



Azzah Khadim Hussain¹, Arooj Ali²

¹Lecturer, Govt. Dyal Singh Graduate College, Lahore, Pakistan, Email: azzah.khadim@gmail.com

²Pharmacist, D pharm, University College of pharmacy, University of the Punjab, Lahore, Pakistan.

Email: aroorj.ali0@gmail.com

KEYWORDS	ABSTRACT
Chemotherapeutic Shortages, Medicine, Shortage, Anti-Cancer, and Oncology.	This study aimed to explore the present status of the anti-cancer drug shortages in Pakistan, their determinants, impact, accepted mitigating strategies, and recommendations. Thirty-five Oncology hospital Pharmacists were chosen to take qualitative semi structured in-depth interviews from August 2025 to October 2025. The data were transcribed verbatim and then analyzed using a thematic analysis approach by an inductive method. Data collection was done face-to-face and online. As the pandemic continued, most of the participants faced the problems of drug shortages of anti-cancer drugs, which worsened further. The doses of etoposide, paclitaxel, vincristine, dacarbazine and methotrexate were too low many times. The failure of the regulatory system, lack of local manufacturing and poor inventory management were all key factors in the issue. Some of the consequences were that of patients' priorities, increasing workload, uncomfortable working atmosphere, and patients' trust issues about the pharmacist. Patients also had delayed or poor treatment, and out-of-pocket payments were incurred by patients. The participants called for the role of a cautious regulator in revising all stakeholders' policies and also financial support to all stakeholders at their level to facilitate access to such drugs. Based on the results, it is clear that Pakistan is facing a current shortage of anti-cancer medicines. Governments need to be involved in the reconsideration of policies across all levels of the drug supply chain and promote local drug production of these drugs. Collaboration and inventory management are also important for stakeholders to undertake.
ARTICLE HISTORY	
Date of Submission: 17-07-2026 Date of Acceptance: 15-08-2026 Date of Publication: 20-08-2026	
	 2026 Journal of Social Research Development
Correspondence	Azzah Khadim Hussain
Email:	azzah.khadim@gmail.com
DOI	https://doi.org/10.59075/jsrd.v7i6.558
Volume/Issue	7(6), 2026, 348-363

Introduction

Essential medicines are a key element of universal health coverage and a crucial factor in good health services. Access to safe, effective, quality-assured and affordable medicines is an integral component of the right to health, according to the World Health Organization (WHO). (Atif et al., 2021) Despite this, the problem of medicines shortage in health systems is a serious issue in the global health landscape, in both developed and developing nations. Multiple and interrelated factors can cause drug shortages, such as manufacturing issues, supply chain delays, regulatory issues, raw materials shortages, market forces, and procurement and inventory issues.

(Postma et al., 2022). Such interruptions can have significant implications for the health care providers and for patients, especially when there are few therapeutic options for essential medicines.

Cancer drugs are especially susceptible to the impact of supply shortages on cancer care, as cancer treatment often involves multifaceted, medically coordinated treatment plans. The issue is particularly alarming for medicines that are crucial parts of routine chemotherapy, where the inability to access them could impact treatment effectiveness or safety, and consequently influence the potential outcomes for the patient.

The shortfalls in cancer treatment drugs are not exclusive to clinical outcomes. One specialty of particular significance in this regard is that of the pharmacist, who takes part directly in medicine procurement, inventory management, the dispensing of medicines, therapeutic substitution, communication with physicians and coordination with suppliers and patient. Pharmacists have a particular role in this regard as they are directly involved in medicine procurement, medicine inventory management, dispensing, therapeutic substitution, communication with physicians and coordination with medicine suppliers and patient. Therefore, pharmacists are a key group within healthcare who tend to be the first to identify a shortage and must be able to implement practical solutions to ensure the continuity of treatment. These experiences can thus be used to learn lessons about the causes, consequences and management of shortages of anticancer medicines.

The issue may be especially difficult in developing countries, where health services can often struggle to cope with insufficient budget, procurement resources, system, medicine regulation, local production capacity, and specialized cancer services. Such environments may render people more susceptible to international medicine shortages, exchange-rate volatility, transportation issues, and shifts in the international pharmaceutical market (Kobyakova et al., 2023). The lack of reliable data on medicine stocks and shortages can add to the difficulties that healthcare institutions and regulators face in making the right decisions. These structural barriers could eventually result in the economic and clinical burden being borne by patients and their families.

In this regard, Pakistan is an interesting background in which to analyse these problems. The country continues to struggle with limitations in the health care infrastructure, specialized oncology services, and access to necessary medicines, especially for the equitable distribution of

medicines (Logan & Guikema, 2020; Zaidi et al., 2013), along with an increasing burden of cancer cases. Despite having a significant pharmaceutical industry, dependence on imported APIs and finished pharmaceuticals, regulation, procurement, and flaws in medicine supply chain management can hamper the availability of medicines in Pakistan. Such difficulties can be more significant for anticancer drugs, where access to certain medicines and dosage form is often a requirement for treatment.

There is relatively little evidence on the national situation of Pakistan with respect to shortages of medicine and even less in the context of anticancer medicine shortages from a healthcare professional point of view (Ndwandwe et al., 2026). The current evidence indicates that issues with the availability of medicine can impact cancer treatment, and that the problems can cause extra financial and organizational load for healthcare institutions and patients (Alshibli et al., 2024). Quantitative estimates of shortages, however, are not sufficient to capture the nature of shortages at the point of care, the pharmacist's response to shortages, or the impact of shortages on treatment decisions and the relationships between health professionals and patients. Qualitative investigation is therefore useful, as it can identify the experiences, perceptions, coping and practical challenges that may not be captured in routine supply or administration information.

Knowing what a pharmacist experiences is especially relevant since they are on the front lines of medicine procurement, hospital inventory systems, clinical care, regulatory requirements and patient needs. The experiences they face can highlight current issues such as poor forecasting, delays in procurement, communication challenges among stakeholders, regulatory restrictions, low domestic production, and poor inventory management, among others, as well as underlying systemic issues. In addition, it is possible to identify the strategy being adopted in response to the shortages of the pharmacists and gain evidence for establishing more sustainable interventions based on their experiences (Musazzi et al., 2020).

In this context, the present study of qualitative nature aims at examining the experiences of the Oncology hospitals pharmacists in Pakistan with regard to Anti cancer medicine shortage. Specifically, the study aims to describe the current scope of these shortages, to highlight the perceived factors contributing to them, investigate their impact on pharmacists, health care providers and patients, and to outline strategies that have been implemented to reduce the impact of these shortages on health care and patients. The study further explores pharmacists' suggestions for enhancing the availability and continuity of anticancer drugs in Pakistan. The study tries to provide the contextual evidences for policy makers, regulatory authorities, healthcare institutions, pharmaceutical industry and oncology practitioners for enhancing the resilience of anticancer medicine supply system in Pakistan (Shukar et al., 2024).

This study adds to the body of knowledge by giving the in-depth qualitative insight into the cancer medicine deficit in Pakistan from pharmacists' point of view who are directly involved in the management of oncology medicine and patient care. In contrast to existing studies, which have mostly centered on the rate of medicine shortages, availability and general causes of medicine shortages, this study contributes to the evidence by exploring how medicine shortages are

experienced at hospital level, the impact that shortages have on both the pharmacist and patient, and how healthcare professionals respond to the disruption of medicines supply. The study presents several interconnected organizational, regulatory, supply-chain and pharmaceutical-sector factors that could potentially lead to shortages of anticancer medicines, and points to practical challenges for pharmacists in ensuring continuity of cancer treatment. It contributes by recording how the pharmacist can contribute to documentation of mitigation measures taken and suggestions for improved procurement, inventory management, stakeholder coordination, regulatory oversight, and domestic availability of essential anticancer medicines. From a policy perspective, the findings can provide context-specific evidence for government agencies, drug regulatory authorities, hospital administrators, pharmaceutical manufacturers, and oncology stakeholders to strengthen medicine-supply systems and develop more responsive shortage-management policies. The study therefore provides both empirical and practical contributions by connecting pharmacists' frontline experiences with broader policy and health-system challenges associated with access to anticancer medicines in Pakistan.

Materials and Methods

Study Design and Data Collection

This study employed a qualitative exploratory design to investigate the experiences, perceptions, and responses of hospital pharmacists regarding anticancer medicine shortages in Pakistan during the period 2021–2025. The study specifically focused on hospital pharmacists working in oncology-related departments of selected public and private hospitals in Lahore, Punjab, Pakistan, because Lahore is a major healthcare and oncology-service hub with a large concentration of tertiary-care hospitals and cancer treatment facilities. The target population comprised hospital pharmacists directly involved in the procurement, storage, inventory management, dispensing, and supply of anticancer medicines, while the study sample consisted of pharmacists who had direct experience of anticancer medicine shortages during 2021–2025. Participants were selected through purposive sampling to ensure that individuals with relevant professional experience could provide detailed information about the phenomenon under investigation. A semi-structured interview guide was developed following an extensive review of previous literature on medicine shortages and the objectives of the study. The interview guide was reviewed by three investigators with relevant expertise, after which a pilot study was conducted with three hospital pharmacists who were not included in the final sample. Based on the pilot feedback, the questions were refined for clarity, sequence, and depth. The final interview guide consisted of five domains covering participants' professional background and institutional context, general experiences of anticancer medicine shortages, perceived causes and contributing factors, consequences for patients and healthcare services, and strategies and recommendations for managing shortages (Sagib et al., 2018). Hospital pharmacists were selected because they occupy a critical position within the oncology medicine supply chain and routinely interact with physicians, hospital administrators, manufacturers, distributors, suppliers, and patients; consequently, they are well positioned to identify shortages, assess their operational

consequences, and describe institutional responses. A total of 25 hospital pharmacists meeting the eligibility criteria were included in the final study, representing pharmacists working in oncology services in selected hospitals in Lahore. Participants were eligible if they had professional responsibility for or direct exposure to anticancer medicine management and had experience of medicine shortages during the study period; pharmacists without relevant oncology-related responsibilities or without experience of anticancer medicine shortages were excluded. Data were collected between August and October 2025 through individual semi-structured interviews conducted via Zoom. Before each interview, participants were informed about the purpose and procedures of the study, confidentiality arrangements, voluntary participation, and their right to withdraw. Interviews were conducted in English, audio-recorded with participants' permission, and subsequently transcribed verbatim for qualitative analysis. Importantly, participants were asked to reflect retrospectively on the 2021–2025 period, allowing the study to examine not only the existence of anticancer medicine shortages but also perceived changes in their frequency, severity, affected medicines, causes, consequences, and management strategies over time. This five-year retrospective perspective was incorporated to provide a more comprehensive understanding of the evolution of anticancer medicine shortages following the major disruptions to pharmaceutical supply chains and the subsequent recovery phase, thereby generating context-specific evidence on persistent and emerging challenges affecting the availability of anticancer medicines in Lahore, Pakistan.

Data Analysis

The interview recordings were transcribed verbatim and analyzed using NVivo software through an inductive thematic analysis approach. The analysis began with repeated reading of the transcripts to develop a thorough understanding of participants' experiences and to identify recurring ideas related to anticancer medicine shortages. Two researchers independently reviewed the transcripts and performed the initial coding manually, assigning codes to words, phrases, statements, and passages that were relevant to the research questions. Rather than imposing predetermined categories, the initial codes were developed directly from participants' accounts, allowing unexpected issues and perspectives to emerge from the data. As the analysis progressed, codes identified in the earlier interviews were reviewed and refined and were subsequently used as a preliminary coding framework for examining the remaining interviews. The researchers then compared codes across transcripts and conducted focused coding to identify similarities, differences, patterns, relationships, and recurring explanations within participants' responses. Related codes were grouped into broader conceptual categories, which were subsequently examined and organized into themes and subthemes reflecting the major dimensions of anticancer medicine shortages, including their perceived causes, effects, management practices, and potential solutions. The research team repeatedly returned to the original transcripts during this process to ensure that the emerging themes remained grounded in the participants' actual accounts and that important contextual information was not overlooked. Disagreements concerning the interpretation or classification of data were discussed among the researchers until a shared interpretation was reached. NVivo was used to organize the transcripts, codes, categories,

and thematic relationships and to facilitate systematic retrieval and comparison of coded material. To provide an additional indication of the prominence of particular issues, the researchers also documented the number of participants who referred to each major theme; however, frequency was not treated as a measure of statistical importance, and qualitative interpretation remained the primary basis for determining the significance of findings. Regular meetings among members of the research team were conducted throughout the analysis to review coding decisions, refine categories, resolve discrepancies, and maintain consistency in interpretation. This iterative process helped establish a transparent analytical pathway from participants' original statements to the final themes and strengthened the credibility and dependability of the study findings.

Results

Demographic Analysis

Table 1 indicates the frequency distribution of the 35 hospital pharmacists included in the qualitative study from selected hospitals in Lahore, Pakistan. Regarding facility type, the largest proportion of participants worked in trust hospitals, accounting for 16 pharmacists (45.7%), followed by semi-government and private hospitals, with 8 pharmacists (22.9%) from each category. Government hospitals contributed 3 pharmacists (8.6%), representing the smallest proportion of participants. In terms of sex, the majority of participants were male (24; 68.6%), whereas 11 participants (31.4%) were female. With respect to age, the largest group consisted of pharmacists aged 29–33 years (13; 37.1%), followed by those aged below 28 years (11; 31.4%). Pharmacists aged 34–38 years accounted for 6 (17.1%), while 4 participants (11.4%) were between 44 and 48 years of age. Only 1 pharmacist (2.9%) belonged to the 39–43-year age group. Overall, the demographic distribution shows that the study included pharmacists from different types of healthcare institutions and a range of age groups, providing perspectives from professionals working in varied hospital settings in Lahore.

Table 1 Demographic Analysis

Variable	Category	Frequency (n)	Percentage (%)
Facility Type	Government hospital	3	8.6
	Semi-government hospital	8	22.9
	Private hospital	8	22.9
	Trust hospital	16	45.7
Sex	Male	24	68.6
	Female	11	31.4
Age	<28 years	11	31.4
	29–33 years	13	37.1
	34–38 years	6	17.1
	39–43 years	1	2.9
	44–48 years	4	11.4

	44–48 years	4	11.4
Total	Hospital pharmacists	35	100.0

Theme 1: Dynamics and Perceptions of Anticancer Medicine Shortages in Lahore

The interviews revealed that anticancer medicine shortages were widely recognized by pharmacists working in oncology-related hospitals in Lahore, irrespective of whether they were employed in public, semi-government, private, or trust-sector institutions. Participants described medicine shortages as a recurring problem rather than an isolated event, although the frequency and duration differed between hospitals and across individual medicines. Several pharmacists reported encountering shortages on a monthly basis, while others described shortages occurring daily, weekly, quarterly, or at longer intervals. The medicines most frequently identified as being unavailable or inadequately stocked included etoposide, paclitaxel, vincristine, dacarbazine, methotrexate, gemcitabine, vinblastine, and bleomycin. Participants also perceived that the availability of several anticancer medicines had become more difficult during the 2021–2025 period, with particular concern about the disruptions experienced during and following the COVID-19 pandemic. According to the pharmacists, interruptions in procurement and distribution, difficulties in maintaining adequate stocks, and increases in the prices of some medicines further complicated the situation. The shortage was described as having direct implications for the daily work of pharmacists because they were often required to check alternative sources, communicate with oncologists and suppliers, and determine how limited quantities could be allocated among patients. When an essential medicine was available only in a limited quantity, several participants reported using a first-come, first-served approach to dispensing, particularly when no formal institutional prioritization protocol was available. Overall, the accounts from pharmacists suggest that anticancer medicine shortages in Lahore represent a continuing supply and service-delivery challenge, with variations in frequency, affected medicines, and institutional responses across healthcare settings.

Theme 2: Perceived Determinants of Anticancer Medicine Shortages in Lahore

Participants described anticancer medicine shortages as the result of multiple, interconnected weaknesses across the medicine supply chain, extending from pharmaceutical manufacturers and distributors to regulatory authorities and hospital-level procurement and inventory systems. Rather than attributing shortages to a single factor, pharmacists emphasized that problems occurring at different stages of the supply process could reinforce one another and ultimately affect medicine availability at the hospital level. Three determinants emerged particularly strongly from the interviews. First, participants expressed concerns about weaknesses in regulatory oversight and coordination, suggesting that delays in regulatory processes, inadequate monitoring of medicine availability, and limited communication among relevant stakeholders could contribute to interruptions in supply. Second, pharmacists highlighted limited domestic production of essential anticancer medicines and the resulting dependence on external sources as an important vulnerability. According to participants, reliance on imported medicines may expose hospitals to disruptions associated with international supply chains, procurement

difficulties, currency-related pressures, and delays in obtaining pharmaceutical products. Third, inadequate inventory and stock-management practices at the hospital level were repeatedly identified as a contributing factor. Participants referred to difficulties in forecasting demand, maintaining appropriate safety stocks, monitoring consumption patterns, and anticipating future shortages. These problems were perceived to become particularly important for medicines with irregular demand or limited availability. Taken together, the interviews suggest that anticancer medicine shortages in Lahore should be understood as a supply-system problem involving regulatory, manufacturing, procurement, and hospital inventory dimensions, rather than as an isolated failure at any single point in the medicine distribution chain.

Theme 3: Consequences of Anticancer Medicine Shortages for Patients and Pharmacy Services

Pharmacists described anticancer medicine shortages as a problem that extends beyond stock availability and directly affects the delivery of oncology care in Lahore. Participants reported that when prescribed medicines were unavailable, pharmacists frequently had to communicate with oncologists, search for alternative sources, and explain the situation to patients and their families. These additional responsibilities increased the workload associated with routine pharmacy services and created difficulties in maintaining a smooth dispensing process. From the patient perspective, participants described delays in treatment, changes in prescribed regimens, additional visits to hospitals or pharmacies, and increased out-of-pocket expenditure when medicines had to be obtained from alternative sources. Some pharmacists also noted that patients and families became frustrated when medicines were unavailable despite having a valid prescription. This situation could place pharmacists in difficult communication situations because they had to explain supply limitations while attempting to maintain patients' confidence in the healthcare system. Participants further indicated that shortages were particularly challenging when an unavailable medicine was an essential component of a chemotherapy protocol and could not easily be replaced. Overall, the pharmacists' accounts suggest that medicine shortages create a chain of consequences involving treatment continuity, patient financial burden, pharmacy workload, and communication between patients and healthcare professionals.

Theme 4: Pharmacists' Adaptive Strategies for Managing Medicine Shortages

The interviews showed that pharmacists in Lahore were not passive recipients of supply disruptions; instead, they developed a range of practical, short-term responses to maintain the availability of anticancer medicines. Participants reported regularly checking stock levels, communicating with suppliers and distributors, contacting other hospitals, and exploring alternative procurement channels when routine supplies were interrupted. Some pharmacists described maintaining closer surveillance of fast-moving and frequently unavailable medicines so that replenishment could be initiated before stocks were completely depleted. When shortages occurred, pharmacists also communicated with oncologists regarding the availability of alternative medicines or possible adjustments to treatment plans, where clinically appropriate. Participants emphasized the importance of interdepartmental communication and timely information sharing, particularly between pharmacy departments, oncology units, procurement

sections, hospital administration, and external suppliers. In situations where quantities were severely limited, pharmacists described the need to prioritize available stock according to institutional practices and immediate patient requirements. However, participants also indicated that many of these measures were reactive rather than part of a standardized shortage-management system. The findings therefore highlight the central role of pharmacists in maintaining continuity of oncology services while also revealing the need for more systematic institutional mechanisms for shortage forecasting, communication, emergency procurement, and stock allocation (Rosário et al., 2024).

Theme 5: Building a More Resilient Anticancer Medicine Supply System

A further theme emerging from the interviews concerned the need to move from short-term responses toward long-term supply-system improvements. Pharmacists argued that recurring shortages could not be addressed solely through emergency purchasing or individual efforts at the hospital level. Participants emphasized the importance of stronger coordination among regulatory authorities, pharmaceutical manufacturers, distributors, hospitals, pharmacists, and oncology specialists. Several participants considered greater domestic production of essential anticancer medicines to be an important component of long-term supply security, particularly for medicines that are repeatedly difficult to obtain through conventional procurement channels. They also highlighted the need for more accurate demand forecasting, minimum stock or safety-stock policies, timely procurement, and improved communication about anticipated supply interruptions. Participants suggested that hospitals should maintain reliable records of medicine consumption and shortage episodes so that procurement decisions could be based on actual demand rather than retrospective responses to stock-outs. Another recurring recommendation was the development of a formal medicine-shortage reporting and early-warning mechanism through which hospitals could communicate emerging shortages to relevant authorities and other healthcare institutions. From the pharmacists' perspective, strengthening these mechanisms could improve preparedness, reduce unexpected interruptions, and support more coordinated decision-making across Lahore's oncology medicine supply network.

Discussion

The findings of this qualitative study show that anticancer medicine shortages remain a recurring concern among hospital pharmacists working in Lahore, Pakistan. Participants from government, semi-government, private, and trust hospitals described shortages as an ongoing problem, although the frequency and intensity differed across institutions. Differences between hospitals may be associated with variations in purchasing capacity, patient volume, financial resources, procurement procedures, and relationships with suppliers. This finding is consistent with previous research showing that medicine shortages are rarely caused by one isolated factor and instead develop through the interaction of regulatory, manufacturing, economic, procurement, and distribution-related conditions (Bachoolall & Suleman, 2025). The presence of shortages across

different hospital sectors in Lahore also indicates that the problem cannot be viewed simply as an issue affecting one particular type of healthcare institution.

The pharmacists' accounts covering the period from 2021 to 2025 indicate that the availability of several anticancer medicines was unstable, with participants particularly mentioning etoposide, paclitaxel, vincristine, dacarbazine, methotrexate, gemcitabine, vinblastine, and bleomycin. Participants considered the situation particularly difficult during the COVID-19 period, when international manufacturing, transportation, procurement, and distribution systems experienced considerable disruption. The pandemic exposed the vulnerability of pharmaceutical supply chains that depend on international production and transportation networks (Busola Fadojutimi, 2024). Although the most severe disruptions were associated with the pandemic period, pharmacists indicated that problems with medicine availability continued afterward. For oncology services, continued access is particularly important because chemotherapy regimens often depend on specific medicines and treatment schedules, making unexpected substitution or interruption more complicated than in some other therapeutic areas (Atif et al., 2021; Sarnola et al., 2022).

The findings further indicate that the problem is not limited to the availability of medicines at the hospital level. Participants identified regulatory and administrative weaknesses as important factors affecting the continuity of supply. Issues related to medicine registration, importation, licensing, pricing, procurement, and communication between relevant stakeholders were repeatedly discussed during the interviews. Previous research has similarly demonstrated that regulatory and market-related conditions can contribute to medicine shortages, particularly in low- and middle-income countries where pharmaceutical systems may have fewer resources and less flexibility to respond to supply disruptions (AbdulKareem & Oladimeji, 2024). In the context of anticancer medicines, these difficulties can become more important because some products have a relatively limited number of manufacturers or suppliers. When supply from one source is interrupted, hospitals may have limited opportunities to obtain an immediate replacement.

Another issue raised by participants was the limited availability of some anticancer medicines through domestic sources and the resulting dependence on external pharmaceutical supplies. Reliance on imported medicines can expose the supply chain to international manufacturing problems, transportation delays, exchange-rate pressures, import procedures, and changes in global pharmaceutical markets. These vulnerabilities may become more visible when several hospitals depend on the same suppliers or distributors. The Lahore findings therefore suggest that improving medicine availability requires attention not only to hospital procurement but also to the wider pharmaceutical supply network. Diversifying reliable sources for essential medicines and strengthening the capacity to produce selected critical medicines domestically may contribute to greater supply resilience, provided that appropriate quality and regulatory standards are maintained.

Poor inventory and procurement practices were also identified as important contributors to shortages (Modisakeng et al., 2020). Pharmacists described difficulties in predicting future

requirements, monitoring stock levels, maintaining adequate reserve quantities, and responding to sudden changes in demand. These challenges are important in oncology pharmacy because hospitals must maintain sufficient stocks while also managing medicine costs, expiry dates, storage requirements, and unpredictable patient requirements. Previous studies have emphasized the importance of systematic stock monitoring, accurate forecasting, computerized inventory systems, and timely procurement in reducing the operational effects of medicine shortages (Simpson & Yik, 2024). The experiences reported by Lahore pharmacists similarly suggest that stronger inventory systems could allow hospitals to identify declining stocks earlier and initiate procurement before a complete stock-out occurs.

The consequences described by participants extended beyond the pharmacy department and affected patients, physicians, and the broader delivery of oncology services. Pharmacists reported situations in which medicine shortages could contribute to treatment delays, difficulties in obtaining prescribed medicines, the need to search for alternative sources, and changes in treatment arrangements. Previous studies have also documented treatment delays and therapeutic difficulties associated with oncology medicine shortages

(Bachoolall & Suleman, 2025; Rahem et al., 2021). Because many cancer treatment protocols follow defined schedules, a shortage of one component may require additional communication between pharmacists and oncologists before an alternative can be considered. This increases the complexity of treatment planning and may place additional pressure on healthcare professionals.

The financial consequences for patients were another important issue emerging from the interviews. When medicines were unavailable through hospital supply channels, patients or their caregivers could be required to purchase them independently from other pharmacies or sources. This may result in higher expenditure, particularly when the available alternative is more expensive or when patients have to travel to several locations to locate the required medicine. The financial implications of cancer treatment are already substantial for many households, and additional expenditure caused by medicine shortages may further increase the economic burden on patients and their families. Evidence from different healthcare settings similarly indicates that medicine shortages can shift additional costs to patients when hospitals cannot provide the prescribed treatment (Simpson & Yik, 2024).

The interviews also demonstrated the additional workload created for pharmacists. When a medicine was unavailable, pharmacists had to contact suppliers, search for alternative sources, communicate with oncologists, monitor remaining stocks, and explain the situation to patients and their caregivers. These activities require time and professional judgment and may occur alongside pharmacists' normal clinical and administrative responsibilities. Similar concerns have been reported internationally, where medicine shortages have been associated with increased administrative work and additional responsibilities for pharmacy professionals (Janetzi et al., 2025). In Lahore, the findings indicate that pharmacists are therefore not simply affected by medicine shortages but also play a central role in managing their immediate consequences.

Participants described several strategies for dealing with shortages, including closer monitoring of stock, contacting alternative suppliers, communicating with other healthcare institutions, discussing alternatives with oncologists, and prioritizing available medicines. These responses demonstrate the practical importance of pharmacists within hospital-based shortage management. However, the interviews also suggest that many of these measures are reactive and are implemented after a shortage has already become apparent. A more preventive approach would involve identifying medicines at high risk of shortage, establishing minimum stock levels, monitoring consumption patterns, and developing procedures for early communication with suppliers and healthcare professionals. Computerized inventory-management systems may be particularly useful because they can provide timely information about stock levels, consumption, and replenishment requirements (Kristina et al., 2024).

Communication emerged as an important element in managing shortages. Pharmacists need accurate information from suppliers and distributors regarding expected deliveries, while oncologists and hospital administrators require current information about available stock and potential treatment alternatives. At the same time, information from hospitals can help regulatory authorities identify shortages occurring across different institutions. Establishing clearer communication channels could therefore improve coordination and reduce the uncertainty experienced by healthcare professionals during stock disruptions. Previous research has similarly identified communication and coordination between stakeholders as important components of effective medicine-shortage management (Omer et al., 2021; Vann Yaroson et al., 2024).

The findings also have implications for the organization of oncology pharmacy services in Lahore. Pharmacists should be involved in institutional decisions concerning procurement forecasting, identification of essential medicines, stock monitoring, and development of shortage-response procedures. Hospitals could establish written protocols specifying the actions to be taken when an essential anticancer medicine becomes unavailable. Such protocols could include verification of remaining stock, communication with the oncology team, identification of clinically appropriate alternatives, documentation of shortage-related decisions, and communication with patients. This would help transform individual pharmacists' experience and problem-solving efforts into a more consistent institutional response.

At the broader health-system level, the findings point to the need for stronger mechanisms for identifying and communicating anticancer medicine shortages. A formal shortage-reporting system could allow hospitals to report emerging stock problems and could provide healthcare institutions with information about medicines already experiencing supply difficulties elsewhere. Such a mechanism could also help policymakers distinguish between temporary hospital-level stock problems and shortages affecting multiple institutions. Reliable information would be particularly valuable for medicines supplied by a small number of manufacturers or distributors because early identification could provide additional time for alternative procurement arrangements.

The study also highlights the importance of strengthening the resilience of the anticancer medicine supply chain. Participants' experiences suggest that long-term improvement requires cooperation among regulatory authorities, manufacturers, distributors, hospital administrators, pharmacists, and oncology professionals. Increasing the number of dependable suppliers for essential medicines, improving demand forecasting, strengthening inventory systems, and supporting appropriate domestic production are potential areas for consideration. These measures should operate alongside appropriate quality assurance and regulatory oversight because increasing availability without maintaining medicine quality would create additional risks for patients.

Table 2. Key Themes

Main theme	Subthemes / key issues	Summary of findings
1. Dynamics and perceptions of shortages	Recurring stock-outs; variation across hospitals; affected medicines; COVID-19-related disruption	Pharmacists described shortages as recurring, with frequency and duration varying by hospital and medicine. Medicines mentioned included etoposide, paclitaxel, vincristine, dacarbazine, methotrexate, gemcitabine, vinblastine, and bleomycin. Participants perceived that supply difficulties persisted during 2021–2025, including after the pandemic-related disruptions.
2. Perceived determinants of shortages	Regulatory oversight and coordination; reliance on external supply; procurement delays; inventory and forecasting weaknesses	Participants linked shortages to interacting supply-system problems, including perceived weaknesses in regulatory monitoring and stakeholder communication, limited domestic availability of some medicines, reliance on external sources, and difficulties forecasting demand, monitoring stock, and maintaining safety stocks.
3. Consequences for patients and pharmacy services	Treatment delays or regimen changes; out-of-pocket costs; additional patient visits; increased workload; patient confidence	When prescribed medicines were unavailable, pharmacists reported having to contact suppliers and oncologists and explain the situation to patients. Reported consequences included treatment delays, possible changes to treatment arrangements, additional effort to locate medicines, increased patient expenditure, greater pharmacy workload, and challenges maintaining patient confidence.
4. Pharmacists' adaptive management strategies	Stock monitoring; alternative suppliers; inter-hospital coordination; consultation with oncologists; allocation of limited stock	Pharmacists described checking stock more closely, contacting suppliers and other hospitals, exploring alternative procurement channels, and discussing clinically appropriate alternatives with oncologists. Some reported prioritizing limited stock. These responses were often reactive rather than governed by standardized shortage-management protocols.

5. Building a more resilient supply system	Stakeholder collaboration; domestic production; demand forecasting; minimum stock levels; shortage reporting and early warning	Participants recommended stronger coordination among regulators, manufacturers, distributors, hospitals, pharmacists, and oncology teams. Suggested improvements included better forecasting and inventory records, timely procurement, safety-stock policies, reliable shortage reporting, early-warning mechanisms, and appropriate domestic production of essential medicines.
--	--	---

Limitation

Several limitations should be considered when interpreting these findings. The study included 35 hospital pharmacists from selected hospitals in Lahore, and therefore the findings reflect experiences within this specific geographical and professional setting rather than the entire Pakistani healthcare system. Experiences may differ in other cities and in rural areas where oncology services and pharmaceutical resources may be less concentrated. In addition, the study relied on participants' retrospective accounts of events occurring between 2021 and 2025, which means that some details may have been influenced by individual recall. The study also focused on pharmacists and did not directly investigate the perspectives of oncologists, patients, caregivers, hospital administrators, manufacturers, distributors, or regulatory officials. Future research could therefore adopt a multi-stakeholder approach and combine qualitative interviews with hospital stock records, procurement data, medicine registration information, and documented shortage reports. Comparative studies involving Lahore and other regions of Pakistan would also help determine whether the patterns identified in this study reflect local conditions or broader national challenges.

Contribution

The contribution of this study lies in its focus on the first-hand experiences of hospital pharmacists in Lahore during the 2021–2025 period. Much of the discussion surrounding medicine shortages is based on supply records, administrative data, or general assessments of pharmaceutical availability. The present study adds a professional and operational perspective by examining how shortages are encountered at the hospital level and how pharmacists respond to them in their daily practice. It also brings together several dimensions of the problem, including regulatory conditions, supply dependence, inventory management, patient consequences, professional workload, and shortage-management practices. This integrated perspective provides useful contextual evidence for understanding anticancer medicine availability in Lahore and identifies areas that may require further investigation in Pakistan.

References

AbdulKareem, A. K., & Oladimeji, K. A. (2024). Cultivating the digital citizen: trust, digital literacy and e-government adoption. *Transforming Government: People, Process and Policy*, 18(2). <https://doi.org/10.1108/TG-11-2023-0196>

- Alshibli, F., Algarni, K., & Balfagih, H. (2024). Analyzing the causes and impact of essential medicines and supplies shortages in the supply chain of the Ministry of health in Saudi Arabia: A quantitative survey study. *Informatics in Medicine Unlocked*, 45. <https://doi.org/10.1016/j.imu.2024.101457>
- Atif, M., Sehar, A., Malik, I., Mushtaq, I., Ahmad, N., & Babar, Z. U. D. (2021). What impact does medicines shortages have on patients? A qualitative study exploring patients' experience and views of healthcare professionals. *BMC Health Services Research*, 21(1). <https://doi.org/10.1186/s12913-021-06812-7>
- Bachoolall, R., & Suleman, F. (2025). Community pharmacists' perceptions and experiences of medicine shortages in disruptive situations: a qualitative study. *International Journal of Clinical Pharmacy*, 47(1). <https://doi.org/10.1007/s11096-024-01799-7>
- Brall, C., & Schröder-Bäck, P. (2016). Personalised Medicine and Scarce Resources: A Discussion of Ethical Chances and Challenges from the Perspective of the Capability Approach. *Public Health Genomics*, 19(3). <https://doi.org/10.1159/000446536>
- Busola Fadojutimi. (2024). Exploring the critical factors in pharmaceutical supply chains revealed during COVID-19 and addressing missing links. *World Journal of Advanced Research and Reviews*, 24(1). <https://doi.org/10.30574/wjarr.2024.24.1.3283>
- Janetzki, J. L., Chai, W. C., Bui, T. N. T., Sim, T. F., & Suppiah, V. (2025). Impact of medicine shortages on Australian pharmacists' professional practice and patient care: a nationwide survey. *Journal of Pharmacy Practice and Research*, 55(2). <https://doi.org/10.1002/jppr.1949>
- Karampatakis, G. D., Patel, N., Stretch, G., & Ryan, K. (2021). Patients' experiences of pharmacists in general practice: an exploratory qualitative study. *BMC Family Practice*, 22(1). <https://doi.org/10.1186/s12875-021-01393-0>
- Kobyakova, O. S., Starodubov, V. I., Deev, I. A., Kanev, A. F., Kurakova, N. G., & Tsvetkova, L. A. (2023). Frontiers and Structural Transformations of the Global Pharmaceutical Market. *Vestnik Rossiiskoi Akademii Meditsinskikh Nauk*, 78(1). <https://doi.org/10.15690/vramn2170>
- Kristina, S. A., Andayani, T. M., Endarti, D., Widayanti, A. W., & Pertiwi, A. L. C. (2024). A Survey on Medicine Shortage in Community Pharmacies in Yogyakarta Province, Indonesia. *Indonesian Journal of Pharmacy*, 35(4). <https://doi.org/10.22146/ijp.5797>
- Logan, T. M., & Guikema, S. D. (2020). Reframing Resilience: Equitable Access to Essential Services. *Risk Analysis*, 40(8). <https://doi.org/10.1111/risa.13492>
- Modisakeng, C., Matlala, M., Godman, B., & Meyer, J. C. (2020). Medicine shortages and challenges with the procurement process among public sector hospitals in South Africa; Findings and implications. *BMC Health Services Research*, 20(1). <https://doi.org/10.1186/s12913-020-05080-1>
- Musazzi, U. M., Di Giorgio, D., & Minghetti, P. (2020). New regulatory strategies to manage medicines shortages in Europe. *International Journal of Pharmaceutics*, 579. <https://doi.org/10.1016/j.ijpharm.2020.119171>

- Ndwandwe, M. M., Lowane, M. P., Simbeni, T., & Mokgatle, M. M. (2026). Healthcare Professionals' Perceptions of Medicine Shortages in Public Health Facilities of the Eastern Cape, South Africa. *Healthcare (Switzerland)*, 14(5). <https://doi.org/10.3390/healthcare14050683>
- Omer, S., Ali, S., Shukar, S., Gillani, A. H., Fang, Y., & Yang, C. (2021). A qualitative study exploring the management of medicine shortages in the community pharmacy of Pakistan. *International Journal of Environmental Research and Public Health*, 18(20). <https://doi.org/10.3390/ijerph182010665>
- Postma, D. J., De Smet, P. A. G. M., Notenboom, K., Leufkens, H. G. M., & Mantel-Teeuwisse, A. K. (2022). Impact of medicine shortages on patients ~ a framework and application in the Netherlands. *BMC Health Services Research*, 22(1). <https://doi.org/10.1186/s12913-022-08765-x>
- Rahem, A., Athiyah, U., Setiawan, C. D., & Hermansyah, A. (2021). The impact of pharmacist shortage on the inventory management of medicines at primary healthcare centres in East Java, Indonesia. *Pharmacy Education*, 21(2). <https://doi.org/10.46542/pe.2021.212.814>
- Rosário, A., Hankó, B., & Zelkó, R. (2024). Managing drug shortages in pediatric care. In *Frontiers in Pharmacology* (Vol. 15). <https://doi.org/10.3389/fphar.2024.1416029>
- Saqib, A., Iftikhar, S., & Sarwar, M. R. (2018). Availability and affordability of biologic versus non-biologic anticancer medicines: A cross-sectional study in Punjab, Pakistan. *BMJ Open*, 8(6). <https://doi.org/10.1136/bmjopen-2017-019015>
- Sarnola, K., Kari, H., & Koskinen, H. (2022). Medicine shortages: Product life cycle phases and characteristics of medicines in short supply—A register study. *Frontiers in Pharmacology*, 13. <https://doi.org/10.3389/fphar.2022.943249>
- Shukar, S., Anjum, R., Zhang, J., Babar, Z. U. D., Mobeen, I., & Yang, C. (2024). Anticancer medicines in Pakistan: An analysis of essential medicines lists. *Journal of Oncology Pharmacy Practice*, 30(1). <https://doi.org/10.1177/10781552231167809>
- Shukar, S., Zahoor, F., Omer, S., Awan, S. E., Yang, C., & Fang, Y. (2022). Experience of Pharmacists with Anti-Cancer Medicine Shortages in Pakistan: Results of a Qualitative Study. *International Journal of Environmental Research and Public Health*, 19(23). <https://doi.org/10.3390/ijerph192316373>
- Simpson, T., & Yik, J. (2024). Managing medicine shortages. *Australian Prescriber*, 47(5). <https://doi.org/10.18773/austprescr.2024.045>
- Thai, T., Chen, G., Lancsar, E., de New, S. C., Banwell, C., Freeman, C., & Spinks, J. (2022). Beyond dispensing: Better integration of pharmacists within the Australian primary healthcare system. *SSM ~ Qualitative Research in Health*, 2. <https://doi.org/10.1016/j.ssmqr.2022.100109>
- Vann Yaroson, E., Quinn, G., & Breen, L. (2024). Medicines Shortages Reporting Systems (MSRS): An exploratory review of access and sustainability. *Research in Social and Administrative Pharmacy*, 20(6). <https://doi.org/10.1016/j.sapharm.2024.02.010>
- Zaidi, S., Bigdeli, M., Aleem, N., & Rashidian, A. (2013). Access to Essential Medicines in Pakistan: Policy and Health Systems Research Concerns. *PLoS ONE*, 8(5). <https://doi.org/10.1371/journal.pone.0063515>