Detailed EDA Report for [Hospitals and Beds maintained by Ministry of Defense.csv]

INTRODUCTION:

This report presents a detailed analysis of the dataset containing information about hospitals and beds maintained by the Ministry of Defense in India. We aim to explore the distribution of hospitals and beds across different states, identify key patterns, and uncover insights that can inform healthcare resource allocation and planning.

Overview of Data File

1. Source: Hospitals and Beds maintained by Ministry of Defense.csv

2. Rows: 31 rows contains data for multiple states/UTs

3. Columns: total **4** columns

4. Datatypes: Object (Name of State), Numeric (No. of Hospitals, No. of beds), float64(2), int64(1)

Techniques Used Pre-Analysis on Dataset

Data cleaning: Removal of the 'Total' row to focus on state-level data

Calculation of derived metric: Beds per Hospital

Null handling: KNN method for numerical columns, Mode for categorical columns

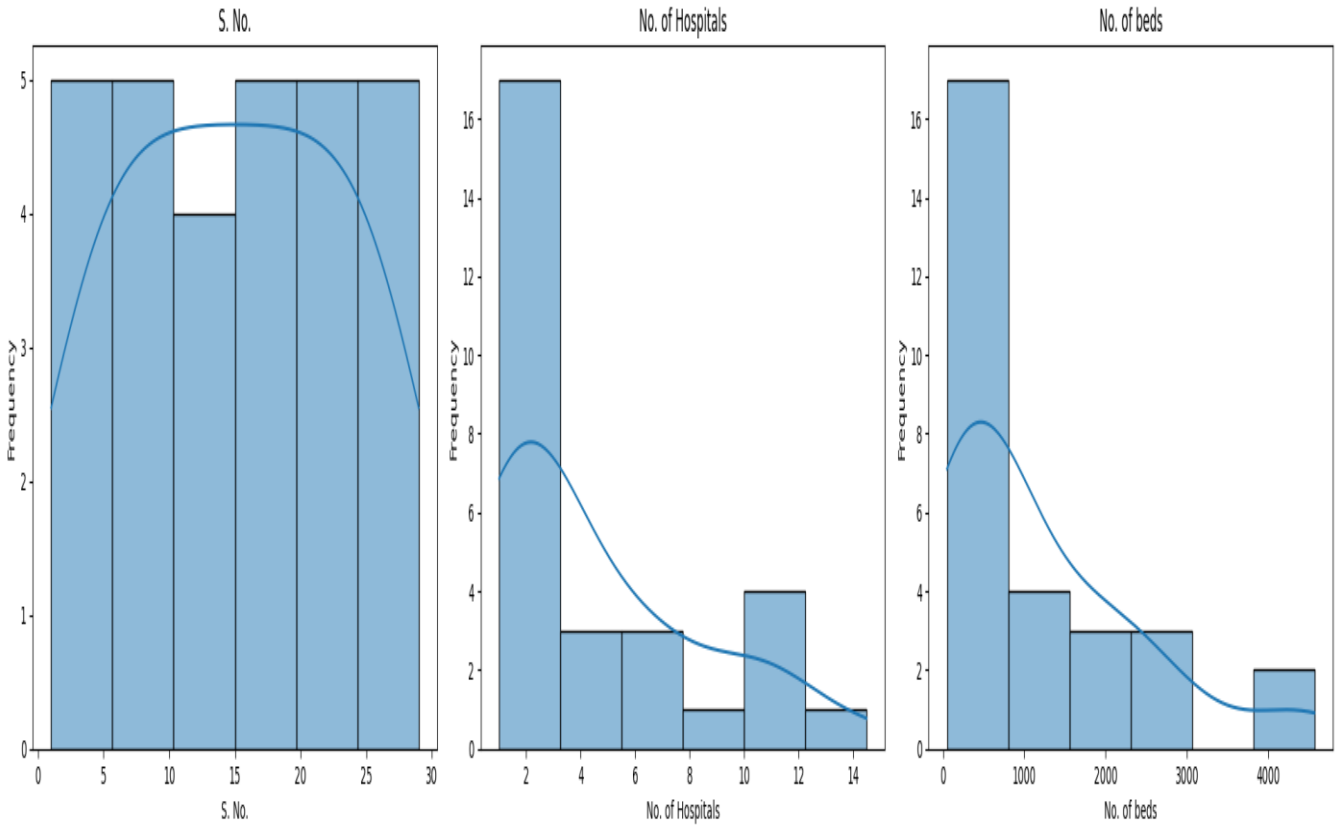
Outlier handling: z-score method and IQR method

Analysis:

Phase 1: Column Based Analysis

UNIVARIATE ANALYSIS

Due to the limited number of variables, we focused on the distribution of hospitals and beds across states.



1. Number of Hospitals:

- The distribution is right-skewed, with most states having fewer hospitals and a few states having a larger number.

- Uttar Pradesh leads with the highest number of hospitals (14).

- There is a wide range in the number of hospitals across states, indicating uneven distribution.

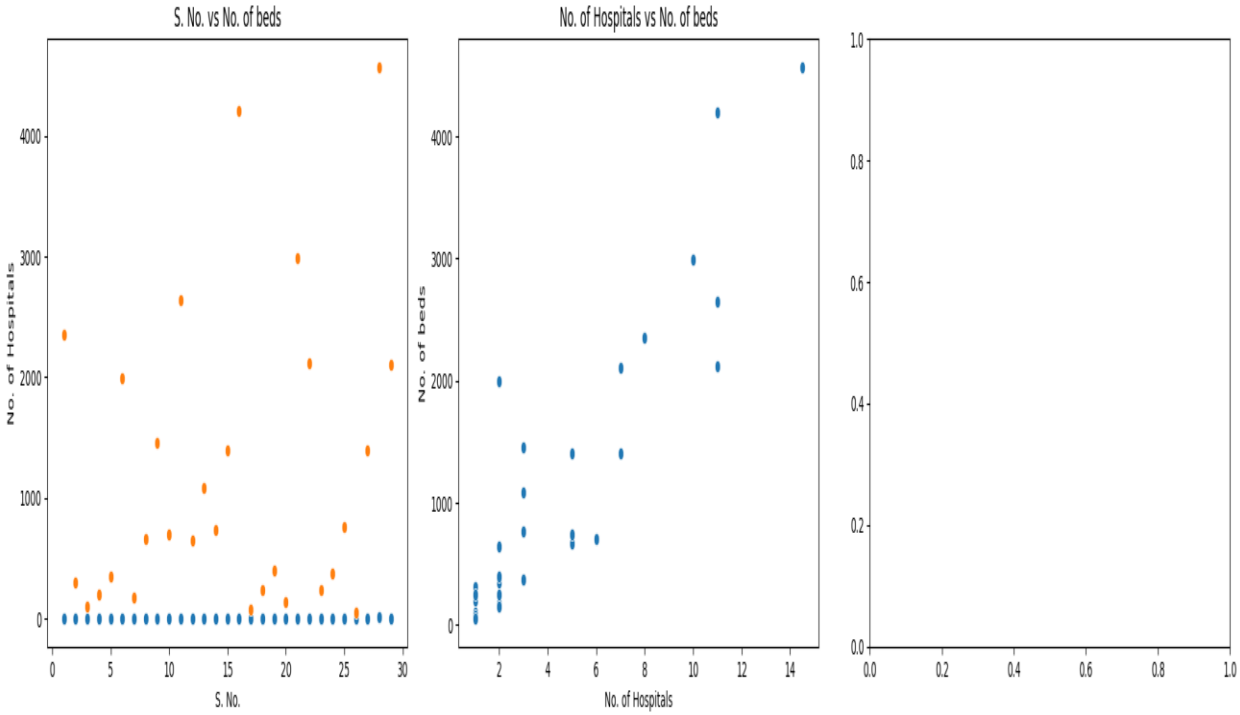
2. Number of Beds:

- Similar to hospitals, the distribution of beds is also right-skewed.

- There is significant variation in bed capacity across states.

- Some states have disproportionately high bed counts relative to their hospital numbers.

BIVARIATE ANALYSIS:



1. Hospitals vs. Beds:

- There is a positive correlation between the number of hospitals and the number of beds.

- However, the relationship is not linear, suggesting variations in hospital sizes across states.

2. Beds per Hospital:

- This derived metric reveals interesting patterns in hospital capacity across states.

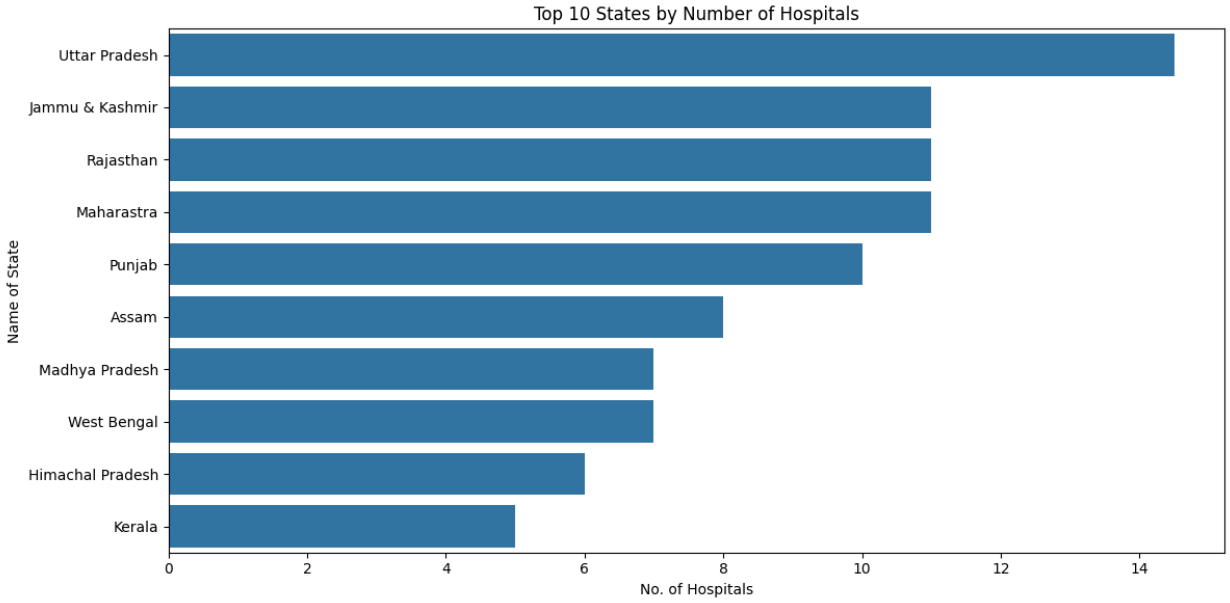
- Delhi stands out with the highest number of beds per hospital, indicating larger hospital facilities.

- There is significant variation in this metric, suggesting different strategies or needs across states.

MULTIVARIATE ANALYSIS

Given the limited number of variables, a full multivariate analysis is not applicable. However, we can consider the relationships between states, hospitals, and beds simultaneously.

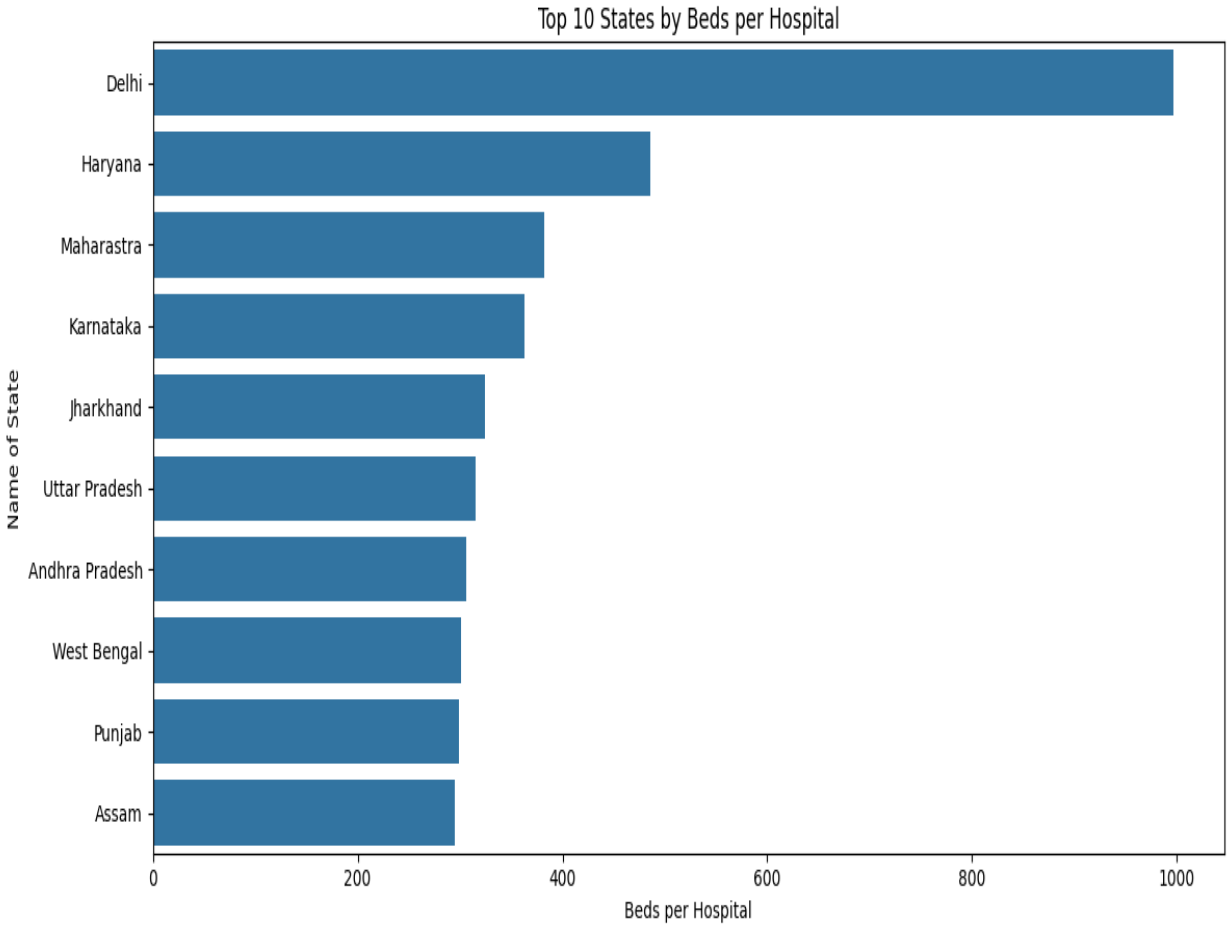
1. Top 10 States by Number of Hospitals:



- Uttar Pradesh, Jammu & Kashmir, and Rajasthan lead in hospital count.

- The top 10 list includes a mix of large and smaller states, suggesting factors beyond population influence hospital distribution.

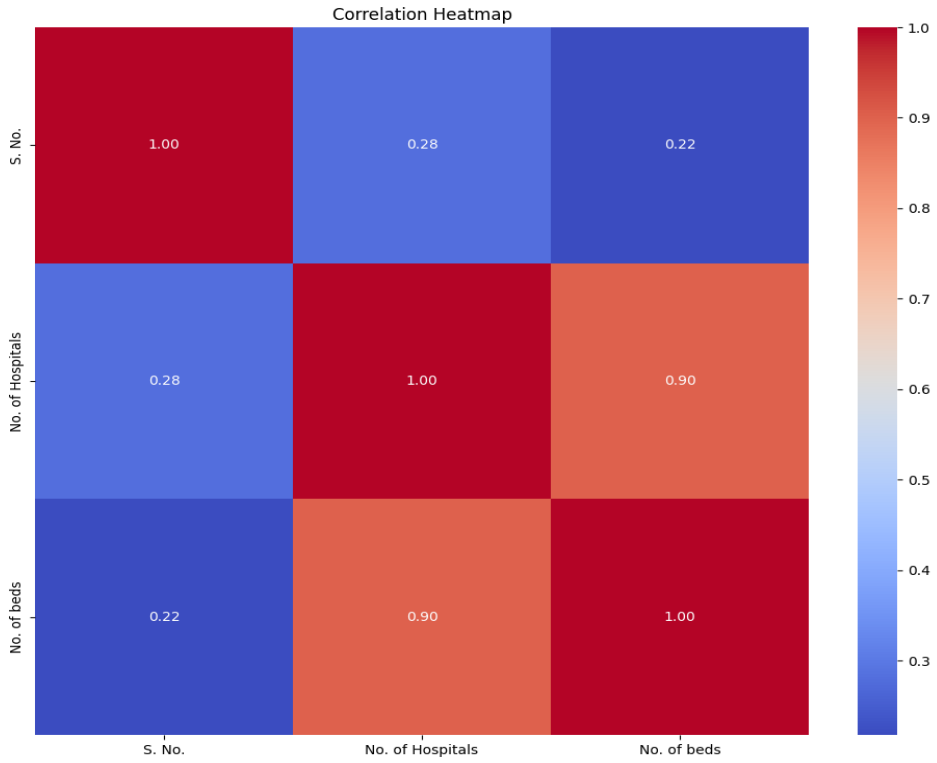
2. Top 10 States by Beds per Hospital:



- Delhi, Haryana, and Maharashtra lead in this metric.

- The presence of both large metropolitan areas and smaller states in this list suggests diverse factors influencing hospital size and capacity.

Additional Analysis: Correlation Heatmap



The correlation heatmap offers insights into the relationships between the variables in our dataset.

1. Correlation between S. No. and other variables:

- S. No. has a weak positive correlation with No. of Hospitals (0.28) and No. of beds (0.22).

- This suggests a slight tendency for states listed later in the dataset to have more hospitals and beds, but the relationship is not strong.

2. Correlation between No. of Hospitals and No. of beds:

- There's a strong positive correlation (0.90) between the number of hospitals and the number of beds.

- This indicates that states with more hospitals generally also have more beds, which is expected but not guaranteed.

3. Perfect correlations:

- Each variable has a perfect correlation (1.00) with itself, as expected in a correlation matrix.

4. Asymmetry in the heatmap:

- The heatmap is symmetrical, which is correct for a correlation matrix.

- The strong correlation between hospitals and beds confirms our earlier observation of a positive relationship between these variables.

- The weak correlation between S. No. and other variables suggests that the order of states in the dataset doesn't significantly influence the distribution of healthcare facilities.

- The lack of perfect correlation between hospitals and beds (0.90 instead of 1.00) supports our earlier finding of variations in hospital sizes across states.

Identifying Issues with Phase 1 Analysis

1. Limited Variables: The dataset contains only a few variables, limiting the depth of analysis possible.

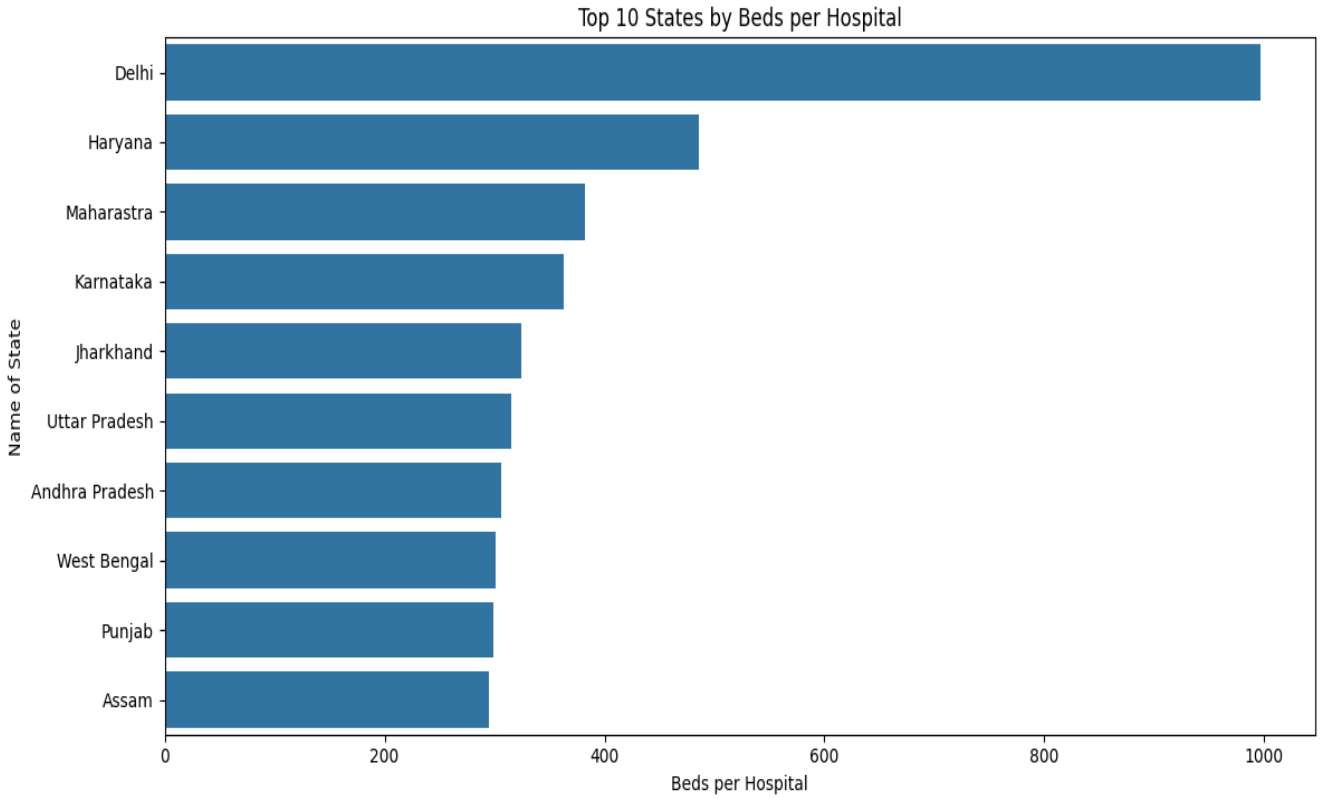
2. Lack of Contextual Data: Without population data or information on military presence, it is challenging to fully interpret the findings.

3. Potential for Oversimplification: The aggregated nature of the data may hide important nuances in healthcare distribution within states.

Introducing PCA as a Solution

Given the limited number of variables and the nature of the data, Principal Component Analysis (PCA) may not provide significant additional insights for this particular dataset. Instead, we focused on deriving meaningful metrics and visualizations from the available data.

Implementing Alternative Analysis



1. Calculation of Beds per Hospital: This derived metric provides insights into the average size and capacity of hospitals in each state.

2. Ranking and Comparative Analysis: Identifying top states in various categories helps highlight disparities and potential areas for resource allocation.

3. Visualization: Bar charts effectively communicate the distribution of hospitals and beds across states.

Phase 2: Analysis Post Alternative Approach

UNIVARIATE ANALYSIS

The distribution of beds per hospital reveals:

- A wide range of hospital sizes across states

- Potential differences in healthcare strategies (fewer, larger hospitals vs. more, smaller facilities)

BIVARIATE ANALYSIS

Comparing number of hospitals to beds per hospital shows:

- Some states prioritize many smaller facilities (e.g., Uttar Pradesh)

- Others have fewer but larger hospitals (e.g., Delhi)

Key Takeaways

1. Total number of states/UTs in the dataset: **29**

2. Total number of hospitals: **132**

3. Total number of beds: **34520**

4. State with the most hospitals: **Uttar Pradesh (14 hospitals)**

5. State with the most beds: **Uttar Pradesh (4570 beds)**

6. Average number of beds per hospital across all states: **260.53 beds**

7. Distribution of Healthcare Facilities:

- Significant variation in both number of hospitals and beds across states

- Uttar Pradesh leads in number of hospitals, while Delhi leads in beds per hospital

8. Hospital Size and Capacity:

- Delhi has the highest number of beds per hospital, suggesting larger facilities

- States like Uttar Pradesh have more hospitals but potentially smaller average sizes

9. Regional Patterns:

- Northern states (Uttar Pradesh, Jammu & Kashmir, Rajasthan) tend to have more hospitals

- Metropolitan areas (Delhi, Maharashtra) have higher bed-to-hospital ratios

10. Potential Factors Influencing Distribution:

- Military presence and strategic importance may play a role in facility allocation

- Population density and urbanization likely influence hospital size and capacity

11. Correlation Insights:

- Strong positive correlation (0.90) between number of hospitals and number of beds across states.

- Weak positive correlations between the order of states in the dataset and their healthcare facilities, suggesting geographical location or alphabetical order does not significantly influence resource allocation.

CONCLUSION:

- The analysis of hospitals and beds maintained by the Ministry of Defense reveals significant variations across Indian states. While some states focus on a larger number of potentially smaller hospitals, others have fewer but larger facilities. This distribution likely reflects a combination of factors including military needs, population density, and regional healthcare strategies.

- The data suggests that the Ministry of Defense's healthcare infrastructure is not uniformly distributed, with certain states like Uttar Pradesh, Jammu & Kashmir, and Rajasthan having a higher concentration of facilities. However, states like Delhi stand out for their high bed-to-hospital ratio, indicating a focus on larger, potentially more specialized facilities.

- The correlation analysis further supports these findings, revealing a strong relationship between the number of hospitals and beds across states. This suggests that the Ministry of Defense generally scales bed capacity proportionally with the number of hospitals in each state. However, the imperfect correlation also confirms the variations in hospital sizes and capacities we observed earlier.

These insights can inform decision-making in resource allocation, healthcare planning, and potentially highlight areas where civilian and military healthcare infrastructure might be complementary. Further analysis incorporating additional contextual data such as military personnel distribution, population demographics, and existing civilian healthcare infrastructure could provide even more nuanced insights for strategic healthcare planning.