Summary and Recommendations:

1. **Customer Churn Overview**:
    - A **countplot** and a **pie chart** were created to show the distribution of churned and non-churned customers. The charts indicate that churned customers make up a significant portion of the dataset.
2. **Demographic Analysis**:
    - **Gender and Senior Citizen Status** were analyzed to see their impact on churn. The results show:
        - Churn rates do not differ significantly between genders.
        - Senior citizens have a higher likelihood of churn compared to non-senior citizens.
3. **Service Usage Patterns**:
    - Various countplots were generated for services like **Phone Service, Internet Service, Online Security, and Streaming Services**.
    - Customers with **no additional services (like Online Security, Tech Support, or Device Protection)** exhibit higher churn rates.
    - **Fiber optic internet users** tend to churn more compared to DSL users.
4. **Data Processing**:
    - The dataset was cleaned by converting missing or incorrect values in the **TotalCharges** column.
    - **Senior Citizen** values were transformed to categorical labels for better interpretation.

Overall, the analysis emphasizes that **lack of additional services** and **being a senior citizen** are strong indicators of potential churn. This suggests that offering bundled services or personalized support to senior customers may help reduce churn rates.

This analysis focuses on understanding customer churn patterns within a telecom dataset by examining various demographic and service usage factors. The findings are based on a series of visualizations and data processing steps aimed at uncovering key insights into churn behavior.

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1. Overall Customer Churn Analysis

- **Churn Distribution**:

- Approximately **26.5%** of customers have churned, while **73.5%** have remained.
- The churn distribution was visualized using a **countplot** and a **pie chart** to illustrate the proportion of churned and non-churned customers clearly.

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2. Demographic Analysis

- **Gender-Based Churn**:
  - Churn rates among **Male** and **Female** customers are very similar, indicating **no significant gender-based impact** on churn.
  - The distribution of churn shows that **Male and Female churn rates** hover around **26%**, suggesting gender is not a primary driver of churn.
- **Senior Citizen Impact**:
  - **Senior citizens** exhibit higher churn rates compared to non-senior citizens.
  - **Churn Rates**:
    - **Senior Citizens**: About **42%** churn rate.
    - **Non-Senior Citizens**: About **24%** churn rate.
  - This indicates that senior citizens are nearly **twice as likely to churn** compared to non-senior citizens.

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3. Service Usage and Churn Analysis

Countplots for various services were generated to explore how different service subscriptions correlate with churn. Key findings include:

- **Phone Service & Multiple Lines**:
  - Customers without **Phone Service** show a slightly higher churn rate.
  - Among customers with **Multiple Lines**, churn rates are moderate.
- **Internet Service**:
  - Customers with **Fiber Optic Internet** exhibit a higher churn rate (~~**30%)**~~ ~~compared to those with **DSL (**~~**19%**).
  - Customers with **no internet service** have a significantly lower churn rate (~**10%**).
- **Additional Services Impact**:
  Lack of additional services like **Online Security, Online Backup, Device Protection, and Tech Support** is associated with higher churn rates. For example:

    - **Online Security**:
        - Customers **without Online Security** have a churn rate of about **42%**.
        - Customers **with Online Security** have a churn rate of only **15%**.
    - **Tech Support**:
        - Customers **without Tech Support** have a churn rate of about **41%**.
        - Customers **with Tech Support** have a churn rate of only **14%**.
- **Streaming Services**:
    - Churn rates are higher among customers who subscribe to **Streaming TV** and **Streaming Movies**.
    - This suggests that while these services are popular, they may not be sufficient to retain customers without other supporting services.

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4. Data Processing Highlights

- **Data Cleaning**:
    - The **TotalCharges** column had missing or blank values replaced with zeros and converted to numerical data for analysis.
- **Senior Citizen Conversion**:
    - The **SeniorCitizen** column was transformed from numerical values (0 and 1) to categorical labels ("Yes" and "No") to facilitate better interpretation in visualizations.

Recommendations:

1. **Senior citizens** and customers with **Fiber Optic Internet** are more likely to churn.
2. **Additional services** (such as **Online Security, Tech Support, and Device Protection**) play a crucial role in reducing churn, with churn rates dropping by more than **50%** when these services are included.
3. **Gender** does not significantly impact churn rates.
4. Providing bundled services and targeted support for senior citizens may help mitigate churn.

These insights can guide customer retention strategies, emphasizing personalized service offerings and support for high-risk groups.