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Review Article

Evaluating maternal health service coverage across districts of Himachal Pradesh, India through composite index approach

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ABSTRACT

Despite advancements in maternal health in India, disparities in service coverage persist, particularly in rural and challenging regions. This study evaluates the maternal health service coverage index (MHSI) in Himachal Pradesh, a predominantly hilly state with a largely rural population. By calculating this composite index, the study aims to identify disparities in service utilization across districts. The findings will inform targeted interventions to improve maternal health outcomes and address inequalities within the state. A retrospective analysis was conducted using maternal health indicators from the health management information system (HMIS) report of Himachal Pradesh from March 2020 to April 2024. Separate indices for antenatal, perinatal, and postnatal services were calculated which were then combined into a composite index (MHSI) using arithmetic mean method. The analysis revealed significant disparities in maternal health service coverage across districts. Districts like Bilaspur, Mandi, and Shimla consistently showed high composite indices, indicating robust maternal health services. In contrast, remote districts such as Lahul and Spiti, Kinnaur, and Chamba faced challenges in service coverage, particularly in antenatal care (ANC) and perinatal care. The findings highlight significant disparities in maternal health service coverage across Himachal Pradesh, particularly in remote districts (Lahaul-Spiti and Kinnaur). These disparities underscore the need for targeted interventions to improve access to and utilization of maternal health services in underserved regions.

Keywords: Maternal health, Service coverage, Himachal Pradesh, Composite index, Antenatal care, Perinatal care, Postnatal care, Health disparities

INTRODUCTION

Access to antenatal care, skilled care during birth, and postnatal support is essential for all pregnant women, which is crucial for reducing maternal mortality and morbidity.[1] India has made significant strides in reducing maternal mortality over the past two decades, with the maternal mortality ratio (MMR) declining from 384 deaths per 100,000 live births in 2000 to 103 in 2020.[2] This remarkable progress can be attributed to various maternal health programs and schemes implemented by the Government of India, including Pradhan Mantri Matru Vandana Yojana (PMMVY), Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA), Janani Suraksha Yojana (JSY), Janani Shishu Suraksha Karyakaram (JSSK), and DAKSHATA.[3]

Himachal Pradesh (H.P), a hilly state in northern India, has a population of 6.86 million, with 89.9% living in rural areas and a literacy rate of 83.3%, though literacy rates for women remain notably lower.[4] The state's geography and predominantly rural population poses challenge in access to health services, resulting in disparities across districts in terms of population and health-related accessibility indicators. Despite this, Himachal Pradesh has made significant improvement in maternal health services, as evidenced by data from the National Family Health

Surveys (NFHS) 4 and 5.[5] Overall, 77.7% of women in Himachal Pradesh received at least four ANC check-ups, with higher coverage reported in districts like Bilaspur, Kinnaur, Shimla, Sirmaur, and Solan (75.3% to 88.2%) compared to districts such as Chamba, Hamirpur, Kangra, Kullu, and Lahul and Spiti, where coverage ranged from 56.3% to 65.6%.[6] According to the health management information system (HMIS) 2019-20, 92.5% of deliveries occurred in institutions, predominantly public health facilities (82.9%). Notwithstanding these overall improvements, maternal health service utilization remains a challenge in tribal districts of Himachal Pradesh, as highlighted by specific studies on tribal populations and health disparities in the region.[7]

The current study aims to estimate the maternal health service coverage index (MHSI) for districts in Himachal Pradesh and analyse trends over four years to identify disparities in health service utilization across the districts. By calculating a composite index, the study aims to identify areas with insufficient health service utilization, guiding targeted interventions to enhance maternal health outcomes state-wide. This approach will aid in resource allocation and policy formulation to ensure equitable access to maternal health services for all women, irrespective of their geographic location.

METHODS

Study design and duration

A retrospective analysis using the HMIS maternal health indicators of data of Himachal Pradesh was conducted in the reference period of FY 2020 to 2024.

Study setting

Himachal Pradesh, a northern Indian state renowned for its diverse and rugged terrain, serves as the setting for this study. The 12 districts: Bilaspur, Chamba, Hamirpur, Kangra, Kinnaur, Kullu, Lahaul and Spiti, Mandi, Shimla, Sirmaur, Solan, and Una are grouped into three divisions namely Shimla, Kangra, and Mandi. Scheduled tribes constitute 5.71% of the population.[8] The literacy rate varies significantly across districts, with Hamirpur having the highest literacy rate at 89.01% and Chamba the lowest at 73.19%.[9]

The state's geographical diversity, including valleys, dense forests, and high mountain peaks, contributes to significant challenges in healthcare service delivery. For example, Lahaul and Spiti, which is the largest district, is located at an altitude of 4,270 meters, experiences heavy snowfall, and has rough terrain, making it one of the most remote and inaccessible districts.[10] Tribal districts like Kinnaur and Lahaul-Spiti, as well as sub-divisions like Pangi and Bharmour in Chamba, face more significant challenges due to their remote locations and difficult terrain.[11] Despite these challenges, the state has developed an extensive network of health facilities and provides services through maternal health programs. This network includes around 2,114 sub-centers, approximately 553 primary health centers (PHCs), about 98 community health centers (CHCs), and at least one district hospital in each district.[12]

Data analysis

The study utilized facility-based data on maternal health services from health facilities across all districts of Himachal Pradesh, as reported in the HMIS of four years FY 2020 to 2024. The maternal health indicators were analyzed under three categories: antenatal service coverage, perinatal service coverage, and postnatal maternal health services. To calculate the MHSI, separate indices were calculated for each of the three categories, and the arithmetic mean of these indices formed the composite index.

From the HMIS data, percentages for various maternal health indicators were calculated. For antenatal services, indicators included out of the total ANC registered: percentage of women registered in the first trimester, those receiving four ANC check-ups, given 180 IFA tablets, tested for hemoglobin, tested for blood sugar using the oral glucose tolerance test (OGTT). Perinatal service indicators included the percentage of SBA-attended home deliveries, the percentage of institutional deliveries and the percentage of C-section deliveries out of reported institutional deliveries. Postnatal service indicators included the percentage of women receiving their first postpartum check-up within 48 hours of home delivery.

To normalize these indicators, the study used the 'minimum–maximum approach was utilized. The study fixed 100% as the maximum value (aspirational goal) and 0% as the minimum value (natural zero) for normalization. This means that the actual value of each indicator is adjusted to a scale between 0 and 100, where 0 represents the worst possible performance and 100 represents the best possible performance in terms of maternal health service coverage.[13]

RESULTS

Antenatal service coverage in Himachal Pradesh

The total ANC registrations in Himachal Pradesh decreased over the four years: 112,198 (2020-21), 106,340 (2021-22), 107,571 (2022-23), and 103,029 (2023-24).

Early ANC registration (first trimester)

The percentage of women registering in the first trimester out of the total registered increased from 84.4% to 87.8% over the same period. Kullu led in early ANC registration, consistently remaining above 97%, while Kinnaur improved from 76.5% to 82.3%. Lahul and Spiti had persistently low registrations, ranging from 60.6% to 71.4%.

Four or more ANC check-ups

The percentage of women receiving four or more ANC check-ups in Himachal Pradesh rose from 80.8% in 2020-21 to 87.6% in 2023-24. Both Bilaspur and Shimla achieved full coverage by the end of this period, starting from initial rates of 95.4% and 55.5%, respectively. Conversely, Lahul and Spiti reported the lowest figures, ranging from 28.8% to 44.4%.

IFA supplementation

The percentage of pregnant women receiving 180 IFA tablets out of the total ANC registrations in Himachal Pradesh increased from 81.0% in 2022-23 to 89.6% in 2023-24. Bilaspur and Shimla both reached full coverage, up from initial rates of 96.5% and 68.3%. Lahul and Spiti's coverage varied between 66.9% and 83.6%.

Hemoglobin testing (four or more times)

Hemoglobin testing discrepancies were notable, with Shimla recording a low of 42.4% in 2020-21, while Bilaspur and Hamirpur consistently showed more than 88% coverage. Lahul-Spiti continued to record the lowest percentages across the years, with 36.2% in 2023-24.

Blood sugar testing

Testing for blood sugar using OGTT in Shimla achieved full coverage from 2020-22. Bilaspur and Kinnaur led with high percentages, ranging from 96.1% and 65.0%, respectively, to full coverage in subsequent years, while Una consistently recorded the lowest rates, ranging from 10.9% to 14.1% in 2023-24.

Antenatal service coverage index

Bilaspur and Hamirpur had strong ANC coverage, with indices generally above 0.8, reaching as high as 1.00 for Bilaspur in 2021-22. Lahul and Spiti had the lowest ANC indices, starting at 0.56 in 2020-21 and declining to 0.50 in 2023-24, indicating significant challenges in accessing or utilizing antenatal services. Kinnaur showed improvement in ANC coverage over the years, rising from 0.71 in 2020-21 to 0.81 in 2023-24.

Perinatal service coverage in Himachal Pradesh

SBA attended home deliveries

In H.P, home deliveries reported were 7,490 in 2020-21, 6,493 in 2021-22, 4,476 in 2022-23, and 3,815 in 2023-24. In 2020-21, Lahul-Spiti had the highest percentage of SBA attended home deliveries at 52.9%, while Mandi recorded the lowest at 0.1%. In 2021-22, Kinnaur led with 59.7%. In 2022-23, Lahul-Spiti increased to 80.0%. In 2023-24, Hamirpur had highest SBA home deliveries at 28.6%, with several districts including Kinnaur, Kullu, Lahul and Spiti, Mandi, Shimla, and Sirmaur, reporting no SBA attendance.

Institutional deliveries

Institutional deliveries (including both public and private facilities) were 80,892 in 2020-21, 82,252 in 2021-22, 81,674 in 2022-23, and 80,005 in 2023-24. Hamirpur consistently achieved the highest institutional delivery rates: 98.9% in 2020-21, 99.7% in 2021-22, and 99.8% in both 2022-23 and 2023-24. Chamba had the lowest rates, starting at 61.5% in 2020-21 and improving to 72.6% by 2023-24, indicating ongoing challenges in accessing institutional care.

C-section deliveries

Una recorded the highest percentage of C-section deliveries across all years, starting at 47.3% in 2020-21 and peaking at 50.9% in 2022-23. Lahul and Spiti consistently had the lowest, ranging from 17.6% in 2020-21 to 0.0% in subsequent years, reflecting limited access to surgical facilities.

Perinatal service coverage index

Una consistently had the highest perinatal index, particularly in 2023-24 (0.54), indicating relatively strong coverage of perinatal services. Lahul and Spiti showed fluctuating but generally lower perinatal indices, peaking at 0.56 in 2022-23 but dropping to 0.28 in 2023-24, highlighting significant inconsistencies in perinatal service delivery. Shimla and Sirmaur displayed steady performance with perinatal indices hovering around 0.4, though these values suggest room for improvement in service coverage.

Post-natal service coverage

Over the four-year period, the total number of deliveries in Himachal Pradesh were as follows: 88,382 in 2020-21, 88,745 in 2021-22, 86,150 in 2022-23, and 83,820 in 2023-24. The percentage of women receiving their first postpartum check-up within 48 hours varied across Himachal Pradesh. Bilaspur, Kinnaur, and Kullu consistently achieved full coverage, while Lahul and Spiti had the lowest percentages, ranging from 50.0% in 2020-21 to 81.4% in 2023-24. Despite improvements, significant disparities in postnatal care remain, particularly in remote areas like Lahul and Spiti.

Postnatal service coverage index

Bilaspur and Kinnaur demonstrated very high postnatal indices, particularly in 2020-21 (1.68 for Bilaspur), indicating excellent postnatal care coverage in those years. Lahul and Spiti again performed poorly, with the postnatal index starting at 0.50 in 2020-21 and decreasing to 0.28 in 2023-24, showing consistent challenges in ensuring timely postnatal care. Sirmaur showed strong postnatal care coverage with indices over 1.0 in several years, indicating effective service delivery in the postnatal period.

Table 1: Maternal health service coverage composite index of Himachal Pradesh from FY 2020 to 2024.

District of Himachal Pradesh	Antenatal care service coverage index				Perinatal service coverage index				Postnatal service coverage index				Composite maternal health service coverage index			
Financial year	2020-21	2021-22	2022-23	2023-24	2020-21	2021-22	2022-23	2023-24	2020-21	2021-22	2022-23	2023-24	2020-21	2021-22	2022-23	2023-24
Bilaspur	0.90	1.00	0.84	0.99	0.45	0.49	0.54	0.44	1.68	0.96	0.54	0.44	1.00	1.00	0.64	0.63
Chamba	0.79	0.84	0.87	0.91	0.41	0.42	0.39	0.32	0.56	0.54	0.39	0.32	0.59	0.60	0.55	0.52
Hamirpur	0.86	0.93	0.88	0.91	0.48	0.50	0.51	0.56	0.81	0.67	0.51	0.56	0.72	0.75	0.63	0.67
Kangra	0.80	0.84	0.82	0.91	0.47	0.50	0.48	0.46	1.00	1.00	0.48	0.46	0.78	0.81	0.59	0.61
Kinnaur	0.71	0.70	0.75	0.81	0.38	0.49	0.38	0.32	1.49	1.31	0.38	0.32	0.86	0.89	0.50	0.48
Kullu	0.75	0.78	0.78	0.91	0.39	0.39	0.43	0.40	1.00	1.04	0.43	0.40	0.74	0.75	0.55	0.57
Lahul and Spiti	0.56	0.51	0.43	0.50	0.50	0.43	0.56	0.28	0.50	0.41	0.56	0.28	0.52	0.48	0.51	0.35
Mandi	0.76	0.80	0.86	0.99	0.38	0.40	0.41	0.41	0.86	1.00	0.41	0.41	0.66	0.69	0.56	0.60
Shimla	0.74	0.75	0.77	1.00	0.40	0.40	0.41	0.41	0.90	0.88	0.41	0.41	0.68	0.69	0.53	0.61
Sirmaur	0.83	0.90	0.85	0.92	0.37	0.36	0.37	0.38	1.00	1.00	0.37	0.38	0.81	0.83	0.53	0.56
Solan	0.71	0.72	0.77	0.80	0.39	0.39	0.39	0.41	0.76	0.88	0.39	0.41	0.62	0.62	0.52	0.54
Una	0.66	0.69	0.77	0.89	0.53	0.56	0.55	0.54	0.79	0.82	0.55	0.54	0.66	0.68	0.62	0.65

Maternal health service coverage composite index

Analysing the composite index data for HP districts from FY 2020-24, several key inferences can be drawn (Table 1). Bilaspur consistently led in maternal health service coverage, with the highest composite index of 1.01 in 2020-21, maintaining strong values throughout. Lahul and Spiti consistently recorded the lowest indices, dropping from 0.52 in 2020-21 to 0.35 by 2023-24, reflecting ongoing challenges. Kangra and Hamirpur showed stable, above-average performance, while Kinnaur and Sirmaur exhibited gradual improvement, particularly in postnatal services. Shimla and Mandi performed moderately well with improvements in antenatal and perinatal care, while Chamba and Kullu made gradual progress but still lagged behind the leading districts. The trend diagram (Figure 1) shows that tribal districts (Kinnaur, Lahul and Spiti, and Chamba) consistently lagged behind other districts in maternal health service coverage from 2020-21 to 2023-24.

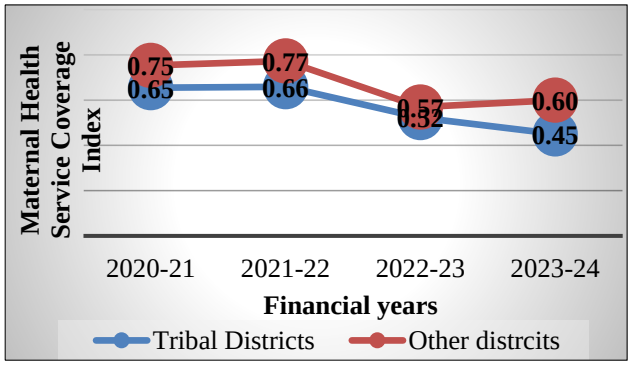

Figure 1: Trend analysis of composite Index comparing tribal districts (Lahul Spiti, Chamba and Kinnaur) with other districts of Himachal Pradesh India.

DISCUSSION

This study highlights significant disparities in maternal health service coverage across Himachal Pradesh, as evidenced by the MHSI. Districts like Bilaspur, Mandi, and Shimla consistently performed well, reflecting stronger healthcare infrastructure and more effective implementation of maternal health programs. The involvement of community health workers and frontline workers have played a crucial role in enhancing service delivery in these areas, contributing to better maternal health outcomes.[3]

In contrast, remote and tribal districts such as Lahaul-Spiti, Kinnaur, and Chamba continue to face substantial challenges. Difficult terrain, inadequate infrastructure, and logistical barriers significantly hinder healthcare delivery in these regions.[10] The sharp decline in MHSI observed in 2022-23, particularly in tribal districts, is likely attributable to the impact of the COVID-19 pandemic, which further strained already limited healthcare resources in remote areas. Although some districts began to recover by 2023-24, tribal regions continued to struggle, highlighting the lasting effects of the pandemic on maternal health services.[14]

The disparities observed in this study align with broader national trends, where resource distribution and accessibility to healthcare services vary significantly between regions. Despite the expansion of healthcare infrastructure, remote areas within Himachal Pradesh remain underserved, exacerbating issues of accessibility and service utilization.[12] Existing literature suggests that factors such as travel time, distance to healthcare facilities, and socioeconomic inequalities critically impact healthcare access in rural areas, further underscoring the need for targeted interventions.[8,9]

Government initiatives, including cash incentive schemes and community health worker programs under the National Health Mission, have shown positive effects, particularly in disadvantaged regions. However, these efforts have not fully bridged the gap in service delivery across the state, especially in the most remote districts.[12,15]

CONCLUSION

Himachal Pradesh has made significant progress in maternal health service coverage. However, while districts like Bilaspur and Hamirpur have shown consistent performance, Lahul and Spiti, along with Kinnaur, continue to face significant challenges. These disparities highlight the urgent need for targeted interventions, especially in tribal and remote areas. Effective strategies, including enhancing healthcare infrastructure, improving the roles of community health workers, and ensuring equitable resource distribution, are essential. By prioritizing these areas, policymakers can aim to achieve uniform maternal health outcomes across all districts in Himachal Pradesh.

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