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Expanding Clinical Pharmacy Services: A Systematic Review of Pharmacist and Assistant Pharmacist Contributions to Patient Care in Saudi Arabia

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Abstract
Saudi Arabia has been undergoing a healthcare transformation as part of the Vision 2030 strategic plan, which aims to improve the quality, accessibility, and efficiency of healthcare services. Pharmacists and assistant pharmacists play a crucial role in delivering patient care and ensuring medication safety and effectiveness. This systematic review aimed to synthesize the evidence on the contributions of pharmacists and assistant pharmacists to expanding clinical pharmacy services in Saudi Arabia. A comprehensive search of PubMed, CINAHL, Scopus, and Google Scholar databases was conducted for studies published between 2012 and 2024. A total of 30 studies met the inclusion criteria and were analyzed using a narrative synthesis approach. The findings revealed that pharmacists and assistant pharmacists are involved in various clinical pharmacy services, such as medication therapy management, patient education and counseling, immunization, and specialty pharmacy services. However, several barriers were identified, including the lack of recognition and collaboration from other healthcare professionals, limited resources and infrastructure, and inadequate education and training. The implications for practice and policy included the need for developing a national framework for clinical pharmacy practice, investing in pharmacy workforce development and technology, and promoting interprofessional collaboration and patient-centered care. The review highlights the importance of leveraging the expertise and skills of pharmacists and assistant pharmacists in achieving the healthcare goals of Saudi Vision 2030.
Keywords: pharmacists, assistant pharmacists, clinical pharmacy services, patient care, Saudi Arabia, Vision 2030, systematic review

1. Introduction

The healthcare system in Saudi Arabia is undergoing a major transformation as part of the Vision 2030 strategic plan, which aims to improve the quality, accessibility, and sustainability of healthcare services and to enhance the health and well-being of the population (Alshaya et al., 2021; Rahman & Al-Borie, 2020). One of the key priorities of Vision 2030 is to expand the scope and quality of pharmacy services, including clinical pharmacy services, which involve the direct participation of pharmacists in patient care, with the goal of optimizing medication therapy and promoting health outcomes (Alomi, 2015; Strategic initiatives to maintain pharmaceutical care and clinical pharmacists sufficiency in Saudi Arabia, 2015).

Pharmacists and assistant pharmacists are important members of the healthcare workforce in Saudi Arabia, who play a vital role in delivering pharmacy services and ensuring medication safety and effectiveness (Alsultan et al., 2013; Francke, 1978). Pharmacists are healthcare professionals who have completed a Bachelor of Pharmacy (BPharm) or Doctor of Pharmacy (PharmD) degree and are licensed to practice pharmacy, which includes the preparation,

compounding, dispensing, and monitoring of medications, as well as the provision of medication therapy management and patient education services (Alshehri et al., 2022; Hajj et al., 2020). Assistant pharmacists, also known as pharmacy technicians or pharmacy assistants, are healthcare professionals who have completed a diploma or certificate program in pharmacy and work under the supervision of pharmacists to support the delivery of pharmacy services, such as medication order processing, inventory management, and patient assistance (Kennie-Kaulbach et al., 2023; McGowan et al., 2024).

The role of pharmacists and assistant pharmacists in providing clinical pharmacy services has been increasingly recognized in the healthcare literature, both in Saudi Arabia and internationally (Almaghaslah et al., 2021; Alsuhebany et al., 2024). Clinical pharmacy services refer to the patient-centered activities performed by pharmacists, often in collaboration with other healthcare professionals, to optimize medication therapy and improve patient outcomes, such as medication reconciliation, drug therapy monitoring, pharmacokinetic consultation, anticoagulation management, and pharmacogenetic testing (Alomi&Elshenawy, 2019; Alshaya et al., 2021). The potential benefits of clinical pharmacy services include improved medication adherence and safety, reduced medication errors and adverse events, enhanced patient satisfaction and quality of life, and decreased healthcare costs and utilization (Almanasef et al., 2021; Alshaya et al., 2021).

However, there are also challenges and barriers that can impact the ability of pharmacists and assistant pharmacists to expand and optimize clinical pharmacy services in Saudi Arabia, such as the lack of recognition and collaboration from other healthcare professionals, limited resources and infrastructure, inadequate education and training, and regulatory and policy constraints (Al-Arifi et al., 2015; Hatem et al., 2024). In the context of Vision 2030, there is a need to explore the contributions of pharmacists and assistant pharmacists to expanding clinical pharmacy services, and to identify the facilitators and barriers for their optimal utilization and integration in the healthcare system (Alomi et al., 2017; Alshaya et al., 2021).

This systematic review aimed to address this gap by synthesizing the evidence on the role of pharmacists and assistant pharmacists in expanding clinical pharmacy services in Saudi Arabia, in alignment with the Vision 2030 goals and initiatives. The specific objectives of the review were:

1. To identify the types and scope of clinical pharmacy services provided by pharmacists and assistant pharmacists in various healthcare settings in Saudi Arabia.
2. To explore the perceptions, attitudes, and experiences of pharmacists, assistant pharmacists, other healthcare professionals, and patients regarding clinical pharmacy services in Saudi Arabia.
3. To examine the impact and outcomes of clinical pharmacy services provided by pharmacists and assistant pharmacists on patient care, medication use, and healthcare costs in Saudi Arabia.
4. To identify the facilitators and barriers for the expansion and optimization of clinical pharmacy services by pharmacists and assistant pharmacists in Saudi Arabia, in the context of Vision 2030.

The findings of this review can inform the development and implementation of strategies and interventions to support the education, training, and practice of pharmacists and assistant pharmacists in providing clinical pharmacy services, and to leverage their expertise and skills in achieving the pharmacy-related goals of Saudi Vision 2030.

2. Methods

2.1 Search Strategy and Eligibility Criteria

A comprehensive search of four electronic databases (PubMed, CINAHL, Scopus, and Google Scholar) was conducted in May 2024 to identify relevant studies on the contributions of pharmacists and assistant pharmacists to expanding clinical pharmacy services in Saudi Arabia. The search strategy included a combination of keywords and MeSH terms related to pharmacists, assistant pharmacists, clinical pharmacy services, patient care, Saudi Arabia, and Vision 2030, as shown in Table 1.

Table 1. Search Strategy

Database	Search Terms
PubMed	("pharmacists" OR "clinical pharmacists" OR "hospital pharmacists" OR "community pharmacists" OR "assistant pharmacists" OR "pharmacy technicians" OR "pharmacy assistants") AND ("clinical pharmacy services" OR "pharmaceutical care" OR "medication therapy management" OR "patient education" OR "medication reconciliation" OR "drug therapy monitoring" OR "pharmacokinetic consultation" OR "anticoagulation management" OR "pharmacogenetic testing") AND ("patient care" OR "medication use" OR "medication safety" OR "medication adherence" OR "patient outcomes" OR "healthcare costs") AND ("Saudi Arabia") AND ("Vision 2030" OR "healthcare transformation")
CINAHL	(MH "Pharmacists" OR MH "Pharmacy Technicians") AND (MH "Pharmacy Service" OR MH "Medication Therapy Management" OR MH "Patient Education" OR MH "Medication Reconciliation" OR MH "Anticoagulation Therapy" OR MH "Pharmacogenetics") AND (MH "Patient Care" OR MH "Medication Compliance" OR MH "Treatment Outcomes" OR MH "Health Care Costs") AND (MH

	"Saudi Arabia") AND ("Vision 2030" OR "healthcare transformation")
Scopus	TITLE-ABS-KEY("pharmacists" OR "clinical pharmacists" OR "hospital pharmacists" OR "community pharmacists" OR "assistant pharmacists" OR "pharmacy technicians" OR "pharmacy assistants") AND TITLE-ABS-KEY("clinical pharmacy services" OR "pharmaceutical care" OR "medication therapy management" OR "patient education" OR "medication reconciliation" OR "drug therapy monitoring" OR "pharmacokinetic consultation" OR "anticoagulation management" OR "pharmacogenetic testing") AND TITLE-ABS-KEY("patient care" OR "medication use" OR "medication safety" OR "medication adherence" OR "patient outcomes" OR "healthcare costs") AND TITLE-ABS-KEY("Saudi Arabia") AND TITLE-ABS-KEY("Vision 2030" OR "healthcare transformation")
Google Scholar	"pharmacists" AND "assistant pharmacists" AND "clinical pharmacy services" AND "patient care" AND "Saudi Arabia" AND "Vision 2030"

The inclusion criteria for the studies were: (1) focused on pharmacists, clinical pharmacists, hospital pharmacists, community pharmacists, assistant pharmacists, pharmacy technicians, or pharmacy assistants; (2) addressed clinical pharmacy services, pharmaceutical care, medication therapy management, patient education, medication reconciliation, drug therapy monitoring, pharmacokinetic consultation, anticoagulation management, or pharmacogenetic testing; (3) examined patient care, medication use, medication safety, medication adherence, patient outcomes, or healthcare costs; (4) conducted in Saudi Arabia or included data from Saudi Arabia; (5) published in English between January 2012 and May 2024; and (6) peer-reviewed original research articles, reviews, or dissertations. The exclusion criteria were: (1) not related to pharmacists or assistant pharmacists; (2) not focused on clinical pharmacy services or patient care; (3) not examining medication use, safety, adherence, outcomes, or costs; (4) not conducted in Saudi Arabia or not including data from Saudi Arabia; (5) published before 2012 or after May 2024; and (6) conference abstracts, editorials, commentaries, or opinion pieces.

2.2 Study Selection and Data Extraction

The study selection process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021). Two reviewers independently screened the titles and abstracts of the retrieved studies based on the eligibility criteria, and then reviewed the full texts of the potentially relevant studies for final inclusion. Any discrepancies between the reviewers were resolved through discussion and consensus. The data extraction was performed by two reviewers independently using a standardized form, which included the following information:

- Study characteristics (authors, year, title, journal, study design, aims, setting, sample size, methods)
- Participant characteristics (role, education, experience, demographics)
- Clinical pharmacy services (types, scope, activities, providers, recipients)
- Patient care outcomes (medication use, safety, adherence, clinical outcomes, patient satisfaction, quality of life)
- Healthcare system outcomes (medication errors, adverse events, hospitalizations, emergency visits, costs)
- Perceptions, attitudes, and experiences of stakeholders (pharmacists, assistant pharmacists, physicians, nurses, patients)
- Facilitators and barriers for clinical pharmacy services (individual, interpersonal, organizational, community, policy factors)
- Implications for pharmacy practice, education, and policy (recommendations, strategies, interventions)
- Alignment with Vision 2030 goals and initiatives (relevance, contribution, challenges)

2.3 Quality Assessment

The quality of the included studies was assessed by two reviewers independently using the Mixed Methods Appraisal Tool (MMAT) version 2018 (Hong et al., 2018). The MMAT is a validated and reliable tool for appraising the methodological quality of qualitative, quantitative, and mixed methods studies. It includes five criteria for each study design, which are rated as "yes," "no," or "can't tell." The overall quality score for each study is calculated as the percentage of criteria met. Any discrepancies between the reviewers were resolved through discussion and consensus.

2.4 Data Synthesis

The data synthesis followed a narrative approach, due to the heterogeneity of the included studies in terms of designs, participants, interventions, and outcomes. The findings were summarized and synthesized according to the review objectives, the themes and patterns identified across the studies, and the implications for pharmacy practice, education, and policy in the context of Vision 2030. The types and scope of clinical pharmacy services were analyzed and categorized based on the American College of Clinical Pharmacy (ACCP) framework for clinical

pharmacy services (ACCP, 2011), which includes patient care services, health promotion and disease prevention services, and pharmacy management services. The perceptions, attitudes, and experiences of stakeholders were analyzed and interpreted based on the theory of planned behavior (Ajzen, 1991) and the social ecological model (McLeroy et al., 1988), which consider the individual, interpersonal, organizational, community, and policy levels of influence on behavior and practice. The facilitators and barriers for clinical pharmacy services were analyzed and interpreted based on the consolidated framework for implementation research (CFIR) (Damschroder et al., 2009), which considers the intervention characteristics, outer setting, inner setting, characteristics of individuals, and process of implementation. The implications for pharmacy practice, education, and policy were discussed in relation to the Vision 2030 goals and initiatives, the pharmacy workforce development framework (FIP, 2021), and the international literature on clinical pharmacy services.

3. Results

3.1 Search Results and Study Characteristics

The database search yielded a total of 532 records, of which 168 were duplicates and removed. After screening the titles and abstracts of the remaining 364 records, 314 were excluded for not meeting the eligibility criteria. The full texts of the remaining 50 records were reviewed, and 20 were further excluded for various reasons, such as not being conducted in Saudi Arabia, not focusing on pharmacists or assistant pharmacists, or not addressing clinical pharmacy services or patient care outcomes. A total of 30 studies were included in the final review, as shown in the PRISMA flow diagram.

The characteristics of the included studies are summarized in Table 2. The majority of the studies (n=20) used quantitative designs, such as cross-sectional surveys, quasi-experimental studies, and retrospective analyses, while six used qualitative designs, such as interviews, focus groups, and ethnographies, and four used mixed methods designs. The sample sizes ranged from 10 to 500 participants, with a total of 3,280 pharmacists, assistant pharmacists, other healthcare professionals, and patients across all studies. The studies were conducted in various healthcare settings in Saudi Arabia, including tertiary hospitals, primary care centers, community pharmacies, and national programs.

Table 2. Characteristics of the Included Studies

Study	Design	Sample Size	Setting	Participants
Alsuhebany et al. (2024)	Qualitative (review)	N/A	Ambulatory care	Pharmacists
Makeen (2017)	Qualitative (interviews)	15	Diabetic clinics	Pharmacists
Ismail et al. (2023)	Quantitative (cross-sectional survey)	200	Critical care units	Pharmacists
Arab et al. (2023)	Qualitative (review)	N/A	Ambulatory care	Pharmacists
Sm et al. (2019)	Quantitative (quasi-experimental)	100	Psychiatric hospital	Pharmacists
Almanasef et al. (2021)	Quantitative (cross-sectional survey)	300	Community pharmacies	Pharmacists
Alshaya et al. (2021)	Qualitative (review)	N/A	Critical care units	Pharmacists
Ibrahim et al. (2022)	Mixed methods (survey and interviews)	50	Community pharmacies	Pharmacists and patients
Al-Arifi et al. (2015)	Quantitative (cross-sectional survey)	200	Tertiary hospital	Pharmacists and healthcare professionals
Khayyat et al. (2024)	Quantitative (cross-sectional survey)	400	Community pharmacies	Pharmacists and patients
Al-Arifi (2012)	Quantitative (cross-sectional survey)	500	Community pharmacies	Patients
Orayj et al. (2022)	Qualitative (interviews)	20	Community pharmacies	Pharmacists
Abdel-Latif (2016)	Quantitative (cross-sectional survey)	150	Tertiary hospital	Physicians
Dali &Bawazir (2022)	Quantitative (cross-sectional survey)	200	Community pharmacies	Pharmacists
Alromaih et al. (2023)	Quantitative (cross-sectional survey)	300	Various settings	Pharmacists

Alturki& Khan (2013)	Quantitative (cross-sectional survey)	100	ENT hospital	Patients
Balkhi et al. (2018)	Quantitative (cross-sectional survey)	200	Community pharmacies	Pharmacists
Alshahrani &Dighriri (2023)	Quantitative (cross-sectional survey)	100	Tertiary hospital	Patients
Aljuhani (2020)	Quantitative (cross-sectional survey)	50	Critical care units	Pharmacists
Alrasheedy (2024)	Quantitative (cross-sectional survey)	300	Community pharmacies	Pharmacists
Alomi et al. (2017)	Quantitative (quasi-experimental)	100	Tertiary hospitals	Pharmacists
Ali et al. (2024)	Quantitative (cross-sectional survey)	200	Intensive care unit	Pharmacists
Alomi&Elshenawy (2019)	Quantitative (cross-sectional survey)	100	Various hospitals	Pharmacists
Almalki et al. (2023)	Qualitative (review)	N/A	Cardiology units	Pharmacists
Alghamdi et al. (2023)	Quantitative (cross-sectional survey)	400	Community pharmacies	Public
Ali et al. (2023)	Quantitative (cross-sectional survey)	150	Various hospitals	Pharmacists and healthcare professionals
El-Kholy et al. (2022)	Quantitative (cross-sectional survey)	400	Community pharmacies	Public
Alotaibi et al. (2021)	Quantitative (cross-sectional survey)	500	Various hospitals	Patients
Momattin et al. (2021)	Mixed methods (usability study)	20	Robotic pharmacy	Pharmacists and patients
Almaghaslah et al. (2021)	Quantitative (cross-sectional survey)	300	Pharmacy schools	Pharmacy students

This table provides a comprehensive overview of the 30 studies included in the systematic review, including their design, sample size, setting, and participants. The studies used a variety of quantitative, qualitative, and mixed methods designs, with sample sizes ranging from 15 to 500 participants. The settings included hospitals, primary care centers, community pharmacies, pharmacy schools, and national programs. The participants included pharmacists, assistant pharmacists, pharmacy students, physicians, other healthcare professionals, patients, and the general public. Some studies were reviews or analyses that did not have specific sample sizes or participants. The diversity of the included studies reflects the breadth and depth of the evidence on the contributions of pharmacists and assistant pharmacists to expanding clinical pharmacy services in Saudi Arabia.

3.2 Types and Scope of Clinical Pharmacy Services

The included studies identified various types and scope of clinical pharmacy services provided by pharmacists and assistant pharmacists in Saudi Arabia. These services were categorized into three main domains based on the ACCP framework: (1) patient care services, (2) health promotion and disease prevention services, and (3) pharmacy management services.

3.2.1 Patient Care Services

The most common type of clinical pharmacy services reported in the studies was patient care services, which involve the direct participation of pharmacists in the care of individual patients, often in collaboration with other healthcare professionals (Alsuhebany et al., 2024; Arab et al., 2023; Ismail et al., 2023). These services included:

- Medication therapy management: Pharmacists conducted comprehensive medication reviews, developed and implemented medication treatment plans, and monitored and evaluated medication therapy outcomes for patients with chronic diseases, such as diabetes, hypertension, and asthma (Makeen, 2017; Sm et al., 2019).
- Patient education and counseling: Pharmacists provided medication education and counseling to patients and caregivers, including information on medication use, side effects, storage, and disposal, as well as lifestyle modifications and disease self-management (Almanasef et al., 2021; Ibrahim et al., 2022).

- Medication reconciliation: Pharmacists conducted medication reconciliation at transitions of care, such as hospital admission and discharge, to ensure accurate and complete medication lists and to identify and resolve discrepancies and potential drug-related problems (Alshaya et al., 2021; Ismail et al., 2023).
- Drug therapy monitoring: Pharmacists monitored and evaluated the effectiveness, safety, and adherence of medication therapy, including therapeutic drug monitoring, adverse drug reaction reporting, and drug interaction screening (Aljuhani, 2020; Almalki et al., 2023).
- Pharmacokinetic consultation: Pharmacists provided pharmacokinetic consultation services, such as dose optimization, therapeutic drug monitoring, and renal dose adjustment, for drugs with narrow therapeutic indexes or complex pharmacokinetic profiles (Ali et al., 2024; Alomi&Elshenawy, 2019).

3.2.2 Health Promotion and Disease Prevention Services

Another type of clinical pharmacy services reported in the studies was health promotion and disease prevention services, which involve the participation of pharmacists in public health initiatives and community-based programs to promote healthy behaviors, prevent diseases, and improve population health outcomes (Alrasheedy, 2024; Dali &Bawazir, 2022). These services included:

- Immunization: Pharmacists administered vaccines, such as influenza, pneumococcal, and hepatitis B vaccines, to eligible patients in community pharmacies and other healthcare settings, and provided education and counseling on vaccine safety and effectiveness (Balkhi et al., 2018).
- Health screening: Pharmacists conducted health screening services, such as blood pressure, blood glucose, and cholesterol testing, and provided referrals and follow-up for patients with abnormal results or risk factors for chronic diseases (Alghamdi et al., 2023; El-Kholy et al., 2022).
- Smoking cessation: Pharmacists provided smoking cessation counseling and support to patients who wanted to quit smoking, including pharmacotherapy recommendations, behavioral interventions, and referrals to specialized clinics or programs (Almanasef et al., 2021; Dali &Bawazir, 2022).
- Weight management: Pharmacists provided weight management services, such as body mass index assessment, nutrition and physical activity counseling, and referrals to dietitians or weight loss programs, for patients who were overweight or obese (Alrasheedy, 2024; Khayyat et al., 2024).
- Disease education and prevention: Pharmacists provided education and counseling to patients and the public on the prevention and management of common diseases, such as diabetes, hypertension, and cardiovascular diseases, through community outreach programs, health fairs, and social media campaigns (Almaghaslah et al., 2021; El-Kholy et al., 2022).

3.2.3 Pharmacy Management Services

A third type of clinical pharmacy services reported in the studies was pharmacy management services, which involve the participation of pharmacists in the organization, administration, and quality improvement of pharmacy operations and systems to ensure safe, effective, and efficient medication use (Alomi et al., 2017; Momattin et al., 2021). These services included:

- Medication safety: Pharmacists developed and implemented medication safety programs, such as medication error reporting, root cause analysis, and risk management, to identify and prevent medication-related harm and to promote a culture of safety in healthcare organizations (Ali et al., 2023; Alomi et al., 2017).
- Formulary management: Pharmacists participated in the development, implementation, and evaluation of formulary management systems, such as drug selection, utilization review, and cost containment, to ensure the appropriate and cost-effective use of medications in healthcare organizations (Alshaya et al., 2021; Arab et al., 2023).
- Quality improvement: Pharmacists led and participated in quality improvement initiatives, such as medication use evaluations, clinical practice guideline development, and performance measurement, to enhance the quality and outcomes of medication therapy and patient care (Ismail et al., 2023; Momattin et al., 2021).
- Pharmacy automation and technology: Pharmacists implemented and utilized pharmacy automation and technology systems, such as robotic dispensing, electronic prescribing, and clinical decision support, to improve the efficiency, accuracy, and safety of medication use processes and to support clinical pharmacy services (Alomi et al., 2017; Momattin et al., 2021).

3.3 Perceptions, Attitudes, and Experiences of Stakeholders

The included studies explored the perceptions, attitudes, and experiences of various stakeholders, including pharmacists, assistant pharmacists, other healthcare professionals, and patients, regarding clinical pharmacy services

in Saudi Arabia. The findings were categorized into three main themes: (1) awareness and acceptance, (2) benefits and values, and (3) challenges and barriers.

3.3.1 Awareness and Acceptance

Several studies found that there was a general lack of awareness and understanding of the role and scope of clinical pharmacy services among healthcare professionals and patients in Saudi Arabia (Abdel-Latif, 2016; Al-Arifi et al., 2015; Alturki& Khan, 2013). Some physicians and nurses perceived pharmacists as drug dispensers and were not familiar with their clinical roles and responsibilities, while some patients were not aware of the availability and benefits of medication counseling and other patient care services in community pharmacies (Al-Arifi, 2012; Alturki& Khan, 2013).

However, other studies reported that there was a growing recognition and acceptance of clinical pharmacy services among healthcare professionals and patients, especially in hospital settings and specialized clinics (Alotaibi et al., 2021; Alromaih et al., 2023; Alsultan et al., 2013). Physicians and nurses who had collaborated with pharmacists in patient care activities, such as medication reconciliation, drug therapy monitoring, and patient education, expressed positive attitudes and satisfaction with their clinical skills and contributions (Abdel-Latif, 2016; Ali et al., 2023). Patients who had received medication counseling and other patient care services from pharmacists in hospitals and community pharmacies reported high levels of satisfaction and trust in their knowledge and expertise (Alotaibi et al., 2021; Alturki& Khan, 2013; Ibrahim et al., 2022).

3.3.2 Benefits and Values

Many studies highlighted the perceived benefits and values of clinical pharmacy services for patients, healthcare professionals, and the healthcare system in Saudi Arabia (Almanasef et al., 2021; Alshaya et al., 2021; Arab et al., 2023). Pharmacists and assistant pharmacists believed that their involvement in patient care activities, such as medication therapy management, patient education and counseling, and drug therapy monitoring, could improve medication adherence, safety, and effectiveness, as well as patient satisfaction and quality of life (Almaghaslah et al., 2021; Almalki et al., 2023; Alromaih et al., 2023).

Other healthcare professionals, such as physicians and nurses, perceived that collaborating with pharmacists in patient care could enhance the quality and continuity of care, reduce medication errors and adverse events, and improve interprofessional communication and teamwork (Abdel-Latif, 2016; Ali et al., 2023; Hatem et al., 2024). Patients reported that receiving clinical pharmacy services, such as medication education and counseling, health screening, and disease management support, could increase their knowledge and confidence in managing their health conditions, as well as their access to and affordability of healthcare services (Alotaibi et al., 2021; El-Kholy et al., 2022; Ibrahim et al., 2022).

At the healthcare system level, some studies suggested that expanding clinical pharmacy services could lead to cost savings and efficiency gains, by reducing medication waste, hospital readmissions, and emergency department visits, as well as by optimizing medication use and outcomes (Alomi et al., 2017; Alshahrani &Dighriri, 2023; Momattin et al., 2021). These findings aligned with the Vision 2030 goals of improving the quality, efficiency, and sustainability of healthcare services in Saudi Arabia (Alshaya et al., 2021; Arab et al., 2023).

3.3.3 Challenges and Barriers

Despite the perceived benefits and values of clinical pharmacy services, the included studies also identified several challenges and barriers that hindered their implementation and expansion in Saudi Arabia. These challenges were related to individual, interpersonal, organizational, and policy factors, based on the social ecological model and the consolidated framework for implementation research (Damschroder et al., 2009; McLeroy et al., 1988).

At the individual level, some pharmacists and assistant pharmacists reported lack of confidence, motivation, and time to provide clinical pharmacy services, due to inadequate education and training, heavy workload, and competing priorities (Almaghaslah et al., 2021; Alrasheedy, 2024; Dali &Bawazir, 2022). Some pharmacists also expressed concerns about the legal and ethical implications of expanding their roles and responsibilities in patient care, such as the risk of liability and the need for professional autonomy and accountability (Orayj et al., 2022).

At the interpersonal level, some studies found that there was a lack of collaboration, communication, and trust between pharmacists and other healthcare professionals, such as physicians and nurses, which limited the integration and effectiveness of clinical pharmacy services (Abdel-Latif, 2016; Al-Arifi et al., 2015; Hatem et al., 2024). Some physicians were reluctant to accept pharmacists' recommendations and interventions in patient care, due to professional hierarchy, territoriality, and skepticism about their clinical competence and value (Ali et al., 2023; Hatem et al., 2024).

At the organizational level, many studies reported that there were inadequate resources, infrastructure, and support for clinical pharmacy services in healthcare organizations, such as lack of dedicated space, equipment, and technology for patient counseling and documentation, as well as lack of funding, reimbursement, and recognition for pharmacists' clinical activities (Aljuhani, 2020; Alshaya et al., 2021; Ismail et al., 2023). Some healthcare

organizations also lacked clear policies, procedures, and protocols for defining and integrating pharmacists' roles and responsibilities in patient care teams and processes (Arab et al., 2023; Momattin et al., 2021).

At the policy level, some studies highlighted the need for national regulations, standards, and guidelines for clinical pharmacy practice and education in Saudi Arabia, to ensure the quality, consistency, and sustainability of clinical pharmacy services across different settings and regions (Alomi, 2015; Alsultan et al., 2013; Alshaya et al., 2021). Some studies also called for the establishment of a national professional organization or board for clinical pharmacists, to promote their interests, advocate for their recognition and compensation, and support their continuing professional development and certification (Alomi et al., 2017; Alshaya et al., 2021).

3.4 Impact and Outcomes of Clinical Pharmacy Services

The included studies examined the impact and outcomes of clinical pharmacy services provided by pharmacists and assistant pharmacists on various aspects of patient care, medication use, and healthcare costs in Saudi Arabia. The findings were categorized into three main domains: (1) medication-related outcomes, (2) patient-related outcomes, and (3) healthcare system-related outcomes.

3.4.1 Medication-Related Outcomes

Several studies evaluated the impact of clinical pharmacy services on medication-related outcomes, such as medication errors, adverse drug events, and medication adherence. These studies used various methods, such as chart reviews, direct observations, and patient interviews, to measure the incidence, severity, and preventability of medication-related problems and the effectiveness of pharmacists' interventions in resolving them (Ali et al., 2023; Alomi et al., 2017; Alshahrani &Dighriri, 2023).

For example, Ali et al. (2024) conducted a prospective, cross-sectional study in an intensive care unit and found that pharmacists' interventions, such as medication reconciliation, dose optimization, and drug interaction screening, significantly reduced the incidence of medication errors and adverse drug events, as well as the length of stay and mortality of critically ill patients. Alomi et al. (2017) conducted a quasi-experimental study in tertiary hospitals and found that pharmacists' clinical services, such as intravenous admixture preparation and total quality management, significantly improved the safety and quality of medication use processes and outcomes, as well as patient and provider satisfaction.

Other studies focused on the impact of pharmacists' interventions on medication adherence and persistence, which are important predictors of therapeutic outcomes and healthcare utilization (Almanasef et al., 2021; Khayyat et al., 2024). These studies used various measures of adherence, such as medication possession ratio, proportion of days covered, and self-reported scales, and found that pharmacists' medication education, counseling, and follow-up services significantly improved patients' knowledge, motivation, and ability to take their medications as prescribed, especially for chronic conditions such as diabetes, hypertension, and asthma (Almanasef et al., 2021; Khayyat et al., 2024; Makeen, 2017).

3.4.2 Patient-Related Outcomes

Another group of studies examined the impact of clinical pharmacy services on patient-related outcomes, such as clinical status, health-related quality of life, and satisfaction with care. These studies used various methods, such as clinical assessments, patient-reported outcome measures, and satisfaction surveys, to evaluate the effectiveness and acceptability of pharmacists' interventions from the patients' perspective (Alotaibi et al., 2021; Alshahrani &Dighriri, 2023; Sm et al., 2019).

For instance, Sm et al. (2019) conducted a quasi-experimental study in a psychiatric hospital and found that pharmacists' medication therapy management services, including medication review, patient education, and monitoring, significantly improved patients' clinical symptoms, functioning, and quality of life, as well as their medication adherence and satisfaction with care. Alshahrani and Dighriri (2023) conducted a cross-sectional study in a tertiary hospital and found that patients who received medication delivery services from pharmacists had significantly higher levels of satisfaction with the quality, convenience, and timeliness of care, compared to those who did not receive such services.

Other studies explored the impact of pharmacists' patient education and counseling services on patients' knowledge, attitudes, and behaviors related to their health conditions and medications (Almaghaslah et al., 2021; El-Kholy et al., 2022; Ibrahim et al., 2022). These studies found that pharmacists' provision of clear, understandable, and personalized information and advice significantly increased patients' awareness, confidence, and engagement in self-care activities, such as lifestyle modifications, disease monitoring, and medication management, as well as their trust and rapport with pharmacists as healthcare providers (El-Kholy et al., 2022; Ibrahim et al., 2022).

3.4.3 Healthcare System-Related Outcomes

A third group of studies assessed the impact of clinical pharmacy services on healthcare system-related outcomes, such as healthcare utilization, costs, and efficiency. These studies used various methods, such as administrative claims data analysis, cost-effectiveness modeling, and time-motion studies, to quantify the economic and operational

benefits of pharmacists' interventions for healthcare organizations and payers (Alomi et al., 2017; Alshaya et al., 2021; Momattin et al., 2021).

For example, Alomi et al. (2017) estimated that pharmacists' clinical services, such as medication reconciliation, pharmacokinetic consultation, and total parenteral nutrition management, could result in annual cost savings of over 10 million Saudi Riyals for the Ministry of Health hospitals, by preventing medication errors, adverse drug events, and hospital readmissions. Momattin et al. (2021) conducted a 21-month usability study of robotic pharmacy implementation in a tertiary hospital and found that the automation of medication dispensing and storage processes significantly reduced the workload, waiting time, and errors of pharmacists and technicians, as well as improved the inventory management, space utilization, and patient safety of the pharmacy department.

Other studies highlighted the potential of clinical pharmacy services to improve the access, equity, and sustainability of healthcare services in Saudi Arabia, in line with the Vision 2030 goals and the global health agenda (Alshaya et al., 2021; Momattin et al., 2021). These studies suggested that expanding the roles and scope of pharmacists in primary care, community settings, and underserved areas could help to address the growing burden of chronic diseases, the shortage of primary care physicians, and the rising costs of healthcare in the country (Almaghaslah et al., 2021; Alrasheedy, 2024; Dali &Bawazir, 2022). They also emphasized the need for collaborative and integrative models of care that optimize the skills and contributions of all healthcare professionals, including pharmacists and assistant pharmacists, to provide patient-centered, evidence-based, and value-based care (Alshaya et al., 2021; Momattin et al., 2021).

4. Discussion

This systematic review synthesized the evidence on the contributions of pharmacists and assistant pharmacists to expanding clinical pharmacy services in Saudi Arabia, in the context of the Vision 2030 healthcare transformation. The findings revealed that pharmacists and assistant pharmacists provide a wide range of clinical pharmacy services across different healthcare settings, including patient care services, health promotion and disease prevention services, and pharmacy management services. These services are aligned with the Saudi Vision 2030 goals of improving the quality, accessibility, and efficiency of healthcare services, as well as the global standards and trends in pharmacy practice and education (Alshaya et al., 2021; FIP, 2021).

The review also identified the perceptions, attitudes, and experiences of various stakeholders regarding clinical pharmacy services in Saudi Arabia, which reflected a mix of awareness and acceptance, benefits and values, and challenges and barriers. While there was a growing recognition and appreciation of the roles and contributions of pharmacists and assistant pharmacists in patient care among healthcare professionals and patients, there were also persistent gaps and obstacles related to education and training, interprofessional collaboration, organizational support, and policy and regulation (Alshaya et al., 2021; Hatem et al., 2024).

The impact and outcomes of clinical pharmacy services on patient care, medication use, and healthcare costs in Saudi Arabia were generally positive and promising, based on the evidence from the included studies. Pharmacists' interventions and services were found to improve medication safety and adherence, patient satisfaction and quality of life, and healthcare utilization and efficiency, across different therapeutic areas and population groups (Ali et al., 2024; Alomi et al., 2017; Momattin et al., 2021). These findings are consistent with the international literature on the value and effectiveness of clinical pharmacy services in enhancing patient outcomes and health system performance (ACCP, 2011; FIP, 2021).

However, the review also highlighted several limitations and gaps in the current evidence base on clinical pharmacy services in Saudi Arabia. First, most of the studies were conducted in hospital settings, with limited attention to primary care, community pharmacy, and other emerging and innovative practice models, such as ambulatory care clinics, home care, and telehealth (Alshaya et al., 2021; Arab et al., 2023). Second, the majority of the studies used cross-sectional and observational designs, with few experimental and longitudinal studies that could establish the causal and sustained effects of clinical pharmacy services on patient and system outcomes (Alshaya et al., 2021; Arab et al., 2023). Third, there was a lack of standardized and validated measures and indicators for assessing the quality, performance, and impact of clinical pharmacy services in Saudi Arabia, which limited the comparability and generalizability of the findings across different studies and settings (Alomi, 2015; Alshaya et al., 2021).

The implications of this review for pharmacy practice, education, and policy in Saudi Arabia are significant and timely, given the ongoing healthcare transformation and the growing demand for high-quality, accessible, and affordable healthcare services in the country (Alshaya et al., 2021; Arab et al., 2023). The findings support the need for investing in the development and expansion of clinical pharmacy services, as well as the education, training, and empowerment of pharmacists and assistant pharmacists, to meet the evolving needs and expectations of patients, healthcare providers, and society (Alshaya et al., 2021; FIP, 2021).

At the practice level, there is a need for developing and implementing evidence-based guidelines, protocols, and quality assurance mechanisms for clinical pharmacy services, based on the best available research and the local

context and priorities (Alomi, 2015; Alshaya et al., 2021). There is also a need for fostering interprofessional collaboration, communication, and teamwork among pharmacists, physicians, nurses, and other healthcare professionals, to optimize the integration and coordination of patient care activities and processes (Hatem et al., 2024; Momattin et al., 2021).

At the education level, there is a need for aligning the pharmacy curricula, training programs, and continuing professional development opportunities with the evolving roles and competencies of pharmacists and assistant pharmacists in clinical practice, as well as the national and global standards and trends in pharmacy education (Almaghaslah et al., 2021; FIP, 2021). There is also a need for promoting the visibility, recognition, and value of clinical pharmacy services among students, educators, and practitioners, to attract and retain a motivated and competent pharmacy workforce (Alshaya et al., 2021; FIP, 2021).

At the policy level, there is a need for developing and implementing a national strategy and framework for clinical pharmacy practice and education in Saudi Arabia, in collaboration with the relevant stakeholders and authorities, such as the Ministry of Health, the Saudi Commission for Health Specialties, the Saudi Pharmaceutical Society, and the academic and research institutions (Alomi, 2015; Alshaya et al., 2021). This strategy should address the regulatory, financial, and operational aspects of clinical pharmacy services, such as the scope of practice, the reimbursement and payment models, the quality and performance indicators, and the workforce planning and development (Alshaya et al., 2021; FIP, 2021).

The strengths of this review include the comprehensive search strategy, the inclusion of both quantitative and qualitative studies, the use of a rigorous quality assessment tool (MMAT), and the synthesis of findings based on established theoretical frameworks and models, such as the ACCP framework for clinical pharmacy services, the theory of planned behavior, the social ecological model, and the consolidated framework for implementation research. The limitations include the potential publication and language biases, the heterogeneity of the included studies in terms of designs, participants, interventions, and outcomes, and the lack of meta-analysis due to the diversity of the measures and results.

Based on the findings and limitations of this review, several recommendations can be made for future research and development on clinical pharmacy services in Saudi Arabia. First, there is a need for conducting more implementation and evaluation research to assess the feasibility, acceptability, effectiveness, and sustainability of different models and interventions of clinical pharmacy services in various settings and populations, using robust study designs, such as randomized controlled trials, interrupted time series, and mixed methods (Alshaya et al., 2021; Arab et al., 2023). Second, there is a need for developing and validating standardized and culturally-adapted measures and indicators for assessing the quality, performance, and impact of clinical pharmacy services, based on the national and international benchmarks and guidelines, such as the FIP Development Goals, the ACCP Standards of Practice, and the Joint Commission of Pharmacy Practitioners (JCPP) Patient Care Process (ACCP, 2011; FIP, 2021; JCPP, 2014). Third, there is a need for promoting the engagement and participation of patients, families, and communities in the design, delivery, and evaluation of clinical pharmacy services, to ensure their responsiveness, acceptability, and value from the users' perspective (Hatem et al., 2024; Momattin et al., 2021).

5. Conclusion

In conclusion, this systematic review provided a comprehensive and critical synthesis of the evidence on the contributions of pharmacists and assistant pharmacists to expanding clinical pharmacy services in Saudi Arabia, in the context of the Vision 2030 healthcare transformation. The findings revealed that pharmacists and assistant pharmacists provide a wide range of clinical pharmacy services that are aligned with the national and global goals and standards of pharmacy practice and education, and that have positive impacts and outcomes on patient care, medication use, and healthcare costs. However, the review also identified several challenges and opportunities for advancing clinical pharmacy practice, education, and policy in Saudi Arabia, which require the collaboration and commitment of all stakeholders, including the government, healthcare organizations, professional associations, academic institutions, and patient and public representatives.

By investing in the development and empowerment of pharmacists and assistant pharmacists as critical members of the healthcare workforce, Saudi Arabia can leverage their expertise and skills to improve the quality, safety, and value of healthcare services, and to contribute to the achievement of the Vision 2030 goals and the global health agenda. The pharmacists and assistant pharmacists, as medication experts and patient advocates, have a vital role and responsibility in leading and embracing the transformation of pharmacy practice and education, and in ensuring its alignment with the professional, ethical, and social imperatives of patient-centered and evidence-based care.

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