In [3]:

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

# Load CSV
df = pd.read_csv("Retail Sales Analysis_utf.csv")

# Preview
df.head()
```

Out[3]:

	transactions_id	sale_date	sale_time	customer_id	gender	age	category	quantiy
0	180	2022-11-05	10:47:00	117	Male	41.0	Clothing	3.0
1	522	2022-07-09	11:00:00	52	Male	46.0	Beauty	3.0
2	559	2022-12-12	10:48:00	5	Female	40.0	Clothing	4.0
3	1180	2022-01-06	08:53:00	85	Male	41.0	Clothing	3.0
4	1522	2022-11-14	08:35:00	48	Male	46.0	Beauty	3.0

In [ ]:

```
#----------------------Basic Exploration
```

In [27]:

```
df.info()           # Data types & missing values
df.describe()       # Summary statistics
df.isnull().sum()   # Missing value count
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2000 entries, 0 to 1999
Data columns (total 11 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   transactions_id  2000 non-null   int64  
 1   sale_date        2000 non-null   object 
 2   sale_time        2000 non-null   object 
 3   customer_id      2000 non-null   int64  
 4   gender           2000 non-null   object 
 5   age              1990 non-null   float64
 6   category         2000 non-null   object 
 7   quantiy          1997 non-null   float64
 8   price_per_unit   1997 non-null   float64
 9   cogs             1997 non-null   float64
 10  total_sale       1997 non-null   float64
dtypes: float64(5), int64(2), object(4)
memory usage: 172.0+ KB
```

```
Out[27]: transactions_id     0
         sale_date           0
         sale_time           0
         customer_id         0
         gender              0
         age                10
         category            0
         quantiy             3
         price_per_unit      3
         cogs                3
         total_sale          3
         dtype: int64
```

```
In [29]: # Fill missing categorical with "NA"
         cat_cols = df.select_dtypes(include=['object']).columns
         df[cat_cols] = df[cat_cols].fillna("NA")

         # Fill missing numeric with median
         num_cols = df.select_dtypes(include=['number']).columns
         df[num_cols] = df[num_cols].fillna(df[num_cols].median())
```

```
In [31]: df.isnull().sum()  # Missing value count
```

```
Out[31]: transactions_id    0
         sale_date          0
         sale_time          0
         customer_id        0
         gender             0
         age                0
         category           0
         quantiy            0
         price_per_unit     0
         cogs               0
         total_sale         0
         dtype: int64
```

```
In [ ]: #----------------Basic KPIs
```

```
In [41]: # Total Sales
         total_sales = df['total_sale'].sum()

         print(total_sales)

        912170.0
```

```
In [45]: revenue_per_category=df.groupby('category')['total_sale'].sum().reset_index()
         print(revenue_per_category)

              category  total_sale
        0       Beauty    287140.0
        1     Clothing    311220.0
        2  Electronics    313810.0
```

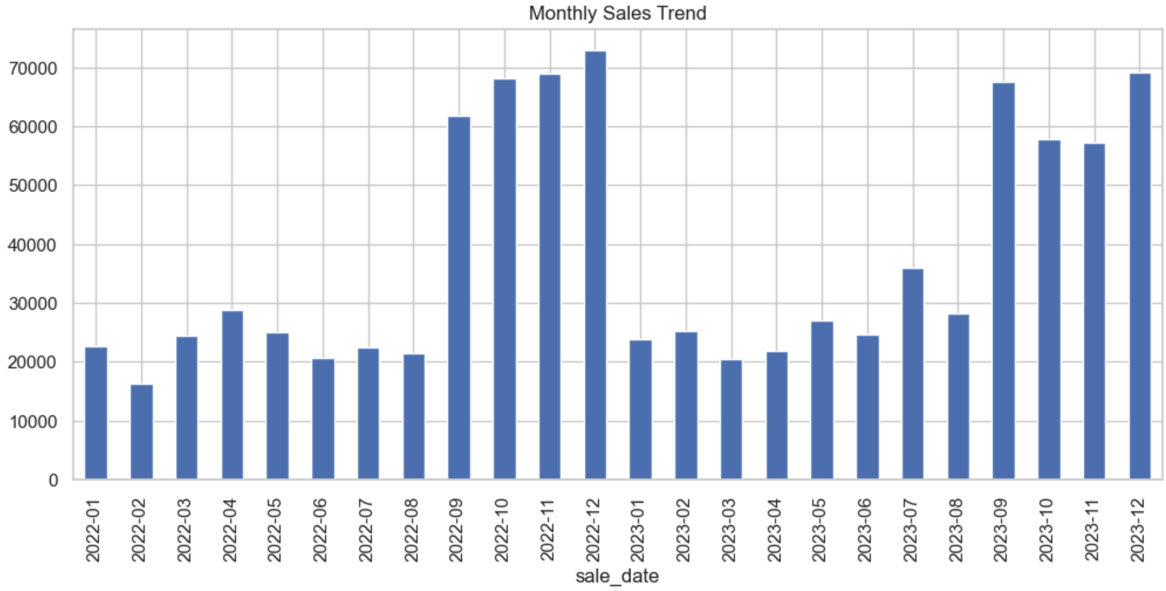
```
In [49]: # Average Order Value
         avg_order_value=df['total_sale'].mean()
         print(avg_order_value)

        456.085
```

In [51]:

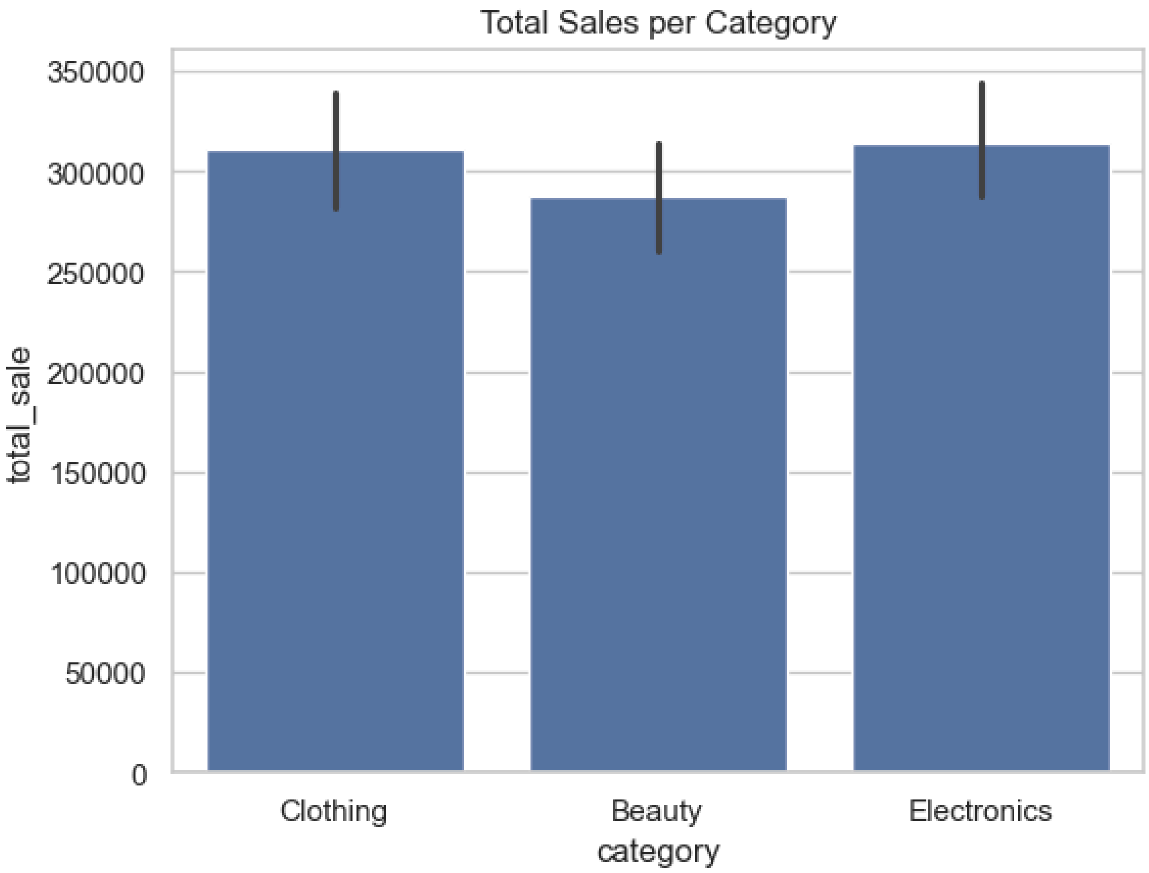
```
# ---------Sales Trends & Seasonality
# Convert sale_date to datetime
df['sale_date'] = pd.to_datetime(df['sale_date'])

# Monthly sales trend
monthly_sales = df.groupby(df['sale_date'].dt.to_period('M'))['total_sale'].sum(
monthly_sales.plot(kind='bar', figsize=(12,5))
plt.title("Monthly Sales Trend")
plt.show()
```

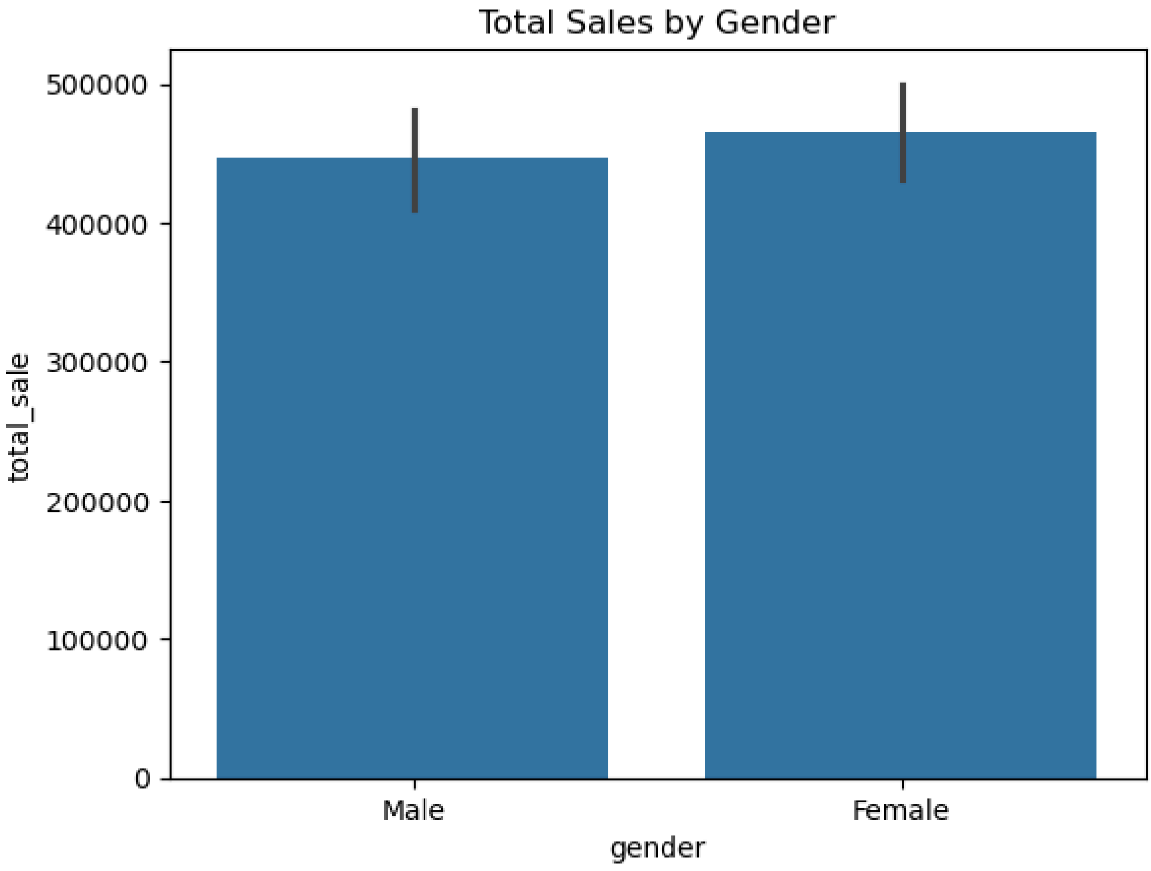


In [53]:

```
#----------Category-wise Analysis
sns.barplot(x='category', y='total_sale', data=df, estimator=sum)
plt.title("Total Sales per Category")
plt.show()
```

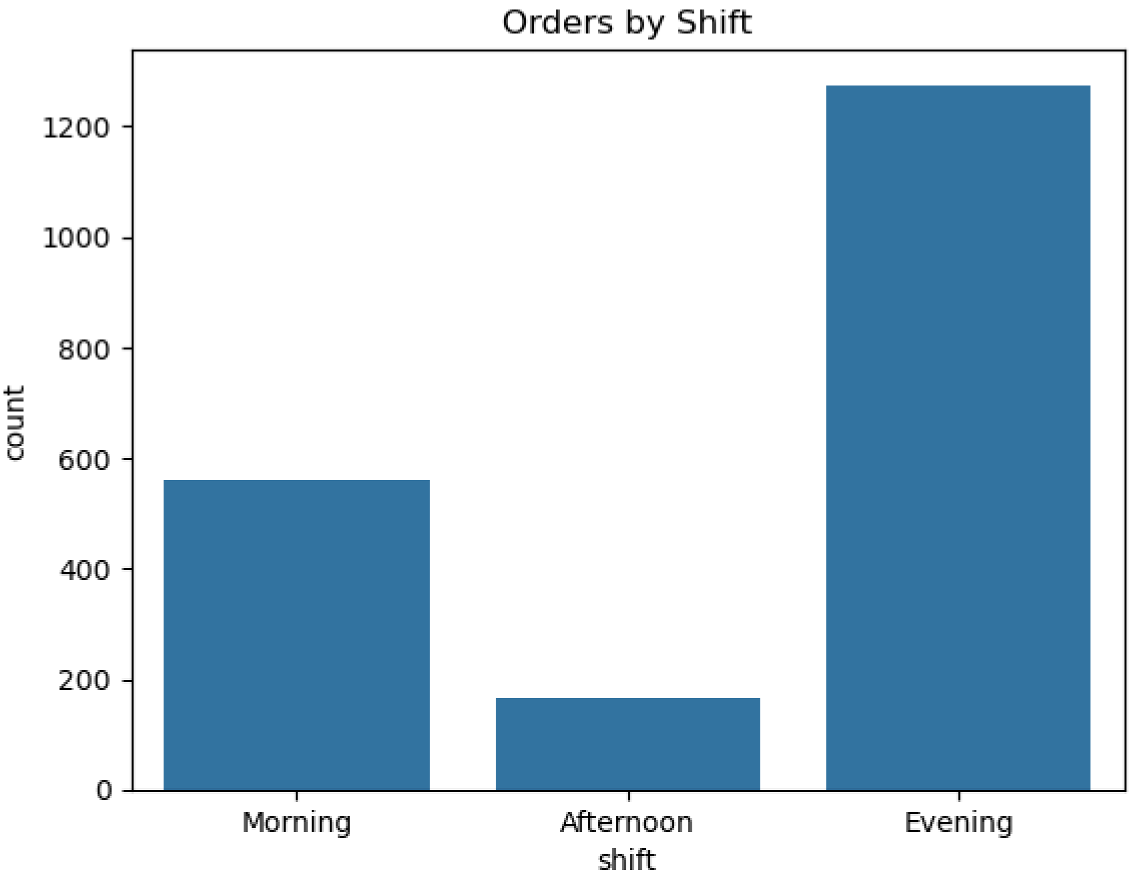


```
In [5]: #------Gender-based Sales
sns.barplot(x='gender', y='total_sale', data=df, estimator=sum)
plt.title("Total Sales by Gender")
plt.show()
```



```
In [7]: #------------------------- Time of Day (Shift) Analysis
        # Create shift column
        df['hour'] = pd.to_datetime(df['sale_time'], format='%H:%M:%S').dt.hour
        df['shift'] = pd.cut(df['hour'], bins=[0,12,17,24], labels=['Morning','Afternoon

        sns.countplot(x='shift', data=df)
        plt.title("Orders by Shift")
        plt.show()
```



```
In [ ]:
```