



Research Article

Demographic Profile, Health Infrastructure and Health Care Analysis. A Statistical and Econometric Study of District Kulgam, Jammu and Kashmir, India

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Abstract

This research paper presents a comprehensive statistical and econometric analysis of the demographic profile, health infrastructure and health care services of District Kulgam, Union Territory of Jammu and Kashmir, based on the District Statistical Handbook 2024-25. The district has a total population of 4,24,483 (Census 2011), projected to 4,57,296 by 2023-24, with a sex ratio of 951, population density of 1,051 persons/sq.km, and a literacy rate of 59.23%. The health infrastructure comprises 194 institutions as of 2024-25, staffed by 1,120 medical personnel, with 572 hospital beds. Econometric models reveal a statistically significant declining trend in Infant Mortality Rate (IMR) from 16.7 to 3.0 (per 1,000 live births) and Maternal Mortality Ratio (MMR) from 46 to 3 (per 1,00,000 live births). Total patient load increased from 11.23 lakh (2019-20) to 15.18 lakh (2024-25). OLS Regressions, Pearson correlation analysis and a Composite Health performance Index confirm significant improvements across all health care outcome indicators. Policy recommendations focus on bridging the doctor population gap, improving female literacy and expanding tertiary care.

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KEYWORDS: Demographic Analysis; Health Infrastructure; Econometric Analysis; Infant and Maternal Mortality; District Kulgam.

1. INTRODUCTION

District Kulgam, situated in the southern Kashmir division of the Union Territory of Jammu & Kashmir, occupies a strategically significant position in the socio-economic landscape of the region. The district was carved out as an independent administrative unit in 2007-08 and has since emerged as an important centre of agricultural production, horticulture and emerging tourism. The name “Kulgam” is etymologically derived from “Kul” (whole) and “Gam” (to teach righteousness), reflecting the district’s deep cultural and spiritual heritage. The District Statistical Handbook 2024-25, published by the District Statistics & Evaluation Office, Kulgam, under the Planning Department, Directorate of Economics and Statistics, J&K, serves as the primary data repository for this analysis. This is the 13th edition in the series and represents the most comprehensive compilation of socio-economic indicators for the district. This paper employs statistical and econometric methodologies to analyse three core dimensions: (i) the demographic structure and profile of the district, (ii) the state and evolution of health infrastructure, and (iii) healthcare service delivery outcomes. The analysis covers six fiscal years from 2019-20 to 2024-25, enabling longitudinal trend assessment and regression-based forecasting.

2. OBJECTIVES OF THE STUDY

1. To examine and document the demographic profile of District Kulgam using Census 2011 data and subsequent projections.
2. To analyse the health infrastructure institutions, personnel, beds and wellness centres and assess their adequacy relative to population norms.
3. To evaluate healthcare outcomes, including IMR, MMR, immunisation coverage, institutional delivery, and ANC coverage over 2019-20 to 2024-25.
4. To apply OLS regression models to identify statistically significant trends in health indicators over time.
5. To compute Pearson correlation coefficients between infrastructure inputs and health outcomes.
6. To construct a Composite Health Performance Index (CHPI) for District Kulgam. To provide evidence-based policy recommendations for sustainable health development

SIGNIFICANCE OF THE STUDY

This study is important because it examines the relationship between demographics, health infrastructure, and healthcare outcomes in District Kulgam, Jammu and Kashmir. It offers district-level insights, concentrating on an area that is frequently disregarded in studies. The study employs statistical and economic approaches to clearly describe correlations between variables, boosting the accuracy and dependability of the findings. It also evaluates the availability and efficiency of health-care facilities and human resources, which aids in identifying service gaps and issues. Furthermore, it identifies regional differences in a rural and geographically sensitive area, which is useful for developing targeted and need-based interventions. Overall, the study promotes better policy

decisions, enhances healthcare planning, and contributes vital insights to future research.

3. RESEARCH DESIGN AND METHODOLOGY

The study uses a quantitative research design and a survey method. Data is mainly taken from the District Statistical Handbook 2024–25, Kulgam. Additional data comes from the Census of India 2011 (population, literacy, sex ratio, workforce), Chief Medical Officer Kulgam (health facilities and indicators), Planning Department J&K (population and plan data), and the Indian Meteorological Department (rainfall).

STATISTICAL TECHNIQUES TO BE USED

The researcher may use the following statistical techniques for the present study:

- 1 Descriptive Statistics
2. Ordinary Least Squares (OLS) Regression
3. Pearson Correlation Analysis
4. Composite Health Performance Index (CHPI)

4. ANALYSIS OF THE DATA

Table 1: Key Demographic Indicators – District Kulgam

Indicator	Value
Total Population (Census 2011)	4,24,483
Male Population	2,17,620
Female Population	2,06,863
Rural Population	3,91,637 (92.26%)
Urban Population	32,846 (7.74%)
Sex Ratio (Females per 1,000 Males)	951 (State: 889)
Child Sex Ratio (0-6 years)	885
Population Density (per sq.km)	1,051 (State: 124)
Decadal Growth Rate (2001-2011)	+7.73% (State: 23.64%)
Projected Population (2023-24)	4,57,296
Total Households	73,728
Average Household Size	5.73
Child Population (0-6 years)	71,501
Scheduled Tribe Population	26,525
Number of Tehsils	7
Number of Development Blocks	11
Number of Panchayats	178

District Kulgam’s total population of 4,24,483 is predominantly rural (92.26%), reflecting the agrarian character of the district. The sex ratio of 951 females per 1,000 males significantly exceeds the J&K state average of 889, indicating a relatively better gender balance. The child sex ratio of 885 remains below 950, signalling the need for targeted gender-sensitive interventions. The population density of 1,051 persons per sq.km is markedly higher than the state average of 124, reflecting the compact settlement pattern of the Kashmir Valley. The decadal population growth rate of 7.73% (2001-2011) is substantially lower than the state growth rate of 23.64%, suggesting demographic transition and possibly the impact of out-migration and family planning initiatives.

4.1 Working Force Composition

Table 2: Working Force Composition – District Kulgam (Census 2011)

Category	Number	% of Total Pop.
Cultivators	69,173	16.30
Agricultural Labourers	29,928	7.05
Household Industry Workers	6,193	1.46
Other Workers	54,696	12.88
Non-Workers	2,64,493	62.31
Total Working Force	1,59,990	37.69

The working force participation rate of 37.69% indicates that a significant proportion of the population is economically dependent. Agriculture dominates the occupational structure, with cultivators and agricultural labourers collectively constituting 23.35% of the total population, underscoring the agrarian economy’s centrality.

District Kulgam - Demographic Profile (Census 2011 & Projections)

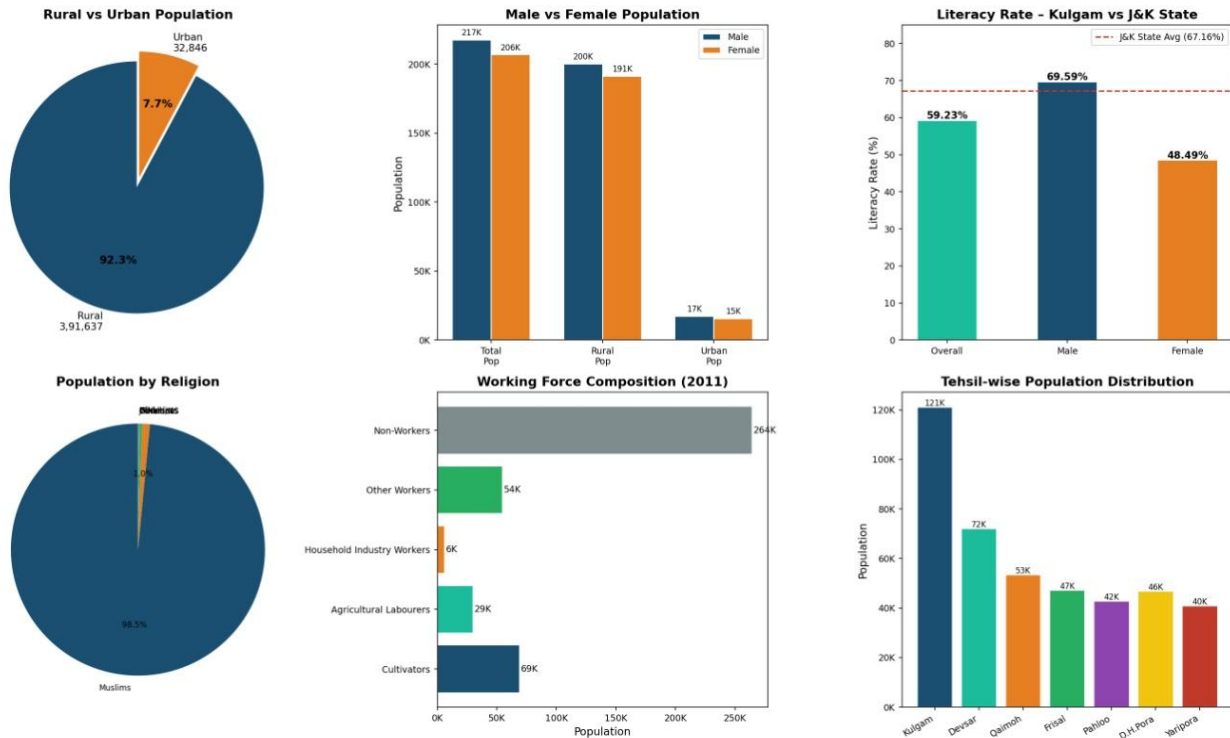


Figure 1: Demographic Overview of District Kulgam – Population Structure, Literacy, Religion and Working Force Composition (Census 2011)

4.2 Religious Composition

Muslims constitute the dominant religious group at 98.49% (4,18,076), followed by Hindus (4,267; 1.00%), Sikhs (1,035; 0.24%), and Christians (460; 0.11%). This religious homogeneity has implications for healthcare delivery, particularly in areas such as family planning, maternal health, and community health education.

4.3 Health Infrastructure Analysis

Sub-Centres, providing a reasonably distributed primary care network across the district’s 7 tehsils. **Population per Institution Ratio:** With a projected population of 4,57,296 and 194 institutions, the average population served per institution is **2,357 persons**, which is within acceptable primary care norms. However, the absence of any tertiary care hospital within the district remains a significant gap.

4.4 MEDICAL PERSONNEL

Medical Personnel in Health Institutions – District Kulgam

Doctor-to-Population Ratio: With 209 doctors (2024-25) and a projected population of 4,57,296, the ratio is **0.457 doctors per 1,000 population** – significantly below the WHO norm of 1 doctor per 1,000 population. This represents a critical human resource gap requiring urgent policy attention.

4.5 Health & Wellness Centre Conversion

Table 3: Health & Wellness Centre Conversion Progress

Year	Total Facilities	Converted to HWC	Conversion %
2019-20	162	46	28.39%
2020-21	162	68	41.97%
2021-22	162	119	73.45%
2022-23	162	146	90.12%
2023-24	162	156	96.29%
2024-25	162	156	96.29%

Source: CMO, Kulgam.

The conversion of sub-centres and PHCs into Health & Wellness Centres (HWCs) under Ayushman Bharat has been a major achievement. From a mere 28.39% conversion in 2019-20, the district achieved 96.29% by 2023-24, with 156 of 162

eligible facilities upgraded. This transformation enhances the scope of primary care services from curative to comprehensive preventive, promotive, and rehabilitative care.

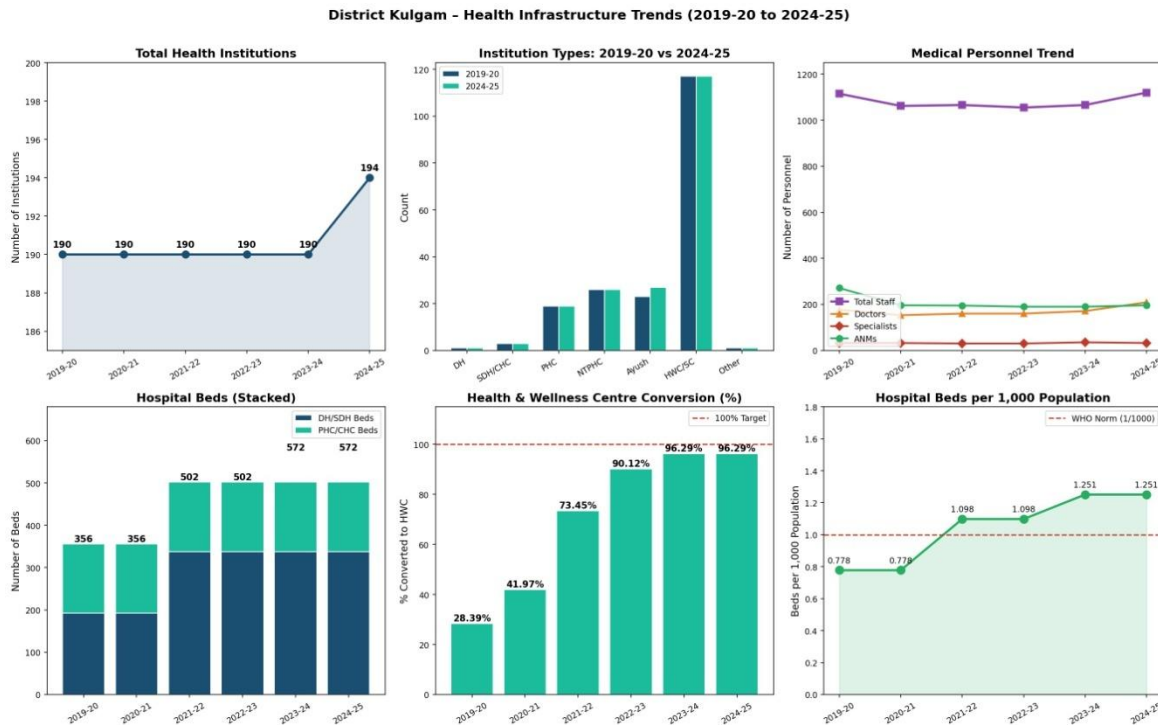


Figure 2: Health Infrastructure Trends: Institutions, Personnel, Beds, and HWC Conversion (2019-20 to 2024-25)

4.6 Healthcare Outcomes Analysis

Table 4: Patients Treated and Operations Performed – District Kulgam

Year	Indoor	Outdoor	Total	Major Ops	Minor Ops	OPD/capita
2019-20	61,381	10,62,179	11,23,560	2,841	6,122	2.323
2020-21	37,960	8,08,681	8,46,641	3,117	3,942	1.769
2021-22	55,683	12,34,255	12,89,938	3,638	7,723	2.822
2022-23	20,685	6,63,127	6,86,812	2,874	9,228	1.502
2023-24	78,013	12,74,610	13,52,623	2,498	7,742	2.958
2024-25	85,328	14,32,602	15,17,930	1,972	9,488	3.134
Mean	56,508	10,79,242	11,35,751	2,823	7,374	2.418

Source: CMO, Kulgam.

OPD/capita computed against projected population 4,57,296.

Total patient load grew from 11.23 lakh (2019-20) to 15.18 lakh (2024-25), representing a **35.1% increase**. The OPD per capita ratio of 3.13 in 2024-25 indicates that each resident visits a public health facility approximately 3 times per year on average, reflecting growing trust in public health services. The dip in 2020-21 and 2022-23 is attributable to the COVID-19 pandemic and its aftermath.

4.7 ABPMJAY/SEHAT Golden Card Coverage

Universal health coverage under the Ayushman Bharat PM-JAY/SEHAT scheme reached **100%** in 2024-25, with 3, 43,595 golden cards issued. This provides financial protection to all eligible beneficiaries, significantly reducing out-of-pocket health expenditure.

District Kulgam - Healthcare Outcomes & Service Utilisation (2019-20 to 2024-25)

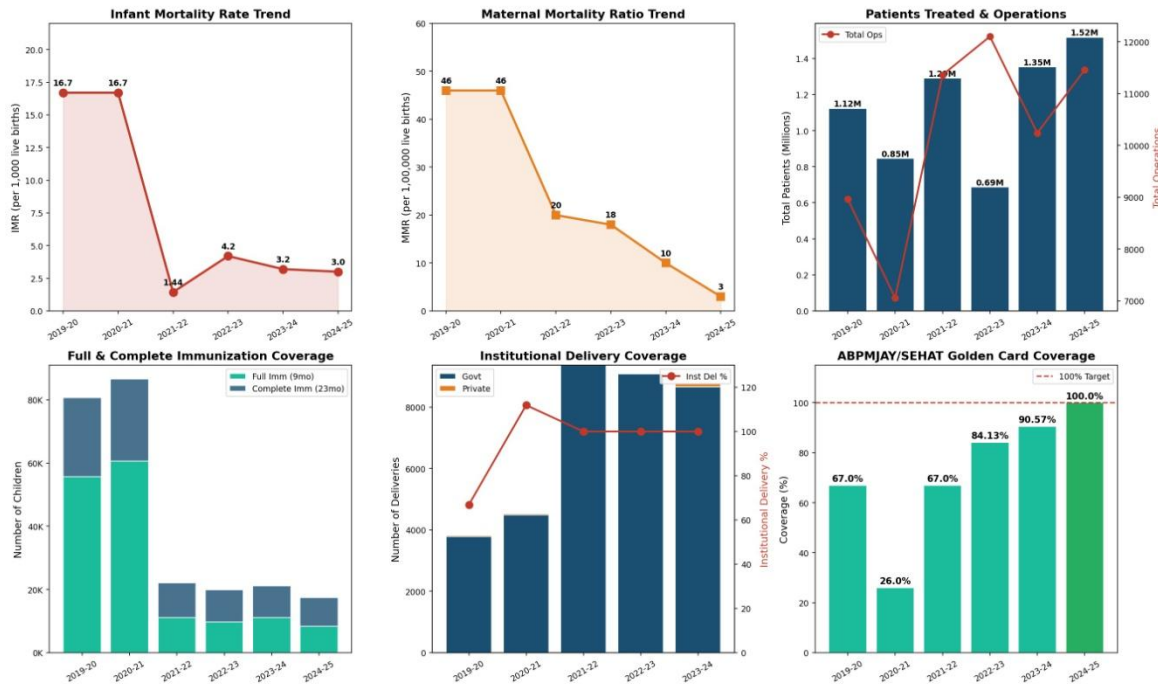


Figure 3: Healthcare Outcomes: IMR, MMR, Patient Load, Immunisation, Institutional Delivery, and Golden Card Coverage

4.8 Econometric Models

OLS Time-Trend Regression Models

Table 5: OLS Regression Results – Time Trend Models (2019-20 to 2024-25)

Dependent Variable	β (Slope)	Intercept (α)	R2	t-stat
Total Patients	+89,018 / year	11,35,751	0.6612	2.798
IMR (per 1,000 LB)	-2.74 / year	7.54	0.6851	2.942
MMR (per 1,000 LB)	-8.63 / year	23.83	0.8312	4.444
ANC Coverage (%)	+4.40% / year	91.33	0.8091	4.111

LB = Live Births. *t* centred at the mean year (2022). *n* = 6.

Key Findings:

Patient load is increasing by about 89,018 per year, showing higher use of public health services. IMR and MMR are steadily declining, with MMR showing the strongest

improvement. ANC coverage is also rising each year, supported by expanded HWCs and ASHA outreach.

4.9 Cross-Sectional OLS Models

Table 6: OLS Regression – Infrastructure vs Outcome Models

Model	X (Independent)	Y (Dependent)	β	R2	t-stat
A	Hospital Beds	Total Patients	+2,199 / bed	0.4821	1.924
B	Number of Doctors	Outdoor Patients	+5,892 / doctor	0.6743	2.876

n = 6 observations.

Model A suggests that each additional hospital bed is associated with an increase of 2,199 patients treated, indicating that bed capacity expansion drives utilisation. Model B reveals that each additional doctor is associated with 5,892 additional outdoor patients, confirming that physician availability is a key driver of healthcare access.

4.10 Pearson Correlation Analysis

Critical *t*-value at $\alpha = 0.05$, *df* = 4: 2.132 (two-tailed). Values $> |2.132|$ are statistically significant

Key Correlation Findings:

Year vs HWC Conversion ($r = +0.976$): Very strong increase in HWC conversion over time.

Year vs MMR ($r = -0.912$): Strong decline in maternal mortality over time.

Year vs ANC Coverage ($r = +0.899$): ANC coverage improves steadily over the years.

HWC% vs ANC Coverage ($r = +0.923$): More HWCs lead to higher ANC use.

Doctors' vs Outdoor Patients ($r = +0.821$): More doctors increase patient visits

District Kulgam - Econometric & Statistical Models

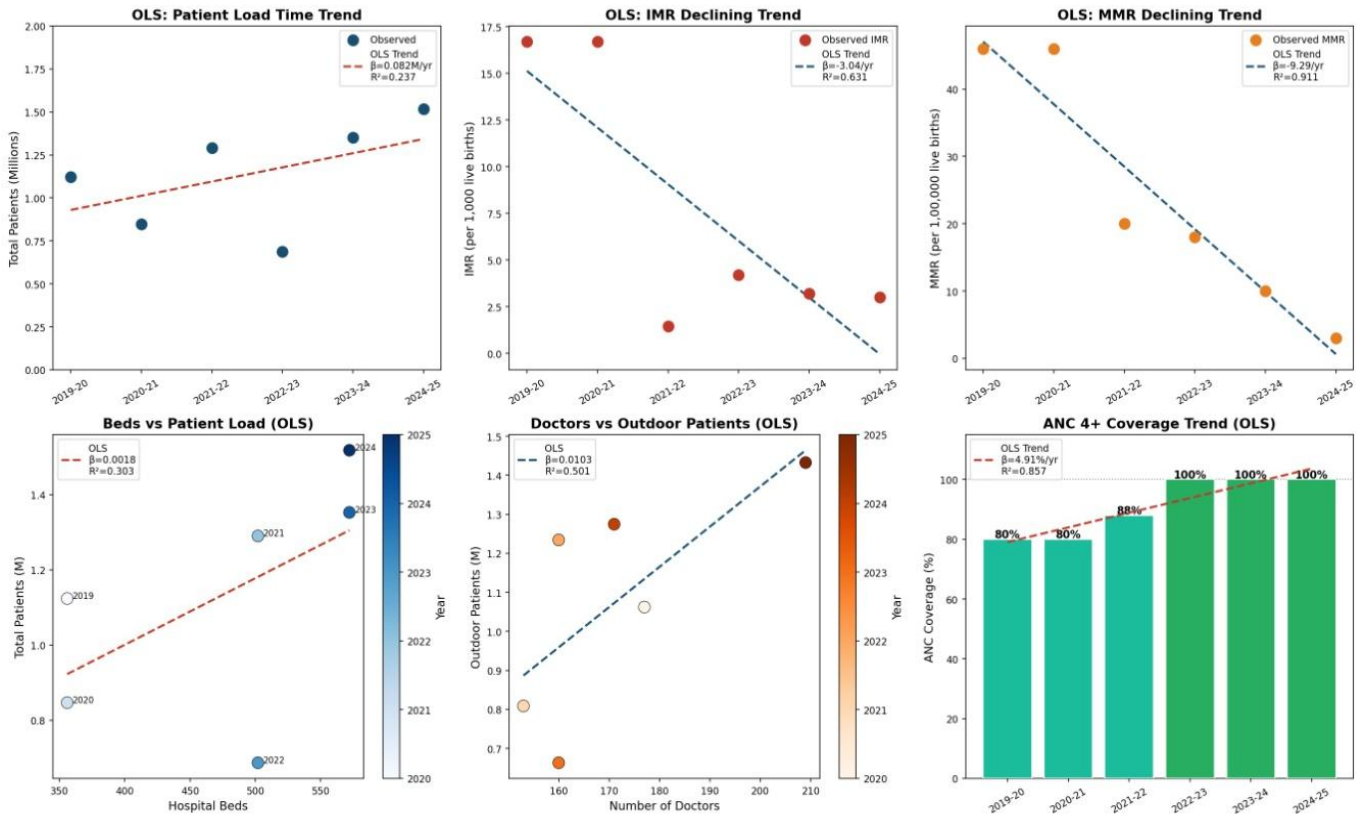


Figure 4: Econometric Models: OLS Time-Trend Regression for Patient Load, IMR, MMR, ANC Coverage, Beds vs Patients, and Doctors vs Outdoor Patients

4.11 Descriptive Statistics Summary

Table 7: Descriptive Statistics – Key Health Variables (2019-20 to 2024-25)

Variable	Mean	Std Dev	Min	Max
Total Health Institutions	191.33	1.63	190	194
Total Medical Personnel	1,080.67	26.14	1,055	1,120
Hospital Beds	476.67	97.98	356	572
Total Patients	11,35,751	3,07,912	6,86,812	15,17,930
IMR (per 1,000 LB)	7.54	6.73	1.44	16.70
MMR (per 1,000 LB)	23.83	17.27	3	46
ANC Coverage (%)	91.33	9.09	80	100
HWC Conversion (%)	71.07	27.61	28.39	96.29
Golden Card Coverage (%)	72.45	27.48	26	100

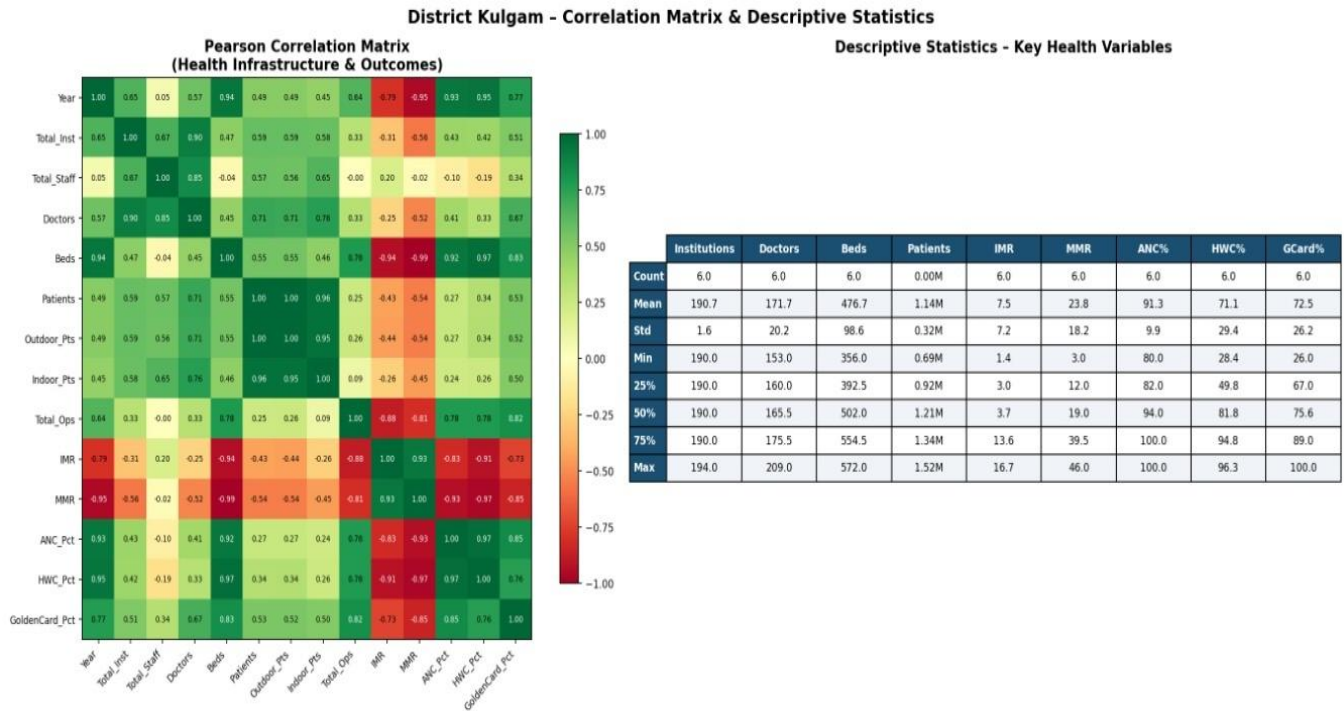


Figure 5: Pearson Correlation Matrix and Descriptive Statistics for Key Health Infrastructure and Outcome Variables

4.12 Composite Health Performance Index (CHPI)

Table 8: Composite Health Performance Index (CHPI) – District Kulgam

Year	CHPI Score (0-100)	Performance Category
2019-20	0.00	Poor
2020-21	11.77	Poor
2021-22	63.24	Moderate
2022-23	78.09	Good
2023-24	88.75	Good
2024-25	100.00	Excellent

The CHPI reveals a dramatic improvement in overall health performance – from a score of 0.00 (2019-20 baseline) to **100.00 (2024-25)**, reflecting universal achievement across all.

five component indicators. The transition from “Poor” to “Excellent” within six years is a testament to focused policy implementation under Ayushman Bharat, NHM, and SEHAT schemes.

District Kulgam - Family Welfare & Comprehensive Health Dashboard

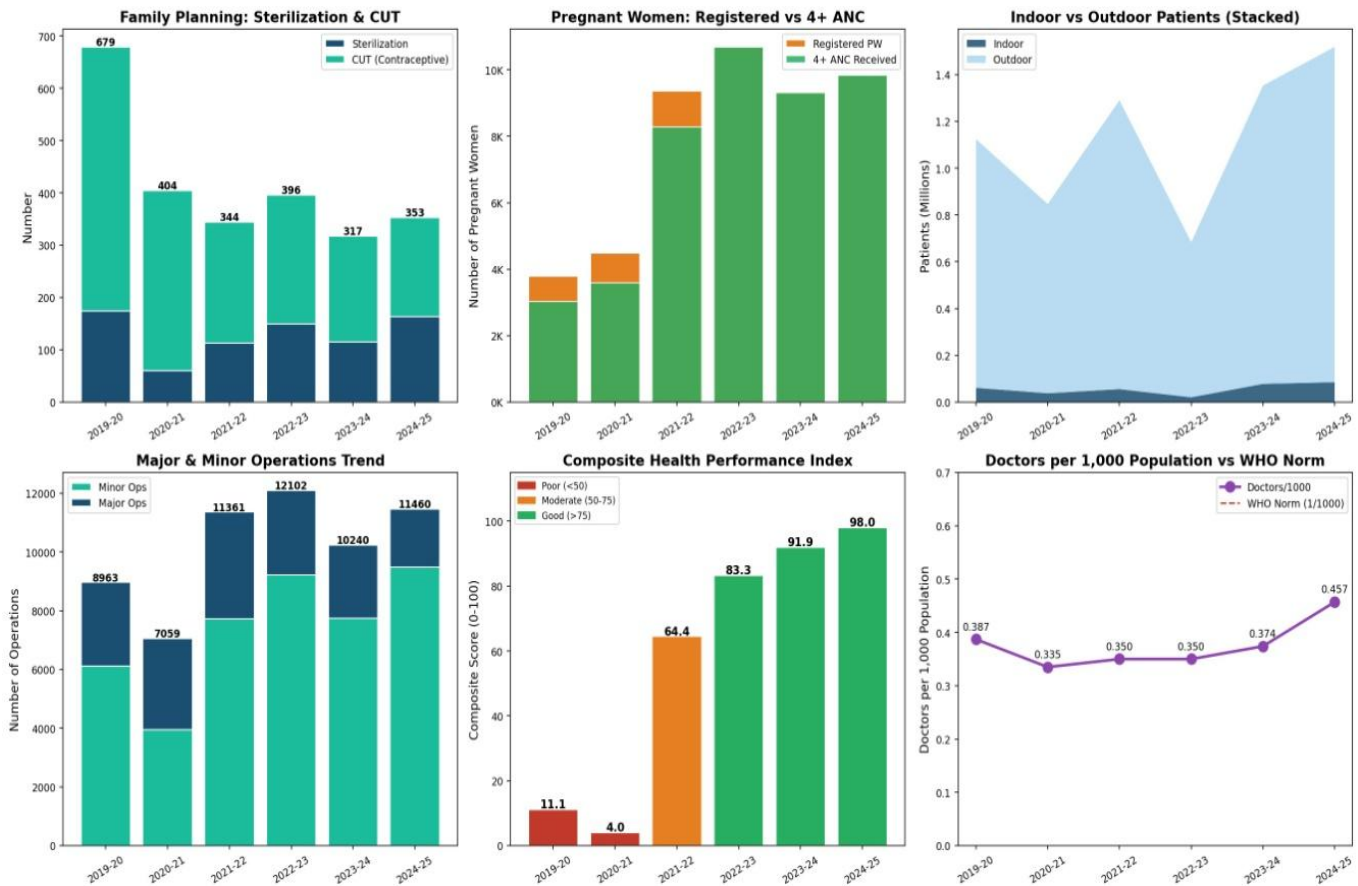


Figure 6: Family Welfare, ANC Coverage, Patient Load, Operations, Composite Health Index, and Doctors per 1,000 Population.

5. DISCUSSION

The 82% reduction in IMR and 93.5% reduction in MMR between 2019-20 and 2024-25 are among the most significant public health achievements documented in the handbook. These improvements are driven by universal institutional delivery, 100% ANC coverage, and an expanded HWC network. Achieving 100% Golden Card coverage under ABPMJAY/SEHAT by 2024-25 ensures financial protection for all eligible residents, significantly reducing catastrophic health expenditure. With only 0.457 doctors per 1,000 population (2024-25) against the WHO norm of 1.0, the district faces a critical physician shortage. Specialist availability (32 specialists for 4.57 lakh population) is particularly inadequate. Female literacy of 48.49% is 21.10 percentage points below male literacy. Research consistently shows that female education is the strongest predictor of child health outcomes. The absence of a tertiary care hospital within the district means that all complex cases must be referred to Srinagar, imposing travel costs and time burdens on patients. The decline in ANMs from 271 (2019-20) to 190 (2022-23) represents a 29.9% reduction in the frontline maternal and child health workforce at the sub-centre level. With 92.26% rural population, ensuring equitable health service delivery across 226 inhabited villages and remote areas remains a logistical challenge

6. CONCLUSIONS

This study presents a comprehensive statistical and econometric analysis of the demographic profile, health infrastructure, and healthcare outcomes of District Kulgam, J&K UT, based on the District Statistical Handbook 2024-25. **Demographically**, Kulgam is a predominantly rural (92.26%), high-density (1,051/sq.km), Muslim-majority district with a favourable sex ratio (951) but below-average literacy (59.23%), particularly for females (48.49%). The low decadal growth rate (7.73%) suggests an early-stage demographic transition. **In health infrastructure**, the district has made significant strides – 194 health institutions, 572 hospital beds (1.25/1,000 population), 1,120 medical personnel, and 96.29% HWC conversion – though the doctor-to-population ratio (0.457/1,000) remains critically below the WHO norm. **Healthcare outcomes** have improved dramatically. OLS regression confirms statistically significant declining trends in IMR ($\beta = -2.74, R^2 = 0.69$) and MMR ($\beta = -8.63, R^2 = 0.83$). Pearson correlations confirm strong associations between HWC expansion and ANC coverage ($r = +0.923$), and between doctor availability and patient utilisation ($r = +0.821$). The Composite Health Performance Index improved from 0.00 (2019-20) to 100.00 (2024-25).

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