Sales Pattern Analysis and Operational Bottlenecks in a Dine-In Restaurant Using POS Data

A Final report for the BDM capstone Project

Submitted by:

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Contents

1. Executive Summary

This capstone project focuses on “The Royale Place”, a vegetarian multicuisine restaurant located in Bhawanipur, Kolkata, West Bengal. Offering a wide range of dishes with special attention to Jain dietary needs and fresh daily catering, the restaurant operates in the B2C food and beverage sector and has built a loyal dine-in customer base. However, the business faces two major challenges: **low online sales and limited visibility into sales patterns**. The lack of analytical insight into customer demand and peak hours has led to suboptimal staff allocation, slower service during rush hours, and missed opportunities to scale through digital platforms.

For this project, three months of transactional data (January to March) was collected from the restaurant’s POS system. The dataset includes two key reports: an Orders Master Report capturing invoice-level details such as order dates, payment methods, order types, revenue components, and taxes; and an Item-Wise Report providing granular insights into individual dishes, quantities, pricing, and table allocations. To analyze these patterns, KPI analysis and descriptive analytics were applied to evaluate online sales performance and uncover key sales trends.

The analysis showed that dine-in orders dominated overall sales, with limited online activity indicating an untapped digital opportunity. Friday and Sunday recorded the highest sales, while late evenings (10 PM–12 AM) emerged as peak hours. January had the most orders and revenue, likely due to festive demand. Beverages like Milk Tea and Kinley Water Bottle and staples such as Tawa Roti were the top-selling items. Although cash remained the preferred payment method, online transactions showed higher average spending per order.

The findings suggest strong dine-in performance but underdeveloped online sales. Expanding partnerships with delivery platforms, launching weekend offers, and promoting high-margin combos like *Dal-Roti* can enhance profitability. Collaborating with influencers and running targeted online promotions can further boost visibility and engagement.

2. Detailed Explanation of Analysis Process/Method

2.1. Data Collection

The dataset was collected over a duration of a few weeks through several visits to the restaurant and follow-up communication with the Owner via **Gmail**. Mr. Soni uses **Petpooja software** for managing and storing their data at one place. Petpooja is a restaurant management software (RMS) platform that helps merchants manage their end-to-end operations.

For this project, the restaurant provided month-wise data in two formats: a Master Report containing sales-wise details and an Item-wise Report capturing product-level sales. Since the raw reports were separated by month (January, February, and March), they had to be carefully consolidated and integrated into a single dataset to ensure continuity.

2.2. Data Cleaning and Preprocessing

Since the reports were split across January, February, and March, the first step was to consolidate and integrate them into a single combined sheet for each format. This ensured continuity and enabled a seamless three-month analysis instead of restricting the study to isolated months.

For preprocessing, minimal cleaning was required because the data was already structured and organized directly from the RMS. The main preprocessing task was integration of the three monthly reports into one consolidated dataset, making it suitable for further analysis.

2.3. Analysis Process/Method

2.3.1. KPI Analysis for Online Orders

- The purpose of KPI (Key Performance Indicator) analysis is to evaluate the financial and operational efficiency of the restaurant's online sales channel.

- It measures key aspects such as total online revenue and average customer online spending.
- The dataset includes an attribute “Order Type”, which classifies each transaction as either:
    - Dine In – for orders placed and served at the restaurant.
    - Delivery(Parcel) – for orders placed through online delivery platforms.
- For KPI analysis, only transactions where: Order Type="Delivery(Parcel)"
- Total Online Sales (TOS):

$$TOS = \sum_{i=1}^{n} Total\ (₹)$$

Where:

- $Total\ (₹)$ = Net sales amount for the i^{th} online order
- n = Total count of successful online orders

- Online Order Volume (OOV):

$$OOV = n$$

Where:

- n = Total count of successful online orders

- Average Online Order Value (AOV)

$$AOV = TOS / OOV$$

Where:

- TOS = Total Online Sales
- OOV = Online Order Volume

2.3.2. Descriptive & Time-Series Analysis

Descriptive and Time-Series Analysis is an analytical approach used to summarize and interpret past sales data to identify patterns, trends, and variations over time. This analysis helps in understanding customer behavior, peak demand hours, and seasonal or monthly fluctuations in performance. By visualizing data across different time dimensions, it enables management to make informed, data-driven decisions regarding staffing, promotions, and inventory planning.

From this Descriptive and Time-Series Analysis, the following charts were created to illustrate key insights:

1. **Orders by Day of the Week and Sales** –
   → *X-axis:* Days of the week (Monday to Sunday)
   → *Y-axis:* Number of orders
   → This chart helps identify which weekdays experience the highest footfall and sales, revealing weekly demand patterns that can assist in planning special offers or resource allocation.

2. **Orders by Hour of the Day and Sales** –
   → *X-axis:* Hourly intervals (12 AM to 12 AM)
   → *Y-axis:* Number of orders
   → It highlights daily peak hours, showing when customers most frequently dine in or place online orders, helping optimize kitchen and delivery operations during rush hours.

3. **Month-wise Orders and Sales** –
   → *X-axis:* Months (January to March 2025)
   → *Y-axis:* Number of orders and total monthly revenue
   → This chart tracks performance trends over time, indicating how overall sales and customer engagement changed month to month.

4. **Top 15 Most Ordered Items and Sales** –

   → *X-axis:* Food and beverage items

   → *Y-axis:* Total quantity ordered

   → It identifies the restaurant's best-selling products and helps determine customer preferences, guiding menu optimization and pricing strategies.

5. **Cash vs. Online Payment Analysis** –

   → *X-axis:* Payment modes (Cash, UPI / Online)

   → *Y-axis:* Number of transactions and total revenue

   →This comparison provides insight into customer payment behavior, highlighting the proportion of digital versus cash payments, which can inform financial planning and digital promotion strategies.

All analyses and visualizations in this project were conducted using Google Colab with Python libraries such as Pandas and Matplotlib.

Google Colab: BDM Analysis.ipynb

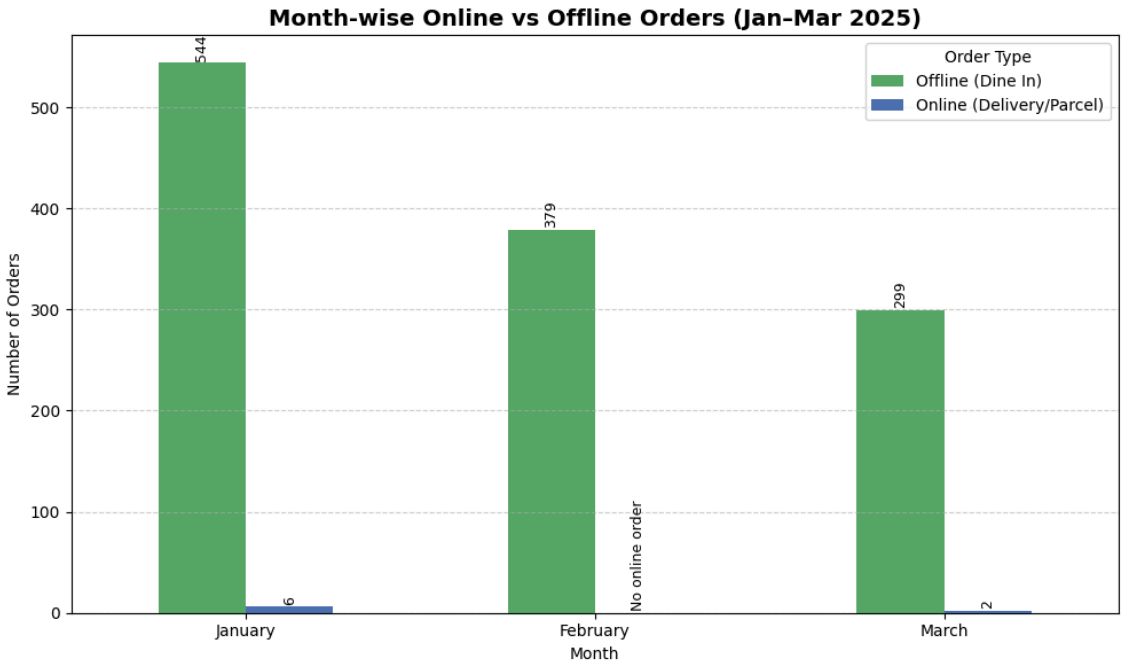
3. Results and Findings

By the end of the analysis phase, the findings were derived through a combination of KPI Analysis, Descriptive Analysis, and Time-Series Analysis, aimed at assessing the restaurant's financial performance, customer behavior, and sales trends. These analytical methods helped evaluate both online (delivery/parcel) and offline (dine-in) operations to identify key performance gaps and growth opportunities.

The dataset used for the analysis contained detailed transactional information, including sales amounts, payment types, order timings, and product categories. Using this data, various performance indicators such as Total Online Sales (TOS), Online Order Volume (OOV), and Average Order Value (AOV) were calculated to measure the efficiency of the restaurant's online sales channel.

The insights presented below are based on three months of transactional data — **January, February, and March 2025**

3.1. KPI Analysis



Picture 1 - Month wise Online vs Offline Orders

Based on the analysis, the restaurant's order pattern clearly shows that offline (dine-in) orders dominate over online (delivery/parcel) orders throughout the three-month period. In January 2025, offline orders peaked at **544**, while only **6** online orders were recorded. Similarly, February (**379** offline orders) and March (**299** offline orders) continued this trend, with negligible or no online activity.

📈 KPI Summary:

	KPI	Value
0	Total Online Sales (TOS)	1231.000
1	Online Order Volume (OOV)	8.000
2	Average Online Order Value (AOV)	153.875

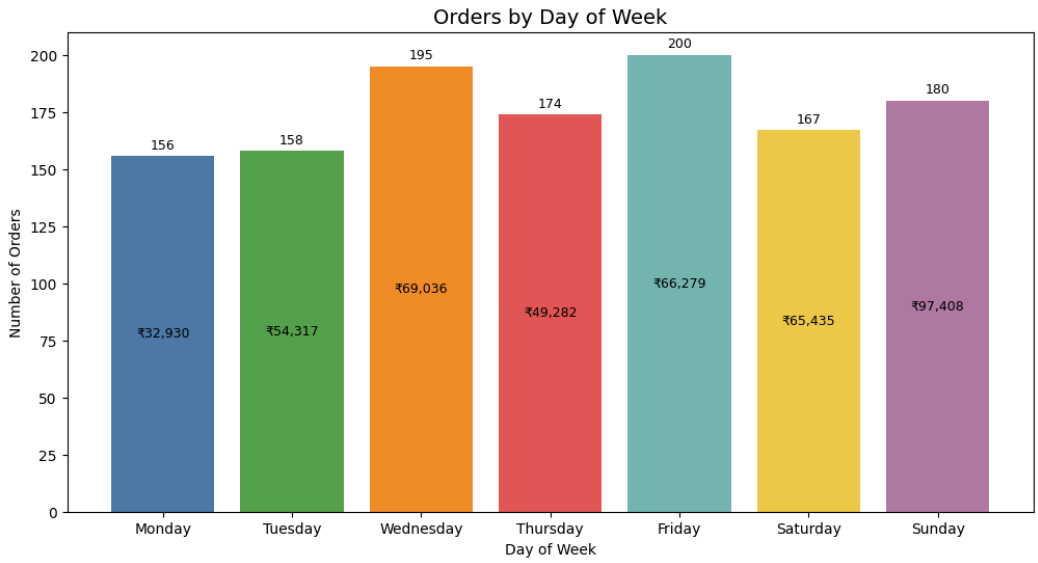
Picture 2 - KPI Summary

The KPI Summary highlights the restaurant's online performance during the analysis period. The total online sales (TOS) amounted to **₹1,231**, generated from only eight successful online orders (OOV). This results in an average online order value (AOV) of **₹153.88**.

These figures clearly indicate that the restaurant's online sales channel remains underutilized, contributing only a small portion to total revenue. This suggests a strong need to expand digital reach, enhance visibility on delivery platforms, and attract more online customers through promotions and partnerships.

3.2. Descriptive & Time-Series Analysis

3.2.1. Orders by Day of the Week and Sales



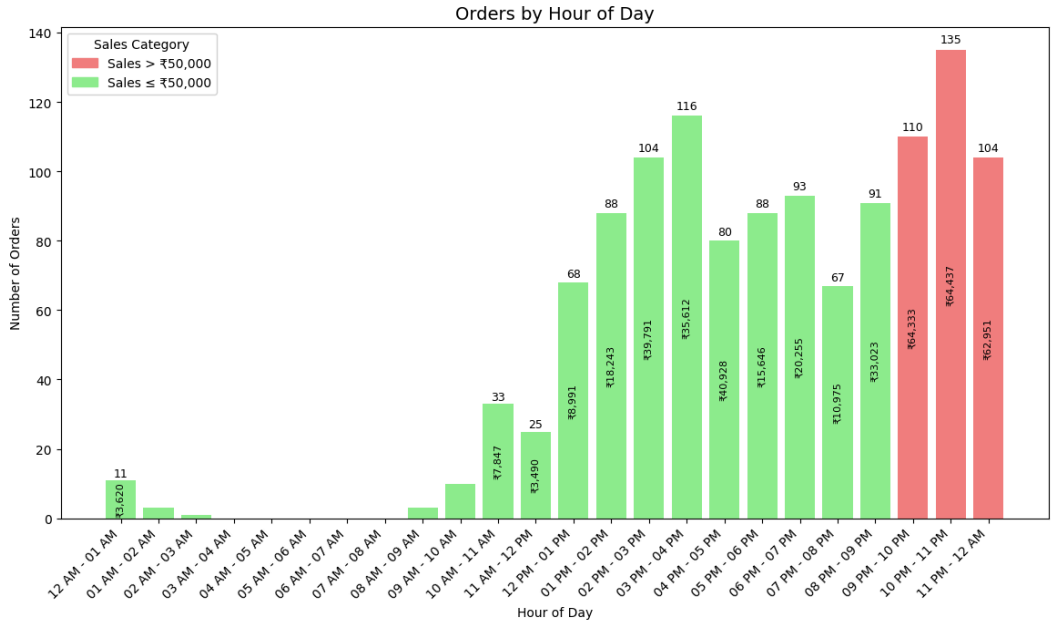
Picture 3 - Chart of No. of Order v/s Day of Week

This chart illustrates how customer orders and sales were distributed throughout the week at the restaurant. The analysis shows that **Friday** recorded the highest number of orders

(200) with total sales of **₹66,279**, indicating strong customer engagement as the weekend approached. **Sunday**, despite having slightly fewer orders (180), generated the highest sales value (**₹97,408**) — suggesting that customers tend to spend more on premium or family meals during weekends.

In contrast, **Monday** experienced the lowest activity (**156 orders, ₹32,930**), reflecting a clear drop in both footfall and spending after the weekend. Overall, the pattern reveals that mid-to-late week and weekends are the restaurant's most profitable periods. This insight can help optimize staffing levels, plan special weekend promotions, and manage inventory more efficiently during high-demand days.

3.2.2. Orders by Hour of the Day and Sales



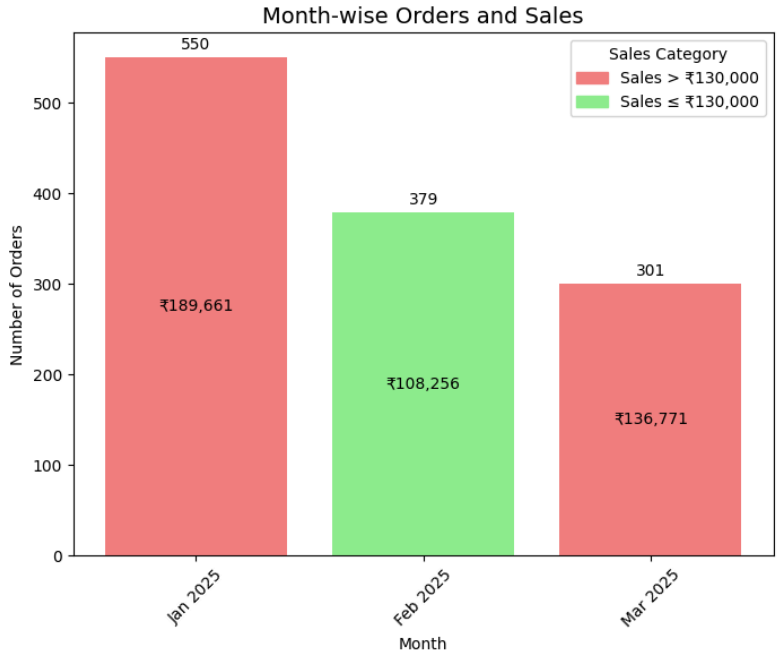
Picture 4-Chart of No. of Order v/s Hours of Day

The chart illustrates the distribution of customer orders by hour of the day. It reveals that sales activity remains minimal during the early morning hours, with almost no orders **before 10 AM.** Activity gradually increases through late morning and afternoon, reflecting a moderate lunch-time rush **between 12 PM and 4 PM**. This pattern suggests

that dine-in or takeaway orders tend to pick up closer to midday, aligning with typical meal hours.

However, the most significant surge in orders occurs during the late evening hours, peaking **between 10 PM–11 PM (135 orders, ₹64,437)** and **11 PM–12 AM (104 orders, ₹62,951)**. This strong concentration of sales during the night indicates that the restaurant primarily caters to late-night dining and delivery demand. Such insights highlight a potential opportunity to further optimize staffing, promotions, and kitchen operations during these high-demand periods while exploring strategies to boost engagement during low-activity hours.

3.2.3. Month-wise Orders and Sales



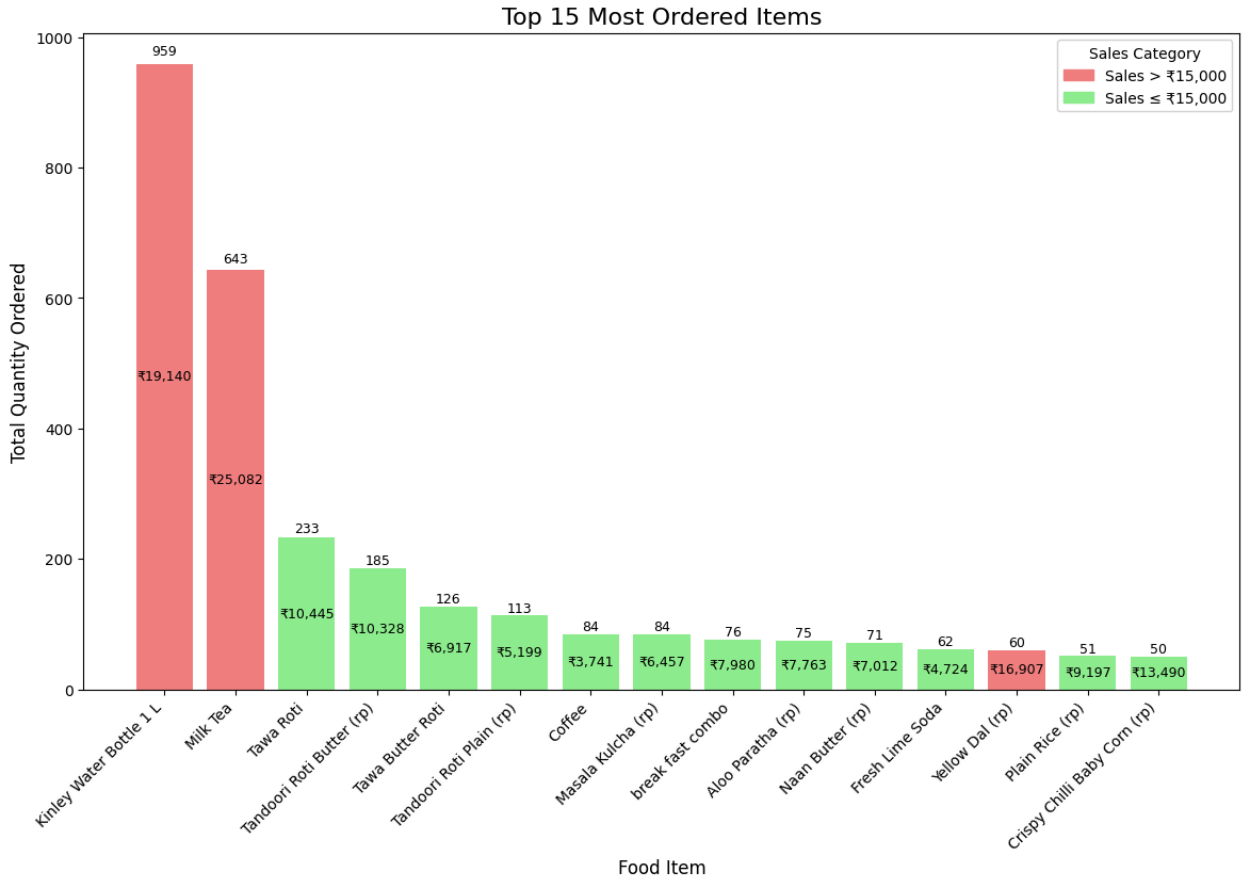
Picture 5 - Chart of No. of Order v/s Month

The chart presents the restaurant's month-wise performance across January, February, and March 2025, highlighting fluctuations in both order volume and total sales. January recorded the highest number of orders (550) and sales of ₹189,661, likely driven by

festive demand and increased customer footfall at the beginning of the year. This period represents a strong start, showcasing the restaurant's ability to attract a large customer base during peak seasons.

However, sales performance declined in February, with 379 orders generating ₹108,256, indicating a slowdown in customer activity. Interestingly, although March saw a further drop in total orders (301), the sales rose to ₹136,771, suggesting that customers placed higher-value or bulk orders. This pattern implies a shift from frequent, smaller transactions to fewer but more premium purchases. The insight highlights the restaurant's potential to capitalize on high-value customers and optimize marketing efforts to stabilize demand in lower-traffic months.

3.2.4. Top 15 Most Ordered Items and Sales



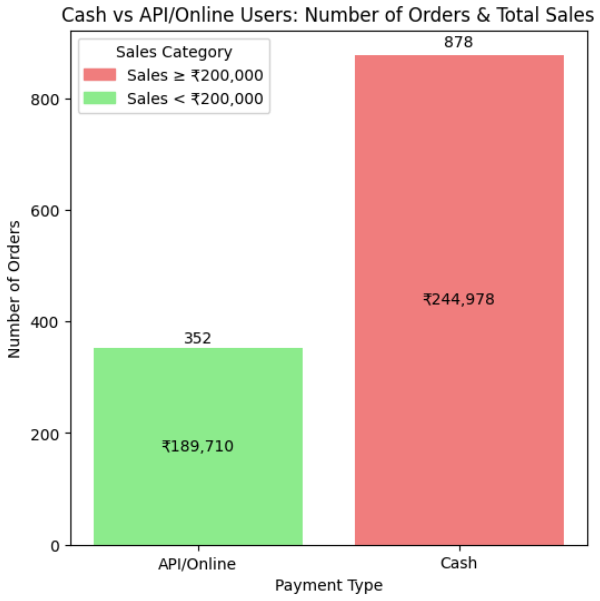
Picture 6 - Total Quantity Ordered v/s Food Item

The chart illustrates the Top 15 most ordered items at the restaurant, showcasing clear customer preferences and consumption behavior. Beverages lead the list, with Kinley Water Bottle (959 units) and Milk Tea (643 units) recording the highest sales volumes, indicating strong demand for low-cost, high-frequency items. This suggests that customers often purchase beverages as add-ons or essentials with meals, significantly contributing to total order counts and consistent revenue streams.

Among the food items, Tawa Roti (233 units), Tandoori Roti Butter (185 units), and Tawa Butter Roti (126 units) emerge as the most popular choices, confirming that traditional Indian breads are central to meal orders. Interestingly, although Yellow Dal (60 portions, ₹16,907) has lower quantity sales, its strong revenue contribution highlights its role as a high-value complementary dish.

Overall, the data indicates that simple, everyday menu items — especially rotis, teas, and water — dominate customer demand, while pairing strategies like "Dal + Roti" or "Tea + Snacks" could further optimize profitability and encourage higher basket sizes.

3.2.5. Cash vs API/Online Users and Sales



Picture 7 - Chart of No. of Order v/s Payment Type

This chart shows the preferred payment methods of customers. The majority of orders were made through cash (**878 orders, ₹244,978**), while online/API payments were much fewer (**352 orders, ₹189,710**). Even though online orders were almost half in number, their total sales value is still quite close to cash payments, which means online users tend to spend more per order. This highlights that while cash is still the most common payment method at the restaurant, online transactions are becoming valuable because of higher average spending.

All Charts: Charts

4. Interpretation of Results and Recommendation

4.1. Interpretation of Results

The analysis of restaurant performance for the period from January to March 2025 was carried out using Key Performance Indicator (KPI), Descriptive, and Time-Series analyses. The objective was to evaluate monthly sales trends, payment preferences, and operational patterns across both online (delivery/parcel) and offline (dine-in) channels.

The results indicate that offline dine-in orders form the major portion of total operations, whereas online orders remain negligible. During January, dine-in orders reached 544 compared to only 6 online orders. This was followed by 379 offline and 0 online orders in February, and 299 offline and 0 online orders in March. The data reflects a consistent dependence on dine-in services with limited digital ordering activity.

Time-based sales analysis revealed higher order volumes on Fridays and Sundays, suggesting increased group or family dining during weekends. Mondays recorded the lowest number of orders, representing potential opportunities for weekday promotional offers. Furthermore, the 10 PM–12 AM period showed the highest order frequency, while mornings displayed minimal activity, highlighting clear demand peaks.

From a monthly perspective, January registered the highest sales of ₹189,661 with 550 total orders. February witnessed a decline in both orders and revenue, reaching ₹108,256. However, March showed a stable revenue pattern despite fewer total orders, indicating a higher average order value and greater spending per visit.

Menu analysis indicated that beverages and staple items dominate customer preferences. The most frequently sold items were *Kinley Water Bottle (959 units)* and *Milk Tea (643 units)*, followed by *Tawa Roti*, *Butter Roti*, and *Dal* dishes. This demonstrates that the majority of orders are composed of repetitive, basic meal combinations rather than premium food items.

Payment analysis revealed that cash transactions (878 orders) were more common, yet online payments (352 orders) accounted for nearly the same total revenue of ₹189,710. This suggests that customers who pay digitally tend to spend more per order, representing an opportunity to encourage further digital adoption.

4.2. Recommendations

Based on the findings, the following strategic recommendations are proposed to improve sales performance, strengthen market presence, and enhance operational efficiency:

1. **Expand Online Presence with Promotional Discounts -**
    a. Partner with major food delivery platforms such as Swiggy and Zomato to reach a larger customer base.
    b. Introduce seasonal or festival-based offers to attract new users and boost online order volume.
    c. Provide exclusive discounts for first-time online users to encourage trial purchases.
    d. Launch limited-time promotional campaigns to convert dine-in customers into digital buyers.

2. **Leverage Influencer Marketing -**
    a. Collaborate with local food bloggers and social media influencers to increase brand awareness.
    b. Offer personalized coupon codes or discount vouchers for their followers.
    c. Track coupon redemptions to measure campaign success and customer conversion.
    d. Encourage influencers to share authentic dining experiences, strengthening brand trust.

3. **Introduce Weekend Promotions and Family Combos -**
    a. Utilize the insight that Fridays and Sundays show the highest sales and customer traffic.
    b. Introduce weekend meal combos, family platters, and group discounts to attract larger gatherings.
    c. Provide combo meal options that offer better value and convenience for customers.
    d. Strengthen customer loyalty by making weekends a signature attraction for the restaurant.

4. **Increase Digital Content and Online Engagement -**
    a. Create engaging social media content showcasing signature dishes and special events.
    b. Share behind-the-scenes videos, customer testimonials, and chef features to humanize the brand.
    c. Encourage customers to share reviews and tag the restaurant for organic reach.
    d. Maintain consistent posting schedules to keep the restaurant visible and relevant online.

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5. **Highlight High-Margin Menu Combinations -**
    a. Promote profitable meal pairings such as Dal with Rotis or Tea with Snacks.
    b. Display these combinations prominently on menus, in-store boards, and online platforms.
    c. Use suggestive selling techniques to encourage customers to add sides or beverages.

d. Focus on upselling items with higher margins to increase the overall Average Order Value (AOV).

6. **Utilize Off-Peak Hours for New Offerings -**
    a. Introduce breakfast or light meal options during low-traffic hours (9 AM–12 PM).
    b. Provide limited-time discounts to attract early diners and office-goers.
    c. Develop quick-serve combos or takeaway options for convenience during morning hours.
    d. Improve kitchen utilization and daily sales balance by spreading demand throughout the day.

5. Presentation and Legibility of the Report

The report showcases a professional structure with clear sections, insightful visuals, and concise content. Visual elements like charts and graphs enhance data interpretation, while the narrative is logically organized. The inclusion of relevant citations adds credibility to the analysis. The report's digital compatibility ensures seamless access, while its readability and user-friendly design contribute to its effectiveness in conveying valuable insights.