Republic of Yemen
The ministry of high education and scientific research
21 Sep. University of medical and applied sciences
Clinical pharmacy faculty

CAUSES OF DRUG RELATED PROBLEMS AMONG CHRONIC KIDNEY DISEASE PATIENTS WITH DIABETIC MELLITUS AND/OR HYPERTENSION IN PRIVATE HOSPITAL, YEMEN

Prepared by

- Odai Al burihi
- Muaath Aledrisy
- Shaker Othman
- Fuad Al khawlani
- Hameed Alqames
- Belal Shams aldin
- Ahmed Alshameri
- Abdulhafed Albosline
- Abudullah Almahbashi
- Abudlmalik Saif
- Anwar Hajar
- Basam Alameri
- Marwan Sadhan
- Omaima Alsubari
- Heba Alaqrabi
- Thuraya Shuhait
- Hakeem AlSaeedi
- Thuraya Albadwi
- Enas Rajeh
- Fatema Abudullteef
- Fatma Algharsi
- Maram Shamsan
- Ibrahim Jawah
- Kamal Massoud
- Momhammed Alsebaei
- Omar Almahbashi

Supervisor:

Dr. Elham Aldolimy

Dr. Eqbal Abdalrhman

Feb - 2022

ACKNOWLEDGMENTS

First, Thank God who enabled us to conclude Degree of B.Sc. the clincical pharmacy , Faculty of clinical pharmacy , 21 September University, 2020-2021.

We acknowledge our supervisor **Dr. Elham AL dolimy** , Department of nephrolgist and en, Faculty of Medicine, 21 September University. For giving strong support and ideal guidance during study period.

As well wish to express our sincere appreciation to **Dr.Eqbal Abdalrhman,** , Department of clinical pharmacy **.**For their kind generous support, expert guidance, encouragement and great advice throughout execution of this study.

As well as to our dear parents who supported us throughout the bachelor's period and . We would like to record our sincere thankfulness to all whom we would always remember, though they are not mentioned in this acknowledgement.

TABLE OF CONTENTS

ACKNOWLEDGMENTS ..... **I**

TABLE OF CONTENTS ..... **II**

LIST OF TABLES ..... **VI**

LIST OF FIGURES ..... **VI**

LIST OF ABBREVIATIONS ..... **VII**

ABSTRACT ..... **IX**

CHAPTER 1 INTRODUCTION **1**

1.1 CHRONIC KIDNEY DISEASES 2

1.1.1 Definition 2

1.1.2 Prevalence 2

1.1.3 Prognosis 2

1.1.4 Classification of CKD 2

1.1.5 Risk Factors for CKD 3

1.1.6 CKD-Related Complications 3

1.2 DIABETIC MELLITUS 3

1.2.1 Definition 3

1.2.2 Prevalence: 3

1.1.3 Classification of D.M according to ADA. [6] 4

1.2.3.1 Type 1 diabetic 4

1.2.3.2 Type 2 diabetic: 5

1.2.3.3 Gestational Diabetes 5

1.2.4 Risk Factors of D.M: [7] 5

1.2.5 Complication of D.M 6

1.3 HYPERTENSION 6

1.3.1 Definition: 6

Table 1 Classification of BP and Hypertension and Lifestyle Modification Recommendations 6

1.3.2 Prevalence 7

1.3.3 Causes 7

1.3.4 Complications 7

1.3.5 Treatment 7

1.4 DRPS: 8

1.4.1 Prevalence: 9
1.4.2 DRP Impact 9
1.5 RESEARCH PROBLEM 10
1.6 JUSTIFICATION 10
CHAPTER 2 LITERATURE REVIEW 11
2.1 CLASSIFICATION OF DRP 12
2.2 DRP TYPES 12
2.2.1 Indication Without Drug (IWD) 13
2.2.2 Drug without Indication (DWI) 13
2.2.3 Improper Drug Selection (IDS) 14
2.2.4 Inappropriate Dosage Adjustments 15
2.2.5 Adverse Drug Reactions (ADRs) 15
2.2.6 Patient Non-adherence: 16
2.3 RISK FACTORS OF DRP: 17
2.3.1 Age 17
2.3.2 Comorbidities 17
2.3.3 Gender 18
2.3.4 Number of drugs used 18
2.4 DRP IN CKD 19
2.5 DRP IN DM 20
2.6 DRP IN HTN 21
2.7 DRP IN DM AND HTN 21
2.8 OBJECTIVES 22
2.8.1 General objectives 22
2.8.2 Specific objectives 22
CHAPTER 3 METHODOLOGY 23
3.1 STUDY DESIGN AND SITE 24
3.1.1 Sample Size 24
3.1.2 Data collection: 24
3.1.3 Criteria 24
3.1.4 Ethical approval 25
3.2 EVALUATION OF DRUG RELATED PROBLEMS AND CLASSIFICATION 25
3.3 STATISTICAL ANALYSIS: 25
3.4 LIMITATION OF RESEARCH 25

CHAPTER 4 RESULTS.....26

Figure 1 Data collection flow 27
4.1 PATIENT CHARACTERISTICS 27
4.1.1 Demographic Characteristics of patients 27
Table 2 Demographic characteristics of patients (N= 106) 28
4.1.2 Social Characteristics of patients 28
Table 3 Social characteristics of patients (N= 106) 28
4.1.3 Clinical Characteristics 28
Figure 2 diagnosis for patients. 29
Table 4 Clinical characteristics of patients (N= 106) 29
4.1.4 Characteristics of HTN Management 29
Table 5 Number of medications 30
4.1.5 Characteristics of DM Management 30
Table 6 frequency of antidiabetic drug use 30
4.1.5.1 Number of medications 31
Table 7 type and frequency of antidiabetic drug use 31
4.1.6 Drug Related Problems (DRPs) Characteristics 31
4.1.6.1 Prevalence of DRPs 31
Figure 3 prevalence of drug related problems among study patients 31
4.1.6.2 Causes of DRPs 32
Figure 4 Types and classifications of drug related problems 32
4.1.6.3 First DRP: Drug Selection 32
Figure 5 classification of drug selection 33
4.1.6.4 Second DRP: Drug Dosing 33
Figure 6 Classification of drug selection. 33
4.1.6.5 Treatment duration 34
Figure 7 Classifications of treatment duration problems 34
4.2 SOCIO- DEMOGRAPHIC FACTORS ASSOCIATED WITH DRPS 34
Table 8 Demographic factors associated with DRPs (N=106) 35
4.3 CLINICAL FACTORS ASSOCIATED WITH DRP 35
Table 9 Clinical Factors associated with DRPs 35
4.4 ASSOCIATION BETWEEN DRPS AND NUMBER OF DRUGS USED 35

Table 10 Association between DRPs and number of drugs used 35
4.5 COMPARISON BETWEEN NUMBER OF DRPS AMONG DIFFERENT CKD STAGES OR WITH DIFFERENT DISEASES 36
Table 11 (N=106) 36
CHAPTER 5 DISCUSSION 37
5.1 SOCIO DEMOGRAPHIC FACTOR 38
5.2 CLINICAL CHARACTERISTIC FACTOR 38
5.3 CAUSES DRPS 39
5.4 FIRST DRUG SELECTION 39
5.5 SECOND DOSE SELECTION 40
5.6 MANAGEMENT OF HTN 41
5.6 MANAGEMENT OF D.M 42
5.7 FACTOR ASSOCIATED WITH DRP 43
CHAPTER 6 CONCLUSIONS AND RECOMMENDATIONS 44
6.1 RECOMMENDATIONS 45
6.2 CONCLUSION 45
REFERENCES 46
APPENDIX(1) DATA COLLECTION FORM 53

LIST OF TABLES

table 1 Classification Of Bp And Hypertension And Lifestyle Modification Recommendations 6
Table 2 Demographic characteristics of patients (N= 106) 28
Table 3 Social characteristics of patients (N= 106) 28
Table 4 Clinical characteristics of patients (N= 106) 29
Table 5 Number of medications 30
Table 6 frequency of antidiabetic drug use 30
Table 7 type and frequency of antidiabetic drug use 31
Table 8 Demographic factors associated with DRPs (N=106) 35
Table 9 Clinical Factors associated with DRPs 35
Table 10 Association between DRPs and number of drugs used 35
Table 11 (N=106) 36

LIST OF FIGURES

Figure 1 Data collection flow 27
Figure 2 diagnosis for patients. 29
Figure 3 prevalence of drug related problems among study patients 31
Figure 4 Types and classifications of drug related problems 32
Figure 5 classification of drug selection 33
Figure 6 Classification of drug selection. 33
Figure 7 Classifications of treatment duration problems 34

LIST OF ABBREVIATIONS

1. CKD	(Chronic kidney disease)
2. GFR	(Glomerular filtration rate)
3. DM	(Diabetic Mellitus)
4. IDF	(International Diabetes Federation)
5. ADA	(American Diabetic association)
6. ICAs	(Islet Cell Antibodies)
7. DKA	(Diabetic Ketoacidosis)
8. LADA	(Latent autoimmune diabetes in adults)
9. HDL	(High Density Lipoprotein)
10.GDM	(Gestational Diabetes mellitus)
11.ASCVD	(Atherosclerotic cardiovascular disease)
12.VD	(Vasodilator)
13.CCB	(Calcium Channel Blocker)
14.ACEi	(Angiotensin Converting Enzyme Inhibitors)
15.ARBs	(Angiotensin Receptor Blockers)
16.DASH	(Dietary Approaches to Stop Hypertension)
17.DRPs	(Drug Related Problems)
18.DTPs	(Drug Therapy Problems)
19.HTN	(Hypertension)
20.PCNE	(Pharmaceutical Care Network Europe)
21.IWD	(Indication Without Drug)
22.DWI	(Drug Without Indication)
23.MRPs	(Medication Related Problems)
24.IDS	(improper Drug Selection)

25.DN	(Diabetic Nephropathy)
26.HRQOL	(Health Related Quality Of life)
27.KRH	(Kibuye Referral Hospital)
28.ADEs	(Adverse Drug Events)

ABSTRACT

Background. There is an alarming rise of chronic kidney disease prevalence globally associated with significant morbidity and mortality necessitating special attention as one of the major growing public health problems. Medication-related problems are common in hospitalized patients including chronic kidney disease and may lead to increase hospital stay and health care cost and augment the risk of morbidity and mortality**.**

Objective: to identify and evaluate drug-related problems (DRPs) and the associated risk factor with patient treated for chronic kidney disease (CKD) with Diabetes Mellitus and/or Hypertension .

Methodology: A retrospective observational study was conducted among the patients diagnosed with CKD and DM and/or HTN. Patient who admitted to one hospital in Sana'a (University Science and Technology Hospital) study was conducted for three months from [1/ Dec /2021 to 10/ Feb/ 2022]. Data regarding patient characteristics, medications, diagnosis, and laboratory results were collected through review of patients' medical charts. Data were analyzed by using Statistical Package for the Social Sciences (SPSS) version 21.0

Results: Out of 106 CKD with D.M and /or HTN, 86 (81.1%) of patients had DRPS, on

average at least two per patient. A total number of 233 drug related problems (DRPs) the causes of each DRP were identified the most common DRPS among patients were drug selection (n=140 (40%)), dose selection (n=80 (34.4%)), and treatment duration (n=13 (5.6%)). most common cause of drug selection is inappropriate drug selection (48.6%) and the most common causes of dose selection is dose too low (52.5%).

Conclusions: identification of the DRPs in and understanding their main risk factors would provide a valuable sight for the healthcare professionals, which as result will lead to decrease the DRPs incidence and prevent their occurrence. Determination the DRPs among patients will not only help at the prevention of DRPs, but also in improving patient's clinical outcomes, and reducing the cost of treatment

Key word: chronic kidney diseases, diabetic type 2, hypertension and drug related problems

CHAPTER 1

INTRODUCTION

1.1 Chronic Kidney Diseases

1.1.1 Definition

Chronic kidney disease (CKD) is a progressive condition characterized by structural and functional changes to of the kidney, which occurs due to a wide variety of etiologies. It is typically defined as a reduction in the kidney function, estimated glomerular filtration rate [eGFR] < 60 ml/min/1.73m^2, or markers of kidney damage, such as albuminuria, hematuria or abnormalities detected on imaging, present for at least 3 months [1].

1.1.2 Prevalence

The global burden of CKD is substantial and growing as the prevalence of CKD was estimated to be 9.1% in 2017, and increased significantly, by 87%, from 1990 to 2016, especially in elderly patients and patients with chronic diseases [2,3]; approximately 10% of the adults worldwide are affected by some form of CKD, resulting in 1.2 million deaths [2,4]. By 2040, it is estimated that CKD will become the fifth leading cause of death globally.

1.1.3 Prognosis

The prognosis of chronic kidney disease (CKD) varies based on cause of kidney disease, Glomerular Filtration Rate (GFR) at the time of diagnosis, Extent of albuminuria and Existence of other co-morbid conditions [5].

1.1.4 Classification of CKD

The NKF-KDOQI has classified CKD into five stages, irrespective of the underlying cause and based on GFR [6].

Stage 1: Kidney damage with normal or increased GFR (GFR ~ 90 ml/minute/1.73m^2)

Stage 2: Kidney damage with a mild decrease in GFR (GFR 60-89 ml/minute/1.73m^2)

Stage 3: Moderate decrease in GFR (GFR 30-59 ml/ minute/1.73m^2)

Stage 4: Severe decrease in GFR (GFR 15-29 ml/minute/1.73m^2)

Stage 5: Kidney failure (GFR < 15ml/minute/1.73m^2) (ESRD)

1.1.5 Risk Factors for CKD

Risk factors for CKD include Diabetic Mellitus, high Blood Pressure, proteinuria, family history of renal disease, increasing age, hyperlipidemia, tobacco usage, obesity, recovery from acute kidney injury. [7]

1.1.6 CKD-Related Complications

Progressive CKD is linked to several complications. The major complications are Hypertension, Cardiovascular complications, Anemia, CKD-related mineral bone disorder, Salt and water retention, Metabolic acidosis and electrolyte disorders and Uremic symptoms.

These complications contribute to high morbidity and mortality and poor quality of life. Often complications of CKD are unrecognized or are inappropriately managed [5].

1.2 Diabetic Mellitus

1.2.1 Definition

Diabetes mellitus is a group of metabolic disorders caused either by the inability to produce insulin or by the body not being able to use insulin effectively or both [8].

1.2.2 Prevalence:

D.M. has been steadily increasing throughout the world. In 2019, the International Diabetes Federation (IDF) estimated 463 million adult

people with diabetes worldwide [9]. The prevalence is expected to rise to 10.2% (578 million) by 2030 and 10.9% (700 million) by 2045, which contributes to 4.6 million deaths globally [10]. This number will ascend at 69% of people with diabetes in developing countries and in developed countries at 20% [11] The IDF also estimated 19.4 million adults living with diabetes in Africa. In Ethiopia, there are large numbers of people living with diabetes with an estimated 2.6 million [9]. Saudi Arabia is ranked second in the Middle East and seventh in the world for the prevalence of diabetes with an estimated 7 million population suffering from diabetes [12] Diabetes is a global health problem and an economic burden worldwide [9]. Diabetes-related global healthcare expenditure was 850 billion USD in 2017. It was estimated 1 death every 6 to 10 seconds caused by its complications around the world [13]. Globally, diabetes contributed about 5 million deaths among the adult population in 2017. Similarly, it resulted 6% of all-cause mortality in the Africa region [9].

1.1.3 Classification of D.M according to ADA. [6]

American diabetic association classification categorizes diabetes into four categories:

1.2.3.1 Type 1 diabetic

Formerly called insulin-dependent diabetes, type 1 DM is the result of autoimmune destruction of the β-cells of the pancreas. Type 1 DM is believed to be initiated by exposure to an environmental trigger in a genetically susceptible individual. There is a link between currently known genetic markers for autoimmunity and the development of type 1 DM. However, β-cell autoimmunity develops in less than 10% of the genetically susceptible individuals and progresses to type 1 DM in less than 1%. On the other hand, β-cell autoimmunity, including ICAs, is present at the time of diagnosis in 90% of individuals.

Type 1 diabetes most commonly develops in childhood or young adulthood; however, it can occur at any age. Children and adolescents typically have a more rapid rate of β-cell destruction and are more likely to present with DKA. Adults may maintain sufficient insulin secretion to prevent ketoacidosis for many months or years; this slowly progressive form of type 1 DM is sometimes referred to as LADA.

1.2.3.2 Type 2 diabetic:

Erroneously called noninsulin-dependent diabetes or adult-onset diabetes, type 2 DM is the result of β-cell dysfunction coupled with some degree of insulin Resistance. Over time, there is a progressive loss of β-cells. Most individuals with type 2 DM are overweight or obese. Abdominal adiposity is a major contributor to insulin resistance.

In patients with type 2 DM, high blood pressure and dyslipidemia, characterized by high-serum triglycerides and low HDL-cholesterol levels, are very frequent comorbid conditions.

1.2.3.3 Gestational Diabetes

GDM develops during pregnancy. Most common in third trimester, if DM is diagnosed prior to pregnancy, this is not GDM, but rather pregnancy with pre-existing DM. Hormone changes during pregnancy result in increased insulin resistance, and GDM may ensue if the mother cannot increase insulin secretion to adequately compensate to maintain normoglycemia. The Prevalence: 1%–14% of pregnancies (complicates about 4% of pregnancies).

1.2.4 Risk Factors of D.M: [7]

The major risk factors are: Age >45 years, overweight or obese (BMI > 20), Sedentary life style, Family history and Hypertension >140/90 mmHg

1.2.5 Complication of D.M

Short term complications include symptoms of excessive urination, fatigue, and weight loss. In patients who are ketosis-prone, sustained elevations of BG above 200 to 300 mg/dL (11.1 to 16.7 mmol/L) can lead to DKA [Diabetic Ketoacidosis]. Long-term complications also include atherosclerotic cardiovascular disease (ASCVD) leading to CV events. Nephropathy often resulting in renal insufficiency and retinopathy that potentially may lead to vision loss. neuropathy also may occur and may cause a wide variety of debilitating symptoms [7].

1.3 Hypertension

1.3.1 Definition:

Hypertension is defined as a condition of arterial blood pressure that exceeds the normal level of persistence [<120/80mmHg]. Hypertension is a direct cause of various cardiovascular diseases, so it can increase mortality and morbidity [14].

Table 1 Classification of BP and Hypertension and Lifestyle Modification Recommendations

BP Classification	SBP (mm Hg)		DBP (mm Hg)
Normal	<120	and	<80
Elevated	120-129	and	<80
Stage1 hypertension	130-139	or	80-89
Stag 2 hypertension	≥140	or	≥90
Hypertensive urgency/Emergency	>180	or	>180

1.3.2 Prevalence

Hypertension occurs in 1.13 billion people worldwide in 2015 and will be projected to increase to 1.56 in the next 10 years [15]. The high prevalence of hypertension in the world is also consistent with what is in Indonesia that in the population> 18 years, this case increased from 25.8% in 2013 to 34.1% in 2018 [16].

1.3.3 Causes

Hypertension results from specific causes such as polycystic kidney disease, renovascular hypertension, hydronephrosis, Cushing's syndrome, aldosteronism, pheochromocytoma, hypothyroidism, hyperthyroidism, sleep apnea and obesity or an underlying pathophysiologic mechanism include atherosclerosis, increased vascular reactivity due to excesses sodium intake and increased intracellular calcium concentration [17].

1.3.4 Complications

Hypertension has a variety of complications such as increased aortic stiffness, kidney disorders, and the case of cardiovascular events [18]. This condition will occur if there is no effort to stabilize blood pressure with a healthy lifestyle and consumption of drugs.

1.3.5 Treatment

Select an appropriate drug therapy regimen. Initiating therapy with a single antihypertensive drug is reasonable in adults with stage 1 HTN and a BP goal of less than 130/80 mm Hg. If adults with stage 2 HTN, initiating antihypertensive drug therapy with two first-line agents of different classes is recommended, and an average BP greater than 20/10 mm Hg above their BP target.

The first-line agents include thiazide diuretics, CCBs, and ACEIs or ARBs.

The second line agent include B blockers, loop diuretics, a1 blockers, and VDs.

The most familiar non-pharmacological therapy is DASH (Dietary Approaches to Stop Hypertension) related to the dose of sodium, the amount of alcohol, and the pattern of physical activity. Pharmacological therapy uses a variety of antihypertensive agents by selecting them according to clinical conditions [14].

1.4 DRPS:

DRPs are implicated with significant morbidity and decreased health related quality of life. A DRP is "an event or circumstance involving drug therapy that actually or potentially interferes with desired health outcomes" [19]. If not used appropriately, a medication intended for diagnosis, prophylaxis or treatment of medical conditions may have negative effects on patients [5]. Drug therapy problems (DTPs) may arise at all stages of the medication process from prescription to follow up of the treatment [20] [21,22]. Drug-related problems include both actual and potential problem. An actual problem: has resulted in clinical manifestations (e.g., a drug-related rash, an adverse drug reaction), or therapy failure due to incorrect dosage. A potential problem: is not manifest, but if left unresolved, it may lead to drug-related harm to the patient [23].

Generally, DRPs include an untreated indication improper drug selection, sub-therapeutic dose, over dosage, adverse drug reactions, failure to receive drugs, drug-drug interactions and drug use without indication. The identification of DRP involves the systematic review of each drug order on the patient's medication chart for its appropriateness [19]. Assessing, identifying preventing and resolving DRP is one of the

cornerstones of pharmaceutical care [24]. The occurrence of DRP could prevent or delay patients from achieving the desired therapeutic goals [5].

1.4.1 Prevalence:

Drug therapy problems are significant public health problems worldwide and have been significantly increased over the past few decades. It was estimated that around 5–10% of hospital admissions were due to drug related problems, in which 50% of them are avoidable. Approximately 25% of patient's drug related hospitalizations in Canadian hospital over 70% of these causes were preventable [21]. Each year in Australia, medication related problems account for an estimated 140,000 admissions to hospital annually and an estimated annual economic burden of $380 million [21]. It is estimated that the annual cost of drug-related morbidity and mortality is nearly 177 billion dollars in the United States [25]. Drug therapy problem is one of the factors which affect the outcome of therapy and safety medical care [21]. It is a clinical problem, unless intervention done on the spot of the problems occurrence, and it must be identified and resolved in a manner similar to other clinical problems [21].

1.4.2 DRP Impact

DRPs are implicated with significant morbidity and decreased health related quality of life. Also, the occurrence of DRP could prevent or delay patients from achieving the desired therapeutic goals. [26], [27], [28].and it has been attributed to unnecessary over prescription of drugs, substantial worsening of diseases, avoidable increases in hospital admission rates, and longer hospital stays leading to a significant medical burden [27].

1.5 Research Problem

Drug related problems are of a major concern in health care because of increased morbidity, mortality and health care cost. It is associated with prolonged length of hospital stay, increased economic burden, and an almost 2-fold increased risk of death [22, 29]. More specifically, hospitalization resulting from DRPs is a major concern to both patients and healthcare provides due to its tremendous health and economic burdens [29]. DRPs could prevent or delay patients from achieving desired therapeutic goals and it has been attributing to unnecessary over prescription of drugs, substantial worsening of diseases, avoidable increases in hospital admission rates, and longer hospital stays leading to a significant medical burden. They also increase the risk of deterioration of the disease state

- What are the risk factors that related to DRPS?
- What happened if occur DRPS?
- How can we prevent or decrease the related risk factors?
- What is the advice and recommendation for the healthcare team to eradicate this problem?
- How can patient related factors and behavior participation in propagation and prevalence in DRPS?

1.6 Justification

The justification of our research to decrease the morbidity, mortality, hospital stay, decrease the cost. Improve awareness of Health care practitioner to DRPs and improve adherence of patient to treatments.

CHAPTER 2
LITERATURE REVIEW

A literature review was performed to identify and evaluate DRP, DRP in (chronic kidney disease (CKD), D.M, HTN).

Although medications play a vital role in the cure, palliation and inhibition of disease, they also expose patients to drug related problems (DRPs). Therefore, addressing DRPs has become a priority, due to the complexity of today's drug therapy, which consequently makes appropriate drug prescribing increasingly challenging [17–3]. A DRP is a clinical problem, and it must be identified, resolved in a method similar to other clinical problems [10]. Drug related problems are among dominant reasons for patient hospitalization [29].

2.1 Classification of DRP

The identified DRPs was classified based on the Pharmaceutical Care Network Europe (PCNE) Classification for Drug related problems V 9.01(page 5). It is an established system that has been revised several times and its validity and reproducibility have been tested [30,31]. It has been used by many recent studies [30,5,32] [28]

2.2 DRP types

All patients' problems involving medications can be grouped into one of the seven types of DRPs include (unnecessary drug therapy; need additional drug therapy, ineffective drug, dosage too low, adverse drug reactions (ADRs), dosage too high, and noncompliance) [25]. Pharmaceutical Care Network Europe (PCNE) further categorizes the DRPs based on the causes of the problem that includes the selection of inappropriate drug therapy, medication errors, overuse or underuse of drugs, adverse drug reactions, drug-drug interactions, and drug-food interactions [12].

2.2.1 Indication Without Drug (IWD)

A DRP that occurs when there is a medical condition that requires the initiation of drug therapy, or preventive drug therapy is required to reduce the risk of developing a new condition, or a medical condition requires additional medication to attain synergistic effects [33–12].

A retrospective cross-sectional study was conducted among type 2 Diabetes Mellitus patents on follow up at public health institutions of Kemisse town, northeast Ethiopia.: study was conducted to determine prevalence of drug related problems and associated factors among patients with type 2 Diabetes Mellitus A total of 149 DRPs were identified in 126 (80.8%) T2DM patients. From the seven drug related problems identified, the most prevalent DRPs were need for additional drug therapy60 (40.3%) [29].

Other prospective cross-sectional study among type 2 diabetes patients with hypertension comorbidity at Jimma University Specialized Hospital (JUSH) from April 4 to May 11, 2016. The aim of this study was to assess drug-related problems and its determinants in type 2 diabetes patients with hypertension co-morbidity. A total of 300 type 2 diabetes patients with hypertension co-morbidity were studied. A total number of 494 drug related problems (DRPs) were identified. The mean number of DRPs was 1.65 ± 1.05. The majority (82%) of the participants had at least one DRP. One hundred twenty-one (40.3%) of the participants had two drug related problems Need for additional drug therapy was the most common drug related problem; 29.35% [20].

2.2.2 Drug without Indication (DWI)

A DRP that occurs when there is no valid medical indication for the drug therapy, or the medical condition is better treated with non-drug therapy, or drug therapy is being taken to treat an avoidable adverse

reaction associated with another medication, or multiple drug products are being used for a condition that requires single drug therapy [33–12]

A retrospective cross-sectional study in Eastern Ethiopia was conducted that aim to assess the drug-related problem among patients with type 2 diabetes in this study from the total 148 PMRs, 95 (64.2%) patients had at least one DRP identified and a total of 127 DRPs were identified, which is 0.9 DRPs per patient. The second most common type is unnecessary drug therapy, 25(19.7%) [34]. Whereas other prospective observational study was conducted among 103 chronic kidney disease patients admitted to Jimma University Medical Center in Ethiopia from April to September 2018. To determine prevalence of medication-related problems and associated factors among chronic kidney disease patients Out of 103 study participants, 81 (78.6%) of patients had MRPs. The most common MRPs among CKD patients were need additional drug therapy (62 (31%) [25].

2.2.3 Improper Drug Selection (IDS)

The choice of drug used for treatment also plays an important role in determining if the patient will experience a DRP. Around 26% of the renal risk drugs are associated with DRPs [31].

Improper drug selection is a major cause of DRPs in patients with renal impairment [22], [30], [31].

Prospective study was conducted from October to December 2015 at a secondary-care hospital in Indonesia; The aim of the study was to identify the DRPs in type 2 diabetic patients who also diagnosed with hypertension. 261 DRPs were identified in 90 inpatient the most common causes are inappropriate drug selection in ratio [25.3%] [35].

2.2.4 Inappropriate Dosage Adjustments

Literature has often pointed out that errors in dosing are one of the leading causes of DRPs in patients with CKD. [17], [2], [13], [30] Impaired renal function has pronounced effects on the pharmacokinetic properties of many drugs. The most common effect is a decrease in drug excretion, resulting in an increase in plasma concentrations and increased risk of drug toxicity. Therefore, there is an increased risk of DRPs such as the use of drugs which are contraindicated and use of inappropriate dosages, with potentially adverse outcomes. Thus, in CKD patients, it is essential to select the appropriate drug and individualize the dosage in order to avoid the occurrence of adverse drug reaction (ADR). [36] Drug dosing errors are common in patients with CKD and can cause numerous adverse effects and result in poor health outcomes. [31]. in a study conducted in Pakistan, a total of 205 medical charts were assessed. Out of the 1534 drugs that were prescribed to CKD patients, nearly 34.0% drugs required dose adjustment. Among these drugs, only 41.8% were properly dose adjusted [31].

2.2.5 Adverse Drug Reactions (ADRs)

A DRP that occurs when the medication causes undesirable reaction which is not dose-related, or a safer drug is needed because of patient risk factors, or a drug interaction causes an undesirable reaction that is not dose-related [33–12] [29]. retrospective study involved hospitalized DN patients at a tertiary hospital in Malaysia from June 2014 to May 2015. The data source was the medical records of the patients. This research was conducted to determine the prevalence of DRPs among 104 hospitalized patients with DN. In this study found the prevalence of DRPs was 77%adverse drug reaction (ADR), in which 45 cases (20.93%) were observed. [30]. Other A six-months prospective observational study was

conducted in a tertiary care teaching hospital in India. This study aimed to identify and characterize drug-related problems among chronic kidney disease patients. During the study, 2239 medication orders were reviewed, and the most common drug-related problem was found in adverse drug event. In this study, a total of 723 DRPs were identified sub-domains, DRPs related to adverse drug event (possibly)occurring 578 (79.94%) was identified as the major DRP [5].

2.2.6 Patient Non-adherence:

that occurs when the patient fails to understand instructions of drug administration, or the patient can't self-administer the drug product appropriately, or the drug product is too expensive for the patient, or the patient prefers not to take the medication, or the drug product is not available for the patient [33,12]. A total of 200 hypertensive patients were recruited in this cross-sectional correlation study that was conducted across the cardiac outpatient clinic at Jordan University Hospital. The purpose of this study was to identify the influence of different types of DRPs on the HRQOL of hypertensive patients. The total number of identified DRPs was 1261 (mean=6.31, SD 2.63, range 0–15). among them 1020 were considered actual DRPs (mean=5.1, SD=2.3, range= 0–14), the ratio of Inappropriate adherence to medications (35%) [33]. Whereas in prospective observational study was conducted among 103 chronic kidney disease patients admitted to Jimma University Medical Center in Ethiopia from April to September 2018. To determine prevalence of medication-related problems and associated factors among chronic kidney disease patients Out of 103 study participants, 81 (78.6%) of patients had MRPs. The second common MRPs among CKD patients were nonadherence (40 (20%) [25].

2.3 Risk Factors of DRP:

- Dependent variable: Drug related problem is the dependent variable.
- Independent variables: Patient related factors: Age, Sex, Educational level, marital status, and social drug use.
- Disease related factors: Presence of co-morbidity, duration of illness, emergency visit in the last one year, hospitalization in the last one year.
- Drug related factors: type of drug utilized, no of medications utilized and duration of treatment.

2.3.1 Age

In Malaysia from January 2009 to December 2011 a retrospective study involved T2DM patients with hypertension and was conducted at a tertiary Hospital that aims to analyze the DRPs and identify factors affecting the DRPs in this patient population from Two hundred patients were included in this study, the main age of patient was 62.3 ± 12.7 years old. [28]. Whereas Other retrospective cross-sectional study in Eastern Ethiopia was conducted that aim to assess the drug-related problem among patients with type 2 diabetes. In this study, a total of 148 T2DM, the mean age of the study participants was 51.26 ± 7.08. [34].

2.3.2 Comorbidities

Diseases or disorders that exist together with an index disease, or co-occurrence of two or more diseases or disorders in an individual [25]. The risk of patients experiencing DRP is 11,491 times greater if they have comorbidities [16]. The most Factors associated with DRPs in these patients are found to be presence of more than 3 comorbid conditions [31]. one of the prospective observational studies included in this review

focused on risk factors associated with DRPs in CKD patients. In the study conducted by [37] in Jimma, Ethiopia, in 2019 it was found that patients who had 5 or more comorbidities were 3.616 times more likely to develop DRPs compared to those who had less than 5 comorbidities [25].

2.3.3 Gender

A prospective cross-sectional study was conducted among ambulatory type 2 diabetes mellitus patients at Madda Walabu University Goba Referral Hospital from April 1, 2017, to June 30, 2017 in South-East Ethiopia, that aim to assess the prevalence of drug therapy problems, pharmacists' intervention and determinants of drug therapy problems in the management of type 2 diabetes mellitus patients. In this study there were 216 type 2 diabetes mellitus participants were included in the study, of these more than half of them (52.8%) were males. [21]. also, in other retrospective cross-sectional study in Eastern Ethiopia was conducted that aim to assess the drug-related problem among patients with type 2 diabetes In this study, a total of 148 T2DM PMR were included. More than half, 83 (57.4%) were males and the rest 65(42.6%) were females. [34]

2.3.4 Number of drugs used

A retrospective cross-sectional study involved patients' files with T2DM and HTN, who were admitted at KRH from January 2013 to December 2017 in Rwand. this study aims to assess the DRPs among T2DM patients with HTN admitted at Kibuye Referral Hospital (KRH). Findings revealed that the prevalence of DRPs was 81.29% (313/385) and most of them each patient had at least two DRPs (69.05%). The most occurrence of DRP in patient who consumed more than or equal to 5 drugs were 2.4 times more likely to develop DRPs than those who took

the number of medicines less than 5 (AOR = 15.4; P < 0.001; 95% CI: 8.8–26.8) [11].

2.4 DRP in CKD

The progression of CKD leads to the use of an increased number of medications and consequently increases the occurrence of drug related problems (DRPs). [5] Almost all CKD patients are at risk for DRPs owing to the presence of multiple risk factors. Furthermore, these patients are usually found to be non-adherent to their medications. It has been demonstrated that the incidence of DRPs and adverse drug events (ADEs) is higher in patients with CKD than in those without any sort of renal insufficiency [31]. Therefore, drug related problems (DRPs) are very common in patients with chronic kidney disease (CKD). More than 80% of patients with CKD experience one or more drug related problem [17], [2], [21], [13].

In a study conducted in Kenya, an average of 4.5 DRPs was identified among 60 participants and each of these 60 participants had at least one DRP thus resulting in a prevalence rate of 100%. [29] [31]. A prospective observational three-month study was conducted in adult patients with CKD hospitalized in five general medical wards and one intensive cardiac care unit in a major teaching hospital in Indonesia. that aim to identify and evaluate drug-related problems (DRPs) in patients with chronic kidney disease (CKD), in this study found During this three-month study, the pharmacist reviewed 2404 medication orders prescribed for 105 patients and identified 1026 DRPs. The rate of DRPs in the present study was 42.7 DRPs per 100 medication orders and approximately ten DRPs for each patient [32]. Other prospective observational study was conducted among 103 chronic kidney disease patients admitted to Jimma University Medical Center in Ethiopia from

April to September 2018. To determine precross-sectional cation-related problems and associated factors among chronic kidney disease patients out of 103 study participants, 81 (78.6%) of patients had MRPs, on average 1.94 ± 0.873 MRPs per patient. The rate of overall MRPs was 30.95 per 100 medication orders [25].

2.5 DRP in DM

Diabetes, its complications, and comorbid conditions cause patients to require multiple drug therapy. This results in diabetic patients more vulnerable to drug-related problems [9]. A retrospective cross-sectional study was conducted among type 2 Diabetes Mellitus Patients on follow up at public health institutions of Kemisse town, northeast Ethiopia. study was conducted to determine prevalence of drug related problems and associated factors among patients with type 2 Diabetes Mellitus From the total of 156 patients included in the study, 126 (80.8%) patients have at least one drug related problem with a total of 149 drug related problems [29].

Other prospective cross-sectional study was conducted among ambulatory type 2 diabetes mellitus patients at Madda Walabu University Goba Referral Hospital from April 1, 2017 to June 30, 2017 in South-East Ethiopia, that aim to assess the prevalence of drug therapy problems, pharmacists' intervention and determinants of drug therapy problems in the management of type 2 diabetes mellitus patients. In this study there were 216 type 2 diabetes mellitus participants, 88% have at least one drug therapy problems. [21]. Other cross-sectional study in Southwest Ethiopia was conducted from September 1, 2019 to November 30, 2019, that aim to assess drug-related problems and their predictors among patients with diabetes attending the ambulatory clinic of Gebre Tsadik Shawo General Hospital From a total of 141 patients with diabetes included in the study,

58.2% of them had at least one drug-related problem during the 3-month study period. A total of 156 drug-related problems were identified in 141 patients. were encountered with a mean ±SD of 1.10 ±0.44 DRPs per patient [22].

2.6 DRP in HTN

A cross sectional study was conducted using medical records' data, prescriptions, and nursing records to observe DRPs that occurred in outpatients with hypertension from February to April 2019. This study aimed to analyze DRPs in Indonesian hypertensive patients focusing on drug therapy effectiveness and adverse drug reactions. A total of 114 outpatients of all participants, 65 (57%) outpatients were found to have DRPs related to treatment effectiveness (54 cases) and adverse drug reactions (36 cases). The primary cause of the problems was an inappropriate drug (94.14%) and dose selection (2.86%). Potential drug interactions were found high (62.14%) in the combination of an antihypertensive agent with other drugs among patients [38]. Other study that conducted out of 200 hypertensive patients were recruited in this cross-sectional correlation study that was conducted across the cardiac outpatient clinic at Jordan University Hospital. The purpose of this study was to identify the influence of different types of DRPs on the HRQOL of hypertensive patients. The total number of identified DRPs was 1261 (mean=6.31, SD 2.63, range 0–15). Among them, 1020 were considered actual DRPs (mean=5.1, SD=2.3, range= 0–14) The average number of actual DRPs was 5.1 per patient [33].

2.7 DRP in DM and HTN

Type 2 diabetic patients who also diagnosed with hypertension often received a complex medication regimen. The situation may lead to the increased risk of drug-related problems (DRPs). In Malaysia from

January 2009 to December 2011 a retrospective study involved T2DM patients with hypertension and was conducted at a tertiary hospital that aims to analyze the DRPs and identify factors affecting the DRPs in this patient population from Two hundred patients with a total of 387 DRPs were identified. Among these patients, 90.5% had at least one DRP, averaging 1.9 ± 1.2 problems per patient [28]. Also, in a retrospective cross-sectional study involved patients' files with T2DM and HTN, who were admitted at KRH from January 2013 to December 2017. this study aims to assess the DRPs among T2DM patients with HTN admitted at Kibuye Referral Hospital (KRH). Findings revealed that the prevalence of DRPs was 81.29% (313/385) and most of them each patient had at least two DRPs (69.05%). [11] Also in a prospective study was conducted from October to December 2015 at a secondary-care hospital in Indonesia; The aim of the study was to identify the DRPs in type 2 diabetic patients who also diagnosed with hypertension. 261 DRPs were identified in 90 inpatients averaging 2.88(SD=0.23) problems per patient [35].

2.8 Objectives

2.8.1 General objectives

To identify and evaluate drug-related problems (DRPs) Associated with the treatment for chronic kidney disease (CKD) with Hypertension and/or Diabetes Mellitus

2.8.2 Specific objectives

- To determine the incidence of DRPs in CKD who have DM or HTN.
- To investigate the types of DRPs in CKD who have DM or HTN.
- To identify the risk factors that associated with the incidence of DRPs.

CHAPTER 3

METHODOLOGY

3.1 Study Design and Site

A retrospective observational study was conducted among the patients diagnosed with CKD and DM and/or HTN. Patient who admitted to one hospital in Sana'a (University of Science and Technology Hospital) study was done for three months from [1/ Dec /2021 to 10/ Feb/ 2022].

3.1.1 Sample Size

The sample size was calculated based on the availability of patients during the period of the study.

3.1.2 Data collection:

A suitable patient data collection form (appendix 1) was designed to obtain information including patient laboratory investigations and treatment details. The data of the patients who met the inclusion criteria were collected from their clinical record. Details including the medications administered to the patients along with its dose, frequency and route of administration during the course of study were noted. The patient treatment was thoroughly reviewed from the day of the commencement of therapy with the intention of identifying the aforementioned DRPs. The study pharmacist on identifying the DRPs reported it to the concerned clinicians and also classified them based on the PCNE classification version 9.02.(appendix 2)

3.1.3 Criteria

Patients of either gender above 18 years of age diagnosed with CKD .and D.M type 2 and /or HTN were included in the study. Patients who were not willing to give consent were exclusion.

3.1.4 Ethical approval

The study was approved by the institutional ethics committee of NGSM Institute of Pharmaceutical Sciences. Ref No: NGSMIPS/IEC/07/2018/19.

3.2 Evaluation of drug related problems and classification

There have been different approaches to classify and summarize DRPs. However, few of these systems are validated and reliable [39]. We used the Pharmaceutical Care Network Europe Classification scheme for drug related problems V9.01 [25]. Identification of DRPs was assessed by nephrologist and clinical pharmacists who were trained on study protocol developed based on the Drug Information Handbook [40], standards of medical care in diabetes 2020 [11][8].

3.3 Statistical Analysis:

Qualitative variables were presented using frequency and percentage. Quantitative variables were summarized using mean and standard deviation. Analysis of the data was performed using SPSS (version 21.0)

3.4 Limitation of research

- The study did not classify DRPs by their severity level, mild, moderate and sever
- Our study period was short which resulted in small sample size.
- The type of study is retrospective so there is no obtain for all information required.

CHAPTER 4

RESULTS

Data was collected from patients' medical records at university science and technology hospital. A total of 106 patients data were collected and analyzed. Results of those data will be presented in this chapter.

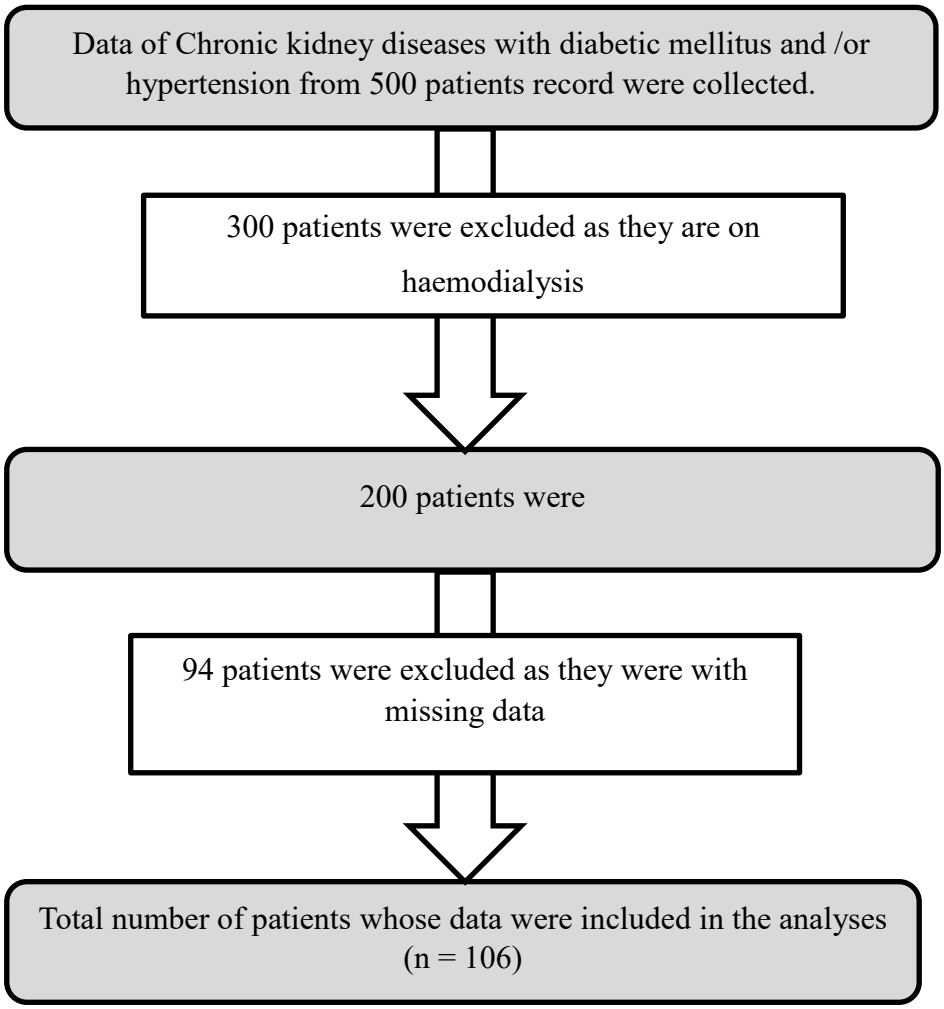

Figure 1 Data collection flow

4.1 Patient Characteristics

4.1.1 Demographic Characteristics of patients

As many as 106 patients meet inclusion of criteria of study. Most of the patients were male (n79; 74.5%) and the rest were female. The majority of the patients were under 60 years of age (n58; 54.7%). The

mean of patients' age was 46(SD =9). Among this patient (n90; 89.9%) were married.

Table 2 Demographic characteristics of patients (N= 106)

	Characters	Frequency, n (%)	Mean ± SD	Median
Age	Non-elderly (<60)	58 (54.7%)	46±9	47
	Elderly (≥60)	48(45.3%)	68± 6.7	66
Note: SD= standard deviation				

4.1.2 Social Characteristics of patients

Table 3 Social characteristics of patients (N= 106)

	Characters	Frequency, n (%)
Marital status	Unmarried	16(15.1%)
	Married	90(84.9%)
Gender	Male	79(74.5%)
	Female	27(25.5%)

4.1.3 Clinical Characteristics

Among the 106 patients include in study, 59 (55.7%) the most common condition among patient were diagnosed (chronic kidney disease with hypertension). 44(41.4%) the most frequent condition among patient were diagnosed (chronic kidney disease with hypertension and diabetic mellitus) (Figure 2). About 34(32.1%) of them had co-morbid conditions. The most common comorbid condition diagnosed among this patient. Cardiovascular disease was the most common comorbidities found in this patient (20; 58.8%) followed by cerebrovascular accident (9, 26.5%) and chronic liver diseases (5; 14.7%). About 82(77.4%) of them used number of chronic medication equal or less than three drug and 24(22.6%) of patient used number of chronic medications above three drugs (Table 4).

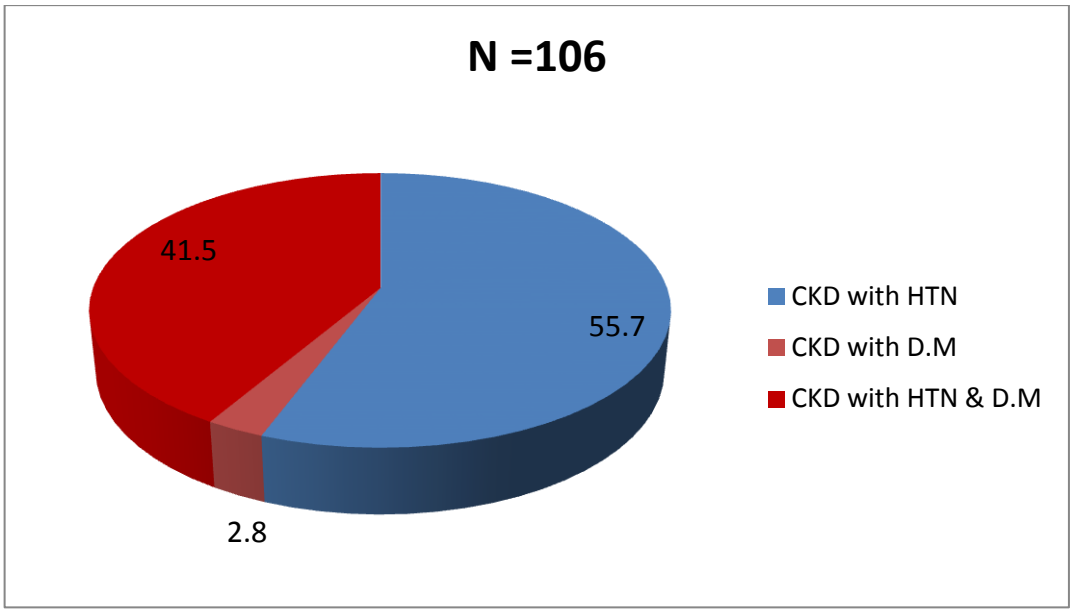

Figure 2 diagnosis for patients.

Table 4 Clinical characteristics of patients (N= 106)

	Characters	Frequency, n (%)
Co-morbidities	Yes	34(32.1%)
	No	72(67.9%)
Type of co-morbidities	CVS	20(58.8%)
	CLD	5(14.7%)
	CVA	9(26.5%)
Number of chronic medications	<Three	82(77.4%)
	>Three	24(22.6%)
Note: One patient can have more than one co-morbidity		

4.1.4 Characteristics of HTN Management

Among 106 patients included in the study. from the total 233 anti-hypertension agent. The most common anti hypertension drug was prescribed calcium channel blockers (37.3%), followed by beta blockers (30.7%) and diuretic (27.4%). Amlodipine was the most frequently used antihypertensive medication was prescribed in study area (37.3%).

Carvedilol the most common beta blockers was prescribed (24,9%). Torsemide the most common diuretic medication was prescribed (17.6%).

Table 5 Number of medications

Categories	Frequency	percent
Anti-hypertensive drugs		
Amlodipine	87	37.30%
Carvedilol	58	24.90%
Torsemide	41	17.60%
Furosemide	11	4.70%
Bisoprolol	10	4.30%
Losartan/Hydrochlorothiazide	5	2.10%
Indapamide	5	2.10%
Spironolactone	5	2.10%
Labetalol	3	1.30%
Metolazone	2	0.90%
Losartan	2	0.90%
Methyldopa	2	0.90%
Lisinopril	2	0.90%

4.1.5 Characteristics of DM Management

Among 106 patients included in the study. The most common anti diabetic medication oral anti diabetic was prescribed for 22 (46.8%) patients, followed by insulin alone were prescribed for 21(44.7%) patients and the dual anti diabetic agent oral anti diabetic were prescribed for 4(8.5%) patients (Table 6).

Table 6 frequency of antidiabetic drug use

Categories	Frequency n (%)
Anti-diabetic drugs	
Insulin alone	21(44.7)
Oral anti-diabetic	22(46.8)
Oral anti-diabetic & Insulin	4(8.5)

4.1.5.1 Number of medications

From the total 57 anti-diabetic medication the most common prescribed anti diabetic medication was prescribed mixtard 20(35.1%), followed by oral anti diabetic gliclazide 13(22.7%) and combination oral anti diabetic drug glibenclamid + metformin7(12.3%)

Table 7 type and frequency of antidiabetic drug use

Categories	Frequency	Percent
Anti-diabetic drugs		
Mixtard	20	35.10%
Gliclazid	13	22.70%
Glibenclamid +metformin	7	12.30%
Insulin Human	6	10.50%
Vildagliptin	3	5.30%
Metformin	2	3.50%
Vildagliptin + Metformin	2	3.50%
Dapagliflozin	2	3.50%
Sitagliptin + Metformin	1	1.80%
Pioglitazone	1	1.80%

4.1.6 Drug Related Problems (DRPs) Characteristics

4.1.6.1 Prevalence of DRPs

From the total of 106 patients included in the study, 86 (81.1%) had drug related problem in average at least two DRPs per patient (Figure 3).

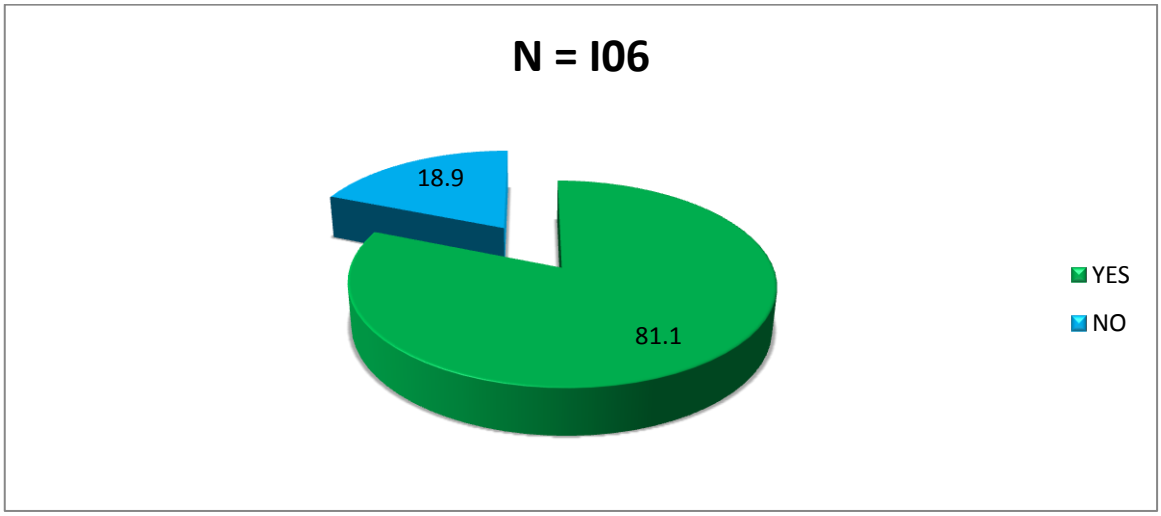

Figure 3 prevalence of drug related problems among study patients

4.1.6.2 Causes of DRPs

A total number of 233 drug related problems (DRPs) the causes of each DRP were identified (Fig 3.6). The major frequent three causes of the drug related problems the most common drug selection, 140 (60%); follow by dose selection, 80 (34.4 %) and treatment duration, 13 (5.6%).

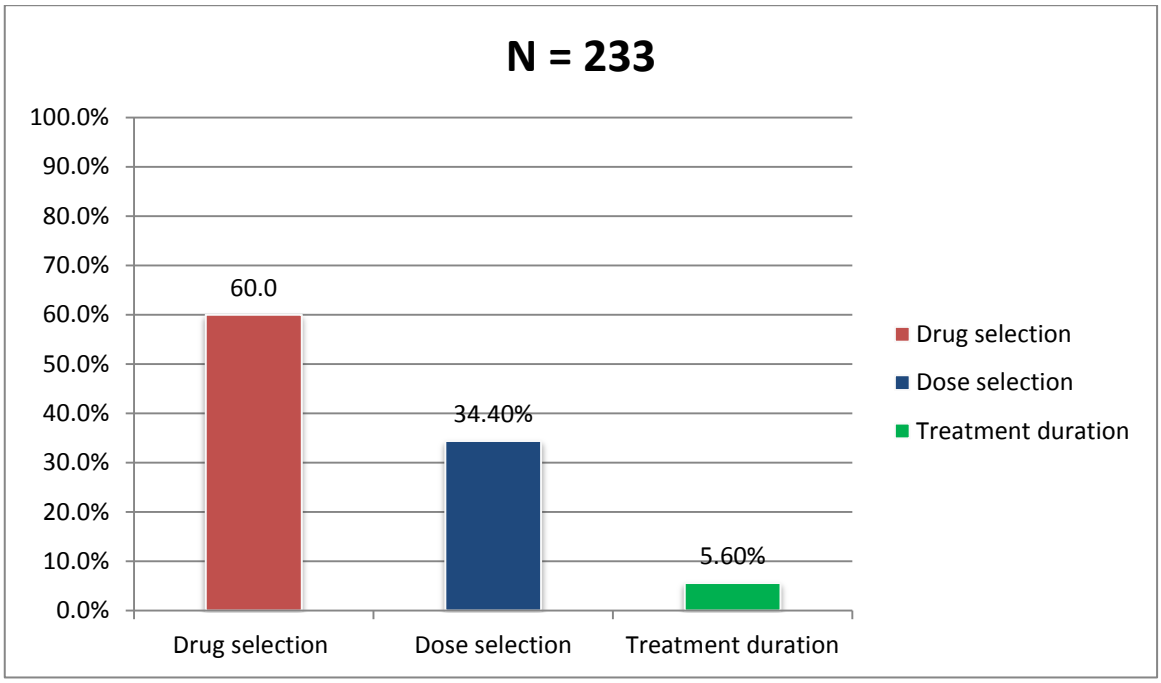

Figure 4 Types and classifications of drug related problems

4.1.6.3 First DRP: Drug Selection

There found six of DRPS caused by drug selection. Most of the DRPs were caused by drug selection with “inappropriate drug selection” being the most common cause (48.6%) followed by “no indication for drug” (27.1%) and too many different drugs prescribed for indication (20.7%).

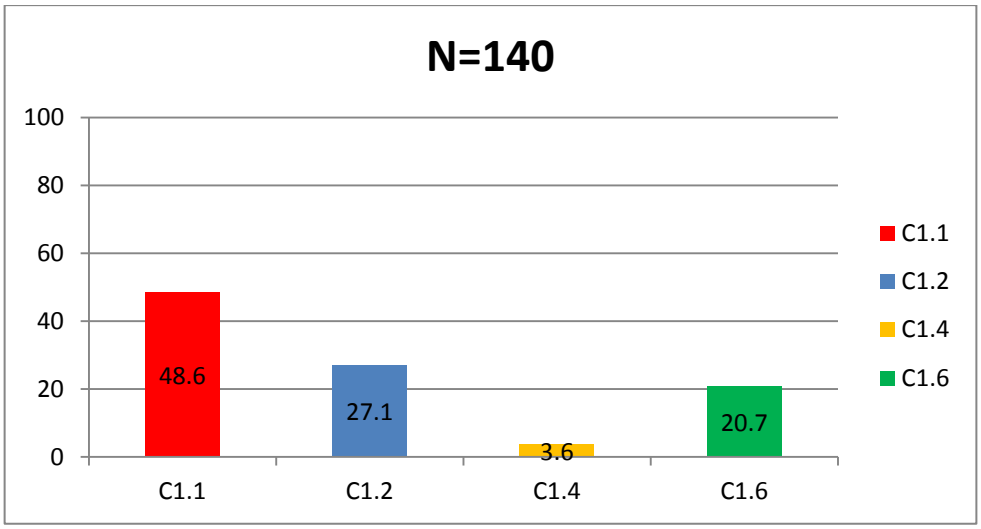

Figure 5 classification of drug selection

C.1.1 inappropriate drug selection .C1.2 no indication for drug

C1.4inappropriate duplication of therapeutic group.C1.6 too many different drugs prescribed for indication.

4.1.6.4 Second DRP: Drug Dosing

There found five of DRPS caused by dose selection. Most of the DRPs were caused by dose selection with "drug dose too low" being the most common cause (52.5%). The second majority caused by dose timing unclear or missing" (30%), followed by drug dose to high (11.2%) (Figure 6)

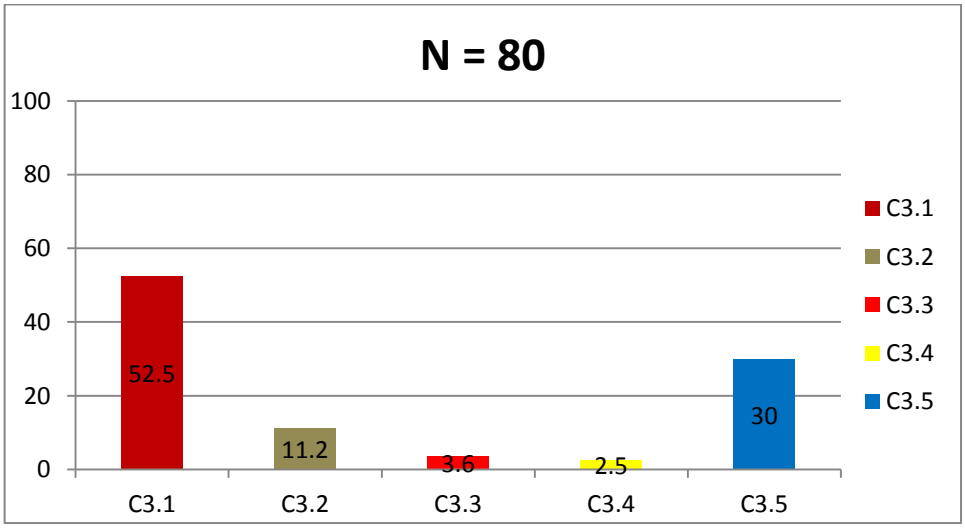

Figure 6 Classification of drug selection.

C3.1 Drug dose too low C3.2 Drug dose of a single active ingredient too high

C3.3 Dosage regimen not frequent enough .C3.4 Dosage regimen too frequent

C3.5 Dose timing instructions wrong, unclear or missing

4.1.6.5 Treatment duration

There found two of DRPS caused by treatment duration. (69.2%) duration of treatment to short being the most common cause of the DRPs were caused by treatment duration. (30.8%) duration of treatment too high the second majority caused o DRPs by treatment duration (Figure 7)

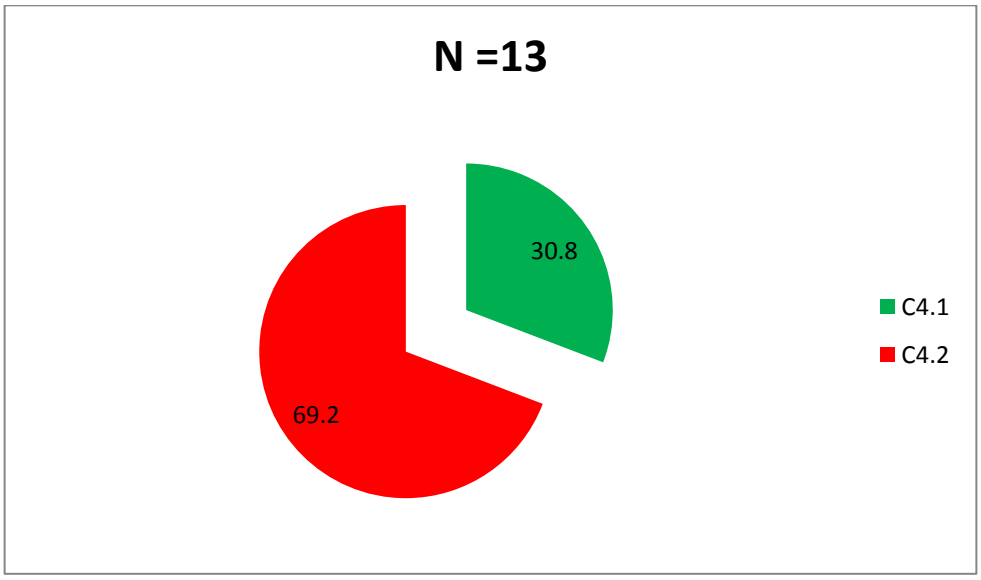

Figure 7 Classifications of treatment duration problems

C4.1 = treatment duration to short. C4.2= treatment duration to high.

4.2 Socio- Demographic Factors associated with DRPs

For those aged equal or under than 60 years old were more likely to DRPs than those aged above 60 years old. Nevertheless, there was no significant association between DRPs and age (Table 8).

Table 8 Demographic factors associated with DRPs (N=106)

Variable	DRP		
	Yes	No	*p* value [a]
	`	Frequency, n (%)	
Age			
Non-elderly	48(82.8%)	10 (17.2%)	0.638
Elderly	38(79.2%)	10(20.8)	
Note: [a] Pearson chi-square Test			

4.3 Clinical Factors associated with DRP

Table 9 Clinical Factors associated with DRPs

Variable	DRP		
	YES	NO	*P* value
	Frequency, n (%)	Frequency, n (%)	
Comorbidities			
YES	29(85.3%)	5(14.7%)	0.542
NO	57(79.2%)	15(20.3%)	

4.4 Association between DRPs and number of drugs used

The patient who consumed less than or equal to 3 drugs were more likely to develop DRPs than those who took types of drugs more than 3

Table 10 Association between DRPs and number of drugs used

Variable	DRP		
	Yes	No	*p* value [a]
	Frequency, n (%)	Frequency, n (%)	
Number of medications			
Equal or less than three	65(80.2%)	16(19.8%)	0.675
More than three	42(84.0%)	4(16.0%)	

4.5 Comparison between number of DRPs among different CKD stages or with different diseases

48(55.8%) it the most DRPs were occurred in patients with chronic kidney disease and hypertension. The majority of drug related problem 36(41.9%) were occurred in patients with chronic kidney disease, diabetic mellitus and hypertension. (Table 11).

Table 11 (N=106)

DRPs	Frequency, n (%)
CKD	
Alone	
HTN	48(55.8%)
HTN+DM	36(41.9%)
D.M	2(2.3%)

CHAPTER 5
DISCUSSION

5.1 Socio demographic Factor

The present study was conducted to identify and evaluate the drug related problems (DRPs) among chronic kidney disease with D.M and/or HTN patients. In this study, the male population outweighed the female population This is similar to the study conducted by [Bharath Raj KC et al] (4). Majority of the patients in our study belonged to the age group of equal and less than 60 years which agrees with the study conducted by (Stevens LA et al., 2010) (42). This is because the prevalence of CKD is expected to increase with age. This can also be explained by the reduced life expectancy in the CKD population resulting in a lower number of patients aged 80 years and above] [27].

5.2 Clinical characteristic Factor

59 (55.7%) Chronic kidney disease with hypertension were the most present among our study it less than the other study that finding all the patients with CKD had hypertension 160 (100) the study conducted by (Subeesh, et al.:) (27). The major comorbidities observed in our study was cardiovascular diseases, which was concordant to the findings of the study done by (Ramadaniati et al.2016) (25), which reported that most common co-morbid conditions including ischemic heart diseases, heart failure and cerebrovascular diseases. This similarity may be due to Hypertension and diabetes are considered as diseases that led to the initiation and progression of CKD which support the prevalence of these conditions in the study population. [27] The multiple comorbidities and complications in CKD increase the risk of polypharmacy. Almost all the CKD patients have hypertension as the most common comorbidity. The relationship between hypertension and CKD is cyclic. Uncontrolled hypertension,

A risk factor for developing CKD, is associated with a more rapid progression of CKD. Meanwhile, progressive renal disease can exacerbate uncontrolled hypertension due to volume expansion and increased systemic vascular resistance.

5.3 Causes DRPS

Among the study participants, 81.1% encountered at least two or more drug related problems. From the three causes of DRP categories, a total of 233 DTPs was identified. The result of our study is relatively similar with the [Aster Wakjira Garedow et al 2019], studies ((78.6%) which had at least 1.94 ± 0.873 DRPs [42]. The result of this study is lower number of DTPs than [Bharath Raj KC et al .2020] had average number of DRP per patient was found to be 3.61, DTPs. The difference might be due to these studies were done in multicentre setting, large sample population were used and Participants who received at least two drugs to management of hypertension or glycemic control drugs included. Participants included in this study were those who had at least one antidiabetic drugs. Hypertension control, Good glycemic control and for further prevention of diabetic related risks more than one drug might be required, for example participants on insulin only needs oral anti diabetic drug that used in CKD additionally for synergetic and extra benefit. Likewise, in the study unit the comprehensive pharmaceutical care was not implemented previously to minimise the existence of drug related problems. This contributes for higher DTPs in our setting.

5.4 First drug selection

From the three classes of causes DTPs, (60%); were under Drug selection. This was under than the study by [Ramadaniati et al. 2016] (21). which reported drug selection as the most frequent problem (66.5%). This different in studies the study also demonstrated that

occurrence of DRPs have a HTN and or hypertension consequence on CKD patients who are already burdened by multimodal treatment. It is evident that DRPs result in extended hospital stay, readmission to hospital and increased expenditure. The study mainly involved medication chart reviews in order to identify DRPs, but medication history interview or patient interviewing were not done. The most causes of DRPs that causes by drug selection is inappropriate drug selection (48.6%) of total drug selection, which is higher than result with studies done in Indonesia [Ramadaniati et al] (5.5%) and in France [Belaiche et al] (12%). Such discrepancy may be explained by the difference in the study participants, medication used, and the method of DRP classification. Healthcare professionals at should be encouraged to use standard treatment guideline. Anther causes of DRPs no indication for drug (27.1%) from drug selection which was consistent with studies conducted in in America (30.9%), [14], Netherlands (25.5%) Canada (5.5%) (13). In comparison, this finding is higher than the studies conducted in, Canada (5.5%) [42]. Malaysia (20.9%), and Pakistan (21.2%) [4]. Despite the difference of figures in many countries, polypharmacy is common among CKD population due to the nature of its management [13].

5.5 Second dose selection

The second most common drug therapy problem in our study was dose selection (34.4 %) of the total DRPs, which is Higher than result with the study done in France (19%) had inadequate Dosage. Inappropriate drug monitoring and failure of adjusting renal-dosed drugs as per the renal function could be the reason.

Dose tow low: the most causes DRPs that caused by dose selection dose too low accounted for 18% of all DRPS identified, which was consistent with studies conducted in France (19%) [27] and Nigeria

(20.9%) [7] is may be due to the similar study design used. Conversely, dose too low accounted for higher proportion of the DRPS in studies conducted in USA (33.5%) [19], France (25.5%) [13], Pakistan (31.1%) [6], and Beirut (10%) [45]. difference can be explained by the difference in study design used and health care setting in which the studies were conducted.

Dose to high: overdosage was accounted for (11.3%) from all dosage selection identified, which was consistent with studies conducted in Canada (13.6%) [42] and Switzerland (16%) [44]. Conversely, dose too high accounted for a larger proportion of the DRPs in studies conducted in USA (20.3%), France (42.2%), Canada (23.7%), and Beirut (28%) [45]. is difference might be an underestimate due to the lack of comprehensive documentation at the point of admission in the study.

5.6 Management of HTN

Among our study the most drug used for management of hypertension is amlodipine (37.3%) which is higher than the study (Ramadaniati et al.2016) (25) that finding most prevalent drugs prescribed in the study setting included amlodipine. This different in our study may be due to one of them the patient not come for follow up so the doctor prescribed amlodipine not ACEI or ARPS and Angiotensin-converting enzyme inhibitors (ACEIs) and angiotensin receptor blockers (ARBs), which are preferred drugs in the initial stages of CKD, can cause hyperkalemia in the end stages of CKD. Dose adjustment is required for ACEIs and ARBs in chronic renal failure due to the altered pharmacokinetic parameters. Hence, these drugs are least preferred in the end stages of CKD. However, to reduce proteinuria, ACEIs and ARBs are preferred over other drugs since they can reduce intra-osmotic pressure in Bowman’s capsule.

In our study the most frequent used were diuretic, which is lower than the study in India were found diuretic more used in the study population Meanwhile, progressive renal disease can exacerbate uncontrolled hypertension due to volume expansion and increased systemic vascular resistance so diuretics are necessary in CKD for the control of extracellular fluid volume expansion and their associated effects on blood pressure. Fluid retention is one of the complications of hypertension in CKD patients. Patients require diuretics to reduce blood pressure and to control fluid overload. The most diuretic used is torsemide which similar to study (Subeesh, et al.:) which found loop diuretics (torsemide and furosemide) are more used than thiazide diuretics. Former is recommended in the final stages (Stages 4 and 5) and latter is recommended in the initial stages (Stages 1–3) according to KDOQI guideline. All thiazide diuretics except metolazone are ineffective in CKD Stages 4 and 5 due to thiazides inability to reach the site of action. Torsemide, furosemide, and metolazone are the diuretics used in the CKD patients in this study.

5.6 Management of D.M

Among our study the most common drug used for management of D2M is insulin which is nearly similar to studies (Subeesh, et al.:) and Bajait et al. [27] that finding the insulin was the most prescribed antidiabetic versus oral hypoglycemic drugs. This similarity may be due to in diabetic patients, rigorous glycemic control decreases the rate and progression of microalbuminuria. However, during the phase of deteriorating renal function, insulin requirement falls because the kidney is a site of insulin degradation, and this might be the reason for the remarkable number of patients not receiving any antidiabetic agent.

5.7 Factor associated with DRP

Among our study marital status was significantly associated with the number of DRPs which is similar from most findings [4, 42] where marital status was not an independent predictor of DRPs.

In our study number of drug equal or less than 3 was significantly associated with a number of DRPs which is different with studies conducted in France and India [27, 42, 53]. is difference might be due to number of drug difference of study participants and large sample of the study.

Number of comorbidities was not significantly associated with the number of DRP which is in different with studies conducted in USA and India [14, 41]. Possible reasons for prescribers not picking up some of the comorbidities and inadequate information transfer between the patient and the prescriber.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

6.1 Recommendations

For future research, the study should be done in multiple nephron specialized centers to obtain the opportunity to compare the prevalence of DRPs in different centers. Furthermore, a larger sample size can be collected. A prospective, interventional study to test the pharmacist role in decreasing the number of DRPs is also recommended in order to provide more accurate results. Doing the study over a longer time can help in increasing the sample size to get more accurate results.

6.2 Conclusion

Identification of the DRPs and understanding their main risk factors would provide a valuable sight for the healthcare professionals, which as result will lead to decrease the DRPs incidence and prevent their occurrence.

Determination the DRPs among patients will not only help at the prevention of DRPs, but also in improving patient's clinical outcomes, and reducing the cost of treatment.

References

1. Webster AC, Nagler EV, Morton RL, Masson P. Chronic kidney disease. The lancet 2017; 389(10075): 1238-52.
2. Bikbov B, Purcell CA, Levey AS, et al. Global, regional, and national burden of chronic kidney disease, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. The Lancet 2020; 395(10225): 709-33.
3. Xie Y, Bowe B, Mokdad AH, et al. Analysis of the Global Burden of Disease study highlights the global, regional, and national trends of chronic kidney disease epidemiology from 1990 to 2016. Kidney international 2018; 94(3): 567-81.
4. Bharath Raj KC et al / Drug-related problems among chronic kidney disease patients: a clinical pharmacist led study International Journal of Pharmaceutical Research | Oct - Dec 2020 | Vol 12 | Issue.
5. [Guideline] Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group. KDIGO 2012 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease. Kidney Int Suppl. 2013. 3:1-150.
6. Dipiro, J. T., Talbert, G. C., Yee, G. R., Matzke, B. G., & Wells, L. M. P. (2021). Pharmacotherapy: A Pathophysiology Approach, 10th Edition. Mc-Graw Hill Medical, 6007–6048.
7. Yohanes Ayele2* , Kibkab. M, Mesay.D, Mohammed.B.A and Boressa .A.H. Assessment of drug related problems among type 2 diabetes mellitus patients with hypertension in Hiwot Fana Specialized University Hospital, Harar, Eastern Ethiopia. BMC Res Notes (2018) 11:728.

8. Tadesse Sheleme1* , Tamiru.S and Desalegn .F. Identification and resolution of drug‑related problems among diabetic patients attending a referral hospital: a prospective observational Study. Pharm Policy and Pract (2021) 14:50 https://doi.org/10.1186/s40545-021-00332-9.
9. Belayneh Kefale1 , Gobezie T T, Yitayih .K,Mulugeta.M, Amien .E and Amsalu.D. Magnitude and determinants of drug therapy problems among type 2 diabetes mellitus patients with hypertension in Ethiopia. Volume 8: 1–8 © The Author(s) 2020 Article reuse guidelines: sagepub.com/journals-permissions DOI: 10.1177/2050312120954695.
10. Joseph Nzayisenga1*, Nicholas Njau Ngomi2, John Nyiligira2. Drug related problems among type II diabetes mellitus patients with hypertension: a cross-sectional study DOI: 10.12032/life2020-0125-101.
11. Ejaz Cheema.et.al. Exploring Drug-Related Problems in Diabetic Patients during Ramadan Fasting in Saudi Arabia: A Mixed-Methods Study. Int. J. Environ. Res. Public Health 2019, 16, 499; doi:10.3390/ijerph16030499.
12. Silvy Hartuti1, Azizah. N, Santi. S. The Effect of Drug-Related Problems on Blood Glucose Level in the Treatment of Patients with Type 2 Diabetes Mellitus. Open Access Macedonian Journal of Medical Sciences. 2019 Jun 15; 7(11):1798-180
13. Fildza Huwaina Fathnin, et.al. The Relation of Drug Amount, Comorbidity, Blood Pressure, and Residential Area to Drug-Related-Problems of Hypertension Patients. Public Health Perspectives Journal 5 (3) 2020 178-186.
14. Tientcheu, D., Ayers, C., Das, S. R., McGuire, D. K., De Lemos, J. A., Khera, A., Vongpatanasin, W. (2015). Target organ

complications and cardiovascular events associated with masked hypertension and white-coat hypertension: Analysis from the Dallas Heart Study. Journal of the American College of Cardiology, 66(20), 2159–2169.

15. Hesty U Ramadaniati, Yusi Anggriani, Vonny M Wowor, Alvina Rianti. Drug-related problems in chronic kidneys disease patients in an Indonesian hospital: do the problems really matter? Int J Pharm Pharm Sci 2016;8(12):298-30
16. Kirsten K. Viktil and Hege Salvesen Blix. The Impact of Clinical Pharmacists on Drug-Related Problems and Clinical Outcomes. Journal compilation © 2008 Nordic Pharmacological Society. Basic & Clinical Pharmacology &Toxicology 102, 275–280.
17. Parthasarthi G, Nyfort – Hansen K, Nahata MC(2012). A textbook of Clinical Pharmacy Practice. 2nd ed. Hyderabad: Universities Press; Chapter 13, Medication Review, p.194.
18. Ayele M Argaw1*, Tsegaye T Hiwet2 and Bodena B Derse3. Drug Therapy Problems and Determinants among Ambulatory Type2 Diabetes Mellitus Patients: Pharmacists' Intervention in South-East Ethiopia. Endocrinol Metab Syndr, Vol. 8 Iss. 4 No: 303.
19. Aster Wakjira Garedow , Eshetu .M.B, Amare .D.W, Fantu .K.D, Fanta .G.F, Birtukan .I.L ,et.al. Drug-Related Problems and Associated Factors among Patients Admitted with Chronic Kidney Disease at Jimma University Medical Center, Jimma Zone, Jimma, Southwest Ethiopia: A Hospital-Based Prospective Observational Study. International Journal of Nephrology. Volume 2019, Article ID 1504371, 9 pages.
20. Norkasihan Ibrahim & Ian CK Wong & Susan Patey & Stephen Tomlin & Manish D Sinha & Yogini Jani. Drug-related problem in

children with chronic kidney disease In London . Pediatr Nephrol (2013) 28:25–31.

21. Viswam K. Subeesh, Rishma .A, Minnikanti .V.S.S, Kranthi .S.K. Evaluation of prescribing practices and drug‐related problems in chronic kidney disease patients: A cross‐sectional study In India. Perspectives in Clinical Research | Volume 11 | Issue 2 | April-June 2020.
22. Hasniza Zaman Huri, and Hoo Fun Wee. Drug related problems in type 2 diabetes patients with hypertension: a cross-sectional retrospective study in Malaysia. BMC Endocrine Disorders 2013, 13:2.
23. Yaschilal Muche Belayneh ,Teshome .M, Solomon .A, Zemene .D.K. A retrospective study of drug related problems and contributing factors among type 2 diabetes mellitus patients on follow up at public health institutions of kemisse town, north east Ethiopia. Metabolism Open 11 (2021) 100098.
24. Mechessa and Kebede. Drug-Related Problems and Their Predictors Among Patients with Diabetes Attending the Ambulatory Clinic of Gebre Tsadik Shawo General Hospital, Southwest Ethiopia. Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy 2020:13
25. Van Roozendaal BW, Krass I: Development of an evidence-based checklist for the detection of drug related problems in type 2 diabetes. Pharm World Sci 2009, 31(5):580–595.
26. Chan DC, Chen JH, Kuo HK, We CJ, Lu IS, Chiu LS, et al: Drug-related problems (DRPs) identified from geriatric medication safety review clinics. Arch Gerontol Geriatr 2011, 54:168–174.
27. Eichenberger PM, Lampert ML, Kahmann IV, van Mil JWF, Hersberger KE: Classification of drug-related problems with new

prescriptions using a modified PCNE classification system. Pharm World Sci 2010, 32(3):362–372.

28. Belayneh YM, Amberbir G, Agalu A. A prospective observational study of drug related problems in medical ward of a referral hospital in northeast Ethiopia. BMC Health Serv Res 2018 Dec;18(1):808.
29. Cipolle RJ, Strand LM, Morley PC. Pharmaceutical Care practice: A Clinician's Guide. second ed. New York: McGraw-Hill; 2004. p. 178–9.
30. Yimama et al. . Determinants of drug‑related problems among ambulatory type 2 diabetes patients with hypertension comorbidity in Southwest Ethiopia: a prospective cross sectional study BMC Res Notes (2018) 11:679.
31. Haymen Abdulmalik, Yohannes .T, and Nanati .L. Assessment of drug‑related problems among type 2 diabetic patients on follow up at Hiwot Fana Specialized University Hospital, Harar, Eastern Ethiopia. BMC Res Notes (2019) 12:771.
32. Ramadaniati HU, Anggriani YU, Wowor VM, et al., Drug-related problems in chronic kidneys disease patients in an Indonesian hospital: Do the problems really matter. Int J Pharm Phar Sci. 2016;8(12):298-302.
33. Stevens LA, Viswanathan G, Weiner DE (2010). Chronic kidney disease and end-stage renal disease in the elderly population: current prevalence, future projections, and clinical significance. Advances in chronic kidney disease,17(4), 293-301.
34. Adibe MO, Igboeli NU, Ukwe CV. Evaluation of drug therapy problems among renal patients receiving care in some tertiary hospitals in Nigeria. Tropical Journal of Pharmaceutical Research. 2017;16(3):697-704.

35. Garedow AW, Mulisa Bobasa E, Desalegn Wolide A, et al., Drug-related Problems and Associated Factors Among Patients Admitted with Chronic Kidney Disease at Jimma University Medical Center, Jimma Zone, Jimma, Southwest Ethiopia: A Hospital-based Prospective Observational Study. International Journal of Nephrology. 2019;2019.
36. Subeesh VK, Abraham R, Sai MV, et al., Evaluation of prescribing practices and drug-related problems in chronic kidney disease patients: A cross-sectional study. Perspectives in Clinical Research. 2020 Apr;11(2):70..
37. Belaiche S, Romanet T, Allenet B, et al., Identification of drug-related problems in ambulatory chronic kidney disease patients: a 6-month prospective study. J Nephrol. 2012;25(5):782-8.
38. Matzke GR, Aronoff GR, Atkinson Jr AJ, et al., Drug dosing consideration in patients with acute and chronic kidney disease- a clinical update from Kidney Disease: Improving Global Outcomes (KDIGO). Kidney international. 2011; 80(11):1122-37.
39. Saleem A, Masood I. Pattern and predictors of medication dosing errors in chronic kidney disease patients in Pakistan: a single center retrospective analysis. PloS one. 2016;11(7).
40. Dika P. Destiani, Athirah Ghazali. Drug Related Problems of Diabetic Nephropathy Patients in a Tertiary Hospital in Malaysia. Pharmacology and Clinical Pharmacy Research Vol.1 NO.2 August 2016.
41. Rana ABU FARHA, Akram SALEH, Salah ABURUZ. The impact of drug related problems on health-related quality of life among hypertensive patient. Pharmacy Practice 2017 Jul-Sep;15(3):995.
42. Rani NV, Rini Thoma RE, Soundararajan P. A study on drug related problems in chronic kidney disease patients of a tertiary care

teaching hospital in south India. World Journal of Pharmaceutical Research. 2014;3(4).

43. Njeri, Lisper W. Assessment of medication related problems among patients with chronic kidney disease in Kenyatta National Hospital. Diss.University of Nairobi, 2016.
44. Kusumawardani LA, Andrajati R, Nusaibah A. Drug-related problems in hypertensive patients: A cross-sectional study from Indonesia. J Res Pharm Pract 2020;9:140-5.
45. Zazuli Z, Rohaya A, Adnyana IK. Drug-Related Problems in Type 2 Diabetic Patients with Hypertension: A Prospective Study. J Basic Clin Pharma 2017;8:251-254.
46. van Mil JW, Westerlund LO, Hersberger KE, Schaefer MA. Drug-related problem classification systems. Ann Pharmacother. 2004;38(5):859–67.

Appendix(1) data collection form

Causes of Drug Related Problem in Chronic Kidney diseases with diabetic and/or hypertension

name of hospital: ……

Patient number: ……

Patient adherence

Age:

Sex: M ☐ F ☐

Family History:

Marital state: Married ☐ Single ☐

Diagnosis: CKD ☐ HTN ☐ DM ☐

First begin disease: CKD ☐ HTN ☐ DM ☐ HTN

DURATION: 0-5 Years ☐ 5-10 Years ☐ ≥ 10 Years ☐

BP: 120-129 mmhg ☐ 130-139mmhg ☐ ≥ 140mmhg ☐

Control ☐ uncontrol ☐

DRUG			
1- Name of drug	2- Dose	3- Frequency	4- Duration

DM

LAB RESULT: FSH

RBS

A1C

Control ☐ uncontrol ☐

DRUG			
1- Name of drug	**2- Dose**	**3- Frequency**	**4- Duration**

CKD ☐ ☐ ☐

DRUG			
1- Name of drug	**2- Dose**	**3- Frequency**	**4- Duration**

LAB DATA	
LAB	**RESULT**
K ✚	
Na ✚	
Ca ✚	
S. Cr	
Albumin	
Urea	

Notes: drugs that prescribed to use other than above drugs : [number of drugs taken by day]
Number of comorbidities:
.

Appendix (2) PCNE Causes

PCNE Classification for Drug-Related Problems V9.1 - Page 5

The Causes (including possible causes for potential problems)

Primary Domain	Code and causes
1. Drug selection The cause of the (potential) DRP is related to the selection of the drug (by patient or health professional)	**C1.1** Inappropriate drug according to guidelines/formulary **C1.2** No indication for drug **C1.3** Inappropriate combination of drugs, or drugs and herbal medications, or drugs and dietary supplements **C1.4** Inappropriate duplication of therapeutic group or active ingredient **C1.5** No or incomplete drug treatment in spite of

	existing indication **C1.6** Too many different drugs/active ingredients prescribed for indication
3. Dose selection The cause of the DRP is related to the selection of the dose or dosage	**C3.1** Drug dose too low **C3.2** Drug dose of a single active ingredient too high **C3.3** Dosage regimen not frequent enough **C3.4** Dosage regimen too frequent **C3.5** Dose timing instructions wrong, unclear or missing
4. Treatment duration The cause of the DRP is related to the duration of treatment	**C4.1** Duration of treatment too short **C4.2** Duration of treatment too long

هناك ارتفاع مقلق في انتشار أمراض الكلى المزمنة المرتبطة بمعدل اعتلال و وفيات والتي تتطلب اهتمامًا خاصًا باعتبارها إحدى مشكلات الصحة العامة المتزايدة. المشاكل المتعلقة بالأدوية شائعة في المرضى في المستشفيات بما في ذلك أمراض الكلى المزمنة وقد تؤدي إلى زيادة الإقامة في المستشفى وتكلفة الرعاية الصحية وزيادة مخاطر المرض و معدل الوفيات.

الهدف:

تحديد وتقييم المشاكل المتعلقة بالدواء وعوامل الخطر المرتبطة بالمريض المعالج من مرض الكلى المزمن مع ارتفاع ضغط الدم و / أو مرض السكري.

المنهجية:

الدراسة التي أجريت قائمة على الملاحظة بأثر رجعي بين المرضى الذين تم تشخيص إصابتهم بمرض الكلى المزمن وارتفاع ضغط الدم مع و/ او مرض السكري.

تم إجراء دراسة على المريض الذي أدخل إلى إحدى المستشفيات في صنعاء (مستشفى العلوم والتكنولوجيا الجامعي) لمدة ثلاثة أشهر من [١ / ديسمبر / ٢٠٢١ إلى ١٠ / فبراير / ٢٠٢٢]، وجمع البيانات المتعلقة بخصائص المريض والأدوية والتشخيص والنتائج المعملية من خلال مراجعة المخططات الطبية للمريض، و تم تحليل البيانات باستخدام برنامج الحزمة الإحصائية للعلوم الاجتماعية (SPSS) الإصدار ٢١.٠.

النتائج:

من بين ١٠٦ مريض كلى المزمن مع سكري و/أو ضغط ، كان ٨٦ (٨١.١ ٪) من المرضى يعانون من DRPS ، أي متوسط ما لا يقل عن اثنين لكل مريض.

إجمالي عدد ٢٣٣ مشكلة متعلقة بالدواء (DRPs) وتم تحديد أسباب كل DRP. وكان أكثر DRP شيوعًا بين المرضى متعلقا باختيار الدواء (40) (140 = n٪)، واختيار الجرعة (80 = n) (34.4٪)، و مدة العلاج (ن = ١٣) (٥.٦٪).

السبب الأكثر شيوعًا لاختيار الدواء هو الاختيار غير المناسب للعقار (٤٨.٦٪) والسبب الأكثر شيوعًا لاختيار الجرعة هي الجرعة المنخفضة جدًا (٥٢.٥٪)

الاستنتاجات: تحديد DRPs وفهم عوامل الخطر الرئيسية الخاصة به والذي من شأنه أن يوفر رؤية قيمة لأخصائي الرعاية الصحية ، مما سيؤدي إلى تقليل حدوث DRPs ومنع حدوثه.

لن يساعد تحديد DRPs بين المرضى في الوقاية من DRPs فحسب ، بل سيساعد أيضًا في تحسين النتائج السريرية للمريض وتقليل تكلفة العلاج.

الكلمات المفتاحية:

أمراض الكلى المزمنة ، السكري من النوع ٢ ، ارتفاع ضغط الدم والمشاكل المتعلقة بالأدوية.

الجمهورية اليمنية
وزارة التعليم العالي والبحث العلمي
جامعة ٢١ سبتمبر للعلوم الطبية والتطبيقية
كلية الصيدلة السريرية

أسباب المشاكل المتعلقة بأدوية مرضى الكلى المزمن المترافق مع اصابتهم بمرض سكر الدم مع او بدون مرض ارتفاع ضغط الدم في مستشفى خاص في اليمن

إعـــداد:

- عدي البريهي
- معاذ الادريسي
- شاكر عثمان
- فؤاد الخولاني
- حكيم السعيدي
- بلال شمس الدين
- احمد الشميري
- عبدالحافظ البصلاني
- عبد الله المحبشي
- عبدالملك سيف
- بسام العامري
- مروان سدهان
- انور حجر
- اميمة الصباري
- هبة العقربي
- ثريا شحيط
- حميد القامص
- ثريا البدوي
- ايناس راجح
- فاطمة عبداللطيف
- فاطمة الغرسي
- مرام شمسان
- ابراهيم جواح
- كمال مسعود
- محمد السباعي
- عمر المحبشي

إشراف:
د. الهام الضليمي
د. اقبال عبدالرحمن الوادعي

فبراير ٢٠٢٢م