SCIENTIFIC CULTURE
www.sci-cult.com

SCIENTIFIC CULTURE, Vol. 12, No. 2.1, (2026), pp. 7620-7627
Open Access. Online & Print

DOI: 10.5281/zenodo.122126589

A CROSS SECTIONAL STUDY ON AVAILABILITY OF ESSENTIAL MEDICINES AT SELECTED DISTRICTS OF UTTAR PRADESH

Vidhu Saxena[1*], Saurabh Kumar Banerjee[2]

*[*1]PhD Research Scholar, School of Pharmaceutical Management, IIHMR University, Jaipur, India.*
[2]Professor, School of Pharmaceutical Management, IIHMR University, Jaipur, India.

Received: 11/12/2025
Accepted: 25/04/2026

Corresponding author: Saurabh Kumar Banerjee
(saurabhb.research@gmail.com)

ABSTRACT

Essential medicines range across a broad spectrum of therapeutic categories from antibiotics, antivirals, antimalarials, and vaccines to the drugs used in pain management and long-term chronic conditions such as diabetes, hypertension, and mental health disorders. They play a crucial role in addressing both communicable as well as non-communicable diseases, which make the largest contributions to the disease burden worldwide. The access to such medicines would bring down the rates of mortality and morbidity, especially in low- and middle-income countries. The primary focus of the research work was to study percentage availability of specific essential medicines at primary and secondary levels of public health care facilities and private pharmacies with an emphasis on the extent to which the public health system can maintain uninterrupted stocks of essential medicines required for timely and effective treatment of patients. The comprehensive findings of this study gave a unified view of the availability of essential medicines in public health institutions and private pharmacies in selected districts of Uttar Pradesh. It was observed that there was a gap between the availability of essential drugs at the primary and secondary levels of health facilities. Availability was relatively better in secondary level health care facilities. In the case of the private sector, even when there are high rates of availability, the main barrier is the affordability, given the expensive nature of the originators and, to an extent, generics drugs.

KEYWORDS: Essential medicines, availability, World Health Organization, Primary Health Centres (PHCs), Community Health Centres (CHCs*)*

1. INTRODUCTION

The use of essential drugs is vital for enhancing public health because these essential drugs are effective and economical for the treatment of major communicable and non-communicable diseases [1]. In India, the state with the highest population, i.e, Uttar Pradesh, there are numerous constraints associated with its healthcare system. Its large number of residents live in urban, semi-urban and rural regions.

Accessibility to essential drugs at health care facilities is vital in ensuring reduced personal medical expenses incurred by the patient, particularly from economically disadvantaged individuals. Lack of stocks, unreliable supply and inefficient logistics often create barriers to accessing such essential drugs [3]. While private health centres may be more prevalent in certain regions, the charges imposed tend to be out of reach for a substantial proportion of the population. The other aspect to consider when evaluating access to essential drugs is that of affordability. The exorbitant nature of health costs may sidetrack the patients from visiting health care centres, which may have severe repercussions on their finances, health and overall quality of life [4].

The government of the state of Uttar Pradesh, for its part, has launched a number of schemes and policies aimed at making medicines accessible and affordable for the population. The idea of free medicine distribution schemes for public health institutions is indeed commendable; however, these initiatives may well be constrained by various issues, including poor oversight, accountability, and inadequate funding. The understanding of the dynamics on the ground concerning the accessibility and affordability of medicines entails an examination from both sides of the demand and supply spectrum. From the standpoint of the supply aspect, issues of inefficiencies in purchasing, storing and distributing medicines is prevalent[5]. In the selected districts of Uttar Pradesh, these challenges present differently because of the local variation in healthcare infrastructure, administrative efficiency, and community health practices [6]. The present study contributed to closing the existing gaps and would guide the policy makers in decisions pertaining to medicines allocation and distribution at grass-root levels of healthcare [7]. The study also stressed on the importance of involving multiple stakeholders including government organizations, healthcare providers, pharmaceutical companies and non-government organizations in this process.

The availability and accessibility of essential medicines play an important role in making progress towards achieving universal health coverage and improving the health status of people in Uttar Pradesh [8]. It requires a holistic strategy comprising political commitment, resource allocation, health care delivery system and community involvement.

1.1. Essential Medicines

Essential medicines are defined as drugs that meet the priority health-care needs of the population. These are selected based on due consideration to disease prevalence, evidence of efficacy and safety, and comparative cost-effectiveness. The World Health Organization (WHO) first introduced the concept of essential medicines in 1977 as a means to improve access to necessary medications across the globe [9]. These medicines are intended to be available at all times, in sufficient quantities, in appropriate dosage forms, of assured quality, and at a price that is affordable to both the individual and health systems.

Essential medicines are continually chosen and updated time to time with respect to changes in health problems, further research in medical science, shift in disease patterns and many more. WHO has published a list of model essential medicines which became a benchmark for countries when selecting essential medicine models for their national and institutional essential medicine lists [10]. The list of essential medicines helps in rationalizing drug use, ensuring procurement efficiency and guiding healthcare professionals in prescribing practices.

Essential medicines range across a broad spectrum of therapeutic categories from antibiotics, antivirals, antimalarials and vaccines to the drugs used in pain management and long-term chronic conditions such as diabetes, hypertension and mental health disorders. They play a crucial role in addressing both communicable as well as non-communicable diseases, which make the largest contributions to the burden of disease worldwide. The access to such medicines would bring down the rates of mortality and morbidity, especially in low- and middle-income countries.

Essential medicine availability is the most important performance indicator of any healthcare system [11]. It indicates how well the healthcare system can deliver necessary health services to its people. This also include essential medicines in national health insurance schemes.

Governments play a fundamental role in providing essential medicines as well as affordability through policy development, regulation and implementation of health programs [12]. National lists of essential medicines, procurement policies, pricing regulations and public health campaigns are the tools that

governments utilize to increase the availability of essential medicines. In addition, technical support, funding and advocacy by international organizations and partnerships supplement global efforts toward this goal.

Effective supply chain management is important for a medicine available in the market. Efficient procurement processes, dependable distribution networks and proper storage facilities will ensure that medicines are constantly supplied to the patients [13].

The use of electronic tracking of inventories, decentralization of distribution processes and public-private partnerships can be considered some of the innovative solutions to the challenges raised by supply chains operations.

It should also be mentioned that a considerable share of the required medicines comes from the private sector, particularly in those regions where the healthcare system is underdeveloped [14]. The filling of deficiencies in the presence of drugs is typically left for pharmacies, clinics and non-government organizations. However, the proper regulation and collaboration are needed in terms of quality and price control.

The Bhore committee focused on ensuring that health care services were provided in an equitable manner across the nation, especially in the impoverished areas, through the formal recruitment of health practitioners into the public sector [15].

1.2. Healthcare Landscape in Uttar Pradesh

The landscape of Uttar Pradesh brings a multifaceted health system characterized by the diversity that results from its massive population base, economic inequalities and geographic variations. The population of the state exceeds 200 million people and is spread out in urban areas, semi-urban areas and rural communities, each presenting a unique set of challenges within their own health systems. Health care in the state of Uttar Pradesh is divided into two broad sectors, namely public and private health sectors [16].

Healthcare provision through the public healthcare system in the state of Uttar Pradesh operates on multiple levels, which include sub-centers, Primary Health Centres (PHCs), Community Health Centres (CHCs), district hospitals and tertiary health institutions. The objective of the present study was to provide an integrated healthcare system that provides care from its preventive and promotive dimensions right up to its curative and rehabilitative aspects. In the case of the public health sector, there are numerous problems such as inadequate staffing, resource constraints, archaic facilities, as well as inconsistent and unreliable service provision, particularly in rural and remote areas. The private health facilities form the larger component of the healthcare industry, particularly in urban and semi-urban areas of Uttar Pradesh. The private health facilities include multispecialty and multigenetic health facilities to small clinics and even health practitioners operating on a smaller scale, who generally have less developed infrastructures and are slow on the uptake but less expensive in comparison to private specialized healthcare settings.

The biggest problems faced by Uttar Pradesh in regard to health concerns include the high incidence of communicable as well as non-communicable diseases. Communicable diseases including tuberculosis, malaria and diarrhea are highly common, especially in the poorer sections where there is poor hygiene and less access to medical facilities. Simultaneously, non-communicable diseases including diabetes, hypertension, heart diseases and cancer are increasingly common, primarily because of lifestyle changes and aging population.

Table 1: Healthcare Landscape in Uttar Pradesh

Component	Details
Population	Total Population: 199,812,341 (16.50% of India's total population)
	Rural Population: 155,317,278 (77.73%)
	Urban Population: 44,495,063 (22.26%)
Healthcare Infrastructure	Three-tier system: Sub-Centers (SC), Primary Health Centers (PHC), Community Health Centers (CHC), District Hospitals (DH)
Sub-Centers	Located in rural areas with populations of 3,000–5,000 (or 3,000 in remote regions)
Primary Health Centers (PHC)	Located in rural areas, serving populations of 20,000–30,000
Community Health Centers (CHC)	Located in more populous areas, serving 80,000–120,000 people, offering secondary healthcare services
District Hospitals (DH)	Serve populations of 100,000–1 million people, offering tertiary care and specialized services.
Challenges	- Understaffing in rural areas
	- Inadequate infrastructure and medical supplies
	- Limited access to healthcare in rural regions
	- Urban-rural healthcare disparity
	- High maternal and child mortality rates
Government Programs	- National Health Mission (NHM)

	- Ayushman Bharat (National Health Protection Scheme)
	- Janani Suraksha Yojana (Maternal Health Program)
	- Immunization programs
Private Healthcare Sector	Predominantly in urban areas, offering specialized care but often inaccessible to lower-income populations
Health Indicators	- Infant Mortality Rate (IMR): Higher compared to the national average
	- Maternal Mortality Rate (MMR): Still a concern
	- Chronic Diseases: Increasing prevalence of conditions like diabetes, hypertension, and heart disease
Medicine Accessibility	- Shortages and inaccessibility in rural and remote areas
	- High cost of essential medicines in both public and private healthcare systems

2. MATERIALS AND METHODS

The cross-sectional study aimed to provide information about the availability of selected essential medicines in two districts of Uttar Pradesh. The methods followed the standard operating procedures of the World Health Organization (WHO) and the Health Action International (HAI) for evaluating medicine availability. Public-sector healthcare facilities included in the study across two levels, namely, primary health centres (PHCs) and community health centres (CHCs) which are the representative of primary and secondary care. Comparison between the public and private sectors was made with the inclusion of private pharmacies located in the same districts.

3. RESULTS

The data demonstrates that the supply of the necessary medicines in the 16 PHCs of Gorakhpur is strong and stable, and the overwhelming majority of the therapeutic categories have almost perfect availability in most of the facilities. Solutions to water and electrolyte imbalances are critical interventions that save lives, and are universally found at 100% in all centers, whereas cardiovascular medications, which form the basis of chronic disease management, have a 100 percent availability in 15 out of 16 centers.

Table 2: % Availability of essential medicines at selected PHCs of District Gorakhpur

Therapeutic Category	**PHC 1**	**PHC 2**	**PHC 3**	**PHC 4**	**PHC 5**	**PHC 6**	**PHC 7**	**PHC 8**	**PHC 9**	**PHC 10**	**PHC 11**	**PHC 12**	**PHC 13**	**PHC 14**	**PHC 15**	**PHC 16**
Anaesthetics	100%	100%	100%	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	0	100%
Analgesics, Antipyretics & Anti-Inflammatory Drugs	90.91%	90.91%	81.82%	90.91%	90.91%	81.82%	90.91%	81.82%	90.91%	90.91%	81.82%	63.64%	75%	81.82%	72.70%	81.82%
Antibiotic Drugs	91.67%	100%	83.33%	95.83%	87.50%	95.83%	87.50%	88%	84%	87.50%	83.33%	79.17%	79.17%	75.00%	83.35	72%
Anti-Allergic And Corticosteroids	85.71%	100%	100%	100%	100%	0%	85.71%	85.71%	100%	71.43%	100%	85.71%	57.14%	85.71%	100%	71.45
Cardiovascualr Drug	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	0	100%
Dermatology Drug	100%	100%	85.71%	71.43%	100%	100%	100%	100%	87.50%	100%	87.50%	62.50%	100%	62.50%	100%	87.50%
Drug Acting On The Respiratory Tract	100%	100%	100%	100%	100%	100%	0%	100%	0	100%	100%	100%	100%	100%	100%	100%
Drugs Affecting Coagulation	100%	100%	100%	100%	100%	95.83%	100%	100%	100%	100%	75%	100%	50%	75%	75%	75%
Drug In Gynecology And Obstetrics	100%	100%	100%	100%	85.71%	91.67%	100%	85.71%	85.71%	71.43%	85.71%	100%	100%	71.43%	100%	85.70%
Gastrointestinal Drug	100%	100%	85.71%	71.43%	91.67%	100%	83.33%	91.67%	91.67%	91.67%	100%	75%	66.67%	83.335	83.30%	75%
Hormones And Other Endocrine Drugs	100%	100%	100%	100%	100%	100%	100%	0	100%	0	100%	100%	100%	100%	0	100%
Immunologicals	100%	100%	50%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	50%	100%
MISCELLANEOUS Drugs	100%	100%	100%	100%	100%	50%	100%	100%	100%	100%	100%	75%	100%	75%	100%	75%

Solutions Correcting Water Electrolite And Acid Disturbance	100 %	100 %	100 %	100 %	100 %	10 0%	10 0%	10 0%	10 0%	100 %	100 %	100 %	100 %	100 %	100 %	100 %
VITAMINS And MINERALS	100 %	100 %	86. 67 %	80 %	80 %	10 0%	93. 33 %	93. 33 %	86. 67 %	93. 33 %	86. 67 %	80 %	66. 67 %	80 %	80 %	66. 70 %

The study of the availability of medicine in the 16 private pharmacies in Gorakhpur shows a very disorganized and unequal situation, with a high level of discrepancy in the stock levels between facilities. Although there is a small group of pharmacies that have been shown to have a high level of inventory management with almost a 100 percent availability of virtually all therapeutic classes, most of the facilities have a low level of performance as indicated by most locations such as PHC 5, PHC 15, and PHC 16 having 0 percent availability of vital classes of drugs like cardiovascular, endocrine, and respiratory drugs.

Table 3: % Availability of essential medicines at selected privare pharmacies of District Gorakhpur

Therapeutic Category	**PHC 1**	**PHC 2**	**PHC 3**	**PHC 4**	**PHC 5**	**PHC 6**	**PHC 7**	**PHC 8**	**PHC 9**	**PHC 10**	**PHC 11**	**PHC 12**	**PHC 13**	**PHC 14**	**PHC 15**	**PHC 16**
Anaesthetics	10 0%	100 %	100 %	10 0%	0. %	100 %	100 %	10 0%	10 0%	100 %	100 %	100 %	100 %	100 %	0%	100 %
Analgesics, Antipyretics & Anti-Inflammatory Drugs	90. 90 %	27. 30 %	45. 50 %	36. 40 %	54. 50 %	90. 90 %	72. 70 %	90. 90 %	36. 40 %	45. 50 %	36. 40 %	54. 50 %	54. 50 %	36. 40 %	45. 50 %	63. 60 %
Antibiotic Drugs	92 %	41. 70 %	58. 30 %	50. 00 %	50. 00 %	92. 30 %	41. 70 %	91. 70 %	20. 80 %	50. 00 %	29. 20 %	54. 20 %	56. 00 %	52. 00 %	48. 00 %	40. 00 %
Anti-Allergic And Corticosteroids	85. 70 %	28. 60 %	28. 60 %	28. 60 %	57. 10 %	85. 70 %	42. 90 %	85. 70 %	42. 90 %	28. 60 %	71. 40 %	42. 90 %	14. 30 %	28. 60 %	71. 40 %	42. 90 %
Cardiovascualr Drug	10 0%	0.0 0%	100 %	0%	0%	100 %	0%	10 0%	0%	0%	100 %	100 %	100 %	100 %	0%	0.0 0%
Dermatology Drug	10 0%	25. 00 %	25. 00 %	50. 00 %	50. 00 %	100 .00 %	62. 50 %	10 0%	50. 00 %	37. 50 %	75. 00 %	75. 00 %	50. 00 %	50. 00 %	50. 00 %	37. 50 %
Drug Acting On The Respiratory Tract	10 0%	100 .00 %	100 .00 %	0.0 0%	0.0 0%	100 .00 %	100 .00 %	10 0%	10 0%	100 .00 %	0.0 0%	100 .00 %	0.0 0%	0.0 0%	0.0 0%	0.0 0%
Drugs Affecting Coagulation	10 0%	0.0 0%	25 %	25 %	50 %	100 %	75 %	10 0%	25 %	0%	50 %	25 %	75 %	75 %	50 %	50 %
Drug In Gynecology And Obstetrics	10 0%	57. 10 %	57. 10 %	57. 10 %	28. 60 %	100 %	57. 10 %	10 0%	42. 90 %	71. 40 %	42. 90 %	14. 30 %	71. 40 %	42. 90 %	42. 90 %	0.0 0%
Gastrointestinal Drug	10 0%	50 %	58. 30 %	58. 30 %	41. 70 %	100 .00 %	41. 70 %	10 0%	58. 30 %	50 %	25. 00 %	58. 30 %	41. 70 %	58. 30 %	33. 30 %	50. 00 %
Hormones And Other Endocrine Drugs	10 0%	0%	0%	0%	0%	100 %	100 %	10 0%	0%	100 %	100 %	0%	0%	0%	0%	0%
Immunologicals	10 0%	50 %	100 %	50 %	50 %	100 %	0%	10 0%	0%	50 %	50 %	50 %	100 %	50 %	100 %	0%
MISCELLANEOUS Drugs	10 0%	50 %	25 %	50 %	75 %	100 %	75 %	10 0%	75 %	75 %	50 %	50 %	25 %	25 %	50 %	50 %
Solutions Correcting Water Electrolite And Acid Disturbance	10 0%	33. 06 %	39. 93 %	29. 12 %	44. 32 %	100 %	53. 08 %	10 0%	31 %	63. 77 %	0%	0%	0%	100 %	0.0 %	100 %
VITAMINS And MINERALS	10 0%	31. 96 %	37. 69 %	27. 73 %	45. 63 %	100 %	52. 21 %	10 0%	28. 86 %	65. 10 %	53. 30 %	73. 30 %	40 %	40. %	60 %	46. 70 %

The data on the availability of the 16 PHCs in Kushinagar represent a relatively well-supplied public health system, which is, however, plagued by gross inequities and lacks particular facility-level failures. Although the best facilities such as PHC 1 have near-perfect availability of most categories, the district shows a problematic binary trend of critical chronic disease drugs: Cardiovascular and Hormonal drugs are at 100% in most locations but at 0% in several others (PHC 6, 10, 11, and 15), posing a

significant barrier to access by patients with diabetes or hypertension in such areas. The worst failure is seen at PHC 10, which serves as a strong outlier with zero availability of five major therapeutic categories, such as Cardiovascular, Respiratory, Gynae, Hormonal, and Immunological drugs, and the least availability of the essentials, such as Anti-infectives (40%) and Vitamins (46.7) in the district.

Table 4: % Availability of essential medicines at selected PHCs of District Kushinagar

Therapeutic Category	PHC 1	PHC 2	PHC 3	PHC 4	PHC 5	PHC 6	PHC 7	PHC 8	PHC 9	PHC 10	PHC 11	PHC 12	PHC 13	PHC 14	PHC 15	PHC 16
Anaesthetics	100%	100%	100%	100%	100%	0	100%	100%	100%	100%	100%	0%	100%	100%	100%	100%
Analgesics, Antipyretics & Anti-Inflammatory Drugs	90.90%	63.60%	54.50%	63.60%	63.60%	54.50%	72.70%	63.60%	90.90%	63.60%	63.60%	72.70%	54.50%	90.90%	81.80%	90.90%
Antibiotic Drugs	92.30%	70.80%	75.00%	70.80%	84%	88%	80%	84%	92.30%	40.00%	75%	66.70%	70.80%	91.70%	62.50%	91.70%
Anti-Allergic And Corticosteroids	85.70%	85.70%	71.40%	57.10%	85.70%	100%	85.70%	100%	85.70%	42.90%	85.70%	100%	85.70%	85.70%	42.90%	85.70%
Cardiovascualr Drug	100%	100%	100%	100.00%	100%	0	100%	100%	100%	0.00%	0	100%	100%	100%	0	100%
Dermatology Drug	100%	62.50%	87.50%	87.50%	87.50%	62.50%	87.50%	75%	100%	37.50%	75%	62.50%	75%	100%	87.50%	100%
Drug Acting On The Respiratory Tract	100%	100%	100%	100%	100%	100%	0	100%	100%	0.00%	0	100%	100%	100%	100%	100%
Drugs Affecting Coagulation	100%	75%	75%	100%	75%	100%	100%	100%	100%	50%	100%	75%	100%	100%	100%	100%
Drug In Gynecology And Obstetrics	100%	71.40%	85.70%	71.40%	100%	85.70%	100%	85.70%	100%	0.00%	85.70%	100%	71.40%	100%	71.40%	100%
Gastrointestinal Drug	100%	75.00%	83.30%	83.30%	91.70%	66.70%	83.30%	75%	100%	50%	75%	66.70%	83.30%	100%	75%	100%
Hormones And Other Endocrine Drugs	100%	100%	100%	100%	0	100%	100%	100%	100%	0%	0	100%	100%	100%	100%	100%
Immunologicals	100%	100%	100%	100%	50%	100%	100%	100%	100%	0%	100%	50%	100%	100%	100%	100%
MISCELLANEOUS Drugs	100%	100.00%	75%	75%	100%	75%	75%	50%	100%	50%	100%	100%	100%	100%	100%	100%
Solutions Correcting Water Electrolite And Acid Disturbance	100%	100%	0%	100%	100%	0	100%	100%	100%	100%	100%	0	100%	100%	0	100%
VITAMINS And MINERALS	100%	86.70%	80.00%	73.30%	93.30%	73.30%	73.30%	66.70%	100%	46.70%	66.70%	60%	73.30%	100%	60%	100%

The evidence reveals a gross ineffectiveness of chronic disease management in the private sector, with cardiovascular medication being completely out of stock (0%) in six out of sixteen pharmacies (PHC 2, 5, 10, 11, 15, and 16), which practically deprives patients in these locations of hypertension and heart medications. Equally, the availability of life-saving anti-infectives is extremely unequal; where some facilities have consistently had over 80% availability, PHC 16 has a dismal 16.7 availability, and PHC 15 has a dismal 33.3% availability; thereby providing high-risk areas where common infections cannot be successfully treated. Also, although respiratory and hormonal drugs are generally available in most locations, certain stock-outs of respiratory and endocrine drugs occur in PHC 3, 11, and 15, and 11 and 16, respectively, and again highlight the unpredictability of the system. Finally, the network of the privatized pharmacies in Kushinagar seems to be polarized between several trusted high-performing units and a higher number of low-performing units, where patients stand a high risk of walking out without the necessary medicines.

Table 5: % Availability of essential medicines at selected privare pharmacies of District Gorakhpur

Therapeutic Category	PHC 1	PHC 2	PHC 3	PHC 4	PHC 5	PHC 6	PHC 7	PHC 8	PHC 9	PHC 10	PHC 11	PHC 12	PHC 13	PHC 14	PHC 15	PHC 16
Anaesthetics	100%	100%	100%	100%	0	100%	100%	100%	100%	0	100%	100%	100%	100%	100%	100%
Analgesics, Antipyretics & Anti-Inflammatory Drugs	90.90%	72.70%	81.80%	63.60%	63.60%	72.70%	63.60%	54.50%	63.60%	72.70%	72.70%	90.90%	90.90%	90.90%	27.30%	36.40%
Antibiotic Drugs	87.50%	58.30%	66.70%	58.30%	75%	50%	58.30%	62.50%	62.50%	66.70%	45.80%	83.30%	83.30%	91.70%	33.30%	16.70%
Anti-Allergic And Corticosteroids	85.70%	85.70%	85.70%	85.70%	100%	100%	85.70%	57.10%	71.40%	100%	42.90%	71.40%	85.70%	85.70%	28.60%	57.10%
Cardiovascualr Drug	100%	0	100%	100%	0	100%	100%	100%	100%	0	0	100%	100%	100%	0	0
Dermatology Drug	100%	50%	75%	37.50%	75%	75%	75%	62.50%	75%	62.50%	25%	100%	100%	100%	12.50%	50%
Drug Acting On The Respiratory Tract	100%	100%	0	100%	100%	100%	100%	100%	100%	100%	0	100%	100%	100%	0	100%
Drugs Affecting Coagulation	100%	100%	50%	25%	100%	25%	75%	25%	50%	50%	50%	100%	100%	100%	25%	25%
Drug In Gynecology And Obstetrics	100%	71.40%	100%	57.10%	71.40%	100%	71.40%	71.40%	57.10%	42.90%	14.30%	100%	100%	100%	42.90%	42.90%
Gastrointestinal Drug	100%	91.70%	50%	50%	75%	75%	58.30%	75%	66.70%	75%	33.30%	100%	100%	100%	50%	41.70%
Hormones And Other Endocrine Drugs	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	0	100%	100%	100%	100%	0
Immunologicals	100%	0	100%	0	100%	50%	100%	0	100%	100%	50%	100%	100%	100%	100%	50%
MISCELLANEOUS Drugs	100%	100%	100%	50%	100%	75%	50	50%	100%	75%	50%	100%	100%	100%	50%	75%
Solutions Correcting Water Electrolite And Acid Disturbance	100%	100%	100%	100%	100%	0	100%	100%	100%	100%	100%	100%	100%	100%	100%	0
VITAMINS And MINERALS	100%	66.70%	60%	40%	66.70%	60%	53.30%	66.70%	46.70%	60%	40%	100%	100%	100%	46.70%	40%

4. DISCUSSION

In the PHCs observed at District Gorakhpur, the stock-out incidents in isolation indicate that the public sector system is more or less stable, but specific facilities require specific logistic enhancement to provide equal access, especially to hormonal and respiratory treatment. Although this was a good overall performance, some deficiencies at a facility level are notable; PHC 15 has had great gaps with 0% availability of anaesthetics, and hormones, PHC 8, 10, and 15 are entirely lacking endocrine drugs, and PHC 7 and 9 lack respiratory drugs altogether.

In the private pharmacies observed at District Gorakhpur, such a tendency towards all-or-nothing stocking is especially concerning when it comes to the treatment of chronic diseases; half of the sampled pharmacies are totally out of stock with the necessary medications that treat such illnesses as high blood pressure and diabetes, and even such simple drugs as infections and analgesics are all over the place. All in all, this level of contrast shows that the ability to obtain crucial medicines in the private sector is heavily reliant on the facility a patient attends, which reveals significant inconsistency in the reliability of the supply chain and access to healthcare in the district.

In the PHCs observed at District Khushinagar, even though most of the life-saving interventions, such as water and electrolyte solutions, are readily available, the entire stock-outs of respiratory drugs at PHCs 7, 10, and 11 also prove the fragility of the supply chains. As a result, the overall availability is strong, whereas the system is still highly variable, as the patient receives critical treatment only upon visiting a high-performing facility or one of the weak points that have been identified.

In the private pharmacies observed at District Khushinagar, the supply of the basic medicines throughout the 16 private pharmacies in Kushinagar shows a highly broken and untrustworthy supply chain, with drastic differences in facilities and a disturbing all-or-nothing inventory of vital treatments. Although some of the pharmacies, especially PHC 1, 12, 13, and 14, have a strong inventory and high availability of most of the categories, a large percentage of the facilities are under-stocked, especially PHC 15 and PHC 16.

5. CONCLUSION

Availability and affordability of essential medicines in the sampled districts of Uttar Pradesh mirror a larger range of structural challenges confronting the state's healthcare delivery system, going far beyond the mere prescription of appropriate intervention mechanisms, requiring a concerted and sustained effort to bring about equitable health outcomes. Essential medicines should be the mainstay of public health yet, their availability is affected by interrelated factors, including procurement practices, supply chain efficiency, health infrastructure disparities, socio-economic differentials, and types of governance mechanisms.

Socio-economic inequalities such as poverty, education, and health awareness exert influences on health-seeking behaviours and access to medicines, which, in turn, often lead to delayed treatment and greater disease burden.

AUTHOR CONTRIBUTION

Both the autors have equally contributed to the conceptualization, data collection and analysis of research work.

ACKNOWLEDGEMENT

The authors would like to extenf their heartfelt gratitude to The IIHMR University, Jaipur for providing all the necessary assistance for successful execution of research work.

REFERENCES

1. World Health Organization. (2021). The selection and use of essential medicines: report of the WHO Expert Committee on Selection and Use of Essential Medicines, 2021 (including the 22nd WHO model list of essential medicines and the 8th WHO model list of essential medicines for children).
2. Kelkar, S. (2021). India's Public Health Care Delivery. *India's Public Health Care Delivery; Indian Journal of Psychological Medicine*.
3. Bilal, A. I., Bititci, U. S., & Fenta, T. G. (2024). Effective Supply Chain Strategies in Addressing Demand and Supply Uncertainty: A Case Study of Ethiopian Pharmaceutical Supply Services. *Pharmacy*, *12*(5), 132.
4. Kvien, T. K., Patel, K., & Strand, V. (2022, February). The cost savings of biosimilars can help increase patient access and lift the financial burden of health care systems. In *Seminars in arthritis and rheumatism* (Vol. 52, p. 151939). WB Saunders.
5. Sarker, E., Halder, P., Seyedmahmoudian, M., Jamei, E., Horan, B., Mekhilef, S., & Stojcevski, A. (2021). Progress on the demand side management in smart grid and optimization approaches. *International Journal of Energy Research*, *45*(1), 36-64.
6. Meghani, A., Tripathi, A. B., Bilal, H., Gupta, S., Prakash, R., Namasivayam, V., ... & Ramesh, B. M. (2022). Optimizing the health management information system in Uttar Pradesh, India: implementation insights and key learnings. *Global Health: Science and Practice*, *10*(4).
7. Koduah, A., Baatiema, L., Kretchy, I. A., Agyepong, I. A., Danso-Appiah, A., de Chavez, A. C., ... & Mirzoev, T. (2022). Powers, engagements and resultant influences over the design and implementation of medicine pricing policies in Ghana. *BMJ global health*, *7*(5), e008225.
8. Mor, N. (2021, August). *A Potential Pathway Towards Universal Health Coverage (UHC) for an Indian State*.
9. Aronson, J. K., & Green, A. R. (2020). Me□too pharmaceutical products: History, definitions, examples, and relevance to drug shortages and essential medicines lists. *British Journal of Clinical Pharmacology*, *86*(11), 2114-2122.
10. Zang, D., & Liu, C. (2023). Exploring the clinical translation intensity of papers published by the world's top scientists in basic medicine. *Scientometrics*, *128*(4), 2371-2416.
11. Tanwar, S., Parekh, K., & Evans, R. (2020). Blockchain-based electronic healthcare record system for healthcare 4.0 applications. *Journal of Information Security and Applications*, *50*, 102407.
12. Ozawa, S., Higgins, C. R., Yemeke, T. T., Nwokike, J. I., Evans, L., Hajjou, M., & Pribluda, V. S. (2020). Importance of medicine quality in achieving universal health coverage. *PLoS One*, *15*(7), e0232966.
13. Musamih, A., Salah, K., Jayaraman, R., Arshad, J., Debe, M., Al-Hammadi, Y., & Ellahham, S. (2021). A blockchain-based approach for drug traceability in healthcare supply chain. *IEEE access*, *9*, 9728-9743.

14. Kapologwe, N. A., Meara, J. G., Kengia, J. T., Sonda, Y., Gwajima, D., Alidina, S., & Kalolo, A. (2020). Development and upgrading of public primary healthcare facilities with essential surgical services infrastructure: a strategy towards achieving universal health coverage in Tanzania. *BMC health services research*, *20*, 1-14.
15. Mehta, A. (2023). *Exploring strategies and evaluating systems: insights to inform primary health care strengthening in India* (Doctoral dissertation, Johns Hopkins University).
16. Mukherjee, K., & Majumdar, S. (2024). Framework for assessing the value of healthcare innovations in India for universal health coverage. In *Social Enterprise Values and Processes: Entrepreneurship Studies from India* (pp. 249-269). Singapore: Springer Nature Singapore.