In [9]:

```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

# Load the data
df = pd.read_csv("credit_control_analysis_1000rows.csv")

# Convert date columns
df["Invoice_Date"] = pd.to_datetime(df["Invoice_Date"])
df["Due_Date"] = pd.to_datetime(df["Due_Date"])
df["Payment_Date"] = pd.to_datetime(df["Payment_Date"])

# Create additional fields
df["Month"] = df["Invoice_Date"].dt.to_period("M")
df["Overdue_Amount"] = df["Invoice_Amount"] - df["Paid_Amount"]
df["Aging_Bucket"] = pd.cut(
    df["Overdue_Days"],
    bins=[-1, 30, 60, 90, 9999],
    labels=["0-30 Days", "31-60 Days", "61-90 Days", "90+ Days"]
)

# Set seaborn style
sns.set(style="whitegrid")

# --------------------------
# 📌 1. Summary Report
# --------------------------
print("\n====== 📌 CREDIT CONTROL SUMMARY REPORT ======\n")
print(f"📌 Total Invoices: {len(df)}")
print(f"📌 Total Invoice Amount: ₹{df['Invoice_Amount'].sum():,.2f}")
print(f"📌 Total Paid Amount: ₹{df['Paid_Amount'].sum():,.2f}")
print(f"📌 Total Overdue Amount: ₹{df['Overdue_Amount'].sum():,.2f}")
print(f"📌 Avg Overdue Days: {df['Overdue_Days'].mean():.2f}")
print("\n📌 Top 5 Companies with Highest Overdue Amount:")
print(df.groupby("Company_Name")["Overdue_Amount"].sum().sort_values(ascending
print("\n📌 Monthly Collection Summary:")
print(df.groupby("Month")[["Invoice_Amount", "Paid_Amount"]].sum())

# --------------------------
# 📌 Helper: Add labels
# --------------------------
def add_labels(ax):
    for container in ax.containers:
        ax.bar_label(container, fmt='%.0f', label_type='edge', fontsize=8)

# --------------------------
# 📌 2. Invoice Status Distribution
# --------------------------
plt.figure(figsize=(6, 4))
ax = sns.countplot(data=df, x="Status", hue="Status", palette="Set2", legend=F
plt.title("Invoice Status Distribution")
add_labels(ax)
plt.tight_layout()
```

```
plt.show()

# --------------------------
# 📌 3. Invoice vs Paid Amount by Company
# --------------------------
top_companies = df.groupby("Company_Name")[["Invoice_Amount", "Paid_Amount"]]
    .sum().sort_values("Invoice_Amount", ascending=False).head(10)

ax = top_companies.plot(kind='bar', figsize=(10, 6))
plt.title("Invoice vs Paid Amount by Company")
plt.ylabel("Amount (INR)")
plt.xticks(rotation=45)
for container in ax.containers:
    ax.bar_label(container, fmt='%.0f', fontsize=8)
plt.tight_layout()
plt.show()

# --------------------------
# 📌 4. Overdue Aging Bucket
# --------------------------
plt.figure(figsize=(8, 4))
ax = sns.countplot(
    data=df[df["Status"] == "Overdue"],
    x="Aging_Bucket",
    hue="Aging_Bucket",
    palette="coolwarm",
    legend=False
)
plt.title("Overdue Invoices by Aging Bucket")
add_labels(ax)
plt.tight_layout()
plt.show()

# --------------------------
# 📌 5. Monthly Collection Trend
# --------------------------
monthly = df.groupby("Month")[["Invoice_Amount", "Paid_Amount"]].sum().reset_i
monthly["Month"] = monthly["Month"].astype(str)

plt.figure(figsize=(10, 6))
sns.lineplot(data=monthly, x="Month", y="Invoice_Amount", marker="o", label="I
sns.lineplot(data=monthly, x="Month", y="Paid_Amount", marker="o", label="Paid
plt.title("Monthly Collection Trend")
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()

# --------------------------
# 📌 6. Top 10 Overdue Customers
# --------------------------
top_overdue = df[df["Status"] == "Overdue"].groupby("Company_Name")["Overdue_A
    .sum().sort_values(ascending=False).head(10)
```

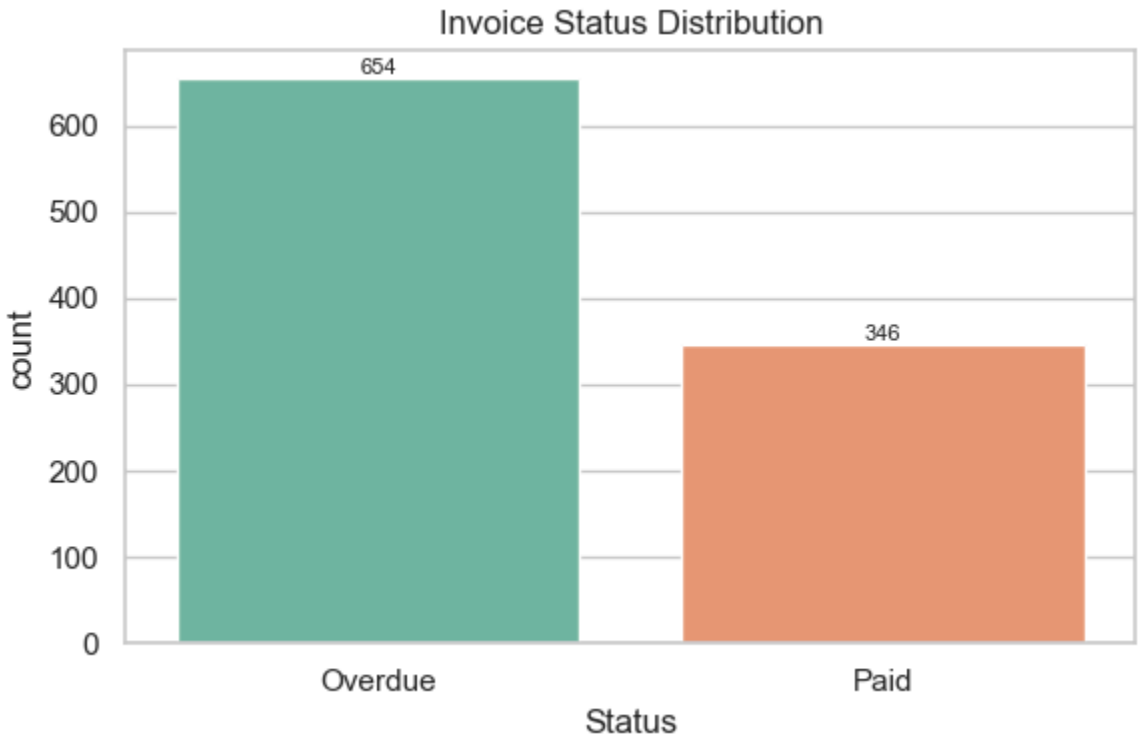
```python
ax = top_overdue.plot(kind='bar', figsize=(10, 5), color="darkorange")
plt.title("Top 10 Companies with Overdue Amounts")
plt.ylabel("Overdue Amount (INR)")
plt.xticks(rotation=45)
for container in ax.containers:
    ax.bar_label(container, fmt='%.0f', fontsize=8)
plt.tight_layout()
plt.show()

# --------------------------
# 📌 7. Payment Delay Distribution
# --------------------------
plt.figure(figsize=(8, 4))
sns.histplot(df["Overdue_Days"], bins=30, kde=True, color="purple")
plt.title("Distribution of Overdue Days")
plt.xlabel("Overdue Days")
plt.tight_layout()
plt.show()

# --------------------------
# 📌 8. Average Delay by Company
# --------------------------
avg_delay = df.groupby("Company_Name")["Overdue_Days"] \
    .mean().sort_values(ascending=False).head(10)

ax = avg_delay.plot(kind='barh', figsize=(10, 6), color='teal')
plt.title("Top 10 Companies by Average Payment Delay")
plt.xlabel("Average Overdue Days")
plt.gca().invert_yaxis()
for container in ax.containers:
    ax.bar_label(container, fmt='%.1f', fontsize=8)
plt.tight_layout()
plt.show()
```

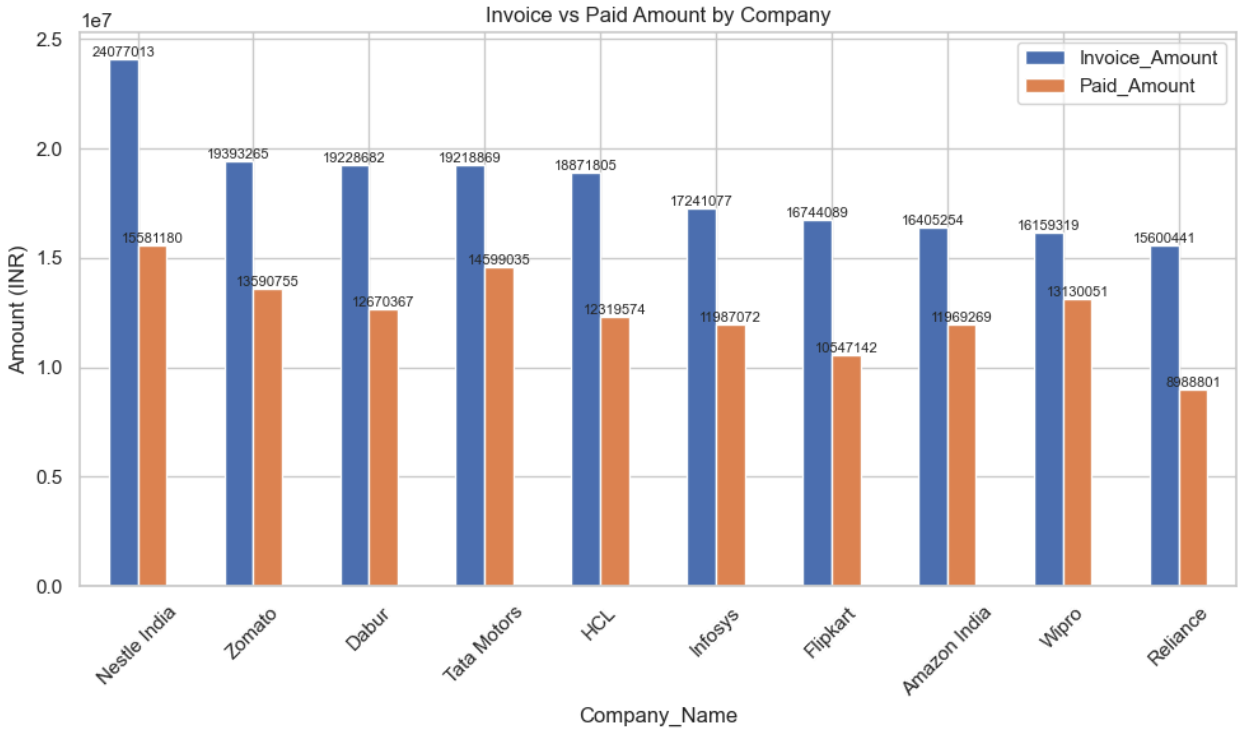
====== 📌 CREDIT CONTROL SUMMARY REPORT ======

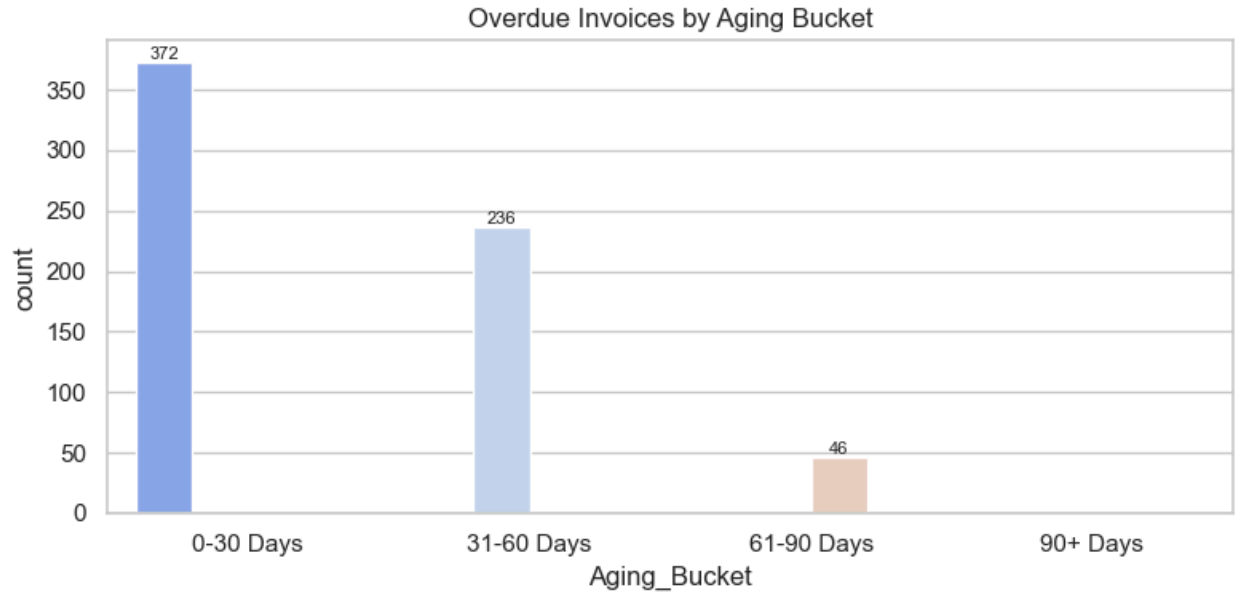
📌 Total Invoices: 1000
📌 Total Invoice Amount: ₹254,570,826.50
📌 Total Paid Amount: ₹172,528,368.02
📌 Total Overdue Amount: ₹82,042,458.48
📌 Avg Overdue Days: 19.14

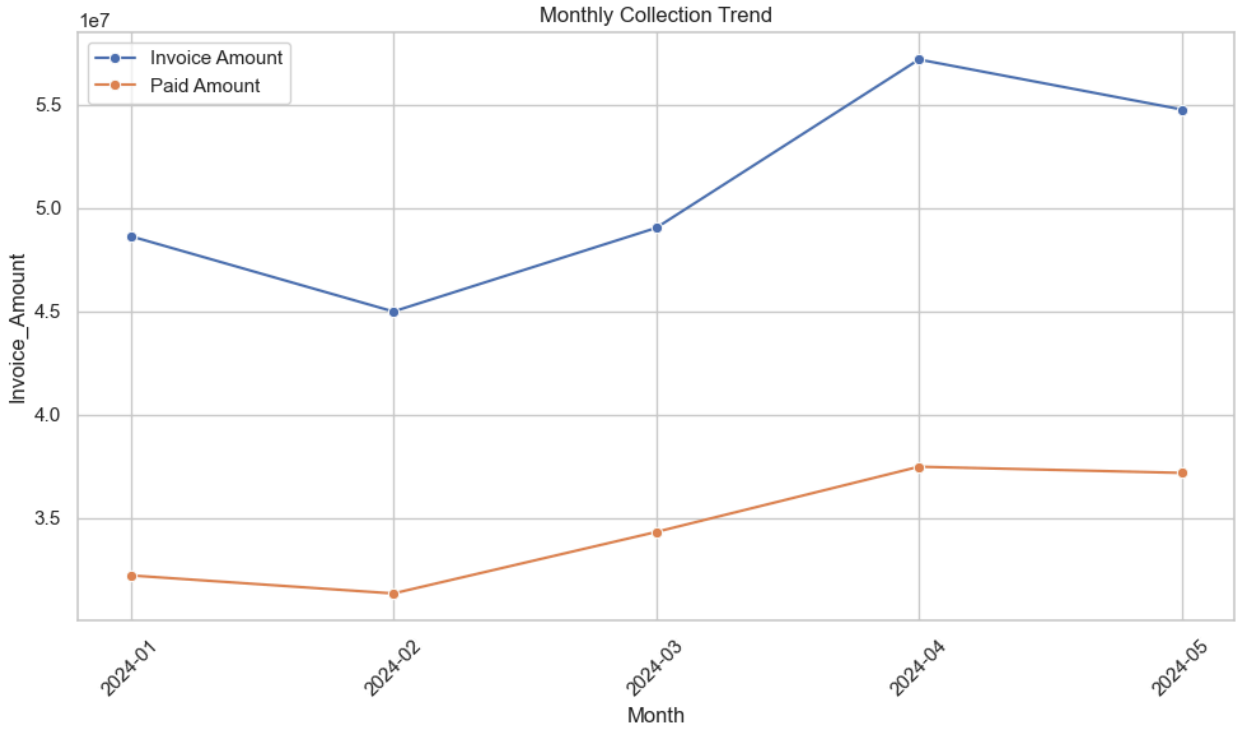
📌 Top 5 Companies with Highest Overdue Amount:
Company_Name
Nestle India   8495833.21
Reliance   6611639.26
Dabur   6558314.27
HCL   6552231.54
Flipkart   6196947.37
Name: Overdue_Amount, dtype: float64

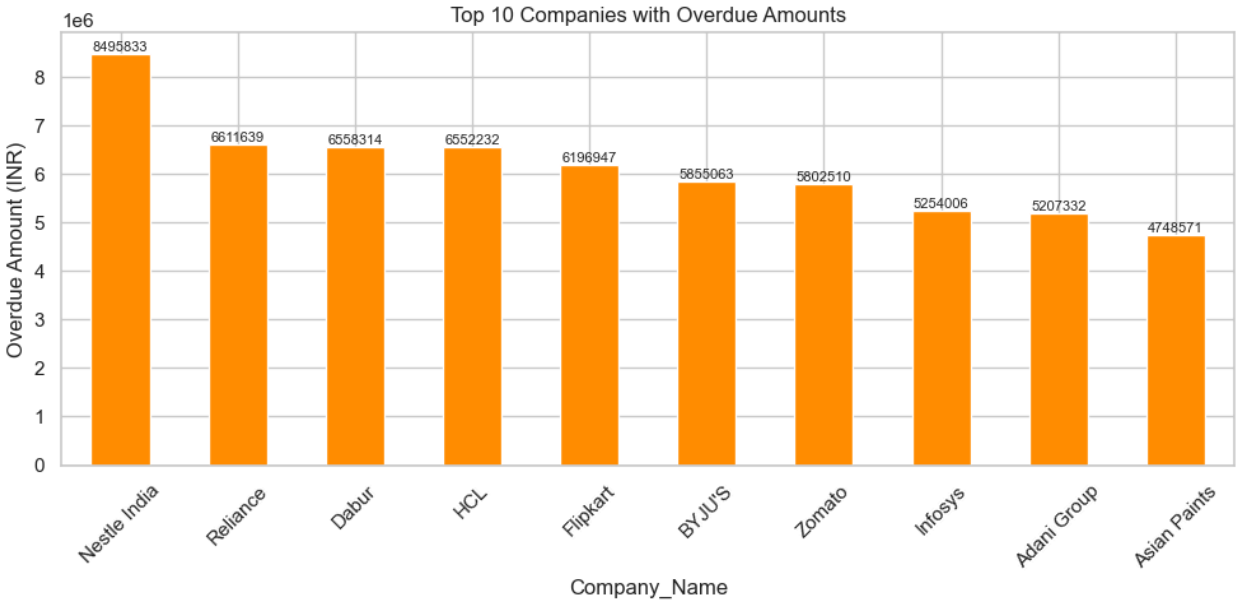
📌 Monthly Collection Summary:
         Invoice_Amount Paid_Amount
Month
2024-01   48627001.64 32216215.20
2024-02   44982961.73 31343150.89
2024-03   49028275.36 34318153.26
2024-04   57175103.37 37474756.63
2024-05   54757484.40 37176092.04

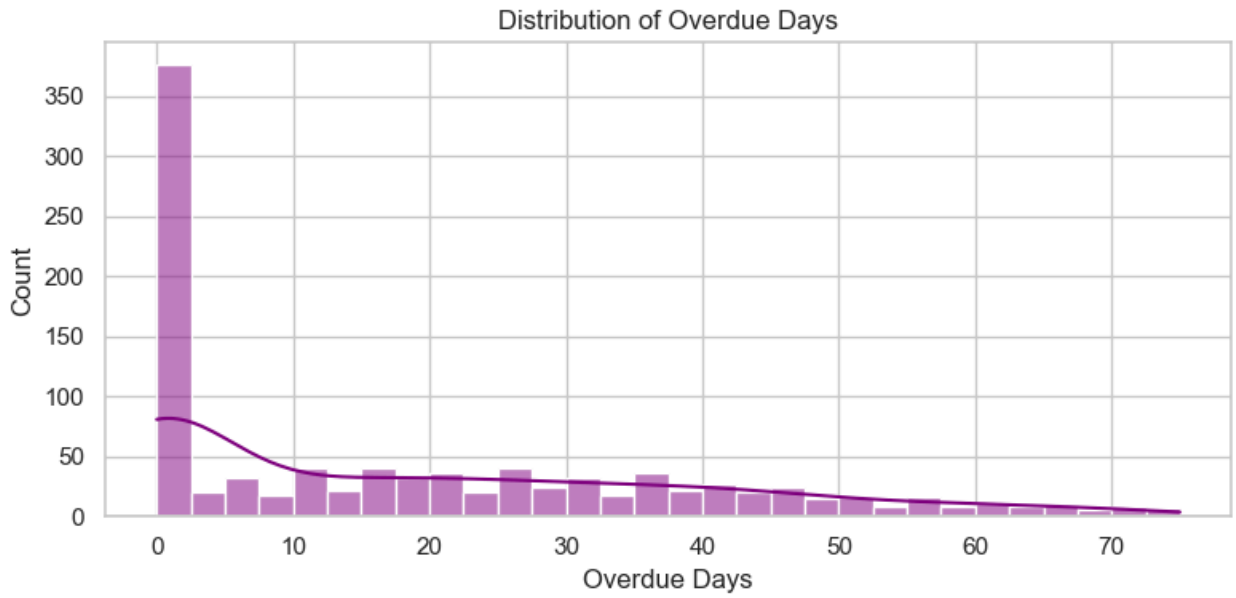


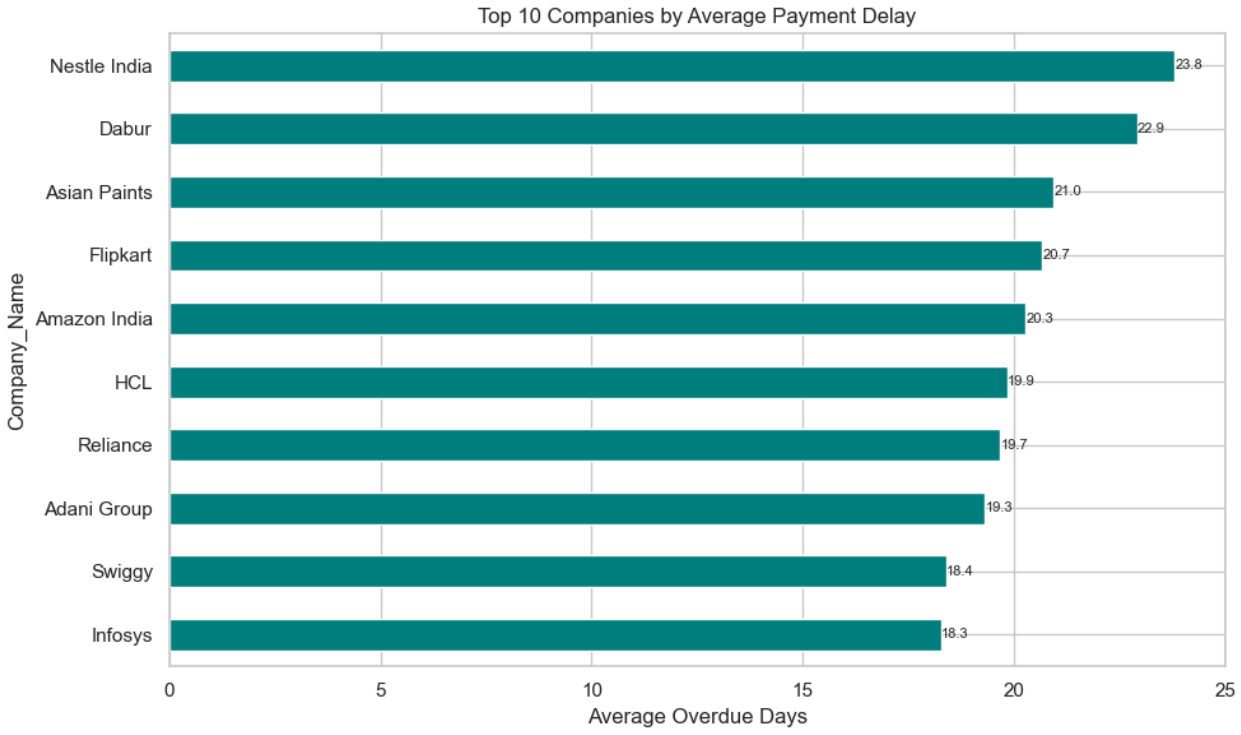

Invoice vs Paid Amount by Company
1e7
2.5
2.0
1.5
1.0
0.5
0.0
Amount (INR)
Invoice_Amount
Paid_Amount
24077013
15581180
19393265
13590755
19228682
12670367
19218869
14599035
18871805
12319574
17241077
11987072
16744089
10547142
16405254
11969269
16159319
13130051
15600441
8988801
Nestle India
Zomato
Dabur
Tata Motors
HCL
Infosys
Flipkart
Amazon India
Wipro
Reliance
Company_Name


Overdue Invoices by Aging Bucket
count
350
300
250
200
150
100
50
0
372
236
46
0-30 Days
31-60 Days
61-90 Days
90+ Days
Aging_Bucket


Monthly Collection Trend
1e7
Invoice Amount
Paid Amount
5.5
5.0
4.5
4.0
3.5
Invoice_Amount
2024-01
2024-02
2024-03
2024-04
2024-05
Month


Top 10 Companies with Overdue Amounts
1e6
8495833
6611639
6558314
6552232
6196947
5855063
5802510
5254006
5207332
4748571
8
7
6
5
4
3
2
1
0
Overdue Amount (INR)
Nestle India
Reliance
Dabur
HCL
Flipkart
BYJUS
Zomato
Infosys
Adani Group
Asian Paints
Company_Name


Distribution of Overdue Days
Count
Overdue Days
0
50
100
150
200
250
300
350
0
10
20
30
40
50
60
70


Top 10 Companies by Average Payment Delay
Company_Name
Average Overdue Days
Nestle India
Dabur
Asian Paints
Flipkart
Amazon India
HCL
Reliance
Adani Group
Swiggy
Infosys
23.8
22.9
21.0
20.7
20.3
19.9
19.7
19.3
18.4
18.3
0
5
10
15
20
25

In [ ]: