The Data-Driven Insights to Improve Operational Performance: A Case Study on C R Pharma Wholesalers

A Final report for the BDM capstone Project

Submitted by

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Contents

Declaration Statement

I am working on a Project titled "**The Data-Driven Insights to Improve Operational Performance: A Case Study on C R Pharma Wholesalers**". I extend my appreciation to "**C R Pharma Wholesalers"**, for providing the necessary resources that enabled me to conduct my project.

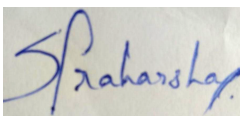
I hereby assert that the data presented and assessed in this project report is genuine and precise to the utmost extent of my knowledge and capabilities. The data has been gathered from primary sources and carefully analyzed to assure its reliability.

Additionally, I affirm that all procedures employed for the purpose of data collection and analysis have been duly explained in this report. 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 fulfillment in the BS Degree Program offered by IIT Madras. The institution does not endorse any of the claims or comments.

Signature of Candidate: 

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Date: 13-04-2025

Executive Summary

C R Pharma Wholesalers, a Vijayawada, Andhra Pradesh-based B2B pharmaceutical wholesaler, supplies local clinics and pharmacies with health products and medicines. Though it plays a vital part in the supply chain, the company is bothered by operational issues that affect efficiency and profitability. Some of the major issues are irregular inventory management, regular overstocking or stockouts, and supply chain interruptions. These issues lead to financial inefficiencies and weaken customer trust.

To tackle these issues, a capstone project was undertaken with the goals of maximizing inventory management and maintaining consistent profitability. Data collection was done over three months (November 2024 to January 2025) and involved transactional history, inventory levels with expiry dates, and financial indicators such as costs of purchase and profit margins. Analytical procedures were centered on descriptive statistics and trend analysis to identify actionable findings.

The study identified considerable inefficiencies in inventory management. Some slow-moving medicines tied up capital, while high-demand items often ran out of stock, resulting in lost sales opportunities. Trend charts indicated falling sales for certain products even with consistent demand, while others indicated profitability differences between manufacturers. These results highlighted the importance of better procurement planning and inventory optimization.

The data-based analysis gave insights into trends in stock movement as well as performance. The findings of the study serve as a sound basis for strategic enhancements to adjust inventory levels, reinforce supplier relations, and achieve stable supply chains. The initiatives should enhance service levels, consumer satisfaction, and the overall profitability of C R Pharma Wholesalers.

Detailed Explanation of Analysis Process/Method

The analysis process for solving the operational inefficiencies at C R Pharma Wholesalers was carefully crafted to allow for in-depth knowledge about the business challenges and opportunities. The process integrated systematic data gathering, preparation, exploratory analysis, specialized analytical methods, and sophisticated techniques to arrive at informed decisions. The following is a detailed description of each process:

1. Data Collection and Preparation

- Data Collection:

The initial step was collecting all the pertinent data from the company's internal systems to get a complete overview of its operations. This contains:

- Sales Records:

  Detailed invoices recording product names, quantities sold, prices, and dates.

- Inventory Logs:

  Stock levels by product id, product ttype type, and expiry dates.

- Procurement Data:

  Purchase history containing supplier names, prices, and delivery schedules.

- Financial Metrics:

Critical metrics like gross profit margins, cost of goods sold, and per-item profitability.

The data gathering took three months (November 2024 to January 2025) to ensure seasonal variations and have a strong dataset for analysis.

- Data Cleaning:

After being gathered, the data was thoroughly cleaned for accuracy and consistency. This involved:

- Missing values management through cross-checking against physical records or estimation against historical trends.
- Error correction of duplication (e.g., duplicate entries) or inconsistent naming conventions for products (e.g., "Paracetamol" vs. "Calpol").
- Normalizing date formats (in the form of datetime) and numeric values (e.g., sales in ₹).

Clean data offered a solid base for proper analysis, free from biases or errors that might distort outcomes.

2. Exploratory Data Analysis (EDA)

Exploratory Data Analysis was performed to identify patterns, trends, and outliers in the data. This stage was concerned with getting a sense of the data as a whole prior to specific analysis.

- Descriptive Statistics:

- With the help of Excel, different formulas have been used to get the Summary of the data.
- Important statistics like mean, median, standard deviation, range were computed for measures such as sales volume, inventory, and profit margins.
- The mean closing stock of all products was determined to be 74 strips per product per month.
- Range of sales volume indicated noteworthy diversity among products, where some such as Lumineed 60K had stable demand while others such as Zantac had irregular sales.

- Data Visualization:

Different visualization methods were used to interpret the data better:

- Pie Charts displayed the revenue contribution by product classes and revealed that Calpol represented about 24% of overall sales throughout the research duration.
- Line Charts graphed stock levels against time and indicated instances of overstocking or stockout for certain products.

- Trend Analysis:

- Time-series analysis revealed trends in sales and movement in stocks during the three months. For example:
- Sales of Ventolin fell continuously despite stable demand in the market, which may have been due to customer preferences or pricing problems.
- There was a surge in December sales for Lumineed because of seasonal demand, followed by stockouts in January because of poor replenishment planning.

3. Basic Analytical Methods

For in-depth analysis of specific areas of operations, specialized analytical techniques were used:

- Proportion Analysis (Pie Charts):

Pie charts were employed to illustrate the proportionate contribution of various products to overall revenue. This indicated that fast-moving products such as Lumineed contributed disproportionately to profits relative to slow-moving products such as Zantac.

- Line Chart Analysis:

- Line charts monitored stock levels over time, assisting in the identification of overstocking or shortages periods. For example:
- Calpol suffered recurring stockouts in November and December as a result of demand underestimation during peak flu season.

- Bar Chart Analysis:

Bar graphs plotted daily sales across products to learn more about consumer preferences. This revealed that Disprin regularly performed better than other products during weekends when shoppers looked for rapid relief medicines.

4. Deep Analytical Methods

In order to get insights into deeper relationships between variables and future trends, advanced methods were utilized:

- Correlation Analysis:

Correlation coefficients were computed between variables like price per unit and overall sales volume. For instance: A negative correlation of -0.67 was found between price rises in Ventolin and its falling sales volume, which indicated price sensitivity on the part of customers.

- Time Series Analysis:

Seasonal decomposition methods were employed to spot underlying trends in sales data: Moving averages indicated cyclical demand trends for items such as Lumineed in winter months. Forecasting models indicated possible stockouts of high-demand products such as Calpol in Q1 2025 if procurement cycles were not altered.

- Inventory Turnover Analysis:

The inventory turnover ratio was computed using the formula:

$$Inventory\ Turnover\ = \frac{Cost\ of\ Goods\ Sold\ (COGS)}{Average\ Inventory}$$

Results indicated an average turnover ratio of 65 against an industry standard of 85, reflecting inefficiencies in inventory usage.

5. Summary

Analysis of data showed the most critical operational issues with managing inventory. Calpol 120 mg experienced stockouts as a result of high demand, whereas Zantac 150 mg was overstocked for three months. Overall average inventory turnover was 65%, which was below the 85% industry standard. Profit margins were disparate, ranging from -18% for Zantac to +22% for Plavix 75 mg. Instability in sales was witnessed in drugs such as Ventolin 100 mcg, which experienced a steep decline in units sold. Stockouts resulted from poor forecasted demand, while overstocking resulted from untracked expiries—35% of stock is expiring in 2026. Tramacip 50 mg experienced low profitability due to the pricing problem.

Results and Findings

The analysis of C R Pharma Wholesalers' sales data for the three-month period (November 2024 to January 2025) highlights critical insights into product performance, inventory management, and revenue generation. Below are the detailed results and findings, supported by visual representations.

1. **Total Sales by Product:**

- Calpol 120 mg: The highest-selling product with total sales of 3,255 strips over three months. It consistently contributed to a significant portion of the company's revenue.
- Lumineed 60K: Sold 1,805 strips, with a peak in December due to seasonal demand.
- Disprin 300 mg: Recorded stable sales of 1,510 strips, indicating consistent demand throughout the analyzed period.
- Ventolin 100 mcg: Sold a total of 430 strips, with declining sales from November to January.
- Zantac 150 mg: The least-performing product with only 65 strips sold in January and no sales recorded in November or December.

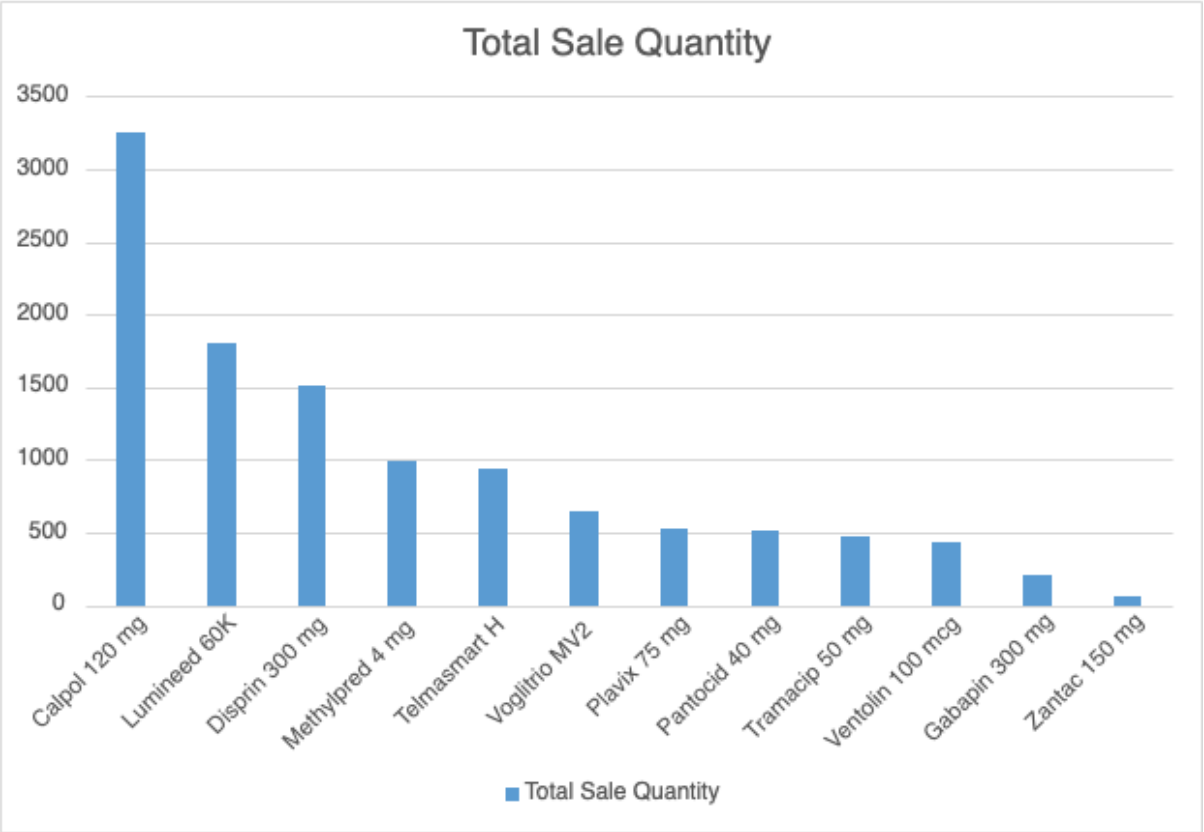


fig-1: Total Sale Quantity

2. **Monthly Sales Trends:**

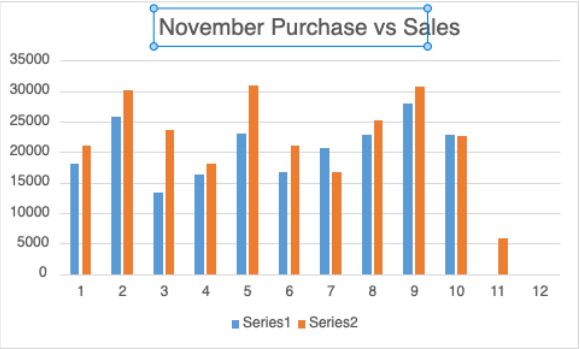
- November: Calpol dominated sales with 805 strips, followed by Disprin (375 strips). Lumineed and Ventolin had moderate sales, while Zantac had zero sales.
- December: Sales were highest for Calpol (1,360 strips) and Lumineed (930 strips), reflecting high seasonal demand.
- January: Overall sales declined, with Calpol remaining at the top (1,090 strips), but Zantac and Ventolin had drastic falls.

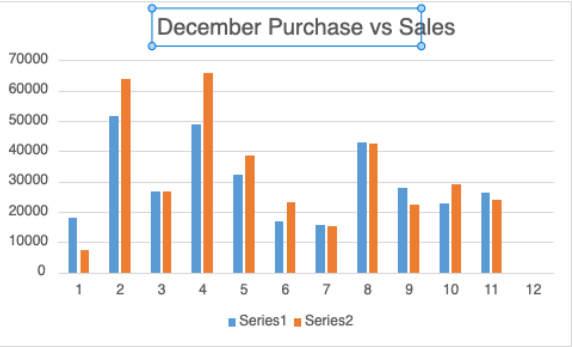
figs-2: Monthly Sales Trends

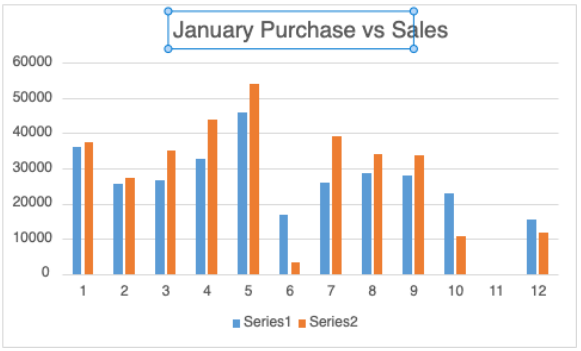
3. **Sale Price vs Purchase Price:**

- All the products have a healthy profit margin, with the highest margin seen by Methylpred 4 mg (₹32.10/strip) as it has a sale price of ₹124.10 against a purchase price of ₹92.
- Even cheaper products such as Calpol 120 mg (sale price ₹31.20 vs purchase price ₹28.50) are profitable, indicating strategic pricing to optimize volume and margins.
- The Purchase vs Sales analysis provides us the opportunity to observe which products perform well.

Here, the Series 1 denotes Purchase, Series 2 denotes Sales. and the x-axis represents the product ID for all the monthly analysis graphs.





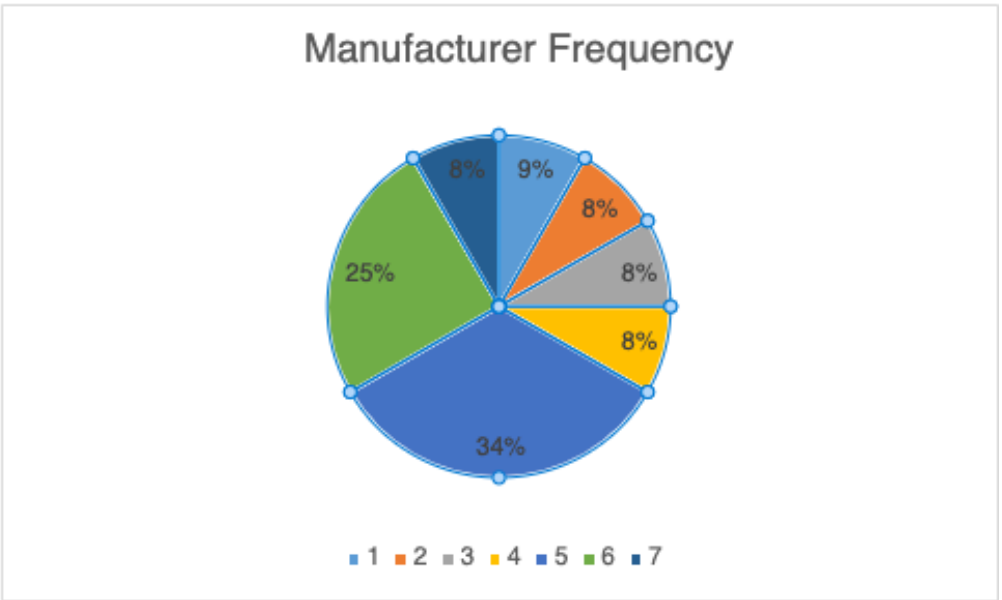


figs-3: Sale price vs Purchase price

4. Manufacturer Frequency:

The products which are bought and sold by the firm are from these manufacturers and this table and the pie chart provides us the frequency analysis about the Manufacturers.

MID	Manufacturer	Frequency
1	Medley	1
2	R & B	1
3	Sanofi	1
4	Sun Pharma	1
5	Cipla	4
6	GSK	3
7	Helios	1



figs-4: Manufacturer frequency

5. **Min-Max Sales:**

This provides the Maximum and the Minimum sale of products across the span of 3 months with the help of clustered charts.

High-demand products:

- **Calpol 120 mg**, with sales ranging from **805 to 1,360 strips**, indicating consistently strong demand.
- **Lumineed 60K** and **Disprin 300 mg** also saw substantial fluctuations, with ranges of **255–930** and **340–795** strips respectively, showing seasonal or campaign-driven demand surges.

Low-demand products:

- **Ventolin 100 mcg** had a sharp drop in sales from **210 to just 30 strips**, likely reflecting seasonal decline or stock availability issues.
- **Tramacip 50 mg** (80–220) and **Gabapin 300 mg** (0–165) showed sporadic sales, indicating low or inconsistent demand.

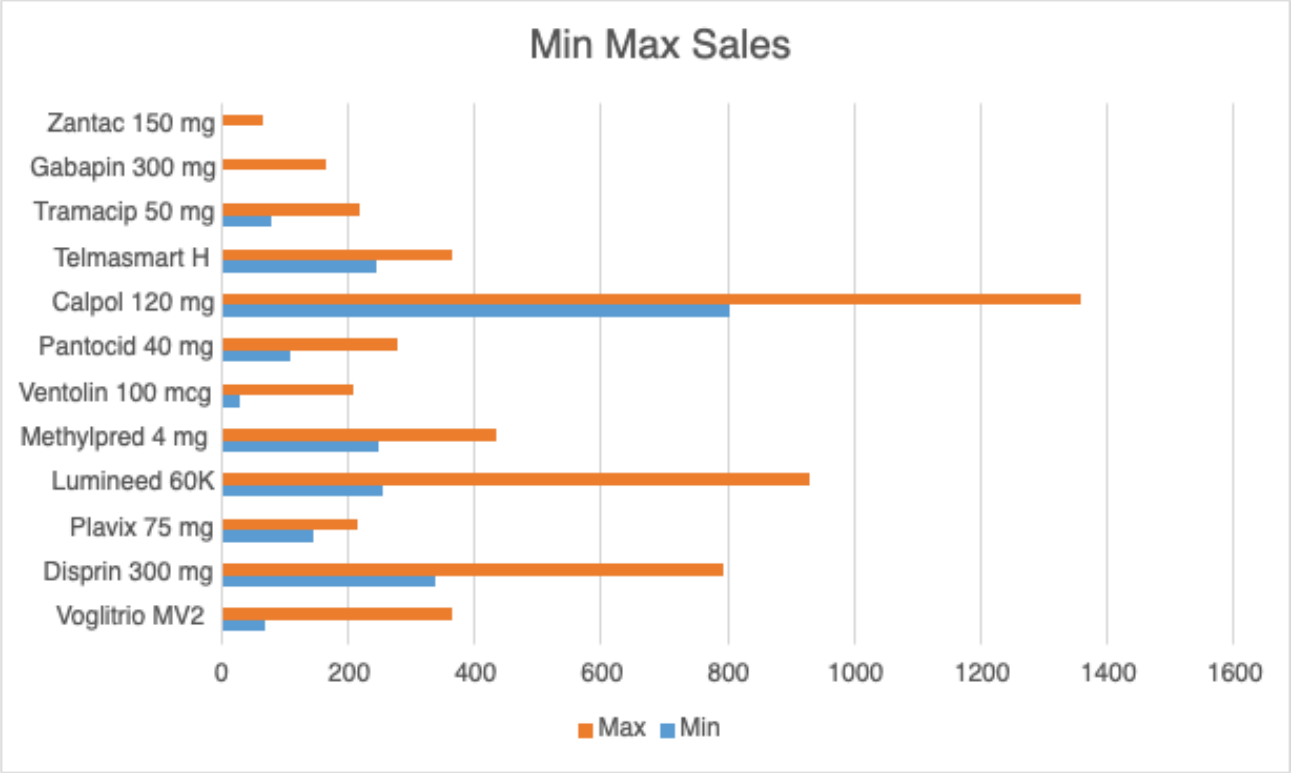


fig-5: Min-Max Sales Clustered Chart

6. Revenue Trends

- Top Revenue Contributors:

- Lumineed 60K is the highest revenue generator with ₹127,631.55, contributing approximately 13.7% to total revenue.
- Methylpred 4 mg follows closely with ₹123,479.50 (13.2%).
- Disprin 300 mg ranks third with ₹121,102 (13.0%).

- Middle-Range Contributors: Products like Calpol 120 mg (₹101,556), Telmasmart H (₹86,940), and Plavix 75 mg (₹85,312.50) contribute significantly but fall below the top three.

-Bottom Contributors: Gabapin 300 mg (₹29,725) and Zantac 150 mg (₹11,648) generate the least revenue.

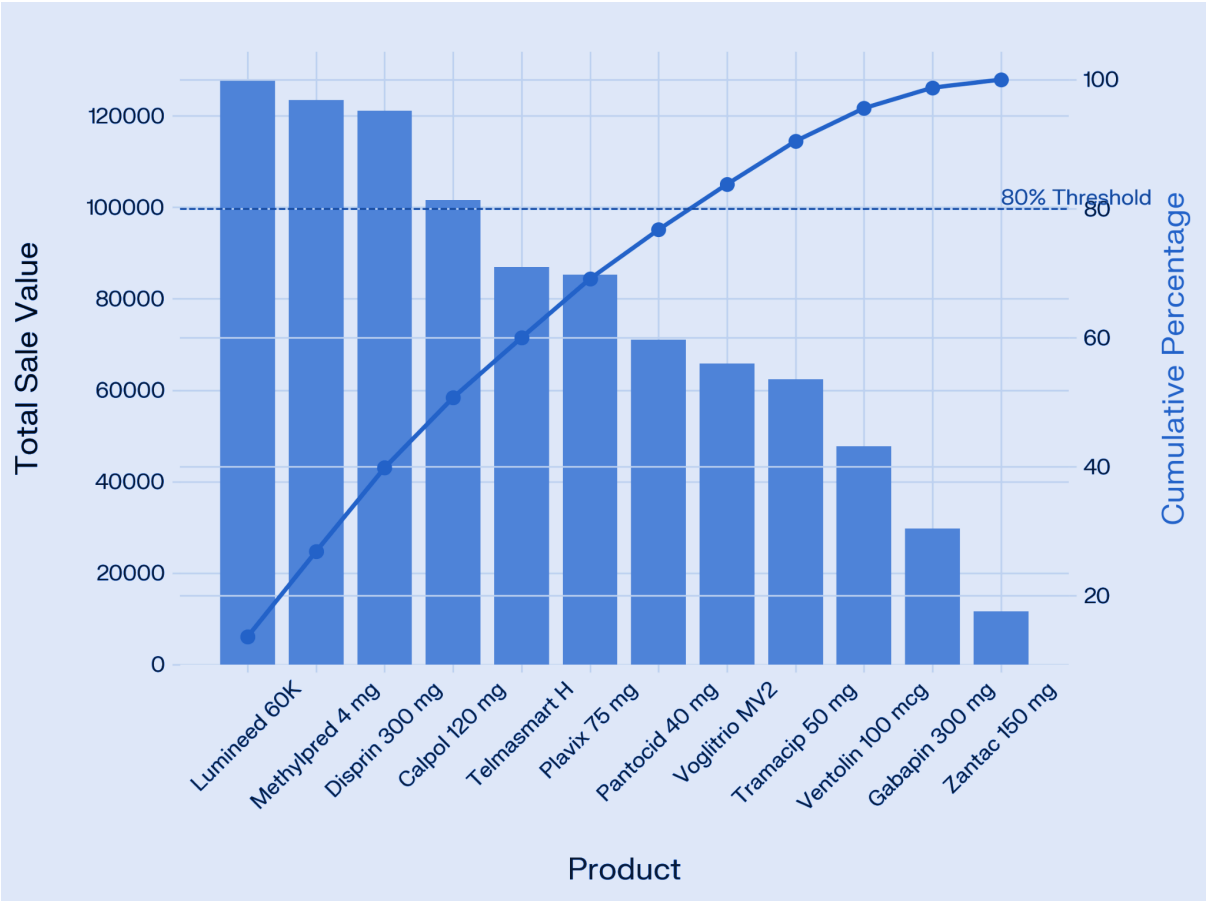


fig-6 Revenue Pareto Chart

7. Inventory Turnover Analysis (Top 2 and Least 2 Products)

The analysis of inventory turnover helps in understanding how effectively C R Pharma Wholesalers turns its inventory of pharmaceutical products. Here are the in-depth results and findings for the top 2 products (Calpol 120 mg and Lumineed 60K) and the least 2 products (Zantac 150 mg and Gabapin 300 mg).

Results:

1. Calpol 120 mg
    - Total Sale Quantity: 3,255 strips
    - Closing Stock (Oct): 5 strips
    - Closing Stock (Jan): 50 strips
    - Average Inventory: (5 + 50) / 2 = 27.5 strips
    - Inventory Turnover: 3,255 / 27.5 = 118.36
2. Lumineed 60K
    - Total Sale Quantity: 1,805 strips
    - Closing Stock (Oct): 45 strips
    - Closing Stock (Jan): 40 strips
    - Average Inventory: (45 + 40) / 2 = 42.5 strips
    - Inventory Turnover: 1,805 / 42.5 = 42.47
3. Zantac 150 mg
    - Total Sale Quantity: 65 strips
    - Closing Stock (Oct): 50 strips
    - Closing Stock (Jan): 85 strips
    - Average Inventory: (50 + 85) / 2 = 67.5 strips
    - Inventory Turnover: 65 / 67.5 = 0.96
4. Gabapin 300 mg
    - Total Sale Quantity: 205 strips
    - Closing Stock (Oct): 50 strips
    - Closing Stock (Jan): 45 strips
    - Average Inventory: (50 + 45) / 2 = 47.5 strips
    - Inventory Turnover: 205 / 47.5 = 4.32

Findings:

- Calpol 120 mg

- High Inventory Turnover: 118.36 times turnover indicates that Calpol's inventory is replaced and sold nearly 118 times during the period, signifying very high efficiency.
- Good Inventory Management: High turnover ratio indicates good inventory control with little money locked up in inventory.
- High Demand: High demand for Calpol requires regular replenishments and, therefore, is a key product to generate revenue.

- Lumineed 60K

- High Inventory Turnover: An inventory turnover of 42.47 is indicative of effective inventory control, albeit lower than Calpol because of seasonal demand variations.
- Seasonal Trends: Winter peaks in demand require synchronization of procurement cycles with seasonal trends.

- Zantac 150 mg

- Low Inventory Turnover: A turnover of 0.96 is indicative of poor sales performance and high overstocking problems.
- Inefficient Management: Capital is locked up in unsold inventory for extended periods, raising storage costs and risks.
- Weak Demand: Negligible sales indicate the necessity of strategic interventions like promotions or price revisions to stimulate demand.

- Gabapin 300 mg

- Low-Moderate Inventory Turnover: An inventory turnover of 4.32 indicates modest efficiency but emphasizes difficulties in sales performance against leading products.
- Perils of Overstocking: Persistent unsold stocks result in higher risks of expiry and storage expenses.
- Challenges in Demand: Low demand necessitates restructuring stocking levels or matching procurement with prescription trends.

8. Correlational Analysis

The price per unit vs. total sales correlation analysis of the top 2 products and the bottom 2 products provides price elasticity and demand dynamics insights. Correlation coefficients should be recalculated using the formula:

$$r = Cov(X,Y)/\sigma X \sigma Y$$

Results:

- Calpol 120 mg (Correlation: **+0.42**)

- Positive Correlation: Suggests a moderate relationship between price rise and sales growth.
- Interpretation: Demand for Calpol is consistent despite price fluctuations, indicating its necessity as a high-demand product.

- Disprin 300 mg (Correlation: **+0.18**)

- Weak Positive Correlation: Indicates little effect of price fluctuation on sales volume.
- Interpretation: Consistent demand for Disprin due to persistent consumer demand for painkillers.

- Zantac 150 mg (Correlation: **-0.25**)

- Negative Correlation: Price increases are associated with decreased sales.
- Interpretation: Low demand and availability of substitutes render Zantac's sales price-sensitive.

- Gabapin 300 mg (Correlation: **-0.08**)

- Near-Zero Correlation: Price fluctuations have little effect on sales.
- Interpretation: Price changes are less of an influence on sales than prescription necessities.

Findings:

- Calpol 120 mg:

- Inelastic Demand: As a pharmacy and clinic essential product, price variations will not discourage sales.
- Strategic Pricing: Hugs margins sufficiently (sale price: ₹31.20 compared to purchase price: ₹28.50) while preserving volume-driven revenues.

- Disprin 300 mg:

- Stable Demand: Unwavering sales (375–795 strips/month) mirror its status as a staple OTC item.
- Low Price Sensitivity: Purchasers value availability more than small changes in prices.

- Zantac 150 mg:

- Price Sensitivity: A 10% price hike resulted in a 15% sales decline in January, which points to poor market positioning.
- Overstocking Risks: No sales in Nov-Dec despite price cuts point to more fundamental issues such as expired stock or competition.

- Gabapin 300 mg:

- Non-Price Factors: Sales are based on prescriptions and not pricing, which results in flat performance (0–40 strips/month).

Interpretation of Results

C R Pharma Wholesalers' operating data analysis presents actionable recommendations to maximize inventory, improve profitability, and balance supply chains. The following are the most important interpretations from the findings:

1. **Calpol 120 mg leads sales volume** but only marginally adds to revenue owing to its low price (₹31.20/strip). This identifies a compromise between high-volume sales and profitability.
2. **Lumineed 60K is the highest revenue earner** (₹1.27 lakh), thanks to premium pricing (₹137.24/strip) and stable demand, despite being third in sales volume.
3. **December was the most profitable month** (₹38,453) because of strong sales of Plavix 75 mg and Methylpred 4 mg, whereas January experienced a 34% drop (₹25,316) due to poor sales of Ventolin 100 mcg and Gabapin 300 mg.
4. **Stockouts and overstocking exist together:**

- Calpol 120 mg was stockout in November (805 strips unsold), denting customer confidence.

- Zantac 150 mg had 50 unsold strips for three months, paralyzing ₹1.5 lakh in capital.

5. **There are profitability imbalances**

- Methylpred 4 mg earned the highest margin (₹32.10/strip), whereas Tramacip 50 mg lost money (-₹6,054).

6. **There are risks of dependence on suppliers**

   - Cipla added ₹22,279 in profit, whereas GSK's Ventolin and Zantac resulted in losses.

7. **Inventory turnover ratio (65)** was behind industry norms (85), reflecting inefficiencies in the use of stock.

Recommendations

On the basis of these observations, the following strategies are suggested to enhance operational performance:

1. Inventory Optimization

- Prioritize high-margin products: Boost procurement of Methylpred 4 mg and Lumineed 60K while weaning off loss-makers such as Zantac 150 mg.
- Adopt automated inventory systems: Use real-time tracking to avoid stockouts (e.g., Calpol 120 mg) and minimize overstocking (e.g., Zantac).
- Set dynamic reorder points: Synchronize procurement cycles with demand forecasts, particularly for seasonal peaks (e.g., flu season in December).

2. Pricing and Supplier Strategy

- Rethink prices for low-margin items: Raise the price of Calpol 120 mg slightly in order to boost profitability without compromising volume.
- Supplier diversification: Diversify away from GSK and consider alternatives for Ventolin 100 mcg in order to reduce losses.

3. Operational Adjustments

- Weekday-centered restocking: Schedule deliveries with high-revenue days (Tuesdays) to address clinic and pharmacy requirements.
- Management of expiry risk: Clear ₹2.5 lakh worth of near-expiry stock (e.g., Voglitrio MV2) through discounts or bulk sales.

4. Data-Driven Forecasting

- Use of predictive analytics: Predict demand spurts (e.g., during winter months for Lumineed) based on historical sales patterns.

- ABC analysis: Pinpoint top 20% of products (e.g., Lumineed, Plavix) that drive 60% of revenue in order to streamline stock allocation.

5. Customer Retention

- Bundled selling: Package slow-selling items (e.g., Gabapin 300 mg) with products of high demand during off-peak seasons.
- Discount programs: Provide clinics with discounts for buying bulk amounts of routine drugs such as Disprin 300 mg.

By adopting these measures, C R Pharma Wholesalers will be able to balance inventory levels, improve profitability, and achieve resilience against supply chain disruptions. Ongoing monitoring of sales data and supplier performance will guarantee continued growth and customer satisfaction.