

IMPACT OF PATIENT COUNSELLING ON CLINICAL OUTCOMES AND MEDICATION ADHERENCE IN PATIENTS WITH NON- COMMUNICABLE DISEASES IN A TERTIARY CARE HOSPITAL: A REVIEW

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ABSTRACT

Globally, non-communicable diseases (NCDs) include cancer, chronic renal disease, diabetes mellitus, heart disease, and chronic respiratory conditions are the leading causes of morbidity and mortality. Due to long-term treatment needs, growing healthcare expenditures, and decreased patient quality of life, the increased frequency of these chronic diseases has posed serious difficulties to healthcare systems. Thru patient-centered pharmaceutical care and medication management services, clinical chemists have become significant healthcare specialists in the prevention and treatment of non-communicable illnesses. By maximising pharmaceutical therapy, tracking therapeutic results, spotting drug-related issues, averting unpleasant drug responses, and encouraging sensible medication usage, clinical chemists make a substantial contribution. In addition, they provide pharmacovigilance, lifestyle change counselling, therapeutic medication

monitoring, patient counselling, and involvement in disease preventive initiatives. Pharmacist interventions enhance medication adherence, disease control, and overall patient outcomes in

chronic conditions such diabetes mellitus, hypertension, asthma, cancer, and chronic kidney disease. In order to lower disease risk factors and complications, clinical chemists also take part in health screening programs, vaccine awareness campaigns, and preventative healthcare initiatives. The function of clinical chemists is growing in contemporary healthcare systems despite obstacles such low knowledge of clinical pharmacy services, a lack of qualified personnel, and inadequate healthcare infrastructure. The numerous interventions and contributions made by clinical chemists to the prevention and management of non-communicable illnesses are highlighted in this study. Improving therapeutic outcomes, lowering healthcare costs, and raising the standard of patient care globally can all be achieved by bolstering clinical pharmacy services and incorporating chemists into interdisciplinary healthcare teams.

KEYWORDS: Clinical Pharmacists, Non-Communicable Diseases, Pharmaceutical Care, Medication Therapy, Disease Prevention, Patient counseling.

1. INTRODUCTION

Due in large part to urbanisation and the adoption of unhealthy lifestyles, the burden of non-communicable illnesses has rapidly increased in both developed and developing nations. In addition to having an impact on people's health, non-communicable diseases place a heavy social and financial strain on healthcare systems. Chronic illness patients frequently need lifelong care and ongoing medical supervision, which raises healthcare expenses and lowers quality of life overall.^[1] Therefore, in order to slow the evolution of the disease and its complications, appropriate preventative and management techniques are crucial.

In order to maximise medication therapy and encourage patients with chronic illnesses to use medications sensibly, clinical chemists are crucial. Medication safety, treatment compliance, and therapeutic results have all greatly improved as a result of their involvement in healthcare settings. Clinical chemists monitor adverse drug responses, assess prescriptions for appropriateness, spot drug-related issues, and suggest required therapy adjustments.^[2] Additionally, they work with doctors and other medical specialists to create customised treatment programs based on the requirements of each patient.

Patient education and counselling is one of clinical chemists' main contributions. Chronic patients frequently need to take several drugs for extended periods of time, which can result in medication mistakes, poor adherence, and drug interactions. Clinical chemists instruct

patients on how to take pharmaceuticals correctly, including dosing regimens, storage conditions, potential adverse effects, and therapy-related precautions. Appropriate counselling lowers the risk of consequences from improper pharmaceutical usage, increases patient knowledge, and improves compliance.^[3]

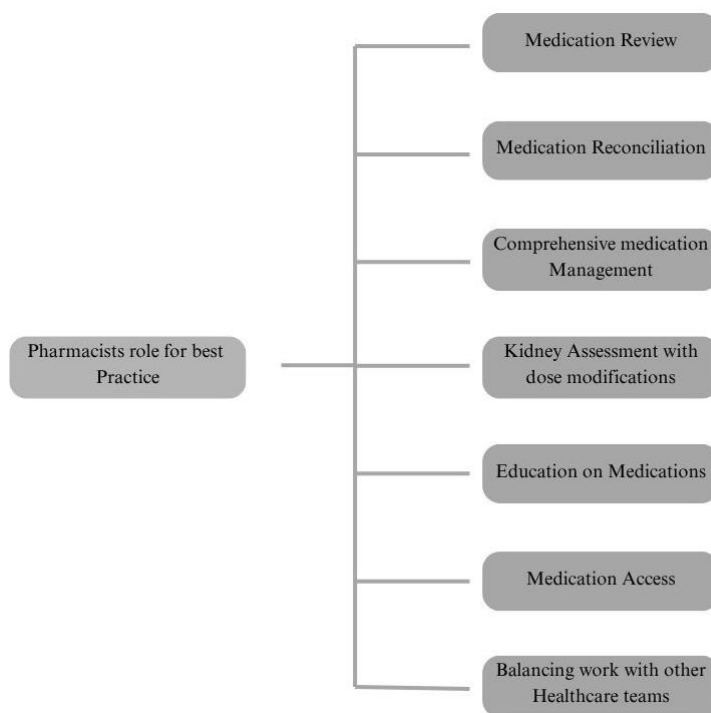
Clinical chemists help patients with diabetes mellitus by keeping an eye on blood glucose levels, giving advice on how to administer insulin, and teaching them about dietary changes and physical activity. Pharmacists monitor blood pressure, support adherence to antihypertensive medicine, and urge lifestyle changes in patients with hypertension and cardiovascular illnesses. Their therapies improve disease control and lower cardiovascular risks.

Additionally, clinical chemists regularly participate in the treatment of long-term respiratory conditions such as asthma and chronic obstructive pulmonary disease (COPD). They offer instruction on proper inhaler usage, medication adherence, and smoking cessation tactics. Pharmacists help with chemotherapy dose estimations, side effect monitoring, and supportive care counselling in cancer management. Similar to this, chemists assist in preventing nephrotoxicity and adjusting medicine dosages based on renal function in patients with chronic kidney disease.^[4]

In addition to managing illnesses, clinical chemists have a major role in preventing and controlling non-communicable diseases thru health awareness campaigns, screening initiatives, vaccine counselling, and education on lifestyle changes. To lower illness risk factors, they promote a nutritious diet, frequent exercise, stress reduction, quitting smoking, and abstaining from alcohol. The incidence and complications of chronic diseases can be considerably decreased by chemists' early detection and preventive measures.^[5]

Despite their crucial function, clinical pharmacists encounter a number of difficulties, such as a lack of knowledge about clinical pharmacy services, a lack of healthcare infrastructure, insufficient staffing, and a lack of professional collaboration. However, the function of clinical chemists continues to develop internationally due to the increasing acknowledgement of pharmaceutical care services and patient-centered healthcare practices. Their active participation in the management of chronic diseases can enhance patient quality of life, minimise hospital admissions, lower healthcare costs, and improve therapeutic outcomes.^[6] As a result, clinical chemist interventions are now a crucial aspect of contemporary

healthcare systems, especially when it comes to the management and prevention of non-communicable illnesses.^[7]



Classification of Non-Communicable Diseases

Non-communicable diseases (NCDs) are long-term conditions that typically take a long time to manifest. The organ system impacted, the disease's pathophysiology, and related risk factors are typically used to categorise them. Non-communicable illnesses necessitate long-term medical management, lifestyle changes, and ongoing healthcare monitoring since they dramatically increase morbidity and mortality worldwide. Diabetes mellitus, cancer, chronic renal disease, chronic respiratory disorders, and cardiovascular illnesses are the main types of NCDs.

2.1 Heart Conditions

One of the main causes of death in the world, cardiovascular diseases (CVDs) are conditions that affect the heart and blood arteries. These conditions include peripheral vascular disease, heart failure, myocardial infarction, coronary artery disease, hypertension, and stroke. The primary cause of cardiovascular disorders is atherosclerosis-induced blood channel constriction or blockage, which lowers the blood supply to essential organs.^[8] Smoking, obesity, poor nutrition, inactivity, stress, diabetes mellitus, hyperlipidaemia, and excessive alcohol use are common risk factors for cardiovascular illnesses.^[9]

One of the most prevalent cardiovascular conditions, hypertension is sometimes referred to as a "silent killer" due to the fact that it may not show any symptoms for a considerable amount of time. Severe consequences like stroke, renal failure, and heart attack can result from uncontrolled hypertension. Long-term medication, dietary restriction, lifestyle changes, and routine blood pressure and cholesterol monitoring are all necessary for the effective management of cardiovascular illnesses.

2.2 Mellitus Diabetes

Elevated blood glucose levels are a hallmark of diabetes mellitus, a chronic metabolic disease caused by either inadequate insulin synthesis or defective insulin action. Type 1 diabetes, Type 2 diabetes, and gestational diabetes are the general categories into which it is divided. While Type 2 diabetes is mostly linked to insulin resistance and lifestyle variables including obesity and physical inactivity, Type 1 diabetes is caused by the autoimmune loss of pancreatic beta cells.

Diabetic neuropathy, nephropathy, retinopathy, cardiovascular disorders, diabetic foot ulcers, and kidney failure are all major consequences of poorly managed diabetes. Excessive thirst, frequent urination, exhaustion, blurred eyesight, and delayed wound healing are all signs of diabetes. Blood glucose monitoring, insulin or oral hypoglycemic medication, dietary changes, consistent exercise, and patient education are all part of proper management.^[10] To avoid long-term problems related to diabetes mellitus, early diagnosis and stringent glycaemic control are crucial.

2.3 Long-Term Respiratory Conditions

Long-term conditions affecting the lungs and airways are known as chronic respiratory illnesses. Asthma and chronic obstructive pulmonary disease (COPD) are the two most prevalent respiratory conditions. Airway hyperresponsiveness, wheezing, dyspnoea, chest tightness, and coughing are the hallmarks of asthma, a chronic inflammatory illness. COPD is a progressive respiratory disease that causes breathing problems and airflow restriction. It is linked to emphysema and chronic bronchitis.

The main risk factor for long-term respiratory diseases is to be smoking. Disease development is also influenced by genetic predisposition, respiratory infections, occupational dust exposure, and environmental pollutants.^[11] These illnesses have a major negative impact on patients' quality of life and, if left untreated, can result in respiratory failure and repeated

hospital stays. Bronchodilators, corticosteroids, oxygen therapy, inhalation therapy, pulmonary rehabilitation, and counselling for quitting smoking are the primary treatments.

2.4 Cancer

A collection of illnesses known as cancer are defined by the body's aberrant cells growing, dividing, and spreading out of control. Cancer is one of the leading causes of death worldwide and can impact nearly any organ or tissue.^[12] Lung, breast, colorectal, prostate, cervical, and liver cancers are among the common cancer kinds. Genetic mutations, environmental exposure, smoking, alcohol use, radiation exposure, virus infections, and poor lifestyles are all linked to the development of cancer.

Depending on which organ is impacted, cancer symptoms can include persistent lumps or swelling, exhaustion, pain, irregular bleeding, and unexplained weight loss. Chemotherapy, radiation, surgery, immunotherapy, hormone therapy, and targeted therapy are all used in the treatment of cancer. Programs for early detection and screening are crucial for raising survival rates and lowering cancer-related mortality.^[13]

2.5 Chronic Kidney Disease

Kidney function gradually declines over time as a result of chronic kidney disease (CKD). The kidneys are vital for controlling blood pressure, preserving electrolyte balance, and filtering waste. Toxin buildup and fluid imbalance are caused by reduced kidney function in chronic renal disease.^[14]

Diabetes mellitus and hypertension are the most frequent causes of chronic kidney disease (CKD). Glomerulonephritis, recurring kidney infections, long-term use of nephrotoxic medications, and hereditary abnormalities are further contributing factors. Fatigue, oedema, nausea, reduced urine production, cramping in the muscles, and hypertension are all possible signs of chronic kidney disease (CKD). If left untreated, chronic kidney disease (CKD) can develop into end-stage renal disease that needs kidney transplantation or dialysis. Strict blood pressure and blood glucose control, dietary changes, hydration management, and proper drug therapy are all part of the management of chronic kidney disease. Preventing the advancement of the disease and its implications requires early detection and routine monitoring of renal function.^[15]

3. Role of Clinical Pharmacists in Healthcare

Clinical chemists are highly qualified medical experts with a focus on the sensible, safe, and efficient use of pharmaceuticals. By actively participating in patient care, their main objective is to optimise medication and enhance patient outcomes. Clinical chemists now have a variety of roles in contemporary healthcare systems, including patient-centered pharmaceutical care, therapeutic monitoring, disease management, and collaboration with interdisciplinary healthcare teams.^[16]

In hospitals, clinics, and community healthcare settings, clinical chemists collaborate closely with doctors, nurses, and other medical specialists. They actively participate in prescription review, drug-related issue detection, medication error prevention, therapeutic response monitoring, and patient education. Their efforts minimise hospital admissions, lessen adverse drug responses, increase therapeutic efficacy, and improve the general standard of healthcare services.^[17]

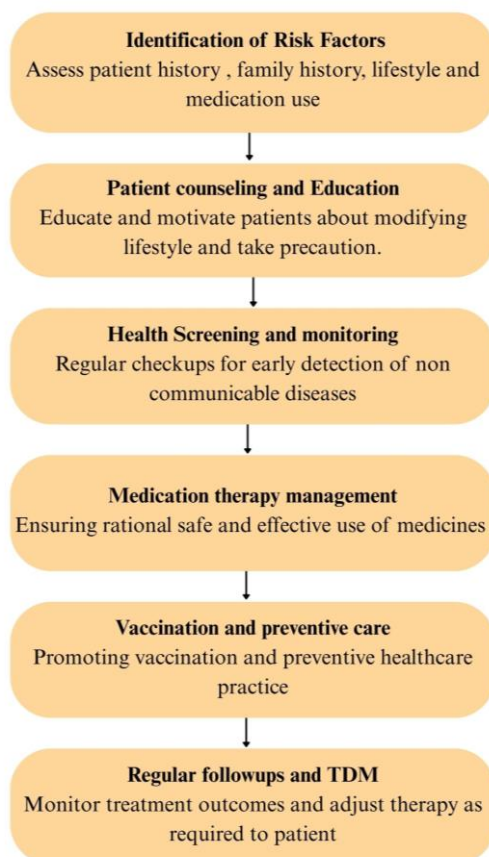
Additionally, clinical chemists are crucial to the care of chronic illnesses, especially in patients with non-communicable conditions like cancer, diabetes mellitus, hypertension, cardiovascular disease, asthma, and chronic kidney disease. Pharmacists help guarantee medication adherence and safe drug usage while lowering consequences associated with incorrect therapy, as many disorders frequently require long-term therapy and multiple medications.^[18]

3.1 Medication Therapy Management

One of the most significant duties of clinical chemists is medication therapy management, or MTM. To guarantee the best possible treatment results, it entails thorough assessment and monitoring of drug therapy. Clinical chemists evaluate prescription drugs for proper drug selection, dose, frequency, administration method, length of treatment, and any drug interactions.

Patients with chronic illnesses sometimes take several drugs at once, which raises the possibility of medication mistakes, polypharmacy, and severe drug reactions. Clinical chemists use test findings and patient medication histories to find and fix these drug-related issues.^[19] When needed, they also suggest therapeutic substitutes and dose modifications.

Medication treatment management lowers healthcare costs, increases patient safety, prevents needless drug use, and improves medication adherence. Additionally, clinical chemists guarantee logical prescribing procedures and offer medical professionals evidence-based suggestions to enhance treatment results.^[18]



3.2 Patient Counseling

One of the most crucial tasks carried out by clinical chemists is patient counselling, which is an essential part of pharmaceutical treatment. Good counselling enhances patients' comprehension of medical issues and drug regimens, which eventually improves therapeutic results.^[20]

Clinical chemists instruct patients on how to take medications correctly, including dosing regimens, storage conditions, precautions, potential side effects, and drug-food combinations. They also stress the significance of following recommended therapies and finishing treatment plans. Patients with chronic illnesses that necessitate lifelong pharmaceutical management benefit greatly from counselling.

Pharmacists educate patients with diabetes mellitus on how to administer insulin, monitor blood sugar, control nutrition, and engage in physical activity. Pharmacists instruct patients with COPD and asthma on how to use inhalers correctly and how to quit smoking. A crucial component of patient counselling is lifestyle modification counselling, which includes advice on maintaining a healthy diet, managing weight, reducing stress, quitting smoking, and abstaining from alcohol.

Effective patient counselling enhances medication compliance, lowers treatment failure, minimises medication errors, and boosts patient confidence in managing their illness.^{[18][21]}

3.3 Therapeutic Drug Monitoring

In order to maximise therapeutic efficacy and reduce toxicity, therapeutic drug monitoring, or TDM, measures and interprets drug concentrations in biological fluids. Clinical chemists are crucial in providing safe drug therapy and keeping an eye on how patients react to their prescriptions.^[22]

For medications with a narrow therapeutic index, where slight variations in drug concentration may cause toxicity or therapeutic failure, therapeutic monitoring is especially crucial. Digoxin, lithium, warfarin, aminoglycoside antibiotics, anticonvulsants, and several anticancer medications are a few examples. Clinical chemists analyse test results, evaluate the clinical situations of patients, and suggest dosage modifications based on patient-specific factors such as age, body weight, hepatic and renal function, and the severity of the disease. They also keep an eye on pharmaceutical side effects and therapeutic results. Achieving targeted drug concentrations, avoiding toxicity, enhancing treatment efficacy, and lowering hospitalisation linked to incorrect medication therapy are all made possible by therapeutic drug monitoring.^[23]

3.4 Pharmacovigilance and ADR Monitoring

The science of identifying, evaluating, comprehending, and preventing side effects or other drug-related issues is known as pharmacovigilance. To guarantee pharmaceutical safety, clinical chemists actively take part in pharmacovigilance programs and adverse drug reaction (ADR) monitoring initiatives.

One of the leading causes of illness, mortality, and hospital admissions globally is adverse medication reactions. Clinical chemists recognise, evaluate, record, and report adverse drug

reactions (ADRs). In order to reduce patient damage, they also assess the severity, causation, and preventability of adverse reactions and suggest suitable measures.^[24]

Clinical chemists promote the reporting of potential adverse events and instruct patients and medical professionals on safe medication practices.^[25] In patients receiving several medications, chemotherapy, antibiotics, anticoagulants, and high-risk pharmaceuticals, their participation in ADR monitoring is particularly crucial.

Pharmacovigilance initiatives support sensible medication use, improve patient care, lower medication-related problems, and improve drug safety profiles. Improved treatment outcomes and safer healthcare systems are further benefits of effective ADR monitoring.

4. Clinical Pharmacist Interventions in Specific Non-Communicable Diseases

Through patient-centered pharmaceutical care, medication administration, therapeutic monitoring, and health education, clinical chemists are essential to the management and prevention of non-communicable illnesses. Their efforts minimise disease-related complications, enhance therapeutic outcomes, decrease adverse drug reactions, and increase medication adherence. Clinical chemists are becoming crucial components of multidisciplinary healthcare teams since non-communicable diseases necessitate long-term treatment and ongoing monitoring.^[25]

4.1 Role in Diabetes Mellitus

By assuring the safe and efficient administration of antidiabetic drugs, clinical chemists play a major role in the management of diabetes mellitus. Diabetes is a chronic metabolic disease that necessitates ongoing care, frequent monitoring, and lifestyle changes. Based on patient-specific variables such as age, blood glucose levels, comorbidities, and renal function, clinical chemists help doctors choose the best medication. Medication evaluation and monitoring is one of the main duties of clinical chemists in the treatment of diabetes. In order to avoid medication errors, therapeutic duplication, and drug interactions, chemists review prescriptions. They instruct patients on how to properly administer insulin and oral hypoglycemic medications, how to store insulin, how to recognise hypoglycemia signs, and how important it is to take medications as prescribed.^[26]

Additionally, clinical chemists offer food management, exercise, weight control, and blood glucose self-monitoring counselling. To avoid long-term problems such as diabetic neuropathy,

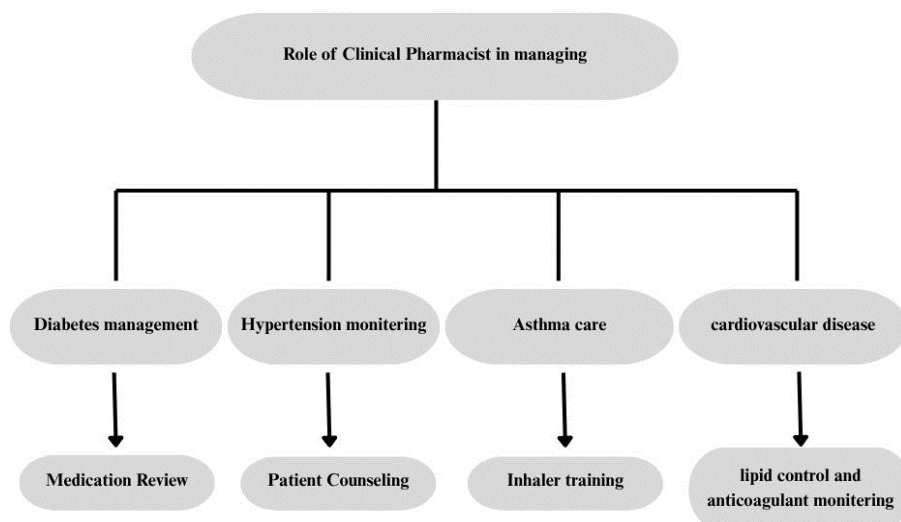
nephropathy, retinopathy, cardiovascular illnesses, and diabetic foot ulcers, they advise patients to maintain healthy lives and follow treatment regimens.^[27] Glycaemic management and general quality of life are enhanced by chemists' routine patient education and follow-up.

4.2 Role in Hypertension and Cardiovascular Diseases

Cardiovascular disorders and hypertension are among the world's top causes of death, necessitating long-term medication and ongoing monitoring. By encouraging the sensible use of cardiovascular and antihypertensive drugs, clinical chemists contribute significantly to the management of these conditions. Clinical chemists evaluate pharmaceutical therapy, keep an eye on blood pressure, and evaluate patients' compliance with recommended treatment plans. They uncover drug-related issues that may impact cardiovascular health, such as improper drug selection, adverse drug reactions, and drug interactions. Together with doctors, chemists also suggest treatment changes and dose adjustments.^[28]

Another significant intervention that clinical chemists offer is lifestyle modification counselling. Patients receive education about stress management, quitting smoking, avoiding drinking, eating a low-fat diet, limiting salt intake, and engaging in regular physical activity. Additionally, chemists advise patients about the significance of routine blood pressure monitoring and adherence to drugs including anticoagulants, beta-blockers, ACE inhibitors, and calcium channel blockers.^[29]

Clinical chemists assist in lowering the risk of consequences from uncontrolled hypertension and cardiovascular disorders, including stroke, myocardial infarction, heart failure, and kidney damage, thru patient counselling and ongoing monitoring.



4.3 Role in Asthma and COPD

In the treatment of long-term respiratory conditions including asthma and chronic obstructive pulmonary disease (COPD), clinical chemists are crucial. For these conditions to effectively control symptoms and avoid exacerbations, long-term care and appropriate inhalation treatments are necessary. Teaching patients how to use inhalers correctly is one of the main interventions that clinical chemists offer. Drug distribution to the lungs and therapeutic efficacy may be diminished by improper inhaler use. To guarantee the best possible drug administration, chemists teach how to utilise nebulisers, dry powder inhalers, and metered-dose inhalers.

Additionally, clinical chemists advise patients on the significance of routine follow-up, avoiding environmental triggers, and adhering to respiratory treatment regimens. Since smoking is a significant risk factor for the advancement of the disease, smoking cessation counselling is especially crucial to the therapy of COPD. Pharmacists assist patients in understanding the significance of giving up smoking and, if necessary, offer support through behavioural counselling and nicotine replacement therapy.^[30]

Pharmacists also evaluate prescription side effects, track therapeutic response, and spot drug interactions including corticosteroids and bronchodilators.^[31] Their interventions boost patient quality of life, lower hospitalisation rates, and improve respiratory function.

4.4 Role in Cancer Management

Clinical chemists regularly participate in the treatment of cancer and offer oncology patients specialised pharmaceutical care. Chemotherapy, radiation, immunotherapy, and supportive drugs are just a few of the complicated treatment plans that are frequently used in cancer therapy. In order to ensure that these treatments are administered safely and effectively, clinical pharmacists are essential.

Based on patient characteristics such body surface area, renal function, and hepatic function, clinical chemists help calculate chemotherapy dosages. They check prescriptions for accuracy and keep an eye out for side effects from chemotherapy, including organ damage, myelosuppression, nausea, vomiting, and mucositis.^[32]

Another crucial component of oncology pharmacy practice is patient counselling. Pharmacists inform patients about infection prevention, nutritional support, supportive care strategies, potential side effects, and drug schedules. In order to enhance patient adherence and treatment results, they also offer counselling and emotional support. Clinical chemists oversee the proper handling of cytotoxic pharmaceuticals, keep an eye on drug interactions, and handle supporting treatments including painkillers and antiemetics.^[33] Their efforts increase patient safety, lower medication mistakes, and boost cancer treatment efficacy.

4.5 Role in Chronic Kidney Disease

By maximising pharmaceutical therapy and halting further decline in renal function, clinical chemists are crucial to the management of chronic kidney disease (CKD). In patients with chronic kidney disease (CKD), cautious dose modification and therapeutic monitoring are crucial because renal impairment impairs medication excretion.

Before advising the right dosages of medications, clinical chemists evaluate renal function using test measures such serum creatinine and glomerular filtration rate (GFR). By modifying the dosages of antibiotics, antidiabetic medications, antihypertensive meds, and other pharmaceuticals excreted thru the kidneys, they assist minimise drug buildup and toxicity.

Additionally, chemists recognise and keep an eye on nephrotoxic drugs that could exacerbate renal impairment. They provide patients with advice on dietary restrictions, medication adherence, hydration management, and avoiding over-the-counter nephrotoxic medications such non-steroidal anti-inflammatory medicines (NSAIDs).^[34]

Clinical chemists help dialysis patients with complicated medication schedules, electrolyte balance monitoring, anaemia treatment, and mineral supplements.^[34] Patients with chronic kidney disease benefit from their therapies, which lower complications, improve therapeutic outcomes, and improve their quality of life.

Table No. 1: Clinical Pharmacist Interventions in Specific Non-Communicable Diseases.^{[36][37]}

S. No.	Disease Condition	Role of Clinical Pharmacists	Major Interventions	Outcomes/Benefits
1.	Diabetes Mellitus	Ensure safe and effective use of antidiabetic medications	Medication review, insulin counseling, blood glucose monitoring, dietary and lifestyle counseling	Improved glycemic control, better medication adherence, prevention of diabetic complications
2.	Hypertension and Cardiovascular Diseases	Optimize cardiovascular therapy and monitor patient adherence	Blood pressure monitoring, medication review, lifestyle modification counseling, dose adjustment recommendations	Reduced cardiovascular risk, prevention of stroke and heart failure, improved patient outcomes
3.	Asthma and COPD	Improve respiratory therapy management and inhaler use	Inhaler technique education, smoking cessation counseling, monitoring therapeutic response	Better respiratory function, reduced hospitalizations, improved quality of life
4.	Cancer Management	Support safe and effective chemotherapy administration	Chemotherapy dose calculations, ADR monitoring, supportive care counseling, medication adherence education	Reduced medication errors, improved patient safety, enhanced treatment effectiveness
5.	Chronic Kidney Disease (CKD)	Optimize medication therapy according to renal function	Dose adjustment, monitoring nephrotoxic drugs, electrolyte monitoring, dietary counseling	Prevention of drug toxicity, reduced kidney damage progression, improved therapeutic outcomes

5. Prevention and Control of Non-Communicable Diseases

Clinical chemists take an active part in health promotion and illness prevention initiatives.

5.1 Counselling for Lifestyle Modification

Pharmacists counsel patients on maintaining a healthy diet, getting regular exercise, controlling their weight, quitting smoking, and abstaining from alcohol. This kind of counselling lowers the chance of developing chronic illnesses.^[38]

5.2 Programs for Health Screening and Awareness

Health screening camps for blood pressure, blood glucose, cholesterol, and body mass index monitoring are arranged by clinical chemists. Timely care and the avoidance of complications are facilitated by early disease detection.^[39]

5.3 Immunisation and Preventive Care

Clinical chemists inform the public about preventative healthcare practices and encourage immunisation knowledge among high-risk individuals.^[40]

6. Challenges Faced by Clinical Pharmacists

Clinical pharmacy services are becoming more and more important, but there are still a number of obstacles that prevent hospitals and other healthcare facilities from effectively implementing them. The lack of knowledge among patients, medical professionals, and healthcare administrators about the significance and possible advantages of clinical pharmacy services is one of the main obstacles.

Additionally, there is a lack of clinical chemists with the necessary training and credentials, especially in medical facilities where there is a significant need for pharmacological care. The efficient provision of clinical pharmacy services may also be hampered by inadequate healthcare infrastructure, a lack of pharmacy facilities, and a lack of funding. Inadequate cooperation and communication between pharmacists and other medical specialists, such as doctors and nurses, may further restrict the pharmacist's ability to provide complete patient care.

Clinical chemists may find it challenging to dedicate enough time for medication evaluation and patient counselling in tertiary-care hospitals due to their demanding workload, high patient volume, and staffing shortages. Additionally, clinical chemists might not participate as much in multidisciplinary patient care activities, ward rounds, and clinical decision-making procedures. Their ability to contribute to the provision of healthcare may be further limited by a lack of institutional support, professional recognition, and clearly defined clinical pharmacy tasks.

Furthermore, the efficacy of pharmacist-led treatments may be diminished by low patient knowledge of medication adherence, appropriate drug use, and the advantages of pharmaceutical care. The successful integration of clinical pharmacy services into

contemporary healthcare practice depends on addressing these issues thru appropriate training, institutional support, multidisciplinary collaboration, adequate staffing, improved infrastructure, and increased recognition of the role of the clinical pharmacist.

7. Future Perspectives

Clinical pharmacy is anticipated to become much more prevalent in hospitals and other healthcare facilities in the future. Clinical chemists are increasingly contributing to multidisciplinary healthcare teams alongside doctors, nurses, and other medical professionals, and their services are becoming an essential component of patient treatment. It is anticipated that they will become more involved, especially in the management and prevention of chronic conditions like diabetes mellitus, hypertension, cardiovascular disease, and other non-communicable diseases. Medication evaluation, recording, monitoring, and professional communication will all be made easier by the integration of digital healthcare systems and electronic medical records.

Furthermore, telepharmacy and remote patient counselling services are projected to increase access to pharmaceutical care, especially for patients who find it difficult to routinely visit medical facilities.^[41] Clinical chemists may be able to help with customised medication selection and dosing based on patient-specific genetic and clinical factors thanks to developments in pharmacogenomics and personalised medicine. By identifying, preventing, and reporting adverse drug reactions and medication-related issues, clinical chemists are also expected to play an increasingly significant role in pharmacovigilance and medication safety programs. The chemist's role in enhancing medication adherence, treatment results, and quality of life will be further strengthened by the creation of patient-centered pharmaceutical care services.^[42] Better communication between doctors, nurses, and chemists will result in more complete and well-coordinated patient care.

As a result, it is anticipated that clinical chemists will be more widely acknowledged as crucial medical specialists in contemporary healthcare systems due to the mounting evidence of their contribution to medication optimisation, patient safety, and clinical outcomes.

8. CONCLUSION

By assuring the safe and efficient administration of drugs, clinical chemists play a significant role in the management and prevention of non-communicable illnesses. Their participation in

pharmacovigilance, therapeutic drug monitoring, patient counselling, and medication treatment management enhances patient outcomes and quality of life.

Additionally, clinical chemists instruct patients on disease prevention techniques, drug adherence, and lifestyle changes. Their treatments aid in lowering prescription errors, bad drug reactions, and difficulties associated with illness. Thru ongoing monitoring and customised patient care, chemists provide a substantial contribution to chronic diseases like diabetes mellitus, hypertension, asthma, cancer, and chronic kidney disease. They collaborate closely with doctors and other medical specialists to enhance treatment regimens and encourage sensible drug use.

Additionally, clinical chemists take part in screening initiatives, health awareness campaigns, and preventative healthcare services. Despite obstacles such inadequate infrastructure and a lack of knowledge about clinical pharmacy services, their significance in contemporary healthcare systems keeps growing. Enhancing clinical pharmacy practice and incorporating chemists into multidisciplinary healthcare teams can improve public health generally, lower healthcare costs, and improve treatment outcomes. Clinical chemists are therefore crucial medical experts in the successful global prevention and management of non-communicable illnesses.

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