In [1]:
```
import pandas as pd
```

In [2]:
```
import numpy as np
```

In [24]:
```
import matplotlib.pyplot as plt
```

In [25]:
```
import seaborn as sb
```

In [5]:
```
decade_spending = pd.read_csv("C:/Users/SAI/OneDrive/Desktop/Data Science/my experiment
```

In [ ]:
```
```

In [7]:
```
print("Last 10 years spendings")
print(decade_spending.info())
```

```
Last 10 years spendings
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 13 entries, 0 to 12
Data columns (total 10 columns):
 #   Column              Non-Null Count  Dtype
---  ------              --------------  -----
 0   Year                13 non-null     int64
 1   PercentCelebrating  13 non-null     int64
 2   PerPerson           13 non-null     float64
 3   Candy               13 non-null     float64
 4   Flowers             13 non-null     float64
 5   Jewelry             13 non-null     float64
 6   GreetingCards       13 non-null     float64
 7   EveningOut          13 non-null     float64
 8   Clothing            13 non-null     float64
 9   GiftCards           13 non-null     float64
dtypes: float64(8), int64(2)
memory usage: 1.1 KB
None
```

In [8]:
```
print(decade_spending.head())
```

```
   Year  PercentCelebrating  PerPerson  Candy  Flowers  Jewelry  \
0  2010                  60     103.00   8.60    12.33    21.52
1  2011                  58     116.21  10.75    12.62    26.18
2  2012                  59     126.03  10.85    13.49    29.60
3  2013                  60     130.97  11.64    13.48    30.94
4  2014                  54     133.91  10.80    15.00    30.58

   GreetingCards  EveningOut  Clothing  GiftCards
0           5.91       23.76     10.93       8.42
1           8.09       24.86     12.00      11.21
2           6.93       25.66     10.42       8.43
3           8.32       27.93     11.46      10.23
4           7.97       27.48     13.37       9.00
```

In [14]:
```
gender_wise=pd.read_csv("C:/Users/SAI/OneDrive/Desktop/Data Science/my experiments/vale
```

In [15]:
```
print("gender vise gifts:-")
print(gender_wise.head())
```

```
gender vise gifts:-
  Gender  SpendingCelebrating  Candy  Flowers  Jewelry  GreetingCards  \
0    Men                  27     52       56       30             37
1  Women                  27     59       19       14             43

   EveningOut  Clothing  GiftCards
0          33        20         18
1          29        24         24
```

In [16]:
```
age_wise=pd.read_csv("C:/Users//SAI/OneDrive/Desktop/Data Science/my experiments/valent
```

In [17]:
```
print(age_wise)
```

```
     Age  SpendingCelebrating  Candy  Flowers  Jewelry  GreetingCards  \
0  18-24                   51     70       50       33             33
1  25-34                   40     62       44       34             33
2  35-44                   31     58       41       29             42
3  45-54                   19     60       37       20             42
4  55-64                   18     50       32       13             43
5    65+                   13     42       25        8             44

   EveningOut  Clothing  GiftCards
0          41        33         23
1          37        27         19
2          30        26         22
3          31        20         23
4          29        19         20
5          24        12         20
```

In [18]:
```
print(decade_spending.isnull().sum())
```

```
Year                 0
PercentCelebrating   0
PerPerson            0
Candy                0
Flowers              0
Jewelry              0
GreetingCards        0
EveningOut           0
Clothing             0
GiftCards            0
dtype: int64
```

In [19]:
```
decade_spending.rename(columns={'PerPerson': 'PerPersonSpending'}, inplace=True)
```

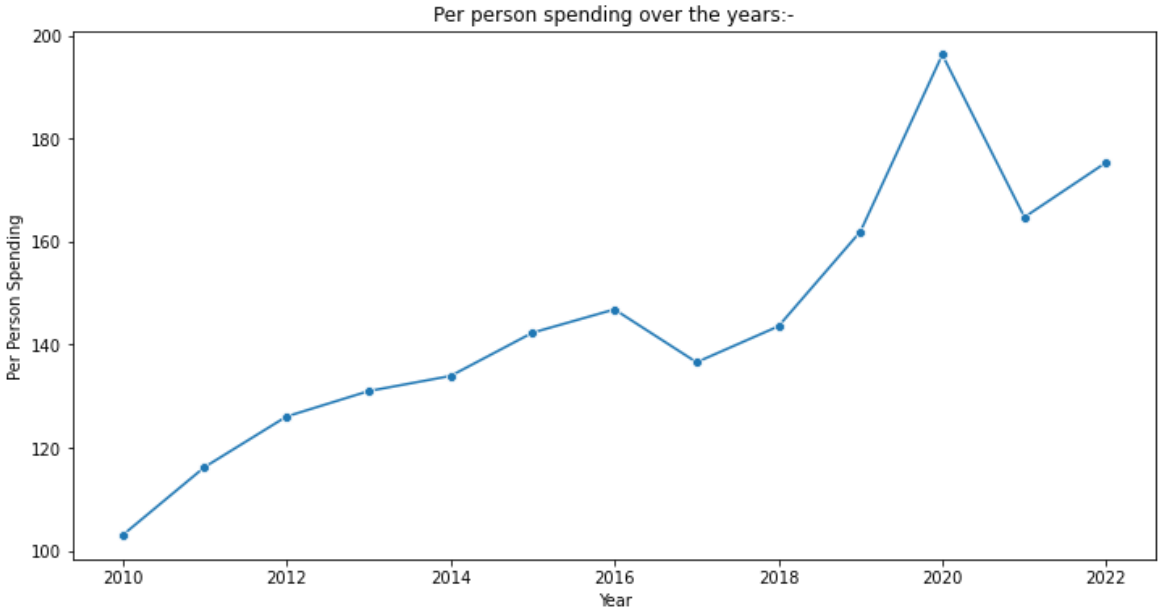
In [21]:
```
decade_spending['Year'] = pd.to_datetime(decade_spending['Year'], format='%Y')
```

In [22]:
```
decade_statistics = decade_spending.describe()
```

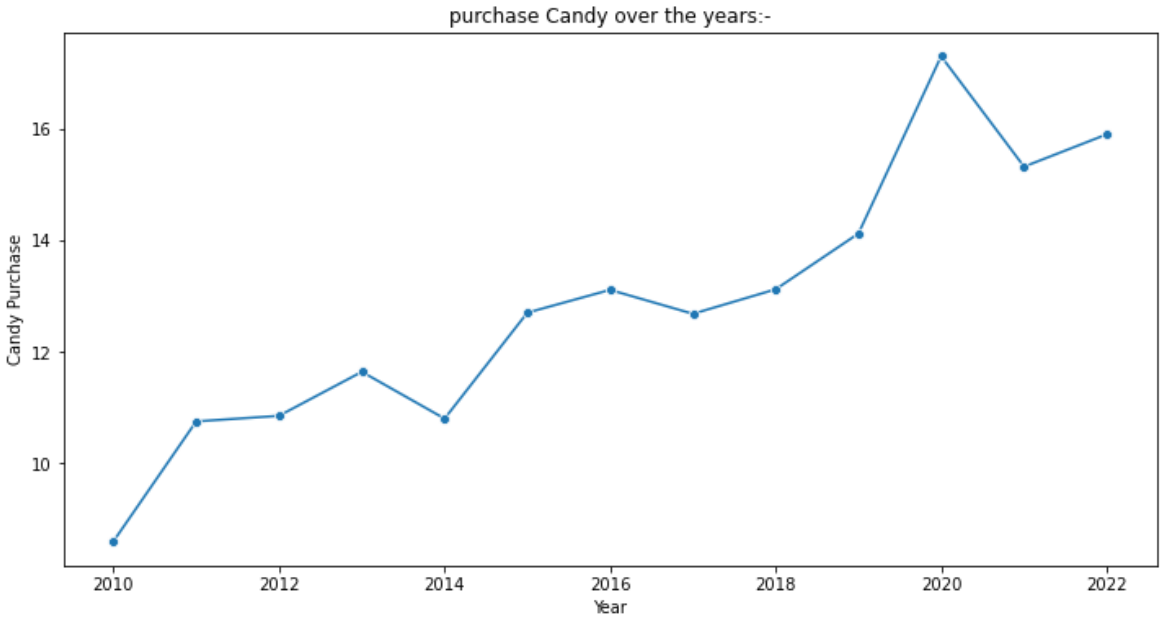
In [23]:
```
print("\nSummary Statistics for decade Spending:")
print(decade_statistics)
```

```
Summary Statistics for decade Spending:
       PercentCelebrating  PerPersonSpending      Candy    Flowers    Jewelry  \
count           13.000000          13.000000  13.000000  13.000000  13.000000
mean            55.461538         144.449231  12.837692  14.653077  32.546154
std              2.933013          25.146163   2.400483   1.351261   6.188459
min             51.000000         103.000000   8.600000  12.330000  21.520000
25%             54.000000         130.970000  10.850000  13.490000  30.340000
50%             55.000000         142.310000  12.700000  14.780000  30.940000
75%             58.000000         161.960000  14.120000  15.420000  34.100000
max             60.000000         196.310000  17.300000  16.710000  45.750000

       GreetingCards  EveningOut   Clothing  GiftCards
count      13.000000   13.000000  13.000000  13.000000
mean        7.676154   27.467692  14.935385  11.503077
std         0.869286    3.217966   3.701526   2.720188
min         5.910000   21.390000  10.420000   8.420000
25%         7.310000   25.660000  12.000000  10.230000
50%         7.870000   27.480000  14.040000  11.040000
75%         8.320000   28.460000  16.080000  12.520000
max         9.010000   33.460000  21.460000  17.220000
```

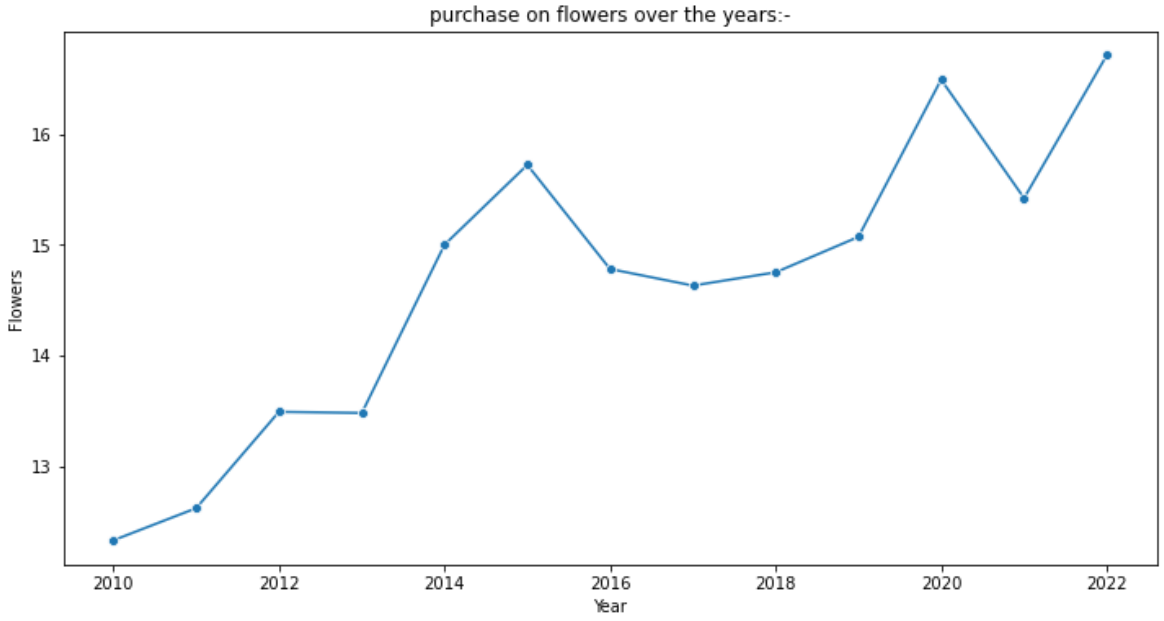
In [32]:
```
plt.figure(figsize=(12,6))
sb.lineplot(data=decade_spending, x= 'Year', y='PerPersonSpending',marker='o')
plt.title('Per person spending over the years:-')
plt.xlabel('Year')
plt.ylabel('Per Person Spending')
plt.show()
```



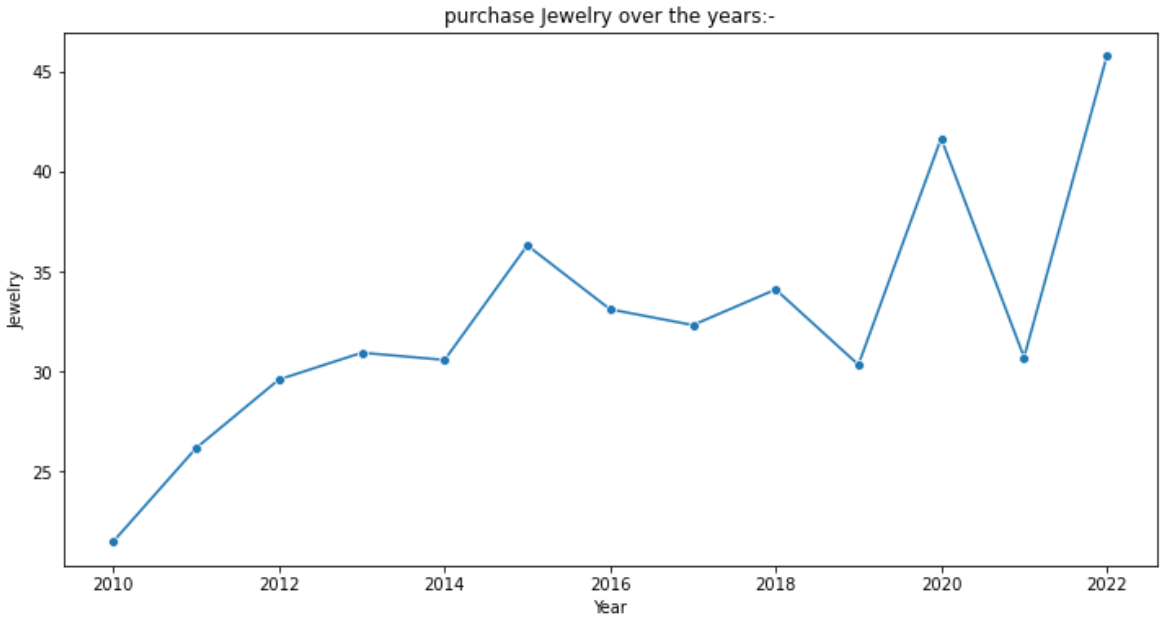
In [33]:
```
plt.figure(figsize=(12,6))
sb.lineplot(data=decade_spending, x= 'Year', y='Candy',marker='o')
plt.title('purchase Candy over the years:-')
plt.xlabel('Year')
plt.ylabel('Candy Purchase')
plt.show()
```



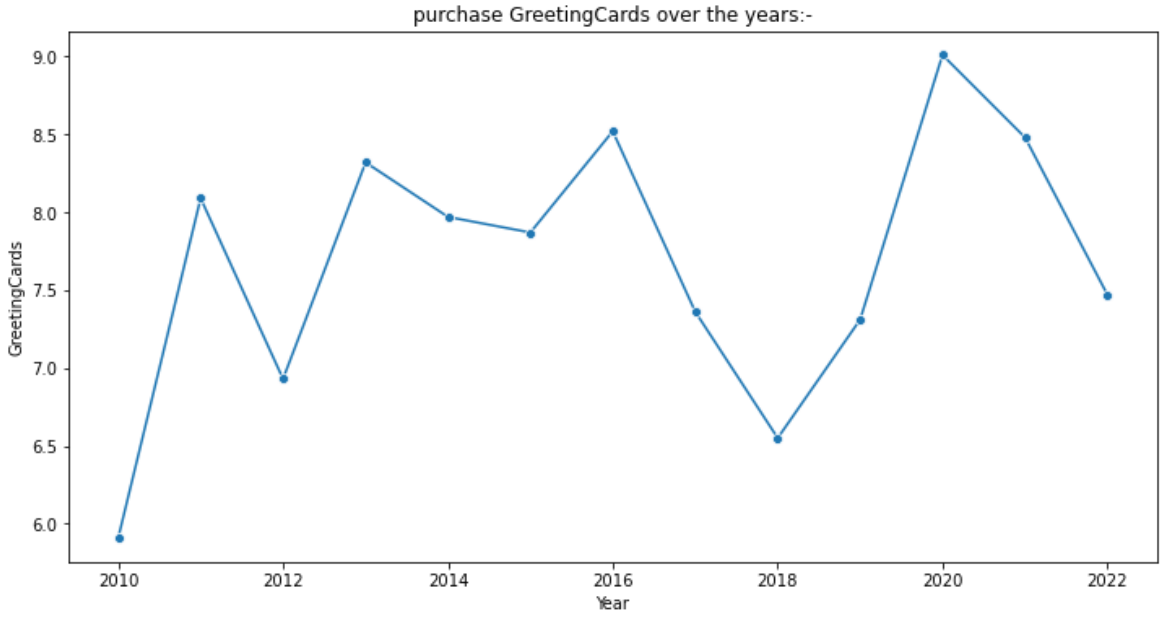
In [34]:
```
plt.figure(figsize=(12,6))
sb.lineplot(data=decade_spending, x= 'Year', y='Flowers',marker='o')
plt.title('purchase on flowers over the years:-')
plt.xlabel('Year')
plt.ylabel('Flowers')
plt.show()
```



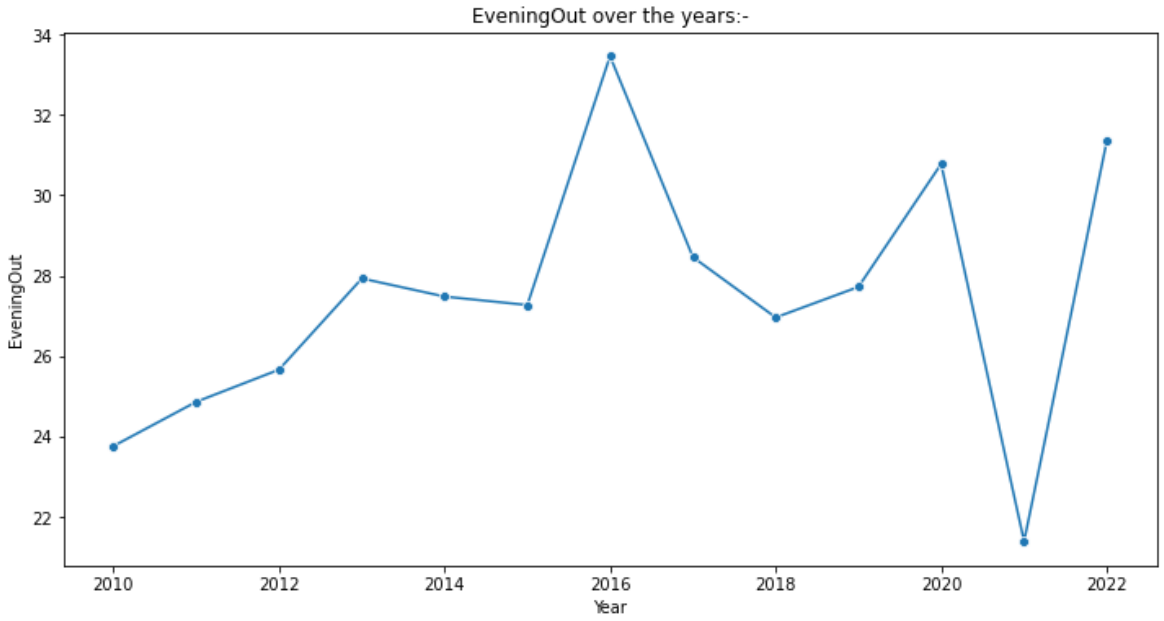
In [35]:
```
plt.figure(figsize=(12,6))
sb.lineplot(data=decade_spending, x= 'Year', y='Jewelry',marker='o')
plt.title('purchase Jewelry over the years:-')
plt.xlabel('Year')
plt.ylabel('Jewelry')
plt.show()
```



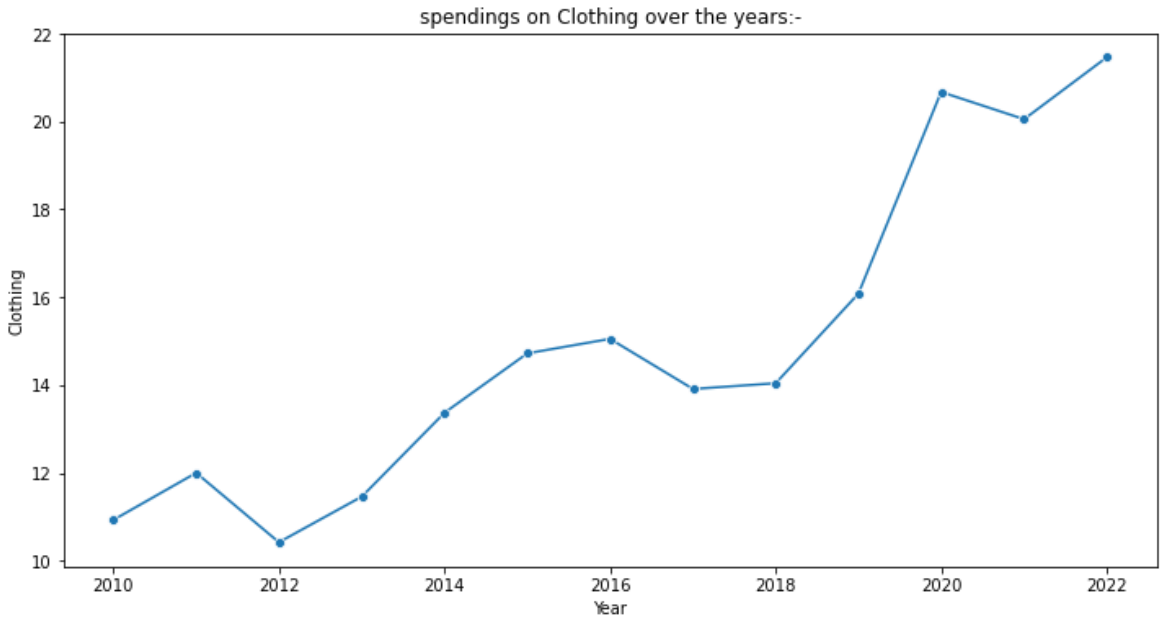
In [36]:
```
plt.figure(figsize=(12,6))
sb.lineplot(data=decade_spending, x= 'Year', y='GreetingCards',marker='o')
plt.title('purchase GreetingCards over the years:-')
plt.xlabel('Year')
plt.ylabel('GreetingCards')
plt.show()
```



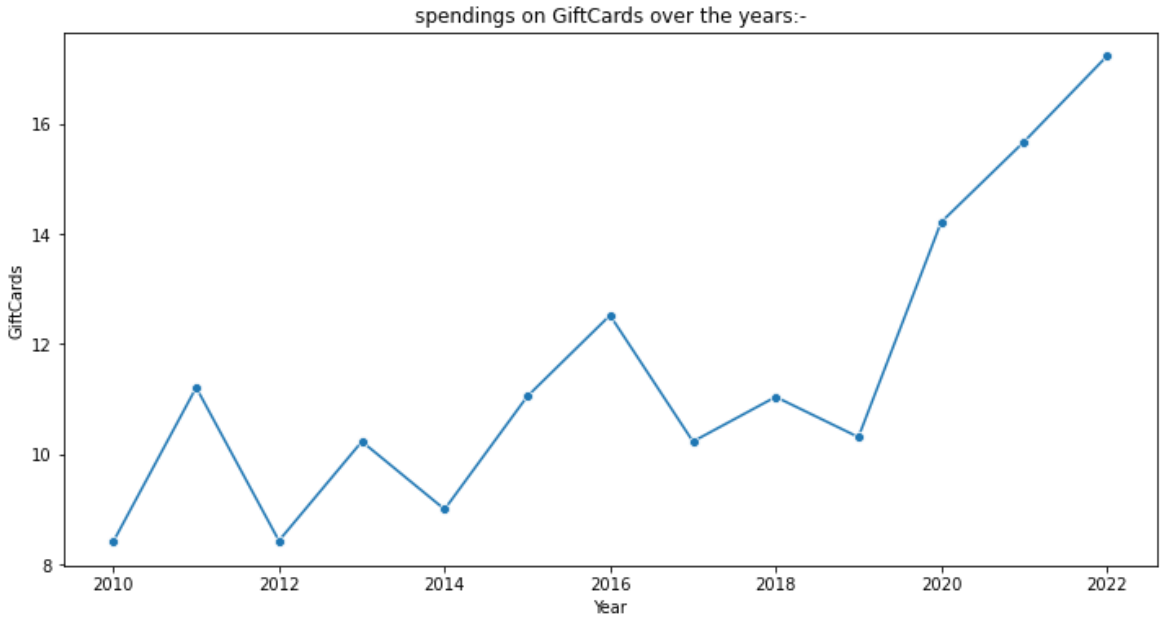
In [37]:
```
plt.figure(figsize=(12,6))
sb.lineplot(data=decade_spending, x= 'Year', y='EveningOut',marker='o')
plt.title('EveningOut over the years:-')
plt.xlabel('Year')
plt.ylabel('EveningOut')
plt.show()
```



In [38]:
```
plt.figure(figsize=(12,6))
sb.lineplot(data=decade_spending, x= 'Year', y='Clothing',marker='o')
plt.title('spendings on Clothing over the years:-')
plt.xlabel('Year')
plt.ylabel('Clothing')
plt.show()
```



In [39]:
```
plt.figure(figsize=(12,6))
sb.lineplot(data=decade_spending, x= 'Year', y='GiftCards',marker='o')
plt.title('spendings on GiftCards over the years:-')
plt.xlabel('Year')
plt.ylabel('GiftCards')
plt.show()
```



In [40]:
```
print("\nMissing Values in Gender-wise Gifts Data:")
print(gender_gifts.isnull().sum())
```

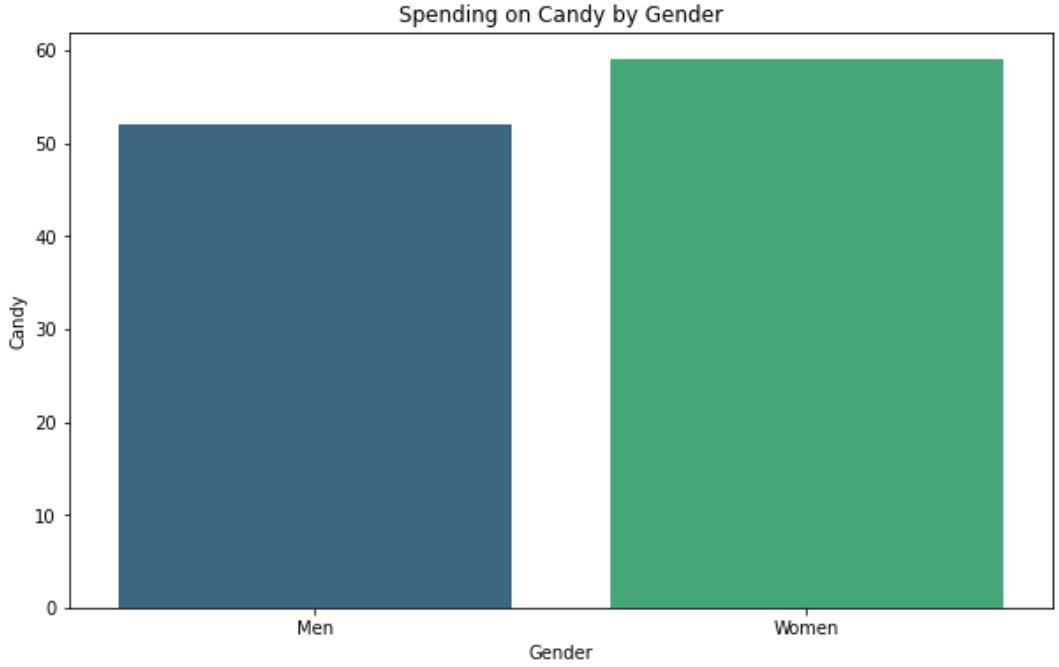
```
Missing Values in Gender-wise Gifts Data:
Gender                0
SpendingCelebrating   0
Candy                 0
Flowers               0
Jewelry               0
GreetingCards         0
EveningOut            0
Clothing              0
GiftCards             0
dtype: int64
```

In [42]:
```
gender_statistics = gender_wise.describe()
print("\nSummary Statistics for Gender-wise Gifts:")
print(gender_statistics)
```

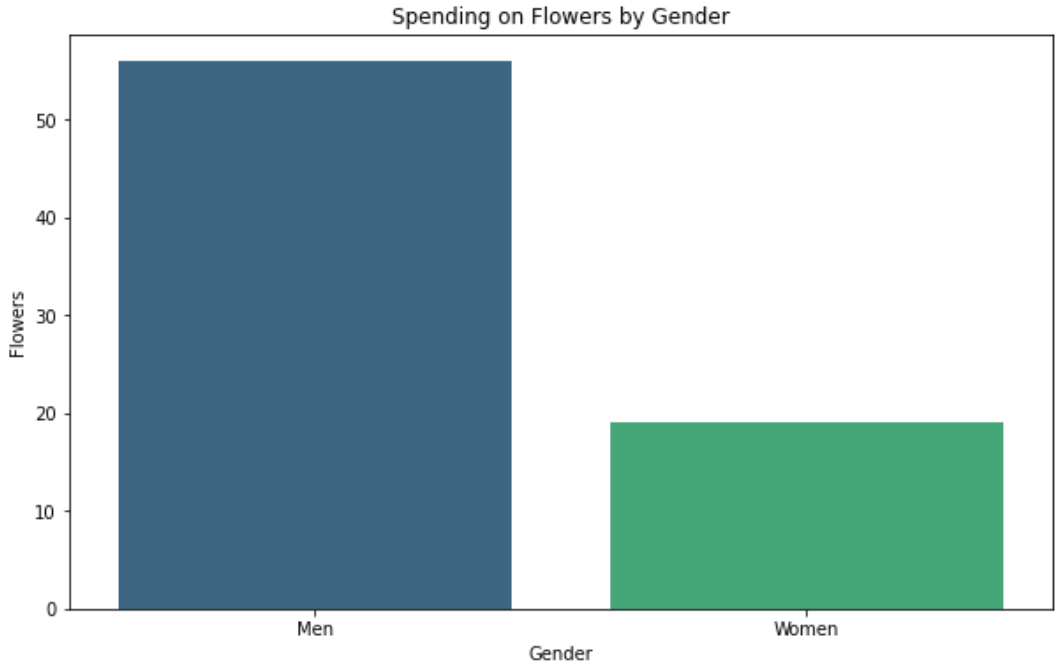
```
Summary Statistics for Gender-wise Gifts:
       SpendingCelebrating      Candy    Flowers    Jewelry  GreetingCards  \
count                  2.0   2.000000   2.000000   2.000000       2.000000
mean                  27.0  55.500000  37.500000  22.000000      40.000000
std                    0.0   4.949747  26.162951  11.313708       4.242641
min                   27.0  52.000000  19.000000  14.000000      37.000000
25%                   27.0  53.750000  28.250000  18.000000      38.500000
50%                   27.0  55.500000  37.500000  22.000000      40.000000
75%                   27.0  57.250000  46.750000  26.000000      41.500000
max                   27.0  59.000000  56.000000  30.000000      43.000000

       EveningOut   Clothing  GiftCards
count    2.000000   2.000000   2.000000
mean    31.000000  22.000000  21.000000
std      2.828427   2.828427   4.242641
min     29.000000  20.000000  18.000000
25%     30.000000  21.000000  19.500000
50%     31.000000  22.000000  21.000000
75%     32.000000  23.000000  22.500000
max     33.000000  24.000000  24.000000
```

In [48]:
```
plt.figure(figsize=(10, 6))
sb.barplot(data=gender_wise, x='Gender', y='SpendingCelebrating', palette='viridis')
plt.title('Spending Distribution by Gender')
plt.xlabel('Gender')
plt.ylabel('Spending Celebrating')
plt.show()
```

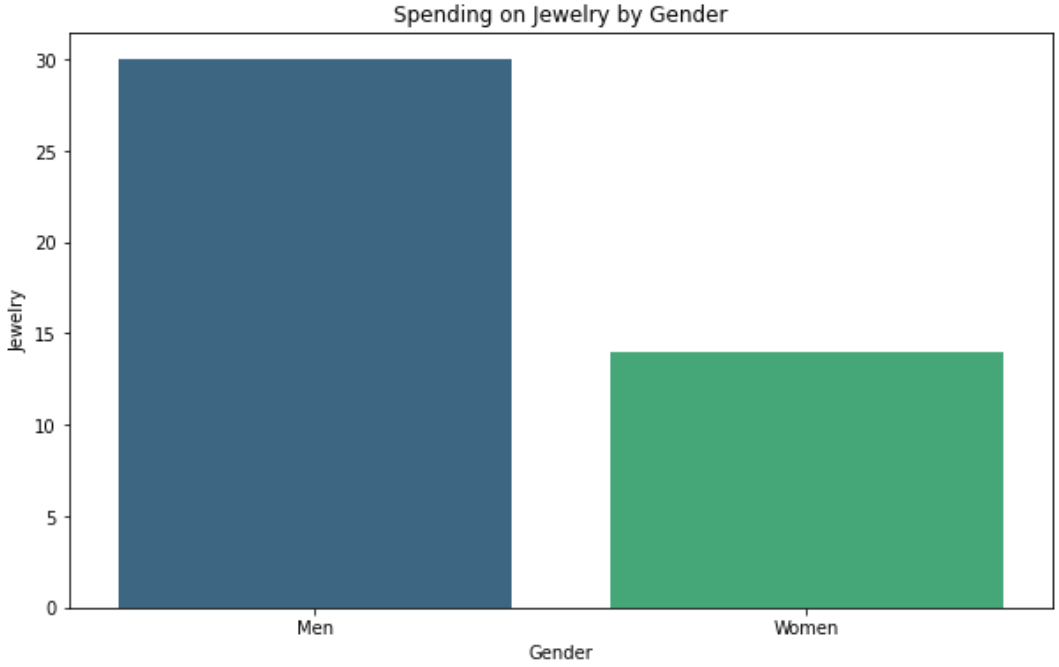
In [49]:
```
plt.figure(figsize=(10, 6))
sb.barplot(data=gender_wise, x='Gender', y='Candy', palette='viridis')
plt.title('Spending on Candy by Gender')
plt.xlabel('Gender')
plt.ylabel('Candy')
plt.show()
```



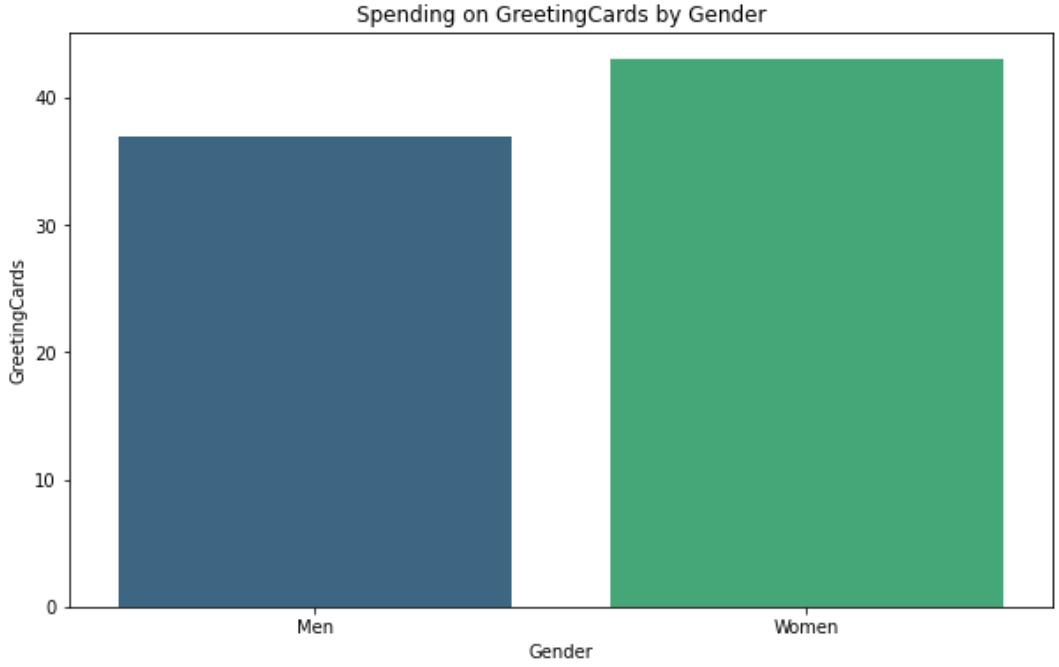
In [50]:
```
plt.figure(figsize=(10, 6))
sb.barplot(data=gender_wise, x='Gender', y='Flowers', palette='viridis')
plt.title('Spending on Flowers by Gender')
plt.xlabel('Gender')
plt.ylabel('Flowers')
plt.show()
```



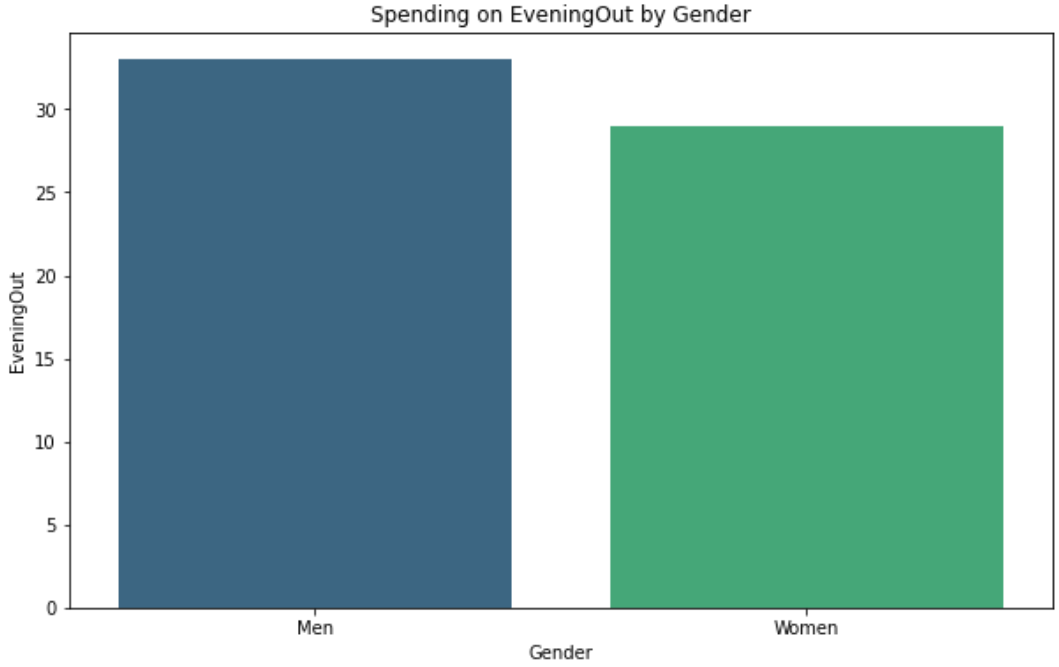
In [51]:
```
plt.figure(figsize=(10, 6))
sb.barplot(data=gender_wise, x='Gender', y='Jewelry', palette='viridis')
plt.title('Spending on Jewelry by Gender')
plt.xlabel('Gender')
plt.ylabel('Jewelry')
plt.show()
```



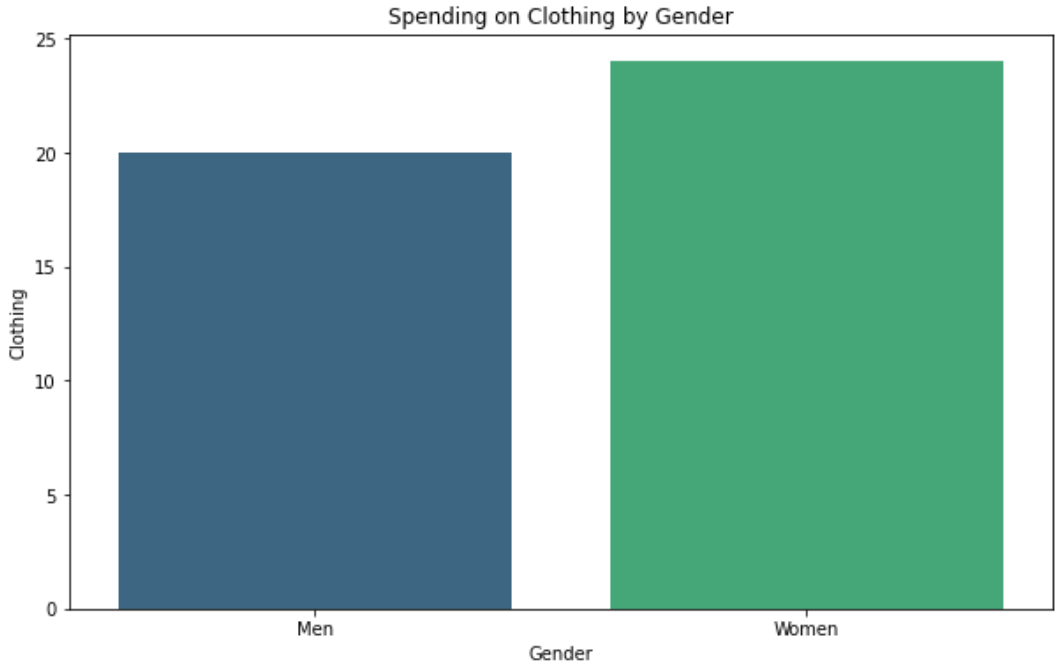
In [52]:
```
plt.figure(figsize=(10, 6))
sb.barplot(data=gender_wise, x='Gender', y='GreetingCards', palette='viridis')
plt.title('Spending on GreetingCards by Gender')
plt.xlabel('Gender')
plt.ylabel('GreetingCards')
plt.show()
```



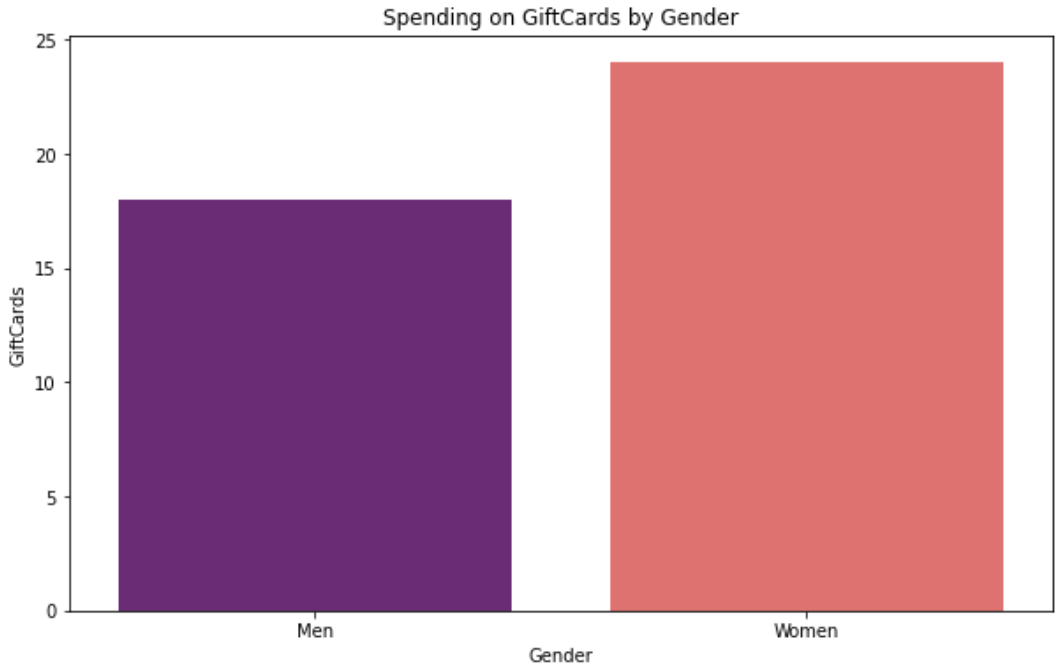
In [55]:
```
plt.figure(figsize=(10, 6))
sb.barplot(data=gender_wise, x='Gender', y='EveningOut', palette='viridis')
plt.title('Spending on EveningOut by Gender')
plt.xlabel('Gender')
plt.ylabel('EveningOut')
plt.show()
```



In [56]:
```
plt.figure(figsize=(10, 6))
sb.barplot(data=gender_wise, x='Gender', y='Clothing', palette='viridis')
plt.title('Spending on Clothing by Gender')
plt.xlabel('Gender')
plt.ylabel('Clothing')
plt.show()
```



In [67]:
```
plt.figure(figsize=(10, 6))
sb.barplot(data=gender_wise, x='Gender', y='GiftCards', palette='magma')
plt.title('Spending on GiftCards by Gender')
plt.xlabel('Gender')
plt.ylabel('GiftCards')
plt.show()
```



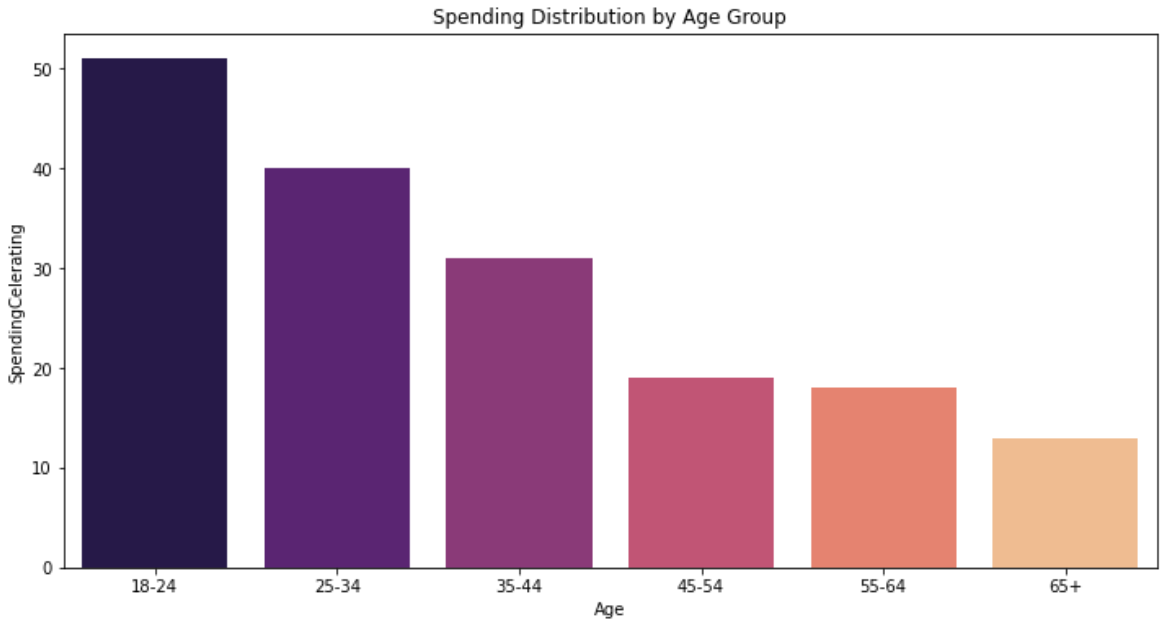
In [59]:
```
print('\n misiing valuse in age wise gifts')
print(age_wise.isnull().sum())
```

```
 misiing valuse in age wise gifts
Age                   0
SpendingCelebrating   0
Candy                 0
Flowers               0
Jewelry               0
GreetingCards         0
EveningOut            0
Clothing              0
GiftCards             0
dtype: int64
```

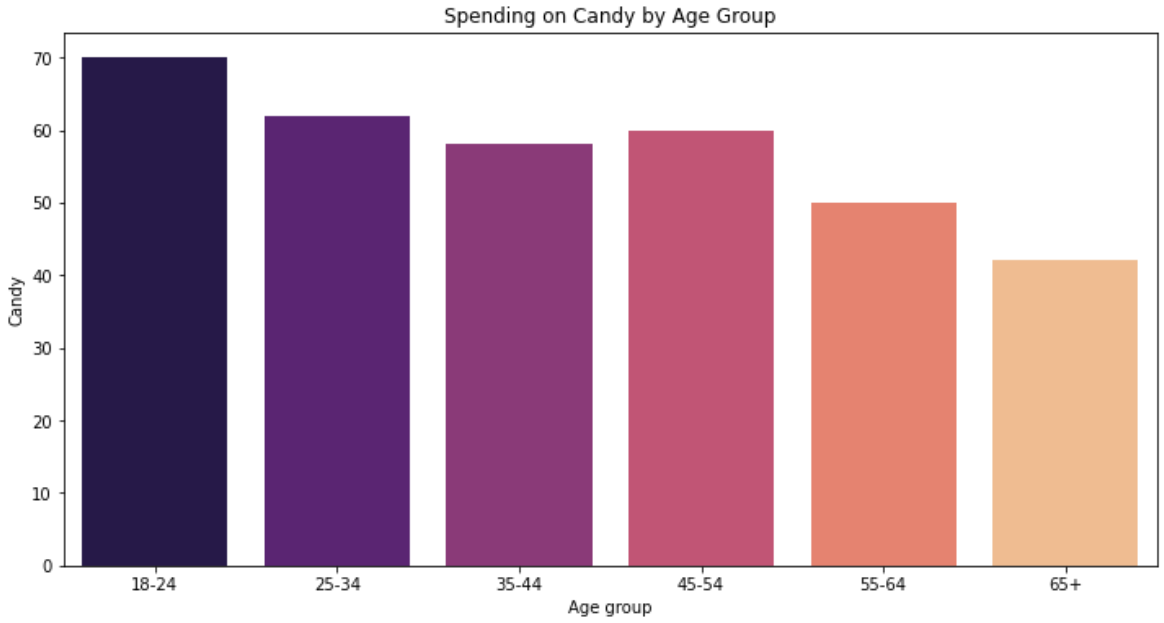
In [62]:
```
agewise_stats=age_wise.describe()
print('\n age wise gifts stats:-')
print(agewise_stats)
```

```
 age wise gifts stats:-
       SpendingCelebrating      Candy    Flowers    Jewelry  GreetingCards  \
count             6.000000   6.000000   6.000000   6.000000       6.000000
mean             28.666667  57.000000  38.166667  22.833333      39.500000
std              14.733183   9.777525   8.886319  10.870449       5.089204
min              13.000000  42.000000  25.000000   8.000000      33.000000
25%              18.250000  52.000000  33.250000  14.750000      35.250000
50%              25.000000  59.000000  39.000000  24.500000      42.000000
75%              37.750000  61.500000  43.250000  32.000000      42.750000
max              51.000000  70.000000  50.000000  34.000000      44.000000

       EveningOut   Clothing  GiftCards
count      6.0000   6.000000   6.000000
mean      32.0000  22.833333  21.166667
std        6.0663   7.359801   1.722401
min       24.0000  12.000000  19.000000
25%       29.2500  19.250000  20.000000
50%       30.5000  23.000000  21.000000
75%       35.5000  26.750000  22.750000
max       41.0000  33.000000  23.000000
```

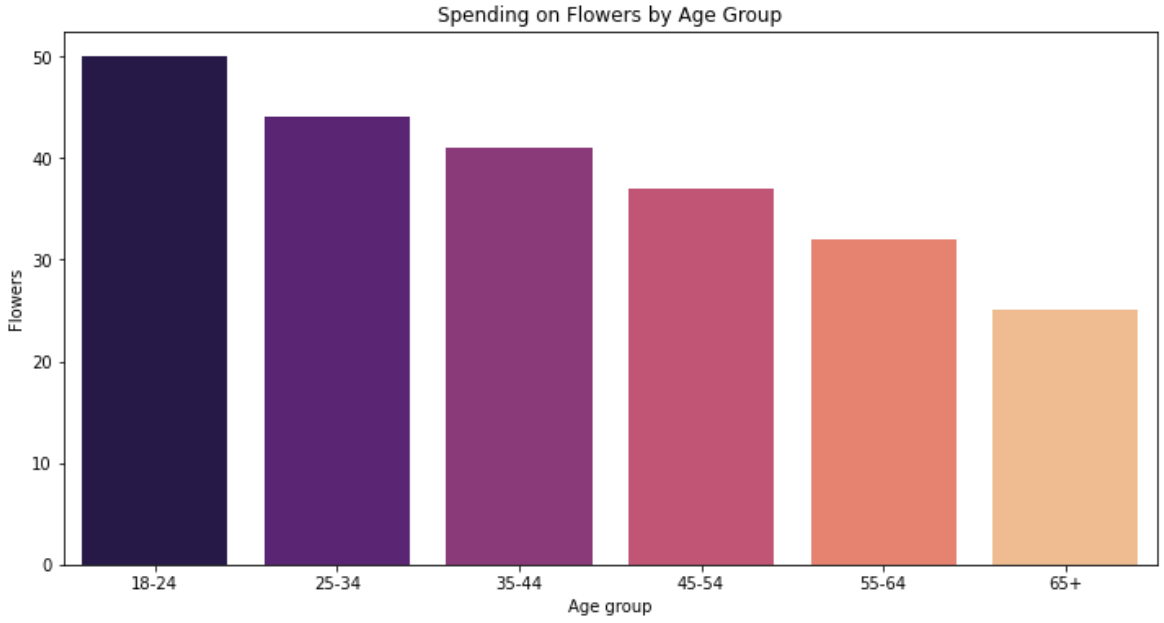
In [66]:
```
plt.figure(figsize=(12,6))
sb.barplot(data=age_wise, x="Age", y="SpendingCelebrating", palette='magma')
plt.title('Spending Distribution by Age Group')
plt.xlabel('Age')
plt.ylabel('SpendingCelerating')
plt.show()
```



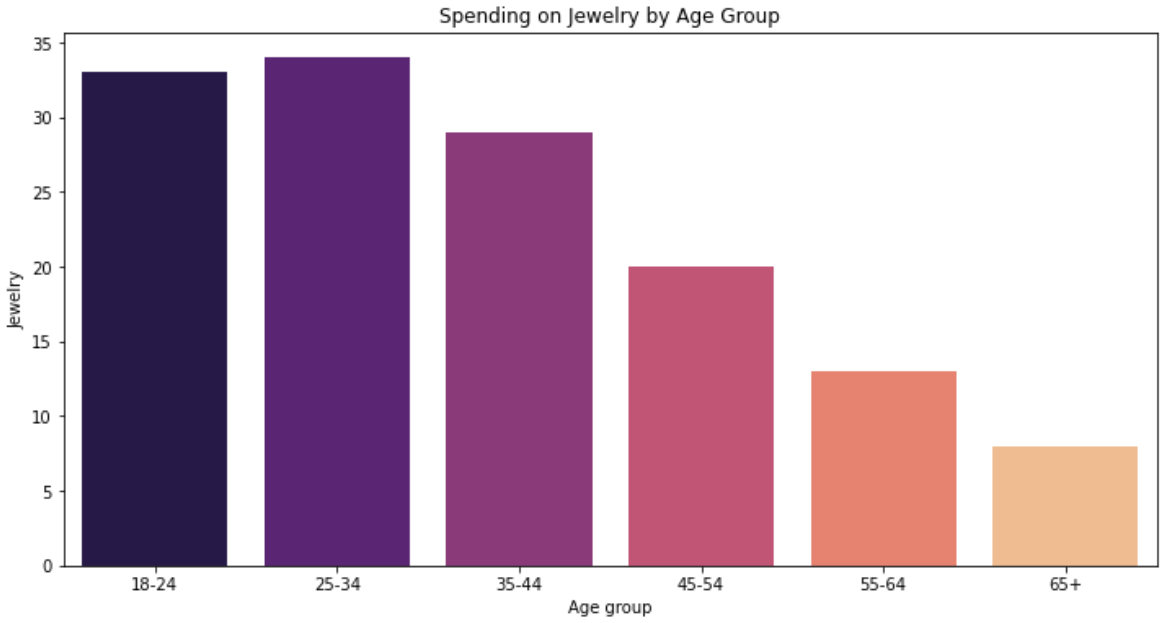
In [68]:
```
plt.figure(figsize=(12,6))
sb.barplot(data=age_wise, x="Age", y="Candy", palette='magma')
plt.title('Spending on Candy by Age Group')
plt.xlabel('Age group')
plt.ylabel('Candy')
plt.show()
```



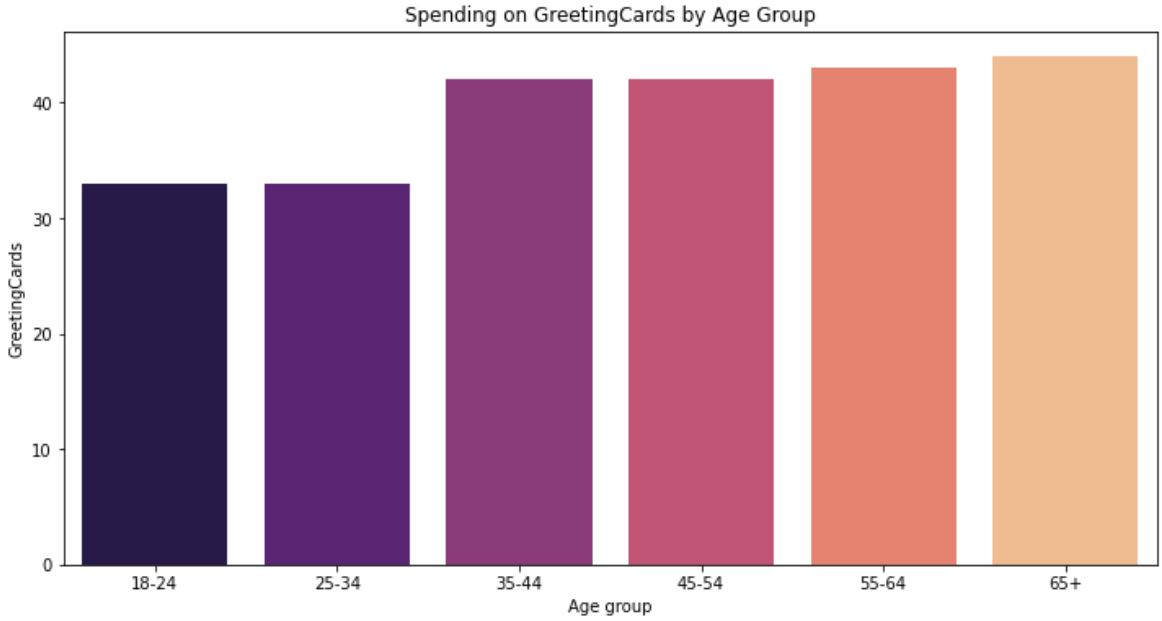
In [69]:
```
plt.figure(figsize=(12,6))
sb.barplot(data=age_wise, x="Age", y="Flowers", palette='magma')
plt.title('Spending on Flowers by Age Group')
plt.xlabel('Age group')
plt.ylabel('Flowers')
plt.show()
```



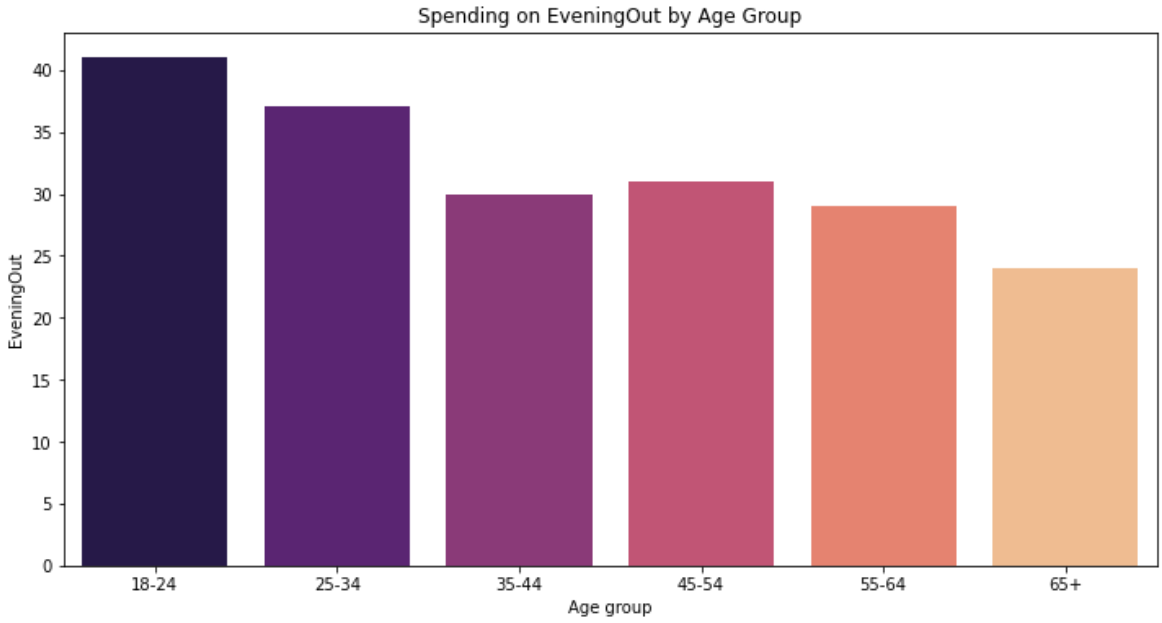
In [70]:
```
plt.figure(figsize=(12,6))
sb.barplot(data=age_wise, x="Age", y="Jewelry", palette='magma')
plt.title('Spending on Jewelry by Age Group')
plt.xlabel('Age group')
plt.ylabel('Jewelry')
plt.show()
```



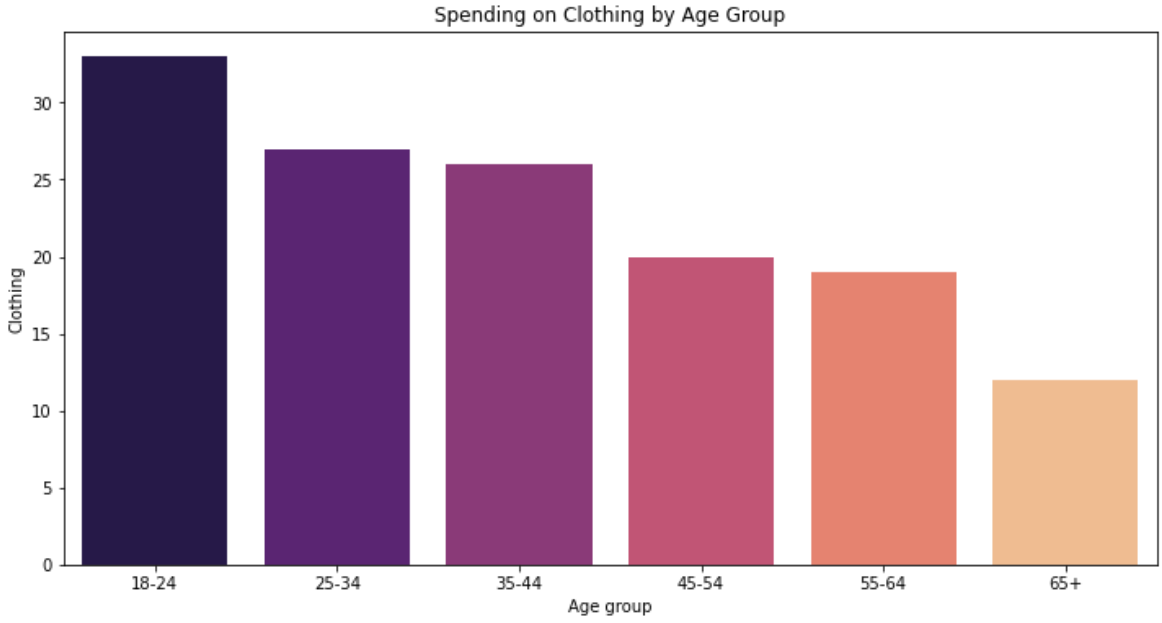
In [71]:
```
plt.figure(figsize=(12,6))
sb.barplot(data=age_wise, x="Age", y="GreetingCards", palette='magma')
plt.title('Spending on GreetingCards by Age Group')
plt.xlabel('Age group')
plt.ylabel('GreetingCards')
plt.show()
```



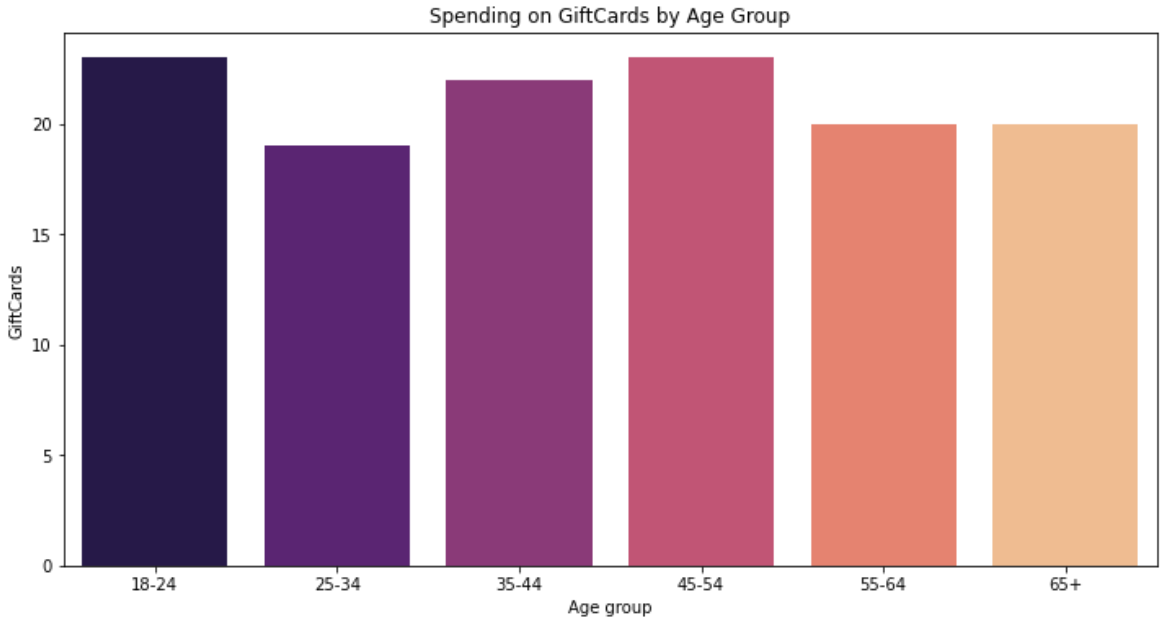
In [72]:
```
plt.figure(figsize=(12,6))
sb.barplot(data=age_wise, x="Age", y="EveningOut", palette='magma')
plt.title('Spending on EveningOut by Age Group')
plt.xlabel('Age group')
plt.ylabel('EveningOut')
plt.show()
```



In [73]:
```
plt.figure(figsize=(12,6))
sb.barplot(data=age_wise, x="Age", y="Clothing", palette='magma')
plt.title('Spending on Clothing by Age Group')
plt.xlabel('Age group')
plt.ylabel('Clothing')
plt.show()
```



In [74]:
```
plt.figure(figsize=(12,6))
sb.barplot(data=age_wise, x="Age", y="GiftCards", palette='magma')
plt.title('Spending on GiftCards by Age Group')
plt.xlabel('Age group')
plt.ylabel('GiftCards')
plt.show()
```

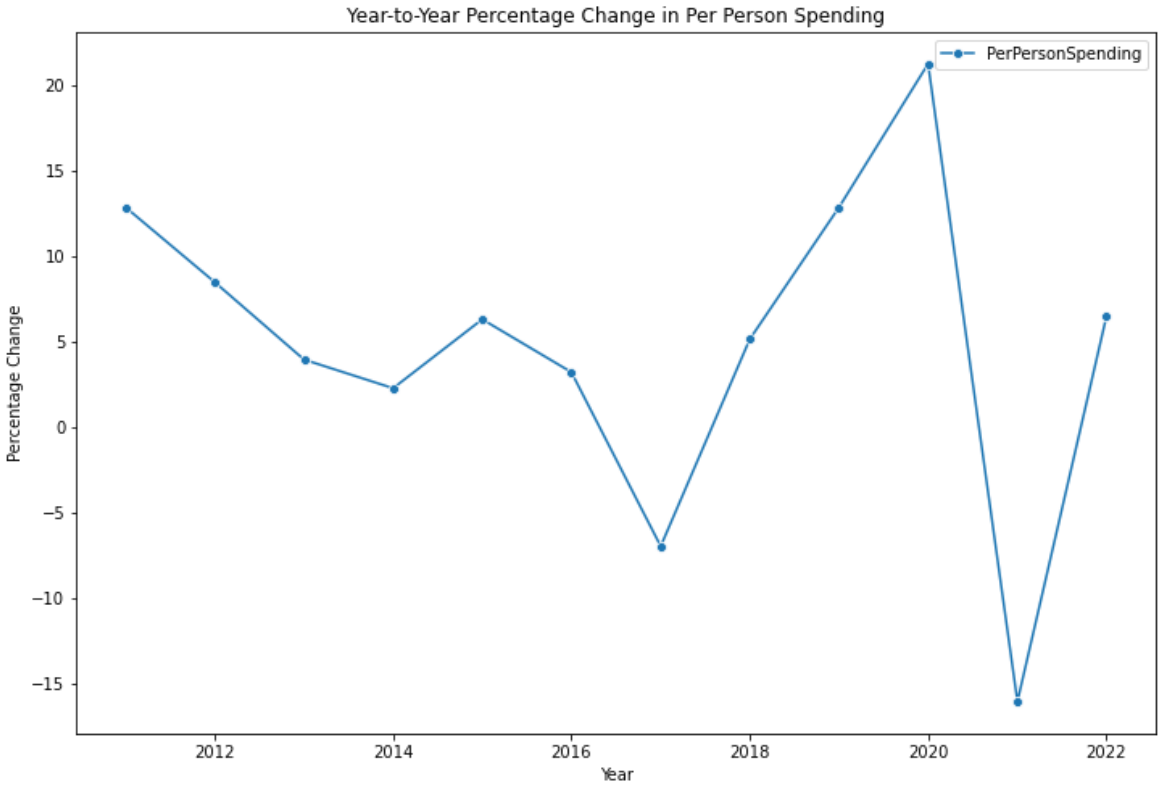


In [75]:
```
decade_spending['PerPersonSpendingChange'] = decade_spending['PerPersonSpending'].pct_c
decade_spending['CandyChange'] = decade_spending['Candy'].pct_change() * 100
decade_spending['FlowersChange'] = decade_spending['Flowers'].pct_change() * 100
decade_spending['JewelryChange'] = decade_spending['Jewelry'].pct_change() * 100
decade_spending['GreetingCardsChange'] = decade_spending['GreetingCards'].pct_change()
decade_spending['EveningOutChange'] = decade_spending['EveningOut'].pct_change() * 100
decade_spending['ClothingChange'] = decade_spending['Clothing'].pct_change() * 100
decade_spending['GiftCardsChange'] = decade_spending['GiftCards'].pct_change() * 100
```

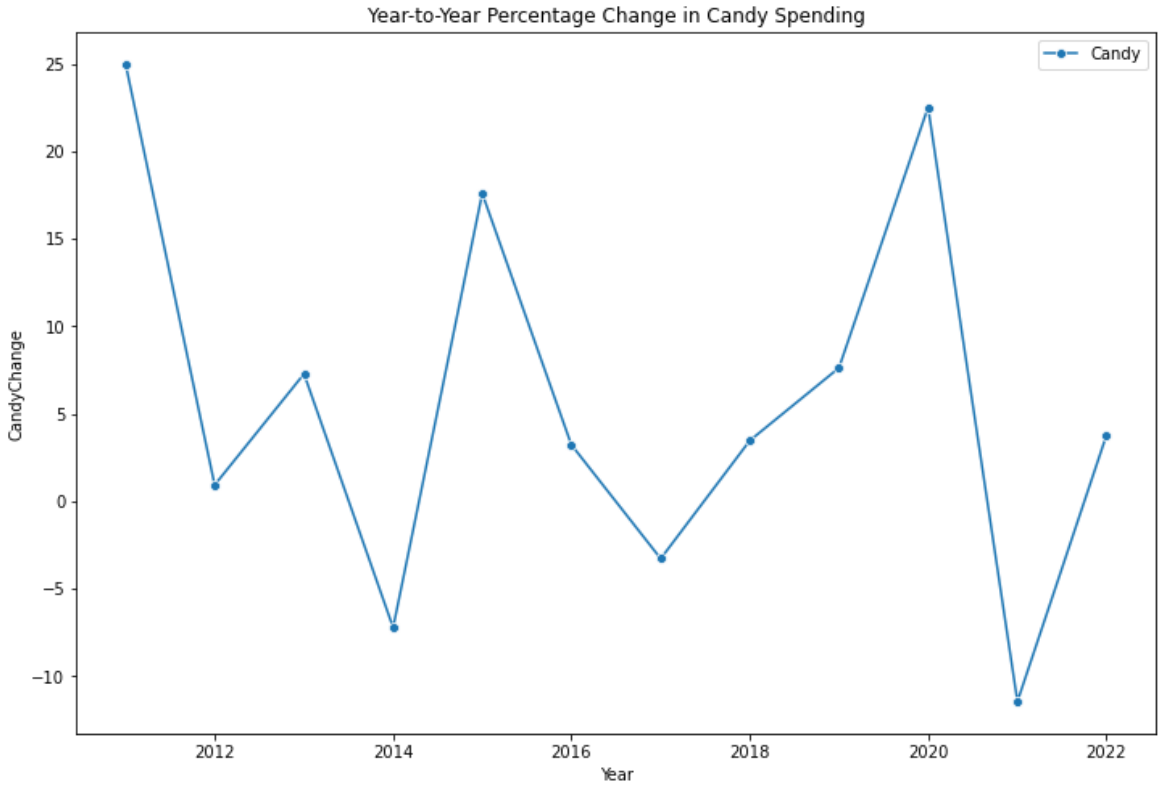
In [76]:
```
changes = decade_spending[['Year', 'PerPersonSpendingChange', 'CandyChange', 'FlowersCh
                           'GreetingCardsChange', 'EveningOutChange', 'ClothingCha
print("\nYear-to-Year Percentage Changes:")
print(changes)
```

```
Year-to-Year Percentage Changes:
         Year  PerPersonSpendingChange  CandyChange  FlowersChange  \
0  2010-01-01                      NaN          NaN            NaN
1  2011-01-01                12.825243    25.000000       2.351987
2  2012-01-01                 8.450219     0.930233       6.893819
3  2013-01-01                 3.919702     7.281106      -0.074129
4  2014-01-01                 2.244789    -7.216495      11.275964
5  2015-01-01                 6.272870    17.592593       4.800000
6  2016-01-01                 3.183192     3.228346      -5.979644
7  2017-01-01                -6.994007    -3.279939      -1.014885
8  2018-01-01                 5.118254     3.470032       0.820232
9  2019-01-01                12.816941     7.621951       2.169492
10 2020-01-01                21.208940    22.521246       9.422694
11 2021-01-01               -16.071520   -11.445087      -6.488781
12 2022-01-01                 6.463948     3.785901       8.365759

    JewelryChange  GreetingCardsChange  EveningOutChange  ClothingChange  \
0             NaN                  NaN               NaN             NaN
1       21.654275            36.886633          4.629630        9.789570
2       13.063407           -14.338690          3.218021      -13.166667
3        4.527027            20.057720          8.846454        9.980806
4       -1.163542            -4.206731         -1.611171       16.666667
5       18.705036            -1.254705         -0.764192       10.097233
6       -8.787879             8.259212         22.698937        2.241848
7       -2.385986           -13.615023        -14.943216       -7.574751
8        5.507426           -11.005435         -5.270555        0.934579
9      -11.026393            11.603053          2.818991       14.529915
10      37.277521            23.255814         11.038961       28.544776
11     -26.266507            -5.882353        -30.506823       -2.999516
12      48.974275           -11.910377         46.563815        7.032419

    GiftCardsChange
0               NaN
1         33.135392
2        -24.799286
3         21.352313
4        -12.023460
5         22.777778
6         13.303167
7        -18.290735
8          7.917889
9         -6.612319
10        37.827352
11        10.274455
12         9.891512
```

In [77]:
```
plt.figure(figsize=(12, 8))
sb.lineplot(data=changes, x='Year', y='PerPersonSpendingChange', marker='o', label='Per
plt.title('Year-to-Year Percentage Change in Per Person Spending')
plt.xlabel('Year')
plt.ylabel('Percentage Change')
plt.legend()
plt.show()
```

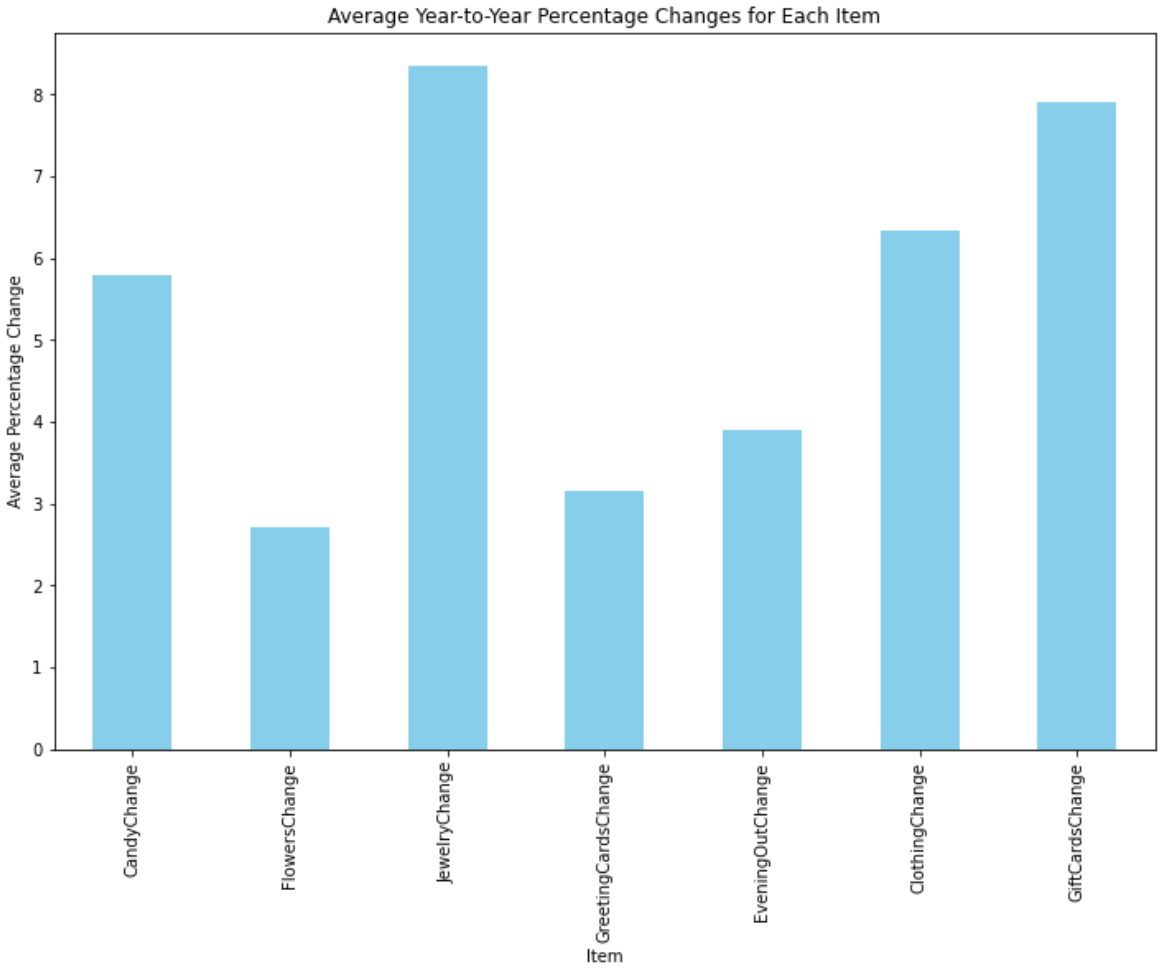


In [78]:
```
plt.figure(figsize=(12, 8))
sb.lineplot(data=changes, x='Year', y='CandyChange', marker='o', label='Candy')
plt.title('Year-to-Year Percentage Change in Candy Spending')
plt.xlabel('Year')
plt.ylabel('CandyChange')
plt.legend()
plt.show()
```



In [80]:
```
average_changes = decade_spending[['CandyChange', 'FlowersChange', 'JewelryChange', 'Gr
                                   'EveningOutChange', 'ClothingChange', 'GiftCardsC

print("\nAverage Year-to-Year Percentage Changes for Each Item:")
print(average_changes)

plt.figure(figsize=(12, 8))
average_changes.plot(kind='bar', color='skyblue')
plt.title('Average Year-to-Year Percentage Changes for Each Item')
plt.xlabel('Item')
plt.ylabel('Average Percentage Change')
plt.show()
```

```
Average Year-to-Year Percentage Changes for Each Item:
CandyChange            5.790824
FlowersChange          2.711876
JewelryChange          8.339888
GreetingCardsChange    3.154093
EveningOutChange       3.893238
ClothingChange         6.339740
GiftCardsChange        7.896171
dtype: float64
```



In [81]:
```
from sklearn.linear_model import LinearRegression
from sklearn.model_selection import train_test_split
from sklearn.metrics import mean_squared_error, r2_score
```

In [89]:
```
X = decade_spending[['Year']]
y = decade_spending['PerPersonSpending']
```

In [84]:
```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=4
```

In [95]:
```
X_test_copy = X_test.copy()
X_test_copy['Year'] = pd.to_datetime(X_test_copy['Year'])
X_test_copy['Year'] = X_test_copy['Year'].dt.year
y_pred = model.predict(X_test_copy)
```

In [96]:
```
print(f"Predicted Total Spending for 2023: ${y_pred[0]:.2f}")
```

```
Predicted Total Spending for 2023: $144.45
```

In [97]:
```
X = decade_spending[['Year']]
y = decade_spending['Candy']
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=4
X_test_copy = X_test.copy()
X_test_copy['Year'] = pd.to_datetime(X_test_copy['Year'])
X_test_copy['Year'] = X_test_copy['Year'].dt.year
y_pred = model.predict(X_test_copy)
print(f"Predicted Total Spending on Candy for 2023: ${y_pred[0]:.2f}")
```

```
Predicted Total Spending on Candy for 2023: $144.45
```

In [98]:
```
X = decade_spending[['Year']]
y = decade_spending['Flowers']
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=4
X_test_copy = X_test.copy()
X_test_copy['Year'] = pd.to_datetime(X_test_copy['Year'])
X_test_copy['Year'] = X_test_copy['Year'].dt.year
y_pred = model.predict(X_test_copy)
print(f"Predicted Total Spending on Flowers for 2023: ${y_pred[0]:.2f}")
```

```
Predicted Total Spending on Flowers for 2023: $144.45
```

In [103]:
```
# Extract the predicted spending for candy in 2023
predicted_candy_spending = y_pred[0]

# Historical spending on candy
historical_candy_spending = decade_spending['Candy'].values[-1]

# Calculate the percentage change
percentage_change_candy = ((predicted_candy_spending - historical_candy_spending) / his

# Print the results
print(f"\nPredicted Candy Spending for 2023: ${predicted_candy_spending:.2f}")
print(f"Historical Candy Spending: ${historical_candy_spending:.2f}")
print(f"Percentage Change: {percentage_change_candy:.2f}%")
```

```
Predicted Candy Spending for 2023: $144.45
Historical Candy Spending: $15.90
Percentage Change: 808.49%
```

In [102]:
```
# Extract the predicted spending for candy in 2023
predicted_Flowers_spending = y_pred[0]

# Historical spending on candy
historical_Flowers_spending = decade_spending['Flowers'].values[-1]

# Calculate the percentage change
percentage_change_Flowers = ((predicted_Flowers_spending - historical_Flowers_spending)

# Print the results
print(f"\nPredicted Flowers Spending for 2023: ${predicted_Flowers_spending:.2f}")
print(f"Historical Flowers Spending: ${historical_Flowers_spending:.2f}")
print(f"Percentage Change: {percentage_change_Flowers:.2f}%")
```

```
Predicted Flowers Spending for 2023: $144.45
Historical Flowers Spending: $16.71
Percentage Change: 764.45%
```

In [ ]: