Volume 3, Issue 10, 2025

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

DRUG-RELATED PROBLEMS AND RENAL DOSE ADJUSTMENT IN HOSPITALIZED DIABETIC PATIENTS

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DOI: https://doi.org/10.5281/zenodo.17990157

Keywords
Diabetes mellitus, renal dose adjustment, serum creatinine level, chronic kidney disease, pharmacotherapy, drug-related problems

Article History
Received: 19 October 2025
Accepted: 30 November 2025
Published: 19 December 2025

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Abstract

Diabetes mellitus (DM) has been identified as a major cause of chronic kidney disease (CKD) and the kidney clearance rate changes considerably with the advancement of renal failure in the diabetic patients; thus, raising the probability of adverse effects, drug toxicity and treatment failure. The aim of this observational study involving the use of internship, which was held at the District Headquarter (DHQ) Teaching Hospital, Kohat was to evaluate the necessity of renal dose adjustment in diabetic patients admitted in the hospital. Ward rotations of fifteen patients with diabetes mellitus were studied and the case history filled out using a structured questionnaire that elicited demographic, medical/family history, chief complaints, lab investigations, comorbidity, and medications prescribed including dose, frequency and duration. The results showed that of the fifteen patients (eleven males and four females), three patients (20%) needed renal dose modification owing to high levels of serum creatinine exceeding 1.5mg/dl (indicating high levels of impaired renal functioning). In addition, CKD was identified in 46.6% of study population, hypertension was identified in 40% and gastroenteritis was identified in 13.3% which identifies the abilities of comorbidity in diabetic patients. Also identified were drug-related problems which were mainly adverse drug reactions (headache, vomiting, diarrhea and anorexia). These findings emphasize the value of integrating the use of renal function monitoring into regular diabetes management and changing the number of drugs used to achieve the safe and effective treatment. Conclusions are made by the study that clinical pharmacists should be at the center of treatment, irrational prescribing prevention, and patient safety through rational drug administration, and renal dose on-time adjustment in diabetic patients with impaired renal functioning.

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ISSN: (e) 3007-1607 (p) 3007-1593

INTRODUCTION

Diabetes Mellitus (DM) is a long-term metabolic condition that is typified by unremitting hyperglycemia due to malfunctioning insulin secretion, insulin action, or a combination of the two. The long-term hyperglycemia causes progressive impairment and dysfunction of various bodily systems, especially the ones that are located in the eyes, kidneys, nerves, heart, and blood vessels (American Diabetes Association, 2023). The condition is categorically divided into Type 1 diabetes mellitus (T1DM), which is mainly autoimmune in nature and characterized by the destruction of the pancreatic 8-cells, and Type 2 diabetes mellitus (T2DM), which is more prevalent, and is caused by insulin resistance, obesity, sedentary lifestyle, and genetic susceptibility. There are also the gestational diabetes and other rare types, which also add to the burden of the global disease (World Health Organization, 2021). The signs of hyperglycemia are frequent urination, excessive thirst, fatigue, hunger, weight loss, blurred vision, cramps in the abdomen, constipation, and frequent infections, including candidiasis (Rang et al., 2019). The symptoms are fast and severe in T1DM and silent in T2DM, which is revealed only when complications set in. Diabetes may develop into cardiovascular disease, end-stage renal failure, and premature death unless treated (National Kidney Foundation, 2022).

Pathophysiologic ally, all types of diabetes have insulin deficiency or decreased receptor sensitivity at the heart. Insulin is usually known to aid in the absorption of glucose into the cells, glycogen storage in the liver and muscles as well as the breakdown of fat and protein. In diabetes, such processes are dysregulated and result in a high blood glucose level, disturbed lipid metabolism, and catabolism of proteins. Oxidative stress, the generation of advanced glycation end-products, as well as inflammatory mechanisms enhance vascular and renal injury, are also caused by hyperglycemia (KDIGO, 2022).

Diabetes has a global concern because of its epidemiology. Its global prevalence is estimated to be approximately 285 million individuals, of which 90 percent of them have Type 2 diabetes (World Health Organization, 2021). Urbanization and change in lifestyle are causing the prevalence to grow at an alarming rate in developing countries. International Diabetes Federation (IDF) estimates that in 2007, there were 6.9 million diabetic patients in Pakistan and projections that showed the number of diabetic patients to 11.5 million by 2025 (International Diabetes Federation, 2007). According to regional statistics, the most affected group are adults of ages 41–60 years with prevalence rates of 46 and 40 per cent in the 41-50- and 51-60-years age groups, respectively.

Table 1. Age-wise occurrence of diabetes in South Asian countries

Country	Patients aged 20–90 (millions)	Patients aged 60–79 (millions)
Maldives	0.01	0.002
Afghanistan	0.86	0.20
Nepal	0.51	0.004
Bangladesh	5.86	0.99
Pakistan	7.15	1.65
India	50.7	15.58

There are acute and chronic complications that are linked to diabetes. Acute ones are diabetic ketoacidosis (DKA) and hyperosmolar hyperglycemic syndrome (HHS) which are life threatening when not

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ISSN: (e) 3007-1607 (p) 3007-1593

treated. Chronic complications are separated into microvascular (retinopathy, nephropathy, neuropathy) and macrovascular (ischemic heart disease, stroke, peripheral vascular disease) (Rang et al., 2019). Namely, diabetic nephropathy is one of the most frequent causes of chronic kidney disease (CKD) and end-stage renal disease (ESRD). It is defined by chronic (persistent) albuminuria, decreasing glomerular filtration rate (GFR), and renal failure (National Kidney Foundation, 2022).

Since CKD is very common in people with diabetes, it is a vital factor to renal dose adjustment of pharmacotherapy. Medications that are excreted via the kidneys could also build up in patients with a compromised renal system resulting in toxicity. On the other hand, non-dose adjustment can lead to subtherapeutic effects (KDIGO, 2022). Clinical pharmacists are crucial in terms of renal monitoring, drug regimen changes, and adverse drug reactions (ADRs) prevention.

This research, which was undertaken during an internship period at DHQ Teaching Hospital, Kohat was aimed to identify the prevalence of renal impairment in diabetic patients as well as to determine the necessity of renal dose adjustment. Through reviewing of patient history cases, comorbidities, and drug issue cases, the project demonstrates the relevance of rational prescribing and pharmacist interventions in enhancing patient safety and treatment outcomes.

Morbidity risks related to Diabetes Mellitus

Diabetes mellitus is a significant risk factor of both microvascular and macrovascular complications that lead to morbidity and mortality in the global population. The risks of morbidity are determined by comparing the phenomena of pathological occurrence among diabetic patients to that of non-diabetic patients. These risks are evaluated in terms of morbidity ratios (MBRs), 100 percent of which are normal risk, 200 percent is twice the risk, and so on (American Diabetes Association, 2023).

Macrovascular Complications:

Diabetics are under a high risk of ischemic heart disease (IHD), cerebrovascular accidents (stroke), congestive heart failure (CHF), peripheral vascular disease (PVD), and coronary artery disease (CAD). The latter complications are usually associated with an accelerated atherosclerosis, hypertension, and dyslipidemia that are prevalent comorbidities in diabetics (World Health Organization, 2021).

Microvascular Complications:

Microvascular damage is expressed in diabetic retinopathy, nephropathy and neuropathy. These are directly connected to the chronic hyperglycemia, oxidative stress, and the development of advanced glycation end-products. In many countries, diabetic nephropathy as a subset of end- stage renal disease (ESRD) is the most significant cause of blindness and retinopathy is a significant cause of blindness (National Kidney Foundation, 2022).

Table 3. Morbidity Ratios of Macrovascular Complications by Age Group

Complication	Morbidity Ratio (MBR %)	Age Group (Years)
Ischemic Heart Disease (IHD)	1,350	18–44
	304	45–64
	172	≥65
Stroke	350	40–60
Congestive Heart Failure (CHF)	500	40–60
	247	65–74

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	228	≥75
Peripheral Vascular Disease (PVD)	570	All ages
Lower Limb Amputation	895	All ages
Coronary Artery Disease (CAD)	246	45–64

This table shows that morbidity risks increase significantly with age especially in relation to macrovascular complications of IHD and CHF. The morbidity ratios are high, which underlines the necessity of early diagnosis, stringent glycemic control, and the control of cardiovascular risk factors in diabetic individuals.

Investigation

Diagnostic diagnosis of diabetes mellitus is based on a systemic observation of blood glucose levels and other biochemical indicators. Various standardized tests are regularly used to make a diagnosis of the existence of hyperglycemia as well as keep track of the disease progression. They are fasting blood sugar (FBS), random blood sugar (RBS), glycosylated hemoglobin (HbA1c), and oral glucose tolerance test (OGTT). Both tests offer their own knowledge about the glycemic control of the patient and his or her long-term metabolic state (American Diabetes Association, 2023).

Fasting Blood Sugar (FBS):

The test is taken after 8 hours fast. A value of 126mg/dl and above is a diagnosis of diabetes.

Random Blood Sugar (RBS):

This is tested at any time of the day, where a test of 200 mg/dl and above indicates that one has diabetes particularly with the presence of symptoms.

HbA1c Test:

This indicates the average blood glucose in the last two to three months. Value of above 6.5% is a sure sign of diabetes and 5.7-6.4 is of prediabetes.

Oral Glucose Tolerance Test (OGTT):

Tests that are done after taking of 75 g of glucose. Plasma glucose of 200mg/dl and beyond in 2 hours is a sign of diabetes (World Health Organization, 2021).

These tests are also accompanied by renal functioning tests which are essential in diabetic patients because nephropathy is highly prevalent in diabetic patients. Measurement of serum creatinine, blood urea nitrogen (BUN), and estimated glomerular filtration rate (eGFR) are regularly taken in order to assess kidney performance. An increase in serum creatinine (>1.5 mg/dl) or decrease in eGFR pointing to the poor functioning of the kidneys requires the change of the dose of drugs excreted by the kidneys (National Kidney Foundation, 2022).

Table 4. Diagnostic Criteria for Diabetes Mellitus

Test	Normal Range	Prediabetes Range	Diabetes Range
Fasting Blood Sugar (FBS)		**100–125 mg/dl**	**≥126 mg/dl**
Random Blood Sugar (RBS)		**140–199 mg/dl**	**≥200 mg/dl**
HbA1c		**5.7–6.4%**	**≥6.5%**
OGTT (2-hour plasma glucose)		**140–199 mg/dl**	**≥200 mg/dl**

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Diabetes Mellitus Management and Treatment.

Diabetes mellitus needs a multifaceted management philosophy which integrates lifestyle modification, pharmacological therapy and regular follow up complications monitoring. The ultimate objectives of treatment are to attain the best glycemic control, avoid acute and chronic complications, and enhance the quality of life (American Diabetes Association, 2023).

Lifestyle Modification: Lifestyle interventions are the foundation of the treatment of diabetes. It has been suggested that the patient should take a balanced diet that contains high levels of fibers, whole grains, lean proteins and low levels of saturated fats. A strict calorie intake and a reduction

in weight are especially significant in Type 2 diabetes, in which obesity and a sedentary lifestyle are among the leading causes (World Health Organization, 2021). Regular exercise, including insulin sensitivity and cardiovascular risk minimization (i.e. at least 150 minutes of aerobic exercise or brisk walking at least once per week). Cessation and reduction of alcohol consumption is also highlighted.

Pharmacotherapy: Pharmacological treatment is based on the type and level of diabetes. In Type 1 diabetes, insulin treatment is a requirement with regimens comprising basal-bolus injections or continuous insulin infusion. Metformin, sulfonylureas, DPP-4 inhibitors, and SGLT2 inhibitors are usually used as oral hypoglycemic agents in Type 2 diabetes, with or without insulin in case of poor glycemic control.

Renal Dose Adjustment: Chronic renal kidney disease is very common among diabetic patients and therefore renal dose adjustment is an important aspect of pharmacotherapy. Kidney-excreted drugs, including metformin, sulfonylureas, and some antibiotics, will need a dose adjustment when serum creatinine is above 1.5mg/dl or when the estimated glomerular filtration rate (eGFR) is lower than the recommended limits (National Kidney Foundation, 2022). This might lead to drug accumulation, toxicity and adverse drug reactions due to failure to adjust doses. The clinical pharmacists have a crucial role in the prescription review, inappropriate dosing identification and rational drug use.

Surveillance and Education of Patients: The constant measurement of blood glucose, HbA1c, renal performance, and lipid profile is necessary to inform treatment. Education of the patients is also crucial, because educated patients tend to follow treatment plans more, and to identify an early symptom of complications and seek medical help in time. Dietary, physical activity, medicine and self-blood sugar monitoring counseling sessions may be very helpful (KDIGO, 2022).

Methods

Study Design

The study was performed in the form of an observational internship-based study at the District Headquarter (DHQ) Teaching Hospital, Kohat. This project was conducted in the period of clinical pharmacy internship and intending to test the necessity of renal dose modification of diabetic patients. Its design was a prospective and descriptive study that involved actual patient data of the medical wards A and B to which diabetic patients were admitted with the aim at treating them. Direct recording of the case histories of patients, clinical evidence, and interventions of treatment was also possible through the observational nature of the study and did not modify the usual course of treatment.

Study Population

Fifteen patients with diabetes mellitus were used in the study. The selection of the patients was done according to their availability during the ward rotations and the case history of the patients was recorded in depth using a structured questionnaire. The questionnaire included demographic data, medical history, comorbidity, laboratory inquiries, the prescribed medication, and adverse reactions to medications. The male and female patients were taken into account, which means that they were represented by both genders, and the results depicted the hospital demographic of diabetic patients.

Demographics

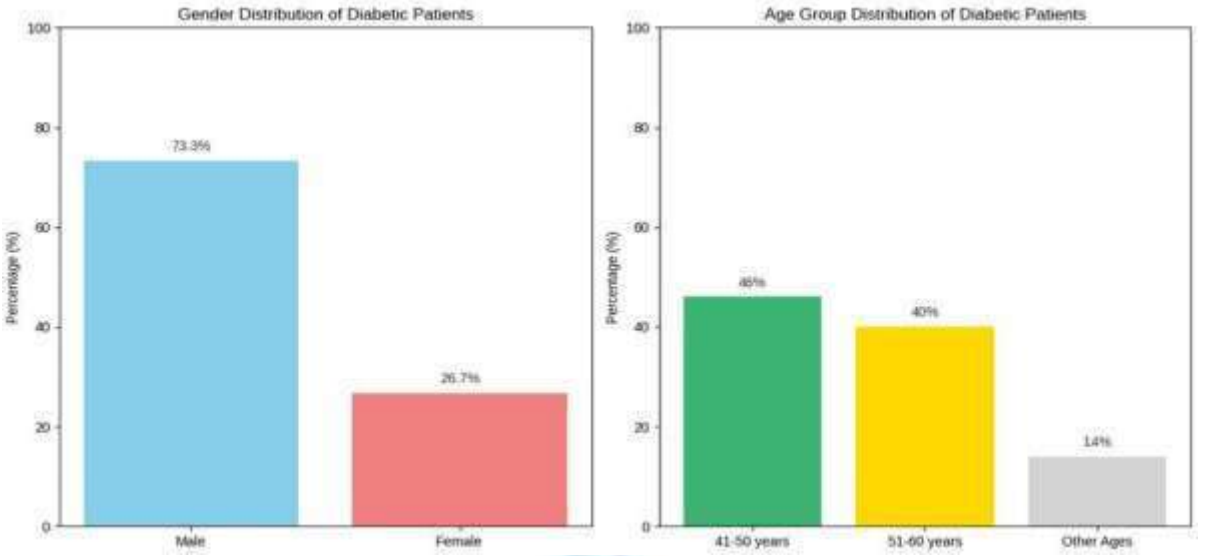
Out of the fifteen patients, eleven of them were males, constituting 73.3% of the study population and four were females, which constituted 26.7%. Most of the patients fell in the middle range of age, that is, forty-one to sixty-years-old. Out of this population, this group was divided into 46 percent that fell between forty-one and fifty years and 40% that fell between

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ISSN: (e) 3007-1607 (p) 3007-1593

fifty-one and sixty years. Such age pattern indicates the prevalence of diabetes mellitus among middle-aged adults, which is in line with national and global epidemiology (International Diabetes Federation, 2007; World Health Organization, 2021).

The age-related outcomes of this research coincide with the data on the demographic factors in the region, according to which the age group of 41–60 years is the most at risk of developing diabetes in Pakistan. The gender bias towards male patients might also be a consequence of the way the hospital admissions are implemented and the nursing routine, instead of the actual prevalence, which underscores the need of gender sensitivity in the treatment of diabetes.



Data Collection

A structured questionnaire that was created specifically in this project was used to collect patient information during the clinical pharmacy internship in the DHQ Teaching Hospital, Kohat. The questionnaire was designed in a way that it would be uniform and complete enough in data collection, including the demographic information, previous medical and family history, chief complaints, clinical tests, and laboratory values including serum creatinine, blood urea nitrogen, and blood glucose levels. It also recorded diagnosis, comorbidities, and prescribed medications details such as the name of the drug, dose, frequency and duration of use. This methodical process made sure that all other issues pertaining to patient care were captured to be analyzed later and the identification of drug related problems could be made in a systematic way.The research was conducted in medical ward A and B where diabetic patients were taken to receive treatment. Case histories were collected by direct access to patient files and daily progress reports with additional sources of information being conversations with the attending physicians and pharmacists. This approach gave practical information on prescribing and patient care in a busy hospital environment.

Parameters Assessed

The research was aimed at the assessment of the renal activity based on the level of serum creatinine, which was the main indicator of kidney activity. Patients with a serum creatinine level above 1.5mg/dl were taken as having an impaired renal function which required dose variation of renally excreted drugs (National Kidney Foundation, 2022).

Hypertension, gastroenteritis, and chronic kidney disease were found and reported because these conditions greatly impact the treatment of diabetes and predispose to polypharmacy (World Health Organization, 2021). There was also the measure of drug related problems (DRPs) which included adverse drug reactions (ADRs) like headaches, vomiting, diarrhea, and loss of appetite; drug interactions and irrational prescribing practices. The necessity of renal

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dose adjustment was identified by the increase of serum creatinine concentration or by the pharmacist examinations that considered the change of the treatment. This multi parameter test was able to give me a holistic perspective of patient care showing the interrelation between renal functioning, comorbidities, and pharmacotherapy.

Ethical Considerations

It took place as a department-supervised project based on the final year Pharm-D internship program at the Department of Pharmacy, Kohat University of Science & Technology. The department gave an ethical approval before the data were collected, and there was adherence to the standards of the institutional research.

Anonymization of the case histories and elimination of any recognizable data in the dataset ensured that patient confidentiality was observed. No interventions were done outside the normal clinical care and the use of data was only used as an academic and research use. The research was compliant with the ethics principles of respect to privacy of patients, integrity in reporting data, and accountability of research.

Results Demographics

The population sample was made up of fifteen patients with diabetes who were admitted to DHQ Teaching Hospital, Kohat. Among them, eleven were men (73.3% and four women (26.7%). This sex difference is indicative of the fact that there were more male patients compared to the observed sample.

The analysis of the age distribution showed the highest occurrence of diabetes in the middle- aged adults. In particular, 46% of the patients were 41 to 50 years, 40% were 51 to 60 years. The percentage of patients who were not within this range is only 14, which proves that the burden of disease in this research was the most within the age group of 41 years to 60 years.

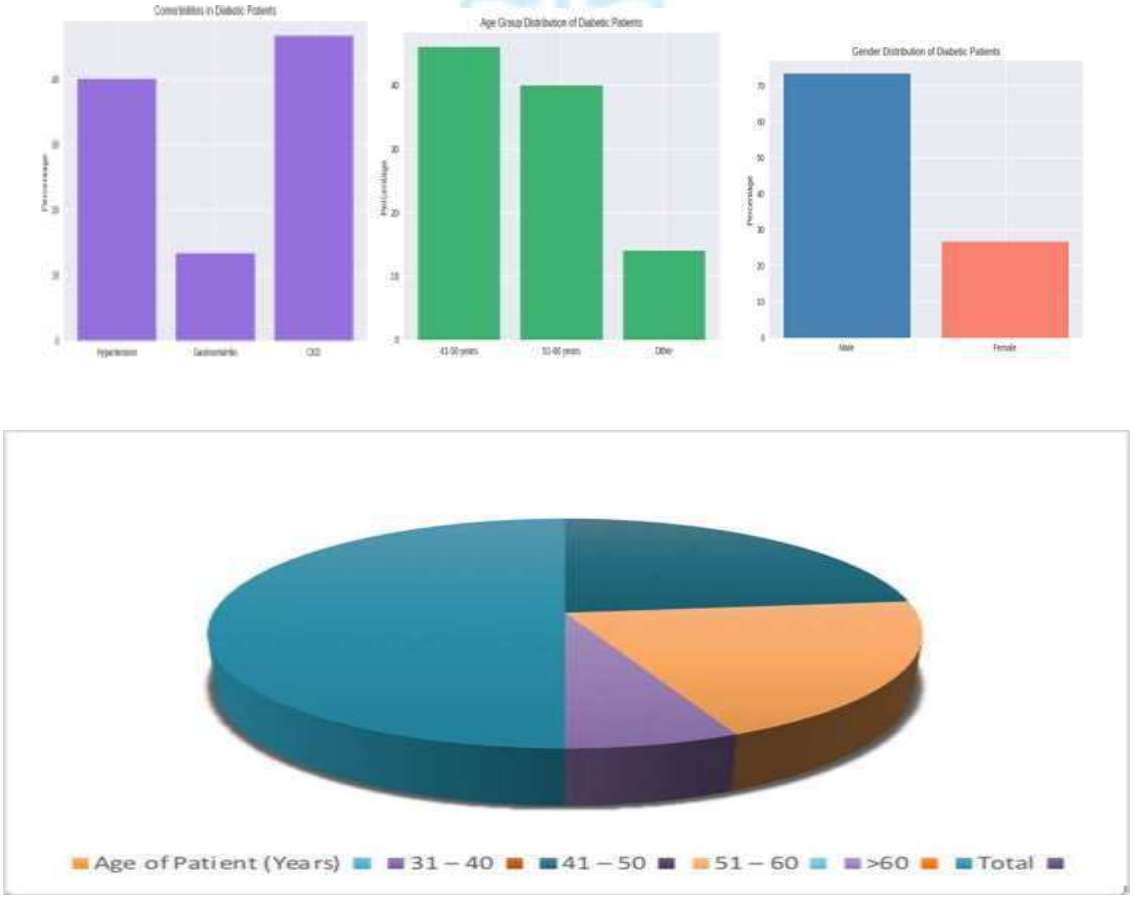


Figure. Age (in years) of patients

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Renal Function

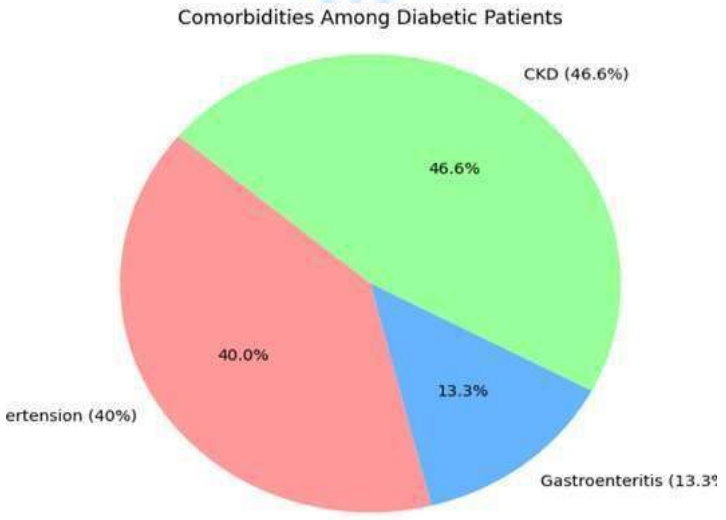
The main indicator of renal functioning was serum creatinine. Three of the fifteen patients (20%) reported a serum creatinine level over 1.5mg/dl, which revealed that their renal function is impaired and requires a change in dosage. The prevalence of chronic kidney disease (CKD) was almost two times higher in patients with diabetes (46.6%), which is an important indicator of the close connection between renal impairment and diabetes.

Table 1. Renal Function Findings

Parameter	Percentage of Patients
Elevated Creatinine (>1.5 mg/dl)	20%
CKD Prevalence	46.6%
Required Dose Adjustment	20%

Comorbidities

The study population had a number of overlapping diseases. The most prevalent comorbidity was hypertension (40% of patients). There was gastroenteritis in 13.3 percent and CKD had been found in 46.6% of patients. These results indicate the multifaceted clinical presentation of diabetic patients, in which other comorbidities frequently coexist and make it challenging to manage patients.



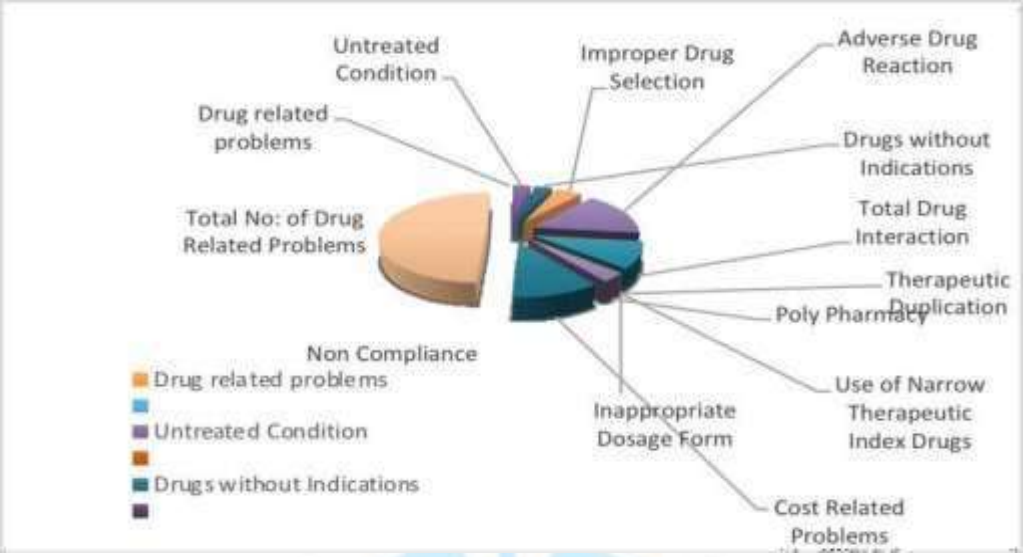
Drug-Related Problems

The study population experienced drug related problems (DRPs) quite often. There were adverse drug reactions (ADRs) in 40% of patients including headache, vomiting, diarrhea and loss of appetite. It was found that drug-drug interactions were present in 2 out of 10 instances and unreasonable prescribing habits that need intervention by pharmacists were detected in 3 out of 10 prescriptions.

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Figure: Frequency and Drug related problems



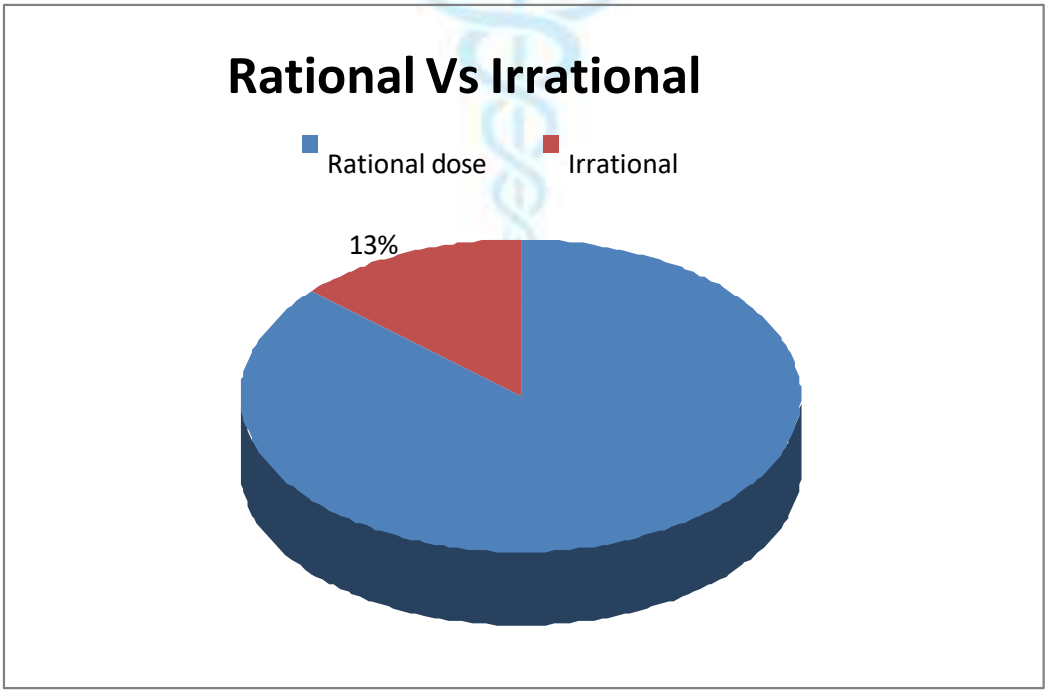


Figure. A Frequency and Percentage wise distribution of Rational and Irrational Drugs dose

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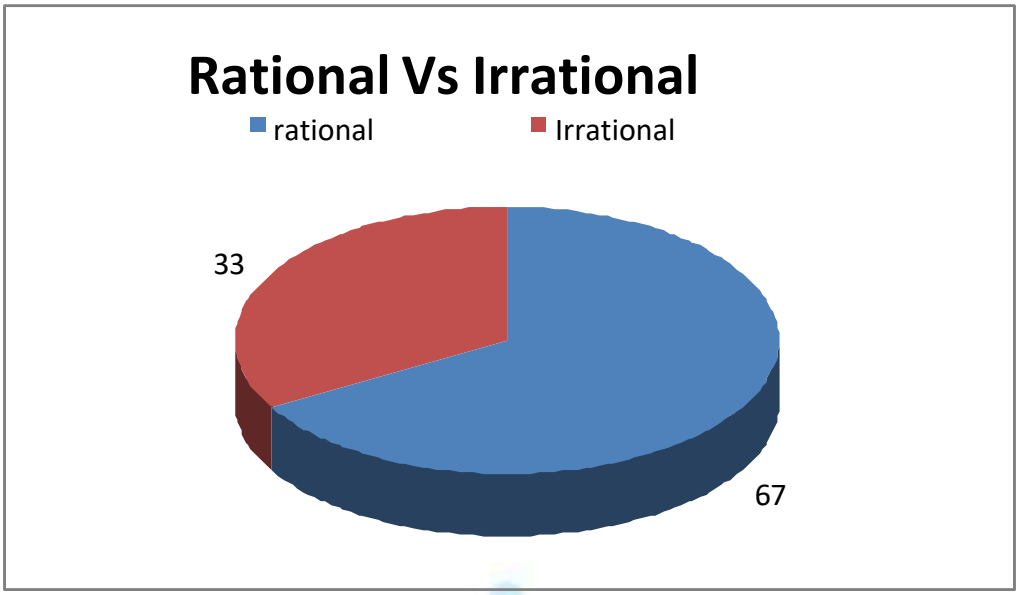


Figure. B Frequency and Percentage wise distribution of Rational and Irrational Drugs strength

Table 2. Frequency of Drug-Related Problems

Type of Problem	Percentage of Patients
Adverse Drug Reactions (ADRs)	40%
Drug-Drug Interactions	20%
Irrational Prescribing	33%

In this chart CKD was the most prevalent comorbidity (46.6%), then Hypertension (40%) and then Gastroenteritis (13.3%). It graphically shows that renal complications prevail in the clinical picture of such patients and the need to change the dose in their treatment.

Discussion

The current research paper emphasizes the need to adjust renal doses among diabetic patients who have been admitted to DHQ Teaching Hospital, Kohat. Among fifteen patients observed, three (20% of the patients) were found to have good serum creatinine level that exceeded 1.5 mg/dl and this implied that their body organs were not functioning properly and there was need to alter their drug therapy. The presence of chronic kidney disease (CKD) was almost at the half of the study population (46.6%), which proved the close association between diabetes and renal impairment. These results highlight the importance of the routine use of renal monitoring as part of diabetes treatment since the lack of any adjustments in doses may result in drug (toxicity) accumulation and the absence of effective therapeutic results.

Demographic profile of the patients revealed that diabetes was highest in middle-aged adults especially

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ISSN: (e) 3007-1607 (p) 3007-1593

between the ages of 41 and 60 years. Eighty six percent of the total study population belonged to this age group indicating the higher susceptibility of middle-aged people to diabetes and its complications. The high proportion of male patients (73.3%) in the study could be an indicator of the trend in hospital admission, or it could be a representation of the risk of developing complications of diabetes that necessitate hospitalization in men in this region.

The study population had high prevalence of comorbidities with 40% having hypertension and 13.3% with gastroenteritis. Polypharmacy through the coexistence of CKD in 46.6% further complicated the treatment since there are many conditions that demand polypharmacy. This enhances the risk of drug-drug interactions and adverse drug reactions (ADRs). ADRs included in this study were headache, vomiting, diarrhea and loss of appetite, and were recorded in 40 percent of the patients, whereas the drug-drug interaction was found in 20 percent of the

patients. There was also irrational prescribing behavior whereby one out of three prescriptions had to be corrected by the pharmacist.

These results highlight the importance of clinical pharmacists in the rational prescribing and safe usage of drugs. Prescription irrationality can be alleviated by pharmacists, in part by discouraging verbal orders, using computerized prescription orders, and performing a periodic review of patient therapy. Education of a patient is also significant because educated patients will adhere more to treatment and be aware of the initial symptoms of an adverse drug reaction.

In general, the article shows that adjustment of renal dose is not only a pharmacological requirement but also a practical intervention that can achieve substantial increase in patient safety and treatment outcomes in diabetic populations.

Conclusion

The current research that was carried out in DHQ Teaching Hospital, Kohat, outlines the essential need to adjust renal doses to diabetic patients. Among the fifteen patients studied, three (20% of all) patients with high levels of serum creatinine of above 1.5 mg/dl were found and their drug therapy had to be altered. The association between diabetes and renal impairment was well confirmed with almost fifty percent of the study population having chronic kidney disease (CKD) (46.6%). The findings highlight that the monitoring of renal status must be part of diabetes care in order to circumvent the build-up of drugs, their toxicity and non-therapeutic effects.

The demographic analysis showed that middle-age adults with ages between 41 and 60 years had the highest prevalence of diabetes with 86 people forming the study population. The high number of male patients (73.3) could also indicate hospital admission trends but it is also possible that men in the region are more susceptible to complications associated with diabetes that necessitate admission to hospital. The proposed demographic profile highlights the necessity to interfere specifically with middle-aged groups, in which the disease burden is the greatest.

The prevalence of comorbid conditions was high among the population of the study; hypertension was present in 40 percent of patients and gastroenteritis was present in 13.3. The presence of CKD in 46.6% of the patients complicated the process of management even more because various conditions frequently demand polypharmacy. This augments the chances of drug-drug interactions and adverse drug reactions (ADRs). In this research, 40% of the patients had ADRs, which included headache, vomiting, diarrhea, and loss of appetite whereas 20% had drug-drug interactions. The rates of irrational prescribing practices that were subject to the action of pharmacists were found to be 33% of the prescriptions.

In general, the research proves that renal dose adjustment is not merely a pharmacological requirement but a feasible intervention that can enhance patient safety and treatment outcomes in diabetic groups to a great extent. The results emphasize the importance of clinical pharmacists

in promoting rational prescription, patient education and drug safety. Hospital can improve the quality of care of diabetic patients with renal impairment and decrease the problem of drug- related issues by making renal monitoring a part of routine diabetes care and increasing the role of the pharmacist.

Recommendations

The results of the given work are highly indicative that regular check-ups of renal performance should be

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ISSN: (e) 3007-1607 (p) 3007-1593

implemented in the treatment of diabetic patients. Serum creatinine and other renal biomarker testing should be done regularly to determine individuals who are prone to drug accumulation and toxicity. Renal monitoring should become a routine procedure in hospital, as it can help guarantee that adjustment of the dose is implemented in a timely manner, which will result in better patient safety and treatment outcomes.

The other important recommendation that can be made through this study is the proactive role of clinical pharmacists in the care of patients. Pharmacists are especially well placed to scan through prescriptions, diagnose drug issues and take action whenever irrational prescription is noted. They can help to minimize the errors and increase the rational use of medicines a lot by their role in discouraging verbal orders, supporting the use of computerized prescription systems, and regular audits of the therapy.

Education of the patients should also be given priority. A lot of the negative drug reactions and compliance complications in this study would have been reduced in case the patients were more educated on their drugs, side effects, and the need to adhere to their medication. An example is when patients are enabled to be educated and as a result, besides improving the compliance, they are able to identify the early signs of complications, thus taking immediate medical action.

Lastly, hospital need to come up with clear policies and guidelines of renal dose adjustment in diabetic patients. These recommendations are to be handed over to prescribers and supported by training programs. There will be a multidisciplinary approach of the physicians, pharmacists, and the nurses involved in making sure that therapy is optimized and complications reduced. Through institutionalization, healthcare systems will be able to offer safer and effective care to diabetic renal impaired patients.

REFERENCES

Ali, M. (2009). *Diabetes Mellitus: Pathophysiology and Clinical Management*. Kohat University of Science & Technology.

American Diabetes Association. (2010). Diagnosis and classification of diabetes mellitus.

Diabetes Care, 33(Suppl. 1), S62–S69.

American Diabetes Association. (2023). *Standards of Medical Care in Diabetes–2023*. *Diabetes Care, 46*(Suppl. 1), S1–S154.

Bodman, M. A., & Varacallo, M. (2020). Peripheral diabetic neuropathy. Kent State University CPM, Department of Orthopedic Surgery, University of Kentucky School of Medicine.

Carolina, R. (2016). Management of diabetes mellitus in individuals with chronic kidney disease. São Paulo, Brazil: NCBI.

Chawla, A. (2016). Microvascular and macrovascular complications of diabetes mellitus. New Delhi, India: NCBI.

Chua, H. R., Schneider, A., & Bellomo, R. (2011). Bicarbonate in diabetic ketoacidosis: A systematic review. *Annals of Intensive Care, 1*(1), 23.

Doogue, M. P. (2011). Drug dosing in renal disease. Bedford Park, Australia: NCBI. Gandi, N. (2014). Epidemiology of diabetes. India: NCBI.

Ghimire, P., & Dhamoon, A. S. (2020). Ketoacidosis. SUNY Upstate Medical University. Goyal, R. (2020). Type 2 diabetes mellitus. New Delhi: NCBI.

Gul, F., & Janzer, S. F. (2020). Peripheral vascular disease. Einstein Medical Center, Philadelphia.

Hegde, S., & Aeddula, N. R. (2020). Hypertension. Georgetown University/MedStar Washington, Deaconess HS, IN University School of Medicine.

Hendrick, A. M., Gibson, M. V., & Kulshreshtha, A. (2015). Diabetic retinopathy. *Primary Care, 42*(3), 451–464.

International Diabetes Federation. (2007). *IDF Diabetes Atlas* (3rd ed.). Brussels: IDF.

KDIGO. (2022). *Clinical Practice Guideline for Diabetes Management in Chronic Kidney Disease*. *Kidney International, 102*(4S), S1–S127.

Li, S. (2019). A population-based study of diabetes mellitus. China: NCBI.

National Kidney Foundation. (2022). *KDOQI Clinical Practice Guidelines for Chronic Kidney Disease Evaluation and Management*. New York: NKF.

Oliver, T. I., & Mutluoglu, M. (2020). Diabetic foot ulcer. University of South Dakota, Saglik Bilimleri Universities.

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

Rafieian-Kopaei, M., Setorki, M., Doudi, M., Baradaran, A., & Nasri, H. (2014). Atherosclerosis: Process, indicators, risk factors and new hopes. *International Journal of Preventive Medicine, 5*(8), 927–946.

Ramachandran, A. (2014). Know the signs and symptoms of diabetes. Chennai, India: NCBI.

Rang, H. P., Dale, M. M., Ritter, J. M., Flower, R. J., & Henderson, G. (2019). *Rang and Dale's Pharmacology* (9th ed.). Elsevier.

Sapra, A. (2020). Diabetes mellitus. NCBI.

Shu, J., & Santulli, G. (2018). Update on peripheral artery disease: Epidemiology and evidence-based facts. *Atherosclerosis, 275*, 379–381.

Stone, W. L., Patel, B. C., & Basit, H. (2020). Retinopathy. East Tennessee State University, University of Utah.

Varghese, R. T., & Jialal, I. (2020). Diabetic nephropathy. White River Medical Center, VA Medical Center, Mather, CA.

Walker, R., & Whittlesea, C. (2012). *Clinical Pharmacy and Therapeutics* (5th ed.). Cardiff: Welsh School of Pharmacy.

Wang, W., & Lo, A. C. Y. (2018). Diabetic retinopathy: Pathophysiology and treatments. *International Journal of Molecular Sciences, 19*(6), 1816.

World Health Organization. (2021). *Global Report on Diabetes*. Geneva: WHO Press.

Zhang, Y., Chen, F., & Wang, L. (2017). Metformin inhibits development of diabetic retinopathy through microRNA-497a-5p. *American Journal of Translational Research, 9*(12), 5558–5566.