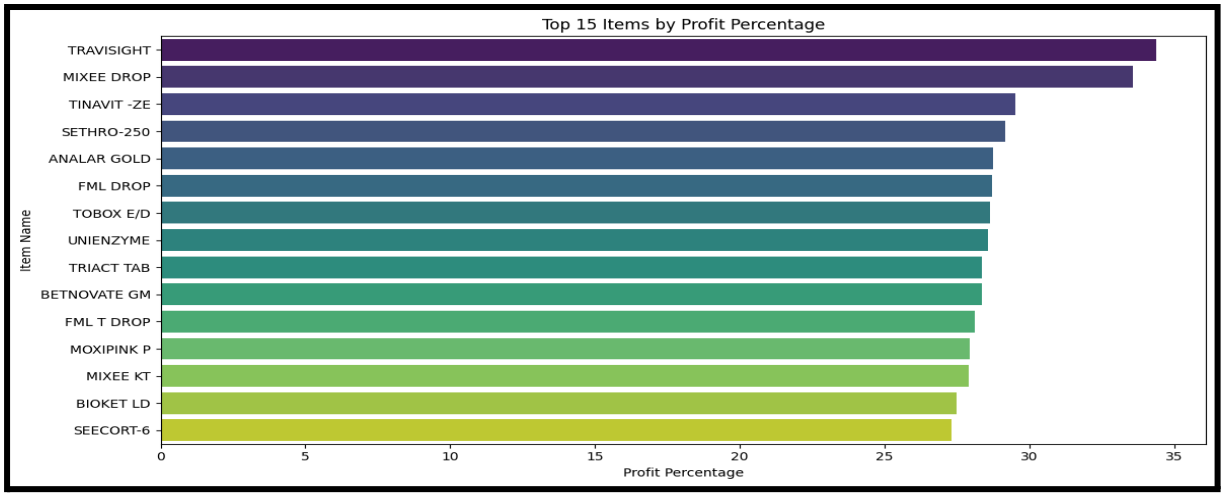
The 70% and 80% thresholds provide benchmarks that may guide strategic decisions. For example, focusing on items that help reach these thresholds could streamline inventory and marketing priorities.



The "DROP" category is the leading contributor to both revenue (68.70%) and profit (70.32%), indicating its critical role in the store's financial performance.

Other categories like "GEL" (10.97% revenue, 9.87% profit) and "TAB" (9.63% revenue, 9.40% profit) also provide significant contributions, making them valuable categories to focus on for sustained revenue and profit.

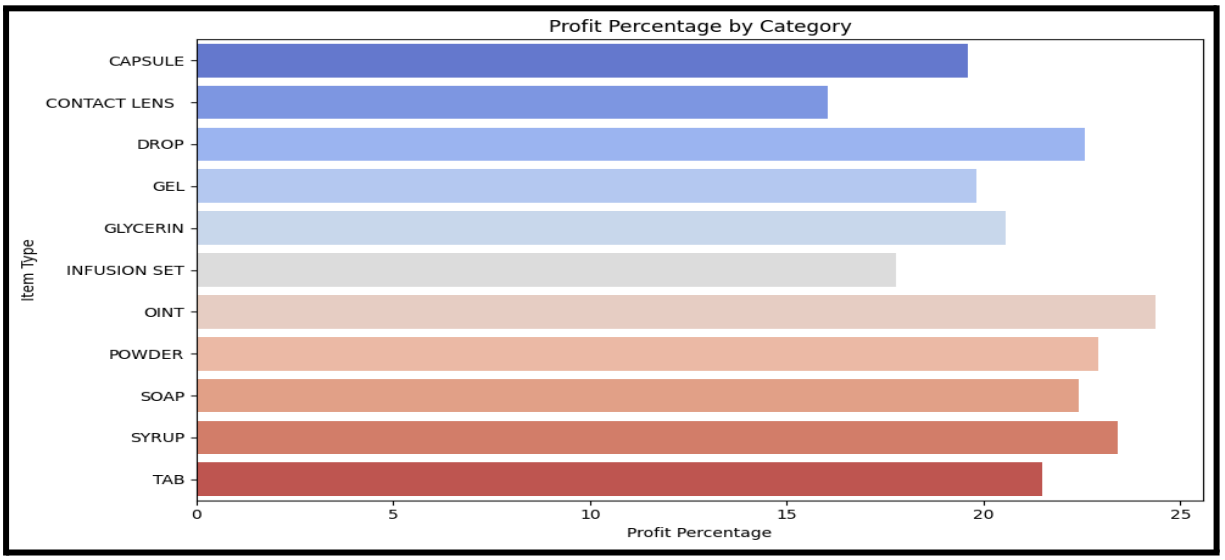
Categories like "CONTACT LENS," "POWDER," and "INFUSION SET" contribute minimally to both revenue and profit.



TRAVISIGHT leads in profit percentage, highlighting its value as a top-margin product for the store.

MIXEE DROP also show high profitability which is also a high-revenue item, indicating strong returns for the store.

The **average item-level profit percentage** is approximately **23.10%.** The profit percentage for these top items ranges from around 30% to 35% while it ranges from 25% to 30% for lower rank categories.

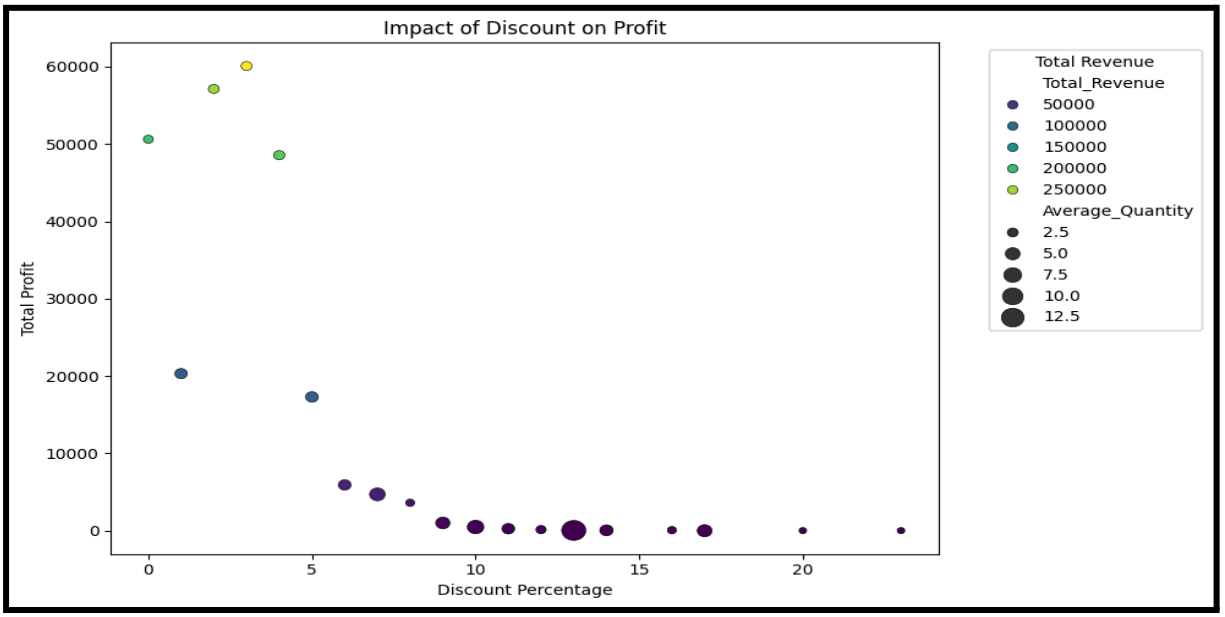


OINTMENTS stands out with the highest average profit percentage of 24.36%, making it the top-performing category in terms of relative profitability.

SYRUP follows closely, with a profit percentage of 23.43%, indicating the strong profitability of liquid medications.

POWDER items, with a profit percentage of 22.93%, round out the top three most profitable categories.

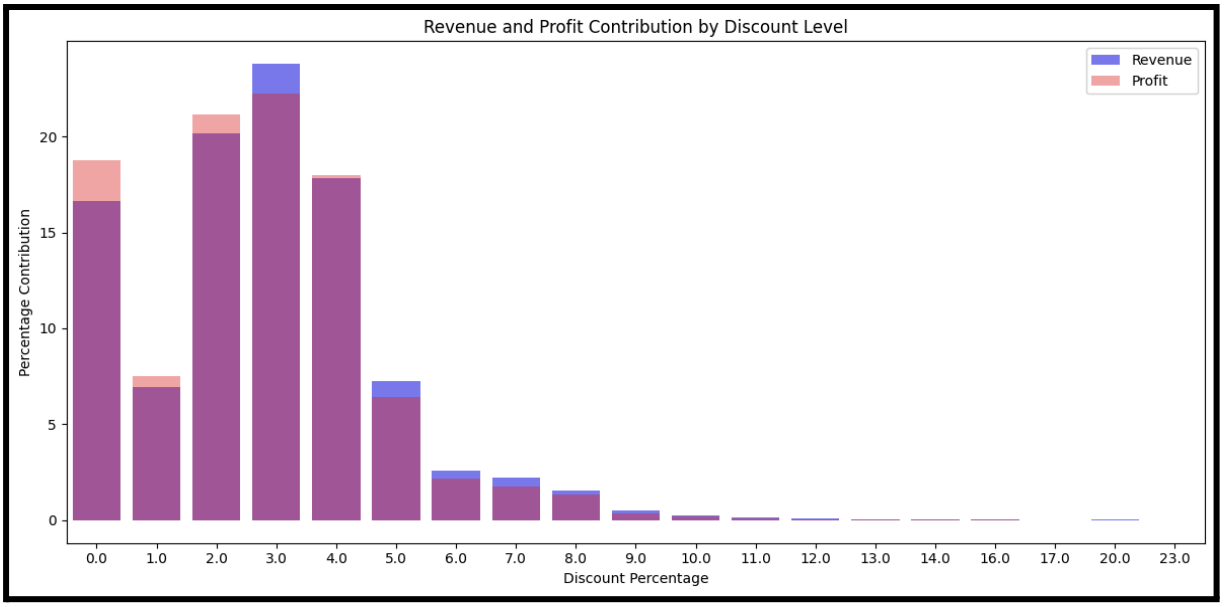
The **average category-level profit percentage** is **21.00%**, highlighting the variability in profit margins across different types of products.



The scatter plot shows a clear trend where higher profits are associated with lower discount percentages, especially between 0% and 5%. Profit values tend to decrease as the discount percentage increases beyond this range, indicating diminishing returns on profitability with deeper discounts.

The size of the markers represents the average quantity sold, with larger markers indicating higher sales volume at lower discount levels (around 0-5%). This suggests that modest discounts still attract considerable customer interest and yield profitable outcomes.

The color gradient, representing total revenue, confirms that revenue also tends to decrease as discounts increase. Higher revenue is concentrated around discount levels of 2%, 3%, and 4%.



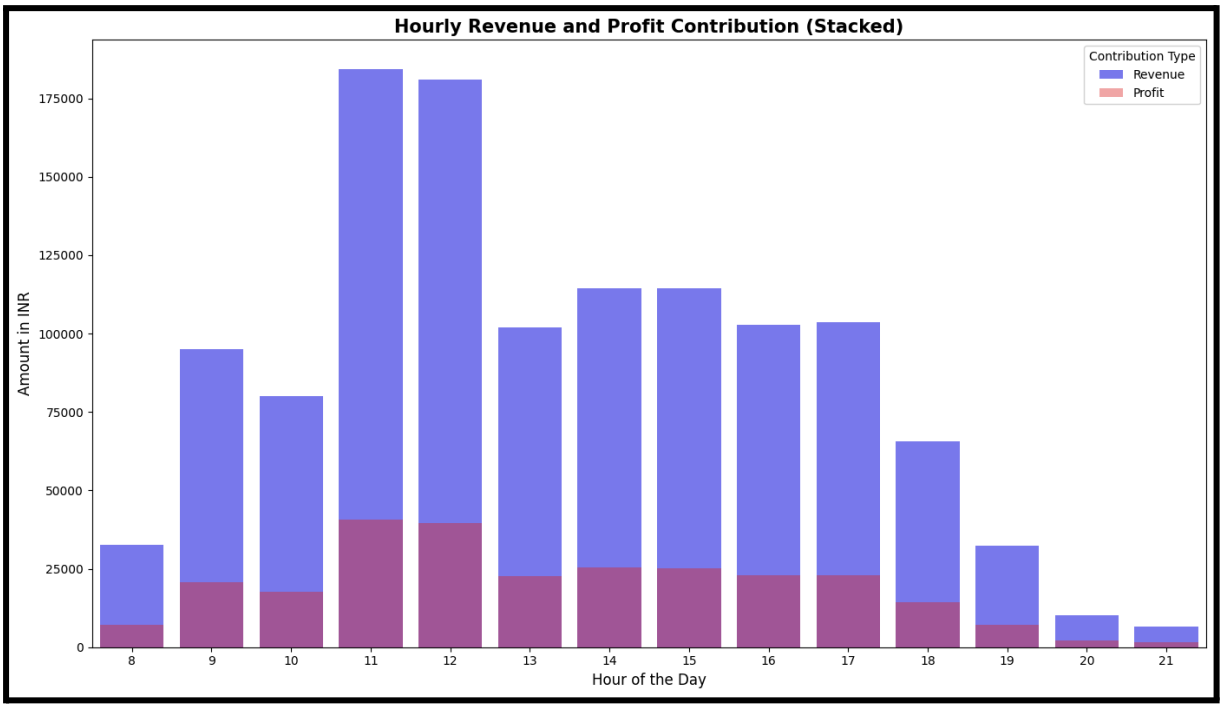
The bar plot breaks down the percentage contributions of revenue and profit by each discount level. It shows that the discount levels with the highest contributions to both revenue and profit are 3%, 2%, and 4%.

3% Discount: Contributes approximately 23.78% to total revenue and 22.25% to total profit, indicating an optimal balance between attracting sales and maintaining profitability.

2% Discount: Accounts for around 20.17% of revenue and 21.15% of profit. This level provides a slightly lower revenue contribution than 3% but still contributes significantly to profit.

4% Discount: Contributes 17.82% to revenue and 17.98% to profit. Though slightly less effective than 2% and 3%, the 4% discount still maintains profitability without drastic losses.

B. Time-Based Analysis



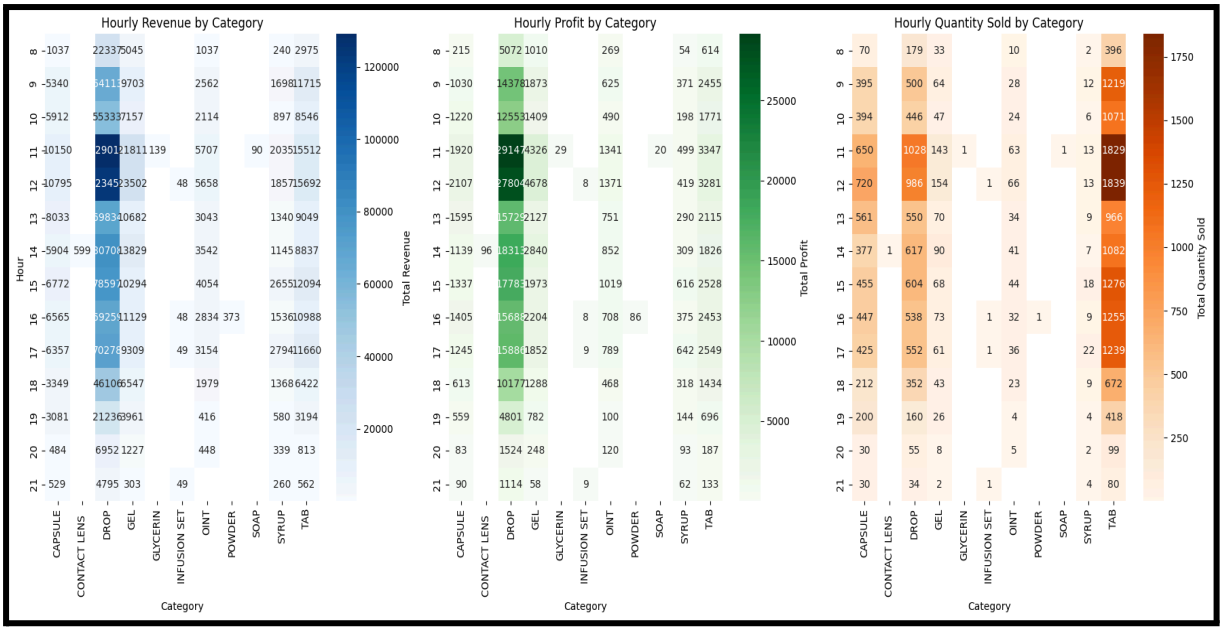
The chart highlights the hours with the most significant revenue and profit contributions, with revenue shown in blue and profit in purple.

Hours **11:00 AM** and **12:00 PM** are the top-performing hours, showing the highest combined revenue and profit contributions. These hours see a marked increase in both revenue and profit, indicating peak customer flow and sales activity.

In the afternoon, **2:00 PM to 5:00 PM** also maintains moderate revenue levels, though slightly lower than the morning peak.

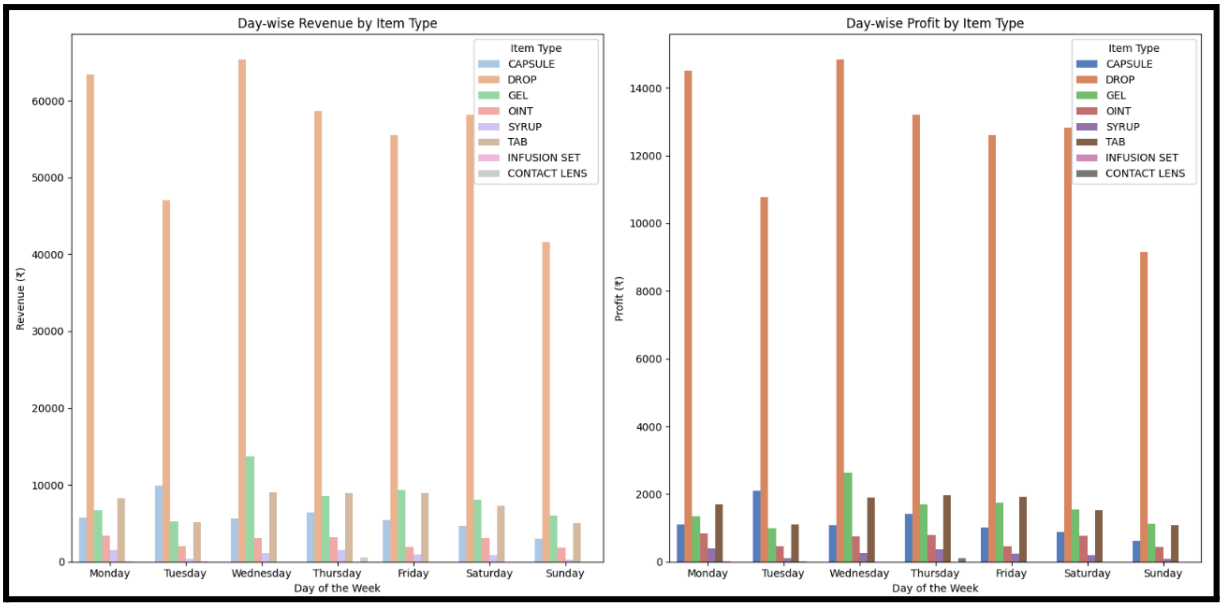
Top Revenue Hours: The top three hours contributing the most to revenue are **11:00 AM (15.05%)**, **12:00 PM (14.77%)**, and **2:00 PM (9.35%)**. These hours capture a substantial portion of daily revenue, confirming the importance of the late morning to early afternoon period.

Top Profit Hours: Similar to revenue, the hours with the highest profit contributions are **11:00 AM (15.04%)**, **12:00 PM (14.68%)**, and **2:00 PM (9.39%)**. This alignment between revenue and profit peaks suggests these hours offer not only high sales volumes but also profitable transactions, with balanced discounts or margin-friendly products.



Demanding Hours: The highest revenue hours are typically between **9 AM and 1 PM**, with peak revenue observed for revenue, profit and quantity sold is around **11 AM to 12 PM**.

1. **Hourly Revenue by Category**
    a. Drop contributes the most significant revenue across hours, especially around 11 AM where it reaches over 129,000.
    b. Capsules and Tab also show considerable hourly revenue, though to a lesser extent than Drop.
    c. Gel is another significant contributor, particularly in the morning.
2. **Hourly Profit by Category**
    a. Drop again is the most profitable, with peaks exceeding 29,000 at 11 AM.
    b. **Capsules** and **Tabs** consistently show high profits as well.
3. **Hourly Quantity Sold by Category**
    a. Tablets consistently have the highest quantity sold across all hours, followed by drops. Peak sales for these two categories occur between **11 AM and 12 PM**, with over **1800 tablets** and **1000 drops** sold.
    b. Capsules maintain steady demand, averaging around **400-700 units** each hour. Gels, ointments, and syrups show lower but consistent sales, with only minor variations throughout the day.



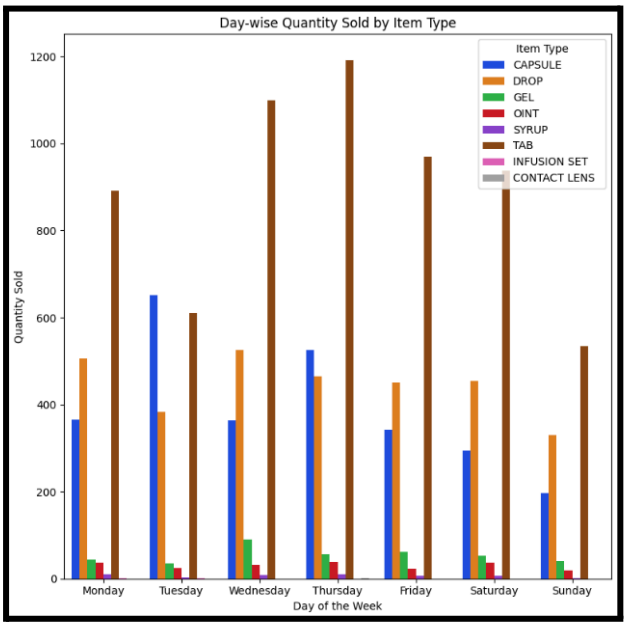
1. **Revenue and Profit Trends by Item Type by Days:**

Drops generate the highest revenue throughout the week, especially on Mondays and Wednesdays, reaching around **₹63,000-₹65,000**. Profit follows a similar pattern, with drops consistently leading in weekly profit contribution.

Tablets and **capsules** also maintain high revenue but lower than drops, with peak revenue on Mondays and Thursdays (around **₹8,000-₹9,000** for tablets).

Gels and **ointments** show moderate sales, with revenue peaking on Wednesdays and Thursdays (e.g., **₹13,765** for gels on Wednesday).

Other items like **infusion sets** and **contact lenses** show minimal revenue and sales, indicating lower demand.



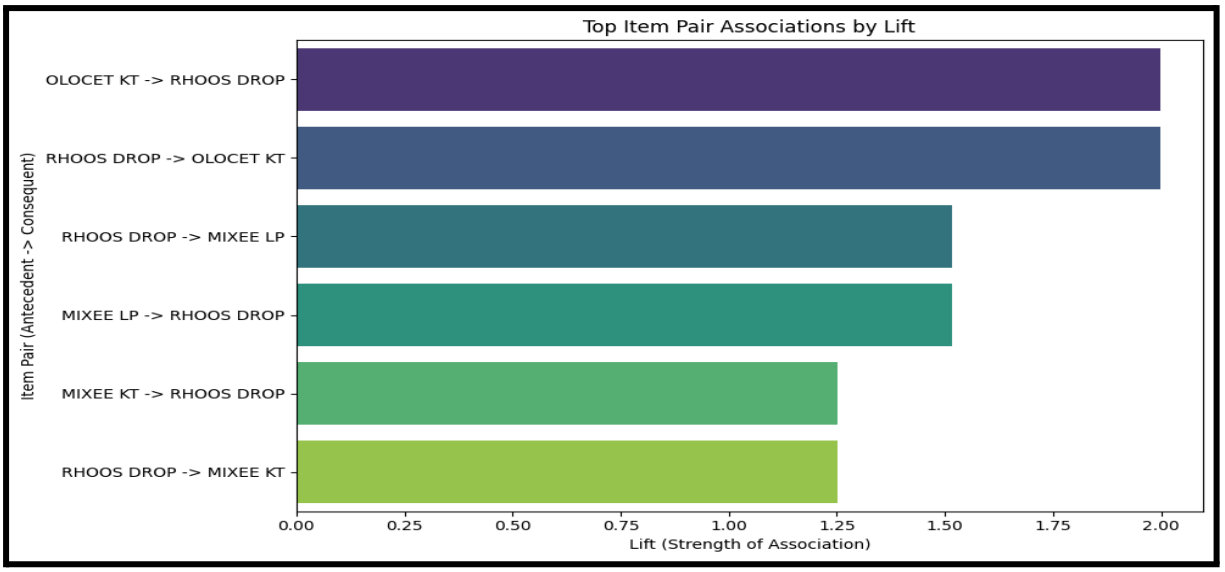
2. **Quantity Sold by Days:**

Tablets are the most sold item type, with sales peaking on **Thursdays** (over **1,190 units**), followed by **drops** with steady sales across the week, peaking on Mondays and Wednesdays.

Capsules see significant demand, especially on **Tuesdays** (around **652 units**), while **ointments** and **gels** maintain a stable but lower volume throughout the week.

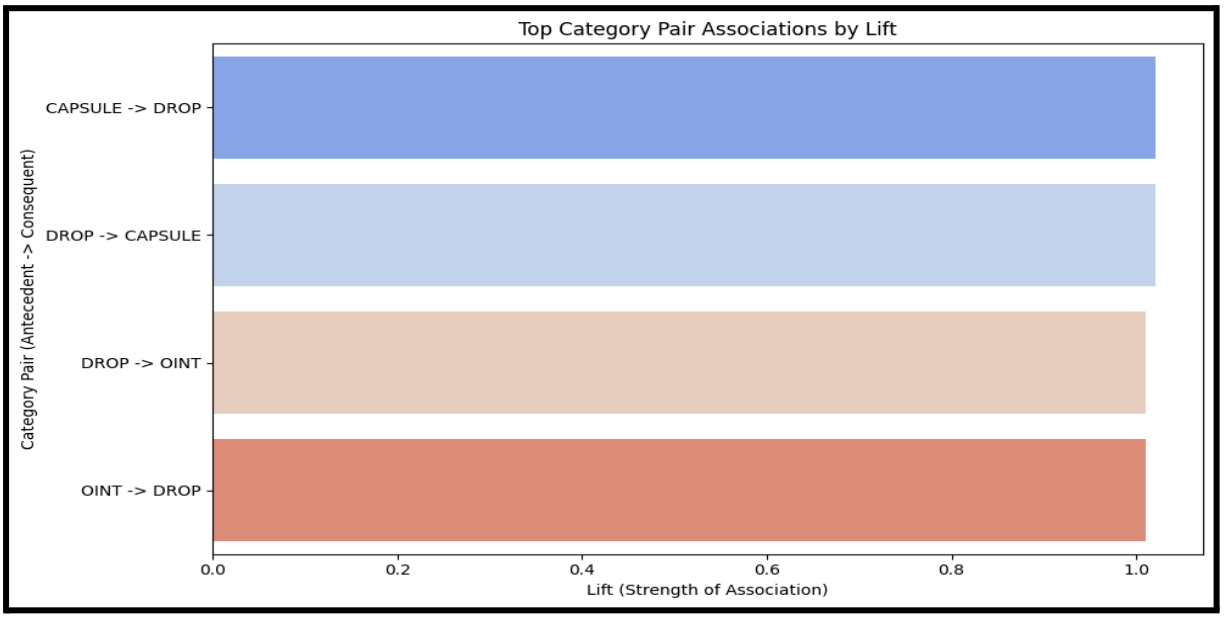
Other items like **syrups** have low but consistent sales, mostly on Mondays and Thursdays.

C. Market Basket Analysis



OLOCET KT and RHOOS DROP show a strong association with the highest lift value of 1.99, indicating they are frequently bought together. The support for this pair is 5.6%, with a confidence of 68.4% for OLOCET KT leading to RHOOS DROP and vice-versa.

RHOOS DROP and MIXEE LP also display significant association, with a lift of 1.51. This pair has a support of 9.6%, and there's a 28.1% confidence that RHOOS DROP will lead to MIXEE LP purchases and vice-versa.



CAPSULE and DROP categories are highly associated, with a lift of 1.02. The support for this category pair is 6.8%, and there's an 86.9% confidence that CAPSULE sales lead to DROP purchases and vice-versa.

DROP and OINT have a lift of 1.01 with a support of 7.5%, suggesting a high likelihood of these categories being purchased together.

4 Interpretation of Results and Recommendations

Interpretation of Results

- The **DROP** category emerges as the primary revenue driver, especially items like "RHOOS DROP" and "MIXEE LP," which collectively generate substantial revenue. The strong performance of drops suggests that the drops are the most prescribed medicine.
- **Gels** and **Capsules** are also significant contributors. For example, "RHOOS GEL" nearly matches the revenue of the top drops, while capsules like "SANOXI PLUS" and "PROZERA" rank highly due to their likely widespread usage or frequent prescription.
- **Tablets** and **Ointments** demonstrate moderate but consistent revenue, supporting a steady stream of sales that contributes to overall profitability. Tablets like "VENAGESIC P" and ointments like "B-CHLOR DX" have moderate revenue, indicating stable demand but lower impact relative to high-performing categories.
- **Syrups** generate lower revenue, but products like "KALYANI SYP" still provide incremental sales. The low revenue from **Powder** and **Infusion Set** items suggests minimal demand, making them lower-priority for inventory and marketing focus.
- A Pareto distribution is evident, with **top 20% of items generating over 84% of revenue and 83% of profit**. This finding aligns with the 80/20 principle, suggesting that the store's financial performance relies heavily on a small subset of items, especially within the DROP category.
- The **"OINTMENT"** category, although modest in revenue, achieves the **highest average profit percentage** at 24.36%, which indicates its relative profitability. **Syrups** and **Powders** follow closely in profit percentage, highlighting liquid medications and powders as profitable products despite lower sales volumes.
- Discounts around **2-4% maximize both revenue and profit**, with 3% emerging as optimal, contributing the highest revenue (23.78%) and profit (22.25%). Higher discounts reduce profitability, highlighting that smaller discounts effectively drive sales without eroding margins.
- The peak hours of **11:00 AM and 12:00 PM** show the highest revenue and profit, indicating high customer flow and likely aligning with common prescription pick-up times or breaks in customers' schedules. This aligns with strategic stocking and staffing during late morning to early afternoon hours to accommodate demand. Afternoon hours, especially **2:00 PM to 5:00 PM**, also generate moderate revenue, though lower than morning peaks, suggesting a steady afternoon demand that helps sustain revenue.
- **Drops** dominate revenue across all high-demand hours, with capsules and tablets also seeing significant contributions, particularly in the morning. The high demand for drops suggests highly or frequently prescribed items, while the demand for capsules and tablets highlights their regular use in treatments. Gels see moderate but consistent morning sales, indicating demand for topical treatments that could be strategically promoted during peak hours.
- **Monday and Wednesday** bring the highest sales for drops, with revenue and profit peaking on these days, likely due to stock replenishments at the start of the week or

post-weekend demand. Tablets and capsules follow similar patterns, peaking on **Mondays and Thursdays**, pointing to potential prescription cycle patterns or routine prescription refills.

- Tablets have the highest weekly sales, with peaks on **Thursdays**. Drops show consistent demand throughout the week, especially on Mondays and Wednesdays, which may point to a doctor in the nearby eye hospital who sits on that weekly basis or schedules for different types of eye diseases that are treated on that day particularly. Capsules are highly sold on Tuesdays, while gels and ointments maintain moderate but steady sales, suggesting their supplementary role in treatments.
- The pairing of **OLOCET KT and RHOOS DROP** exhibits the strongest association, with a **lift value of 1.99** and **68.4% confidence**. This frequent combination, supported in **5.6% of transactions**, suggests a natural pairing that customers often prescribed together, likely fulfilling complementary medical needs.
- **RHOOS DROP** and **MIXEE LP** also show a notable connection with a **1.51 lift** and **28.1% confidence**, coupled with high support at **9.6%**. This relationship suggests bundling potential, as RHOOS DROP, a top seller, frequently leads to MIXEE LP purchases, potentially enhancing revenue through targeted promotions.
- Categories such as **CAPSULES and DROPS** and **DROPS and OINTMENTS** display reliable associations, with lift values of **1.02** and **1.01**, respectively. With confidence levels of **86.9%** for capsules and drops, and **7.5% support** for drops and ointments, these combinations reveal frequent cross-category purchases.

Problem wise Recommendations

1. Inventory Management Optimization

- **Prioritize High-Revenue and High-Demand Products**: Focus on ensuring consistent stock levels for items like **RHOOS DROP**, **MIXEE LP**, and other drops that contribute significantly to revenue. Regularly monitor these products to avoid stockouts, as they align closely with customer demand and revenue goals.
- **Implement Predictive Restocking for Key Categories**: Use optimum historical sales data to forecast restocking needs, especially for **drops, capsules, and gels**. Weekly or monthly inventory reviews will reduce overstocking and prevent issues like expired products. This will also provide a good understanding of seasonality in eye-related diseases.
- **Leverage Market Basket Analysis**: Pair complementary products, such as **OLOCET KT and RHOOS DROP**, on the store display to encourage sales as the most prescribed items are visible to the customer directly, improving product turnover and reducing inventory costs.

2. Customer Service Efficiency during Peak Hours

- **Hire a Part-Time Assistant for Peak Hours**: The busiest hours, 11:00 AM and 12:00 PM, contribute a combined **29.82% of daily revenue**. By hiring a part-time staff member for these two peak hours, store can improve customer service and reduce wait times.
- With hourly revenue of around **₹95,000 per peak hour**, even paying ₹200-₹300 per hour for a part-timer would be a small investment that can boost customer satisfaction and loyalty.

3. Marketing and Revenue Enhancement

- **Discount Strategy Refinement**: Insights reveal that discounts around **3% and 2%** yield the highest revenue and profit, balancing customer attraction with profitability. Focusing on these discount levels during promotions or special events can maximize revenue without eroding profit margins.
- **Targeted Product Promotions for High-Revenue Categories**: Drops are a major revenue driver, especially during peak hours and certain days like **Mondays and Wednesdays**. Special promotions or discounts for drops on slower sales days, such as Tuesdays, could help boost sales throughout the week. Additionally, highlighting **profitable items like MIXEE DROP and TRAVISIGHT** with visible signage can attract more customers to high-margin products.
- **Increase Product Awareness for Associated Items**: Promote commonly paired products, such as **RHOOS DROP with MIXEE LP**, through cross-sell displays or targeted promotions. Pairing high-demand items within the same category, like **capsules and drops**, can also stimulate additional sales.
- **Market the store:** Marketing can help the store stand out from competitors and attract customers. The store could implement Targeted marketing campaigns that can be easily monitored and adjusted based on performance and customer feedback. The campaign could include free eye checkups on the sale of some fixed amount (e.g. ₹500 - ₹600).